Development of Digital Inclusive Finance and Urban-Rural Income Gap in Sichuan Province

Peixiang He[1,a,*]

[1]School of Insurance and Economics, University of International Business and Economics, Chaoyang District, Beijing, China
[a]hpx2000@foxmail.com
*Corresponding author

Keywords: Digital inclusive finance, Urban-rural income gap, Theil index

Abstract: Digital inclusive finance has a great impact on reducing the cost of financial services, providing convenient financial services, alleviating poverty and other aspects. From the perspective of China's national level, it can also significantly narrow the income gap between urban and rural residents. However, few papers set the research objects of digital inclusive finance as prefecture-level cities in Sichuan Province, China. This paper uses the panel data of 18 prefecture-level cities in Sichuan Province from 2014 to 2018 as the research sample, uses the Theil index to measure the urban-rural income gap, and uses the panel fixed effect model to empirically test the impact of digital inclusive finance on the urban-rural income gap in Sichuan Province. The results show that: (1) the development of digital inclusive finance has a mitigating effect on the urban-rural income gap; (2) The mechanism test shows that digital inclusive finance in Sichuan Province mainly reduces the urban-rural income gap through the coverage breadth of digital finance and the digitalization degree of inclusive finance, while the effect of the depth of digital finance on the urban-rural income gap is not obvious.

1. Introduction and Literature Review

Since China's reform and opening up, the economy of Sichuan Province has grown rapidly. However, compared with urban areas, the economic development of rural areas is still relatively slow, which leads to serious urban-rural duality and uneven urban-rural income development. Compared with urban areas, the financial awareness in rural areas is low. Most rural residents do not understand and are not willing to take the initiative to understand the products launched by banks and other financial institutions, resulting in the lack of financial products launched by rural financial institutions compared with urban areas. In addition, since the rural revitalization strategy, a number of small and micro enterprises have actively responded to the call to emerge in rural areas, but the overall lack of financial awareness, such as agriculture-related loans are risky, and the role of insurance for their support is too small; Due to the "20-80 principle", the financial institutions' capital supply for small and micro enterprises is far less than that of urban enterprises. In 2016, China's State Council issued the Plan for Promoting the Development of Inclusive Finance (2016-

2020), which pointed out that vigorously developing inclusive finance "is conducive to promoting the sustainable and balanced development of the financial industry, promoting mass entrepreneurship and innovation, and boosting the transformation and upgrading of economic development mode". In recent years, with the rise and popularization of high and new technologies such as the Internet, China's digital inclusive finance has also developed rapidly. Relying on the Internet and other high and new technologies, digital inclusive finance can largely break the spatial-temporal and geographical restrictions of financial services and effectively reduce the service costs of financial institutions. At the same time, China's e-commerce and electronic payment technology are at the leading level in the world, which has a significant advantage in promoting the development of digital inclusive finance, which is also an important opportunity to realize the transcendental development of China's inclusive finance, maintain the level of economic growth and improve the quality of economic growth (Zhan, 2018) [1]. Can the development of digital inclusive finance significantly narrow the urban-rural income gap and provide new ideas for the coordinated development of regions in China?

Inclusive finance can be defined as a financial system that can effectively and comprehensively provide services to all social classes and groups. Its original intention is to emphasize the continuous improvement of financial infrastructure, improve the availability of financial services, and achieve relatively convenient financial services at a lower cost to people from all walks of life, especially underdeveloped areas and low-income people (Guo et al., 2020) [2]. The G20 Hangzhou Summit in 2016 adopted the G20 High-level Principles on Digital Financial Inclusion, which holds that digital financial inclusion "generally refers to all actions to promote financial inclusion through the use of digital financial services". Previous studies have explored the impact of the development of digital inclusive finance on regional economic development. In general, digital inclusive finance can promote the high-quality development of regional economy (Jiang and Jiang, 2020) [3]. In addition, digital inclusive finance has a significant effect on poverty alleviation, especially for several provinces with low levels of economic development (Gong and Cheng, 2018) [4]. The development of digital inclusive finance also has a stronger role in encouraging entrepreneurship in provinces with low urbanization rate and micro-enterprises with less registered capital, which reflects the characteristics of digital financial inclusiveness (Xie et al., 2018) [5]. Although digital inclusive finance has many benefits for economic development, it is also necessary to be alert to its risks in some specific circumstances. From the perspective of local governments' prevention and control of systemic financial risks, Zhu et al. (2021) argued that there is an inverted U-shaped relationship between digital inclusive finance and local hidden debt risks, and this inverted U-shaped relationship is most significant in the eastern region[6]. Yi and Zhou (2018) used micro data to prove that the development of digital inclusive finance has significantly promoted household consumption in the sample period, and indeed increased the debt-to-income ratio of households, so it is necessary to beware of excessive and rapid growth of household debt[7]. Of course, some scholars believe that the current digital inclusive finance has an inhibitory effect on the number of economic growth in most regions of China (Zhan, 2018) [1].

