Coupling Coordination of Digital Finance and Technological Innovation

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Technological innovation is the first driving force behind development and the key to achieving high-quality economic development. Innovation activities require financial support, but traditional financial systems constrain the development of innovation. Digital finance can alleviate the financial challenges faced by technological innovation. Studying the coordinated relationship between digital finance and technological innovation can deeply explore the driving role of digital finance in technological innovation, as well as the support of technological innovation in the field of digital finance.

Keywords: digital finance ; technological innovation ; coupling coordination

1. Introduction

The traditional economic model that relies on resource endowment is gradually being watered down with the implementation of an innovation-driven strategy. Economic growth fueled by technological innovation is more competitive and sustainable. However, financial issues that stymie the development of technological innovation are common in innovation activities, such as insufficient financial support and information asymmetry caused by the inadequate development of traditional financial markets [1]. As a result, it is critical to improve financial support services to foster technological innovation [2][3].

Digital technology innovation in the financial sector has led to the emergence of digital inclusive finance [4], an emerging financial service model [5] and a key guarantee for the sustainable advancement of technological innovation [6]. It provides new financial services such as mobile payment, credit, insurance, and financing by utilizing the new generation of information digital technology [7], and frees financial businesses from the constraints of “people” and “physical departments”. In order to better match the target customer groups and improve the efficiency of capital allocation [8][9], it also broadens the scope and use-depth of finance, enhances user experience and access to finance [10], and removes barriers that traditional finance faces when supporting innovative activities.

From the standpoint of regional development, the various resource endowments in various regions will result in varying development levels, creating an unbalanced but closely connected spatial pattern. Friedmann [11] used the “core–periphery” theory to explain regional economic development’s spatial relevance. He believes that the different development speeds of different regions will lead to a widening gap and form a spatial pattern, with the faster-developing areas as the core and the slower-developing areas as the periphery. The two types of regions are closely related to each other: the core regions concentrate the important elements needed for development to achieve industrial clusters and have an impact on the peripheral regions through the trickle-down effect; the marginal regions rely on the core regions to make progress. In 1991, Krugman [12] further revealed that the main factor of the “core–periphery theory” is the endogenous comparative advantage of each region: the core region generally has more material and human capital, which drives the development of the peripheral areas via the radiation effect. In terms of the spatial relationship of the coupling coordination between digital finance and technological innovation, building a network in different regions to form a cross-regional collaborative innovation model can reduce potential risks [13], promote the digital flow of financial resources, and stimulate more innovative output [14]. On the one hand, the interaction and coupling of financial institutions and innovation departments within the region can raise the level of digital finance and technological innovation; on the other hand, the spatial connection and spillover effect caused by the movement of elements between regions can further couple and coordinate digital finance and technological innovation.

2. Coupling Coordination of Digital Finance and Technological Innovation

The influence of digital finance on technological innovation

The relationship between digital finance and technological innovation has been a topic of much discussion and research in recent years. The existing literature has theoretically proved that digital finance can promote technological innovation. Digital finance services such as mobile payments can drive innovation by simplifying loan approval, which improves the access of small businesses to credit and drives innovation [15]. Digital construction can assist enterprises in deeply integrating resources to stimulate open innovation [16], and digital finance can guide the flow of social funds to promote the upgrading of high-tech industries, which can provide good technology spillover conditions for technological innovation and improve the level of regional technological innovation [17]. Meanwhile, digital finance can alleviate the financing difficulties of innovative enterprises and provide funds for innovative activities to improve the efficiency of capital allocation, easing the financing constraints of innovative enterprises [18][19]. Lin B et al. [20] also used financing constraints as intermediary variables to conclude that digital finance can promote green innovation by alleviating financing constraints. Some scholars have studied the transmission mechanism of digital finance to technological innovation. For example, Zhao Hongyan et al. [21] empirically studied the significant role of digital finance in promoting collaborative innovation and sorted out the transmission mechanisms of credit scale, social consumption, and industrial upgrading. Jinhui Zhu et al. [22] concluded that the impact mechanisms of digital financial inclusion to promote agricultural enterprises' technological innovation include enterprise digitization, financing constraints, and market efficiency. Digital finance can also influence technological innovation by promoting residents' wage income [23], generating income effects [24], improving consumer credit [25], stimulating consumer demand [26][27], and other factors. Furthermore, digital finance can stimulate green technology innovation [28][29]. Guangqin Li [30] examined the direct role and spatial spillover effect of the digital economy in improving the efficiency of industrial green innovation. In addition, Wenrong Pan et al. [31] demonstrated the non-linear relationship between the digital economy and innovation.

