

FINTECH REGULATION IN SCHOLARLY DEBATE: A BIBLIOMETRIC ANALYSIS

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Abstract

This study used bibliometric analysis to assess 688 scientific publications on fintech regulation, which were published across 436 academic publishing outlets and authored by 1,395 scholars. Research questions were developed through the lens of bibliometric theories, e.g., performance evaluation, citation and co-citation analysis, keywords analytics, and bibliographic coupling, to investigate the most influential papers, scientific publication outlets, authors, emerging trends, and affiliated institutions related to fintech regulation. This work primarily employed R Studio and VOSviewer to analyse bibliographic data from the Scopus database. Of the findings, the most influential source for fintech regulation was *Sustainability* (Switzerland), the most influential author was Douglas W. Arner (Professor at the University of Hong Kong), and the foremost institution was the University of Cambridge. Furthermore, qualitative inductive analysis was performed to address timely issues from the bibliometric findings. The issues identified were fintech and banking regulation, the implications of money laundering for financial regulators, the impact of central bank digital currency (CBDC) on financial inclusion and stability, and the challenges posed by cloud technology for fintech firms. Employing quantitative bibliometric analysis and qualitative inductive reasoning offers critical novelty in evaluating academic debates on fintech regulation, providing practical implications for the regulators, academia, and industry professionals.

Keywords: *bibliometric analysis, cbdc, fintech regulation, machine learning, money laundering*

I. INTRODUCTION

There has been substantial growth in the financial technology (fintech) sector, resulting in a rapid digital transformation of the financial services industry. Fintech has revolutionised the traditional financial industry, offering a wide range of advanced financial solutions, e.g., mobile payments, blockchain, robo-advisors, and peer-to-peer lending.¹ There are around 32,000 fintech

¹ Eskasari Putri et al., “E-Finance Transformation: A Study of M-Wallet Adoption in Indonesia,” *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan* 23, no. 1 (2022): 123–34.

companies² worldwide, which have significantly shaped the global economic landscape. The global fintech sector has attracted over USD500 billion in funding and reached a USD1.3 trillion valuation in 2021, representing 9% of global financial services.³

In 2022, the World Bank used cross-sectional data from around 180 countries,⁴ investigating the relationship between fintech's business activities and infrastructure, financial development, and policy environment. This data identified fintech activity indicators, including fintech firm creation and growth, usage of digital forms of common financial services and mobile distribution channels.⁵ The findings were varied, evincing a positive correlation between fintech activity and infrastructure, and mixed relationship between financial development, and policy implications.⁶ In particular, a positive relationship between a regulatory framework and a high level of fintech activity was found even though not all sampled countries with effective regulations experienced a significant fintech growth.⁷ Such findings imply that an effective and efficient legal framework in the fintech industry is key to developing the fintech sector. However, financial regulators have faced difficulties keeping pace with the swift technological developments, causing serious problems in the financial industry, such as using deepfake technology in financial services.⁸

While the definition of fintech varies among practitioners, politicians, and scientists,⁹ fintech regulations are implemented variably across countries. In recent practice, fintech regulation may be understood by the governing laws, including anti-money laundering (AML), data privacy protection, and know your customer (KYC), to dictate the innovation of financial technology in financial industries. This legal framework is commonly associated with regulatory technology (regtech) and supervisory technology (suptech).¹⁰ The recent practice of a regulatory sandbox was initiated by the United Kingdom's Financial Conduct Authority (FCA) in 2014, followed by financial regulators in other countries, including Indonesia's Financial Authority (OJK) in 2018.

² Boston Consulting Group (BCG) and QED Investors, "Global Fintech 2023: Reimagining the Future of Finance," 2023, <https://www.bcg.com/publications/2023/future-of-fintech-and-banking>.

³ Boston Consulting Group (BCG) and QED Investors.

⁴ The World Bank, "Global Patterns of Fintech Activity and Enabling Factors," 2022, <https://www.worldbank.org/en/publication/fintech-and-the-future-of-finance>.

⁵ The World Bank, "Global Patterns."

⁶ The World Bank, "Global Patterns."

⁷ The World Bank, "Global Patterns."

⁸ Indra Jaya Gunawan and Sylvia Janisriwati, "Legal Analysis on the Use of Deepfake Technology: Threats to Indonesian Banking Institutions," *Law and Justice* 8, no. 2 (2023): 192–210.

⁹ Ramona Rupeika-Apoga and Eleftherios I Thalassinou, "Ideas for a Regulatory Definition of FinTech," *International Journal of Economics and Business Administration* 8, no. 2 (2020): 136 – 154.

¹⁰ Faturrahman Fachsandy, "Regulatory and Supervisory Technology Research: A Bibliometric Analysis," *Journal of Central Banking Law and Institutions* 4, no. 1 (2025): 181–202.

Against the dynamics in legal practices of fintech regulations, what are the critical issues in fintech regulation, and what are the recent developments in scholarly debate on fintech regulation? Despite the increase in fintech research, the primary emphasis has been on fundamental aspects that didn't sufficiently address these questions. The current body of literature has primarily focused on foundational works, e.g., fintech innovation assessment,¹¹ analysis of historical perspective on fintech ecosystem,¹² and a comprehensive literature review on fintech, among others. The current literature has not adequately investigated key issues regarding the development and evaluation of fintech regulation as discussed in academic works.

This study assesses the current literature on fintech regulation to understand the recent development in theoretical and practical contexts. In doing so, a bibliometric analysis, also called a scientometric study, i.e., a kind of data analytics method to evaluate scholarly publications,¹³ is employed. The bibliometric data is harvested from the Scopus database with machine learning tools such as RStudio and VOSviewer and is used for semi-supervised machine learning analytics. Furthermore, qualitative human intelligence is examined to draw practical implications. This paper offers a novel approach to evaluating fintech regulation development in scholarly debate, offering practical relevance for financial services professionals and regulatory authorities.

The remaining part of this paper is as follows. The next section is the literature review, identifying the state-of-the-art academic works on fintech for further research gap identification, and elaborating the theories that ground the bibliometric analysis for developing research questions that this work addresses. This section is followed by an explanation of the methodology, presenting the scholarly approaches to answer the research questions. The results and discussion sections follow this. Finally, the paper presents conclusions and recommendations, generating implications for the findings of this study.

II. LITERATURE REVIEW

Fintech leverages novel technology to enhance financial services, denoted by various terms, including algorithmic trading, the internet of things (IoT), and

¹¹ Peter Gomber et al., "On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services," *Journal of Management Information Systems* 35, no. 1 (2018): 220–265.

