

Empirical Study on Digital Finance Driving the Development of Real Economy

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Abstract:

Based on China's provincial panel data during the period of 2011-2020, this paper systematically researches the effect of digital finance on the growth of the real economy and its functioning mechanism from both theoretical and empirical perspectives. The results show that the development of digital finance can significantly promote the growth of the real economy, including the improvement of financial efficiency, promotion of enterprise innovation, optimization of resource allocation, etc., and achieve the quality and efficiency of services to the real economy mainly through the promotion of alleviating financing constraints and promoting industrial transformation and upgrading. In the future, financial products and service models should be further innovated to enhance the service capacity of digital finance and provide new momentum for the high-quality development of the local economy.

Keywords:

Digital Finance, Real Economic Growth, Financing Constraints, Industrial Structure Upgrading

1. Introduction

Insisting on putting the focus of economic development on the real economy and building a modern industrial system with the synergistic development of the real economy and modern finance is an important goal and direction of China's economic development. In recent years, with the continuous progress of Internet technology, digital technology based on big data, blockchain and artificial intelligence has been continuously applied to the financial industry, bringing new momentum to China's financial development. As a new form of finance, digital finance is widely used in various industries, and through its advantages of low threshold, low cost and convenience, it can break through the traditional time and space constraints, reduce the risk of uncertainty, realize the change of the financial structure and efficiency enhancement, and maximize the satisfaction of the economic development needs, thus driving the high-quality development of the real economy.

At the same time, as financial innovation continues to advance, the problem of capital being diverted from productive activities to the virtual economy is gradually emerging. The question of how to improve the ability of financial services to serve the

real economy and prevent the economy from moving from the real to the virtual is an important issue for the sound development of China's economy.

Therefore, under the dual-wheel drive of financial resources and digital technology, how to effectively release the boosting power of digital finance on economic growth and make finance better serve the real economy has become a hot issue of concern for governments and scholars in recent years. In this context, it is particularly important to study the driving role of digital finance on real economic growth and its influence mechanism.

This paper systematizes the impact effect and mechanism of digital finance on the growth of the real economy, and at the same time combines with real data to conduct empirical research, with a view to providing a reference basis for the development of high-quality development of China's real economy and the formulation of economic transformation and upgrading policies.

2. Literature Review

2.1. Research on finance-driven real economic growth

After the theory of financial promotion was put forward, the relationship between finance and the real economy in the early days of foreign countries has formed different views such as inhibition and promotion, etc. After the theory of financial development was proposed, scholars have conducted theoretical and empirical research on the relationship between finance and the real economy from different perspectives and levels [1,2].

2.2. Study on the relationship between digital finance and the real economy

In the context of the development of digital economy and digital technology, scholars at home and abroad have conducted theoretical and empirical studies from the perspective of the use of digital technology in financial institutions [3], the development of digital finance supported by technologies such as AI and blockchain [4] and other perspectives of theoretical and empirical research, found that digital finance can effectively alleviate the endogenous mechanism of financial friction - information asymmetry problem, so as to improve the efficiency of financial resource allocation, reduce the cost of service to the real economy, and increase the support to the real economy. Scholars also incorporates digital finance factors into the regional economic growth model and finds that the development of digital finance promotes local regional economic growth [5].

2.3. Research on the impact effects of digital finance

In the context of the development of digital economy and digital technology, scholars at home and abroad have conducted theoretical and empirical studies from

2.3.1. Digital finance affects economic development

Scholars have come to different conclusions when studying digital finance affecting economic development.

Some scholars believe that digital finance will promote economic development. It was found that the optimization of the quality of economic growth improves with the increasing strength of digital financial inputs when the impact of the strength of digital financial inputs on the quality of economic growth in China was studied [6].

