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A Retrospective Study of the Digital Financial Inclusion Literature[1]

Dijital Finansal Kapsayıcılık Literatürü Üzerine Retrospektif Bir Çalışma

Tuğba Betül Özav[2] Engin Küçüksille[3]

Abstract

This study examines the current state, research gaps, and intellectual evolution of the digital financial inclusion (DFI) literature using bibliometric methods. A total of 1,638 English-language publications indexed in Scopus (2008–2023) were analyzed in R with the Bibliometrix/Biblioshiny package. We apply descriptive performance analysis (annual scientific production and leading sources), author/paper co-citation analysis (intellectual structure), keyword co-occurrence analysis (conceptual structure), and thematic mapping/thematic evolution to identify dominant and emerging themes. Results show that DFI research accelerated markedly after 2016, consistent with the expanding global policy agenda and the digitalization impulse during the COVID-19 period (annual growth rate of 50.68%). Publication and citation patterns indicate concentration in China and parts of Africa, reflecting the prominence of mobile money and data availability. The literature clusters around three streams: (1) digital infrastructure and technology-enabled finance, (2) regulatory and policy frameworks, and (3) socio-economic impacts. The study highlights gaps in underrepresented regions and emerging topics such as central bank digital currencies and AI-supported financial services, offering implications for future research and inclusive digital finance policy design.

Keywords: *Digital Financial Inclusion, Fintech, Bibliometric Analysis, Financial Inclusion*

Öz

Bu çalışma, dijital finansal kapsayıcılık (DFK) literatürünün mevcut durumunu, araştırma boşluklarını ve entelektüel evrimini bibliyometrik yöntemlerle incelemektedir. Scopus'ta 2008–2023 döneminde indekslenen 1.638 İngilizce yayın, R ortamında Bibliometrix/Biblioshiny paketi kullanılarak analiz edilmiştir. Baskın ve yükselen temaları belirlemek amacıyla betimleyici performans analizi (yıllara göre bilimsel üretim ve başlıca kaynaklar), yazar/makale ortak atıf analizi (entelektüel yapı), anahtar kelime eş-oluşum analizi (kavramsal yapı) ile tematik haritalama/tematik evrim analizleri uygulanmıştır. Bulgular, DFK araştırmalarının 2016 sonrasında belirgin biçimde hızlandığını; bunun genişleyen küresel politika gündemi ve COVID-19 dönemindeki dijitalleşme ivmesiyle uyumlu olduğunu göstermektedir (yıllık büyüme oranı %50,68). Yayın ve atıf örüntüleri, mobil paranın yaygınlığı ve veri erişilebilirliğiyle ilişkili olarak Çin ve Afrika'nın bazı bölgelerinde yoğunlaşmaya işaret etmektedir. Literatür üç ana akımda kümelenmektedir: (1) dijital altyapı ve teknoloji temelli finans, (2) düzenleyici ve politika çerçeveleri, (3) sosyoekonomik etkiler. Çalışma, az temsil edilen bölgelerdeki boşlukları ve merkez bankası dijital paraları ile yapay zekâ destekli finansal hizmetler gibi yükselen konuları vurgulayarak gelecekteki araştırmalar ve kapsayıcı dijital finans politika tasarımı için çıkarımlar sunmaktadır.

Anahtar Kelimeler: *Dijital Finansal Kapsayılık, Fintek, Bibliyometrik Analiz, Finansal Kapsayıcılık*

[Research Paper]

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Introduction

Financial inclusion (FI) is defined as the process of enabling all stakeholders in an economy to gain access to and effectively use the traditional financial system, while ensuring ease of use for these stakeholders (Sarma & Pais, 2011: 613). According to the Financial Stability Report of the Central Bank of the Republic of Turkey, FI is the process of integrating individuals who cannot benefit from financial system owing to various factors (economic, social, gender, etc.) into an economy, and it focuses on providing the necessary physical facilities for this process (Central Bank of the Republic of Turkey, 2019: 2). The objective of FI is to make affordable financial opportunities available to individuals without access to banking and financial services (Hannig & Jansen, 2010: 1). Spreading FI at the grassroots level helps reduce poverty, close gender gaps, increase savings, support more optimal financial decisions, and boost investments (Burgess & Pande, 2005: 780). FI acts as a driving force for economic growth, particularly in developing countries (Claessens, 2006: 207; Omar & Inaba, 2020: 9).

Over the past few years, the rapid evolution and extensive adoption of information and communication technologies (ICT) have affected different dimensions of daily life, significant increasing the use of digital tools and strengthering interest in FI. It is noteworthy that the new research trends in FI are mostly focused on mobile phones, credit cards, and internet-based financial services (Gai, Qiu & Sun, 2018: 262; Demirguc-Kunt et al., 2020: 1). From this perspective, the widespread adoption of the internet and smartphones has led to a new transformation in the financial sector in terms of both demand (consumer behaviour) and supply (new products, services, and intermediaries) (Gallego-Losada et al., 2023: 2).

During the 2016 G20 Summit in Hangzhou, it was emphasized that significant progress had been made in the field of FI. Nonetheless, despite these advancements, two billion individuals worldwide were still disadvantaged in terms of access to financial tools, which limits their potential to improve their living conditions. Furthermore, it was noted that the resolutions and strategies devised at this summit for the advancement of financial inclusion predominantly concentrated on traditional financial services, thereby neglecting the significance of digital finance. From this perspective, to accelerate the digital finance era, "digital financial inclusion (DFI)" was officially introduced at this summit, and advanced principles of DFI were proposed (Global Partnership for Financial Inclusion [GPFI], 2016). According to GPFI (2016: 3), DFI is defined as "the utilization of digital financial services to foster FI," enabling unbanked and unbanked individuals to access financial products at a cost appropriate to their needs. DFI is an innovative area of financial development that removes the geographical constraints of traditional FI by empowering small businesses through internet and big data based technologies, thereby reducing financing costs (Geng & He, 2021: 307). The objective of DFI is to contribute to alleviating poverty, enhancing financial intermediation, and achieving the 2030 Sustainable Development Goals (SDGs) by providing financial products through digital areas to people, families, enterprises, and governments. Additionally, the report prepared by UNSGSA (2018: 2) highlights the essential function of DFI in expediting the accomplishment of the 2030 Sustainable Development Goals (SDGs). It emphasizes that DFI may substantially contribute to 13 out of the 17 SDGs (SDG 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 16).