¹² In Lee and Yong Jae Shin, "Fintech: Ecosystem, Business Models, Investment Decisions, and Challenges," *Business Horizons* 61, no. 1 (2018): 35–46.

¹³ M. Kabir Hassan et al., "Evaluating Indonesian Islamic Banking Scholarly Publications: A Data Analytics," *Journal of Islamic Monetary Economics and Finance* 8, no. 3 (2022).

internet finance,¹⁴ among others, that have laid the groundwork for financial inclusion and sustainable development, but which have also had adverse consequences, such as funding terrorism and money laundering.¹⁵ Following the 2008 financial crisis, the number of fintech start-ups (e.g., peer-to-peer (P2P) lending) has increased.¹⁶ The recent fifth industrial revolution has transformed global fintech practices, with cutting-edge technologies, including blockchain, intelligent machines, and others, yielding a significant impact on the industry.¹⁷ The installation of the telegraph in 1838 and the construction of the transatlantic cable in 1866¹⁸ marked the start of the internet in the early 1990s, which were historically associated with the origins of fintech.¹⁹

Fintech research has grown, with influential works primarily addressing fundamental issues. These issues include the impact of fintech on traditional financial services and exploring how fintech has changed operational management in financial services.²⁰ Other works have discussed fintech adaptation in the conventional banking system, elaborating the fintech ecosystem, its business models, types of investments, and the challenges faced by both fintech firms and traditional financial institutions.²¹ Such works have also linked fintech with digital finance, offering evidence for promoting financial inclusivity and stability. In addition, a previous study has investigated shadow banking in fintech development, providing empirical evidence of the varying impact of regulatory frameworks and technology on such shadow banking growth.²²

Nevertheless, academic publications have not covered the development of fintech regulation, especially in the context of bibliometric analysis. Bibliometric study is important as it allows numerical evaluation of academic literature, discovering specific directions, patterns, and areas of a particular

¹⁴ Fahmi Ali Hudaefi, "How Does Islamic Fintech Promote the SDGs? Qualitative Evidence from Indonesia," *Qualitative Research in Financial Markets* 12, no. 4 (2020): 353–66.

¹⁵ Jamal Wiwoho et al., "Financial Crime in Digital Payments," *Journal of Central Banking Law and Institutions* 1, no. 1 (2022): 47–70.

¹⁶ Fahmi Ali Hudaefi et al., "Exploring the Development of Islamic Fintech Ecosystem in Indonesia: A Text Analytics," *Qualitative Research in Financial Markets* 15, no. 3 (2023): 514–33.

¹⁷ Wulan Fitriana and Maiza Dea Nuraini, "Juridical Analysis of Legal Updates on Crypto Assets in Indonesia (Comparative Study of Indonesian Law with Singapore and Islamic Law Views)," *Journal of Transcendental Law* 5, no. 1 (2023): 55–72.

¹⁸ Bernardo Nicoletti, *The Future of FinTech: Integrating Finance and Technology in Financial Services* (Palgrave McMillan, 2017).

¹⁹ Douglas W. Arner et al., "The Evolution of Fintech: A New Post-Crisis Paradigm?," *University of Hong Kong Faculty of Law Research Paper* (2015).

²⁰ Gomber et al., "Fintech Revolution."

²¹ Lee and Shin, "Fintech: Ecosystem."

²² Greg Buchak et al., "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks," *Journal of Financial Economics* 130, no. 3 (2018): 453 – 483.

research topic or academic publishing outlet.²³ This paper aims to fill this particular gap in the fintech literature.

II.A. Bibliometric Study of Fintech

Evaluating scientific publications may be categorised into three main streams: systematic literature review (SLR), meta-analysis, and bibliometric analysis.²⁴ SLR is a qualitative method to analyse a small number of publications, while meta-analysis summarises empirical evidence and discovers unexplored relationships from publication data.²⁵ A bibliometric study, also called a scientometric study,²⁶ takes a data-driven approach to big data analytics, analysing large publication data, often using machine learning tools.

There has been significant growth in fintech research evaluation using bibliometric analysis. Those studies have predominantly harvested data from Scopus and Web of Sciences (WoS) databases, covering several topics, including the development of fintech research with specific periods of publication,²⁷ and various subtopics, e.g., customer due diligence,²⁸ digital finance,²⁹ societal and environmental issues, and financing small and medium-sized enterprises (SMEs),³⁰ among others. However, no bibliometric analysis of fintech regulation was found, leading this study to address this knowledge gap.

II.B. Theories and Research Questions

Probabilistic theory is the foundation for bibliometric analysis, assuming success generates success.³¹ This theory in academic literature implies that an article containing many citations has a greater chance of being cited again,

²³ Hassan et al, “Indonesian Islamic Banking.”

²⁴ Naveen Donthu et al., “How to Conduct a Bibliometric Analysis: An Overview and Guidelines,” *Journal of Business Research* 133 (2021): 285–96.

²⁵ Hassan et al., “Indonesian Islamic Banking.”

²⁶ Egi Arvian Firmansyah et al., “A Scientometric Study on Management Literature in Southeast Asia,” *Journal of Risk and Financial Management* 15, no. 11 (2022).

²⁷ Bo Li and Zeshui Xu, “Insights into Financial Technology (FinTech): A Bibliometric and Visual Study,” *Financial Innovation* 7, no. 1 (2021); Mohammad Sahabuddin et al., “The Evolution of FinTech in Scientific Research: A Bibliometric Analysis,” *Sustainability (Switzerland)* 15, no. 9 (2023).

²⁸ William Gaviyau and Athenia Bongani Sibindi, “Customer Due Diligence in the FinTech Era: A Bibliometric Analysis,” *Risks* 11, no. 1 (2023).

²⁹ Said Khalfa Mokhtar Brika, “A Bibliometric Analysis of Fintech Trends and Digital Finance,” *Frontiers in Environmental Science* 9 (2022); Zongsen Zou et al., “Insight into Digital Finance and Fintech: A Bibliometric and Content Analysis,” *Technology in Society* 73 (2023).

³⁰ Bahati Sanga and Meshach Aziakpono, “FinTech and SMEs Financing: A Systematic Literature Review and Bibliometric Analysis,” *Digital Business* 3, no. 2 (2023).

³¹ Derek De Solla Price, “A General Theory of Bibliometric and Other Cumulative Advantage Processes,” *Journal of the American Society for Information Science* 27, no. 5 (1976): 292–306.

unlike a manuscript with fewer citations.³² This theory also applies to the authorship, where authors with many citations are likelier to engage in frequent publication than those with a small number of publication records.

