



ECONOMIC TOKENIZATION: A BIBLIOMETRIC ANALYSIS OF INTELLECTUAL AND CONCEPTUAL FOUNDATIONS

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ABSTRACT

This study provides a comprehensive bibliometric analysis of the emerging academic field of economic tokenization. Using a dataset of 264 documents from Scopus and Web of Science, we employ performance analysis and science mapping to delineate the intellectual, conceptual, and social structures of this domain. The findings reveal a field in a nascent, pre-paradigmatic stage, characterized by exponential growth in publications since 2021 but a fragmented intellectual and social structure. Performance analysis identifies the most influential works, authors, and journals, showing that while specialized outlets drive publication volume, the most impactful research appears in top-tier finance journals. The internal citation network is sparse, indicating a lack of cohesive academic conversation. Science mapping reveals the field's intellectual foundations are built on three pillars: the foundational technology of blockchain protocols, the economic precedent of Initial Coin Offerings (ICOs), and the formal economic theory of "tokenomics." Co-occurrence analysis maps the conceptual landscape, which is structured around a technological core (blockchain, smart contracts) that branches into key themes such as entrepreneurial finance, Decentralized Finance (DeFi), Real-World Asset (RWA) tokenization, and sustainability. Temporal analysis demonstrates a clear research trajectory from foundational concepts toward newer frontiers like DeFi, DAOs, and Central Bank Digital Currencies (CBDCs). Finally, co-authorship analysis confirms the field's social fragmentation, with research being conducted by small, disconnected teams.

Keywords: Economic Tokenization, Financial Economics, Blockchain Protocols, Decentralized Finance (DeFi), Bibliometric Analysis.

JEL classification: E42; G14; O33; L86; C81

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INTRODUCTION

Blockchain technology and the broader ecosystem of Distributed Ledger Technologies (DLT) are driving a fundamental shift in the architecture of modern finance. The initial wave of innovation focused on cryptocurrencies; however, a more profound transformation of tokenizing economic assets is now underway. This process, which creates programmable, peer-to-peer transferable digital representations of value, promises to reshape capital markets by unlocking trillions of dollars in illiquid assets and reconfiguring financial intermediation.

The scholarly response to this complex landscape has been a rapid exponential increase in academic publications, particularly since 2021. However, this burgeoning literature is currently nascent, highly fragmented, and dispersed across a wide variety of disciplines, including finance, computer science, law, and



policy (Alt & Gräser, 2025; Izadin & Yusof, 2024). Researchers are increasingly tackling distinct problems ranging from the mechanics of Decentralized Finance (DeFi) to the legal frameworks of Security Token Offerings (STOs). However, there is still a lack of cohesion in the field.

While the broader domain of blockchain finance has been subject to recent bibliometric scrutiny, existing reviews remain segmented or focus on adjacent technical niches. Early foundational work provided technical taxonomies for software architecture (Xu et al., 2017), while more recent generalist reviews have mapped blockchain's broad application to supply chains and sustainability (Kuzior & Sira, 2022) and consensus mechanisms (Ahn et al., 2024). In the financial domain, significant attention has been paid to the specific vertical of Decentralized Finance (DeFi), with studies by (Kumar et al., 2025), (Romero-Castro et al., 2025), (Aydaner & Okuyan, 2024) and (Ma'arif et al., 2025) mapping its evolution; notably, however, these reviews explicitly identify a gap regarding the integration of DeFi with the real economy. Similarly, extensive analyses exist for the cryptocurrency market (Atree & Tripathy, 2025), banking (Patel et al., 2022), accounting and auditing (Hassanein et al., 2025) or isolated specific digital instrument types, such as Central Bank Digital Currencies (Bilgiç Ulun, 2025), and Non-Fungible Tokens (Nobanee & Ellili, 2023). However, these studies tend to focus on trading mechanics, reporting standards, or cryptocurrencies as money, rather than the transformation of asset ownership. Consequently, the distinct field of asset tokenization, which encompasses the economic restructuring of capital formation through STOs, RWAs, and programmable value, has not yet been mapped as a unified research domain.

To address this gap, this study provides the first large-scale bibliometric analysis of the economics of tokenization. Using a dataset of 264 documents from Scopus and Web of Science, we employ performance analysis and science mapping to delineate the field's intellectual, conceptual, and social structures. By systematically analyzing the evolution of this literature, this paper aims to provide a robust overview of the state of the art, identify the primary research fronts, and highlight the "missing links" in the current academic conversation.

The remainder of this paper is organized as follows: Section 2 reviews the theoretical foundations and current state of tokenization literature; Section 3 details the methodology used; Section 4 presents the results of the bibliometric analysis; and Section 5 discusses the implications for research and practice.

LITERATURE REVIEW

To understand the trajectory of the research field, it is necessary to establish the core concepts, economic rationales, and applications that define the current body of literature. Tokenization is commonly defined as the process of creating a programmable, blockchain-based digital representation of a real-world asset or claim (Carapella et al., 2023). The Bank for International Settlements (BIS) characterizes tokenization as recording claims on real or financial assets on a programmable platform (BIS, 2023). Distributed Ledger Technology (DLT) provides the technical foundation for tokenization by replicating data across multiple nodes and enabling programmable enforcement without a single centralized intermediary (Alt & Gräser, 2025).



The academic interest in tokenization is driven by several economic rationales. Smart contracts on distributed ledgers enable automation of clearing and settlement functions (Alt & Gräser, 2025). Economists emphasize that blockchain affects key cost channels, notably verification and networking costs, which alters incentives for market organization and can enable trust-minimized enforcement (Catalini & Gans, 2020). Evidence from decentralized finance (DeFi) deployments indicates that automation can reduce transaction times and costs in certain settings, although these benefits depend on implementation and regulatory context (Oben & Özdamlı, 2024).

Research also highlights potential gains in liquidity and transparency. Immutable on-chain records can improve price discovery by making transaction and ownership histories visible to market participants (OECD, 2020). At the system level, digital financial platforms and token-based instruments can broaden participation and reshape trading structures in ways that may support deeper markets (Allen et al., 2022). At the token level, however, liquidity outcomes are conditioned on incentive design and governance rules. Tokenomics and governance choices determine whether transparent ownership records produce sustained secondary-market activity (Samela Kivilo et al., 2025).