The influence of technological innovation on digital finance

There are few relevant documents on the impact of technological innovation on digital finance. Lin Liang and Yan Li [32] concluded the impact of the regional innovation ecosystem on the digital economy, proving the positive spatial spillover effect of regional innovation on the digital economy. Xiaohui Chen et al. [33] analyzed the role of fintech on the digital economy and its internal impact mechanism based on the CRITIC method, believing that fintech can accelerate the development of China's digital economy by promoting technological innovation.

Coupling coordination

There have been few studies on the interactive coupling relationship between digital finance and technological innovation. Zou Xinyue and Wang Wang [2] used the spatial simultaneous model to empirically study the interaction between digital finance and technological innovation. Most scholars chose to adopt the coupling coordination degree (CCD) model to measure the coupling coordinated development relationship between digital finance and technological innovation; the degree of coupling coordination between digital finance and technological innovation in China was relatively low but increasing steadily, and the distribution characteristics are high in the southeast and low in the northwest [2][34][35]. LV Jianglin [35] studied the coordinated development level of digital inclusive finance and real economy by using the Dagum Gini coefficient, kernel density estimation, and standard deviation ellipse. They also concluded that while the overall level was still low, the eastern region was higher than the midwestern regions, and the regional difference was gradually decreasing. In addition, some scholars used the CCD model to study other coupling coordination relationships: the coupling coordination of digital economy and green technology innovation [36]; technological innovation and green development [37]; tourism development and resource environment carrying capacity [38]; data elements and green development [39]; digitalization and energy storage innovation [40]; and so on.

Scholars generally believe that digital finance plays a positive role in promoting technological innovation. However, research on the relationship between digital finance and technological innovation primarily focuses on the unilateral influence of digital finance on technological innovation, with little research on the impact of technological innovation on digital finance. The relationship between digital finance and technological innovation should be complementary and interdependent, and that studying the coordinated development of the two is beneficial to economic sustainability and the conversion of economic momentum.

References

1. Xiaolong, L.; Guanghe, R.; Wei, Z. How the distortion of financial factors affects the innovative investment of enterprises—From the perspective of financing constraints. Stud. Int. Financ. 2017, 2017, 25–35.

2. Zou, X.; Wang, W. Spatiotemporal Evolution and the Interaction of the Coupling Coordinative Development Between Digital Finance and Technological Innovation in China. J. Guangdong Univ. Financ. Econ. 2021, 36, 4–17.
3. Hirsch-Kreinsen, H. Financial market capitalism and technological innovation. Z. Soziolog. 2011, 40, 356–370.
4. Ozili, P.K. Impact of digital finance on financial inclusion and stability. Borsa Istanb. Rev. 2018, 18, 329–340.
5. Gomber, P.; Koch, J.; Siering, M. Digital Finance and FinTech: Current research and future research directions. J. Bus. Econ. 2017, 87, 537–580.
6. Tang, S.; Wu, X.; Zhu, J. Digital Finance and Enterprise Technology Innovation: Structural Feature, Mechanism Identification and Effect Difference under Financial Supervision. Manag. World 2020, 36, 52–66.
7. Huang, Y.; Huang, Z. The Development of Digital Finance in China: Present and Future. China Econ. Q. 2018, 17, 1489–1502.
8. Feng, S.; Chong, Y.; Yu, H.; Ye, X.; Li, G. Digital financial development and ecological footprint: Evidence from green-biased technology innovation and environmental inclusion. J. Clean. Prod. 2022, 380, 135069.
9. Luo, Y.; Peng, Y.; Zeng, L. Digital financial capability and entrepreneurial performance. Int. Rev. Econ. Financ. 2021, 76, 55–74.
10. Demertzis, M.; Merler, S.; Wolff, G.B. Capital Markets Union and the Fintech Opportunity. J. Financ. Regul. 2018, 4, 157–165.
11. Friedmann, J.; Miller, J. The urban field. J. Am. Plan. Assoc. 1965, 31, 312–320.
12. Krugman, P. Increasing Returns and Economic Geography. J. Political Econ. 1991, 99, 483–499.
13. Fan, F.; Lian, H.; Wang, S. Can regional collaborative innovation improve innovation efficiency? An empirical study of Chinese cities. Growth Chang. 2020, 51, 440–463.
14. Guan, J.; Zuo, K.; Chen, K.; Yam, R.C. Does country-level R&D efficiency benefit from the collaboration network structure? Res. Policy 2016, 45, 770–784.
15. Beck, T.; Pamuk, H.; Ramrattan, R.; Uras, B.R. Payment instruments, finance and development. J. Dev. Econ. 2018, 133, 162–186.
16. Wu, L.; Sun, L.; Chang, Q.; Zhang, D.; Qi, P. How do digitalization capabilities enable open innovation in manufacturing enterprises? A multiple case study based on resource integration perspective. Technol. Forecast. Soc. Chang. 2022, 184, 122019.
17. Nie, X.; Jiang, P.; Zheng, X.; Wu, Q. Research on Digital Finance and Regional Technology Innovation. J. Financ. Res. 2021, 132, 150.
18. Li, X.; Shao, X.; Chang, T.; Albu, L.L. Does digital finance promote the green innovation of China's listed companies? Energy Econ. 2022, 114, 106254.
19. Feng, S.; Zhang, R.; Li, G. Environmental decentralization, digital finance and green technology innovation. Struct. Chang. Econ. Dyn. 2022, 61, 70–83.
20. Lin, B.; Ma, R. How does digital finance influence green technology innovation in China? Evidence from the financing constraints perspective. J. Environ. Manag. 2022, 320, 115833.
21. Zhao, H.; Zheng, W.; Loutfoullina, I. Digital Finance and Collaborative Innovation: Case Study of the Yangtze River Delta, China. Sustainability 2022, 14, 10784.
22. Zhu, J.; Li, Z. Can digital financial inclusion effectively stimulate technological Innovation of agricultural enterprises? A case study on China. Natl. Account. Rev. 2021, 3, 398–421.
23. Zheng, Y. Can Digital Inclusive Finance Promote the Output of Chinese Regional Innovation? An Empirical Study Based on China's Provincial Panel Data. Econ. Probl. 2020, 53–61, 101889.
24. Yanan, W.; Feng, X.; Lekai, Z. Can digital finance drive urban innovation? Secur. Mark. Her. 2020, 7, 9–19.
25. Fu, Q.; Huang, Y. Digital Finances Heterogeneous Effects On Rural Financial Demand: Evidence From China Household Finance Survey and Inclusive Digital Finance Index. J. Financ. Res. 2018, 11, 68–84.
26. Du, C.; Zhang, Y. The Regional Innovation Effect of Digital Finance. Financ. Econ. 2020, 5, 30–42.
27. Xu, Z.; Zhang, L.; Liu, Y. Does the Development of Digital Inclusive Finance Enhance Regional Innovation Capability? Financ. Econ. 2020, 11, 17–28.
28. Cao, S.; Nie, L.; Sun, H.; Sun, W.; Taghizadeh-Hesary, F. Digital finance, green technological innovation and energy-environmental performance: Evidence from China's regional economies. J. Clean. Prod. 2021, 327, 129458.