Digital technologies play a crucial role in promoting financial inclusion and reducing financial exclusion. In this context, a comprehensive study that analyzes the role of digital technologies, examines the areas where current studies are concentrated, focuses on current areas of focus, and explores the sub-dynamics of recent research is needed. The purpose of this research is to address current gaps in the field through a bibliometric analysis. To this end, the methods and data set used in the research are first described. Subsequently, the empirical data are analyzed under nine headings, followed by the conclusion and discussion section.

1. Methods

Recently, bibliometric analysis has emerged as a preferred method for evaluating and visualizing the development of scientific research outputs (Donthu et al., 2021; Goyal & Kumar, 2021; Nasir et al., 2021; Brika, 2022; Yeşilçelebi et al., 2022; Burmaoglu et al., 2023; Zou et al., 2023; Avcı, 2024; Burmaoğlu et al., 2024; Yalvaç & Atalık, 2024). It is particularly employed for the analysis of scientific studies comprising extensive data sets and their associated bibliographic information (Cobo et al., 2011: 146). As stated by Börner, Chen, and Boyack (2003: 180), this method facilitates the examination of disparate research within a specific scientific field from a broader perspective, enabling the formation of interrelated clusters. In this way, the anatomy of knowledge in the field is revealed, and gaps in the research area are identified, guiding future studies. Additionally, it provides the opportunity to examine the changes in academic productivity of researchers in the relevant field over the years and facilitates the comparison of the most impactful publications.

1.1. Data Set

In this study, the "Scopus" database was searched using the term groups "financial inclusion" or "inclusive finance" in combination with "digital" or "mobile money" or "fin-tech" or "technology" or "digital transformation" or "blockchain" or "big data" or "industry 4.0" or "internet of things" or "machine learning" or "artificial intelligence," applying the relevant advance search filters. A total of 1,638 research (articles, conference papers, books, book chapters, etc.) in English in the social sciences published between 2008 and 2023 were downloaded in BibTeX[4] format from the Scopus database. During data collection, several advanced search filters were applied. The above-mentioned word groups were required to appear in the “title, abstract, and keywords” fields of the academic studies. Furthermore, only English-languages studies were included in the analysis. The bibliometric analysis process is presented step by step in Figure 1.

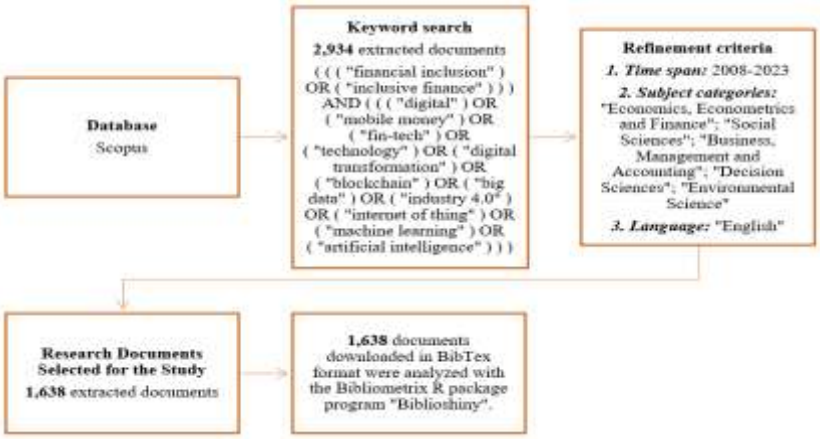

Figure 1. Bibliometric Analysis Process

Source: Authors’ elaboration based on Scopus Database.

1.2. Data Analysis

In this anlaysis phase, 1,638 academic studies obtained through the filtering process were analyzed using the 'biblioshiny-bibliometrix' package in R. Bibliometrix is an open-source program developed by Aria & Cuccurullo (2017: 959) in the R programming language. It is designed to facilitate a deeper understanding of the trends and patterns that emerge over time in the development of a field and is frequently used by researchers. Its open-source nature enables researchers to avoid disadvantageous such as access or usage restrictions arising from commercial licence. In this way, researchers can more easily analyze their data and produce data visualizations and reports.

The analysis is organized under the following headings:

i.distribution of studies by year,

ii.total number and types of publications,

iii.the most cited authors and their productivity over time,

iv.the most cited studies,

v.countries with high academic productivity,

vi.journals publishing the most articles,

vii.the most repeated words and/or phrases,

viii.thematic evolution,

ix.conceptual, intellectual, and social structures of the studies.

This study aims to analyze existing research on DFI to examine key studies, identify shifts in research trends, determine when these trends emerge, and highlight areas that still require further investigation, based on the nine titles mentioned earlier.

[4] Downloaded from the relevant database on 20.11.2024.

2. Empirical Findings

2.1. Distribution of Studies by Year

Interest in digital financial inclusion (DFI) research increased rapidly over the period under review, peaking in 2023. The first study was published in 2008, and only 57 studies had appeared by 2015; after 2015, publication activity accelerated markedly (see Figure 2). This growth may be attributed to several factors. First, DFI was formally introduced at the 2016 G20 Summit, where advanced principles were proposed to accelerate the digital finance era (GPFI, 2016). At the summit, it was also noted that approximately two billion adults worldwide still lack access to traditional financial services, which severely restricts their economic and personal advancement opportunities (GPFI, 2016). Furthermore, while the current financial system contributes to the inclusion of disadvantaged groups, it predominantly concentrates on traditional financial services and thus has a more limited impact on advancing digital finance. Therefore, the existing financial system needs regulation and integration with digital financial services to achieve fuller inclusion. Technological advancements and rapid user adoption—particularly increasing Internet penetration, widespread smartphone usage, and the rise of online financial transactions—have further facilitated progress in the field. The significant increase observed in 2020 can be attributed to the crisis created by COVID-19, which accelerated digitalization across industries and promoted digital transformation in economic operations. The data indicate that the annual growth rate in the relevant field reached 50.68%. This high rate may be associated with the new dynamics within the field and the strong demand for addressing existing research gaps. It is anticipated that the growth rate will decelerate over time as research gaps are closed and certain research areas approach saturation.