A frequently cited benefit is the democratization of access. Fractionalization enabled by tokenization can divide high-value assets (for example, real estate) into smaller, affordable units and thus lower the minimum investment barrier (Izadin & Yusof, 2024). Blockchain-based registries and smart contracts can also reshape trust relationships by automating rights enforcement and reducing reliance on centralized intermediaries, while simultaneously raising questions about legal enforceability and privacy (Guo & Liu, 2025).

Beyond asset representation, a distinct Tokenomics literature models how token design shapes economic outcomes. Formal models show that supply schedules and issuance rules change incentives and platform dynamics (Cong et al., 2019). Consensus and staking mechanisms illustrate how protocol mechanics influence economic behavior and risk allocations (Saleh, 2021). Token distribution and sale mechanisms can act as commitment devices that help platforms coordinate early adopters and manage network effects (Choi & Rocheteau, 2021). Design frameworks stress that governance arrangements and tokenomic choices are often decisive for whether a token economy achieves stable growth and liquidity (Samela Kivilo et al., 2025).

Applications and empirical work have evolved from entrepreneurial finance to institutional experiments. Early research documented the rise of initial coin offerings (ICOs) as a novel fundraising mechanism (Adhami et al., 2018). Subsequent empirical studies examined ICO outcomes and the role of disclosure and signaling for fundraising success (Howell et al., 2020). Scholarship then traced a move toward regulated security token offerings (STOs) and their emerging market structure (Lambert et al., 2022). Institutional pilots by asset managers illustrate practical interest in tokenized investment vehicles (Goldman Sachs, 2025). Recent academic work evaluates tradeoffs between efficiency and risk in tokenized markets (Tanveer et al., 2025). Research on real-world assets documents tokenization of real estate, commodities, and art and explores custody and ownership issues (Jalan et al., 2021). Legal analyses demonstrate that non-fungible tokens and other on-chain ownership claims raise novel private-law questions (Kaisto et al., 2024).



The literature on decentralized finance and related monetary innovations provides additional context. Conceptual reviews describe DeFi mechanisms and their promise (Schär, 2021). Central-bank and supervisory analyses highlight vulnerabilities in DeFi, including liquidity mismatches and interconnectedness, which create potential systemic risks as the sector scales (Aramonte et al., 2021). Work on stablecoins investigates asset-backing designs and implications for monetary functions (De Blasis et al., 2023). Research on central-bank digital currencies (CBDCs) examines interactions with tokenized markets and payment systems (Fernández-Villaverde et al., 2021).

Despite theoretical promise, empirical and policy studies identify substantial barriers. Studies document a liquidity mismatch: tokenizing an asset does not by itself generate active secondary markets (Kreppmeier & Laschinger, 2023). Market-level data analyses find many real-world asset tokens exhibit low trading volumes and thin markets (Mafrur, 2025). Financial-stability reviews warn of volatility transmission and cross-market interconnectedness between crypto and traditional finance (Carapella et al., 2023). Surveys of DeFi and RWA literature emphasize security, legal, and operational risks that can counteract efficiency gains (Oben & Özdamlı, 2024). Systematic reviews of real-estate tokenization and international policy reports point to legal and regulatory frictions as major obstacles to widespread institutional adoption (Izadin & Yusof, 2024; OECD, 2020

METHODOLOGY

This study employs a quantitative bibliometric approach to systematically map the intellectual, conceptual, and social structures of the research field concerning the economic aspects of tokenization. The methodology follows the SPAR-4-SLR (Scientific Procedures and Rationale for Systematic Literature Reviews) protocol, which ensures a rigorous and reproducible process encompassing the assembling, arranging, and assessing of the literature (Paul et al., 2021). The primary software tools used for the analysis were the bibliometrix package in R (Aria & Cuccurullo, 2017) for data processing and performance analysis, and VOSviewer for science mapping and network visualization (Van Eck & Waltman, 2010).

Data Collection and Search Protocol

Data was extracted from two leading bibliographic databases, Scopus and Web of Science (WoS), chosen to ensure the broadest possible coverage of high-quality peer-reviewed literature. The search was conducted in November 2025. The search query was designed to maximize comprehensiveness (high recall) by including various morphological forms of the core concepts ("tokenization", "tokenomics", "asset tokenization"). A targeted AND NOT operator was used to programmatically filter out the most common non-relevant results from the field of Natural Language Processing (NLP) where the term "tokenization" refers to text segmentation rather than financial assets. The process is detailed in Table 1.

Data Cleaning and Curation

Following the initial consolidation, a multi-stage data cleaning and curation protocol was executed to ensure the final dataset's integrity, accuracy, and thematic coherence. First, a manual thematic screening of all 289



document titles and abstracts was conducted. The inclusion criterion was that a document must discuss tokenization in the context of creating a digital representation of an asset, right, or value for economic, financial, or governance purposes. This process resulted in the exclusion of 21 documents which fell into three non-relevant categories: (1) Natural Language Processing, (2) Data Security (referring to sensitive data masking), and (3) Metaphorical Usage.

Second, a metadata integrity check was performed which identified and removed 4 records, comprising 2 entries for entire conference proceedings and 2 entries for individual book chapters whose parent book was already included in the dataset. This step prevented the inclusion of non-standard or duplicate records which would otherwise skew citation counts. Third, to address inconsistencies in the bibliographic data, thesaurus files were created. A keyword thesaurus was developed to merge pluralizations, spelling variations, and direct synonyms (e.g., merging dlt into distributed ledger technology) to prevent the fragmentation of thematic clusters. An author thesaurus was created to standardize author names and consolidate compound entries into a single format to ensure accurate productivity rankings. Finally, as bibliometrix does not support a thesaurus for reference analysis, a MergeMap was created in Microsoft Excel to manually clean and consolidate the 20 most-cited references, ensuring accuracy in most cited references analysis. This comprehensive process yielded a final dataset of 264 documents, which forms the foundation for the subsequent analysis.

