



How Financial Technology Can Enhance Inclusive Finance

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Abstract. The article explores the mechanism of financial technology to enhance the development of inclusive finance and analyzes its impact and challenges. Low efficiency and insufficient coverage of the traditional financial system have created the problems of high cost and difficulty in fulfilling the needs of micro, small and medium-sized enterprises (MSMEs) and disadvantaged groups. Technologies such as big data, artificial intelligence and blockchain have lowered the service threshold and improved efficiency and popularity. The study points out that fintech reduces costs, enhances financial stability and promotes product innovation through mechanisms such as intelligent risk control and blockchain applications. Financial services cover remote areas and disadvantaged groups. However, technology application faces the challenges of high infrastructure requirements and continuous innovation. The government needs to formulate policies to enhance privacy protection, data security and the operationalization of specific measures. The article combines China's digital financial inclusion development cases with international experience to provide targeted recommendations for governments, financial institutions and technology companies to promote deep integration and sustainable development.

Keywords: Financial Technology, Inclusive Finance, Big Data, Artificial Intelligence, Blockchain.

1 Introduction

Nowadays, finance plays a pivotal role in economic development. The traditional financial system, however, has many limitations such as low service efficiency, insufficient service coverage and high labor costs. This makes it difficult to meet the urgent demand for financial services from the vast number of micro, small and medium-sized enterprises (MSMEs), disadvantaged groups and low-income people. Governments and international organizations attach great importance to the development of financial inclusion. In recent years, technologies such as big data, artificial intelligence and blockchain have lowered the threshold and cost of financial services and increased their efficiency and popularity. Financial services have been able to more conveniently and efficiently reach groups and regions that are difficult for traditional finance to reach. An in-depth study of the mechanism of financial science and tech-

nology to enhance the development of financial inclusion can provide a scientific basis for the government to make the relevant policy system more complete and help financial institutions to better utilize scientific and technological means to innovate financial products and optimize the service process. At the same time, it also provides ideas for cooperation between technology companies and financial institutions, which in turn provides strong case support for the development and promotion of new financial products, promoting the implementation of relevant national policies.

In terms of technology adoption, the high cost and complexity of technology and the high infrastructure requirements may lead to a significant reduction in the effectiveness of fintech adoption in some less developed regions [1]. The financial sector is evolving rapidly. It is necessary to phase out and upgrade existing technologies. How to ensure the continuity and stability of technological innovation is also a less studied issue. In terms of technology adoption, the high cost and complexity of technology and the high infrastructure requirements may lead to a significant reduction in the effectiveness of fintech adoption in some less developed regions. With the rapid development of the financial sector, technology needs to be eliminated and upgraded. How to ensure the continuity and stability of technological innovation is also a less studied issue. On the policy side, previous generations lacked comprehensive and operational solutions on how to effectively protect user privacy and data security. The previous research on the prevention mechanism and response strategy for potential risks such as data leakage is also not deep enough. The role of the government remains more at the level of policy advocacy. The research on how to formulate and implement specific policy measures is not perfect, and there is a lack of targeted and operational policy recommendations.

This paper intends to analyze the mechanism of fintech to enhance financial inclusion, discuss the specific impact of fintech on the development of financial inclusion and summarize the challenges may existed in the field of financial inclusion. The purpose is to provide more targeted and operational recommendations for governments, financial institutions and technology companies to further promote the deep integration and sustainable development of fintech and inclusive finance.

This paper will follow the structure of literature review, mechanism research, case analysis, challenges and reflections, and suggestions and conclusions. It strives to comprehensively and systematically explore the issues related to how fintech can enhance the application of inclusive finance and contribute to the research and practice in this field.

2 Literature Review

2.1 The Definition of Inclusive Finance

Definition of the United Nations. Inclusive finance is a financial system that can effectively and comprehensively provide services to all social strata and groups, especially the poor and low-income populations.

Definition of the Government of China. Inclusive finance means the provision of appropriate and effective financial services should be faced to all groups of society who consider financial services to be necessary for themselves, while making them affordable, based on the requirement of equal opportunity and the principle of commercial sustainability.

2.2 The Development of Inclusive Finance

Financial inclusion has become more and more complete in recent years in China. On September 12, 2023, the Ministry of Finance (MOF) of China issued a policy on funds used for inclusive financial development. The policy further leverages the guiding role of fiscal funds through a series of measures. It enhances the financial sector's support for inclusive finance. In October 2023, a conference about finance was held in Beijing by the central government, emphasizing the five aspects of finance. Inclusive finance was included. The policy path of inclusive finance was clearly identified.

