# China's Digital Finance Going Global and Enterprise Innovation in Developing Countries

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**Abstract:** Promoting the "going global" of digital finance is an important path to deepen the high-level opening-up of the financial sector and boost the construction of the "Digital Silk Road", which is of great significance for enhancing the international competitiveness of China's financial system and empowering the innovative growth of developing countries. Based on the overseas download volume data of mobile applications of Chinese fintech enterprises and listed banks in developing countries and the global intellectual property database from 2016 to 2024, this paper examines the impact of China's digital finance going global on enterprise innovation in developing countries and its mechanism of action. The study finds that China's digital finance going global can significantly promote enterprise innovation in the host developing countries, as reflected in the substantial increase in the number of patent grants to enterprises in these countries. Going global indicators on Fintech companies, on banks and their combination all have significant positive driving effects on enterprise innovation in developing countries. This innovation-promoting effect is mainly realized through two mechanisms: one, by alleviating financing frictions, it significantly reduces the explicit debt costs and implicit financial expenses of enterprises and improves the availability of innovation capital; and two, it significantly increases the scale of enterprises' R&D investment and enhances the intensity of resource input in the early stage of innovation. Heterogeneity analysis reveals that the innovation-driving effect of China's digital finance going global is more pronounced for small enterprises and start-ups with a short establishment time. The research findings deepen the understanding of the behavioral logic of China's digital financial internationalization and the innovation spillover effect, and provide a useful policy reference for China to accelerate the advancement of the financial power strategy and build a mutually beneficial cross-border digital financial service network.

**Keywords**: Digital Finance Going Global; Enterprise Innovation; International Inclusive Effect; Developing Countries

## 1. Introduction

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Against the backdrop of fostering a new development pattern of "dual circulation" and steadily advancing institutional opening-up, improving the cross-border financial service system has become an important strategy for China to deepen the reform of the financial system and enhance its global resource allocation capacity. The report to the 20th National Congress of the Communist Party of China clearly proposes to "promote high-level opening-up" and "advance the internationalization of the RMB in an orderly manner", and the going global of digital finance is the concrete practice of this strategy in the era of the digital economy. In recent years, fintech platforms represented by Alipay, as well as mobile banking apps of China's large commercial banks, have accelerated their expansion into the markets of developing countries in Southeast Asia, Africa, Latin America and other regions, forming a unique phenomenon of "China's digital finance going global". This phenomenon has attracted extensive attention from academic and policy circles: Can China's digital finance going global have a substantial positive impact on the real economy of host countries? Especially for developing countries in urgent need of innovation-driven development, can the entry of China's digital finance activate the innovation vitality of local enterprises? Although existing studies have fully demonstrated the promoting effect of digital finance on enterprise innovation from a domestic perspective (Zhang et al., 2020; Yang & Zhang, 2022; Cai et al., 2024), research on placing it in a cross-border context and examining its spillover effect on enterprise innovation in developing countries is still lacking. This research gap restricts the theoretical understanding of the laws of cross-border spillover of digital finance and is difficult to provide academic support for the strategic layout of China's digital financial international cooperation. Thus, this paper focuses on whether and how China's digital finance going global affects the innovation activities of enterprises in developing countries.

From an economic perspective, digital finance is the product of the deep integration of information technology and financial functions, whose core lies in reshaping the information foundation and decision-making mechanism of financial resource allocation through the large-scale application of data elements. Constrained by information asymmetry and high transaction costs, the traditional financial system is difficult to effectively serve enterprise innovation activities with the characteristics of high risk and long cycle (Hall & Lerner, 2010). The advantage of digital finance is that it greatly reduces the cost of information acquisition and processing through technical means such as big data analysis and artificial intelligence algorithms, enabling financial institutions to more accurately identify the real risks of innovative enterprises, thereby alleviating their financing constraints (Gomber et al., 2018). When this capability crosses national borders and enters developing countries with generally underdeveloped financial systems, digital finance has a dual function: on the one hand, it is a "shortcoming supplement" of financial services, filling the structural gap in local financial supply; on the other hand, it is a "spillover effect" of technical capabilities, introducing advanced digital risk control concepts and operation models into host countries, and imperceptibly improving the digital literacy and resource allocation efficiency of enterprises. It is this dual function that constitutes the theoretical logical starting point for China's digital finance going global to affect enterprise innovation in host countries.

China's digital finance going global is not a one-dimensional expansion, but presents a structural characteristic driven by both fintech and bank digitalization. First, fintech going

global represented by mobile payment and internet credit, such as the output of technical solutions by some enterprises, relying on its low transaction costs and strong scenario penetration, directly reaches the tail enterprises that are difficult to cover by traditional banks, alleviating the financing gap (Gomber et al., 2018). Second, bank digital going global represented by state-owned large banks and joint-stock banks embeds China's efficient digital financial services into the trade and investment chains of the "Belt and Road" by building cross-border payment and settlement systems and online trade finance platforms. The combined force of these two, namely the sum of fintech going global and bank digital going global, constitutes a complete map of China's external output of digital finance going global.

Existing literature provides different perspectives for understanding this phenomenon. The first category of research focuses on the innovation effect of financial development. Classic theories hold that financial deepening can promote enterprise innovation by optimizing capital allocation and risk management (King & Levine, 1993). The second category of research pays attention to the spillover effect of Chinese enterprises "going global", and finds that China's infrastructure construction indirectly improves the local economic development level by improving the business environment of host countries (Dreher et al.,2021; Bluhm et al.,2025). However, existing studies have certain shortcomings: the field of international economics mostly focuses on manufacturing going global, ignoring the uniqueness of digital finance as virtual infrastructure; while financial development literature mostly focuses on the impact of domestic digital finance, and insufficiently discusses the heterogeneous role of cross-border digital finance. In particular, few studies separate and compare "fintech going global" and "bank digital going global" to explore whether there are differences in their impacts on enterprise innovation in developing countries—the former may focus more on "technology spillover" and "inclusive access", while the latter may rely more on "large customer supply chain transmission". In view of this, this paper subdivides China's digital finance going global into two dimensions: fintech going global and bank digital going global, and constructs a comprehensive indicator of the two, systematically examining their impact on enterprise innovation in developing countries.

Based on the overseas download volume data of apps of Chinese fintech enterprises and listed banks in 43 developing countries and the BvD Global Intellectual Property Database from 2016 to 2024, this paper studies the impact of China's digital financial services going global on enterprise innovation in host countries and its mechanism of action. The study finds that China's digital finance going global can significantly promote enterprise innovation in developing countries, as reflected in the substantial increase in the number of patent grants to enterprises. Specifically, whether it is fintech going global, bank digital going global, or the comprehensive going global indicator measured by the sum of the two, all have a significant driving effect on enterprise innovation in host countries. Mechanism analysis shows that China's digital finance going global promotes enterprise innovation in host countries mainly through two channels: first, effectively alleviating financial frictions, significantly reducing the explicit debt costs and implicit financial expenses of enterprises in host countries, and reducing the capital constraints in innovation activities; second, increasing the scale of enterprises' R&D investment in the early stage of innovation and enhancing the intensity of innovation input. Heterogeneity analysis shows that the innovation-driving effect of China's digital finance going global has a greater

impact on small enterprises and start-ups, with obvious inclusive financial characteristics.