Based on a spatial econometric model, it was analyzed that the impact on regional economic growth from four aspects: the strength of digital financial input funding, the degree of financing convenience, the size of output capacity, and the advantages and disadvantages of being in the environment, and found that the above four paths have a positive role in promoting regional economic development, in which increasing the strength of digital financial funding has the most obvious effect on economic growth [7]. Other scholars apply spatial econometric models to empirically study whether the development of digital finance can significantly improve the quality of China's economic growth, and the conclusions of the study show that digital finance not only promotes the rapid improvement of the quality of the local economic growth, but also significantly improves the quality of the economic growth of other regions, and the impact of digital finance on the eastern region is particularly obvious [8]. Some scholars believe that digital inclusive finance has a positive promotion effect on the level of high-quality development of China's economy, and the promotion effect on the central and western regions is more obvious than that on the eastern regions [9].

There are also scholars who hold a different view that digital financial inclusion can promote the development of the real economy, but there is a negative spatial spillover effect. That is, the development of digital inclusive finance will promote the development of the real economy in the region, but will inhibit the growth of the real economy in neighboring regions [10].

2.3.2. Digital finance affects the upgrading of industrial structure

Under the new normal of economic development, digital finance has become one of the important channels to promote the upgrading of industrial structure, and has provided support for the promotion of high-quality economic development. Under the policy background that the market plays a decisive role in the allocation of resources, the digital finance derived from the emergence of the optimization of the manufacturing structure has a positive direct effect, and the digital finance can actively promote the rationalization of the manufacturing structure and advanced. At the same time, digital finance can accelerate the optimization of manufacturing structure by promoting technological innovation, and optimize the quality level of capital, labor and other resources in the factor market, and improve the phenomenon of "bad money driving out good money" in the factor market. By strengthening the flow rate and efficiency of production factors and improving the coordination of industries engaged in different production activities, it can stimulate the development of the manufacturing industry and guide the transformation and upgrading of the manufacturing structure.

China needs to optimize the digital financial system and adjust the development of digital finance to support the transformation and upgrading of industrial structure. Digital finance has already improved and strengthened the efficiency of resource allocation in completing the process of capital accumulation, which can solve the problem of balancing the supply and demand of the society, and then promote the upgrading of industrial structure. Focusing on different dimensions of digital finance, the relationship between the development of digital finance and its sub-dimensions and the upgrading of industrial structure based on the panel data of China's prefecture-level cities was empirically analyzed, combined with the threshold regression method, and found that the breadth, depth and digitization degree of digital finance have a non-linear relationship with the upgrading of industrial structure and have a different degree of promotional effect [11].

2.3.3. Digital finance eases financing constraints

Digital finance, through the use of information technology, carries out rapid and efficient differentiated processing of the massive amounts of data generated by residents using the Internet. This allows for the accurate positioning of potential customer groups and the precise prediction of future risks in the course of financial business, thereby influencing the existing mode of operation of traditional financial institutions in terms of customer positioning and risk control, enhancing the availability of financial services to long-tail customer groups, and providing responses to small and medium-sized enterprises faced with the dilemma of financing constraints.

The higher the degree of digital finance development, the more conducive to reducing corporate financing constraints. The development of digital finance can form a significant superimposed effect on the relief of corporate financing constraints in a longer time axis. Digital inclusive finance, as the latest manifestation of strong support for the innovation-driven strategy, improves the situation of micro-principals' financial difficulties mainly through the credit business, and at the same time, through the other businesses, such as investment, insurance and payment, as the conduction path, to improve the financial constraints of micro-principals [12]. At the same time, through other businesses such as investment, insurance, payment and so on, it plays a role in improving the financing constraints of micro-principals, which in turn leads to the improvement of the overall innovation level in the region.

Digital finance, as a financial instrument, can not only strengthen credit rationing by optimizing corporate cash flow, reducing corporate financial expense ratio and corporate leverage, but also alleviate corporate credit constraints by lowering the cost of borrowing, improving the borrowing structure, and making the corporate borrowing structure long-term. At the same time, digital finance can promote the prosperity of technology-intensive manufacturing enterprises by supplementing the supply of capital and providing high value-added integrated services, forcing the marketization process of the financial industry and optimizing the local financial environment. Some scholars have reached the similar conclusion that digital finance can promote technological innovation and regional entrepreneurship through innovative mechanisms, which significantly promotes the development of China's real economy and high-quality development of the economy by exerting the influence of intermediary effects through empirical research [13].