In the aspect of technology, the use of financial technology has become an important force in fostering the development of inclusive finance. In shortening business time, enhancing risk control and reducing labor costs and the probability of bad debts, fintech applications have all had a favorable impact, thus reducing comprehensive costs on all fronts.

According to the statistics of Digital Finance Research Center of Peking University, from 2011 to 2018, China's digital inclusive finance business has achieved leapfrog development. The median value of digital inclusive finance index of each province in 2011 was only 33.6, while by 2018, it has reached a historical high level of 294.3 [2]. Financial inclusion has taken shape with banks, non-bank financial institutions, Internet giants and financial technology enterprises as the main body of service to provide services in the areas of rural revitalization, green inclusive finance, financing of small and micro-enterprises, and people's livelihood. Market scale is expanding.

The inclusive finance of China has also made key breakthroughs in the application of rural revitalization and green finance. The balance of agriculture-related loans was RMB 56.6 trillion by the end of 2023. It had an increase of 14.9% compared with the previous year. In the area of green finance, China has launched two financial instruments to support the reduction of carbon emissions, in order to guide more funds to be invested in green and low-carbon areas [3]. Many places across China are also actively exploring the integration and development of inclusive finance and green finance. For example, Jiangsu took the lead in the country in creating a green financial product called Su Carbon Fusion, which is connected to the refinancing policy and linked to the carbon accounts of enterprises.

Internationally, the development of inclusive finance is also getting better. The Recommendation on Facilitating the Financing of the Transition to a Sustainable Economy, issued by the European Commission in June 2023, encourages financial institutions to provide sustainable financial instruments, such as green retail loans and green mortgages, in order to support the participation of MSMEs in the sustainable transition. This demonstrates that the European Union, while promoting sustainable

financial development, also focuses on fulfill the financing needs of small and medium-sized enterprises through inclusive financial instruments. Mobile payments and blockchain technologies are spreading in developing countries. For example, Kenya brought access to formal banking services to Kenyans through the M-Pesa platform. The service has since spread rapidly across Africa, bringing the digital economy into the daily lives of Africans. M-Pesa deepens financial inclusion, contributes to poverty reduction and gender equality, promoting economic growth across the continent [4].

2.3 The Impact of Financial Technology on Inclusive Finance

In the process of promoting the development of inclusive finance, the application of financial technology is constantly breaking through the boundaries of traditional financial services. Take big data risk control as an example. Big data technology for risk control can address information asymmetries. Fintech is able to integrate various types of data with the help of big data technology to build a more comprehensive and accurate user profile. Information asymmetry between financial institutions and customers will be effectively mitigated [5]. Fintech raises the efficiency and accuracy of credit decisions through big data and other technological tools [6]. Big data analytics can more accurately assess borrower risk and reduce the adverse effects of information asymmetry [7]. Fintech enhances transparency and inclusiveness and encourages usage by populations in less developed areas [8].

The spread of digital credit has improved access to finance. For MSMEs, digitization can effectively reduce their financing threshold and ease the financing constraints, providing them with a new way of financing [9]. Through the online model, digital credit breaks through the geographical limitations of traditional financial services and extends credit services to more remote and rural areas, improving the coverage of financial service groups by reducing transaction costs and improving the efficiency of credit decision-making, enabling more people of different income levels to obtain credit support [10].

3 Analysis of Mechanisms for Fintech to Enhance Financial Inclusion

3.1 Reducing the Cost of Financial Services

Intelligent Risk Control and Lending Audit. Fintech utilizes artificial intelligence and big data technology to analyze and process massive amounts of user data. Compared with traditional manual auditing, the intelligent risk control system can quickly and accurately assess a borrower's credit status. For example, by analyzing multi-dimensional data such as a user's consumption records, tax payment records and social security records, it builds a credit assessment model to quantify risk. This not only saves the links and costs of manual review, but also improves the efficiency of credit approval. Intelligent risk control can shorten the credit approval time from

weeks in traditional banks to hours or minutes. This greatly minimizes the time required for financial services and lowers the consumption of human resources.