Compared with existing studies, the marginal contributions of this paper are mainly reflected in the following three aspects: First, from the research perspective, this paper is the first to systematically examine the cross-border spillover effect of China's digital finance going global on enterprise innovation in developing countries, expanding the international dimension of research on the economic effects of digital finance. Existing literature mainly focuses on the impact of digital finance on domestic consumption (Yang & Zhang, 2022; Huang et al., 2023), inequality (Zhang et al., 2020) and rural development (Cai et al., 2024), and a small number of studies involving cross-border digital finance also mostly stay at the qualitative analysis at the macro level (Frost et al., 2019), lacking rigorous causal inference based on micro enterprise data. This paper uses the overseas download volume data of apps of Chinese fintech enterprises and listed banks in 43 developing countries, and matches it with the Orbis global enterprise patent database, providing direct evidence for evaluating the micro economic effects of China's digital finance going global and filling the gap in empirical research in this field. From a theoretical perspective, this paper extends the financial development theory to the field of cross-border digital finance, reveals the new laws of financial spillover effects under digital technology conditions, and provides theoretical support for understanding financial interconnection under the framework of "South-South cooperation".

Second, in terms of the indicator system, different from existing studies that mostly use macro aggregate data or only focus on partial investigation of a single subject, this paper deconstructs China's digital finance going global into two dimensions: "fintech going global" and "bank digital going global", and on this basis constructs a total indicator of "digital finance going global" which is the sum of the two. The innovation of this indicator design is that, on the one hand, by distinguishing the two types of going global subjects: fintech enterprises and traditional banks, it can capture the essential differences between them in business models, risk preferences and customer positioning, and then reveal their possible heterogeneous impacts and differentiated impact paths on enterprise innovation in host countries; on the other hand, the construction of the aggregated indicator not only comprehensively depicts the overall strength of China's digital finance going global, but also provides an empirical basis for testing whether there is a synergistic effect between the two types of subjects, thus theoretically responding to the academic debate on whether fintech and traditional finance are "substitutes" or "complements".

Third, it provides a policy starting point for China to deepen the high-level two-way opening-up of finance and optimize the path of "South-South cooperation". Although China is vigorously promoting the international layout of financial institutions, there is still a lack of clear depiction of the real economic effects of different types of digital financial services going global, such as fintech platforms and bank digitalization, especially their impact on the core competitiveness of host countries such as basic innovation capabilities. The empirical results of this paper show that China's digital finance going global has a unique comparative advantage in promoting the innovation of developing countries, especially start-ups and small and micro enterprises. This provides empirical evidence for China's financial regulatory authorities to formulate more targeted support policies for going global, and also highlights China's great power responsibility in leading global digital financial governance and promoting global

common prosperity.

The structure of this paper is as follows: the second section is the theoretical mechanism and research hypotheses, the third section is the data sources and identification strategies, the fourth section is the empirical analysis, the fifth section is the mechanism test, the sixth section is the further analysis, and finally the conclusions and policy implications.

## 2. Theoretical Analysis and Hypothesis

The theoretical origin of the relationship between finance and innovation can be traced back to Schumpeter's innovation theory, which expounds the core function of the financial sector in economic development, that is, providing the necessary purchasing power for entrepreneurial innovation through credit creation (Schumpeter, 1912). Modern financial development theory has further deepened this understanding, showing that the efficiency and structure of the financial system directly affect the scale and direction of innovation activities (Levine, 2005). However, many developing countries have been in a state of financial repression for a long time, and the traditional banking system often has serious inefficiency and credit rationing problems, leading to severe financing constraints for local enterprises and hindered innovation activities (McKinnon, 1973; Allen et al., 2014).

China's digital finance going global provides a new possibility to solve the above dilemma. According to the long tail theory, digital finance has a complementary effect on traditional finance. Restricted by the high marginal cost of physical outlets, traditional financial institutions tend to serve large leading enterprises, while the financing needs of a large number of small and medium-sized enterprises are difficult to be effectively met. Relying on technical means such as mobile internet and cloud computing, Chinese digital finance enterprises have significantly reduced the search and operation costs of reaching customers, which can just fill this market gap and make it commercially sustainable to serve a large number of scattered small and medium-sized enterprises in developing countries (Anderson, 2006; Gomber et al., 2018). This cross-geographical financial supply effectively makes up for the shortage of traditional financial services in host countries and injects key funds into the innovation activities of marginalized enterprises (Demirgüç-Kunt et al., 2018; Ozili, 2018).

From the perspective of technology spillover, China's digital finance going global is not only the cross-border flow of capital, but also the output of cutting-edge technologies. China has accumulated world-leading experience in digital payment, big data risk control and platform ecological construction (Huang et al., 2020). This cross-border transfer of technology can produce a significant competitive effect, forcing local financial institutions in host countries to accelerate digital transformation, thereby improving the resource allocation efficiency of the entire financial system and creating a better macro ecological environment for enterprise innovation (Thakor, 2020; Feng et al., 2023). In addition, the development of digital finance can also drive enterprises to carry out product innovation from the demand side by promoting consumption smoothing and market demand expansion (Li et al., 2020). Based on the above analysis, this paper puts forward the following research hypothesis:

**H1**: China's digital finance going global can significantly promote enterprise innovation in developing countries.

**(1) Reducing Financing Costs**

Due to the characteristics of high risk, long cycle and information opacity, enterprise innovation activities face more severe financing constraints than conventional investments (Myers & Majluf, 1984; Hall & Lerner, 2010). Credit rationing theory shows that under the condition of information asymmetry, financial institutions are difficult to effectively distinguish the risk types of borrowing enterprises, and the adverse selection and moral hazard thus generated will lead to a high external financing premium (Stiglitz & Weiss, 1981). This financial friction is directly reflected in the rise of enterprises' interest expenses and financial costs, which squeeze the internal funds that could be used for R&D, thus inhibiting innovation (Brown et al., 2012). Aghion et al. (2007) further pointed out that financing cost constraints are the core financial obstacle leading to insufficient enterprise technological innovation.