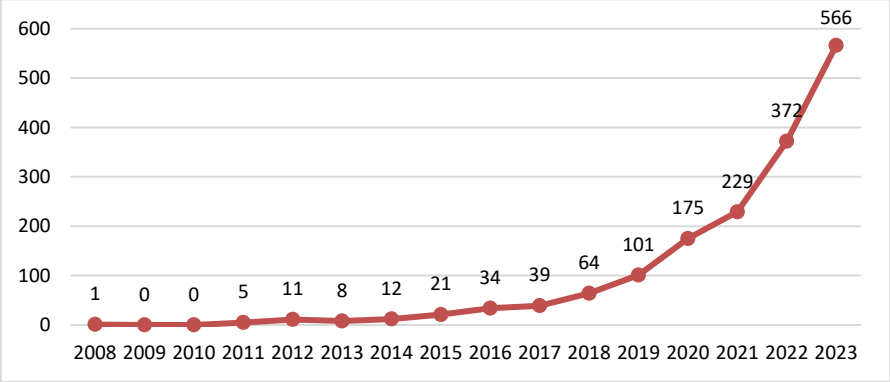

Figure 2. Distribution of studies on DFI by year

Source: Authors' elaboration based on Scopus Database.

2.2. Publication Characteristics

Overall, the DFI literature is disseminated predominantly through journal articles, while book chapters and conference papers constitute smaller shares (see Table 1). Table 1 shows the distribution of studies published in the field of DFI between 2008 and 2023 based on the Scopus database. Among the 1,638 publications, 70.3% (1,152/1,638= 0,70) are journal articles, followed by book chapters at 14% (237/1,638= 0,14) and conference papers at 8% (140/1,638= 0,08), books at 1.0% (32/1,638= 0,01), and other types of publications at 4% (77/1,638= 0,04). This distribution indicates that academic production in the field of DFI is largely based on journal articles.

Table 1. Types and Number of Studies

Publication Type	Number of Publications
Article	1,152
Book	32
Book Chapter	237
Conference Paper	140
Other (review, erratum, editorial etc.)	61
TOTAL	1,638

Source: Authors' elaboration based on Scopus Database

2.3. Most Cited Authors

The most cited authors in the DFI literature exhibit both high productivity and strong citation impact. Table 2 summarizes the leading authors based on Scopus data using total citations (TC), number of publications (NP), g-index, and publication

starting year (PY_start). Overall, the results indicate that a relatively small group of authors accounts for a substantial share of citations, reflecting their central role in shaping the field.

Table 2. Most Cited Authors

	Author	NP	g-index	TC	PY_start
1	Ozili, PK	17	17	1325	2018
2	Li, J	9	9	695	2020
3	Wang, X	16	16	665	2020
4	Mhlanga, D	10	10	582	2020
5	Kumar, S	4	4	540	2019
6	Chen, Y	6	6	533	2020
7	Lee, C.C	6	6	531	2022
8	Goyal, K	1	1	529	2021
9	Wu, Y	6	6	505	2020
10	Gabor, D	2	2	498	2017
Abbreviations: NP= number of publications; TC= total citation; PY_start= publication starting year					

Source: Authors' elaboration based on Scopus Database

Table 2 presents the most influential authors in DFI research based on Scopus data. Highly productive authors such as Ozili (NP=17, TC=1,325) and Wang (NP=16, TC=665) contribute substantially to the field in terms of both publication output and citation impact. In addition, authors such as Gabor (PY_start = 2017) and Kumar (PY_start = 2019) have attracted high citation counts (TC = 498 and TC = 540, respectively) despite having relatively fewer publications. The prominence of authors such as Li (TC = 695), Mhlanga (TC = 582), and Chen (TC = 533), who became active mainly after 2020, suggests that DFI research gained momentum during the pandemic period. Moreover, Goyal's single publication (NP = 1) receiving 529 citations underscores the importance of high-impact contributions in the DFI literature. Overall, these findings provide insights into knowledge production dynamics and research priorities in the field.

Relying solely on total citation counts to evaluate a research field may provide only a partial view. Therefore, examining authors' productivity over time offers a broader perspective on the evolution of DFI research. Figure 3 visualizes the production trajectories of the top 10 authors. In the figure, each circle represents an author's annual research output, with larger and darker circles indicating higher productivity in that year. Considering Figure 3 together with Table 2, Ozili, P.K., who has the highest total citation count, has maintained consistent output since 2018, with productivity peaking in 2021. Overall, the figure suggests that authors' productivity has generally increased in recent years, and Wang, X. displays the highest level of productivity in 2022.

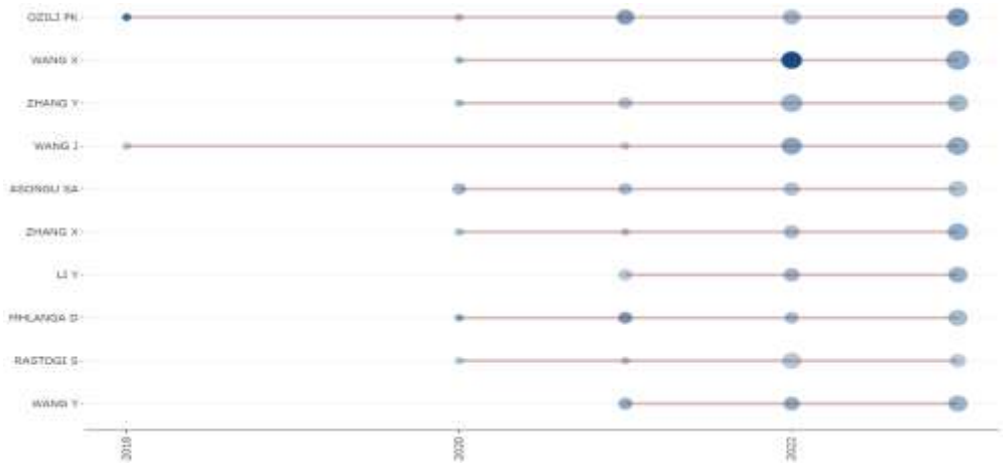

Figure 3. Authors' Production over Time

Source: Authors' elaboration based on Scopus Database.

