

Analysis of the Current Situation of the Development of Digital Inclusive Finance and the R&D Expenditure of Private Enterprises

Kai Li

Jilin University of Finance and Economics, Changchun, Jilin, China

Abstract: With the rapid development of science and technology, digital finance, as an emerging financial service model, is rapidly emerging around the world. With the support of the Internet, big data, artificial intelligence and other advanced technologies, it has not only changed the traditional way of financial services, but also brought far-reaching impact on economic and social development. However, the coverage of digital finance is also becoming increasingly prominent, especially in some developing countries and regions, and the popularization and application of digital finance still face many challenges. There is a mutually reinforcing relationship between the development of digital inclusive finance and R&D expenditures of private enterprises. By strengthening guidance and support, promoting the deep integration of financial technology and the real economy, and establishing sound risk prevention and control mechanisms, the interaction and common development between the two can be further promoted. It is crucial to promote the sustainability of digital finance and improve the inclusiveness of financial services by collecting and analyzing relevant data, conducting field visits and interviews, conducting in-depth analysis of the current development status of inclusive digital finance, research and development expenditures of private companies, and analyzing current challenges and appropriate remedial measures.

Keywords: Digital Financial Inclusion; R&D Expenditure; Private Enterprises; Cover; Status Quo

1. Introduction

With the continuous improvement of science and technology, the ability of science and

technology is becoming stronger and stronger, today's society is gradually transforming to a digital society, and digital inclusive finance has come into being [1]. It relies on digital technologies such as computers, cloud computing, and big data to improve the breadth, depth, and digitalization of financial services, so that inclusive finance can better provide high-quality services for the development of private enterprises [2]. Private enterprises face serious financing constraints in the process of R&D [3]. Traditional financial policies have structural defects such as capital mismatch, which are insufficient to meet the external financing needs of enterprises. As a new form of financial innovation, digital inclusive finance not only helps to effectively improve and alleviate the financing constraints faced by private enterprises in the research and development process. Digital inclusive finance, as a new form of financial innovation, can effectively alleviate the financing constraints faced by private enterprises in the research and development process. There is a close relationship between the development of digital inclusive finance and R&D expenditures of private enterprises, which mutually influence and promote each other. Digital inclusive finance can be effectively managed based on big data, cloud computing, blockchain and other mobile Internet technologies, so as to effectively reduce the degree of information asymmetry, thus providing a low threshold for private enterprises, efficient, diversified and personalized financial services. This will reduce financing bottlenecks in the R&D process of private companies, facilitate access to external funds, and increase R&D spending. Digital inclusive finance reduces the financing costs of private enterprises by improving the breadth and convenience of financial services.

Lower financing costs mean that private enterprises can allocate more funds towards research and development activities, enhancing their technological innovation capabilities and market competitiveness. The alleviation of financing constraints and the reduction of financing costs can help private enterprises increase their investment in research and development of new technologies and products. This not only helps to enhance the core competitiveness of enterprises, but also promotes technological progress and industrial upgrading of the entire industry.

Based on this premise, this paper conducts an in-depth study on the impact of holistic digital finance on private sector R&D spending and systematically examines the robustness of these impacts.

2. Analysis of the Development Status of Digital Inclusive Finance

2.1 Analysis of the Overall Development Status of Digital Inclusive Finance

In recent years, digital inclusive finance has received great attention, and various related supports have been continuously introduced, promoting the continuous and rapid development of digital inclusive finance in China [4]. In 2005, the United Nations vigorously promoted digital inclusive finance and introduced it to China. In 2013, the development of inclusive finance was officially proposed; In 2014, a number of countries participated in the development of financial inclusion projects; In 2015, a plan for the development of inclusive finance was issued [5]; In 2018, digital financial inclusion had a significant impact on the world [6]; In 2020, digital inclusive finance has become a hot topic at the two sessions in recent years.

According to Table1, the digital inclusive finance development indices of Beijing, Shanghai, and Zhejiang Province in 2020 were 417.88, 431.93, and 406.88, respectively, ranking among the top three in the country. In 2020, the development indices of digital inclusive finance in Qinghai, Gansu, and Guizhou provinces were 298.23, 305.5, and 307.94, respectively, indicating a low level of development [7]. This shows that the overall development rate of inclusive digital finance varies from region to region due to the diversity of geographical regions, economic

benefits, policy orientations, etc. The development rate of inclusive digital finance in coastal and economically developed areas is relatively high, while the development rate of inclusive digital finance in inland and economically underdeveloped areas is low. In general, the overall level of development of inclusive finance in all regions is improving, and the gap between the overall level of development of inclusive digital finance in the developed regions of the East and the underdeveloped regions of the core regions is narrowing.