The probabilistic theory is grounded in citation frequency analysis, including examining Lotka's law (Named after Alfred J. Lotka), which refers to quantifying author publication frequency within a specific academic discipline,³³ and Bradford's law.³⁴ This study adopts bibliometric methods for performance and science mapping analyses,³⁵ examining the topic of fintech regulation from the Scopus database. Specifically, science mapping analyses cover citation and co-citation analyses, bibliographic coupling, co-author, and co-word analyses.³⁶

II.B.1. Performance Evaluation

Performance analysis in a bibliometric study evaluates research contributions to knowledge areas using academic evaluation metrics, e.g., citation count, publication count, and the ratio of citations to publications.³⁷ This analysis focuses on the recent developments in a particular subject or academic publication, examining the authors, institutions, countries, and other relevant journals.³⁸ Productivity and impact measures are commonly employed to assess the performance of a scholarly journal, experts' publications, or a particular research topic.

The performance analysis in this study aims to address the first research question (RQ1): *How is the recent development of publications, authors, and their citations related to fintech regulation?*

II.B.2. Citations and Co-citations

Citation analysis is a statistical analysis that measures intellectual connection through citations,³⁹ and is critical to empirically identifying impactful articles,

³² Price, "General Theory."

³³ Miranda Lee Pao, "Lotka's Law: A Testing Procedure," *Information Processing & Management* 21, no. 4 (1985): 305–20.

³⁴ Developed by Samuel C. Bradford. It defines an ongoing trend that predicts the exponential diminishing returns when searching for references in scientific journals. See: G Alabi, "Bradford's Law and Its Application," *International Library Review* 11, no. 1 (1979): 151–58.

³⁵ Donthu et al., "How to Conduct a Bibliometric Analysis: An Overview and Guidelines."

³⁶ Hassan, Hudaei, and Agung, "Evaluating Indonesian Islamic Banking Scholarly Publications: A Data Analytics."

³⁷ Muhamad Subhi Apriantoro, Dartim, and Ninik Andriyani, "Bibliometric Analysis of Carbon Capture and Storage (CCS) Research: Evolution, Impact, and Future Directions," *Challenges in Sustainability* 12, no. 2 (2024): 152 – 162.

³⁸ Vanneza Diva Ariona et al., "Charting the Course of Islamic Education Management Research: A Comprehensive Bibliometric Analysis for Future Inquiry," *Munaddhomah* 4, no. 4 (2023): 950 – 963.

³⁹ P. Wouters and L. Leydesdorff, "Has Price's Dream Come True: Is Scientometrics a Hard Science?," *Scientometrics* 31, no. 2 (1994): 193–222.

journals, or individuals.⁴⁰ Meanwhile, co-citation is based on the assumption that frequently referenced publications share a common theme in a research area. Citation and co-citation analysis investigate the joint occurrence of the analysed objects in a research field, resulting in the emergence of domains and specialities from a particular scholarly publication, a research topic, or an individual expert.⁴¹

This study's citation and co-citation analyses aim to answer the second research question (RQ2): *Which articles, authors, countries, and affiliations have the most scholarly contributions to fintech regulation?*

II.B.3. Co-word and Bibliographic Coupling

Co-word analysis examines the authors' keywords in the dataset of a bibliometric study.⁴² Bibliographic coupling categorises a reference element shared by two articles as a unit of coupling that enables two classifications.⁴³ This facilitates the examination of co-author associations between researchers and journals citing similar references.⁴⁴

In this work, co-word analyses and bibliographic coupling aim to address the third research question (RQ3): *What themes can be generated from the authors' keywords, and how do their publications correlate based on their shared references?*

III. METHODOLOGY

III.A. Harvested Data and Machine Learning Tools

In this study, the bibliographical data were harvested from the Scopus database. The search query "fintech regulation" was applied to Scopus's search feature, including the fields for article titles, abstracts, and keywords. The preliminary search on 5 January 2024 identified 707 documents, indicating an extensive range of scholarly publications on the fintech regulation topic. This dataset was further refined by restricting the time frame to include publications in or before 2023 for accurate interpretation in year-to-year evaluation. Following this process, the final dataset of 688 documents was generated for the analysis.

⁴⁰ Muhamad Subhi Aprianthoro and Sendy Septianozakia, "The Potential of Productive Waqf: Research Stream and Future Direction," *Pakistan Journal of Life and Social Sciences* 22, no. 1 (2024): 1291 – 1306.

⁴¹ Donthu et al., "How to Conduct a Bibliometric Analysis: An Overview and Guidelines."

⁴² Fauzul Hanif Noor Athief et al., "Profit-Loss Sharing Principle in the Islamic Finance Industry: Current Pattern and Future Direction," *International Journal of Advanced and Applied Sciences* 11, no. 9 (2024): 23 – 35.

⁴³ M. M. Kessler, "Bibliographic Coupling between Scientific Papers," *American Documentation* 14, no. 1 (1963): 10–25.

⁴⁴ Athief et al., "Profit-Loss Sharing Principle."

The bibliometric analysis in this study was technically operated via RStudio and VOSviewer. RStudio is a machine learning tool that requires a programming language for statistical computing and graphical analysis. This study used the bibliometric packages, *bibliometrix* and *biblioshiny*⁴⁵, for the analysis. Furthermore, VOSviewer⁴⁶ was employed to generate graphical networks for various bibliometric analyses, including co-occurrence, co-citations, and co-authorship analyses.