2.4. Most Cited Papers

Citation counts provide researchers with an important indication of a paper's impact. As a bibliometric indicator, they are often used to assess academic performance and are essential for measuring the scientific impact of individual researchers, institutions, and universities (Garfield, 1979: 148). Bornmann et al. (2012) argue that a paper receiving more citations than its peers generally signals superior quality and innovation. Current literature suggests that researchers strategically target high-impact-factor journals to boost their academic impact (Tahamtan et al., 2016:1196). The Journal Impact Factor quantifies the average number of citations received by articles published in a specific journal and is often considered a reflection of the journal's prestige (Saha et al., 2003: 46). In this context, a journal's impact factor or prestige level is a meaningful proxy for an article's scientific visibility (Podsakoff et al., 2008:711). Articles published in high-impact factor journals often get more attention and achieve higher citation levels. Consequently, the journal's prestige significantly influences the visibility and perceived credibility of the research in the academic community. Table 3 presents the articles with the most absolute citation counts and ranks them by the number of citations per year to balance the effect of the publication year.

Table 3. The 10 most frequently cited publications in DFI

R	Title / Author(s) / Year	DOI	Journal	Impact Factor (2023)	TC	C/Y
1	"Impact of digital finance on financial inclusion and stability" (Ozili, 2018)	https://doi.org/10.1016/j.bir.2017.12.003	Borsa Istanbul Review	2.19 (JCI); Business, Finance (Q1); Economics (Q1)	844	21.01
2	"Financial literacy: A systematic review and bibliometric analysis" (Goyal & Kumar, 2021)	https://doi.org/10.1111/ijcs.12605	The International Journal of Consumer Studies	1.42 (JCI); Business (Q1)	529	20.58
3	"Digital finance and corporate ESG performance: Empirical evidence from listed companies in China" (Ren, Zeng, & Zhao, 2023)	https://doi.org/10.1016/j.pacfin.2023.102019	Pacific-Basin Finance Journal	1.37 (JCI); Business, Finance (Q1)	143	16.22
4	"Fintech, financial inclusion and income inequality: a quantile regression approach" (Demir et al., 2022)	https://doi.org/10.1080/1351847X.2020.1772335	European Journal of Finance	0.66 (JCI); Business, Finance (Q2)	287	15.38
5	"Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis" (Ozturk & Ullah, 2022)	https://doi.org/10.1016/j.resconrec.2022.106489	Resources, Conservation and Recycling	1.64 (JCI); Engineering, Environmental (Q1); Environmental Sciences (Q1)	270	14.47
6	"The impact of digital finance on household consumption: Evidence from China" (Li, Wu, & Xiao, 2020)	https://doi.org/10.1016/j.econmod.2019.09.027	Economic Modelling	1.43 (JCI); Economics (Q1)	474	14.01
7	"Blockchain disruption and decentralized finance: The rise of decentralized business models" (Chen & Bellavitis, 2020)	https://doi.org/10.1016/j.jbvi.2019.e00151	Journal of Business Venturing Insights	1.58 (JCI); Business (Q1)	369	10.91
8	"Can digital financial inclusion affect CO_2 emissions of China at the prefecture level? Evidence from a spatial econometric approach" (Wang et al., 2022)	https://doi.org/10.1016/j.eneco.2022.105966	Energy Economics	4.32 (JCR); Economics (Q1)	192	10.29
9	"Can digital financial inclusion promote China's economic growth?" (Liu et al., 2021)	https://doi.org/10.1016/j.irfa.2021.101889	International Review of Financial Analysis	2.31 (JCR); Business, Finance (Q1)	240	9.34
10	"Sustainability, FinTech and Financial Inclusion" (Arner et al., 2020)	https://doi.org/10.1007/s40804-020-00183-y	European Business Organization Law Review	1.8 (JCR); Business (Q3); Law (Q1)	287	8.49
Abbreviations: R=rank; TC=total citations; C/Y= Citations per year						

Source: Authors' elaboration based on Scopus Database.

Table 3 displays the academic masthead of the ten most cited research articles in the field of 'DFI' during the specified data period. These articles provide an essential information infrastructure for researchers interested in DFI. These publications provide an essential reference base for researchers interested in DFI and align with the rapid post-2015 increase in publication activity shown in Figure 2. The bibliometric data in Table 3 support this conclusion, showing that

80% of the studies with the highest citation impact were published in 2018 and later. This statistical consistency indicates that during this period, both quantitative growth and qualitative maturation occurred simultaneously. Therefore, it is academically verified that methodological consistency exists between the table findings and the trend analyses presented in the previous sections (Section 2.1). When examining Table 3, it is observed that most studies focus on quantitative analyses, with only four studies considering DFI within a theoretical framework (Ozili, 2018; Arner et al., 2020; Chen & Bellavitis, 2020; Goyal & Kumar, 2021). Ozili's (2018) paper, notable for its 844 citations and an annual citation rate of 21.01, has emerged as a significant reference in the field by analyzing the effects of DFI on financial stability and inclusion. Goyal and Kumar's (2021) systematic review on financial literacy and Ren et al.'s (2023) research on ESG performance in China have substantially contributed to the literature, with yearly citation rates of 20.58 and 16.22, respectively. The fact that 80% of the studies have been published in journals categorized as Q1 indicates the academic maturity of the field. This is supported by the prominence of high impact factor journals such as Energy Economics (IF: 4.32) and International Review of Financial Analysis (IF: 2.31). Based on the study contexts reflected in Table 3, 4 out of the 10 most frequently cited publications draw on China-based evidence, suggesting a concentration of highly cited contributions in a limited set of country settings. In contrast, representation from regions such as Africa, Latin America, Europe, and Southeast Asia appears comparatively limited within this top-cited set. Moreover, the content of the publications listed in Table 3 indicates a thematic emphasis on financial stability, ESG performance, microfinance, income inequality, mobile money, and technology-enabled finance (e.g., blockchain/decentralized finance). Overall, these patterns derived from Figure 3 point to both thematic concentration and remaining geographical research gaps in the DFI literature. Research conducted by Chen & Bellavitis (2020) on decentralized finance, alongside the study by Ozturk & Ullah (2022) addressing economic development and environmental sustainability, reflects current trends in this area.

