

Regional Differences in the Development of Digital Inclusive Financial Services in China

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Abstract—Based on the concept of digital inclusive finance, this paper profoundly analyzes the spatial and temporal patterns and regional differences in developing Digital inclusive finance in China. The development index of digital inclusive finance from 2011 to 2020 published by The Digital Finance Research Center of Peking University was selected to measure the development level of digital inclusive finance in all provinces, and the Theil index was adopted to measure the regional gap in the development of digital inclusive finance in 31 provinces and cities of China. The study found noticeable regional differences in the development level of digital inclusive finance in China, which was narrow over time. Regions with the lower development level of digital inclusive finance were catching up with regions with higher levels faster. Therefore, it is suggested that the government formulate development policies based on the advantages and disadvantages of developing digital inclusive finance in the region and accelerate the construction of digital financial infrastructure.

Keywords—digital inclusive finance; development status; developmental difference

I. INTRODUCTION

In recent years, the development of digital science and technology such as information technology, big data, blockchain, and cloud computing has promoted the progress of digital finance. The concept of digital inclusive finance was put forward just a few years ago. It aims to realize inclusive finance driven by digital technology and improve traditional financial service formats by using big data, the Internet, and other information technology means, then form a new generation of financial services. In 2014, the World Bank pointed out that new technologies have boosted the development of inclusive finance. The *World Development Report 2016: The Digital Dividend* argues that the development of digital technologies and the Internet has provided opportunities for the disadvantaged and poor through innovation, inclusion, and efficiency. The official release of *G20 High-level Principles on Digital Financial Inclusion* in 2016 has provided technical rule support for developing Digital finance in China.

II. LITERATURE REVIEW

Digital Inclusive Finance is proposed and developed based on Inclusive Finance. In 2005, the United Nations first proposed the concept of Inclusive Finance in the International Year of micro-credit. The world bank defined

Inclusive Finance as a financial system that can widely access financial services and provide convenient and safe financial services for all sectors and groups of society. Du [1] first introduced the concept of Inclusive Finance in China. He believed that the development of Inclusive Finance was of great significance and advocated the development of Inclusive Finance to meet the financial needs of customer groups in poor and remote areas. Wibella [2] defined digital Inclusive Finance as filling the insufficient allocation of original financial resources and services in a digital way.

Most scholars focus on the positive role of the development of digital inclusive finance. Liu, Zhu and Liu [3], pointed out that under the role of digital technology, the possibility of poor people's access to financial services has been dramatically enhanced, reducing the pressure of poverty alleviation work. Song [4] believes that digital inclusive finance enhances the accessibility of traditional inclusive finance, gives play to the long-tail theory, and solves the contradiction between cost and income. Moreover, digital inclusive finance can effectively reduce the income gap and make financial services more feasible for low-income people and rural areas. Dong, Chen and Du [5], from the theory, model construction, and path, explored digital inclusive finance taking advantage of financial technology to break the traditional financial difficulties of alleviating poverty. Then, it would optimize resources allocation balance, effectively dispel financial poverty alleviation dual goal conflict problem, and improve the level of financial gain. Jiang [6] explored from the innovation-driven perspective and found that digital inclusive finance is conducive to promoting economic quality improvement by stimulating enterprises' technological innovation on the whole.

Reviewing the existing literature shows that some achievements have been made in the research of digital inclusive finance. However, the achievements in analyzing the spatial and temporal pattern and regional differences in developing digital inclusive finance in China are slightly weak. Given this, this paper uses various methods to fully reveal the spatial and temporal characteristics and regional differences of the development of digital inclusive finance in China.