In general, existing studies have discussed the impact of digital inclusive finance on promoting high-quality economic development, alleviating poverty, encouraging entrepreneurship and other aspects. From the perspective of China's national level, it can also significantly narrow the income gap between urban and rural residents (Song, 2017) [8]. However, few papers have specifically discussed the impact of digital inclusive finance on the urban-rural income gap at the prefecture level in Sichuan Province.

Compared with the existing literature, the marginal contribution of this paper is mainly reflected in the following three aspects: (1) Using Theil index to measure the urban-rural income gap at the prefecture-level, this paper empirically tests the alleviation of the urban-rural income gap by the

development of digital inclusive finance. (2) The conclusions are still robust after the relative income gap is used to replace the explained variables. (3) By testing the influence mechanism, it is concluded that digital inclusive finance in Sichuan Province mainly reduces the urban-rural income gap through the coverage breadth of digital finance and the digitalization degree of inclusive finance, while the effect of the depth of digital finance on the urban-rural income gap is not obvious.

2. Research Design and Data Sources

2.1. Data Sources

This paper takes the panel data of 18 prefecture-level cities in Sichuan Province from 2014 to 2018 as the research sample, and the 18 prefecture-level cities are: Chengdu, Zigong, Panzhihua, Luzhou, Deyang, Mianyang, Guangyuan, Suining, Neijiang, Leshan, Nanchong, Meishan, Yibin, Guang 'an, Dazhou, Ya 'an, Bazhong and Ziyang. The data mainly come from EPS database, CEIC database, China Statistical Yearbook and Sichuan Statistical Yearbook. The digital inclusive financial index is from the China Digital Financial Inclusive Development Index released by the Institute of Digital Finance of Peking University.

2.2. Variable Description

2.2.1. Explained Variable

This paper chooses Theil index to measure the urban-rural income gap in China. The Theil index is more sensitive to the income changes of the high-income and low-income groups at both ends of the dispersion, and is more reasonable than the urban-rural income ratio and Gini coefficient. The Theil index is calculated as follows:

$$GAP_{i,t} = \sum_{j=1}^{2} \left[\frac{p_{ij,t}}{p_{i,t}} \right] \ln \left[\frac{p_{ij,t}}{p_{i,t}} \Big/ \frac{z_{ij,t}}{z_{i,t}} \right] \tag{1}$$

In the robustness test part, this paper uses the urban-rural income ratio(*gap1*) to replace the Theil index, and carries out the robustness test of changing the explained variable.

2.2.2. Explanatory Variables

The index used in this paper to measure the development level of digital inclusive finance is the Index of Digital inclusive Finance of Peking University. The index is jointly compiled by the Institute of Digital Finance of Peking University and Ant Financial. With the help of Ant Financial's transaction account big data platform, the index has good rationality and reliability. In the analysis of influence mechanism, the index of digital inclusive finance is replaced by the index of coverage breadth (measured by the number of electronic accounts), the index of depth of use (measured by the number of people using financial services per 10,000 Alipay users and the per capita transaction activity), and the index of digitalization (measured by the convenience, low cost and the degree of credit). The Institute of Digital Finance of Peking University released the first and second phase of data in 2017/2019, and the measurement time is 2011-2015 /2016-2018. This paper selects these two periods of indexes as the measurement indicators of the development level of digital inclusive finance in Sichuan Province from 2014 to 2018.