2.5. The Distribution of Publications by Country

Corresponding Author's Country indicate the countries of the corresponding authors and the aggregate number of articles generated in those countries. The offer critical insights into the most productive countries, degrees of international participation and collaboration, contributions from various countries, the nations most active in academic collaborations, and country-specific trends. The number of single-country publications (SCPs) is a significant metric representing a country's scientific output and its internal academic interactions. Multiple-country publications (MCPs) capture the extend of multinational collaborations and worldwide academic interactions. The number of MCPs is used to measure the degree of international cooperation.

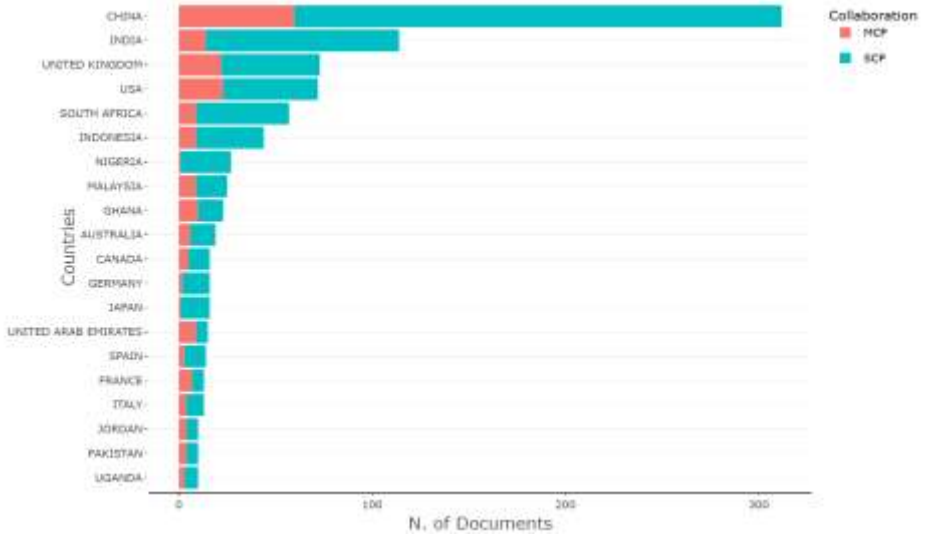

Figure 4. Corresponding Author's Countries

Source: Authors' elaboration based on Scopus Database.

Figure 4 shows the top 20 countries with the highest academic output (single and multi-country publications) in "digital financial inclusion". This figure is based on the authors' national affiliations rather than the journals' countries of the journals. China has the highest academic productivity, producing 312 publications, it also ranks first in terms of cited publications. China's relatively higher publication output may be associated with sustained research interest and the availability of large-scale data sources related to digitalization, which facilitate empirical research and, in turn, scholarly production. Both the regular publication of the China Labor Dynamics Survey and the "Digital Financial Inclusion Index," developed by Peking University to reflect the development of digital finance based on these surveys, offer significant

advantages to researchers working in this field. When the studies conducted on Chinese samples are examined, it is observed that the majority involve empirical research on issues such as regional development, income distribution, economic growth, gender inequality, and environmental degradation (Liu et al., 2021; Wang et al., 2022; Ren et al , 2023; Tao et al.,2023; Zhao et al., 2023; Zhou et al., 2023). After China, DFI research is largely concentrated in Sub-Saharan Africa (notably those using the M-Pesa system) and South Asian countries (Evans, 2018; Okello Candiya Bongomin et al., 2018; Ahmad et al., 2020; Schuetz & Venkatesh, 2020; Thathsarani et al., 2021; Kass-Hanna et al., 2022; Morgan, 2022). This pattern can be explained by the fact that the majority of mobile money users are located in these geographies and research activity tend to follow the diffusion of such systems.

2.6. Most Productive Journals

The journal distribution indicates where DFI research is most frequently disseminated. Table 4 summarizes the top 10 journals by the number of published DFI articles between 2008 and 2023, and, in doing so, highlights the main publication outlets in the field.

Table 4. The Top 10 Most Productive Journals (2008–2023)

	Name of Journal	Article
1	SUSTAINABILITY (SWITZERLAND)	89
2	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	29
3	FINANCE RESEARCH LETTERS	21
4	FRONTIERS IN ENVIRONMENTAL SCIENCE	18
5	COGENT ECONOMICS AND FINANCE	17
6	JOURNAL OF RISK AND FINANCIAL MANAGEMENT	17
7	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	17
8	TELECOMMUNICATIONS POLICY	17
9	INFORMATION TECHNOLOGY FOR DEVELOPMENT	14
10	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	13
	OTHERS	811
TOTAL		1,152

Source: Authors' elaboration based on Scopus Database.

Table 4 reports the leading journals publishing DFI research and the number of articles published in each outlet. The analysis covers 1,152 articles. "Sustainability" (Switzerland) leads with 89 articles, a pattern attributable to several interrelated factors. Its broad, multidisciplinary scope explicitly accommodates research at the intersection of digitalization, financial access, and the SDGs — a thematic convergence that characterizes a large share of contemporary DFI studies. Its open-access model reduces dissemination barriers for researchers from emerging economies, which constitute the primary empirical contexts in this literature. Moreover, its high publication volume and comparatively rapid review process made it a particularly accessible outlet during the post-2016 and COVID-19 periods when DFI output surged. "Environmental Science and Pollution Research" (29 articles) and "Frontiers in Environmental Science" similarly attract DFI studies due to their emphasis on the socio-environmental dimensions of digitalization, which aligns with a growing strand of research examining the environmental implications of DFI. "Finance Research Letters" (21 articles) is particularly suited for shorter empirical contributions on fintech and financial inclusion, making it a natural outlet for concise DFI studies. "Cogent Economics and Finance" and "Journal of Risk and Financial Management" benefit from open-access models that lower publication barriers for researchers from emerging economies. Interdisciplinary outlets such as "Technological Forecasting and Social Change" and "Telecommunications Policy" are well-positioned for studies at the intersection of technology diffusion and financial systems, further explaining their prominence in the DFI literature.