III. ANALYSIS OF THE DEVELOPMENT STATUS OF DIGITAL INCLUSIVE FINANCE IN CHINA

A. The rise of the overall level of development

In recent years, China has made an active layout in the construction of digital inclusive finance, and the overall level of development has constantly been improving, showing the essential characteristics of leapfrog development. Based on the provincial panel data of The Digital Inclusive Finance Index of Peking University from 2011 to 2020, this paper calculates the mean and median of the digital inclusive finance index of 31 provinces and cities in China, and the specific trend is shown in Figure 1. Regarding the overall development level of China's digital inclusive finance, China's digital inclusive finance develops rapidly from 2011 to 2020. In 2020, the average overall digital inclusive finance index is 341.22, which increases 7.5 times compared with 2011, and the average annual growth is 32.17%. The median number of provinces in the Digital inclusive finance index also proliferated, increasing to 334.82 in 2020, 8.9 times in ten years, an average annual growth of 36.1%. It can be seen that the overall development of Digital inclusive finance in China shows a growing trend. The growth rate has declined recently, but the development momentum is still rapid.

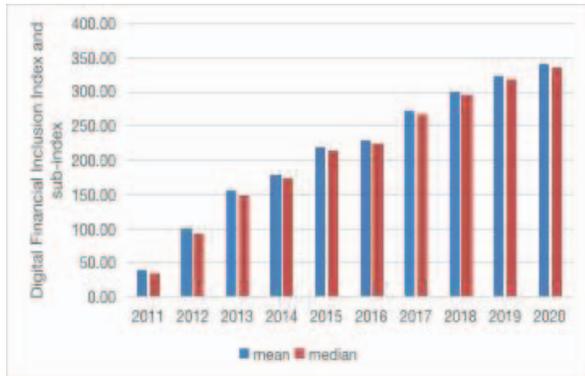


Figure 1. Mean and median of Digital Inclusion Finance Index from 2011 to 2020

From the perspective of the three dimensions of digital financial inclusion index construction, Figure 2. shows the development of the digital inclusive finance index in the breadth of coverage, depth of use, and degree of digitalization in China. It can be seen that from 2011 to 2020, the development of the digitalization degree index has been at the highest level, and the development of the depth index shows a fluctuating upward trend, while the development of the coverage index has been rising but has been at a low level among the three. In 2011, the coverage, depth of use, and the initial level of digitalization of Digital inclusive finance in China are similar. Then, from 2011 to 2013, the depth of use index is second only to the digitalization index and rose rapidly, indicating that the penetration rate of digital inclusive finance is further expanding. From 2014 to 2016, the development of using the depth index fell lower than the coverage index, but after 2016, the growth rate of the depth index exceeds the breadth index and becomes an essential

driving force of the growth of the digital inclusive finance index. From 2015 to 2017, the growth rate of the digitization degree index showed a significant downward trend, but its average value is larger than the other two sub-indices with an increasing trend. In the early stage of the development of digital inclusive finance, the digitalization of financial products and services is mainly promoted. With the digital support of digital inclusive finance reaching a specific scale, the depth of use has increasingly become the core driving force for developing digital inclusive finance. After 2018, the index of coverage breadth and depth of use is gradually approaching. In 2020, the growth rate of the depth of use of digital inclusive finance is 8.06%, which is higher than the growth rate of coverage breadth and digitalization degree of 6.07% and -0.12%, and its development speed is in the top position of the three fields. It shows that the depth of the use of digital inclusive finance has become a non-negligible driving force for the future growth of digital inclusive finance in China, and there is a certain degree of space for expansion. It can be seen that the development of digital finance in the future will mainly rely on the growth space of the depth of use.

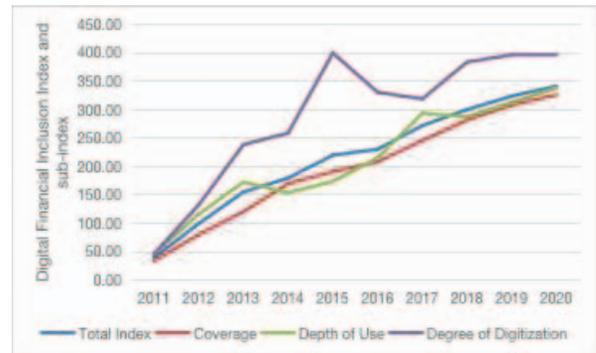


Figure 2. Mean values of Digital Inclusion Finance Index and sub-index provinces from 2011 to 2020