2.2.3. Control Variables

The control variables selected in this paper are the logarithm of per capita real GDP, urbanization rate, industrial structure, government regulation, the number of college students per 10,000 people, and per capita capital stock. ①The logarithm of per capita real GDP(*lnpgdp*), and the square of the logarithm(*lnpgdp2*). According to Kuznet's "inverted U" hypothesis, the urban-rural income gap will expand in the early stage of economic development, and then turn to narrow the urban-rural income gap after reaching a certain critical value. In this paper, the logarithm of the deflated real GDP per capita in 1999 and the square term of the logarithm of the real GDP per capita are used to measure the degree of economic development. ②Urbanization rate (*urban*). The urbanization rate refers to the proportion of permanent residents in a city or town to the total population of the city. The existence of a dual economic structure has greatly limited the mobility of labor between urban and rural areas in China, and administrative and economic measures have been used to restrict farmers from entering cities and seeking employment opportunities. Lu and Chen (2004) through empirical analysis, all concluded that the rise of urbanization level had a narrowing effect on the income gap between urban and rural residents [9]. ③Industrial structure(*indus*). The value added of the tertiary industry in this region is higher than the GDP of that year. If the industry in a certain region is dominated by the tertiary industry in the city, it is likely to lead to a large income gap between urban and rural areas. ④Government regulation (*gov*). In this paper, the government expenditure divided by GDP is used to measure the government's economic regulation. ⑤Education level (*edu*). It is measured by the number of college students per 10,000 people. Urban education resources are relatively abundant, and education is also an important factor affecting income. ⑥The logarithm of capital stock per capita (*lnk*). The investment in fixed assets is deflated at 1999 prices and calculated by the perpetual inventory method. Urban residents are likely to have a higher stock of capital and thus a higher income.

The descriptive statistics of each variable are shown in Table 1.

Table 1: Descriptive statistics

VARIABLES	N	mean	sd	min	max
GAP	90	0.0773	0.0179	0.0323	0.119
index	90	183.7	33.66	116.7	266.8
breadth	90	166.7	28.38	118.1	257.5
depth	90	183.2	48.24	91.81	271.2
level	90	241.0	42.87	143.9	293.1
pgdp	90	30900	14466	11069	83594
lnpgdp	90	10.25	0.425	9.312	11.33
lnpgdp2	90	105.2	8.761	86.71	128.5
urban	90	0.600	0.184	0.173	0.920
indus	90	0.351	0.0719	0.227	0.541
gov	90	0.231	0.0945	0.117	0.656
edu	90	128.6	139.9	2.117	615.4
k	90	2811	2532	323.8	14212
lnk	90	7.627	0.816	5.780	9.562
gap1	90	2.256	0.177	1.892	2.687
year	90	2016	1.422	2014	2018

2.3. Empirical Strategy

In order to test whether the development of digital inclusive finance can reduce the income gap between urban and rural areas, based on the above theoretical analysis and research hypotheses, this paper constructs the following benchmark measurement model:

$$GAP_{it} = \beta_0 + \beta_1 index_{it} + \beta_2 X_{it} + \mu_i + \varepsilon_{it} \tag{2}$$

Panel fixed effect model is used for estimation, which can alleviate the endogenous problem to a certain extent. Where i represents city and t represents time. GAP is the explained variable, represents Theil index, and represents the urban-rural income gap in a certain area; $index$ is the core explanatory variable, representing the digital inclusive financial index, which represents the development level of digital inclusive financial in a region; X is a series of control variables, such as per capita real GDP, urbanization rate, industrial structure, government regulation, number of college students per 10,000 people, per capita capital stock, etc. μ represents city fixed effect; ε represents the random disturbance term.