III.B. Data Overview

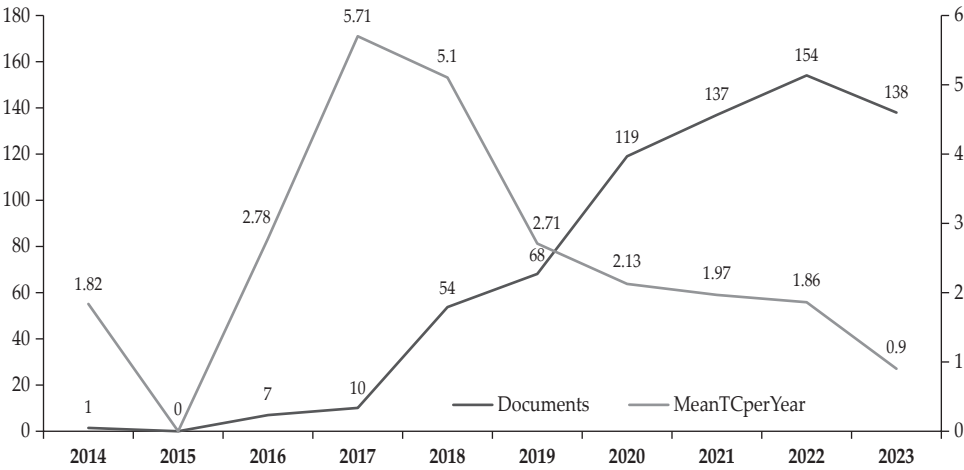
The final dataset includes 1,395 authors and 688 documents from 436 sources published from 2014 to 2023. Of the 688 documents, 56% (386) were journal articles. The remaining documents included 17% book chapters (120 documents), 14% conference papers (94 documents), 6% books (40 documents), reviews (39 documents), conference reviews (0.4%), editorials (0.4%), and notes (0.4%). Research on fintech regulation has been increasing for nearly a decade, as evidenced by the Scopus database, with an approximately 73% annual publication growth rate. Figure 1 visualises this important fact. The green line represents the annual number of publications, analysed against the average number of citations (orange line). Scopus has recorded a significant increase in fintech regulation publications. In 2014, there was one publication record, which skyrocketed to 154 documents in 2022. Fluctuating patterns occurred in the citation trend, with significant growth from 2014 to 2017.

Furthermore, Figure 2 visualises substantial information from the dataset, showing the relationship among impactful authors (middle) to their keywords (right), and the publishing outlets (left). The greater the density of the flow, the greater the contribution level. For instance, Arner DW has significantly contributed to some prominent keywords, such as fintech, financial regulation, and regtech. Arner DW's scholarly works were mostly published in the Handbook of Blockchain, Digital Finance, and Inclusion.

⁴⁵ Aria and Cuccurullo, "Bibliometrix."

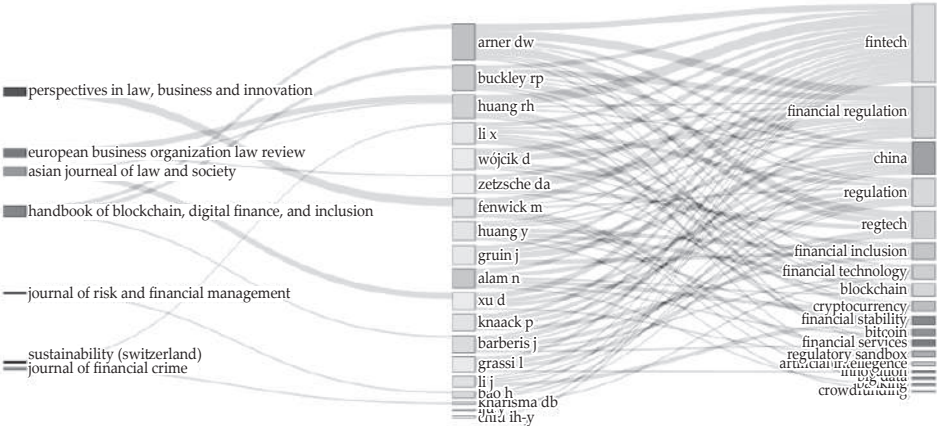
⁴⁶ van Eck and Waltman, "Software Survey: VOSviewer."

Figure 1.
Annual Document Productions and Average Citations



Source: Author's analysis. Reproduced using Microsoft Excel.

Figure 2.
Sankey Graph of Sources, Authors, and Keywords



Source: Author's analysis. The Sankey chart above shows the flows of values from one variable to other variables. The left side presents the value of the names of sources, such as journals, the middle shows the authors' names, and the right side presents the keywords used by the authors in their publications.

IV. RESULTS

IV.A. Addressing RQ1: Impactful Academic Sources

Examining the publishing outlets is essential in the performance analysis of a bibliometric study to discover the most influential academic sources, such as books, conference proceedings, and others.⁴⁷ In this study, the unit analysis for

⁴⁷ Hassan et al., "Indonesian Islamic Banking"

this investigation is the 436 academic publishing outlets in the dataset. Scientific indicators (e.g., h-index, g-index, m-index, total citations (TC), and number of publications (NP)) were used as the measure for impactful academic sources.⁴⁸

Table 1 illustrates the results for the ten most influential sources on fintech regulation. The impact measurement score for *Sustainability* (Switzerland) is the highest (h-index 7, g-index 12, and m-index 1.17), followed by *Technological Forecasting and Social Change* (h-index 6, g-index 6, and m-index 0.86) and *European Business Organisation Law Review* (h-index 5, g-index 7, and m-index 0.71). Regarding the number of published articles, *Lecture Notes in Networks and Systems, Sustainability* (Switzerland), and *Journal of Risk and Financial Management* are the top three, with 13 and 12 articles, respectively. In terms of TC, the *Journal of Financial Economics* is the leader (442 citations), followed by *Electronic Commerce Research and Applications* (304 citations) and the *Journal of Economics and Business* (231 citations).

⁴⁸ Muhamad Subhi Apriantoro et al., “Shaping the Future of Environmental Economics: A Bibliometric Review of Current Trends and Future Directions,” *International Journal of Energy Economics and Policy* 14, no. 3 (2024): 549 – 559.

Table 1.
Top 10 Academic Sources

No	Impact Measurements				Number of Publications (NP)		Total Citations (TC)	
	Sources	h-index	g-index	m-index	Sources	Total	Sources	Total
1	Sustainability (Switzerland)	7	12	1.17	Lecture Notes in Networks and Systems	13	Journal of Financial Economics	442
2	Technological Forecasting and Social Change	6	6	0.86	Sustainability (Switzerland)	12	Electronic Commerce Research and Applications	304
3	European Business Organization Law Review	5	7	0.71	Journal of Risk and Financial Management	12	Journal of Economics and Business	231
4	Handbook of Blockchain, Digital Finance, and Inclusion	5	5	0.63	Perspectives in Law, Business and Innovation	11	International Journal of Environmental Research and Public Health	223
5	Journal of Financial Regulation and Compliance	5	5	1	ACM International Conference Proceeding Series	9	Technological Forecasting and Social Change	219
6	Journal of Risk and Financial Management	5	11	0.83	European Business Law Review	9	Northwestern Journal of International Law and Business	199
7	ACM International Conference Proceeding Series	3	7	0.33	European Business Organization Law Review	7	Sustainability (Switzerland)	196
8	Asian Journal of Law and Society	3	5	0.36	Contributions to Finance and Accounting	7	International Review of Financial Analysis	194
9	Electronic Commerce Research and Applications	3	3	0.43	Technological Forecasting and Social Change	6	Journal of Corporate Finance	169
10	European Business Law Review	3	4	0.6	Financial Innovation	6	Journal of Financial Regulation	154

Source: Author's analysis. H-index identifies the number of publications (h) with at least h citations, e.g., an h-index of 10 means 10 papers with at least 10 citations each. G-index extends h-index, considering highly cited papers with the largest number, where the top (g) papers have at least g² total citations. M-index considers the lengths of researchers' careers or journals' publications, dividing the h-index by the years since the first publication.