Blockchain Technology. Blockchain technology is essential to the functioning of business in cross-border payments. It breaks the mode of relying on intermediaries to complete business in traditional cross-border payment. Blockchain technology realizes direct transactions between the payment parties. The transaction process does not need to be confirmed and cleared by multiple intermediaries such as inter-bank correspondent accounts and clearing agencies. This solves the problems of cumbersome processes, high costs and transaction delays that previously existed with cross-border payments. For example, as seen in cross-border payment solution of Ripple, it eliminates the participation of multiple correspondent banks and intermediaries, thereby reducing associated costs. Ripple uses XRP as a bridging intermediary currency, avoiding the high currency conversion fees charged by banks or foreign exchange service providers. In addition, the decentralized ledger used by Ripple is free from the risk of a single point of failure, ensuring that cross-border payments are sufficiently reliable. It is also open to all participants, eliminating the uncertainty found in traditional payment systems. In short, blockchain technology brings down the cost of cross-border payments while increasing the transparency and security of transactions.

3.2 Enhancing the Stability of the Financial System

Upgraded Regulatory Tools. Fintech provides more advanced and efficient technology for regulatory work. Big data analysis can help regulators monitor the trading behavior and risk profile of financial institutions in real time. By way of collecting transaction-specific data and analyzing the financial data of both parties to a transaction during the course of the transaction, regulators can detect abnormal transactions and potential risks, such as insider trading, in a timely manner. Artificial intelligence technology can be used for risk assessment and early warning. By analyzing the market environment, social policies and financial institutions' data, artificial intelligence technology can assess and predict systemic risks and help regulators take measures to prevent risks in advance. For example, some European regulators, such as the European Central Bank and the European Banking Authority, have already established risk monitoring systems using big data and AI technologies. These systems are able to closely detect the state of the market, identify potential systemic risks in a timely manner and provide cases for resolution.

Enhanced Compliance Efficiency. Through their internal compliance management systems, fintech companies can automatically monitor their business activities to ensure that they comply with relevant laws and regulations, regulatory requirements and their internal compliance policies. For example, in terms of anti-money laundering conduct, companies can monitor transaction behaviors of their customers and analyze their transactions at every moment through big data and data analysis technologies,

detecting suspicious transactions in a timely manner and reporting them to regulators. This not only improves the efficiency of corporate compliance, but also contributes to the stability of the entire financial system.

3.3 Coverage of Remote Areas and Vulnerable Groups

Mobile Payments. Mobile payment platforms, such as Alipay and WeChat Pay, provide residents in remote areas with convenient ways to make payments through smartphones and mobile networks. Those areas lacking traditional bank branches prevent people from going to the field to conduct business operations. However, mobile payment only requires network coverage, making users easily carry out payment behaviors such as transferring money and spending.

Digital RMB. Digital RMB is a digitized form of legal tender. It is characterized by payment-as-settlement and offline payments. It provides a safer and more convenient payment option for remote areas and disadvantaged groups, enabling groups without bank accounts to participate in the digital economy. For example, in some remote mountainous areas, digital RMB can be used to make payments through simple mobile devices without the need to connect to the Internet, providing local residents and small and micro enterprises with more convenient financial services. This helps to reduce geographical and social disparities in financial services.

3.4 Driving Product Innovation

Diversification of Financial Products. The development of financial technology has prompted financial institutions to continuously innovate financial products. For example, in the field of loan products, in addition to traditional consumer loans, business loans and other products, supply chain financial products based on big data and blockchain technology have also emerged. By analyzing the transaction data and logistics information in the supply chain, financial institutions can provide accurate financing services for small and medium-sized enterprises in each link of the supply chain. In the investment field, intelligent investment advisors provide investors with personalized investment advice to help them manage and allocate their asset. Intelligent investment advisor platforms can use algorithms and models to customize investment portfolios for investors based on their risk preferences, investment objectives and other information. This lowers the investment threshold. More investors are able to participate in the financial market.

Personalized Service. Different customers have different service needs. Fintech is able to customize financial services that are specific to each customer through their needs. For example, big data analysis understands the customer's consumption habits, investment preferences and other information and then passes the results to financial

institutions. The financial institution recommends financial products and services that meet the customer's needs. Some fintech companies have also used AI technology to develop intelligent customer service that can answer customers' questions and provide personalized service support 24 hours a day. This meets the diverse needs of customers.