29. Tang, D.; Chen, W.; Zhang, Q.; Zhang, J. Impact of Digital Finance on Green Technology Innovation: The Mediating Effect of Financial Constraints. Sustainability 2023, 15, 3393.
30. Li, G.; Li, X.; Huo, L. Digital economy, spatial spillover and industrial green innovation efficiency: Empirical evidence from China. Heliyon 2023, 9, e12875.
31. Pan, W.; Xie, T.; Wang, Z.; Ma, L. Digital economy: An innovation driver for total factor productivity. J. Bus. Res. 2022, 139, 303–311.
32. Liang, L.; Li, Y. How does government support promote digital economy development in China? The mediating role of regional innovation ecosystem resilience. Technol. Forecast. Soc. Chang. 2023, 188, 122328.
33. Chen, X.; Teng, L.; Chen, W. How does FinTech affect the development of the digital economy? Evidence from China. N. Am. J. Econ. Financ. 2022, 61, 101697.
34. Wang, Y.; Xie, Z.; Li, X. Research on the Coupling and Coordinated Development of Digital Inclusive Finance and Innovation Development. J. Harbin Univ. Commer. 2021, 6, 17–26.
35. Lv, J.; Ye, J.; Zhang, L. Research on the Regional Differences and Effects of the Coordinated Development of the Digital Inclusive Finance and the Real Economy. Contemp. Financ. Econ. 2021, 9, 53–65.
36. Zhao, H.; Meng, Y. Coupling coordination measurement and evaluation of urban digital economy and green technology innovation in China. China Soft Sci. 2022, 9, 97–107.
37. Wu, X.; Ren, B.; Ge, P. Coupling and coordinating relationship between technological innovation and green development in the Yellow River Basin. China Popul. Resour. Environ. 2022, 32, 20–28.
38. Xiao, Y.; Tang, X.; Wang, J.; Huang, H.; Liu, L. Assessment of coordinated development between tourism development and resource environment carrying capacity: A case study of Yangtze River economic Belt in China. Ecol. Indic. 2022, 141, 109125.
39. Tao, C.; Yi, M.; Wang, C. Coupling coordination analysis and Spatiotemporal heterogeneity between data elements and green development in China. Econ. Anal. Policy 2023, 77, 1–15.
40. Zhang, H.; Gao, S.; Zhou, P. Role of digitalization in energy storage technological innovation: Evidence from China. Renew. Sustain. Energy Rev. 2023, 171, 113014.