Table 1. SPAR-4-SLR Protocol for Data Collection

Phase	Consideration	Details
Assembling	Search Focus	Economic, financial, and governance aspects of tokenization
	Search String	See Appendix A for the full query string
	Search Period	All years up to November 2025
	Search Databases	Scopus; Web of Science (Core Collection)
	Search Fields	Title, Abstract, Keywords
	Document Types	Article, Review, Conference Paper, Book, Book Chapter
Arranging	Subject (Research) Areas	Scopus: "Economics, Econometrics and Finance" WoS: "Economics"
	Initial Results	258 documents from Scopus 63 documents from WoS
	Consolidated Results	289 unique documents after merging and automated removal of 32 duplicates using bibliometrix
	Analysis Method	Bibliometric Analysis: Performance Analysis, and Science Mapping (Co-citation, Co-occurrence, Co-authorship)
Assessing	Agenda Method	Proposal Analysis of the field's evolution, conceptual and intellectual structures, and identification of research gaps

Analytical Methods



The final dataset was analyzed using two primary bibliometric techniques: performance analysis and science mapping. Performance Analysis was used to assess the productivity and impact of the research field. This involved calculating key metrics, including annual scientific production, average citation rates, and identifying the most influential documents (globally and locally), authors, journals, and countries.

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(TITLE-ABS-KEY ("tokenisation" OR "tokenization" OR "tokenized" OR "tokenised" OR "Tokenomic*") AND NOT TITLE-ABS-KEY ("NLP"OR"Natural Language Processing "OR" Text preprocessing" OR "Sentiment analysis" OR "lemmatization" OR "parsing" OR "Textual
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Figure 1. Search query used in Scopus

Source: Authors' analysis based on the Scopus and Web of Science dataset

Science Mapping was utilized to visualize the field's intellectual, conceptual, and social structures through network analysis in VOSviewer. To reveal the Intellectual Structure, a co-citation analysis of cited references was performed. This method creates a network where nodes represent influential prior works and links are formed when they are cited together. A minimum threshold of 5 citations was selected to ensure the analysis focused on the most impactful foundational works while filtering out transient or less influential citations, resulting in a network of 22 key references. To map the Conceptual Structure, a keyword co-occurrence analysis was conducted. A minimum threshold of 5 occurrences was applied to balance network clarity with comprehensiveness, effectively filtering out low-frequency noise while retaining a rich set of keywords that represent the field's diverse sub-themes. This yielded a network of the most salient keywords organized into 8 thematic clusters, to which a temporal overlay was applied to visualize thematic evolution. Finally, to examine the Social Structure, a co-authorship analysis was performed. A minimum threshold of 2 documents was chosen for both author and country analyses to focus on contributors with a sustained engagement in the field rather than single-contribution authors, thereby revealing the core collaborative structures. The institutional co-authorship analysis was excluded due to significant data quality issues in the source metadata, which prevented a reliable interpretation.

RESULTS

Performance Analysis

Productivity and Impact

Error! Reference source not found. illustrates the annual scientific output and average citation impact for the field of economic tokenization from 2018 (our earliest entry) to 2025. The data reveal a field in the midst of an exponential growth phase, signaling its rapid emergence as a significant area of economic research.

Annual scientific production was minimal before 2020. However, the field saw a dramatic acceleration beginning in 2021, culminating in a sharp increase between 2023 and 2024, where publications doubled from 40 to 80 documents. The 65 articles already recorded for 2025 underscore that this high level of productivity



is sustained. This surge in publications coincides with the maturation of underlying blockchain technologies and the increasing attention from financial regulators and central banks, which focused academic attention on the topic.

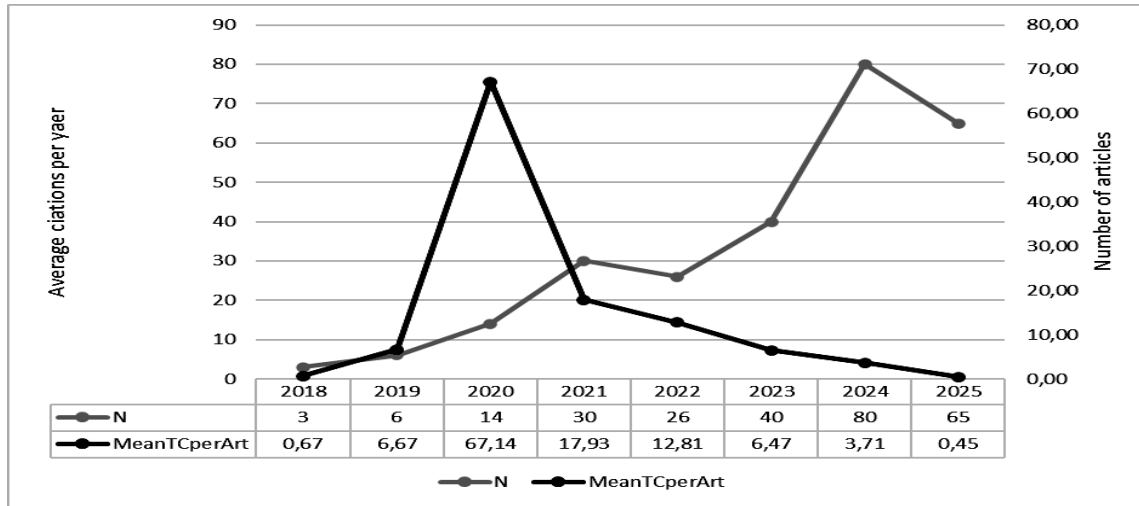


Figure 2. Annual Scientific Production and Average Citation Impact (2018-2025)

Source: Authors' analysis of the 264-document dataset from Scopus and Web of Science (WoS)

The average total citations per article (MeanTCperArt) reveals the impact of early, foundational works. A massive peak is evident in 2020, with an average of 67.14 citations per article. This spike highlights the influence of a agenda-setting publications that provided the first comprehensive frameworks for the field. Following this peak, the citation rate normalizes but remains robust for recent years (e.g., 17.93 in 2021), while the expected decline in the newest publications reflects the natural lag in academic citation.

Intellectual foundations and highly cited research

An analysis of the most cited documents in the dataset reveals the foundational pillars and thematic priorities of the research field. Table 2 presents the top 10 articles ranked by total global citations, which are dominated by conceptual frameworks, theoretical models, and key use-case analyses.