4 Case Analysis

4.1 Red-Certificate Loan

The Red-Certificate Loan launched by Bank of Communications is an online loan product developed by Bank of Communications Jilin Branch in cooperation with Jilin Rural Finance Comprehensive Service Company Limited, which provides farmers with financial support for land transfer, purchase of agricultural materials and other production and operation funds by using their legally owned land operation right certificates as the main collateral. Farmers submit information in the APP and complete the whole process of loan application, approval, disbursement and repayment through face recognition, electronic signature and other technologies. In addition, farmers are able to borrow money at any time and repay it at any time. They can flexibly withdraw funds within the credit limit to meet seasonal business needs.

It is of great significance to rural areas. Red-Certificate Loan breaks through the limitations of physical outlets. It covers 44 counties and 1,866 villages in Jilin Province, serves more than 5,000 farm households, and has lent more than 400 million yuan. Red-Certificate Loan can broaden financing channels. Farmers can use documents such as land management right certificates as collateral. This way of choosing collateral is in line with the status quo of groups in remote and backward areas and lowers the financing threshold. Red-Certificate Loan can improve the efficiency of financial services. Compared with traditional loans for farmers, which take weeks, Red-Certificate Loan can be disbursed in as little as one hour from application to disbursement, with an average processing time of only 10-15 minutes. Red-Certificate Loan can promote agricultural development. The funds are directed to agricultural production scenarios such as land contracting, purchase of seeds and fertilizers. Farmers can also purchase agricultural machinery and equipment or expand the scale of planting and farming to improve agricultural production efficiency and economic benefits. This can accurately support agricultural needs and avoid the risk of misappropriation of funds.

4.2 Agricultural Financial Technology of AgriBORA in Kenya

AgriBORA, a Kenyan agricultural financial technology company, has built a digital ecosystem that covers the entire agricultural chain. The platform is centered on small-holder farmers, integrating multiple links in the agricultural value chain. The platform provides information to farmers through digital tools. For example, by utilizing satellite data from the European Space Agency (ESA), farmers can obtain weather fore-

casts for their location. IoT and sensor technology can give farmers access to soil test results. Artificial intelligence analyzes the data, giving farmers access to information such as crop management recommendations. Through blockchain technology, agri-BORA builds a credit scoring system, combining satellite data and farmers' behavioral data to provide financial institutions with an objective basis for risk assessment. In addition, the platform provides market quotes for agricultural products, which can help farmers optimize their planting decisions and connect with sales channels. By integrating technology, data and financial services, it helps smallholder farmers improve productivity, reduce risk and enhance financial inclusion.

4.3 Central Bank Digital Currency in Latin America

The Central Bank Digital Currency (CBDC) in Latin America is a digital legal tender launched by Latin American countries to address economic challenges, increase financial inclusion, lower the cost of cross-border payments, and reduce dependence on the U.S. dollar. Sand Dollar of Bahamas is the world's first legal tender CBDC. It uses blockchain technology and supports offline payment capabilities. It covers seven islands. Jam-Dex of Jamaica is being launched in 2022. It enables instant payments through smartphones and reduces the cost of cash circulation. CBDC uses Distributed Ledger Technology (DLT) and Blockchain technology. These technologies enable secure and transparent transaction records and ensure that data cannot be tampered with. Sand Dollar enables cross-border payment tracking based on blockchain. Jam-Dex reduces cash management costs through DLT. Big data and data analytics technologies can track the flow of funds and assist in monetary policy making and risk monitoring. The application of fintech has expanded the coverage of financial services in Latin America. It also reduces transaction and remittance costs and promotes regional economic integration. The development of fintech has also led to the growth of fintech startups, providing more jobs.

5 The Challenge of Financial Technology for Financial Inclusion

5.1 Technical Issues

Older and lower income groups may face technological barriers. Many fintech services currently rely on technological tools such as mobile apps and online platforms. Elderly people are not familiar enough with the operation of smart devices. Complex business processes can confuse them and thus resist doing business online. And low-income groups may not be able to acquire or update their devices in a timely manner due to financial reasons, resulting in a lack of access to convenient fintech services. In addition, the network infrastructure in some rural or remote areas is relatively weak. Lagging education on financial basics may also affect the fluency of these groups in using fintech. These problems further exacerbate the digital divide.

5.2 Data Privacy Issues

The self-awareness of the executives of fintech companies is crucial. Insufficient awareness of data privacy protection by executives, such as letting friends and family snoop on company data, can lead to leakage of users' personal privacy data. Insufficient attention to data privacy protection can also lead to insufficient related decisions, such as reducing the amount of money spent on data encryption and security protection. Meanwhile, corporate management issues can also lead to data privacy leakage risks. Within the enterprise, if the access rights to data are not strictly managed, employees may cause data leakage due to operational errors or malicious behavior.

