Financial Engineering and Risk Management (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/ferm.2025.080225
ISSN 2523-2576 Vol. 8 Num. 2

Empowering New Quality Productivity through Technology Finance

Jun Hu*

Hunan Agricultural University, Changsha, China
1097353319@qq.com

Keywords: New Quality Productivity, Public Tech Finance, Market Tech Finance, Regional Innovation Capacity

Abstract: This study focuses on the role of science and technology finance (divided into market-oriented and public types) as a support for new quality productivity, the core driver of high-quality development. Through theoretical analysis, it explores their influence mechanisms on new quality productivity and verifies the mediating effect of regional innovation capacity. Findings show technology finance boosts new quality productivity via two paths: facilitating revolutionary technological breakthroughs and driving industrial upgrading. Regional innovation capacity mediates this relationship by aggregating talents/capital, accelerating enterprise digital transformation and optimizing factor allocation. This research enriches relevant studies on technology finance and new quality productivity, expands the research boundary of regional innovation capacity's mediating effect, and provides theoretical support for policy formulation.

1. Introduction

[1]The introduction of new quality productivity not only enriches the connotation of productivity, but also points out the direction for economic development. [2]The Fourth Plenary Session of the 20th Central Committee once again pointed out the principles that must be followed for economic and social development during the 15th Five-Year Plan period: "Lead development with the new development philosophy and develop new quality productive forces in accordance with local conditions."

Against the backdrop of increasingly fierce global competition in science and technology, new quality productivity, as the core driving force for high-quality development, is becoming a key variable for the reshaping of advantages among countries around the world. The new round of technological revolution and industrial transformation offers China an important window[3] of opportunity. New quality productivity is driven by technological innovation, which is characterized by high risk, long cycle and large investment, and thus cannot do without the support of finance. The 2023 Central Financial Work Conference clearly stated, "Accelerate the building of a strong financial country and do well in five major articles including science and technology finance."

Both science and technology finance and new quality productivity are centered on innovation and aim at high-quality development. How does science and technology finance influence new quality productivity in the process of its development? What role does regional innovation capacity

play in this? These questions remain to be explained.

2. Literature Review

Related research on tech finance, mainly including the definition of tech finance and its socio-economic effects. Regarding the definition of tech finance, the currently influential and frequently cited definition in China holds that tech finance refers to a systematic and innovative arrangement of financial tools, financial systems, financial policies and financial services that promote the development of science and technology, the transformation of achievements and the development of high-tech industries. It is a system[4][5] composed of various entities such as governments, enterprises, markets, and social intermediaries that provide financial resources to scientific and technological innovation activities, as well as their behaviors and activities in the process of financing scientific and technological innovation. Regarding the economic and social effects, science and technology finance has a significant promoting effect on regional innovation capacity. Zhou Shaofu et al. (2023), Wang Xianbin and Zou Huan (2024) studied the mechanism of the combination of science and technology and finance on regional innovation at the urban level and found that promoting the combination of science and technology and finance can significantly enhance the innovation level [6][7]of pilot areas.

Research on new quality productivity mainly includes new interpretations of the connotation of new quality productivity and its influencing factors. Regarding the new interpretation of the connotation of new productivity, Song Deyong and Chen Liang (2024) grasp the "new" of new productivity from aspects such as new science and technology, new production methods, and new industrial forms, and understand the "quality"[8] of new productivity from perspectives such as matter, quality, essence, and quality. Regarding the influencing factors of new quality productivity, scholars have conducted research from various aspects, such as the level of economic development, the level of financial development, the degree of government participation, the level of opening up to the outside world, the degree of marketization, the level of transportation infrastructure, the level of digital infrastructure construction, the cultural environment, the policy environment, the total population, the social security situation, the consumption capacity of residents, the income gap of residents, etc[10][11][12][13].

Regarding the relationship between tech finance and new quality productivity, scholars explored the core role of tech finance in the development of new quality productivity from a theoretical perspective. Technology finance, by providing financial support to technology enterprises and innovation projects, has accelerated technology research and development and transformation, promoted the optimization and upgrading of the industrial structure, and injected new impetus[14][15][16] into the development of the real economy and new quality production. Scholars have also empirically examined the mechanism effect of tech finance on the development of new quality productivity. Zou et al. (2024), Li Yanling and CAI Xiangjie (2024), Li Jigang and Liu Xiangyu (2025) et al. incorporated technology finance and new quality productivity into the same framework and found through empirical research that technology finance can significantly accelerate the formation of new quality productivity[9][17][18].