Table 2. Top 10 Most Globally Cited Documents

Author and Year	Title	Journal	Total Citations	TC per Year
(Esmailian et al., 2020)	Blockchain for the future of sustainable supply chain management in Industry 4.0	Resources, Conservation and Recycling	726	121
(Cong et al., 2021)	Tokenomics: Dynamic Adoption and Valuation	The Review of Financial Studies	231	46,2
(Bao & Roubaud, 2022)	Non-Fungible Token: A Systematic Review and Research Agenda	Journal of Risk and Financial Management	105	26,25



(Sandner et al., 2020)	Convergence of Blockchain, IoT, and AI	Frontiers in Blockchain	78	13
(Schückes & Gutmann, 2021a)	Why do startups pursue initial coin offerings (ICOs)? The role of economic drivers and social identity on funding choice	Small Business Economics	55	11
(Kayani & Hasan, 2024)	Unveiling Cryptocurrency Impact on Financial Markets and Traditional Banking Systems: Lessons for Sustainable Blockchain and Interdisciplinary Collaborations	Journal of Risk and Financial Management	46	23
(Khan et al., 2022)	Tokenization of sukuk: Ethereum case study	Global Finance Journal	42	10,5
(Baum, 2021)	Tokenization—The Future of Real Estate Investment?	The Journal of Portfolio Management	41	8,2
(Sockin & Xiong, 2023)	Decentralization through Tokenization	The Journal of Finance	38	12,67
(Lambert et al., 2022)	Security token offerings	Small Business Economics	37	9,25

Source: Authors' analysis based on Scopus and WoS citation data (as of November 2025)

The citation landscape is overwhelmingly led by (Esmailian et al., 2020), whose paper "Blockchain for the future of sustainable supply chain management in Industry 4.0" amassed 726 citations. The authors synthesize Industry 4.0, blockchain, and sustainable supply chain management by reviewing how these fields intersect. They articulate four major capabilities of blockchain, including tokenization as a mechanism for creating incentives to promote green consumer behavior. While their contribution is conceptual rather than empirical, this framing has provided a widely referenced roadmap for subsequent theoretical and applied research.

The second most influential paper, "Tokenomics: Dynamic Adoption and Valuation" by (Cong et al., 2021), with 231 citations, signals the field's engagement with rigorous economic theory. Its key contribution is a formal dynamic asset pricing model that departs from traditional cash-flow-based valuation. The authors find that a token's price is a function of transactional demand and network effects, and demonstrate that the feedback loop between token price and platform adoption can accelerate growth and reduce volatility.

The third-ranked paper, "Non-Fungible Token: A Systematic Review and Research Agenda" by (Bao & Roubaud, 2022), is a key reference with 105 citations. It offers the first PRISMA-based systematic review of the NFT space (up to April 2022), revealing that most early research focuses on asset pricing. The authors also propose a clear research agenda for future work; particularly on tokenomics, risk, and regulation; highlighting significant gaps in these areas.



Two papers highlight the theme of technological convergence. (Sandner et al., 2020) propose a new business model where autonomous agents (IoT devices) function as independent economic entities, using blockchain for payments. This conceptual work outlines the economic architecture for a "machine economy." In a similar vein, (Kayani & Hasan, 2024), synthesize the broad impact of cryptocurrencies and blockchain on financial markets. Their key contribution is a holistic analysis that explicitly links the advent of asset tokenization to prospects for increased transparency and broader market participation.

The application of tokenization to entrepreneurial finance is another central theme. (Schückes & Gutmann, 2021b) in their qualitative study on ICOs, identify "tokenomics" as one of four key economic and behavioral drivers for startups choosing this funding route. Building on the ICO precedent, (Lambert et al., 2022) provide the first systematic analysis of "Security token offerings (STOs)." Their study defines the STO market, distinguishing it from ICOs, and finds that traditional governance practices are strong predictors of fundraising success.

Finally, the list is rounded out by seminal papers on specific applications and core theory. (Khan et al., 2022) present a critical case study on the "Tokenization of sukuk," providing a cost-benefit analysis that demonstrates how tokenization can reduce costs in Islamic finance. (Baum, 2021) offers a foundational analysis for tokenization in real estate, assessing its potential to enhance liquidity while identifying the significant market and structural barriers to mass adoption. Lastly, the theoretical contribution from (Sockin & Xiong, 2023) provides a formal model where tokenization acts as a strategic commitment device for digital platforms to limit rent-seeking behavior, a significant insight for the economics of industrial organization.

An analysis based on the average number of citations per year (TC per Year) offers a different perspective on influence, highlighting the more recent papers that are rapidly accumulating scholarly attention presented in Table 3.

Table 3. Top 10 Most Impactful Documents by Average Citations Per Year

Author and Year	Title	Journal	Total Citations	TC per Year
(Esmaeilian et al., 2020)	Blockchain for the future of sustainable supply chain management in Industry 4.0	Resources, Conservation and Recycling	726	121
(Cong et al., 2021)	Tokenomics: Dynamic Adoption and Valuation	The Review of Financial Studies	231	46,2
(Bao & Roubaud, 2022)	Non-Fungible Token: A Systematic Review and Research Agenda	Journal of Risk and Financial Management	105	26,25
(Kayani & Hasan, 2024)	Unveiling Cryptocurrency Impact on Financial Markets and Traditional Banking Systems: Lessons for Sustainable Blockchain and Interdisciplinary Collaborations	Journal of Risk and Financial Management	46	23



(Aquilina et al., 2024)	Decentralized Finance (DeFi): A Functional Approach	Journal of Financial Regulation	33	16,5
(Sandner et al., 2020)	Convergence of Blockchain, IoT, and AI	Frontiers in Blockchain	78	13
(Sockin & Xiong, 2023)	Decentralization through Tokenization	The Journal of Finance	38	12,67
(Wankmüller et al., 2023)	Blockchain-based tokenization and its impact on plastic bottle supply chains	International Journal of Production Economics	35	11,67
(Swinkels, 2023)	Empirical evidence on the ownership and liquidity of real estate tokens	Financial Innovation	34	11,33
(Schückes & Gutmann, 2021b)	Why do startups pursue initial coin offerings (ICOs)? The role of economic drivers and social identity on funding choice	Small Business Economics	55	11

Source: Authors' analysis based on Scopus and WoS citation data (as of November 2025)

The top of this list is populated by the same foundational papers identified in the total citations analysis, confirming their enduring and ongoing influence. (Esmailian et al., 2020) remains the clear leader with 121 citations per year, and the seminal theoretical work (Cong et al., 2021) also maintains a top position. The reviews by (Bao & Roubaud, 2022) and (Kayani & Hasan, 2024) and papers (Sandner et al., 2020; Schückes & Gutmann, 2021b; Sockin & Xiong, 2023) are also present.