China's digital finance going global provides a feasible path to solve this dilemma. First, relying on big data risk control technology to alleviate information asymmetry and reduce explicit interest costs. Small and medium-sized enterprises in developing countries generally lack qualified collateral and standardized financial statements, making it difficult for traditional banks to conduct effective risk pricing for them (Beck et al., 2018). The big data risk control technology output by Chinese fintech enterprises can use the massive digital footprints generated by enterprises in e-commerce, payment, supply chain and other scenarios to build an alternative credit evaluation model (Berg et al., 2020; Frost et al., 2019). This risk portrait technology based on machine learning can more accurately identify high-quality enterprises, reduce adverse selection and moral hazard, and enable financial institutions to charge a lower risk premium (Hau et al., 2021; Gambacorta et al., 2022). Second, compressing enterprises' implicit financial expenses by reducing transaction frictions and strengthening market competition. According to transaction cost theory, traditional cross-border financing involves complex due diligence processes and manual approval, resulting in high search, bargaining and execution costs (Coase, 1937). Chinese digital finance apps have drastically cut the above friction costs with standardized online processes and automated approval systems (such as the "310" model) (Fuster et al., 2019). At the same time, the entry of China's digital finance has intensified competition in the financial market of host countries (Philippon, 2016), forcing local financial institutions to reduce service rates to maintain market share, thus promoting the decline of enterprise financial costs as a whole. In summary, China's digital finance going global has significantly reduced enterprises' explicit interest expenses and implicit financial costs by alleviating information asymmetry and reducing transaction frictions, effectively releasing the innovation potential suppressed by financing constraints. Based on this, this paper puts forward the following hypothesis:

**H2**: China's digital finance going global promotes enterprise innovation in developing countries by reducing enterprise financing costs.

**(2) Increasing R&D Investment**

The realization of innovation activities depends on sustained and stable R&D investment, which, as the core material foundation, directly determines the level of patent output. However, R&D activities have the characteristics of long return cycle and irreversibility, and have high requirements for the stability of cash flow (Brown et al., 2009; Hall & Lerner, 2010). The

pecking order theory of financing shows that enterprises give priority to internal financing, followed by debt financing, and finally equity financing when raising funds (Myers & Majluf, 1984). When internal cash flow is insufficient, the availability and cost of external financing directly determine whether enterprises can maintain stable R&D investment. China's digital finance going global has significantly improved the R&D intensity of enterprises in host countries through the dual effects of incremental supplement and allocation optimization.

On the one hand, China's digital finance going global exerts a resource effect and alleviates the liquidity constraints of enterprise R&D investment. For developing countries, the insufficient local financial supply is the main bottleneck restricting R&D investment. Especially for start-ups and science and technology enterprises lacking fixed asset collateral, traditional financing channels are often difficult to cover their R&D capital needs (Beck et al., 2005). The entry of China's digital finance has expanded the total boundary of loanable funds in host countries by providing innovative financing methods such as unsecured credit loans, enabling enterprises to allocate more resources to R&D expenditure while maintaining daily operations (Hsu et al., 2014; Chava et al., 2013). From the perspective of R&D smoothing, digital finance also helps maintain the intertemporal stability of enterprise R&D investment, creating favorable conditions for the continuous development of enterprise innovation activities (Brown & Petersen, 2011; Amore et al., 2013). On the other hand, China's digital finance going global optimizes the allocation efficiency of innovation resources. The traditional financial system often has the problem of credit misallocation, with funds tending to flow to low-efficiency mature sectors rather than high-growth innovative sectors (Goldstein et al., 2019). Relying on big data and artificial intelligence algorithms, digital finance can more acutely identify innovative enterprises with high growth potential and guide funds to these sectors with high R&D return rates, thus correcting the resource allocation distortion in the traditional market (Balyuk & Davydenko, 2019; Huang et al., 2021). This process has effectively improved the R&D investment level of enterprises in developing countries, thereby releasing their innovation potential. Based on this, this paper puts forward the following hypothesis:

**H3**: China's digital finance going global promotes enterprise innovation in developing countries by increasing enterprise R&D investment.

## 3. Data Sources and Identification Strategies

### (1) Data Sources

The research sample of this paper covers enterprise-level data of 43 developing countries from 2016 to 2024, and the main data sources include enterprise patent and financial data, China's digital financial service going global data, and other country-level macro data released by international organizations.

First, the data on enterprise innovation input, output and financial characteristics are from the Orbis Intellectual Property Global Intellectual Property Database of Bureau van Dijk (BvD). This database is one of the most comprehensive enterprise-level intellectual property databases at present, integrating authoritative patent information from major global patent offices such as the World Intellectual Property Organization (WIPO), the European Patent Office (EPO), the United States Patent and Trademark Office (USPTO), and the China National Intellectual

Property Administration (CNIPA). The advantage of this database is that it is connected with BvD's Orbis enterprise database, which can provide complete matching information from patent applications to enterprise financial performance, ownership structure and industrial classification, laying a solid data foundation for this paper to examine enterprise innovation behavior from a micro perspective.

Second, the data on the going global of China's digital financial services are from Sensor Tower, a world-leading mobile application market intelligence platform. This platform covers both Android and iOS platforms and continuously tracks core indicators such as mobile application download volume, active users and income in 84 countries and regions around the world. This paper systematically collects the annual download volume data of Chinese financial institution apps in each sample country from 2016 to 2024, and subdivides it into two sub-indicators: "fintech going global" and "bank digital going global". Among them, the bank digital going global data covers the download of 150 official apps released by 42 commercial banks listed on China's A-share market in each host country. For the identification of fintech going global data, this paper adopts a dual identification strategy of "keyword screening + manual inspection": first, conduct initial screening in the Sensor Tower database based on whether the app name contains keywords such as "finance, payment, transfer, remittance, loan, money, wealth, wallet, cash, insurance, property insurance, securities, stock, fund, wealth management, transaction, investment, bond, futures, option, credit, financing, exchange"; then, eliminate non-fintech platforms through manual one-by-one inspection, and finally construct an app sample library containing 93 Chinese fintech enterprises (including their English versions) such as Alipay, JD Finance, Ant Fortune, and Du Xiaoman Finance. To further examine the overall effect of China's digital finance going global, this paper sums up the overseas download volume of the above two types of apps and constructs a comprehensive indicator of "fintech and bank digital going global".

Third, other international-level data are from the World Development Indicators; information and communication technology development data are from the International Telecommunication Union; legal system level data are from the World Bank's Worldwide Governance Indicators; and the host country's own digital financial development level data are from the Cambridge Centre for Alternative Finance[5].

In addition, in the selection of sample countries, this paper follows the classification standard of the United Nations' *World Economic Situation and Prospects 2025*, excludes developed country samples, and finally obtains 43 representative developing countries as research objects, including Algeria, Argentina, Bahrain, Belarus, Bermuda, Bolivia, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Egypt, Georgia, India, Indonesia, Israel, Kazakhstan, Kenya, Kuwait, Lebanon, Malaysia, Mexico, Oman, Pakistan, Panama, Paraguay, Peru, the Philippines, Qatar, the Russian Federation, Saudi Arabia, Serbia, Singapore, South Africa, Sri Lanka, Thailand, Tunisia, Turkey, Ukraine, the United Arab Emirates, Uruguay, Uzbekistan, and Vietnam.