2.7. Most Frequently Used Words and Word Groups in Title, Abstract and Keywords

This subsection examines the most frequently used words and word groups in DFI research across three fields: article titles (bigrams), authors' keywords, and Keywords Plus. Table 5 summarizes the top 20 terms in each field, providing an overview of the dominant concepts and how they are represented across titles and keyword structures.

Table 5. Most Frequently Used Words and Word Groups by Field (Titles, Authors' Keywords, and Keywords Plus)

Article Titles (bigrams)		Author's Keywords		Keywords Plus	
Words	Frequency	Words	Frequency	Words	Frequency
Financial Inclusion	677	Financial Inclusion	688	Finance	237
Digital Financial	207	Fintech	208	China	195
Mobile Money	148	Mobile Money	150	Financial Inclusions	174
Inclusive Finance	118	Digital Financial Inclusion	137	Financial System	119
Digital Inclusive	103	Digital Inclusive Finance	91	Economic Development	109
Financial Services	74	Digital Finance	76	Financial Services	90
Digital Finance	66	Blockchain	58	Sustainable Development	64
Financial Technology	36	Financial Technology	54	Banking	63
Sustainable Development	34	Financial Literacy	52	Innovation	62
Sub-Saharan Africa	33	China	42	Electronic Money	56
Economic Growth	32	Africa	41	Financial Services	50
Bank Digital	30	Technology	41	Developing World	49
Central Bank	30	Innovation	38	Financial Market	46
Digital Currency	28	Financial Services	37	Carbon	44
Financial Literacy	27	India	37	Digitization	40
Developing Countries	26	Microfinance	36	Technology Adoption	40
Digital Financial	95	Economic Growth	35	Carbon Dioxide	38
Financial Services	52	Mobile Banking	35	Developing Countries	38
Inclusive Finance	40	Artificial Intelligence	32	Panel Data	38
Digital Finance	38	Poverty	31	Inclusive Finances	37

Source: Authors' elaboration based on Scopus Database

Table 5 presents the most frequently used words and phrases in the 1,638 studies included in the bibliometric analysis. In the titles (bigrams), terms associated with financial inclusion and digitalization (for example, "financial inclusion", "digital finance", "mobile money", and "financial technology") appear prominently, indicating that the literature frequently frames DFI through the interaction between inclusion outcomes and digital financial instruments. In the authors' keywords and Keywords Plus, finance-related concepts and contextual terms are also visible, suggesting that DFI studies are often linked to broader topics such as development, sustainability, and technology-enabled financial services. Overall, the term distributions in Table 5 provide a descriptive basis for understanding the thematic boundaries of the field and guide the subsequent thematic analyses. When the two most frequently used words (bigrams) in the article titles, the term "financial inclusion" appears more frequently than other terms. In general, the bigram combinations in the titles show that terms capturing the relationship between FI and elements of digitalization ("mobile money"; "digital financial"; "financial technology"; "mobile banking"; "artificial intelligence") are frequently used. It is also noteworthly that terms reflecting the substansive focus of the studies, such as country groups and methods, frequently appear in titles.

In the analysis of the most frequently used author's keywords, it is observed that the phrase "financial inclusion" is used relatively more than other terms, consistent with the core focus of the field. The joint examination of keywords through knowledge mapping is crucial for identifying the dynamics and boundaries of the study (Chen et al., 2022: 301). In this context, keyword frequency is predominantly concentrated in three clusters. The first of these is the cluster of "microfinance" and "financial literacy," which form the foundations of FI; the second is the cluster of "digital financial services" and its components; and finally, the cluster that includes "sustainable development goals.". Overall, the keyword analysis suggests that the relationship between FI and digitalization tools is predominantly examined, and that this relationship is often supported by empirical anlayses depending on data availability. Additionally, based on the results of the keyword analysis, the relationship between FI and digitalization tools is predominantly examined of the field of DFI include financial technologies and the SDGs.

Keyword Plus is a keyword framework used in databases such as Web of Science and Scopus. These are keywords that do not necessarily appear in the publication titles or among the authors' own keywords, but are extracted from the references cited in the articles. This framework helps researchers identify essential issues and concepts in the literature,

understand their interconnections, and clarify the overall content of the field. In the present study, the word "finance", it is observed that the word "finance" is relatively more frequently repeated compared to other words.

2.8. Thematic Evolution

Thematic evolution offers a holistic mapping opportunity by visualizing how the connections between themes change over specific time periods and how the themes evolve. It also allows for the assessment of whether the importance of particular themes has decreased or increased in recent years and provides a basis for assessing whether the importance of particular themes has decreased or increased in recent years and provides a basis for forecasting potential future developments (Bhatt et al., 2022: 12). In this way, it becomes possible to see which themes researchers have worked on more intensively during the relevant time periods. The rectangles in thematic evolution represent the themes, and their size grows or shrinks in proportion to the frequency with which a theme is used. The links among the rectangles illustrate the evolution of the themes over time. As the correlation between two themes intensifies, the connecting lines between the nodes become more pronounced. Over time, some themes may disappear, whereas others may converge and merge into new themes.

