

## The Impact of Digital Inclusive Finance on Innovation Activity

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### Abstract

**This paper will deeply analyze the direct and indirect effects of digital inclusive finance in broadening the sources of funds, increasing cooperation, enriching the content of activities and reducing the threshold of loans, and then describe the innovation activity from the four dimensions of technological innovation, institutional innovation, activity innovation and open innovation, so as to fully reflect the relationship between digital inclusive finance and innovation activity. The research results are helpful to promote the development of digital inclusive finance and enterprise innovation activity theory.**

### Keywords

**Digital Inclusive Finance; Innovation Activity; Spatial Spillover Effect.**

### 1. Introduction

The report of the 20th National Congress of the Communist Party of China clearly stated that "the implementation of the strategy of expanding domestic demand should be organically combined with the deepening of supply-side structural reforms, and the original function of financial services for the real economy should be strengthened", emphasizing "building a high-quality and efficient modern industrial system, and promoting the deep integration and coordinated development of scientific and technological innovation, modern finance, human resources and the real economy". The 2021 government work report also calls for "accelerating digital development, creating new advantages in the digital economy, synergistically promoting digital industrialization and industrial digital transformation, and accelerating the pace of building a digital society"[1]. The 14th Five-Year Plan emphasizes "accelerating digital development, building a digital China, and promoting the deep integration of digital technology with the real economy", and states that "a modern financial system with a high degree of adaptability, competitiveness, and inclusiveness will be improved, and an institutional mechanism for finance to effectively support the real economy will be built", and the banner clearly calls for "enhancing financial inclusion"[2]. At the same time, in the context of increasingly fierce global financial competition, countries are also accelerating the development of digital inclusive finance, hoping to greatly improve the global competitiveness of their financial industries [3]. In addition, it coincides with the period of active transformation and upgrading of Chinese enterprises, which requires strong support from various technologies and funds, and the development of digital inclusive finance can often bring twice the result with half the effort in technology and capital. Based on the advantages of digital inclusive finance to provide convenience for enterprises and make inclusive finance cover wider, we will use it to respond to the national digital development policy and stimulate the innovation activity of

enterprises, so as to promote the transformation and upgrading of enterprises, promote the high-quality development of China's economy, and enhance the country's economic influence. In order to better integrate digital financial inclusion with innovation activity, it is natural to explore the impact mechanism of digital financial inclusion on innovation activity, and then better propose more constructive measures, which is also the starting point of this study.

Digital financial inclusion is a gradual development of the traditional financial system. The concentration of digital financial inclusion and innovation activity in recent years is also a manifestation of the hot and emerging topic of this topic. Due to the problems of information asymmetry in traditional financial services, it is exclusionary to some groups with poor economic conditions. In order to enable more people to enjoy convenient, diverse, and high-quality financial services, digital inclusive finance came into being. With the adoption of the G20 High-Level Principles for Digital Inclusive Finance at the G20 Hangzhou Summit, the concept of digital inclusive finance was officially put forward for the first time, and all countries will accelerate the promotion of a new model of digital technology-driven inclusive financial development, and the development of inclusive finance has entered a new stage [4].

## 2. Literature Review

### 2.1. Situation Abroad

At present, there are relatively few foreign studies on digital inclusive finance, and through reading relevant literature, foreign scholars' research on digital inclusive finance mainly focuses on the impact of digital inclusive finance, and even less on the impact of innovation activity. Scholars such as Ahmad Mahmood have studied the impact of digital inclusive finance on China's provincial economic growth, and confirmed that digital inclusive finance can indeed drive effective economic growth. Scholar Rita Rena Pudyastuti studied the data of 31 provinces in China through the instrumental variable method and spatial SDM model, and concluded that digital financial inclusion can promote entrepreneurship and drive innovation. As for the research on the mechanism of digital inclusive finance affecting innovation activity, there is currently no foreign research on CNKI, but our research is more valuable.