B. The regional differences in the development of digital inclusive finance in China

With the increase of digital inclusive finance volume and the improvement of development level, the problem of regional differences appears. As seen from the data in Table I, the annual average of China's digital inclusive finance index from 2011 to 2020 is 216.24. The annual mean value of the eastern region is 242.98, which is higher than the national level. The average value of other regions is 203.79 in northeast region, 210.21 in central region, and 199.31 in western region. It can be seen that the eastern region, relying on abundant talent reserve, financial resources, and excellent inclusive financial infrastructure, is constantly improving the level of Fintech. Thus, it promotes the innovation of digital financial service forms and the types of financial products and also promotes the emergence of various forms of digital inclusive finance. Hence, the overall development level of digital inclusive finance is relatively high. In addition, the annual average ratio of the digital inclusive finance index in eastern China to that in northeast

China, middle China, and west China is 1.19, 1.16, and 1.22, respectively, indicating that there is a particular gap between the development level of digital inclusive finance in China's four major economic regions.

TABLE I. ANNUAL AVERAGE OF CHINA DIGITAL FINANCIAL INCLUSION INDEX FROM 2011 TO 2020

Year	Total	Northeast Region	Eastern Region	Central Region	Western Region
2011	40.00	33.79	60.74	32.79	27.85
2012	99.69	92.89	123.56	92.81	84.63
2013	155.35	146.61	183.02	148.67	137.51
2014	179.75	173.68	203.00	172.68	164.43
2015	220.01	214.84	243.76	209.13	206.15
2016	230.41	223.46	251.54	224.62	216.58
2017	271.98	259.57	296.77	267.17	256.08
2018	300.21	280.59	331.46	295.50	280.36
2019	323.73	298.88	358.51	320.08	301.54
2020	341.22	313.54	377.40	338.67	317.94
annual average	216.24	203.79	242.98	210.21	199.31

C. The measurement of regional difference level

Theil index measures the income gap (or inequality degree) between individuals or regions. It is characterized by measuring the contribution of the intra-group gap and inter-group gap to the total gap. The higher the Theil index, the greater the development difference and the higher the imbalance. This paper applies the Theil index to the development of digital inclusive finance to accurately grasp the relative differences and sources of the development of digital inclusive finance in China's four major economic regions. The calculation results are shown in Table II.

TABLE II. THEIL INDEX OF DIGITAL INCLUSIVE FINANCE DEVELOPMENT IN CHINA AND ITS DECOMPOSITION RESULTS

Year	T _{total}	T _{between}	T _b contribution rate	T _{within}	T _w contribution rate
2011	0.04266	0.02644	61.98%	0.01622	38.02%
2012	0.01011	0.00592	58.54%	0.00419	41.46%
2013	0.00573	0.00331	57.80%	0.00242	42.20%
2014	0.00346	0.00180	52.07%	0.00166	47.93%
2015	0.00221	0.00123	55.44%	0.00099	44.56%
2016	0.00173	0.00090	52.27%	0.00083	47.73%

2017	0.00159	0.00089	55.82%	0.00070	44.18%
2018	0.00200	0.00118	58.78%	0.00083	41.22%
2019	0.00215	0.00128	59.43%	0.00087	40.57%
2020	0.00211	0.00127	60.02%	0.00084	39.98%

As seen from the table II, the overall Index of digital inclusive finance development in China shows the first decline and then rise trend. The gap between the development of digital inclusive finance among provinces narrowed year by year from 2011 to 2017, decreasing from 0.04266 in 2011 to 0.00159 in 2017, indicating that the overall development of digital inclusive finance in China showed an overall downward trend. Although the development gap of digital inclusive finance fluctuates slightly in the three years after 2018, it still decreases by 95.05% in the whole sample period. Therefore, on the whole, the development gap of digital inclusive finance in China has decreased significantly. It reflects China's investment and construction achievements in digital inclusive finance in recent years. The financial layout supported by digital technology is more and more completed, allocating financial resources more balanced. Moreover, with the regional gap in financial development becoming smaller and smaller, it would be closer to the goal of coordinated development.