The valuable exploration of digital finance driving real economic growth in the existing literature has not only favourably promoted the development of digital finance, but also laid the foundation for future research on the institutional mechanism linkage model and promotion path for digital finance to further support the high-quality development of the real economy. From the point of view of existing research, most of the literature supports that the application of digital technology promotes the breadth and depth of financial drive real economic growth, but there are relatively few theoretical and empirical studies on the systematic and in-depth digital financial drive of real economic growth in the provinces, and there are fewer comprehensive analyses of how the accelerated development of digital technology under the new development pattern integrates into the institutional mechanism that affects the growth of financial drive of the real economy, which also limits the subsequent relevant policies to a certain extent. To a certain extent, this also restricts the theoretical support basis for subsequent relevant policies. Therefore, under the new development pattern, this

paper combines China's economic background and actual situation, and conducts a systematic research on the role mechanism and realization path of digital finance to drive the growth of the real economy.

3. Theoretical Analysis and Research Hypothesis

3.1. Digital financial development promotes industrial structure upgrading

As a typical general-purpose technology, digital technology has three major techno-economic characteristics of permeability, substitutability and synergy [14]. Digital technology can be embedded in various types of production activities and types of technology, cover all links of the whole industrial chain, improve the efficiency of enterprise production and management, and then enhance the synergistic application of factor inputs in various sectors, improve the efficiency of resource allocation, and promote the transformation and upgrading of industrial structure.

Although new technology-enabled finance exacerbates the Matthew effect of traditional financial services in China's three major industries to a certain extent, it significantly promotes the optimization and transformation of the industrial structure by accelerating the enhancement of financial efficiency, and helps release the siphoning effect of the regional digital financial highlands [15].

3.2. Digital financial development eases financing constraints

Due to the imperfect development of China's financial system, which has been dominated by banks for a long time, this financing channel through the banking system has serious problems such as "attribute mismatch", "domain mismatch" and "stage mismatch" in serving the real economy [16]. Traditional banking institutions, out of profitability objectives and risk control requirements, will be in the process of loan issuance collateral, profitability level and guarantee ability as the credit criteria, so that small and medium-sized enterprises (SMEs) and disadvantaged groups are excluded from the financial services system, the imbalance between the financing model and the financial supply and demand seriously restricts the quality and effectiveness of the financial services of the real economy [17].

Digital finance expands audience coverage, drives capital flow with information flow, effectively alleviates information asymmetry, solves the problem of financing difficulties caused by the inability of financial institutions to grant credit to small and medium-sized enterprises, as well as the mismatch between the cost and benefit of microfinance, and promotes the improvement of the function of social financing. Digital finance improves the degree of competition in the capital market, reduces the cost of searching for and transmitting financial resources, and thus reduces the cost of financing, which is conducive to promoting the steady transformation of corporate innovation into productivity.

3.3. Digital financial development drives real economic growth

Finance embedding in the real economy is a core element of the modern economic system, and plays an important supporting role in optimizing the economic structure and transforming the economic growth momentum. Digital technology is applied to the financial industry chain to create new business models, business processes and financial products, and reconfigure service delivery channels, data usage, information system architecture and risk identification strategies [18]. Digital finance is not only

empowering financial business with digital technology, but also changing the underlying logic of finance, providing power support for industrial structure transformation and upgrading and real economy development by alleviating information asymmetry, expanding financial boundaries and optimizing capital allocation.

Digital technology can promote industrial restructuring and economic growth through the integration and integration of production, business, operation and management of real enterprises, in addition, the deep integration of digital technology and finance also provides important support for economic transformation and development. According to the theory of new structural economics, economic development needs to be upgraded through the factor endowment structure, and the upgrading of the factor endowment structure promotes the upgrading and optimization of industries, thus promoting high-quality economic growth. As a factor endowment at a specific point in time in a region, the structural upgrading of financial capital will inevitably lead to economic development. The deep integration of digital technology and finance has given rise to digital finance, which effectively makes up for the natural shortcomings of traditional finance, improves the financing efficiency, reduces the cost of financing, realizes the upgrading of the factor endowment structure of the financial industry, and then provides efficient and high-quality financial services for the real economy[19].