### 2.2. Domestic Situation

Compared with foreign scholars, domestic scholars have more research on digital inclusive finance, and relatively less research and innovation activity, mainly in the following aspects. Scholar Gao Bicong selected the panel data of 287 cities from 2015 to 2020 to empirically analyze the basic transmission mechanism and heterogeneous transmission path of innovation activity affecting high-quality economic development, and used the share of labor income as a threshold variable to test the nonlinear relationship between innovation activity and high-quality economic development [5]. Zhang Yingjie discussed the driving role of digital inclusive finance and innovation activity on rural revitalization, and proposed that innovation activity can strengthen the driving effect of digital inclusive finance on rural revitalization [6]. In the article by scholars Song Hua and Huang Gaojie, taking China's NEEQ listed enterprises from 2011 to 2020 as a research sample, they empirically test the role of digital inclusive finance development in the technological innovation process of small and medium-sized enterprises, and confirm the innovative role of digital inclusive finance in small and micro enterprises. [7] In addition, Wang Liyuan is one of the few people who has explored the effect of digital inclusive finance on innovation activity, arguing that digital inclusive finance stimulates innovation activity, which in turn affects the high-quality development of enterprises, thereby promoting high-quality economic development. [8] Based on the above literature, although scholars have done a lot of research on digital inclusive finance and innovation activity, there are few

literatures on the influence mechanism of the two, which also provides space and possibility for the writing of this paper, and is also the innovation point and practical value of our research.

### **3. Mechanistic Analysis**

Innovation activity is a necessary condition for enterprises to achieve long-term survival, and it is also an important cornerstone on the way forward. The key factors to enhance the innovation activity of enterprises mainly lie in technological innovation, institutional innovation, activity innovation and open innovation. Technological innovation is the enterprise manufacturing link attaches great importance to, but also directly on products and services, technological innovation through the development of cutting-edge production technology to improve product quality, reduce product production costs and other paths to enhance the competitiveness of enterprises, through the marginal return of the incremental effect of positive feedback on innovation activity. Institutional innovation is a strategic guide for enterprises to adapt to environmental changes, so improving institutional innovation is also guiding the direction of enterprise innovation and providing institutional help. Activity innovation plays an active role in broadening the enterprise market, and enhances the innovation activity of enterprises through the introduction of new products and new models. Open innovation is a new model that provides enterprises with more integrated resources, and it is also a new entrance for enterprises to innovate actively. Digital inclusive finance can enhance enterprise technological innovation, institutional innovation, activity innovation and open innovation at different levels and to different degrees.

#### **3.1. Digital Financial Inclusion Helps Enterprises Get Rid of the Shackles of Innovative Funds and Meet Different Financial Service Needs**

The primary factor for innovation is financial support. The low-cost financing channels brought by digital inclusive finance to enterprises are the best financial guarantee for technological innovation and development innovation, and the advantageous funds directly brought to enterprises are also the financial guarantee for enterprise innovation. Digital inclusive finance can rely on digital technology to accurately collect and process all aspects of information, solve the problem of asymmetric financing information of enterprises, and avoid hindering enterprises from obtaining innovation funds due to information lag. At the same time, digital inclusive finance gives full play to its advantages and lowers the threshold and cost of financial services, so as to better meet the different needs of different enterprises for financial services. Technological innovation requires diversified and professional financial services, and digital inclusive finance has multiple access channels, a variety of online financial services bring different service experiences, and its digital technology analyzes the situation and development trend of enterprises and industries as a whole, providing professional financial solutions that can stand on the basis for technological innovation. Institutional innovation requires long-term and flexible financial services, so that there can be continuous financial support and financial services that can be adjusted with system changes on the way to creating a better system. The central government has issued a series of policies to promote the long-term development of digital inclusive finance, which means that it can bring stable financing to institutional innovation. In addition, the highly innovative nature of digital inclusive finance perfectly caters to the variability of institutional innovation, and has good adaptability in the process of institutional change. For example, the "Digital Inclusive Financial Services" released by Bank of China has launched customized and scenario-based exclusive products and services for key areas such as "specialization, refinement, special innovation" and supply chain.

