

Research on the Impact of The Development of Digital Financial Inclusion on Multidimensional Poverty

Yu Cheng

Hunan University of Science and Technology, Xiangtan 411201, China

Abstract: Based on the provincial panel data of China from 2011 to 2020, this paper empirically analyzes the impact of digital inclusive finance on multidimensional poverty. The research result shows that in the short term, due to the existence of the digital divide effect, the development of digital inclusive finance has deepened the degree of multidimensional poverty; In the long run, digital inclusive finance has played a significant dividend effect, and has promoted the process of multi-dimensional poverty alleviation by reducing the supply cost of financial institutions and the use cost of financial services. The paper provides a useful reference for promoting the development of digital finance, consolidating and expanding the achievements of poverty alleviation and alleviating multidimensional poverty.

Keywords: Digital financial inclusion, Multidimensional poverty, Nonlinear effect.

1. Introduction

Poverty issues run through the development of human society. Solving poverty is the common responsibility and pursuit of the international community, and alleviating poverty is particularly important in developing countries. As the largest developing country in the world, China has achieved phased success in the process of poverty eradication, and has contributed valuable experience to the development of poverty eradication in the world. However, due to the complexity of poverty issues, severe challenges and pressures still exist in the process of deepening poverty alleviation. Although absolute poverty has been eliminated in China, the problem of poverty has not been completely solved. With the development of economy and society and the increase of per capita disposable income, the main task of poverty alleviation has gradually shifted from eradicating absolute poverty to alleviating relative poverty. It must be pointed out that poverty does not only refer to income, but also includes whether the benefits of various dimensions such as economic capacity, development capacity and living standards are deprived. The situation of welfare deprivation in other dimensions besides income reflects the multidimensional situation that China is currently facing in the fight against poverty. The establishment of a long-term mechanism to solve multi-dimensional poverty is a key issue for poverty alleviation policies in the new era.

In recent years, because digital inclusive finance can give full play to the technological advantages and make up for the shortcomings of traditional inclusive finance, the political and academic circles have turned their attention to digital inclusive finance, and the development of digital inclusive finance has become a hot point in anti-poverty research. Digital inclusive finance is an upgrade of traditional finance and inclusive finance. It uses digital means to make up for the disadvantages of traditional inclusive finance. Its essence still belongs to inclusive finance. Traditional inclusive finance is often restricted by space and geography, and can't really play its inclusive role. Digital inclusive finance can use digital means to expand the coverage of traditional inclusive financial services, improve the access of financial services to specific groups, especially the poor, and at the same time

reduce the human and material costs required by financial institutions to provide financial resources. In view of this, this paper hopes to test the effect of digital inclusive finance on multidimensional poverty reduction through empirical methods.

2. Literature Review

The term of inclusive finance was first used by the United Nations in 2005 to promote the Year of Microcredit. William Easterly (2006) believes that inclusive finance is highly relevant to financial exclusion, and the use of inclusive finance can effectively solve the problem of financial exclusion[1]. Sarma and Pais selected relevant indicators and provided the calculation method of inclusive financial index in 2008[2]. The research results of Claessens et al. show that the inclusive development of the financial system can promote the balanced distribution of finance, reduce the inequality of different groups in accessing the financial system and enjoying financial services, and improve the income level of low-income groups[3]. However, some scholars are cautious about the development of inclusive finance. Arestis et al. pointed out that the current government-led inclusive financial development model is more likely to lead to improper allocation of financial resources and inefficient financial services, thus reducing the income level of poor farmers[4].