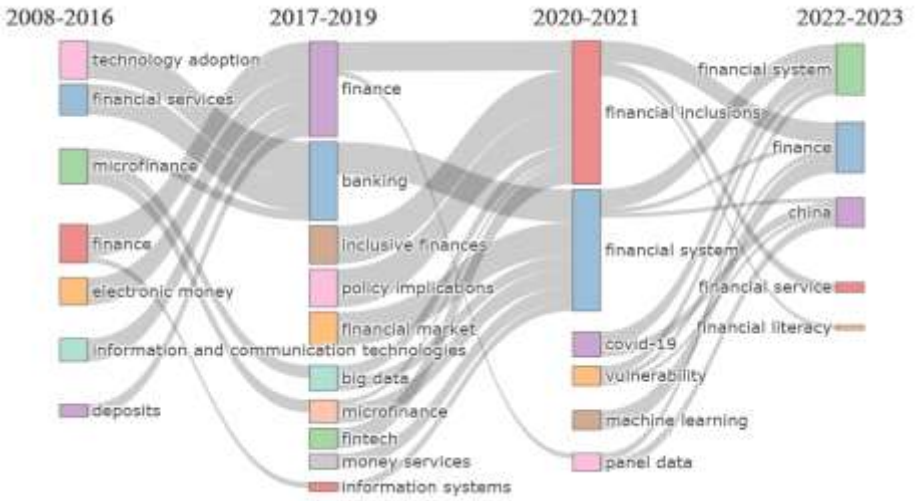

Figure 5. Thematic Evolution of DFI

Source: Authors' elaboration based on Scopus Database

In Figure 5, the thematic evolution of the field and the development of the themes over time are presented. This process investigates the influence of the G20 Summit (2016) and the COVID-19 crisis on research themes in the field and identifies the areas into which these themes have evolved. Since DFI was officially introduced at the 2016 G20 summit, studies conducted during 2008-2016 primarily focused on the G20's main themes such as "microfinance," "financial services," and "technology." In the 2017-2019 period, new themes related to financial inclusion such as "inclusive finances," "fintech," "policy implication," "financial market," and "money services" emerged. In addition, "finance," "banking," "big data," "microfinance," and "information system" continued to be linked to the earlier themes from the previous period. Studies published during 2020–2021 mainly focused on the effects of the COVID-19 crisis on DFI, and the concepts of "COVID-19" and "vulnerability" emerged as new themes. In the 2022-2023 period, rather than completely new themes, existing themes were explored in greater depth. This period emphasized specific themes such as "financial literacy" and "financial services". DFI research predominantly focuses on the Chinese context. This pattern can be attributed to the CLDS data (China Labour Force Dynamics Survey) and the Digital Financial Inclusion Index, released by Peking University. The consistent data flow from this source enables more extensive and detailed research on China.

2.9. Conceptual, intellectual and social structures of the studies

The grouping of studies in bibliometric analyses according to their similarities helps researchers to understand the general view in that field better and to make inferences. This process is also referred to as the 'science mapping method' in the literature and aims to identify the most effective studies in a discipline and to analyze and visualize the relationships between these studies (Small, 1973: 268). This study examined the relationships among terms in article titles using the co-occurrence network analysis developed by Aria & Curccurullo (2017).

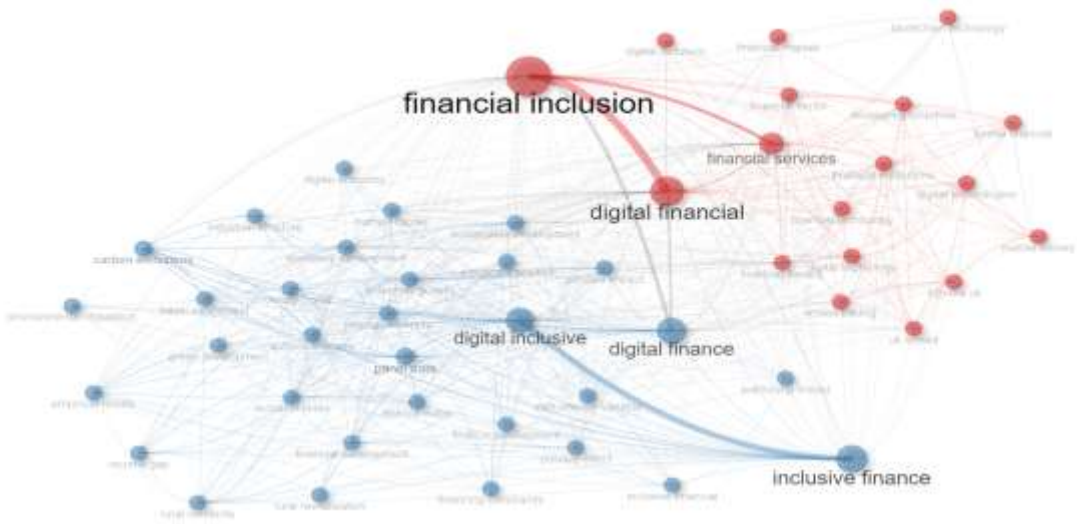

Figure 6. Co-occurrence Network (bigrams)

Source: Authors' elaboration based on Scopus Database

When the results of the conceptual structure in Figure 6 were analyzed, it was revealed that the study topics were clustered under 2 main themes:

- ✓ Financial inclusion (red cluster) (qualitative papers; digital or technology-finance relationship)
- ✓ Digital financial inclusion (blue cluster) (quantitative papers)

The thickness of the lines between the words in the title indicates the strength of the relationship between the words, and the darker the color, the stronger the relationship between the words. In this context, it can be said that the connections between the clusters of words with thick lines have a stronger relationship compared to those with thin lines. When examining the content of the papers where the words in the red cluster are concentrated, it has been observed that these papers generally consist of qualitative studies addressing the integration of digitalization and finance fields (Demirgüç-Kunt, 2014; Ozili, 2018; Chen & Bellavitis, 2020; Demirgüç-Kunt et al., 2020; Gabor & Brooks, 2020; Panos & Wilson, 2020; Schuetz & Venkatesh, 2020; Goyal & Kumar, 2021; Pal et al., 2021; Kass-Hanna et al., 2022; Jutel, 2023; Mhlanga, 2023; Ozili, 2023; Sharma et al., 2023). In the blue cluster, it is noteworthy that empirical studies are predominant (Munyegera & Matsumoto, 2016; Chatterjee, 2020; Li et al., 2020; Polloni-Siva et al., 2021; Demir et al., 2022; Ding et al., 2022; Ozturk & Ullah, 2022; Hu et al., 2023; Wang et al., 2023).

Co-citation network analysis enables the identification of the most influential papers within a study domain and the establishment of linkages among these papers (Small, 1973). Co-citation occurs when a paper cites two different sources simultaneously, and a certain degree of similarity emerges between the cited sources. A connection between two nodes reveals a co-citation relationship. The thicker the connection between two nodes, the stronger their relationship. Depending on the degree of similarity between nodes, different clusters emerge. Figure 7 shows the results of the co-citation analysis related to the field. A total of 4 different clusters have been formed (according to authors' co-citation patterns). When examining the research content of the authors in the formed clusters, it has been observed that a stronger co-citation relationship is established among studies with similar samples and research areas. Additionally, the common point of the 4 different clusters formed is Demirgüç-Kunt's studies (Demirgüç-Kunt, 2014; Demirgüç-Kunt et al., 2020), and all the clusters are interrelated.