### **3.2. Digital Financial Inclusion Can Optimize Risk Management and Reduce Innovation Risks**

The innovation ability of enterprises is also constrained by risks, and innovation activities inevitably contain variable factors and uncontrollable factors, which are high-risk. Digital inclusive finance relies on big data, digitalization, cloud computing and other means to integrate the overall information of financial institutions and enterprises to achieve information symmetry and prevent information symmetry risks. In addition, digital inclusive finance has diversified financing channels, diversified funding sources, and dispersed eggs in different baskets to diversify financing risks. In terms of technological innovation, the reduced financing costs and more financing opportunities brought by digital inclusive finance promote the technological innovation and development of enterprises, reduce the risk of technological innovation funds, and help enterprises improve their R&D capabilities, enhance their core competitiveness, and avoid the risk of similar products and infringement [9]. In terms of institutional innovation, digital inclusive finance has brought a new digital risk control mechanism and information detection system, forcing enterprises to innovate and update their systems. Digital inclusive finance relies on big data models, blockchain smart contracts and other means to carry out real-time monitoring and anomaly detection activities on both sides of the transaction to reduce fraud and money laundering and other illegal acts. The enterprise system should be innovated in line with the risk assessment method of digital inclusive finance to ensure the financial security of enterprises. In terms of activity innovation, digital inclusive finance provides a better market environment for the development of innovative activities by improving the circulation and allocation of factors and reducing the mismatch between resource supply and demand. In terms of open innovation, digital inclusive finance is not limited by space, which greatly broadens the coverage of financial services and creates good opportunities for enterprises to open innovation, especially for remote areas and long-tail groups to feel the equality of financial services.

### **3.3. Digital Inclusive Finance Indirectly Stimulates Innovation Vitality and Enhances the Innovation Activity of Enterprises**

Digital inclusive finance can not only directly stimulate the innovation vitality of enterprises and improve the level of innovation activity, but also affect the innovation ability and innovation level of enterprises through various channels. As the advantages of digital inclusive finance become more prominent, the traditional financial sector will increase its investment and application of digital financial platforms while feeling the pressure to learn better technologies, and this technology spillover effect will promote enterprise innovation. As a product of the collaborative innovation of finance and technology, digital inclusive finance brings enough rich technological innovation content, which can improve the technological innovation of enterprises. This dual-driving mechanism based on competitive pressure and imitation innovation essentially builds a cross-departmental technology collaborative innovation network, and then enhances the innovation momentum of enterprises through supply chain transmission and industry-university-research cooperation. In addition, the core of finance lies in the optimal allocation of resources. Digital financial inclusion can improve the environment for factor circulation, alleviate capital mismatch, and create an environment that supports innovation. It can also stimulate enterprise technological innovation, institutional innovation, activity innovation and open innovation by improving the efficiency of human resources and capital allocation and expanding the coverage area of financial services.

## 4. Analysis of the Current Situation of Digital Financial Inclusion and Innovation Activity

### 4.1. The Development Status of Digital Inclusive Finance

#### 4.1.1. Technological innovation promotes Inclusive Financial Coverage and Cost Optimization

Digital technology has provided a new endogenous force for the development of inclusive finance, and new technologies represented by big data, artificial intelligence, and blockchain have significantly improved the coverage of inclusive finance and greatly reduced the cost of financial services. The "impossible triangle" of inclusive finance, which is difficult to balance between "scale, risk, and return", has been solved with the innovation and progress of digital technology. As of the second quarter of 2024, the balance of loans to small and micro enterprises by banking financial institutions reached 78 trillion yuan, an increase of 233% from the end of 2018; China's mobile payment penetration rate has reached 86%, ranking first in the world. For example, banks can take advantage of the decentralized and tamper-proof nature of blockchain to work with multiple World Banks to simplify international payments and reduce fees.