IV.B. Addressing RQ1 and RQ2: Authorship and Co-authorship Analyses

Table 2 shows the top ten most influential authors (out of 1,395). The measures used the impact metrics, including the number of publications (NP) and total citations (TC). Arner DW (Arner, Douglas Wayne) is the most influential author in terms of scholarly impact (h-index 6, g-index 7, m-index 0.462), followed by Buckley RP (Ross P. Buckley) (h-index 5, g-index 5, m-index 0.6) and NP (5 articles). Furthermore, Buchak G, Matvos G, Piskorski T, and Seru A have a comparable number of the highest TC (442), making them the most influential authors based on TC.

Furthermore, as shown in Table 2, the top 10 affiliations based on the number of published articles range from 6 to 11. The University of Cambridge emerges as the leading institution with 11 articles. Followed by Bina Nusantara University, Chinese University of Hong Kong, Universitas Indonesia, and Shanghai University, with 10, 9, 8, and 7 publications, respectively. Regarding the corresponding authors' nationalities, China, the United Kingdom, and Indonesia stand out with 59, 40, and 32 articles, respectively.

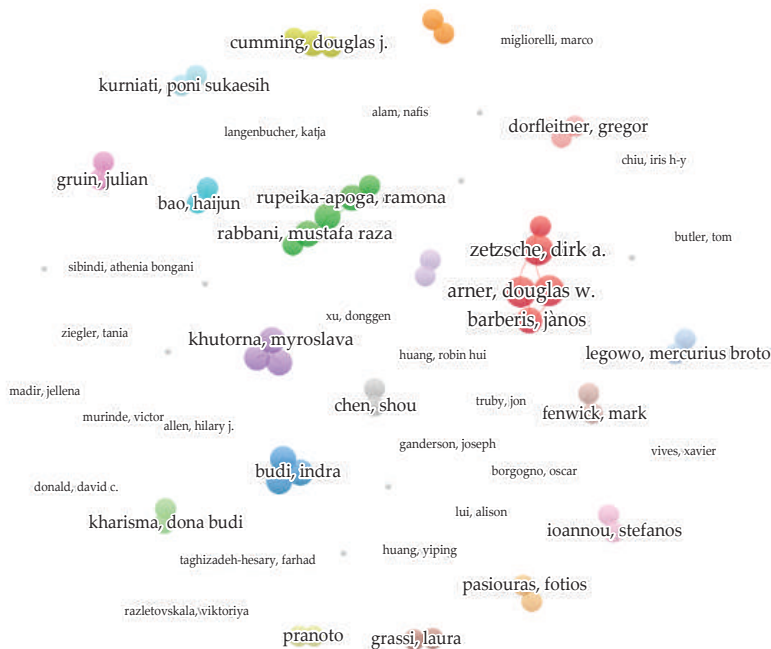
In addition, Figure 3 illustrates authors' collaboration, showing a high level of author disconnects, implying little collaboration among the 1,395 authors in the dataset. This may indicate a lack of collaboration among scholars researching fintech regulation. However, small co-authorship clusters were identified, with the red cluster (Rabani, Mustafa Reza; Rupeika-Apoga, Ramona) and the green cluster (Barberis, Janos, Arner, Douglas W, Zetsche, Dirk A.) being the most significant clusters in the dataset.

Table 2.
Top 10 Authors, Affiliations and Countries

No	Impact Measurements			Number of Publication		Total Citation (TC)		Top Affiliation based on Publication		Top Country Based on Publication	
	Author	h-index	g-index	m-index	Author	Total	Author	Total	Affiliation	Total	Country
1	Arner DW	6	7	0.7	Arner DW	7	Buchak G	442	University of Cambridge	11	China
2	Buckley RP	5	5	0.6	Buckley RP	5	Matvos G	442	Bina Nusantara University	10	United Kingdom
3	Bao H	4	4	1	Huang RH	5	Piskorski T	442	Chinese University of Hong Kong	9	Indonesia
4	Huang RH	4	5	0.6	Alam N	5	Seru A	442	Universitas Indonesia	8	USA
5	Wójcik D	4	4	0.6	Bao H	4	Arner DW	393	Shanghai University	7	Spain
6	Barberis J	3	4	0.3	Wójcik D	4	Buckley RP	382	UCSI University	7	Malaysia
7	Gruin J	3	3	0.5	Barberis J	4	Barberis J	226	Ahlia University	6	Australia
8	Knaack P	3	3	0.5	Zetzsche DA	4	Anagnos-topoulos I	226	Lviv Polytechnic National University	6	Italy
9	Li J	3	3	0.6	Fenwick M	4	Chong B	223	Qatar University	6	India
10	Ozili PK	3	3	0.5	Huang Y	4	Liao S-W	223	Universitas Sebelas Maret	6	Hong Kong

Source: Author's analysis.

Figure 3.
Co-authorship Analysis



Source: Author's analysis.

IV.C. Addressing RQ1 and RQ2: Impactful Manuscripts and Citation Analyses

The unit analysis of impactful manuscripts in this study included 688 articles in the dataset. The indicators used were local citations (LC) (citations in the dataset), global citations (GC) (citations in the Scopus database) and the most frequently cited references.⁴⁹ The manuscript “*Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks*”⁵⁰ is the first influential article with 442 GCs and 41 LCs. In comparison, the manuscript “*Fintech and Regtech: Impact on Regulators and Banks*”⁵¹ is the second most influential article with 226 GCs and 32 LCs. Additionally, a reference titled “*EU Digital Finance Strategy 3*” is the most influential locally cited reference with 38 TCs. Table 3 explains the top 10 manuscripts based on these impactful measurements.

⁴⁹ Hassan et al., “Indonesian Islamic Banking.”

⁵⁰ Buchak et al., “Fintech.”

⁵¹ Ioannis Anagnostopoulos, “Fintech and Regtech: Impact on Regulators and Banks,” *Journal of Economics and Business* 100 (2018): 7–25.