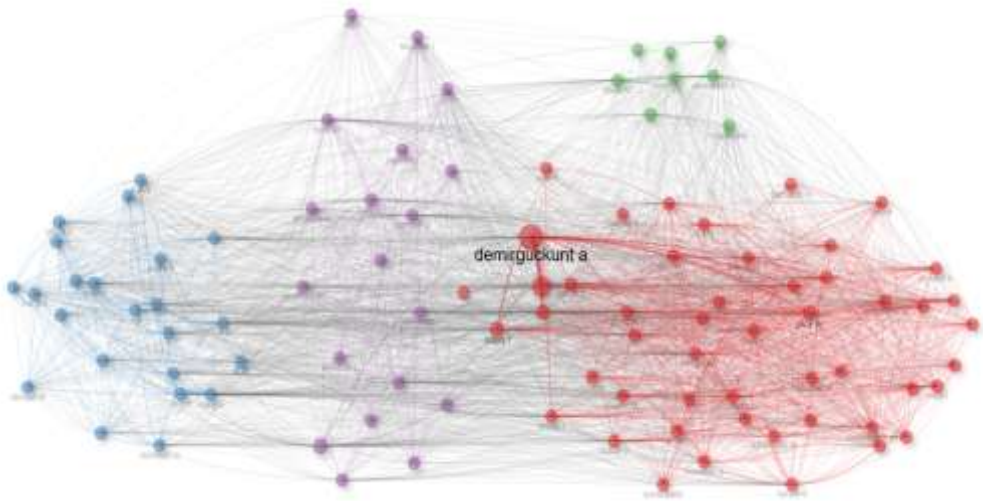

Figure 7. Co-citation Network (Authors)

Source: Authors' elaboration based on Scopus Database

Result and Discussion

The World Bank statistics indicate that nearly 2 billion adults worldwide lack basic financial services. The primary reasons include economic constraints, geographical barriers, and a lack of financial literacy. Policies to increase financial inclusion aim to remove barriers for people excluded from the financial system and support their access to affordable financial products and services. Theoretical and empirical research indicates that increasing financial access enhances income distribution, accelerates economic growth, and reduces regional inequalities. Additionally, these policies are crucial for accomplishing the United Nations' SDGs. At the 2016 G20 Summit, principles were established to support DFI. The summit criticized the existing financial sector for excluding a large segment of the population and highlighted the significant that impact digital technologies can have in eliminating barriers to financial services. In this context, emerging technologies like blockchain, digital wallets, and mobile banking are critical for expanding financial opportunities to broader population groups. However, emerging concerns like the digital divide and cybersecurity threats must be carefully addressed in this process.

Financial inclusion has been an important focus of academic research for several years. Nevertheless, the rapid advancement of technology has made digital financial inclusion (DFI) an increasingly salient recent area. This study aims to comprehensively reveal the key trends, prominent research topics, development dynamics, and geographical distributions in the field by examining the evolution of the DFI literature using bibliometric analysis. This study analyzed documents containing the terms ["financial inclusion" or "inclusive finance"] and ["digital" OR "mobile money" OR "fin-tech" OR "technology" OR "digital transformation" OR "blockchain" OR "big data" OR "industry 4.0" OR "internet of things" OR "machine learning" OR "artificial intelligence"] in their titles, abstracts, or keywords within the Scopus database, resulting in 1,638 academic papers in English from 2008 to 2023.

Bibliometric data from Scopus show that research on DFI has significantly accelerated since 2016. Key factors driving this surge include the promotion of DFI by international organizations, the widespread adoption of mobile financial services, and the COVID-19 pandemic, which has hastened digital transformation. Notably, DFI's annual growth rate (52.59%) is significantly higher than that of traditional FI (7.76%), reflecting researchers' growing interest in this field. Additionally, research indicates that DFI can positively affect 13 of the 17 SDG targets. Much of the research focuses on China, South Asia, and African nations. China stands out due to the availability of detailed statistics such as the "Digital Financial Inclusion Index." Studies in Africa show that mobile money systems, such as M-Pesa, enhance financial inclusion through digitalization. By contrast, research on other regions, including Latin America, Europe, and Southeast Asia, remains relatively limited. This gap suggests that further investigation is needed into how region-specific economic and social dynamics shape DFI. The findings from the cluster analysis indicate that the DFI literature centres on three main themes: (1) technological infrastructure and digitalization, (2) policy and regulatory frameworks, (3) socio-economic impacts. These themes demonstrate that DFI is not only a matter of financial access, but also a key instrument for achieving the SDGs. For example, mobile money applications and digital identity systems facilitate the participation of groups traditionally excluded from the financial system (women, rural populations, low-income individuals) in economic life. However,

alongside these positive effects, there are significant challenges including the digital divide, data security risks, and regulatory uncertainties. In this context, collaborative efforts among public, private, and civil society actors and robust cybersecurity policies are of great importance for the successful implementation of DFI.

These results are also consistent with previous bibliometric studies on fintech and digital finance, which similarly report a strong post-2016 acceleration in scholarly output and an increasing focus on technology-enabled financial services and their broader socio-economic and environmental implications (Nasir et al., 2021; Brika, 2022; Zou et al., 2023; Bhatt et al., 2022). However, while these studies generally examine fintech/digital finance as a broad domain, the present study specifically focuses on digital financial inclusion (DFI) and aims to provide a comprehensive picture of the field by jointly examining publication dynamics, influential authors and papers, and the intellectual and thematic structures of the DFI literature (Zou et al., 2023; Bhatt et al., 2022). In this sense, the findings both align with the broader bibliometric evidence and offer a DFI-focused synthesis by showing that the literature clusters around the three interconnected themes identified above (Nasir et al., 2021; Brika, 2022; Bhatt et al., 2022). Moreover, beyond identifying dominant themes, the results indicate a geographical concentration of highly cited contributions and point to comparatively underrepresented regions as promising directions for future research, thereby extending the existing evidence with an inclusion-oriented perspective.

This research has several limitations. First, the analyses are limited to English publications in the Scopus database. Since other databases (IEEE Xplore, EconLit, Web of Science) or studies in different languages were not included, some important contributions may have been overlooked. Second, although the chosen keywords and time period (2008-2023) delineate the focus of study, future research might re-evaluate the literature using other terms and an extended time frame.

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