#### 4.1.2. Policy Support and Regulatory Framework are Gradually Improving

Since the official proposal to develop "inclusive finance", China's inclusive finance has been further deepened in the past decade, and has achieved leapfrog development from single credit to comprehensive services, from digitalization to digital intelligence. In 2023, the State Council issued the "Implementation Opinions on Promoting the High-quality Development of Inclusive Finance", which emphasizes the need to adhere to the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, clarifies the development direction of high-quality inclusive finance in the future, and strives to achieve the goal of improving supporting services for inclusive finance [10].

#### 4.1.3. The Coverage of Inclusive Financial Services Has Deepened, and the Financial Needs Have Become more Extensive

In the context of the deep empowerment of digital technology, the development of inclusive finance has shown a transformation trend from "scale expansion" to "quality improvement", and has entered a stage of multi-level and differentiated high-quality development. With the help of its own advantages, the banking industry has broken through geographical restrictions, promoted the tilt of resources to weak areas, further improved the quality of financial services in rural and remote areas, and injected vitality into the economic development of counties. Based on the customer portrait built by big data credit, banks can gain an in-depth understanding of customer needs, preferences and consumption behaviors, so as to achieve precision marketing and improve marketing effectiveness and customer satisfaction. According to the customer's credit status and risk appetite, we provide customers with personalized financial service solutions. For example, it provides exclusive wealth management services for high-net-worth customers, and provides more cost-effective savings and loan products for ordinary customers, so as to enhance customer stickiness and loyalty.

### 4.2. The Development Status of Innovation Activity

#### 4.2.1. The Overall Characteristics of China's Innovation Activity

In recent years, China's innovation activity has shown a development trend of "both quantity and quality". China's innovation capability has made significant progress, from 38th in 2000 to 20th in 2011, and then steadily rose to 11th, is the only developing country in the top 15, and the only middle-income country with R&D investment intensity (the ratio of R&D expenditure to GDP) exceeding 2% [11]. In 2022, China's total R&D investment exceeded 3 trillion yuan,

reaching 3,078.29 billion yuan, reaching a new level, an increase of 10.1% over the previous year, continuing the rapid growth momentum. According to statistics, the dominant position of enterprises has been further consolidated, and investment in key areas has continued to expand [12].

#### **4.2.2. Structural Differences in Innovation Activity**

Enterprise innovation presents a "pyramid" pattern: the R&D investment of leading enterprises represented by Huawei and Xiaomi accounts for more than 15%, contributing 61.3% of effective invention patents, but the patent holding rate of small, medium and micro enterprises, which account for 92% of the total number of enterprises, is only 7.8%.

Regional innovation presents a "three-pole driven" trend: Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta concentrate 72% of the country's venture capital, 68% of unicorn enterprises and 85% of the country's technology transaction volume, but the intensity of R&D investment in the northeast region has declined, and the growth rate of technology market turnover in the western provinces is lower than the national average.

#### **4.2.3. Allocation Efficiency of Innovation Elements**

The problem of human capital mismatch is prominent: the conversion rate of scientific research achievements in China's universities is far lower than the average level of European and American countries, and the employment ratio of ICT graduates in the traditional manufacturing industry has dropped from 43% in 2018 to 28% in 2022.

There are institutional distortions in capital allocation: Although the R&D intensity of companies listed on the STAR Market is 15.2%, commercial banks' tolerance for non-performing loans to technology-based SMEs is still 2.1 percentage points lower than the international average, and the risk-averse financing system restricts the flow of innovative capital.