Table 3.
Top 10 Manuscripts and References

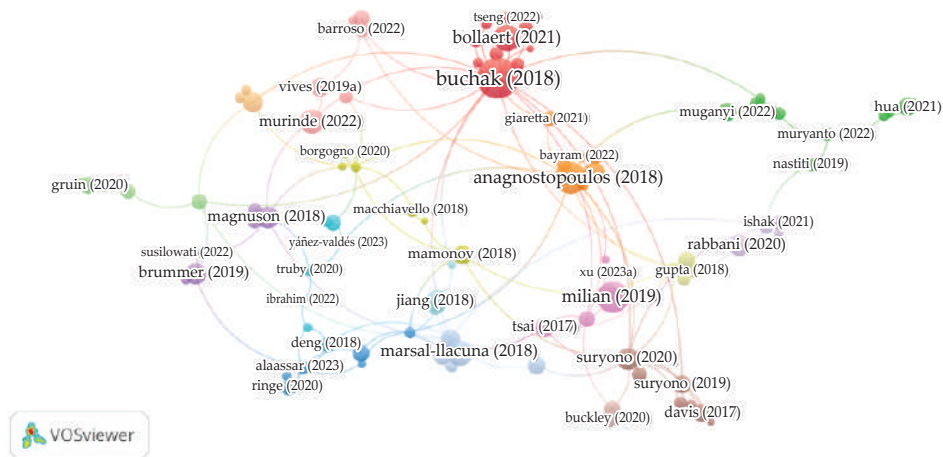
No	Global Citations		Local Citation		Most Cited References	
	Title	Total GC	Title	Total LC	Title	TC
1	Fintech, regulatory arbitrage, and the rise of shadow banks	442	Fintech, regulatory arbitrage, and the rise of shadow banks	41	EU Digital Finance Strategy 3	38
2	Fintech and regtech: Impact on regulators and banks	226	Fintech and regtech: Impact on regulators and banks	32	Transportation Research Part B: Methodological	29
3	Fintechs: A literature review and research agenda	214	Regulating fintech	12	Bitcoin: A Peer-To-Peer Electronic Cash System	23
4	FinTech, RegTech, and the reconceptualization of financial regulation	199	Fintech and the innovation trilemma	10	Fintech and Regtech: Impact on Regulators and Banks	19
5	Fintech and access to finance	141	Digital Disruption in Banking	8	Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks	17
6	Future living framework: Is blockchain the next enabling network?	122	Catching up with Indonesia's fintech industry	8	Regulatory Sandbox	16
7	Decentralized finance	116	Success factors in Title III equity crowdfunding in the United States	7	Commission 2030 Digital Compass	14
8	The impact of the FinTech revolution on the future of banking: Opportunities and risks	107	Regulatory sandboxes	7	Fintech and Market Structure in Financial Services	13
9	Investor Platform Choice: Herding, Platform Attributes, and Regulations	89	Technology v Technocracy: Fintech as a Regulatory Challenge	6	The Emergence of the Global Fintech Market: Economic and Technological Determinants	13
10	Risk spillovers between FinTech and traditional financial institutions: Evidence from the U.S.	87	Evolutionary Approaches and the Construction of Technology-Driven Regulations	6	On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services	12

Source: Author's analysis.

Furthermore, Figure 4 illustrates how frequently the 688 documents have cited each other in the dataset, demonstrating the influence of one manuscript on others. The larger the nodes, the more frequently a manuscript is cited by other articles in the dataset. Of the 688 documents, 101 papers were included for the analysis. A threshold minimum number of five citations was set during

the analysis, resulting in 239 documents meeting the threshold. The largest connection occurred among 101 documents, which was considered for further analysis. There were 17 clusters identified with 144 connections, where the most influential clusters are presented in red, orange, and pink. The red cluster explains the significant influence of Buchak's work on fintech and regulatory arbitrage.⁵² The orange cluster describes Anagnostopoulos' study on the impact of fintech and regtech on regulators,⁵³ while the pink cluster illustrates the influence of Milian's work on the fintech literature review.⁵⁴ These influential manuscripts have contributed significantly to developing the fintech regulation topic in academic debates.

Figure 4.
Citation Analysis of Documents



Source: Author's analysis.

IV.D. Addressing RQ3: Co-word Analysis of Authors' Keywords

The unit analysis of keywords in this study covered 2,816 keywords (1,252 keywords plus 1,564 author keywords). Figure 5 illustrates the occurrences of keywords that appear together in the dataset. There is a correlation between the size of the nodes and the frequency of occurrence of the words in the dataset. It demonstrates the interconnections among frequently used keywords.

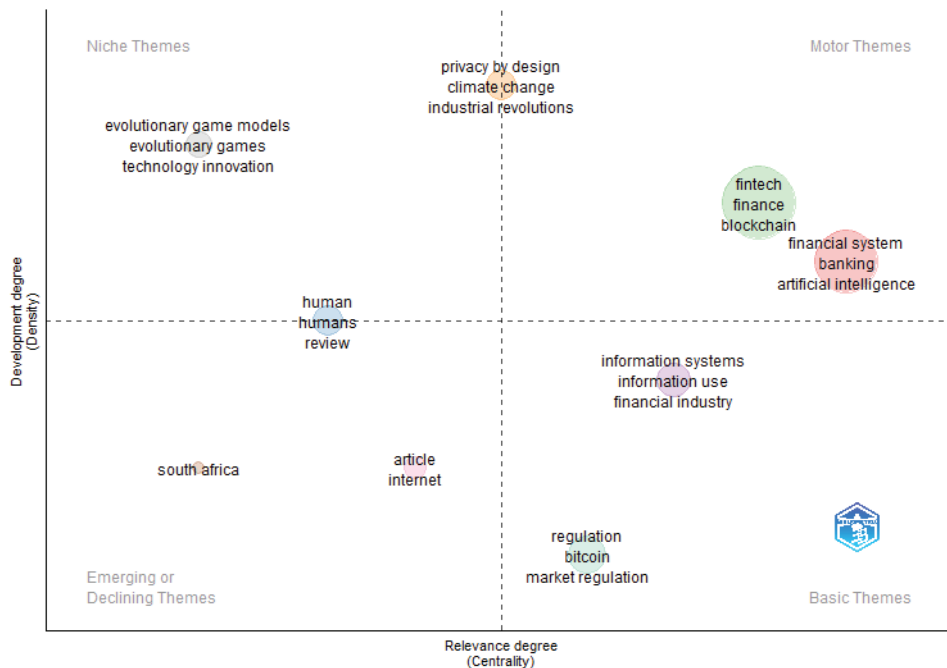
⁵² Buchak et al., "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks."

⁵³ Anagnostopoulos, "Fintech and Regtech."