5 Source: https://ccaf.io/atlas/visualisation/graph.

**(2) Model Setting and Variable Definition**

To test the impact of China's digital financial services going global on enterprise innovation in developing countries, this paper constructs the following econometric model:

$$Innovation_{i,j,c,t} = \alpha + \beta Chinadf_{c,t} + \gamma X_{i,c,t} + \delta Z_{c,t} + \theta_i + \rho_c + \tau_j + \mu_t + \varepsilon_{i,j,c,t} \quad (1)$$

Among them, the subscripts $i$、$j$、$c$、and $t$ represent enterprise, industry, host country and year respectively. The explained variable $Innovation_{i,j,c,t}$ represents the innovation level of enterprise $i$ in industry j of country c in year t, measured by the number of patent grants. The core explanatory variable $Chinadf_{c,t}$ represents the going global of China's digital financial services. $X_{i,c,t}$ and $Z_{c,t}$ represent the control variables at the enterprise and national levels respectively. $\theta_i$、$\rho_c$、$\tau_j$、$\mu_t$ are the fixed effects of enterprise, country, industry and year respectively, and $\varepsilon_{i,j,c,t}$ is the random error term. This paper clusters the robust standard errors of all regression coefficients at the enterprise level.

**Explained variable**: Enterprise innovation ($Innovation_{i,j,c,t}$). To comprehensively measure the innovation activities of enterprises, this paper refers to the practice of existing literature (Bernstein, 2015; Chang et al., 2019) and adopts the number of enterprise patent grants as a proxy variable for innovation output. Specifically, the natural logarithm of the number of patents applied for by enterprises and finally granted plus 1 is taken to reflect the actual innovation output level of enterprises.

**Core explanatory variable**: Scale of China's digital finance going global ($Chinadf_{c,t}$). To comprehensively depict the expansion degree of China's digital financial services in the markets of developing countries, this paper constructs this indicator from the following three levels: first, fintech going global, measured by the natural logarithm of the overseas download volume of apps of Chinese fintech enterprises plus 1; second, bank digital going global, measured by the natural logarithm of the overseas download volume of apps of Chinese A-share listed banks plus 1; third, comprehensive going global indicator, that is, the natural logarithm of the sum of the download volume of the above two types of apps plus 1. App download volume can directly reflect the user penetration rate and actual use activity of China's digital financial services in overseas markets, and better depict the market coverage and user acceptance in host countries.

**Control variables**: To alleviate the estimation bias caused by omitted variables, this paper introduces a series of control variables at the enterprise and national levels respectively. Enterprise-level variables include enterprise age (*Age*), operating income (*Revenue*), enterprise size (*Size*), solvency (*Lev*), and intangible assets (*IntAsset*). National-level variables include GDP growth rate (*GDP*), local digital financial development (*Localdf*), internet penetration rate (Internet), trade openness (*Open*), and population size (*Pop*). To control the impact of extreme values, this paper winsorizes the continuous variables at the 1% and 99% quantiles. Finally, 307,898 observations are obtained, and the specific definitions and calculation methods of each variable are shown in Table 1.

**Table 1 Variable Definitions and Descriptive Statistics**

**Panel A: Variable Definitions**

| | Symbol | Definition |
|---|---|---|
| Enterprise Innovation | *Innovation* | Natural logarithm of the number of patent grants obtained by the enterprise plus one |
| Fintech Going Global | *FinTech* | Natural logarithm of the overseas download volume of apps of Chinese fintech enterprises plus one |
| Bank Digital Going Global | *Bank* | Natural logarithm of the overseas download volume of apps of Chinese listed banks plus one |
| Fintech and Bank Digital Going Global | *Chinadf* | Natural logarithm of the sum of overseas download volume of apps of Chinese fintech enterprises and listed banks plus one |
| Enterprise Age | *Age* | Natural logarithm of the enterprise's operating life plus one |
| Operating Income | *Revenue* | Natural logarithm of the enterprise's operating income plus one |
| Enterprise Size | *Size* | Natural logarithm of the enterprise's total assets |
| Solvency | *Lev* | Current ratio of the enterprise to measure short-term solvency, current ratio = current assets / current liabilities |
| Intangible Assets | *IntAsset* | Ratio of intangible fixed assets to ending total assets |
| GDP Growth Rate | *GDP* | Growth rate of per capita gross domestic product |
| Local Digital Financial Development | *Localdf* | Number of fintech enterprises per thousand people in the host country |
| Internet Penetration Rate | *Internet* | Proportion of individuals using the internet in the total population |
| Trade Openness | *Open* | Ratio of the total import and export of goods and services to domestic GDP |
| Population Size | *Pop* | Natural logarithm of the total domestic population |

**Panel B: Descriptive Statistics Results**

| | Symbol | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|
| Enterprise Innovation | *Innovation* | 307898 | 0.1289 | 0.4180 | 0.0000 | 2.3979 |
| Fintech Going Global | *FinTech* | 307898 | 10.7984 | 1.7537 | 5.8861 | 13.3148 |
| Bank Digital Going Global | *Bank* | 307898 | 8.7614 | 1.4858 | 3.4340 | 11.8582 |
| Fintech and Bank Digital Going Global | *Chinadf* | 307898 | 11.0263 | 1.6326 | 6.5889 | 13.3246 |
| Enterprise Age | *Age* | 307898 | 2.7659 | 0.8003 | 0.6931 | 4.4067 |
| Operating Income | *Revenue* | 307898 | 14.0563 | 4.8384 | 0.0000 | 22.1470 |
| Enterprise Size | *Size* | 307898 | 15.1842 | 3.2245 | 5.1051 | 23.1017 |
| Solvency | *Lev* | 307898 | 4.0009 | 8.1598 | 0.0120 | 57.0670 |
| Intangible Assets | *IntAsset* | 307898 | 0.0335 | 0.1130 | 0.0000 | 0.7513 |
| GDP Growth Rate | *GDP* | 307898 | 0.0259 | 0.0367 | -0.1510 | 0.1647 |
| Local Digital Financial Development | *Localdf* | 307898 | 3.0867 | 1.1375 | 0.0000 | 5.6095 |
| Internet Penetration Rate | *Internet* | 307898 | 0.7712 | 0.1832 | 0.1239 | 0.9742 |
| Trade Openness | *Open* | 307898 | 0.8250 | 0.7616 | 0.2432 | 3.2094 |
| Population Size | *Pop* | 307898 | 18.4700 | 1.3309 | 11.0580 | 2 |

## 4. Empirical Analysis

### (1) Baseline Regression Results

Table 2 reports the baseline regression results of the impact of China's digital finance going global on enterprise innovation in developing countries. Among them, columns (1) to (3) present the preliminary regression results, and columns (4) to (6) are the regression results after adding all control variables. The regression coefficients of the core explanatory variables are significantly positive at the 1% level in all columns. Specifically, in column (6), the coefficient of *Chinadf*, the total indicator of China's digital finance going global (fintech and bank digital going global), is 0.0104, significant at the 1% level. From the perspective of sub-indicators, the regression coefficients of fintech going global (*FinTech*) and bank digital going global (*Bank*) are 0.0072 and 0.0119 respectively, also significant at the 1% level. This result indicates that the cross-border output of China's digital financial services, whether through emerging fintech platforms or through the digital transformation channels of traditional commercial banks, has significantly promoted the innovation level of enterprises in host countries, thus verifying Research Hypothesis 1 of this paper.