3. Empirical Results and Analysis

3.1. Regression Results

Table 2: Regression results

	(1)	(2)	(3)	(4)
index	-0.00011***	-0.00008***	-0.00007***	-0.00008***
	(-14.572)	(-4.133)	(-3.446)	(-4.832)
lnpgdp		-0.10023*	-0.07457	-0.11810***
		(-2.094)	(-1.594)	(-3.642)
lnpgdp2		0.00439*	0.00310	0.00549***
		(2.026)	(1.476)	(3.532)
urban			-0.01930***	-0.00790
			(-3.844)	(-1.722)
gov			0.00149	0.00246
			(0.583)	(1.383)
indus				0.00220
				(0.425)
edu				-0.00008***
				(-5.368)
lnk				-0.00018
				(-0.522)
Constant term	0.09680***	0.65663**	0.53987*	0.73884***
	(72.278)	(2.508)	(2.100)	(4.392)
District fixed effects	YES	YES	YES	YES
N	90.00000	90.00000	90.00000	90.00000
Adjusted R^2	0.90373	0.91911	0.92303	0.95109
F	212.33427	148.23829	354.13903	365.34451

Note: ***, ** and * indicate that the regression results are significant at the levels of 1%, 5% and 10% respectively, and the figures in parentheses are t-statistics.

Table 2 reports our benchmark regression results. In the regression process, we gradually put the

control variables into the regression equation. In the successive regression of the model, the coefficients of digital inclusive finance on the urban-rural income gap in Sichuan are all negative, and they are all significant at the significance level of 1%. The coefficient is stable between -0.00007 and -0.0011, and the fluctuation is small. The impact of digital inclusive finance on the urban-rural income gap is consistent with the theoretical expectation of this paper, and has a significant inhibitory effect.

3.2. Robustness Test

In order to further verify the reliability of the benchmark regression results, digital inclusive finance can inhibit the urban-rural income gap. We replaced the explained variable and replaced Theil index with urban per capita income/rural per capita income. The regression results are shown in Table 3. When the fixed effects are controlled, the regression results of key variables are negative and significant at the level of 1%. The estimated results are basically consistent with the previous results, indicating that the conclusions of this paper are robust.

Table 3: Regression results of robustness test

	(1)
index	-0.00064***
	(-3.275)
Constant term	8.46734***
	(3.929)
Other control variables	YES
District fixed effects	YES
N	90.00000
Adjusted R^2	0.92911
F	150.34060

Note: ***, ** and * indicate that the regression results are significant at the levels of 1%, 5% and 10%, respectively, and the figures in parentheses are t-statistics.

4. Analysis of Influencing Mechanism

In order to specifically explore the impact of the coverage breadth, depth of use and degree of digital support services of digital inclusive finance on the urban-rural income gap, the core explanatory variable *index* is replaced by the coverage breadth index (*breadth*), the depth of use index (*depth*) and the degree of digitalization index (*level*) respectively. The regression results are shown in Table 4.

It can be seen from the results that the value of the coverage breadth index is − 0.00009, which is significant at the level of 1%, indicating that every 100 percentage points increase in the coverage breadth of digital inclusive finance can reduce the Theil index by 0.009% percentage points, and the convergence effect is significant. The value of the depth of use index is -0.00001, indicating that every 100 percentage points increase in the depth of use of digital inclusive finance can reduce the Theil index by 0.001%, but this conclusion fails to pass the significance test of 10%, 5% and 1%. The value of digitization degree index is -0.00002, which is significant at the level of 1%, indicating that every 100 percentage points increase in the digitization degree of digital inclusive finance can reduce the Theil index by 0.002%, and the convergence effect is significant.

The conclusion shows that: first of all, the coverage breadth of digital inclusive finance increases, that is, the availability of digital inclusive finance increases, which plays a great role in narrowing

the urban-rural income gap. At present, rural areas are gradually covered by digital inclusive finance, and this coverage has begun to support rural economic growth in recent years; While cities can improve their economic level through inclusive finance, the impact of inclusive finance development on cities is less than that on rural areas. That is, with the increase of the coverage breadth of digital inclusive finance, the urban-rural income gap has been reduced to a certain extent.

Secondly, the convergence effect of the depth of digital inclusive finance on the urban-rural income gap is not obvious. Most rural areas have not been exposed to digital inclusive finance for a long time. In areas where financial development has just started, it is not possible to enjoy the economic convenience brought by digital inclusive finance to a deeper extent as soon as they are exposed to it. Therefore, the depth of use cannot significantly improve the rural economy, that is, it cannot effectively converge the urban-rural income gap.