⁵⁴ Eduardo Z Milian et al., "Fintechs: A Literature Review and Research Agenda," *Electronic Commerce Research and Applications* 34 (2019): 100833, <https://doi.org/https://doi.org/10.1016/j.elrap.2019.100833>.

“article”, “internet”, and others, suggest emerging or declining themes. The keywords clustered in the upper left quadrant, “evolutionary game models” and “technology innovation”, indicate a highly specialised or niche theme. These themes represent the current debates in fintech regulation.

Figure 6.
Thematic Map Analysis of Keywords



Source: Author's analysis.

IV.E. Addressing RQ3: Bibliographic Coupling

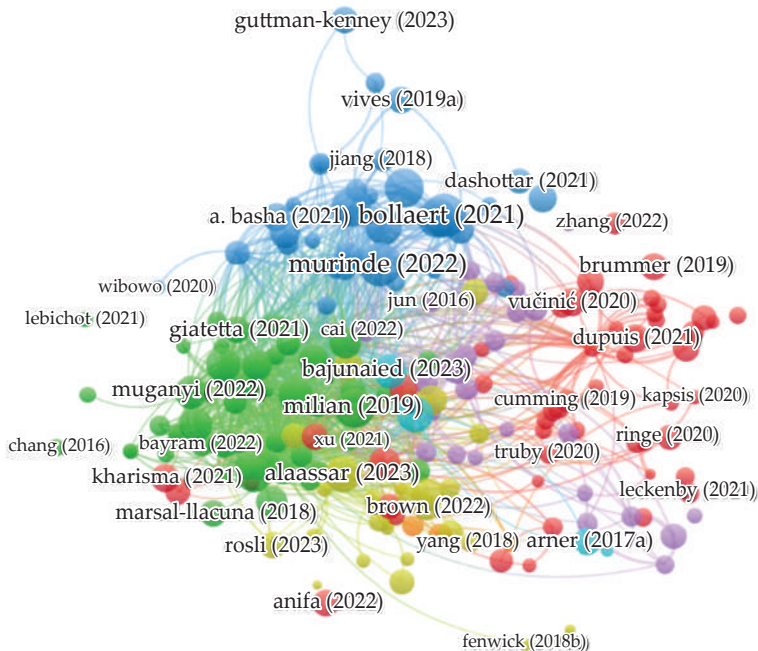
Bibliographic coupling measures the similarity between documents based on shared references, indicating common research interests and thematic connections.⁵⁶ The analysis unit for bibliographic coupling in this study comprises 688 documents. This paper considered a normalised citation measure for correcting the temporal bias in citation counts, ensuring that recently published works are not disadvantaged compared to earlier manuscripts that have received more citations. Theorists posit that an older manuscript will likely receive more citations than a newer one. Normalised citation addresses

⁵⁶ Ririn Riani and Nashr Akbar, “Mapping Central Bank Digital Currency Literature: Lessons for Governments and Research,” *Journal of Central Banking Law and Institutions* 3, no. 2 (2024): 203–38.

this problem.⁵⁷ Such a normalised citation method is critical to effectively discover the significant and timely works on fintech regulation issues.

Figure 7 illustrates the bibliographic coupling of 194 documents (selected from 688 documents), where larger nodes denote higher normalised citations. A minimum threshold of five citations was set during the analysis (semi-supervised machine learning), resulting in 239 documents meeting the threshold, with the final largest connected manuscripts consisting of 194 papers for final analysis. Cluster 1 (red) encompasses 54 manuscripts, focusing on influential regulatory approaches to combat money laundering. Cluster 2 (green) comprises 48 papers, highlighting significant contributions to the fintech literature review. Cluster 3 (blue) consists of 33 works, highlighting the impact of fintech on the banking sector. Cluster 4 (yellow corn) includes 27 articles, underlining impactful research on the facilitators of fintech innovation. Cluster 5 (purple) encompasses 25 manuscripts, showing influential works on China's fintech development. Cluster 6 (blue turquoise) and cluster 7 (orange) consist of four and three papers, respectively, with influential contributions on central bank digital currency (CBDC) and regulatory issues in cloud technologies.

Figure 7.
Bibliographic Coupling



Source: Author's analysis.

⁵⁷ Nees Jan van Eck and Ludo Waltman, VOSviewer Manual, issued 2018, https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.7.pdf.

V. DISCUSSION

Turning to the author's inductive analysis, the key points that shape the debate on fintech regulation in academic works, as in Figure 7, were the author's primary object of the analysis. The first issue is the relationship between fintech development and banking regulations, and the implications for the financial sector. A focal discussion is the impact of money laundering, exploring the challenges it poses for financial regulators and the adaptive measures needed to address this issue. Additionally, the emergence of central bank digital currencies (CBDCs) and their potential impacts on financial inclusion and stability are elaborated. Finally discussed is the transformative influence of cloud technology, exploring its regulatory implications.

V.A. Fintech and Banking Regulations

Fintech and banking regulation are critical issues, as shown in a blue cluster of Figure 7. The fintech revolution has changed the landscape of the banking industry, demanding timely regulations for practical adaptation as new risks, including cybersecurity risks, have emerged in times of fintech growth.⁵⁸ The discussion has centred around an international regulatory framework for fintech, critical to ensuring the financial system's stability, facilitating the efficient functioning of markets, protecting the interests of consumers, and improving social and economic well-being.⁵⁹ Policymakers should prioritise protecting privacy and consumer interests as increasing digitalisation and connectivity create more opportunities for criminals to exploit personal data for illegal activities, e.g., deepfake technology in the financial market.⁶⁰

V.B. Money Laundering and Implications for Financial Regulators

Money laundering emerged as a critical issue represented by the red cluster in Figure 7. Regulatory conflict states that when stricter laws against money laundering exist, financial criminals actively search for opportunities to launder their illegal profits.⁶¹ In times of technological advancement, laundering huge amounts of money without using cryptocurrencies and current conversion methods is practicable.⁶² The recent practices of banking regulators around the world in opening doors to exchanging cryptocurrencies for fiat currencies

⁵⁸ Zahrashafa Mahardika et al., "Going Digital Rupiah: Some Considerations from Sovereignty and Cybersecurity Perspectives," *Journal of Central Banking Law and Institutions* 2, no. 1 (2023): 25–54.

⁵⁹ Victor Murinde et al., "The Impact of the FinTech Revolution on the Future of Banking: Opportunities and Risks," *International Review of Financial Analysis* 81 (2022).

⁶⁰ Gunawan and Janisriwati, "Deepfake Technology."

