Original Research Article

Research status and hot spots of commercial banks under the background of digital inclusive finance development —— Visualization analysis based on CiteSpace

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Abstract: Digital inclusive finance, a blend of traditional finance and emerging tech, eases SMEs' financing woes. Commercial banks are using AI and other new tech to drive inclusive finance. This paper analyzes 458 CNKI articles on "digital inclusive finance * commercial banks" from 2016 - 2024 with CiteSpace. The study reveals new tech has spurred commercial banks' digital transformation, allowing traditional banks to better serve low - income groups and micro - enterprises.

Keywords: Digital inclusive finance; Commercial banks; Emerging technology

In the era of rapid technological advancement, digital inclusive finance, which integrates traditional finance with emerging technologies, has emerged as a powerful solution to address the financing difficulties of SMEs. Commercial banks are actively leveraging AI and other new technologies to promote inclusive finance. This paper conducts an in - depth analysis of 458 CNKI articles on "digital inclusive finance * commercial banks" from 2016 - 2024 using CiteSpace, aiming to explore the impact of new technologies on commercial banks' digital transformation and inclusive finance practice.

1. Data sources and research methods

1.1. Data sources

The data is sourced from China National Knowledge Infrastructure (CNKI). In CNKI's Advanced Search, "Digital Inclusive Finance * Commercial Banks" was entered in the Subject field. 466 documents were retrieved, and after filtering out irrelevant ones, 458 relevant ones from 2016 to the present were obtained. These were downloaded in Refworks format and then imported into CiteSpace for analysis.

1.2. Research technique

The main method is to use CiteSpace for direct visualization analysis of the CNKI - sourced literature. CiteSpace was used to create co - occurrence graphs of authors, keyword co - occurrence, and keyword frequency for "Digital Inclusive Finance * Commercial Banks" from 2016 - 2024, to show future trends and evolutionary dynamics.

2. Analysis of research results

2.1. Document volume analysis

Figure 1 is the result of deduplication and consolidation using WOS in citespace, with the data then copied into Excel. As shown in **Figure 1**, from 2016 to 2024, the number of publications related to inclusive finance * commercial banks fluctuated. From 2019 to 2022, there was a significant increase, reaching a peak of 109 articles in 2022,

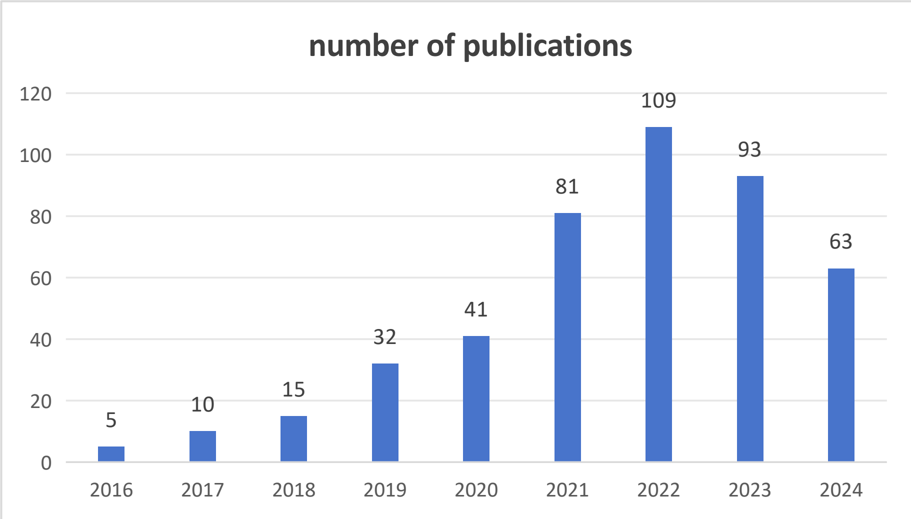

Figure 1. Number of publications from 2016 to 2024.

Research on digital inclusive finance*commercial banks, from the perspective of publication number and timing, has two phases. The first was from 2016 - 2020, an early - exploration stage after the "digital inclusive finance" concept emerged at the 2016 G20 Hangzhou Summit, expanding traditional inclusive finance with digital tech. The second phase started in 2021 and continues. It's characterized by a publication surge, mainly due to government policy support and deeper integration of digital inclusive financial services for SMEs, leading scholars to focus more and keep publication volumes high.