## **5. Analysis of the Current Situation of Digital Financial Inclusion and Innovation Activity**

### **5.1. Structural Improvements in the Availability of Finance**

The in-depth application of digital technology is changing the core logic of traditional credit models. Through real-time integration of multi-dimensional data such as enterprise operations and transaction flows, the structure of corporate credit loans and other aspects can be changed. Through big data credit reporting, banks can better understand the operating conditions and credit risks of small and micro enterprises and individual industrial and commercial households, accelerate the approval rate of small and micro enterprise loans, significantly improve the accuracy of default prediction, and reduce the non-performing loan rate, thereby promoting the development of inclusive finance and broadening the coverage boundary of financial services.

### **5.2. The Efficiency of the Allocation of Innovative Elements Has been Improved**

The dynamic credit evaluation system has established an efficient docking mechanism between innovation and capital. Traditional credit reporting methods rely on limited credit data, while big data credit information integrates multi-channel data, such as market prospects, key technologies, patent values, etc., so that banks can have a more comprehensive understanding of the credit status, assets and liabilities of enterprises, so as to more accurately assess credit risks, and decide whether to approve loan applications, loan amounts and interest rates. The application of artificial intelligence and machine learning technology has improved the ability of risk management and the efficiency of credit approval.

### 5.3. The Digital Evolution of the Innovation Ecosystem

The threshold for participation in digital finance has been gradually lowered, and the patent contribution rate of non-traditional innovation entities has increased year by year, gradually becoming an important force for technological breakthroughs. The combination of blockchain and the Internet of Things (IoT) has created a new collaborative network that enables real-time interoperability of R&D processes between enterprises through encrypted data streams. This shift not only reduces the cost of trust in collaborative innovation, but also gives rise to a distributed R&D model, where an agricultural technology team and materials experts thousands of miles away conduct joint experiments through smart contracts, and complete technical verification in half the time of the traditional cycle.

## 6. Problems and Countermeasures

### 6.1. The Main Problems that Exist

Digital financial inclusion does play an important role in driving corporate innovation activity, but there are also some problems. From the perspective of geographical scope, although digital inclusive finance has a wide coverage, it has the problem of limited coverage. The use of digital financial inclusion relies on digital infrastructure, and it is difficult to obtain support for digital inclusion if the digital infrastructure in remote areas or smaller enterprises is insufficient or even inadequate. From the perspective of digital inclusive finance itself, there are structural blind spots in its services. For non-digital enterprises, because they do not have access to digital infrastructure, they are systematically excluded and cannot access digital inclusive financial services at the root. In addition, digital inclusive finance has weak support for some high-risk, high-investment uncertain enterprises. The algorithm model of digital inclusive finance has not yet broken through the risk assessment of such enterprises with high uncertainty, nor can it determine the innovation value of innovative enterprises, so the support for this service is relatively weak. From the perspective of external influencing factors, digital financial inclusion relies on big data and artificial intelligence technology in risk management and credit approval, which means that one of the inevitable factors for reliable results is data accuracy. Not all companies provide complete and reliable data, which will inevitably lead to errors in the evaluation process, so that some potential innovative companies lose financing opportunities due to deviations, and may even die due to insufficient funding for new projects. In addition, the rapid development of digital inclusive finance has brought new challenges to the regulatory system and regulatory authorities. The development of digital inclusive finance has exceeded the update of relevant laws, resulting in the phenomenon of lagging laws or legal gaps in some aspects, which not only increases the risk of the financial system, but also limits the space for enterprises to use digital inclusion, and affects the improvement of enterprise innovation activity in digital inclusive finance.