2.2 Analysis of the Current Situation of the Breadth of Digital Financial Inclusion

According to Figure 1 and Figure 2, we found that the median breadth of digital financial inclusion was 28.94 in 2011 and 320.45 at the provincial level in 2020. From 2011 to 2020, the growth of coverage breadth is similar to the growth of the overall level, showing a steady growth trend. Figure 3 shows the development level of the digital inclusive finance sub-index in each province, and the horizontal comparison shows that the ratio of the highest and lowest regions in the coverage breadth index in 2020 is 1.36, which is a small gap in coverage breadth compared with other indexes. It may be that the acceleration of the popularization of digital finance in various regions, especially in underdeveloped areas, has narrowed the gap in the coverage of digital inclusive finance.

2.3 Analysis of the Current Situation of the Depth of the Use of Digital Inclusive Finance

According to Figure 1 and Figure 2, we find that from 2011 to 2015, the depth of digital financial inclusion growth was slow, and the provincial median and growth rate showed a downward trend. After 2016, there have been some changes in the growth of the index, and the growth of the depth index has exceeded the breadth of coverage index in 4 years from 2016 to 2020, and the depth of use has gradually developed into an important driving force for the growth of the digital inclusive finance index [8]. Comparing the data in 2018, it can be found that the depth of digital finance use in 2018 has decreased slightly compared with 2017. According to Figure 3, the ratio of the highest to the lowest regions using the

depth index in 2020 was 1.89, which is a large difference between provinces compared with other indices.

2.4 Analysis of the Current Situation of the Degree of Digitalization of Digital Inclusive Finance

According to Figure 1 and Figure 2, we find that between 2011 and 2015, the growth of digital financial inclusion was the fastest compared with other indices. Overall, the digital degree index fluctuates greatly, with two peaks in growth in 2013 and 2015, but each year the level of development is higher than that of other indices [9]. Figure 3 observes, we find that in 2020, the ratio of the highest to the lowest regions in the digital inclusion index was 1.24, and the gap between provinces in terms of digital degree was smaller than that of other indices.

3. Analysis of the Current Situation of R&D Expenditure of Private Enterprises

3.1 Analysis of the Current Situation of the Overall Level of R&D Expenditure of Private Enterprises

According to Table 2, from 2011 to 2019, the group of private enterprises continued to expand. From 2011 to 2012, the fastest growth rate was about 20%. With the rapid development of China's national economy, private enterprises are also developing rapidly. According to the selected sample data, the average R&D expenditure of private enterprises has been steadily increasing, with the average R&D investment in 2011 being only 0.653, while the average R&D investment in 2019 reached 2.585 [10]. This shows that with the strong support of the state, in order to enhance their core competitiveness, private enterprises have increased R&D investment and optimized the industrial structure, so as to promote the innovation and development of enterprises.

Table 1. 2011-2020 Digital Inclusive Finance Development Index for all provinces in China