Finally, the increasing degree of digitalization indicates that the frequency of using digital inclusive finance has increased. Urban residents have become accustomed to various high-frequency digital transactions, such as scanning code payment, mobile banking transfer, etc. However, rural residents have just come into contact with digital inclusive finance, and the economic growth brought by the initial change in the frequency of digital inclusive finance is much greater than that of urban residents where digital inclusive finance has become the norm. Therefore, the degree of digitalization can effectively narrow the urban-rural income gap.

Table 4: Mechanism Test

	(1)	(2)	(3)
breadth	-0.00009***		
	(-5.456)		
depth		-0.00001	
		(-0.961)	
level			-0.00002***
			(-5.904)
Constant term	0.94360***	0.92788***	0.79747***
	(5.707)	(5.126)	(4.903)
Other control variables	YES	YES	YES
District fixed effects	YES	YES	YES
N	90.00000	90.00000	90.00000
Adjusted R^2	0.95526	0.92356	0.93730
F	331.48916	119.77782	229.13082

Note: ***, ** and * indicate that the regression results are significant at the levels of 1%, 5% and 10% respectively, and the figures in parentheses are t-statistics.

5. Conclusion

Based on the existing literature, this paper takes the panel data of 18 prefecture-level cities in Sichuan Province from 2014 to 2018 as the research sample to explore the impact of digital inclusive finance on the urban-rural income gap in Sichuan Province, and verifies the inhibitory effect of digital inclusive finance on the urban-rural income gap in Sichuan Province. This paper further examines the impact mechanism of the coverage breadth of digital inclusive finance, the digitalization degree of inclusive finance and the depth of the use of digital finance. The specific conclusions are as follows: (1) the development of digital inclusive finance has a mitigating effect on the urban-rural income gap. This paper uses Theil index to measure the urban-rural income gap at the prefecture level, and verifies the above conclusions through the robustness test of changing

the explanatory variables. (2) Digital inclusive finance in Sichuan Province mainly reduces the urban-rural income gap through the coverage breadth of digital finance and the digitalization degree of inclusive finance, while the effect of the depth of digital finance on the urban-rural income gap is not obvious.

References

[1] Zhan Yunqiu. (2018) Study on Digital Inclusive Finance's Effect on the Quantity and Quality of Promoting Economic Growth—The System GMM Estimation Based on Provincial Panel Data. Credit Reference, 8, 51-58.
[2] Feng Guo, Jingyi Wang, Fang Wang, Zhiyun Cheng, Tao Kong and Xun Zhang. (2020) Measuring China's Digital Financial Inclusion: Index Compilation and Spatial Characteristics. China Economic Quarterly, 4, 1401-1418.
[3] Jiang Changliu and Jiang Chengtao. (2020) Can Digital Inclusive Finance Promote High-Quality Development of Regional Economy: Based on Empirical Evidence of 258 Cities. Journal of Hunan University of Science and Technology (Social Science Edition), 3, 75-84.
[4] Gong Qinyi and Cheng Xuezhen. (2018) Digital Financial Inclusion, Rural Poverty and Economic Growth. Gansu Social Sciences, 6, 139-145.
[5] Xuanli Xie, Yan Shen, Haoxing Zhang and Feng Guo. (2018) Can Digital Finance Promote Entrepreneurship?—Evidence from China. China Economic Quarterly, 4, 1557-1580.
[6] Zhu Guanping, Hu Wenxiu and Yang Li. (2021) Can the Digital Financial Inclusion Development Alleviate the Local Government Implicit Debts Risks? —Based on Chinese Provincial Panel Data. Modernization of Management, 2, 12-14.
[7] Yi Xingjian and Zhou Li. (2018) Does Digital Financial Inclusion Significantly Influence Household Consumption? Evidence from Household Survey Data in China. Journal of Financial Research, 11, 47-67.
[8] Song Xiaoling. (2017) Empirical Analysis of Digital Inclusive Finance Bridging the Urban-rural Residents' Income Gap. Finance & Economics, 6, 14-25.
[9] Lu Ming and Chen Zhao. (2004) Urbanization, Urban-Biased Economic Policies and Urban-Rural Inequality. Economic Research Journal, 6, 50-58.