Digital inclusive finance is realized by applying digital technology on the basis of inclusive finance, which is an innovative development of traditional inclusive finance. The rapid development of digital technology has had an important impact on inclusive finance[5]. Digital technology can alleviate the service barriers faced by traditional finance, such as information asymmetry, high transaction costs, behavioral bias, lack of competition, etc. which is inherently inclusive[6]. At the same time, the combination of digital finance and inclusive finance is beneficial to financial service users, digital financial providers, governments and regional economies[7]. Song[8] analyzed the poverty reduction effect of digital inclusive finance from the two aspects of threshold effect and exclusion effect, and used some provincial data from 2011 to 2015 to conduct empirical tests. The results show that digital inclusive finance can improve the income of

low-income people. On the basis of Song's research, Li et al. introduced the theory of financial exclusion to explain the impact of digital inclusive finance on regional poverty, and constructed provincial panel data from 2011 to 2017, concluding that digital inclusive finance can reduce the urban-rural income gap and present heterogeneity[9]. Zhang et al. [10]studied the impact of digital inclusive finance on the income of urban and rural residents in China, taking into account the gap between urban and rural areas in the level of development and Internet technology. Through empirical tests, they found that digital inclusive finance can significantly improve the income of urban and rural residents, and from a numerical point of view, the effect of digital inclusive finance on the income of rural residents is more obvious. However, Liu et al. [11] using the data of the China Family Panel Study (CFPS) and the China Digital Inclusive Finance Index, found that digital inclusive finance has a significant positive effect on the income of urban residents, but has no significant impact on the income of rural residents, which indicates that digital inclusive finance has increased the income gap between urban and rural areas, making the rural

poverty level more severe. This conclusion has also been approved by Ji et al., who also believe that digital inclusive finance will lead to the imbalance of urban and rural income in China in a short time[12].

3. Data and Empirical Model

3.1. Variable specification

3.1.1. Dependent variable: multidimensional poverty index(MPI)

Most of the existing documents measure the degree of poverty with the income of residents. However, the poverty of residents is not just a lack of income. If only one indicator is used to measure poverty, this will lead to a one-sided interpretation of the current situation of poverty. This paper comprehensively considers various factors, draws on the definition of multi-dimensional poverty by relevant scholars, and constructs a regional multi-dimensional poverty measurement system from the five dimensions of income, education, medical care, consumption and living standard [13]. Specific indicators are shown in Table 1.

Table 1. Multidimensional poverty indicator system

Dimension of poverty	Concrete index	Index property
Income level	Annual per capita disposable income	negative
Education level	Per capita years of schooling	negative
Medical level	Number of primary medical institutions	negative
Consumption level	Annual per capita consumption	negative
Living level	Engel coefficient	positive

Then, carry out dimensionless processing on the data of the five dimensions, and obtain the multidimensional poverty index by weighting the data under the condition of equal weight

3.1.2. Explanatory variables: Digital inclusive finance index(DIF)

This paper selects the Digital Inclusive Finance Index released by Peking University to measure the level of digital inclusive finance, covering the data of China's provinces from 2011 to 2020. The index describes the development level of digital inclusive finance from three dimensions: coverage breadth, depth of use and degree of digitalization. These three dimensions are positive indicators. The larger the value, the higher the degree of digital financial inclusion.

3.1.3. Control variable

Referring to relevant studies, this paper use the level of economic development, government intervention, education development, openness to the outside world, urbanization level and marketization level as the control variables for the effect of poverty reduction from the economic, social, cultural and geographical perspectives. Government intervention is measured by the ratio of public financial expenditure to regional GDP, recorded as Gov. The level of opening to the

outside world converts the total amount of import and export trade into RMB at the exchange rate of the current year, and then divides it by the gross regional product, which is recorded as Ope. The level of economic development is measured by regional per capita GDP, recorded as Mgdg. The urbanization level is measured by the proportion of urban permanent residents in the total population, which is recorded as Urb. The marketization level is measured by the marketization index, which is recorded as Mar.