Table 4. Top 11 Most Locally Cited References

Item Type	Author and year	Title	Publication Title	Citations
Report	(Buterin, 2014)	A Next-Generation Smart Contract and Decentralized Application Platform	Ethereum whitepaper	22
Journal Article	(Cong et al., 2021)	Tokenomics: Dynamic Adoption and Valuation	The Review of Financial Studies	15
Journal Article	(Adhami et al., 2018)	Why do businesses go crypto? An empirical analysis of initial coin offerings	Journal of Economics and Business	12
Journal Article	(Baum, 2021)	Tokenization—The Future of Real Estate Investment?	The Journal of Portfolio Management	12
Report	(Nakamoto, 2008)	Bitcoin: A Peer-to-Peer Electronic Cash System	Bitcoing.org	12
Journal Article	(Biais et al., 2019)	The Blockchain Folk Theorem	The Review of Financial Studies	8



Journal Article	(Cong et al., 2022)	Token-based platform finance	Journal of Financial Economics	8
Journal Article	(Fisch, 2019)	Initial coin offerings (ICOs) to finance new ventures	Journal of Business Venturing	8
Journal Article	(Howell et al., 2020)	Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales	The Review of Financial Studies	8
Journal Article	(Andoni et al., 2019)	Blockchain technology in the energy sector: A systematic review of challenges and opportunities	Renewable and Sustainable Energy Reviews	7
Journal Article	(Cong & He, 2019)	Blockchain Disruption and Smart Contracts	The Review of Financial Studies	7

Source: Authors' analysis of references cited within the 264-document dataset.

Beyond these, the list reveals several new, highly impactful papers. The work by (Aquilina et al., 2024) provides a functional approach to Decentralized Finance (DeFi). A key contribution of this paper is its argument that while DeFi appears novel, it mimics the functions and inherits the risks of traditional finance, and thus the same economic rationale for regulation should apply. It provides a crucial framework for applying established principles of market failure and financial stability to the new world of tokenized assets.

The analysis also highlights the growing body of empirical and application-focused research. The paper by (Wankmüller et al., 2023) is a significant contribution, moving beyond theory to present an empirical pilot study of a blockchain-based tokenization system designed to incentivize recycling in plastic bottle supply chains. Their work provides practical evidence that token-based incentives can positively alter consumer behavior and improve circular economy outcomes. Similarly, the study by (Swinkels, 2023) offers crucial "Empirical evidence on the ownership and liquidity of real estate tokens." Analyzing on-chain data, its main finding is that while tokenization does enable fragmented ownership, the resulting real estate tokens provide genuine economic exposure to housing prices, validating their use as an investment vehicle.

Overall, this analysis shows that while foundational conceptual works still dominate, the research front is increasingly being shaped by rigorous empirical studies and analyses of specific DeFi applications.

In contrast to global citations, local citations (LC) measure the intensity of the internal dialogue within a field. The analysis of the most locally cited documents reveals which papers are most influential specifically to the community of scholars actively working on economic tokenization Table 5.

The results provide evidence of the field's nascent and highly fragmented nature. The numbers are strikingly low. The most influential paper within the community, an empirical study on real estate security tokens by (Kreppmeier et al., 2023), has received only 3 citations from its peers in the dataset. This is followed by (Sockin & Xiong, 2023), with just 2 local citations. The remaining four papers each have only a single local citation. The extremely sparse internal citation network, with only 6 of 264 documents receiving any local citations,



indicates that a dense, self-referential academic conversation has not yet formed, a classic characteristic of a young and rapidly evolving research domain.

Table 5. Most Locally Cited Documents

Author	Title	Publication Title	Local Citations	Global Citations
(Kreppmeier et al., 2023)	Real estate security token offerings and the secondary market: Driven by crypto hype or fundamentals?	Journal of Banking & Finance	3	22
(Sockin & Xiong, 2023)	Decentralization through Tokenization	The Journal of Finance	2	38
(Blemus & Guégan, 2020)	Initial crypto-asset offerings (ICOs), tokenization and corporate governance	Capital Markets Law Journal	1	12
(Knott et al., 2022)	Uncovering potential barriers of using initial coin offerings to finance artistic projects	Journal of Cultural Economics	1	5
(Marchewka-Bartkowiak et al., 2022)	Digital valuation of personality using personal tokens	Electronic Markets	1	5
(Goldstein et al., 2024)	Utility Tokens as a Commitment to Competition	The Journal of Finance	1	6

Source: Authors' analysis of references cited within the 264-document dataset.

While global citations measure a paper's overall impact, an analysis of the most frequently cited references by the papers within our dataset reveals the specific intellectual foundations upon which the field of economic tokenization is being built. This analysis identifies the core knowledge base that researchers in this domain consider essential. Table 4 presents the top-ranked references cited by the articles in our collection.

The results clearly delineate three intellectual pillars that underpin the field: foundational technology, the ICO precedent, and the emergence of formal economic theory.

The first pillar is the technological foundation, with the most cited reference being the Ethereum Whitepaper by (Buterin, 2014), cited 22 times. This shows that the field is enabled by the programmability of smart contracts, which allows for the creation of complex tokenized assets. The high number of citations for the foundational Bitcoin Whitepaper (Nakamoto, 2008) and the technical guide "Mastering Bitcoin" (Antonopoulos, 2015) further confirms that researchers ground their work in the understanding of original blockchain protocols.