Province	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Beijing	79.41	150.65	215.62	235.36	276.38	286.37	329.94	368.54	399.00	417.88
Tianjin	60.58	122.96	175.26	200.16	237.53	245.84	284.03	316.88	344.11	361.46
Hebei	32.42	89.32	144.98	160.76	199.53	214.36	258.17	282.77	305.06	322.70
Shanxi	33.41	92.98	144.22	167.66	206.30	224.81	259.95	283.65	308.73	325.73
Inner Mongolia	28.89	91.68	146.59	172.56	214.55	229.93	258.50	271.57	293.89	309.39
Liaoning	43.29	103.53	160.07	187.61	226.40	231.41	267.18	290.95	311.01	326.29
Jilin	24.51	87.23	138.36	165.62	208.20	217.07	254.76	276.08	292.77	308.26
Heilongjiang	33.58	87.91	141.40	167.80	209.93	221.89	256.78	274.73	292.87	306.08
Shanghai	80.19	150.77	222.14	239.53	278.11	282.22	336.65	377.73	410.28	431.93
Jiangsu	62.08	122.03	180.98	204.16	244.01	253.75	297.69	334.02	361.93	381.61
Zhejiang	77.39	146.35	205.77	224.45	264.85	268.10	318.05	357.45	387.49	406.88
Anhui	33.07	96.63	150.83	180.59	211.28	228.78	271.60	303.83	330.29	350.16
Fujian	61.76	123.21	183.10	202.59	245.21	252.67	299.28	334.44	360.51	380.13
Jiangxi	29.74	91.93	146.13	175.69	208.35	223.76	267.17	296.23	319.13	340.61
Shandong	38.55	100.35	159.30	181.88	220.66	232.57	272.06	301.13	327.36	347.81
Henan	28.40	83.68	142.08	166.65	205.34	223.12	266.92	295.76	322.12	340.81
Hubei	39.82	101.42	164.76	190.14	226.75	239.86	285.28	319.48	344.40	358.64
Hunan	32.68	93.71	147.71	167.27	206.38	217.69	261.12	286.81	310.85	332.03
Guangdong	69.48	127.06	184.78	201.53	240.95	248.00	296.17	331.92	360.61	379.53
Guangxi	33.89	89.35	141.46	166.12	207.23	223.32	261.94	289.25	309.91	325.17
Hainan	45.56	102.94	158.26	179.62	230.33	231.56	275.64	309.72	328.75	344.05
Chongqing	41.89	100.02	159.86	184.71	221.84	233.89	276.31	301.53	325.47	344.76
Sichuan	40.16	100.13	153.04	173.82	215.48	225.41	267.80	294.30	317.11	334.82
Guizhou	18.47	75.87	121.22	154.62	193.29	209.45	251.46	276.91	293.51	307.94
Yunnan	24.91	84.43	137.90	164.05	203.76	217.34	256.27	285.79	303.46	318.48
Shaanxi	40.96	98.24	148.37	178.73	216.12	229.37	266.85	295.95	322.89	342.04
Gansu	18.84	76.29	128.39	159.76	199.78	204.11	243.78	266.82	289.14	305.50
Qinghai	18.33	61.47	118.01	145.93	195.15	200.38	240.20	263.12	282.65	298.23

Ningxia	31.31	87.13	136.74	165.26	214.70	212.36	255.59	272.92	292.31	310.02
---------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------

Source: Peking University Digital Inclusive Finance Index.

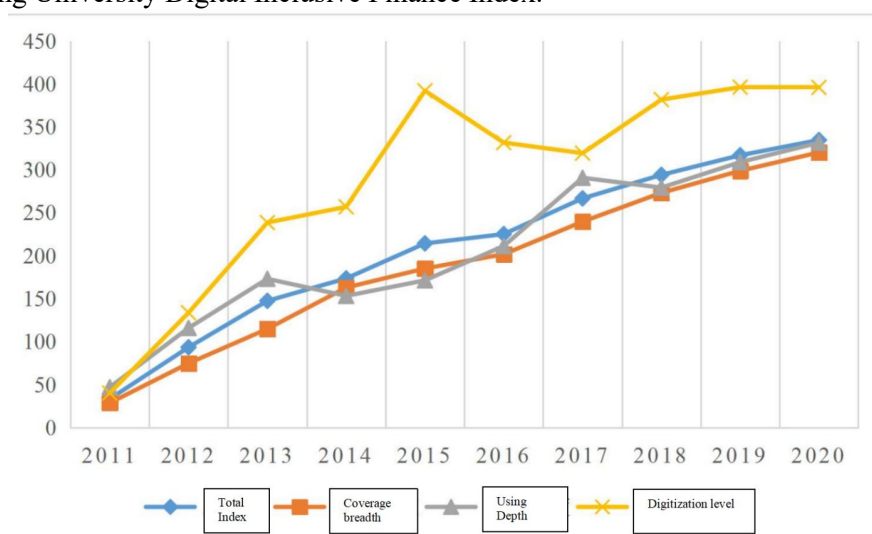


Figure 1. Provincial Median Values of the Digital Financial Inclusion Index and Sub-indices from 2011 to 2020