2.2. Keyword co-occurrence

The creation of **Figure 2** is achieved by selecting node types as keywords in citespace and adjusting the nodes and connections for aesthetic appeal. The larger the keyword in the figure, the higher its frequency of occurrence. In this graph, there are 213 connection points and 291 connections, with a network density of 0.0153. In this graph, keywords such as "fintech," "digital finance," "inclusive finance," "commercial banks," and "rural revitalization" appear more frequently, while terms like "small and micro enterprises," "financial innovation," and "rural finance" have lower frequencies.

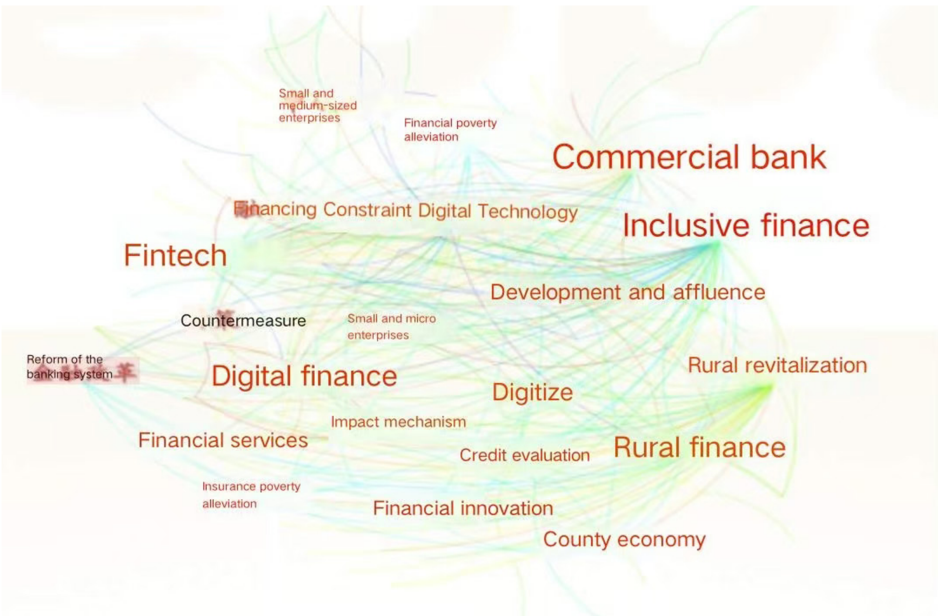

Figure 2. Distribution map of keyword usage frequency with node type selected as keywords in citespace.

At the same time, it also ranks keywords based on their frequency and centrality. Considering the centrality, data with a centrality of 0 is removed, leaving 10 sets of keywords that both have high frequency and centrality for analysis. The magnitude of centrality reflects the strength of influence in the network.

Table 1. Keyword usage frequency from 2016 to 2019.

order number	centrad	a particular year	frequency	keyword
1	0.39	2016	63	inclusive finance
2	0.34	2019	68	rural revitalization
3	0.2	2018	45	bank of commerce
4	0.16	2017	39	Fintech
5	0.14	2016	16	digital technique
6	0.08	2021	16	Financing constraints
7	0.07	2018	23	Digital finance
8	0.06	2017	18	minor enterprises
9	0.05	2021	9	financial service
10	0.05	2019	8	mesomeric effect

Combined with **Table 1**, "inclusive finance" and "rural revitalization" are the most frequently - appearing keywords. "Inclusive finance" shows up 63 times with a centrality of 0.39, and "rural revitalization" appears 68 times with the same centrality. Next come "commercial banks," "fintech," "digital technology," "financing constraints," and "digital finance". Digital inclusive finance research started in 2016, mainly centering on the inclusive finance concept. From the co - occurrence graph and keyword centrality data, the research hotspots of "digital inclusive finance * commercial banks" from 2016 - 2024 are mainly in the following aspects.