Based on this, this paper proposes the following hypotheses.

Hypothesis 1: Digital financial development can drive real economic growth.

Hypothesis 2: Digital financial development drives real economic development by promoting industrial transformation and upgrading and easing financing constraints.

4. Empirical Analysis

4.1. Research design

4.1.1. Modeling

To test the above research hypotheses, a regression model was designed as below:

$$\ln GDP_{it} = \alpha_0 + \alpha_1 DFI_{it} + \alpha_i Control_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

The explained variable $\ln GDP_{it}$ is a measure of the level of development of the real economy, the explanatory variable DFI_{it} is the level of digital financial development in the i th province in period t , $Control_{it}$ denotes the control variable, and λ_i and μ_t denotes the fixed effects controlling for region and time, respectively, and ε_{it} denotes the random error term.

Combined with the results of the previous theoretical analysis, the regression model is established for further discussion of the role mechanism of digital financial development to drive the growth of the real economy:

$$\ln GDP_{it} = \beta_0 + \beta_1 DFI_{it} + \beta_2 Med_{it} + \beta_3 DFI_{it} * Med_{it} + \beta_i Control_{it} + \lambda_i + \mu_t + \varepsilon_{it}$$

Med_{it} stands for financing constraints and industrial structure transformation and upgrading, and the meaning of other parameters remains unchanged.

4.1.2. Selection of variables

In this paper, based on economic growth, the logarithmic value of the incremental GDP of 31 provinces in China is selected as a measure of the level of development of the real economy.

The core explanatory variable is the level of digital financial development, which is measured by the “China Digital Inclusive Finance Index (2021)” compiled by the Digital Finance Research Center of Peking University, which includes not only the total digital finance index of each province, but also three subdimensional indicators such as the breadth of coverage, depth of use, and digitization degree of digital finance.

As for the control variables, this paper refers to the existing research results and selects the control variables mainly including: urbanization level (Urban), which is expressed by the urbanization rate, i.e., the ratio of the urban population to the total population of the province; human capital level (Human), i.e., the level of education in the region, which is expressed by the average number of students enrolled in higher education per 100,000 population; the ratio of the fiscal expenditures to the GDP (Fin); and the ratio of the total import and export trade to the GDP of the province (Fdi).

4.1.3. Descriptive statistics

Due to data availability, this paper selects the balanced panel data of 31 provinces in China (except Hong Kong, Macao and Taiwan) during 2011-2020 as the sample for data analysis. The sample data are mainly from the database of the Development Research Center of the State Council, the Wind database, the National Bureau of Statistics, and provincial statistical yearbooks, except for the “China Digital Inclusive Finance Index (2021)” compiled by Peking University. The descriptive statistics of the main variables are shown in Table 1.

Table 1. Descriptive statistics of variables.

variable	variable name	Mean	Standard deviation	Min	Mix
explained variable	lnGDP	9.5621	0.9796	6.3308	11.4040
explanatory variable	Dfi	2.1034	0.9295	0.1756	4.3193
control variable	Urban	0.5781	0.1325	0.2375	0.8960
	Human	7.9524	3.8621	6.9952	8.6215
	Fin	0.2853	0.2561	0.1142	1.3792
	Fdi	5.6489	2.5912	2.0151	9.8561

4.2. Empirical analysis

Table 2 shows the regression results of the model. The result (1) takes into account the two-way fixed effects of region and time, and it can be seen that the digital financial development is significant at the 1% level, which surfaces that digital finance can drive the real economic growth and verifies the hypothesis proposed in this paper. At the same time, the results also surface that the level of urbanization, human capital can promote real economic growth, and the expansion of the city size is conducive to the region's economic growth; the proportion of government fiscal expenditure will inhibit the level of real economic growth; the degree of foreign investment to a certain extent will promote economic growth.