Source: Peking University Digital Inclusive Finance Index

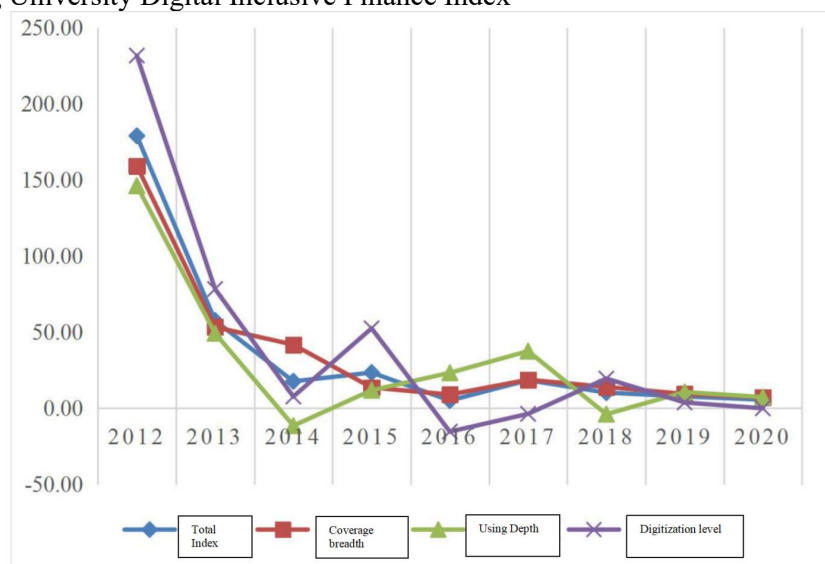


Figure 2. Provincial Median Growth Rate of the Digital Financial Inclusion Index and Sub-indices from 2011 to 2020

Source: Peking University Digital Inclusive Finance Index

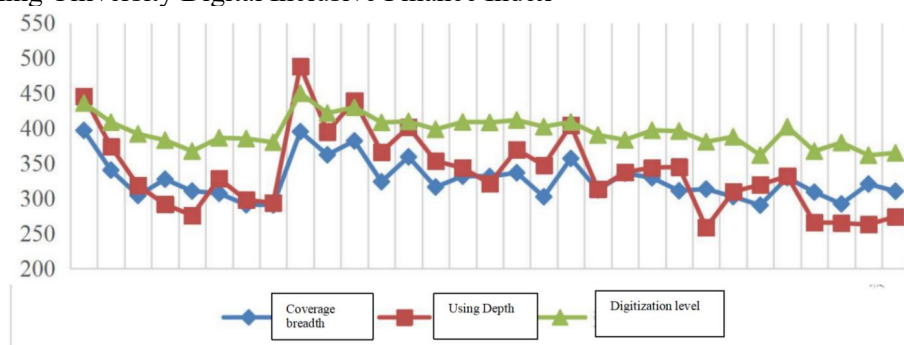


Figure 3. Distribution of Digital Financial Inclusion Sub-indices by Province in 2020

Source: Peking University Digital Inclusive Finance Index

Table 2. 2011-2019 Analysis of the Current Situation of R&D Expenditure of Private Enterprises

Year	Number of samples	Average value	Standard deviation	Minimum	Median	Maximum
2011	2246	0.653	3.416	0.000	0.182	84.926
2012	2707	0.924	3.913	0.000	0.231	88.292
2013	2876	1.026	4.127	0.000	0.261	85.158
2014	2960	1.156	4.686	0.000	0.299	97.099
2015	3010	1.390	6.631	0.000	0.350	193.000
2016	3044	1.596	6.944	0.000	0.435	175.650
2017	3094	1.932	7.999	0.000	0.506	186.010
2018	3160	2.304	9.264	0.000	0.592	210.450
2019	3347	2.585	10.565	0.000	0.659	218.718

Data source: CSMAR database

3.2 Analysis of the Current Situation of Regional Differences in R&D Expenditure of Private Enterprises

In order to examine the regional differences in private enterprise R&D expenditure, we selected and analyzed Private Enterprises from the Eastern and Midwestern regions of the CSMAR database, and found that due to different geographical environment and economic power, the number of private

enterprises in the Eastern Region is smaller than that of the Central and Western regions, as shown in Table 3 below. The average private enterprise R&D expenditure in the Eastern region is 1,164, with the largest being 129,622, while the average private enterprise R&D expenditure in the Midwest region is 0,547 and the maximum expenditure is 96,381, which is much higher than the Midwest region. About 2 times more in the central and western parts.

Table 3. Analysis of R&D Expenditure Differences between the Eastern Region and the Central and Western Regions

Region	Number of samples	Average value	Standard deviation	Minimum	Median	Maximum
eastern region	11913	1.164	4.596	0.000	0.417	129.622
central and western regions	12391	0.547	2.090	0.000	0.182	96.381

Data source: CSMAR database

4. Conclusion and Suggestions

4.1 Conclusion

First, China attaches great importance to the construction of digital inclusive finance in the central and western regions, and has introduced policy support, increased investment, and vigorous support to alleviate the imbalance in the development of digital inclusive finance.