From an economic perspective, when the fintech going global indicator increases by one standard deviation (1.7537), the innovation level of enterprises in developing countries will increase by 0.0126 units (0.0072×1.7537), equivalent to 9.77% of the average innovation level of sample enterprises; when the bank digital going global indicator increases by one standard deviation (1.4858), the enterprise innovation level will increase by 0.0177 units (0.0119×1.4858), equivalent to 13.73% of the sample mean, indicating that the economic effect of bank digital going global is slightly higher than that of fintech going global. From the perspective of comprehensive effect, for each one standard deviation (1.6326) increase in the total indicator of China's digital finance going global, the innovation level of enterprises in host countries can be driven up by 0.017 units (0.0104×1.6326), equivalent to 13.19% of the sample mean. This shows that China's digital finance going global is not only statistically significant, but also has a substantial driving effect on the technological progress of developing countries in economic reality.

The above results mean that China's digital financial services can cross national borders through digital channels such as mobile applications, forming a significant positive spillover effect on the innovation activities of the real economy sector in host countries. This indicates that the "externality" of digital finance is no longer limited to national borders, but has gradually formed a new path of cross-border technology spillover and financial empowerment. This finding further confirms the in-depth value of China's digital finance going global strategy, which not only serves the financial needs of local consumers, but also promotes the innovation activities of productive enterprises in host countries at a deeper level and enhances their long-term growth potential.

**Table 2 China's Digital Finance Going Global and Enterprise Innovation**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Enterprise Innovation | | | | | |
| | 0.0027*** | | | 0.0072*** | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *FinTech* | (0.0010) | | | (0.0014) | | |
| *Bank* | | 0.0123*** | | | 0.0119*** | |
| | | (0.0020) | | | (0.0020) | |
| *Chinadf* | | | 0.0049*** | | | 0.0104*** |
| | | | (0.0011) | | | (0.0017) |
| *Age* | | | | -0.0093* | -0.0125** | -0.0095* |
| | | | | (0.0055) | (0.0055) | (0.0055) |
| *Revenue* | | | | 0.0002 | 0.0002 | 0.0002 |
| | | | | (0.0004) | (0.0004) | (0.0004) |
| *Size* | | | | 0.0124*** | 0.0125*** | 0.0124*** |
| | | | | (0.0010) | (0.0010) | (0.0010) |
| *Lev* | | | | -0.0000 | -0.0000 | -0.0000 |
| | | | | (0.0001) | (0.0001) | (0.0001) |
| *IntAsset* | | | | 0.0558*** | 0.0571*** | 0.0557*** |
| | | | | (0.0139) | (0.0143) | (0.0139) |
| *GDP* | | | | 0.1644*** | 0.1488*** | 0.1679*** |
| | | | | (0.0246) | (0.0228) | (0.0242) |
| *Localdf* | | | | 0.0463*** | 0.0323*** | 0.0500*** |
| | | | | (0.0082) | (0.0082) | (0.0084) |
| *Internet* | | | | 0.1931*** | 0.1211*** | 0.2041*** |
| | | | | (0.0260) | (0.0194) | (0.0255) |
| *Open* | | | | -0.0663*** | -0.0563*** | -0.0633*** |
| | | | | (0.0136) | (0.0135) | (0.0135) |
| *Pop* | | | | -0.3662*** | -0.4152*** | -0.3500*** |
| | | | | (0.0407) | (0.0406) | (0.0405) |
| Constant | 0.0982*** | 0.0220 | 0.0754*** | 6.4107*** | 7.3819*** | 6.0487*** |
| | (0.0103) | (0.0176) | (0.0125) | (0.7451) | (0.7351) | (0.7405) |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 307262 | 304966 | 307898 | 307262 | 304966 | 307898 |
| $R^2$ | 0.5087 | 0.5175 | 0.5143 | 0.5100 | 0.5186 | 0.5155 |

**(2) Robustness Tests**

**1. Endogeneity Problem**

Although this paper controls multi-dimensional fixed effects and rich enterprise and national-level characteristics in the baseline regression, there may still be endogeneity problems caused by omitted variables or reverse causality between China's digital finance going global and enterprise innovation in host countries, such as unobserved digital technology preferences and potential industrial policy support of host countries. Countries with high innovation activity may be more inclined to take the initiative to introduce China's digital financial services. To

this end, referring to the research idea of existing literature on the impact of geographical endowments on economic activities (Nunn & Puga, 2012), this paper selects the coastline ratio of each country as the instrumental variable. The data are from *The World Factbook*[6]. Since the coastline ratio is a geographical characteristic that does not change with time, it will be absorbed by the national fixed effect if directly put into the model. This paper constructs the interaction term between the coastline ratio and the year as a time-varying instrumental variable (Time-varying IV) to identify the causal effect of China's digital finance going global on enterprise innovation.

In terms of correlation, from the perspective of economic geography, the length of the coastline is a natural proxy variable for a country's openness and external connection capacity. First, according to the extended theory of the gravity model of trade, countries with longer coastlines or higher coastline ratios tend to have more ports and lower cross-border transaction costs, and are the "bridgeheads" for international trade and foreign investment inflows (Feyrer, 2019). The going global strategy of Chinese fintech enterprises is usually accompanied by the extension of cross-border e-commerce and international trade paths, and they tend to give priority to layout in coastal countries with high openness and close external economic links. Second, from the physical attribute of digital infrastructure, the backbone network of the global internet mainly relies on submarine optical cable transmission, and the landing stations of submarine optical cables are almost all located in coastal areas. Hjort and Poulsen (2019) found that coastal areas have access to high-speed internet services earlier due to the access of submarine optical cables. Therefore, countries with a higher coastline ratio have lower laying costs of digital financial infrastructure, which is more conducive to the promotion and penetration of Chinese digital finance apps. In terms of exogeneity, the coastline ratio is a natural geographical feature determined by geological structure, which is a strictly exogenous variable. The coastline form of a country was formed many years ago and will not be affected by the reverse impact of the current enterprise innovation activities or short-term economic fluctuations of the country, which meets the exclusivity requirement of instrumental variables.