⁶¹ Daniel Dupuis and Kimberly Gleason, "Money Laundering with Cryptocurrency: Open Doors and the Regulatory Dialectic," *Journal of Financial Crime* 28, no. 1 (January 1, 2020): 60–74.

⁶² Dupuis and Gleason "Money Laundering."

used to launder money could harm both legal businesses, and thus, amending currency laws is deemed critical.⁶³ This draws practical implications for financial regulators in mitigating money laundering practices.

The continuous cycles of innovation and development of digital assets and exchanges are expected to mitigate the growing insensitivity of KYC/AML (know your customer and anti-money laundering) regulations on digital trades.⁶⁴ This further urges the tax law enforcement to address regulatory compliance, data privacy, and financial transparency to implement the automatic exchange of information (AEOI) procedures within CBDC frameworks.⁶⁵ Nevertheless, implementing regulatory supervision on cryptocurrencies and exchanges could potentially result in heightened limitations on individual liberties.⁶⁶

V.C. CBDC Implications for Financial Inclusion and Stability

Cluster 6 in Figure 7 (blue turquoise colour) identifies the critical issue of CBDC implications for financial inclusion and stability. As cryptocurrency and financial stability are closely interconnected, the lack of regulations in this ecosystem poses significant risks to the financial system, demanding an optimal CBDC design, particularly in emerging economies.⁶⁷ This makes it important to introduce regulations governing crypto assets in the financial system to reduce those risks and increase transparency to maintain financial stability. Disconnecting the banking sector from the cryptocurrency ecosystem may reduce the potential for liquidity risks. Conventional wisdom suggests that the best legal approach to govern digital currency would be via settlement institutions and external clearing.⁶⁸

Furthermore, CBDC, fintech, and cryptocurrency services can improve financial inclusion by making formal accounts less reliant on paperwork.⁶⁹ In the future, financial inclusion is expected to focus on providing people with important access to formal financial services because digital tokens, wallets, and cloud storage are making traditional banks less relevant.⁷⁰ The policy

⁶³ Arman Nefi and Agus Sardjono, "The Urgent Need to Amend the Indonesian Law on Currencies to Face the Digital Age," *Journal of Central Banking Law and Institutions* 1, no. 1 (2022): 23–46.

⁶⁴ Dupuis and Gleason, "Money Laundering."

⁶⁵ Ressita Ramadhani et al., "Comparative Analysis of CBDC and Tax Law Enforcement in Selected Countries," *Journal of Central Banking Law and Institutions* 4, no. 1 (2025): 141–80.

⁶⁶ Dupuis and Gleason, "Money Laundering."

⁶⁷ Ferry Syarifuddin, "Optimal Central Bank Digital Currency Design for Emerging Economies," *Journal of Central Banking Law and Institutions* 3, no. 2 (2024): 361–92.

⁶⁸ David K. Linnan, "Central Bank Digital Currencies in the Indonesian Setting: Questions & Choices," *Journal of Central Banking Law and Institutions* 2, no. 2 (2023): 221–64.

⁶⁹ Peterson K. Ozili, "CBDC, Fintech and Cryptocurrency for Financial Inclusion and Financial Stability," *Digital Policy, Regulation and Governance* 25, no. 1 (January 1, 2023): 40–57.

⁷⁰ Ozili, "CBDC, Fintech and Cryptocurrency."

implication for financial regulators is in the shift from “banked” people to people having “restricted, basic, or full access” to formal financial services.⁷¹

V.D. Cloud Technology and Implications for Fintech Firms

The notion of a ‘cloud dilemma’ was coined,⁷² becoming a critical work in the orange cluster of Figure 7. A cloud dilemma explains the complexities in harmonising outsourcing regulations and innovation with cross-border policy. The primary obstacle lies in ensuring compliance, and IT managers comprehensively understand an organisation’s outsourcing practices. Lack of awareness within central IT or compliance departments regarding software as a service (SaaS) partnership can pose a challenge, particularly due to the extensive adoption of SaaS and mobile technologies.⁷³

Such cases are relevant for firms utilising social networking, marketing, and data analytics applications. Regulatory tensions may arise in data protection regulations when participants within the cloud supply chain lack transparency. Thus, companies need to understand their providers’ technical architectures, assess cloud vendors’ reliability, and establish suitable systems and controls to safeguard data privacy, prevent regulatory violations, and maintain sufficient supervision.⁷⁴ Management theory is practical for professionals when they face cloud dilemmas. That is, the assessment of regulatory risk levels involved in outsourcing and evaluating potential arrangements about their outsourcing strategy, rules, controls, and risk tolerance is applicable to consider the appropriate utilisation of cloud-based technologies.⁷⁵

VI. CONCLUSIONS AND LIMITATIONS

This study has employed quantitative bibliometric analysis, followed by qualitative inductive reasoning, to investigate the current state of fintech regulation in academic debate using data from the Scopus database. Findings from the bibliometric analysis identified the most influential manuscripts, authors, academic publishing outlets, affiliations and countries, and critical themes generated from keyword analytics. Meanwhile, findings from the qualitative inductive analysis explained timely issues in fintech regulation, including regulatory issues between fintech and banking, money laundering and its consequences for financial regulators, CBDC’s impact on financial inclusion and stability, and cloud technology challenges for fintech companies.

⁷¹ Ozili, “CBDC, Fintech and Cryptocurrency.”

⁷² Daniel Gozman and Leslie Willcocks, “The Emerging Cloud Dilemma: Balancing Innovation with Cross-Border Privacy and Outsourcing Regulations,” *Journal of Business Research* 97 (2019): 235–56.

⁷³ Gozman and Willcocks, “Emerging Cloud.”

⁷⁴ Gozman and Willcocks, “Emerging Cloud.”

⁷⁵ Gozman and Willcocks, “Emerging Cloud.”

The use of single bibliographical data (i.e., the Scopus database) limits the findings of this study. Generating a dataset from multiple sources (e.g., adding Web of Science (WoS) and other databases) may add other influential works on fintech regulation which are not included in the Scopus dataset. The qualitative analysis may be further enhanced using policy documents for an industry-driven approach to evaluating fintech regulation. Such policy documents are publicly available but not included in academic databases. Thus, sampling such policy documents may discover timely issues on fintech regulation that have not been discussed in academic papers.

This study's use of quantitative and qualitative analyses yielded a scholarly evaluation of the fintech regulation discussed in academic works, providing both practical and theoretical implications for regulators, academia, and industry professionals. That is, the author's qualitative findings may ground future studies in fintech regulation, including regional differences in fintech regulation and the role of artificial intelligence (AI) in regulatory compliance.

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