3.2. Data Sources

The data used in this paper is the panel data of 31 provinces from 2011 to 2020. The original data are from the National Bureau of Statistics, the provincial statistical yearbook, the China Education Statistical Yearbook, the Wind database, the China Health Statistical Yearbook, the marketization index calculated by Fan Gang, and the Peking University Digital Inclusive Financial Index. Because the units of each variable are not completely unified, in order to consolidate the dimension level, this paper logarithmizes the digital inclusive financial index-type unitless variables and the per capita GDP with excessive volatility. The specific descriptive statistical results of variables are shown in Table 2.

Table 2. Descriptive statistics of major variables

Variables	Average value	Standard deviation	Maximum value	Minimum value
MPI	24.32	32.47	110.59	-41.32
DIF	196.54	86.33	344.96	22.78
Gov	31.28	23.01	66.43	11.30
Ope	53.54	19.39	88.63	26.37
Mgdg	53450.14	27352.32	164158	16165
Urb	49.21	21.63	90.92	31.06
Mar	13.33	18.49	5.28	18.55

3.3. Model design

Referring to the research in the field of digital inclusive finance, this paper uses the multi-dimensional poverty level of 31 provinces (municipalities directly under the Central Government and autonomous regions) in China from 2011 to 2020, the digital inclusive finance index and the provincial-level panel data of relevant indicators. and first establishes the benchmark model as follows. At first, we build the *baseline model I* as follows:

$$MPI_{it} = \beta_0 + \beta_1 \ln DIF_{it} + \beta_x X_{it} + \mu_i + \varphi_t + \varepsilon_{it} \quad (1)$$

In order to verify whether digital inclusive finance has a nonlinear impact on the multidimensional poverty index, on the basis of the baseline model, we have added the square term of the digital inclusive finance index. It can not only verify the nonlinear relationship between the digital inclusive finance index and the multidimensional poverty index, but also study the impact of different stages of the development of digital inclusive finance on poverty. The improved model *II* is as follows:

$$MPI_{it} = \beta_0 + \beta_1 \ln DIF_{it} + \beta_2 \ln^2 DIF_{it} + \beta_x X_{it} + \mu_i + \varphi_t + \varepsilon_{it} \quad (2)$$

In formula (1) and (2), MPI_{it} denotes the multidimensional poverty index of province i in year t .

DIF_{it} denotes the digital inclusive finance index of province i in year t . Vector X_{it} represents a series of control variables that may affect the multidimensional poverty index. μ_i stands for the regional fixed effect of province i . φ_t stands for the time fixed effect in year t . ε_{it} represents the random error term. β_1 and β_2 are two parameters to be estimated, and their valence and magnitude predict the direction and strength of the influence of digital financial inclusion on the multidimensional poverty index. After calculating the coefficients β_1 and β_2 , we can calculate the inflection point of the nonlinear relationship of the development of digital inclusive finance to alleviate multidimensional poverty.

4. Empirical Analysis

First of all, the Hausman test is used for the above formula (1) and (2) to determine whether to use random effect estimation or fixed effect estimation. The result shows that the P value is 0.004 and 0.000, respectively, which strongly rejects the original hypothesis. Therefore, this paper chooses to use the two-way fixed effect model.

In order to explore the impact of the level of digital inclusive finance on multidimensional poverty, we put relevant data into the model to obtain the coefficients and significance of each variable. The regression results are as follows:

Table 3. The regression results of models

Variables	baseline model I		improved model II	
	(1)	(2)	(3)	(4)
ln DIF	-0.277** (5.28)	-0.314** (4.17)	0.423** (3.96)	0.526** (4.82)
\ln^2 DIF			-0.134*** (6.17)	-0.171*** (6.65)
Gov		0.000 (0.012)		0.000 (0.007)
Ope		-0.126** (4.38)		-0.097** (3.92)
Mgdp		0.093*** (2.29)		0.122** (3.56)
Urb		-0.012** (3.21)		-0.027*** (3.68)
Mar		0.009 (1.63)		0.013* (1.52)
constant	0.172** (4.37)	0.535*** (5.61)	1.621*** (4.34)	1.434*** (3.92)
Regional effect	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes
N	310	310	310	310
Adjust R^2	0.613	0.735	0.877	0.926