Table 3 reports the instrumental variable regression results using the two-stage least squares method (2SLS). Columns (1), (3) and (5) are the first-stage regression results. The results show that the coefficients of the instrumental variables are significantly positive at the 1% level, indicating that the more obvious the coastline advantage of the host country, the higher the degree of attracting China's digital finance going global, verifying the correlation of the instrumental variables. In addition, the LM statistics all significantly reject the original hypothesis of "underidentification of instrumental variables", and the first-stage F statistics are greater than the critical value of the Stock-Yogo weak identification test, excluding the possibility of weak instrumental variables. Columns (2), (4) and (6) report the second-stage estimation results. After eliminating the potential endogeneity bias through instrumental variables, the regression coefficients of the core explanatory variables fintech going global (*FinTech*), bank digital going global (*Bank*) and fintech and bank digital going global (*Chinadf*) are still significantly positive, and at least significant at the 5% level. To sum up, after

6 Data source: *The World Factbook*, https://www.scribd.com/document/848356005/THE-WORLD-S-COASTAL-AREA-RATIO.

considering the endogeneity problem, the core conclusions of this paper still hold.

**Table 3 Instrumental Variable Regression Results**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Enterprise Innovation | | | | | |
| *Coast area×year* | 0.0097*** | | 0.0038*** | | 0.0083*** | |
| | (0.0002) | | (0.0001) | | (0.0001) | |
| *FinTech* | | 0.0173*** | | | | |
| | | (0.0066) | | | | |
| *Bank* | | | | 0.0337** | | |
| | | | | (0.0171) | | |
| *Chinadf* | | | | | | 0.0203*** |
| | | | | | | (0.0078) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| F statistic | 3226.166 | | 3742.466 | | 3377.021 | |
| LM statistic | 582.804 | | 661.246 | | 540.475 | |
| N | 304508 | 304508 | 302212 | 302212 | 305144 | 305144 |

**2. Replacing the Dependent Variable**

The baseline regression mainly focuses on the increase in the number of enterprise patent applications, that is, examining the impact of China's digital finance going global on enterprise innovation in developing countries from the perspective of the intensive margin. To exclude the interference of data distribution form on the estimation results and further test whether China's digital finance going global can help enterprises cross the innovation threshold, that is, promote enterprise innovation on the extensive margin, this paper reconstructs the explained variable for robustness test. Specifically, this paper constructs a binary dummy variable (whether a patent is obtained) to measure whether an enterprise obtains a patent. If an enterprise is granted at least one patent in the current year, the variable takes the value of 1, otherwise 0. This indicator can directly reflect the tendency and probability of enterprises to carry out innovation activities. Subsequently, this paper keeps the setting of control variables and fixed effects unchanged and re-estimates Model (1). The test results in Table 4 show that the regression coefficients of fintech going global (*FinTech*), bank digital going global (*Bank*) and the overall digital finance going global (*Chinadf*) indicators are all significantly positive at the 1% statistical level. This means that the cross-border penetration of China's digital financial services has significantly increased the probability of enterprise innovation in developing countries. This finding not only verifies the robustness of the baseline regression results, but also further indicates that the innovation incentive effect of China's digital finance going global on enterprises in host countries not only increases the quantity of innovation output, but also expands the coverage of innovation subjects.

**Table 4 Regression Results of Replacing the Dependent Variable**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Whether a Patent is Obtained | | |
| *FinTech* | 0.0026*** | | |
| | (0.0010) | | |
| *Bank* | | 0.0113*** | |
| | | (0.0015) | |
| *Chinadf* | | | 0.0052*** |
| | | | (0.0012) |
| Controls | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| N | 307262 | 304966 | 307898 |
| $R^2$ | 0.3183 | 0.3229 | 0.3215 |

### 3. Test of Controlling Interactive Fixed Effects

Although the baseline regression model has controlled the individual fixed effects at the national, industrial and annual levels, there may still be unobservable factors that change with the cross of time, location or industry interfering with the estimation results. To further verify the robustness of the baseline regression results, this paper controls the possible omitted factors by introducing a multi-dimensional fixed effect model. Specifically, first, control the country-industry fixed effect, firm fixed effect and year fixed effect at the same time to eliminate potential interferences such as the industrial structure characteristics of different countries, enterprise heterogeneity and macro time trends; second, control the firm fixed effect, country fixed effect and industry-year fixed effect under different settings to further alleviate the estimation bias caused by industrial cycle shocks or national-level policy changes. The test results in Table 5 show that no matter which combination of fixed effects is adopted, the coefficients of China's digital finance going global indicators (including fintech going global, bank digital going global and their combined indicators) remain significantly positive at the 1% confidence level. This indicates that the promoting effect of China's digital finance going global on enterprise innovation in developing countries found in the baseline regression is not driven by the national-level industrial heterogeneity or the cyclical fluctuations of the global industry. Even after controlling the extremely strict micro enterprise individual effects and macro interactive effects, the cross-border spillover effect of China's digital financial services still exists steadily, further confirming the reliability of the core conclusions of this paper.

**Table 5 Regression Results of the Test of Controlling Interactive Fixed Effects**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Enterprise Innovation | | | | | |
| *FinTech* | 0.0072*** | | | 0.0071*** | | |
| | (0.0014) | | | (0.0015) | | |
| *Bank* | | 0.0119*** | | | 0.0115*** | |
| | | (0.0020) | | | (0.0021) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Chinadf* | | | 0.0104*** | | | 0.0105*** |
| | | | (0.0017) | | | (0.0017) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | No | No | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | No | No | No |
| Country×Sector FE | Yes | Yes | Yes | No | No | No |
| Sector×Year FE | No | No | No | Yes | Yes | Yes |
| CountryFE | 307262 | 304966 | 307898 | 307262 | 304966 | 307898 |
| YearFE | 0.5088 | 0.5174 | 0.5143 | 0.5109 | 0.5195 | 0.5165 |

## 5. Mechanism Analysis

The aforementioned analysis shows that China's digital financial services going global have significantly improved the enterprise innovation output of developing countries, and this result is robust. In this part, we further explore the mechanisms through which China's digital financial services going global affect enterprise innovation activities.

### (1) Reducing Financing Costs

Enterprise innovation activities usually have the characteristics of high investment, long cycle and high uncertainty, which makes enterprises face more severe financing constraints than conventional investments. According to the pecking order theory of financing, the reduction of external financing costs can effectively improve the willingness and ability of enterprises to carry out R&D activities (Myers and Majluf, 1984). The practice of China's digital finance going global has reduced the financing costs of enterprises in host countries mainly through two paths. First, by outputting big data risk control technology, using "soft information" such as enterprise digital footprints to replace traditional collateral for credit evaluation, effectively alleviating the information asymmetry between banks and enterprises, and reducing the risk premium caused by adverse selection and moral hazard (Beck et al., 2018; Berg et al., 2020); second, relying on mobile applications to realize the online and automation of financial services, drastically cutting the search costs, time costs and the rent-seeking space of traditional intermediaries of enterprises, and directly reducing transaction costs (Gomber et al., 2018; Fuster et al., 2019). To test this mechanism of action, this paper selects the natural logarithm of enterprise interest paid (INTE) and financial expenses (FIEX) as proxy variables for financing costs for regression analysis.