The possible marginal contribution of this paper is: First, the inclusion of technology finance and new quality productivity in the same research framework enriches the existing literature. Second, it analyzed the mediating effect of regional innovation capacity, which is not much discussed in the academic circle at present, and expanded the boundaries of related research. Third, it provides a theoretical basis for policy implementation, taking into account the practical needs of developing new quality productive forces.

3. Theoretical analysis

It is driven by revolutionary technological breakthroughs, innovative allocation of production factors, and deep transformation and upgrading of industries. Its basic connotation is the leap of laborers, means of labor, objects of labor and their optimal combination, and its core sign is a significant increase in total factor productivity. It is characterized by innovation, the key lies in quality, and its essence is advanced productivity.[19]

Market-based technology finance refers to the capital support provided by commercial financial institutions for technological innovation based on the principle of risk-return matching through market-based financial tools, playing a leading role in supporting the development of the technology industry. Public technology finance refers to the government's efforts to correct market failures in the field of science and technology innovation, aiming to fill the "Darwinian Dead Sea" area - that is, technology research and development with high risk and low return. Financial activities that focus on supporting basic research, key technology development and the construction of major science and technology infrastructure through public resource allocation means such as fiscal funds and policy-based financial tools, and reduce innovation costs through policy tools such as fiscal science and technology spending, tax deductions and risk compensation.

This paper conducts theoretical analysis from two aspects: the impact path of science and technology finance promoting new quality productivity and the mediating role of regional innovation capacity. The logic diagram of science and technology finance empowering new quality productivity is shown in Figure 1.

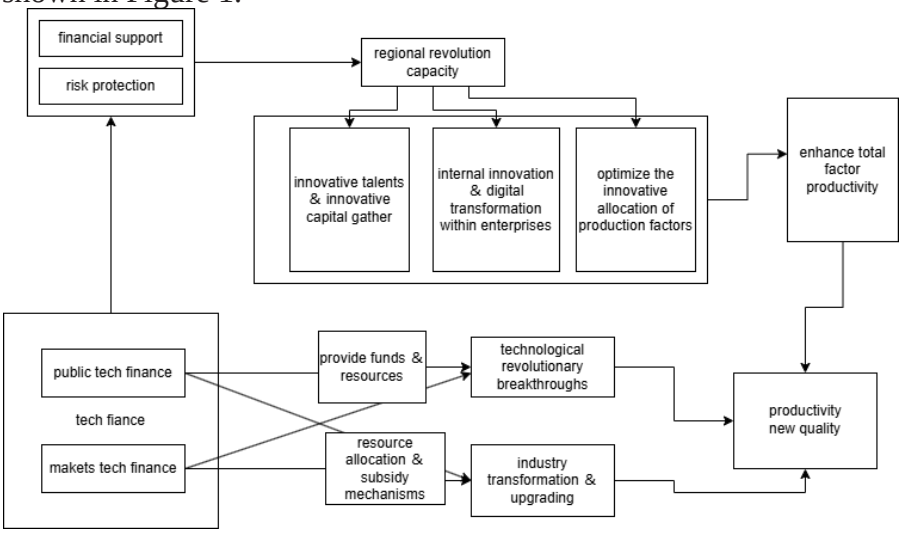

Figure 1 Logic of technology finance empowering new quality productivity

3.1 The pathways through which technology finance promotes new quality productivity

(1) Technological revolutionary breakthrough: Market-based technology finance, through forms such as venture capital and angel investment, provides funds and resources for high-risk innovation activities, promotes enterprise technological innovation and transformation and application, and solves the "valley of death" problem that fails due to lack of financial support in the process of transforming from laboratory prototypes to commercial products. Public science and technology finance fills the "Darwin Dead Sea" through fiscal science and technology spending, addressing the financing problem of application technology development due to high technical risks and low economic returns. This area is almost impossible to obtain financing from market science and technology finance and requires public science and technology finance to make up for market

failures. Both channels can provide financial support for enterprises' key core technological innovation and its transformation, ultimately leading to revolutionary technological breakthroughs and the formation of new quality productivity.

(2) Industrial transformation and upgrading: Market technology finance, through the allocation of venture capital resources, tilts towards the increase in the proportion of high-tech industries and the decrease in the proportion of traditional industries, promoting the formation of a new pattern of industrial development. Public technology finance reduces the transformation costs of enterprises through fiscal subsidies, and the traditional industry exit compensation mechanism and the emerging industry cluster incubation subsidy mechanism help promote the digital transformation of enterprises and industrial upgrading, promote the comprehensive transformation of the quality and efficiency of traditional productive forces, and accelerate the gestation and formation of new quality productive forces.