From the overall composition of differences, the absolute value of intra-regional differences from 2011 to 2020 is significantly greater than the absolute value of inter-regional differences. That is, the formation of digital inclusive finance development differences in China mainly comes from the inter-group development differences in northeast region, eastern region, central region, and western region. From 2011 to 2020, the contribution rate of regional differences in digital inclusive finance is between [52.07%, 61.98%], and the average contribution rate is about 57.22%, with fluctuations but a slightly rising trend. The contribution rate of regional differences is between [38.02%, 47.93%], and the average contribution rate is about 42.78%, but it shows a declining trend with fluctuations. It is concluded that regional differences are the main reason for China's overall regional differences in digital inclusive finance. Therefore, to solve the regional differences in developing digital inclusive finance in China, we should focus on narrowing the regional differences.

IV. COUNTERMEASURES AND SUGGESTIONS TO PROMOTE THE DEVELOPMENT OF DIGITAL INCLUSIVE FINANCE IN CHINA

A. The formulation of the development policies for digital financial inclusion

The four regions should base themselves on the advantages and disadvantages of digital inclusive finance development. The eastern region, which has an excellent traditional financial foundation and a high level of digital technology, should fully use the existing resource advantages

and technological advantages. Various digital inclusive financial instruments will be used comprehensively to expand financial services further, allocate more inclusive financial resources effectively to the real economy, and improve the efficiency and level of digital inclusive financial services to the real economy. For regions with relatively backward digital inclusive finance, there are still problems with the traditional financial foundation and low level of digital technology. Multiple preferential support policies should be fully used to strengthen financial infrastructure construction. Further, the government should enrich the digital products and services of inclusive finance, improve the availability of financial products and services, and promote the coordinated development of digital inclusive finance among regions in China.

B. The principle of technology-driven and independent innovation

The application of digital technology has dramatically reduced the cost paid by financial providers and the cost of obtaining finance by financial demanders, thus promoting the sustainable and deepening development of finance. On the one hand, relevant government departments should strengthen system construction and promote further digital strategy implementation. We will actively encourage the development of science and technology, increase investment in scientific and technological research and development, inject fresh funds into scientific and technological innovation, and increase the enthusiasm for innovation. On the other hand, cooperation between traditional financial institutions, science and technology enterprises, Internet platforms, and government platforms should be strengthened to improve the online trading system, credit investigation system, and supervision system to improve the efficiency of financial business handling and reduce the cost of business operation. The government should improve the application of science and technology in the field of risk control, upgrade the level of risk control, build a complete risk control system, avoid the risk of information leakage under the development of science and technology, and build a solid technological foundation for the development of digital inclusive finance in China.

V. CONCLUSION

This paper draws the following conclusions by studying the development status of digital inclusive finance in China and regional development differences:

First, the high degree of integration of digital technologies and mobile Internet with the traditional financial industry has broken through the spatial limitations of the traditional financial system, expanded the coverage area of the long-tail group to a certain extent, and added

impetus to the further development of inclusive finance in China. With the supporting of relevant primary conditions, China's digital inclusive finance enjoys a sound development momentum, and its development level is constantly improving, especially in the dimension of digitalization degree.

Second, significant regional differences exist in developing digital inclusive finance in China. By observing the development index of digital inclusive finance in four economic regions of China, we find regional differences in the development of digital inclusive finance in China. It can be seen from the results of the decomposition of the Theil index between groups and within groups that the differences mainly come from different regions. Furthermore, the development level of digital inclusive financial services in the eastern region is the highest among the four major economic regions. Therefore, the other three economic regions should also actively introduce talents and improve the infrastructure of digital inclusive finance. Therefore, the other three economic regions should also actively introduce talents and improve the infrastructure of digital inclusive finance to promote the development of digital inclusive finance from three aspects: coverage breadth, depth of use, and degree of digitalization. In this way, we expect to narrow the regional differences and balance the development of digital inclusive finance nationwide by reducing the Theil index.

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