Table 6 reports the impact of China's digital finance going global on the financing costs of enterprises in developing countries. The results in columns (3) and (6) show that the regression coefficients of *Chinadf*, the total indicator of China's digital finance going global, on enterprise interest paid and financial expenses are -0.0319 and -0.0472 respectively, and both are significant at the 1% level. This indicates that on the whole, the entry of China's digital financial services has significantly reduced the explicit debt costs and implicit transaction costs of enterprises in host countries. From a structural perspective, fintech going global (*FinTech*) has a significant negative impact on reducing interest paid (column 1) and financial expenses (column 4), indicating that Chinese fintech enterprises have effectively compressed the

intermediate link costs of financing by virtue of technological advantages. Bank digital going global (*Bank*) mainly plays a significant role in reducing interest paid (column 2), which is consistent with the business logic that commercial banks directly affect enterprise interest expenses by providing credit funds. On the whole, the empirical results support the transmission mechanism of China's digital finance going global promoting enterprise innovation by reducing financing costs.

**Table 6 China's Digital Finance Going Global and Enterprise Financing Costs**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Enterprise Interest Paid | | | Enterprise Financial Expenses | | |
| *FinTech* | -0.0234*** | | | -0.0382*** | | |
| | (0.0076) | | | (0.0121) | | |
| *Bank* | | -0.0214* | | | 0.0277 | |
| | | (0.0110) | | | (0.0174) | |
| *Chinadf* | | | -0.0319*** | | | -0.0472*** |
| | | | (0.0090) | | | (0.0144) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 130538 | 130362 | 131106 | 256187 | 253648 | 256473 |
| $R^2$ | 0.8855 | 0.8841 | 0.8860 | 0.8576 | 0.8565 | 0.8578 |

**(2) Increasing R&D Investment**

R&D investment is a continuous and long-term process that imposes extremely high requirements on the stability of cash flow. Financial markets in developing countries are often plagued by severe frictions and low capital turnover efficiency. China's digital financial services, characterized by "small-sum, high-frequency, and fast-speed" transactions, can effectively smooth the cash flow fluctuations of enterprises. This enables enterprises to maintain R&D intensity and avoid interrupting innovation projects due to short-term liquidity shocks (Hsu et al., 2014; Beck et al., 2016). R&D investment serves as the material foundation and prerequisite for generating patent outputs. According to the endogenous growth theory, R&D activities not only directly determine the rate of knowledge accumulation but also act as a key intermediate link through which enterprises convert external financial resources into internal innovation outputs (Romer, 1990). To test whether China's digital finance going global promotes enterprise innovation in host countries by increasing corporate R&D investment, this paper selects R&D intensity (the ratio of R&D expenses to operating income) as the mediating variable for mechanism testing.

Table 7 reports the impact of China's digital finance going global on the R&D investment of enterprises in developing countries. The results in Column (3) show that the regression coefficient of Chinadf, the total indicator of China's digital finance going global, is 0.0005, which is significant at the 1% level. This indicates that, overall, the cross-border penetration of China's digital financial services has significantly enhanced the R&D inclination and

investment intensity of enterprises in host countries. A structural analysis reveals that this promoting effect is mainly driven by fintech going global. The coefficient of fintech going global (*FinTech*) in Column (1) is significantly positive, while the coefficient of bank digital going global (*Bank*) in Column (2), though positive, is not statistically significant. This may reflect the differences in risk preferences between different types of financial capital: the digital transformation of traditional banks tends to focus more on the digitization of basic services such as deposits, loans, and remittances; in contrast, Chinese fintech platforms are more adept at using big data technology to serve small, medium, and micro enterprises (SMEs) that lack collateral but have high growth potential. They tend to grant credit based on alternative data such as cash flow, which is more compatible with the high-frequency and flexible demand for R&D funds.

**Table 7 China's Digital Finance Going Global and Enterprises' R&D Investment**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Enterprise R&D Investment | | |
| *FinTech* | 0.0005*** | | |
| | (0.0002) | | |
| *Bank* | | 0.000003 | |
| | | (0.0002) | |
| *Chinadf* | | | 0.0005*** |
| | | | (0.0002) |
| Controls | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| N | 56006 | 56037 | 56622 |
| $R^2$ | 0.8556 | 0.8553 | 0.8554 |

## 6. Further Analysis

The foregoing analysis finds that on an average effect basis, the international expansion of China's digital financial services can boost enterprise innovation in developing countries. To gain a deeper understanding of the relationship between the two, this paper further examines the heterogeneous impacts from the perspectives of firm size and growth cycle.

### (1) Heterogeneity by Firm Size

Firm size is often a key characteristic determining the degree of financing constraints and innovation capacity of enterprises. According to the credit rationing theory, compared with large enterprises, small enterprises generally face more severe information opacity, lack of collateral, and higher access barriers to traditional financial services, placing them at the "long tail" of the credit market (Stiglitz & Weiss, 1981). To test whether China's digital finance going global has prominent inclusive characteristics—i.e., whether it can more effectively alleviate the innovation financing predicament of small enterprises—this paper divides the sample into small and large enterprises based on the annual median of the number of employees, and

introduces an interaction term between the digital finance going global indicator and a small enterprise dummy variable into the model for regression. Columns (1) and (3) show that the regression coefficients of the interaction term between fintech going global and small enterprises (*FinTech×Small*) and the interaction term between the total digital finance going global indicator and small enterprises (*Chinadf×Small*) are 0.0067 and 0.0073 respectively, both significantly positive at the 1% statistical level. This indicates that the international expansion of Chinese fintech enterprises has a more pronounced promoting effect on the innovation of small enterprises in host countries compared with large enterprises, showing a clear inclusive bias. The coefficient of the interaction term between bank digital going global and small enterprises (*Bank×Small*) in Column (2) is not significant. This means that the digital international expansion of China's banking industry is more of a "icing on the cake" measure, and its marginal contribution to the innovation of small enterprises is weaker than that of fintech enterprises which mainly serve the long-tail market. In contrast, fintech going global demonstrates a significant "timely help" characteristic, effectively filling the gap in financial services for small enterprises. This finding also verifies Tang's (2019) view that fintech and traditional banks are complementary rather than completely substitutable in the credit market.