(1) Research on the influence of digital inclusive finance on commercial banks

Inclusive finance refers to enabling every person with financial needs to access high-quality financial services in a timely, convenient, and dignified manner at an appropriate price. This service demand is not limited to loans but also includes deposits, payment settlements, insurance, and wealth management. Digital inclusive finance combines digital technology with inclusive finance to extend financial services to more groups, especially those in rural areas [1]. The development of digital inclusive finance has improved the efficiency of commercial banks and had positive impacts on banks in different regions, though the extent varies [2]. By reducing the loan-to-deposit ratio and optimizing credit decisions, digital inclusive finance has reduced risk levels; its effect on reducing bank risk is more pronounced in smaller banks, while it has a weaker impact on larger banks [3].

(2) Research on digital inclusive finance to help rural revitalization

Most small and medium-sized farmers, collective economic organizations, and agricultural micro-enterprises generally lack financial awareness and knowledge due to regional differences and economic limitations. This results in higher borrowing difficulties when they access inclusive financial services, increased costs for rural financial institutions, and inadequate service provision for agriculture, rural areas, and farmers[4]. Therefore, it is necessary to increase the efforts of digital inclusive finance for rural revitalization, develop region-specific plans for the development of digital inclusive finance, enhance the financial literacy and digital skills of rural residents, and promote the construction of digital inclusive finance infrastructure[5]. Finally, rural digital inclusive finance should explore various new models, such as the "digital + supply chain" financial inclusion model and the "digital + smart village" financial inclusion model[6].

(3) Research on the impact of fintech on digital financial inclusion and commercial banks

First, fintech refers to the application of technological innovation in the financial sector, which currently lacks a unified definition. However, its service models and financial product innovations are expected to have significant impacts on financial institutions and markets. Second, fintech has a pronounced positive effect on digital inclusive finance, with higher R&D intensity leading to more significant impacts, especially in underdeveloped regions[7]. Finally, the development of fintech helps reduce risk-taking by commercial banks; the larger the bank's scale, the more evident the risk mitigation effect of fintech. Among different types of banks, the impact of fintech varies: for joint-stock banks, both internal and external fintech can reduce risks, while for rural commercial banks, external fintech may increase risks; after listing, fintech significantly reduces risk-taking[7].

2.3. Keyword clustering

In CiteSpace, the "show the largest clusters" shows 7. **Figure 3** divides the data into 8 regions, with "Financial Management" in "Vocational Education". A Q - value of 0.5765>0.3 and an S - value of 0.784>0.5 prove the cluster analysis is sound and reliable. In this region, "Rural Revitalization" is prominent, followed by other key terms like "Digital Technology".

The cluster map shows 7 regions. For rural revitalization, key terms include "targeted poverty alleviation", and scholars use digital technology for it. There are 83 related papers, with the most - cited one (7, 987 times) identifying problems in China's digital inclusive finance. For digital technology, key terms imply different applications between regions and more use in commercial banks. For small and medium - sized enterprises, there are 78 papers, and the most - cited (6, 871 times) focuses on solving their financing issues.

In fintech, key terms like "big data," "blockchain," and "common prosperity" show that fintech tools can achieve rural revitalization and common prosperity. In inclusive finance, key terms are "digitalization," "financial development," and "rural areas." There are 130 related papers, with the most - cited (19, 285 times) stating that underdeveloped regions have late-mover advantages. Developing digital inclusive finance can boost industrial structure upgrades, digitalization, and service provision. It must match real-economy needs, and both the government and financial institutions should value it and build infrastructure.