To sum up, on the one hand, tech finance gives rise to new quality productivity by providing funds and resources for revolutionary technological breakthroughs; On the other hand, tech finance works on industrial transformation and upgrading through resource allocation and subsidy mechanisms to foster new quality productivity.

3.2 Analysis of the Mediating Mechanism of Regional Innovation Capacity

New quality productivity is driven by scientific and technological innovation. Therefore, the improvement of regional innovation capacity is an inevitable requirement for promoting the development of new quality productivity. The improvement of regional innovation capacity requires a large amount of capital input and risk management, and technology finance can provide financial support and risk protection for technological innovation by offering services such as financing, investment and risk management[20].

The improvement of regional innovation capacity prompts enterprises to shift from relying on traditional low-skilled labor to the demand for high-skilled, innovative talents, which leads to an increase and optimization[21] of the number and quality of local talents under the influence of enterprise self-motivation. At the same time, regional innovation capabilities can also attract more innovative capital inflows. Jiang et al. (2025) found that the aggregation of both innovative talents and innovative capital significantly promotes the improvement [22]of new quality productivity in the region.

The improvement of regional innovation capacity can accelerate internal innovation and digital transformation within enterprises. Digital technology can help enterprises break through the physical space limitations of resource integration, optimize business models, enhance resource integration capabilities and operational capabilities, and significantly improve the quality of regional economic development. Enterprise digitalization can promote efficient intercommunication among various links in the industrial chain, help enterprises obtain various information of the external business environment more timely and accurately, thereby improving investment efficiency, improving regional industrial structure through efficiency-oriented investment, and enhancing the efficiency of resource allocation within the region to promote the development[21][23] of new quality productivity in the local area.

The improvement of regional innovation capacity can optimize the innovative allocation of production factors and lead to an increase in total factor productivity[24]. With the emergence and rapid development of new economic forms such as big data, Internet of Things, and platform economy, data has emerged as a new factor [25]of production. The application and infiltration of data elements throughout the entire process of social production have brought about fundamental changes in productive factors such as laborers, objects of labor, and means of labor, and can also

give rise to numerous new forms and models of business, thereby promoting the improvement of total factor productivity and the formation and development [26]of new quality productive forces.

In summary, technology finance enhances regional innovation capabilities, thereby attracting the aggregation of innovative talents and innovative capital, accelerating internal innovation and digital transformation of enterprises, optimizing the innovative allocation of production factors, enhancing total factor productivity, and promoting the formation and development of new quality productivity.

4. Conclusion

(1) Technology finance has a significant promoting effect on the formation of new quality productivity, and market technology finance and public technology finance work together through differentiated paths: market technology finance focuses on commercial innovation projects to solve the "Valley of death" financing problem; Public technology finance fills the gap in the "Darwin Dead Sea" area and compensates for market failures. The two work together to support technological breakthroughs and industrial upgrading.

(2) Regional innovation capacity serves as a key intermediary link for technology finance to empower new quality productivity. Technology finance enhances regional innovation capacity by providing financial support and risk protection, and then promotes the development of new quality productivity through three channels: talent capital aggregation, digital transformation of enterprises, and optimal allocation of production factors.

(3) Science and technology finance, regional innovation capacity and new quality productivity form a transmission chain of "financial support - capacity enhancement - quality upgrade", and the effective allocation and efficient flow of innovation elements are the core guarantees for the operation of this chain.

(4) To boost the development of new quality productive forces, it is necessary to take multiple measures to synergize the role of science and technology finance and regional innovation capacity: The State shall build a differentiated science and technology finance support system, where market-oriented tools like venture capital and angel investment are encouraged to innovate at the market level to expand commercial financing channels for tech enterprises, and governments at all levels should increase fiscal input in science and technology with optimized policy tools such as tax deductions and risk compensation to focus on supporting basic research and key core technology development; we need to strengthen the cultivation of regional innovation capacity by improving talent introduction and training mechanisms to gather high-skilled innovative talents, building sci-tech innovation platforms to share innovation resources, and breaking down data silos to promote in-depth integration of digital and traditional production factors for higher total factor productivity; relevant departments should promote the synergy between science and technology finance and regional innovation through cross-regional cooperation mechanisms to guide the flow of innovation factors and formulate differentiated policies tailored to regional industrial features and innovation foundations; all parties involved should optimize the policy guarantee environment by improving the sci-tech finance risk prevention and control system to reduce innovation financing risks, enhancing intellectual property protection to stimulate enterprise innovation vitality, and establishing compensation mechanisms for traditional industry exit and subsidies for emerging industry incubation to accelerate industrial transformation and upgrading.

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