Standard errors in parentheses; * means $p < 0.1$, ** means $p < 0.05$, *** means $p < 0.01$

As can be seen from the Table 3, column (1) and column (2) on table 3 are the regression results of benchmark model I. Column (1) does not consider the control variable while column (2) considers the control variable. The regression results show that the estimated coefficient of core explanatory variable, digital inclusive finance index, is significantly negative, indicating that, on the whole, the development of digital inclusive finance can reduce China's multidimensional poverty. Column (3) and column (4) on table 3 are the

regression results of improved model *II*. Column (3) does not consider the control variable while column (4) considers the control variable. The regression results show that the estimated coefficient of core explanatory variable β_1 is significantly positive and the quadratic coefficient β_2 is significantly negative, which indicates that the development of digital inclusive finance will aggravate the degree of multidimensional poverty in the short term, and in the long term, digital inclusive finance will significantly reduce the

degree of multidimensional poverty, which belongs to the inverted "U" relationship in the nonlinear relationship.

According to the results of adjusted decision coefficient R^2 , the decision coefficient of model II is significantly greater than that of model I, which shows that model II is significantly better than model I in fitting the relationship between the index of digital inclusive finance and multidimensional poverty. It is more appropriate to describe the impact of digital inclusive finance on multidimensional poverty with nonlinear effects. According to actual situation, in the early stage of the development of digital inclusive finance, the contacts are mainly the elites of developed cities. They gain greater benefits by virtue of digital inclusive finance, thus widening the gap between rich and poor, and thus making the poverty reduction effect of digital inclusive finance not ideal. In the long run, digital inclusive finance may have a positive impact on multi-dimensional poverty alleviation by reducing the supply and use costs of financial services. For example, mechanisms or approaches such as improving the availability of credit and expanding the coverage of insurance will have a positive effect on multidimensional poverty alleviation.

For the control variable, the coefficient of economic development level and urbanization level is significantly negative, indicating that economic development itself drives investment and employment of some people, thus reducing the multidimensional poverty level. The rising level of urbanization can effectively improve the efficiency of resource exchange, and at the same time, it can gather scattered industries to attract more people and investment to participate in the urbanization construction. In this process, a large number of middle and low-end jobs can be generated to solve the employment problem of the poor, while the supporting construction of the government can alleviate the poverty in education and medical care. The level of government intervention and marketization is not significant. The possible reason is that the government financial expenditure is the sum of all aspects of expenditure and will not all have a direct impact on poverty reduction. The level of marketization is evaluated from the relationship between the government and the market and the development degree of the factor market. These indicators focus on the establishment of the market system and have little impact on the vast rural poor in the urban-rural dual economic system.

5. Conclusion

This paper discusses the mechanism of the impact of digital inclusive finance on multi-dimensional poverty alleviation. Collecting relevant data from 31 provinces and regions in China from 2011 to 2020, and using relevant econometric analysis methods to conduct empirical tests on theoretical assumptions. The research result shows that in the short term, due to the existence of the digital divide effect, the development of digital inclusive finance has deepened the degree of multidimensional poverty. In the long run, digital inclusive finance has played an obvious dividend effect,

promoting the process of multidimensional poverty alleviation by reducing the supply and use costs of financial services.

Based on the research conclusions of this paper, we can obtain the corresponding policy implications as follows: First, we should build and improve the digital inclusive financial ecosystem. Secondly, we should optimize the credit mechanism from both sides of supply and demand, not only to appropriately expand the credit supply, enrich credit products, but also to prevent excessive lending. Thirdly, promote the development of digital insurance services from both sides of supply and demand. Finally, we should pay attention to the regional differences of the poverty reduction effect of digital inclusive finance and promote the implementation of the differentiation strategy.

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