Second, from 2011 to 2019, the standard deviation of private enterprises' R&D expenditure gradually expanded, which shows that with the improvement of economic strength, the development of private enterprises is unbalanced, and there is a large gap. But in general, the scale of China's private enterprises is constantly expanding;

Third, compared with the backward central and western regions, private enterprises in the

eastern region have the economic strength to increase R&D investment. It is not difficult to find that the standard deviation value between the eastern region and the central and western regions is also larger, which indicates that the difference between the R&D investment of private enterprises The difference between the eastern region and the western region is also large, and the internal difference in the eastern places is greater than that in the central and western places. In general, the R&D expenditure of private enterprises in China is unbalanced in terms of regional development, with great differences.

4.2 Suggestions

Firstly, strengthen policy guidance and support: The administration should increase support for digital inclusive finance and R&D of private enterprises. By formulating relevant policies, providing financial subsidies and tax

incentives, financial institutions should be encouraged to increase their credit investment in private enterprises, while also supporting private enterprises to increase their research and development expenditures. Financial institutions can launch special loan products for research and development projects of private enterprises, which should have lower interest rates, flexible repayment methods, and longer loan terms to meet the long-term funding needs of private enterprise research and development expenditures. And encourage financial institutions to accept intangible assets such as intellectual property and patents as collateral from private enterprises, issue loans to support their research and development activities, solve the problem of private enterprises' difficulty in obtaining financing due to the lack of traditional collateral, and ensure that private enterprises can quickly obtain research and development funds. In addition, Use big data, artificial intelligence and other technologies to establish risk assessment models and improve the accuracy and efficiency of credit decisions.

Secondly, promote the deep integration of financial technology and the real economy: promote the deep integration of financial technology and the real economy, encourage financial institutions to use advanced technologies such as big data and cloud computing to improve their financial service level, enhance their risk management capabilities and service efficiency, and support private enterprises to strengthen technological innovation and research and development investment, achieve industrial upgrading and transformation. Through big data analysis, financial institutions can more accurately assess the credit status and repayment ability of private enterprises; Through blockchain technology, transparency and traceability of financial transactions can be achieved. Promote financial technology products such as intelligent investment advisory and intelligent customer service, and provide more personalized and intelligent financial service experiences for private enterprises.

Third, establishing and improving risk prevention and control mechanisms: In order to promote mutual support between digital inclusive finance and private company research and development, it is necessary to establish and improve risk prevention and

control mechanisms, strengthen supervision of financial institutions and private companies, prevent and resolve financial risks, and ensure the stability and security of financial markets.

References

- [1] Dai Fei, Chen Chaoqun. Is state-owned equity participation conducive to reducing the default risk of private enterprise debt Finance and Accounting Monthly, 2024 (12): 1-7.
- [2] Zhang Chao, Jiang Tianying. Can digital finance achieve stable employment for private enterprises Research the World, 2024 (23): 1-12.
- [3] Luo Yungao. Research on the Impact of Local Government Debt on Credit Financing of Private Enterprises. Chinese Academy of Fiscal Sciences, 2024.
- [4] Li Bowen, Xiao Yu. Data Elements Empower the High-quality Development of Inclusive Finance: Theoretical Logic, Practical Problems and Path Exploration. Southwest Finance, 2024(7): 1-12.
- [5] Guo Hui, Zhang Yuanyuan, Hu Weibang. The Efficiency and Influencing Factors of Digital Inclusive Finance Empowering Rural Revitalization: Based on the Panel Data of 30 Provinces (Municipalities and Autonomous Regions). Hubei Agricultural Sciences, 2024, 63(07): 250-256.
- [6] Yang Junyan, Zheng Jianjun. Research on Digital Inclusive Finance Promoting High Quality Development of Private Economy. Journal of Fujian Open University, 2024 (02): 92-96.
- [7] Zhang Chao, Jiang Tianying. Can Digital Finance Achieve Stable Employment of Private Enterprises. Research World, 2024(17):1-12.
- [8] Cao Jingyi. Research on the Impact of Digital Inclusive Finance on Urban Entrepreneurship Activity. China Market, 2024, (20):42-45.
- [9] Wang Peng, Lin Xinkang. Digital Inclusive Finance and Rural Financial Services: Integration and Development. Fintech Times, 2024, 32(07): 44-52.
- [10] Chen Huang. The Impact of Digital Inclusive Finance on the Financial Exclusion of Rural Households in Hunan Province. Cooperative Economy and Science and Technology, 2024, (18):37-39.