**Table 8 Heterogeneity Analysis by Firm Size**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Enterprise Innovation | | |
| *FinTech×Small* | 0.0067*** | | |
| | (0.0014) | | |
| *Bank×Small* | | -0.0046 | |
| | | (0.0028) | |
| *Chinadf×Small* | | | 0.0073*** |
| | | | (0.0016) |
| *FinTech* | 0.0261*** | | |
| | (0.0040) | | |
| *Bank* | | 0.0196*** | |
| | | (0.0043) | |
| *Chinadf* | | | 0.0331*** |
| | | | (0.0047) |
| *Small* | -0.0941*** | 0.0221 | -0.1011*** |
| | (0.0167) | (0.0248) | (0.0187) |
| Controls | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| N | 179080 | 179496 | 179622 |
| $R^2$ | 0.4734 | 0.4835 | 0.4834 |

**(2) Heterogeneity by Enterprise Growth Cycle**

According to the enterprise life cycle theory, start-ups in the initial stage usually have the strongest innovation motivation, but due to the lack of long-term credit records and sufficient

collateral assets, start-ups are often a marginalized group in the traditional credit market (Berger and Udell, 1998). To examine whether China's digital finance going global can effectively alleviate this market failure and fill the financing gap for start-ups, this paper divides the sample into start-ups (Young) and mature enterprises based on the annual median of firm age, and introduces an interaction term into the model for testing. Table 9 reports the results of the heterogeneity test based on firm size. Columns (1) and (3) show that the regression coefficients of the interaction term between fintech going global and start-ups (*FinTech×Young*) and the interaction term between the total digital finance going global indicator and start-ups (*Chinadf×Young*) are both significantly positive. This indicates that the international expansion of Chinese fintech enterprises has a more significant promoting effect on the innovation of start-ups in host countries compared with mature enterprises, reflecting their unique advantages in risk identification and serving long-tail customers. The coefficient of the interaction term between bank digital going global and start-ups (*Bank×Young*) in Column (2) is negative and not significant, indicating that the marginal effect of bank digital going global in alleviating the financing constraints of start-ups is weaker than that of fintech. Fintech enterprises tend to have a higher risk tolerance and can conduct more accurate risk pricing through algorithm models (Fuster et al., 2019). Therefore, China's fintech going global can serve as a useful supplement to the traditional banking system, providing financial support for the high-risk and high-return innovation activities of start-ups in developing countries.

**Table 9 Heterogeneity Analysis by Enterprise Growth Cycle**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Enterprise Innovation | | |
| *FinTech×Young* | 0.0028** | | |
| | (0.0013) | | |
| *Bank×Young* | | -0.0021 | |
| | | (0.0024) | |
| *Chinadf×Young* | | | 0.0028* |
| | | | (0.0015) |
| *FinTech* | 0.0061*** | | |
| | (0.0015) | | |
| *Bank* | | 0.0125*** | |
| | | (0.0021) | |
| *Chinadf* | | | 0.0093*** |
| | | | (0.0018) |
| *Young* | -0.0460*** | 0.0041 | -0.0470*** |
| | (0.0151) | (0.0219) | (0.0176) |
| Controls | Yes | Yes | Yes |
| Firm FE | Yes | Yes | Yes |
| Sector FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| N | 307262 | 304966 | 307898 |
| $R^2$ | 0.5100 | 0.5186 | 0.5156 |

## 7. Conclusions and Implications

Against the backdrop of the deep integration of the digital economy and globalization, China's digital finance going global has become a new driving force for advancing the construction of the Digital Silk Road and deepening South-South cooperation. To thoroughly examine the economic spillover effects of China's digital financial services going global, this paper studies the impact of China's digital financial services going global on enterprise innovation in host countries and its mechanism of action, based on the 2016–2024 overseas download volume data of apps of Chinese fintech enterprises and listed banks in 43 developing countries and the BvD Global Intellectual Property Database. The study finds that China's digital finance going global can significantly promote enterprise innovation in developing countries, as reflected in a substantial increase in the number of patent grants to enterprises. Specifically, fintech going global, bank digital going global, and the comprehensive going global indicator measured by the sum of the two all exert a significant driving effect on enterprise innovation in host countries. Mechanism analysis shows that China's digital finance going global promotes enterprise innovation in host countries mainly through two channels: first, effectively alleviating financial frictions, significantly reducing the explicit debt costs and implicit financial expenses of enterprises in host countries, and reducing capital constraints in innovation activities; second, increasing the scale of enterprises' R&D investment in the early stage of innovation and enhancing the intensity of innovation input. Heterogeneity analysis reveals that the innovation-driven effect of China's digital finance going global exhibits significant structural differences: at the firm size level, the promoting effect on small enterprises is more obvious; at the firm age level, the impact on newly established start-ups is greater. This indicates that China's digital finance going global not only helps improve the overall innovation level of host countries, but also has inclusive financial attributes, making up for the shortcomings of the financial systems in developing countries in supporting the innovation of micro, small and start-up enterprises. This study provides new micro evidence for understanding the real economy effects of cross-border digital finance, and also offers valuable policy implications for China to improve the cross-border financial service system and empower high-level opening-up with high-quality financial development.

First, deepen the digital finance "going global" strategy and build a coordinated cross-border financial service network. The study confirms that both the international expansion of China's fintech and the digital going global of traditional banks have a significant promoting effect on enterprise innovation in developing countries. It is suggested that at the policy level, the comparative advantages of the two types of entities should be further coordinated to form a joint force for going global. On the one hand, support commercial banks to leverage their advantages of low capital costs and good brand reputation to increase credit supply to the manufacturing sector in host countries and channel funds into innovation activities; on the other hand, encourage fintech enterprises to give play to their strengths of rapid technological response and wide scenario coverage to deepen the inclusive finance niche market. At the same time, promote cooperation between banks and enterprises, and build a full-chain digital financial service ecosystem covering payment, credit, insurance and wealth management, so as to empower the innovation of the real economy in host countries with a more multi-dimensional financial supply.

Second, strengthen the connection of digital infrastructure and technical standards to reduce the cost of enterprise innovation. Reducing financing costs and transaction expenses is the key path for China's digital finance going global to promote innovation. In the future, under the framework of the Belt and Road Initiative, the international expansion of digital financial services can be integrated with the construction of digital infrastructure in host countries. On the one hand, support Chinese fintech enterprises to export mature technical solutions such as big data risk control models, help developing countries establish and improve their local credit evaluation systems, and fundamentally alleviate the problem of expensive financing caused by information asymmetry; on the other hand, promote the overseas application of China's mobile payment standards, digital identity authentication and other technologies, simplify the process of cross-border financial services, reduce the search and time costs of enterprises in cross-border settlement and financing applications, and create a low-cost capital environment for innovation activities.

Third, focus on the inclusive financial needs of micro, small and start-up enterprises and give play to the "timely help" effect of digital finance. The results of heterogeneity analysis show that China's digital finance going global has a particularly prominent role in supporting the innovation of small enterprises and start-ups—areas where traditional financial services are insufficiently covered. It is advisable to encourage enterprises going global to develop customized, low-threshold innovative financial products for this customer group, such as unsecured credit loans based on corporate tax data or operating cash flow. At the same time, relevant regulatory authorities should strengthen communication and coordination with the financial regulatory institutions of host countries, and explore the establishment of a microcredit risk-sharing mechanism for start-ups on the premise of ensuring data security and financial stability. By accurately serving the micro and small entities that are the most dynamic but lack resources in the real economy, China's digital finance going global can be built into an important force for promoting economic growth and inclusive development in developing countries.

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