5.3 Financial Risks

P2P lending explosion incidents can bring huge losses to investors. The lack of effective regulation of many P2P lending platforms has led to the excessive pursuit of scale expansion. This has led to a break in the capital chain. Ultimately, the platform is unable to pay investors' principal and interest. For example, the eLend P2P platform, once China's largest P2P platform, attracted funds through fictitious borrowing projects. Some of the funds absorbed by the platform were even used for the private lives of company executives. Eventually, the funds could not be recovered and the platform was seized.

The cryptocurrency market is an emerging market globally based on cryptography and blockchain technology that allows peer-to-peer digital currency transactions between individuals and institutions. The valuation of cryptocurrencies, especially unbacked crypto assets, is largely dependent on highly volatile speculative demand. This leads to dramatic price fluctuations. At the same time, there will be unscrupulous individuals who utilize the anonymity of cryptocurrencies for activities such as money laundering. This increases instability in the financial markets.

5.4 Lag of Regulatory and Policy

The rapid development of fintech makes it difficult for government regulatory measures to keep up quickly. New technologies and business models continue to emerge, resulting in regulators needing to spend time researching and understanding these complex financial innovations. This can lead to regulatory gaps. The implementation of relevant laws is also problematic. Laws need to be formulated and amended through certain procedures, often with a certain lag. In the fintech sector, some existing laws and regulations may not be able to cover new financial business scenarios. This leads to insufficient legal basis when dealing with fintech disputes or violations. Meanwhile, some new cross-border fintech businesses will involve the laws and regulatory requirements of different countries. How to harmonize and implement the relevant laws has become a complex challenge.

6 Suggestions

6.1 Government

The government can establish a sound fintech regulatory system to strengthen supervision. They should strengthen the daily supervision and risk monitoring of fintech companies to ensure their compliant operations.

The government should introduce policies such as financial subsidies for fintech companies and encourage financial institutions and technology companies to carry out inclusive financial services. The government should also strengthen the credit system and guide various organizations to integrate data resources from multiple sources to raise the accuracy and efficiency of services.

Accelerating the formulation of specialized regulations on the emerging fintech sector is also important. By inviting experts in the field of financial technology to participate in policy making, governments can make predictions and policy responses to the rapidly changing financial market. For cross-border business, it is necessary to formulate appropriate cooperation policies in conjunction with different countries.

6.2 Financial Institutions

Financial institutions should cooperate deeply with technology companies. They should use their technological advantages to optimize business processes and improve service efficiency and quality. For example, they should work with financial technology companies to build a digital service platform to realize the online and intelligentization of financial services.

Financial institutions should also design personalized inclusive financial products according to the characteristics of different groups. For example, basic products such as microcredit and savings should be introduced for low-income groups. For the elderly they have to provide simple and easy-to-understand financial management services. Products such as start-up loans should be customized for small and micro enterprises. For groups with insufficient personal financial data, they need to design products that substitute credit assets for assessed risk.

6.3 Science and Technology Companies

Companies should establish a strict data management system to standardize the process of data collection, storage and use. They should also adopt advanced encryption technology to protect user privacy.

Continuously optimize the financial inclusion business model, and reduce costs and improve efficiency through technological innovation. For example, use big data and artificial intelligence to optimize risk assessment and pricing models and develop sustainable financial inclusion solutions.

7 Conclusion

This article systematically discusses the enhancement mechanism, impact and challenges faced by fintech on the development of inclusive finance. The traditional financial system is difficult to fulfill the needs of micro, small and medium-sized enterprises and disadvantaged groups due to low efficiency and insufficient coverage. Fintech has become a key force in promoting financial inclusion by lowering service thresholds and costs, promoting product innovation, and enhancing financial stability. This article verifies the practical effects of fintech through case studies in China, the EU, Kenya and Latin America. It also summarizes the challenges faced in terms of technology and policy, and gives suggestions. However, there are still shortcomings in this paper, such as not exploring the balance between technological upgrading and stability, and not enough research on the coping mechanism of the new types of risks brought by fintech. On the policy side, there are fewer explorations of the national conditions of different countries and regions.

This article provides a practical framework for governments, financial institutions and technology companies to integrate fintech and financial inclusion. Future further research needs to primarily deal with difficulties of technology implementation and policy refinement to promote the sustainable deepening of financial inclusion.

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