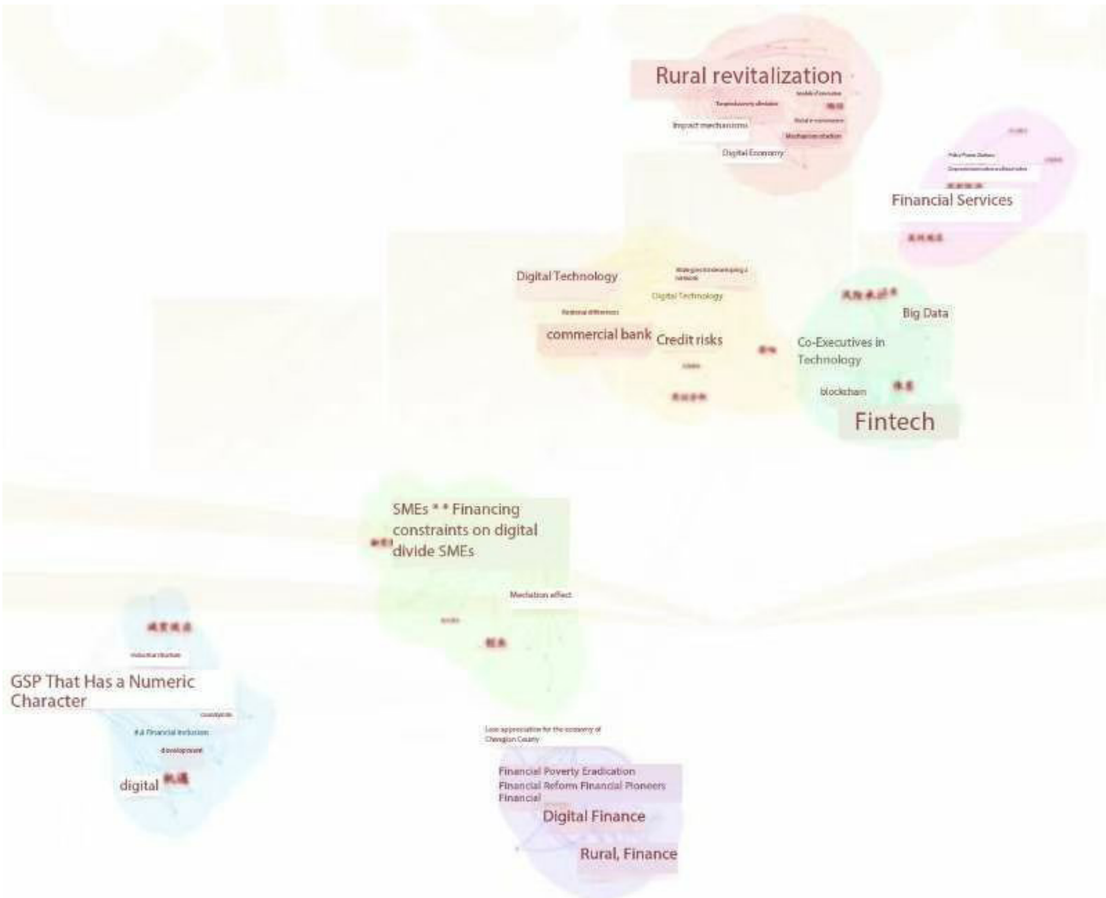

Figure 3. Data partition regions.

3. Summary and outlook

3.1. Research summary

A visual analysis was done on core journal literature of blockchain vocational education in China's CNKI database from 2018 - 2025, and conclusions were drawn with relevant representative literature.

Literature shows the number of core journals in "Digital Inclusive Finance * Commercial Banks" started rising after 2021 and has stayed highly popular, indicating active research. From keyword clustering, seven clusters and eight regions formed, mainly reflecting "small and medium-sized enterprise financing" and "rural finance" issues. Commercial banks prefer lending to large enterprises, causing financing difficulties for SMEs, and low rural financial awareness hampers rural finance development. From time zone maps, research evolution is tied to background and economic growth. As the economy grows, scholars shift focus to digital inclusive finance via AI and emerging technologies. In future, these will make digital inclusive finance more intelligent and efficient, aiding financial institutions in risk assessment, cost reduction, and customized services.

3.2. Thinking about digital inclusive finance in the field of commercial banks

First, scholars should boost the quantity and achievements of literature in "digital inclusive finance * commercial banks", increase publications for future research, and form a core research group to drive development and enrich the field.

Second, commercial banks must re - evaluate traditional models and go digital. Leverage emerging technologies to enhance efficiency, cut costs, and offer more flexible, personalized financial products.

Finally, during the promotion of digital inclusive finance, banks should focus on financial education. Provide knowledge training to help customers understand and use financial tools, raise their financial literacy, and facilitate the spread of financial services.

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Funded by Tianjin Art Science Planning Project

Project Title: Research on the Digital Innovation Management of Cultural Assets Empowered by Traditional Chinese Medicine Elements

Item No.: B24051

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