Table 2. Digital finance and real economic growth.

	lnGDP		
	(1)	(2)	(3)
Dfi	0.5070*** (0.0345)	0.3245*** (0.0059)	0.0352*** (0.0063)
Urban	1.4102** (0.7091)	1.2442*** (0.2701)	2.7583*** (0.4309)
Human	0.1952*** (0.0549)	0.2595** (0.1164)	0.4017*** (0.0897)
Fin	-0.8137*** (0.2025)	-1.1375 (1.1459)	-0.1037* (0.0490)
Fdi	0.0392 (0.3142)	0.0750 (0.0605)	-0.0722 (0.0690)
SA		0.2440 (0.2125)	
Dfi*SA		0.0194*** (0.0030)	
Indus			2.1029*** (0.4130)
Dfi*Indus			0.0636*** (0.0213)
cons	0.1323*** (0.0053)	0.1096*** (0.0034)	0.0168** (0.0081)
N	310	310	310
R ²	0.5612	0.4340	0.5462

Note: The data in the upper row of results for each variable are regression coefficients and the data in the lower row are standard errors. ***, **, and * indicate significant at the 1%, 5%, and 10% levels, respectively.

Results (2) and (3) consider the mechanisms of financing constraints and industrial transformation and upgrading, respectively. SA denotes the level of financing constraints, and this paper constructs the SA index based on the data of listed enterprises in the database of GuotaiAn based on the existing researches, and introduces the interaction term to verify the research hypotheses. Indus denotes the index of industrial structure transformation and upgrading, and the index of industrial structure transformation and upgrading is constructed by assigning weights to the gross domestic product (GDP) of different industries, and calculating the ratio of GDP to GDP. Indus represents the industrial structure transformation and upgrading index, which is constructed by assigning weights to different industries' gross domestic product (GDP) and calculating the ratio between GDP and GDP, and the interaction term is introduced to verify the research hypotheses. The regression results show that the development of digital finance still significantly promotes the growth of the real economy after considering factors such as the level of financing constraints and the status of industrial transformation and upgrading. In addition, the larger the absolute value of the SA index the greater the financing constraints suffered by the surface enterprises, the development of digital finance will have a greater facilitating effect on the enterprises that are more affected by the financing constraints, which will significantly drive the real economic growth; digital finance will have a greater facilitating effect on the regions with a better transformation and upgrading of the industrial structure, which will promote the growth of the real economy.

5. Conclusions and Policy Recommendations

Taking the role mechanism of digital finance in driving real economic growth as the main research object, this paper investigates the role of increasing the level of integration of digital technology and finance in easing financing constraints, promoting industrial transformation and upgrading, etc., under the new development pattern, and empirically analyzes the effect of the development of digital finance on the growth of the real economy. The results of the study found that, first, digital finance can significantly drive real economic growth; second, by introducing an interaction term in the fixed-effects model, it is found that digital finance can effectively alleviate regional financing constraints while optimizing industrial structure, promoting industrial transformation and upgrading, and further driving real economic growth.

With the rapid development of science and technology, digital finance has become an important force in promoting economic development, and will play a greater economic value and improve the ability of financial services to the real economy. Combined with the conclusions of the study, this paper puts forward the following suggestions: first, expand the breadth of digital coverage, improve the ability of digital financial services to the real economy, and at the same time, in the context of the current economic downturn and the increased pressure of systemic financial risks and other pressures, constantly improve the digital financial ecosystem to prevent financial risks; second, accelerate the digital transformation of traditional finance, make full use of digital technology to improve the efficiency of financial services, innovative financial products and service models, and optimize the allocation efficiency of digital financial resources; third, in the context of China's supply-side structural reform, improve the quality and efficiency of digital financial services for the real economy, make use of the advantages of digital finance in easing the financing constraints and reducing the cost of financing, strengthen the role of digital finance in promoting enterprise innovation, further promote the transformation and upgrading of the local economy, and formulate digital financial development policies in accordance with the actual development of the regional economy and adopt corresponding policies. It should also formulate digital financial development policies according to local conditions and the actual economic development of the region, and take corresponding measures to maximize the positive impact of digital finance on the growth of the real economy, so as to provide a new kinetic energy to drive the growth of the real economy.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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