### 6.2. Countermeasures

#### 6.2.1. Policy Level: Building Adaptive Institutional Infrastructure

On the one hand, we will update policies to promote the development of digital inclusive finance, and continue to provide institutional guarantees for digital inclusive finance. At the same time, relevant policies have been introduced to encourage enterprises to actively use digital inclusive financial means to innovate, and guide the direction of innovation and development of enterprises. For example, the introduction of preferential tax policies related to digital inclusive finance, the use of digital inclusive financial support policies, etc., to encourage enterprises to take the initiative to enter the digital inclusive financial space. On the other hand, it is necessary to fill the legal gap of digital inclusive finance, fill the legal gap, correct the old laws that are no longer applicable, reduce the concerns of enterprises about violating the law,

reduce the rate of corporate violations, and enable more enterprises to use digital inclusive finance to make bold innovations and enhance their innovation activity. In addition, it is necessary to introduce relevant regulatory laws and regulations, build a regulatory innovation framework, guide enterprises to innovate in compliance, and point out the risk of corporate violations. The regulatory system needs to be a regulatory system for digital inclusive finance, and work together to comprehensively supervise the whole process of enterprise innovation. It is also possible to establish a digital inclusive financial credit reporting system, giving priority to supporting enterprises with good credit, so as to achieve the effect of supporting excellent enterprises and being vigilant against tail enterprises. In addition, policy support is needed to build digital infrastructure. A digital inclusive finance development fund can be set up, and special bonds for digital infrastructure can be implemented to provide strong financial support for the vigorous construction of digital facilities and expand the breadth of digital inclusive financial services, especially the need to improve the digital infrastructure of remote areas or small enterprises. In addition to expanding digital infrastructure, there is also a need for digital infrastructure gaps, and the word "inclusiveness" of digital inclusive finance needs to be brought into full play.

### **6.2.2. At the Level of Financial Institutions: Deepen Technology Empowerment and Service Innovation**

Improve the level of the data evaluation system of financial institutions, promote the intelligent development of risk assessment, and provide greater financial services for high-risk and high-investment enterprises. An exclusive system for innovative financial risk assessment can be developed to achieve special assessment, accurate assessment, and quantification of its risk assessment technology maturity. Financial institutions flexibly develop service models, design differentiated financial instruments, and develop personalized services for enterprises with different needs and different status situations. Optimize the service technology of financial institutions, improve the service efficiency of financial institutions, reduce the cost of digital inclusive financial services, and provide financial channels for enterprises to reduce capital and increase efficiency. Financial institutions can also innovate service models, unite multiple enterprises to collaborate and innovate, and use the cluster effect to give full play to the advantages of digital inclusive finance, so as to achieve information sharing and reduce the cost of corporate financing needs. In addition, digital inclusive financial institutions should drive innovation and cooperation with traditional financial platforms, learn from the experience of traditional financial platforms, and traditional financial platforms should use digital technology innovation to jointly develop new financial products and services.

### **6.2.3. At the Enterprise Level: Enhance Digital Capabilities and Innovation Resilience**

Enterprises should strengthen their ability to connect with digital technologies and actively use digital inclusive financial means to innovate. It is necessary to build a sound enterprise digital governance framework, coordinate data asset management and innovation decision-making, and promote the digital transformation and upgrading of enterprises while adjusting the corporate governance framework in line with digital inclusive finance. More importantly, it is necessary to strengthen the digital capabilities and data processing capabilities of enterprises to ensure the reliability of the data provided to financial institutions, reduce biases such as evaluation, and obtain more financing support and financial services that are more suitable for the development prospects of enterprises. In addition to the update of the external governance framework, corporate financial tools should also be innovated in order to adapt to various technologies in the docking of digital inclusive finance, and can also drive innovation in other aspects of enterprises and enhance their innovation activity. Digital inclusive finance is open and extensive, and enterprises should grasp this characteristic to create an open innovation system, use network technology to cooperate and co-create with other enterprises, and form a

digital inclusive financial ecological community that is beneficial to exchanges and win-win results. The above development and innovation suggestions naturally need to be built on the basis of a compliance system, which requires enterprises to establish a digital financial management system, put an end to the behavior of exploiting digital loopholes, be vigilant against illegal operations, supervise improper innovation processes, and ensure that enterprise innovation is feasible and innovation results can be obtained.

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