The second pillar is the economic precedent of Initial Coin Offerings (ICOs). A number highly cited references consists of the seminal academic papers on ICOs published between 2018 and 2020. Influential works by (Adhami et al., 2018; Fisch, 2019; Howell et al., 2020) are all among the most cited. This



demonstrates that the academic study of tokenization is a direct successor to the study of ICOs, with researchers adapting and extending the models of token sales and entrepreneurial finance that were first developed during that period.

The third and most recent pillar is the development of formal economic theory and use-case analysis. The most influential academic paper is "Tokenomics: Dynamic Adoption and Valuation" by (Cong et al., 2021) cited 15 times. This is complemented by other highly-cited theoretical works from the same author group on blockchain disruption and platform finance. Furthermore, the high citation count for (Baum, 2021) on real estate tokenization shows the importance of applying these general theories to specific, high-value asset classes. The work by (Andoni et al., 2019) serves a similar function for the energy sector. Finally, the theoretical contribution of (Biais et al., 2019) on "The Blockchain Folk Theorem" provides a game-theoretic foundation for understanding how cooperation is sustained in these decentralized systems.

Table 6. Top contributors by scientific production

Journals	Articles	Authors	Articles	Affiliations	Articles	Countries	Articles
Frontiers In Blockchain	18	Kampakis S	5	UCL Centre For Blockchain Technologies	12	Uk	49
Journal of the British Blockchain Association	8	Benedetti H	4	Poznań University Of Economics And Business	11	Usa	46
Finance Research Letters	7	Themistocleous M	3	Erasmus University Rotterdam	7	Germany	30
Journal Of Risk And Financial Management	6	Bose D	2	University Of Bayreuth	7	China	26
Digital Finance	3	Cong L	2	Vrije Universiteit Amsterdam	6	India	23
Electronic Markets	3	Costantino L	2	Shanghai University Of Finance And Economics	5	Poland	19
Financial Innovation	3	Fernández S	2	University Of Basel	5	Netherlands	18
Journal Of Property Investment And Finance	3	Ferro E	2	University Of Luxembourg	5	Switzerland	18
Research In International Business And Finance	3	Frost J	2	Zhejiang Gongshang University	5	Ukraine	13



Small Business Economics	3	Goodell G	2	Bucharest University Of Economic Studies	4	Russia	11
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Source: Authors' analysis based on the Scopus and Web of Science dataset

Key Contributors

An analysis of the authors, journals, affiliations, and countries publishing on economic tokenization reveals a concentrated and specialized research landscape, with distinct intellectual hubs and a clear set of leading contributors.

An analysis of the publication venues shows that research on economic tokenization is being published across a spectrum of journals, from new, specialized outlets to established, top-tier finance publications (**Error! Reference source not found., Error! Reference source not found.and Error! Reference source not found.**). On one side, the field is driven by a new wave of specialized, interdisciplinary journals that lead in publication volume. *Frontiers in Blockchain* is the most prolific source with 18 articles and also has the highest h-index of 6, establishing it as the core venue for this emerging topic. It is followed in productivity by other dedicated outlets like the *Journal of the British Blockchain Association* (8 articles). The prominence of these journals indicates the formation of a distinct and specialized research community around tokenization. On the other side, the most impactful and heavily cited research is being published in elite, mainstream finance journals. When ranked by the total citations of articles in our dataset, top-tier publications such as the *Review of Financial Studies* (53 total citations), *Journal of Financial Economics* (43), and the *Journal of Finance* (38) dominate. This demonstrates that the most influential theoretical and empirical work is successfully engaging with the central conversations in the finance discipline, signaling the topic's growing legitimacy.

Table 7. Most relevant journals and authors by local citations

Sources	Articles	Author	Local citations	Country	TC
Rev Financ Stud	53	Dorfleitner G	3	Usa	1051
J Financ Econ	43	Kreppmeier J	3	Germany	208
Financ Res Lett	41	Laschinger R	3	United Kingdom	159
J Financ	38	Steininger B	3	China	128
Small Bus Econ	36	Sockin M	2	Netherlands	100
J Bus Venturing	35	Xiong W	2	Spain	79
Manage Sci	31	Blemus S	1	Switzerland	78
J Cult Econ	25	Goldstein I	1	Poland	54
Energ Econ	24	Guégan D	1	Luxembourg	42
Int Rev Financ Anal	20	Gupta D	1	Sweden	38

Source: Authors' analysis based on the Scopus and Web of Science dataset



The analysis of authorship provides the first clear indicator of the field's nascent stage. Productivity is highly concentrated, yet the absolute numbers remain low. The most prolific author, Kampakis S., has contributed only 5 articles, with Benedetti H. following at 4 (**Error! Reference source not found.**). Similarly, author impact metrics are modest, with the highest h-index being just 3 (Steininger B.) (**Error! Reference source not found.**).

Table 8. Most relevant journals and authors by H_index

Source	h_index	Author	h_index
Frontiers In Blockchain	6	Steininger B	3
Finance Research Letters	3	Benedetti H	2
Journal of Risk And Financial Management	3	Cong L	2
Journal of The British Blockchain Association	3	Frost J	2
Small Business Economics	3	Marchewka-Bartkowiak K	2
China Finance Review International	2	Medda F	2
Digital Finance	2	Sarkis J	2
Electronic Markets	2	Schär F	2
Financial Innovation	2	Shen Z	2
Global Finance Journal	2	Swinkels L	2

Source: Authors' analysis based on the Scopus and Web of Science dataset

Furthermore, the local citation data reveals a lack of a dense internal dialogue. The most locally cited authors (Dorfleitner G., Kreppmeier J., Laschinger R., and Steininger B.) have each been cited only 3 times by other papers within the dataset.

The institutional landscape is led by a mix of European and Asian universities with strong focuses on blockchain and business. The UCL Centre for Blockchain Technologies is the most productive affiliation with 12 articles, followed closely by the Poznań University of Economics and Business with 11. Other key institutional players include Erasmus University Rotterdam, the University of Bayreuth, and a notable presence from Chinese institutions like Shanghai University of Finance and Economics and Zhejiang Gongshang University. The prominence of specialized research centers (like UCL's) alongside established economics and business schools highlights the interdisciplinary and applied nature of the field.

Geographically, research on economic tokenization is concentrated in a few key global regions (**Error! Reference source not found.**). In terms of sheer publication volume, the United Kingdom (49 articles) and the United States (46 articles) are the clear leaders, followed by Germany (30) and China (26). This concentration reflects the presence of major financial hubs and leading research universities in these nations.

However, an analysis of corresponding authorship and international collaboration provides a more nuanced picture of global influence (**Error! Reference source not found.**). While the UK and USA lead in single-



country publications (SCP), their rate of multiple-country publications (MCP) is relatively modest at 19% and 11.1%, respectively. In contrast, other European nations demonstrate a higher propensity for international collaboration, with the Netherlands showing a 25% MCP rate. Notably, several leading countries in terms of output, such as Poland and Spain, show no multi-country collaborations among their corresponding authors in this dataset, suggesting more nationally focused research ecosystems. This pattern indicates that while the field is global, it is characterized by strong regional clusters with varying degrees of international integration.

Table 9. Most relevant countries by corresponding authors and scientific collaboration metrics

Country	Articles	Articles %	SCP	MCP	MCP %
United Kingdom	21	8	17	4	19
Usa	18	6,8	16	2	11,1
Germany	16	6,1	14	2	12,5
Switzerland	11	4,2	10	1	9,1
China	10	3,8	9	1	10
Netherlands	8	3	6	2	25
Poland	8	3	8	0	0
Spain	6	2,3	6	0	0
Italy	5	1,9	5	0	0
Ukraine	5	1,9	5	0	0

Source: Authors' analysis based on the Scopus and Web of Science dataset

Science mapping

The intellectual structure: Co-citation analysis

To map the intellectual foundations of the field, a cited reference co-citation analysis was conducted. This method creates a network where nodes represent influential prior works, and a link is formed when they are cited together by papers in our dataset. The resulting map reveals the foundational "schools of thought" that contemporary research is built upon. The analysis, set to a minimum of 5 citations, produced a network of 22 key references organized into 4 distinct clusters (**Error! Reference source not found.**).

The map's structure is sparse, visually confirming the findings from our productivity analysis that the field is nascent. The clusters are distinct, with only a few key documents connecting them, indicating that the foundational knowledge base is composed of several related but separate intellectual traditions.

Cluster 1 (Red): The ICO & Entrepreneurial Finance Precedent

This cluster forms the largest, densest, and most central hub in the entire network, representing the historical and empirical backbone of the field. It is centered entirely on the academic study of Initial Coin Offerings (ICOs). The largest nodes in this cluster are the highly co-cited empirical papers by (Adhami et al., 2018; Fisch, 2019; Howell et al., 2020). These works form a tight core, indicating that they are frequently cited together as the foundational evidence on ICO success factors. The work by (Benedetti & Kostovetsky, 2021;

Benedetti & Nikbakht, 2021) on ICO returns is also a central node. The presence of (Belleflamme et al., 2014) on crowdfunding on the periphery of this cluster shows its role as an earlier, related precedent.

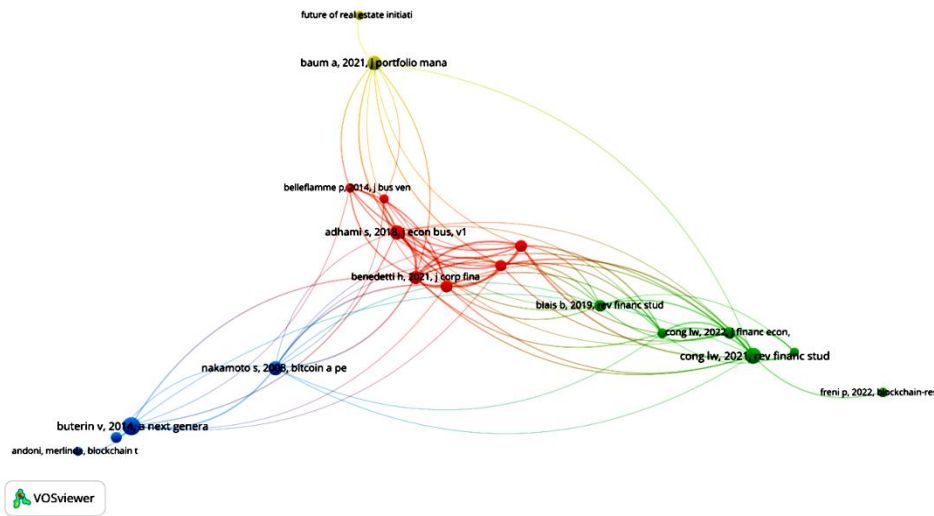


Figure 3. The Intellectual Structure of Tokenization Research: A Co-citation Network Map

Source: Generated using VOSviewer based on co-citation analysis of cited references (minimum 5 citations)

Visually, Cluster 1's centrality is demonstrated by its numerous strong links to all other clusters. It is strongly connected to the "Modern Tokenomics & DeFi Theory" cluster (Cluster 2) through several bridge documents, to the "Technology" cluster (Cluster 3) via papers like (Cong & He, 2019), and serves as the primary intellectual anchor for the "RWA Tokenization" cluster (Cluster 4).

This dense and highly connected cluster represents the "first wave" of rigorous economic research into token-based capital formation. Its central position in the network proves that the study of ICOs is not just a historical precedent but remains the core intellectual nexus from which other research streams in the field.

Cluster 2 (Green): Modern Tokenomics & DeFi Theory

This cluster represents the theoretical frontier of the field. The largest and most central node is the seminal paper "Tokenomics: Dynamic Adoption and Valuation" by (Cong et al., 2021). Its central position and strong links to other nodes within the cluster, such as (Cong et al., 2022) on platform finance and (Liu & Tsyvinski, 2021) on crypto risk factors establish it as the canonical text for the formal economic modeling of tokens.

Crucially, this cluster is connected to the rest of the intellectual map through several key bridge documents. The work by (Cong et al., 2021) is the most significant connector, sharing five links with the ICO cluster (Cluster 1), two links with the Technology cluster (Cluster 3), and one link with the RWA cluster (Cluster 4). Other important bridges include (Biais et al., 2019) and (Liu & Tsyvinski, 2021), which are the closest nodes to the ICO cluster, each sharing four links with it. The work by (Cong et al., 2022) also demonstrates strong cross-cluster relevance with five links to the ICO cluster.



This cluster is the "economic theory" pillar of the field. It signifies the move from describing the ICO phenomenon to building formal, dynamic models of token valuation, platform economics, and market behavior. The strong and numerous links from its core papers back to the ICO cluster demonstrate a direct intellectual lineage.

Cluster 3 (Blue): Foundational Technology & Protocols

This cluster is structurally separate from the main economic clusters, forming a distinct "technological base." It is composed of the primary technical documents of the entire token economy. The nodes for the Ethereum Whitepaper ((Buterin, 2014)) and the Bitcoin Whitepaper ((Nakamoto, 2008)) are the central hubs, with a strong link between them indicating their frequent co-citation as the foundational protocols. The technical guide "Mastering Bitcoin" (Antonopoulos, 2015) is also closely linked, reinforcing the technical focus. This cluster's distinct position visually represents its role as the exogenous technological foundation upon which the economic phenomena in the other clusters are built.

Cluster 4 (Yellow): Real-World Asset (RWA) Tokenization

This small but highly focused and specialized cluster is focused on the application of tokenization to tangible, real-world assets. It is dominated by one central node: the influential article "Tokenization—The Future of Real Estate Investment?" by (Baum, 2021), which is tightly coupled with a report from the Future of Real Estate Initiative (Baum et al., 2020). Visually, this cluster serves as a critical satellite to the main ICO cluster (Cluster 1, Red). The strongest and most numerous co-citation links from (Baum, 2021) connect directly into the core of the ICO literature.

This strong connection demonstrates that the academic conversation around real estate tokenization is intellectually grounded in the empirical lessons and frameworks first developed for studying ICOs. The cluster's connection to the "Tokenomics Theory" cluster (Cluster 2, Green) is more nuanced and indirect, primarily through their shared co-citation with (Biais et al., 2019). This suggests that RWA tokenization represents a specialized application that has grown directly out of the ICO precedent while sharing a more distant theoretical ancestor with the formal Tokenomics literature.

Table 10. Key Academic Studies on Tokenization, ICOs, and Blockchain

Author and year	Title	Cluster	Links	Total link strength	Citations
(Benedetti & Nikbakht, 2021)	Returns and network growth of digital tokens after cross-listings	1	13	43	10
(Benedetti & Kostovetsky, 2021)	Digital Tulips? Returns to investors in initial coin offerings	1	13	43	10
(Fisch, 2019)	Initial coin offerings (ICOs) to finance new ventures	1	13	37	8
(Adhami et al., 2018)	Why do businesses go crypto? An empirical analysis of initial coin offerings	1	13	35	12



(Howell et al., 2020)	Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales	1	12	37	8
(Cong & He, 2019)	Blockchain Disruption and Smart Contracts	1	12	31	7
(Belleflamme et al., 2014)	Crowdfunding: Tapping the right crowd	1	8	19	5
(Zetsche et al., 2020)	Decentralized Finance	1	8	8	5
(Cong et al., 2021)	Tokenomics: Dynamic Adoption and Valuation	2	13	34	15
(Biais et al., 2019)	The Blockchain Folk Theorem	2	11	20	8
(Liu & Tsyvinski, 2021)	Risks and Returns of Cryptocurrency	2	10	22	6
(Cong et al., 2022)	Token-based platform finance	2	9	24	8
(Brunnermeier & Sannikov, 2014)	A Macroeconomic Model with a Financial Sector	2	4	8	5
(Freni et al., 2022)	Tokenomics and blockchain tokens: A design-oriented morphological framework	2	1	2	6
(Nakamoto, 2008)	bitcoin a peer-to-peer electronic cash system	3	11	17	12
(Buterin, 2014)	a next generation smart contract and decentralized application platform	3	9	15	19
(Antonopoulos, 2015)	Mastering Bitcoin: Unlocking Digital Crypto-Currencies	3	2	4	7
(Andoni et al., 2019)	Blockchain technology in the energy sector: A systematic review of challenges and opportunities	3	1	1	5
(Baum, 2021)	Tokenization—The Future of Real Estate Investment?	4	9	14	12
(Baum et al., 2020)	future of real estate initiative	4	1	1	5

Source: Authors' analysis based on the Scopus and Web of Science dataset

Keyword co-occurrence analysis

To map the conceptual structure of the field, a keyword co-occurrence analysis was conducted. This method generates a network where nodes are keywords and links represent their frequent co-appearance in the same publications, revealing the primary themes and their interrelationships. After data cleaning with the thesaurus



file, the analysis yielded a network of the most significant keywords organized into 8 distinct thematic clusters (**Error! Reference source not found.**).

The map reveals a clear and logical structure, organized around a dense technological core from which distinct thematic branches emerge. The conceptual landscape is defined by two major poles of research: one focused on real-world applications and sustainability, and the other on the native digital economy. These two are connected by bridging concepts and specialized sub-fields.

The network is structured around a central core of three highly interconnected keywords that represent the conceptual foundation of the field:

Blockchain (Cluster 1, Occurrences: 127): The largest and most central node, representing the foundational technology.

Tokenization (Cluster 3, Occurrences: 76): The second-largest node, representing the core process being studied.

Smart contracts (Cluster 6, Occurrences: 23): A highly central node representing the enabling mechanism for automation and programmability.

The size, centrality, and thick links between these three keywords visually confirm that they are the conceptual trio of the field. Nearly every research theme is connected to, and built upon, the interplay between the underlying blockchain ledger, the tokenization process it enables, and the smart contracts that govern the resulting assets.

Cluster 1 (Red): Blockchain, Decentralization, and Sustainable Systems

This is the largest and most central cluster in the entire network, anchored by the keyword **blockchain** (127 occurrences, 419 total link strength). The node's size and the large number of connections it shares across the network establish it as the primary technological paradigm from which all other research themes emanate. The link between blockchain and tokenization is by far the strongest single connection in the map, representing the inseparable nature of the underlying technology and the economic process it enables.

The cluster represents the broad discussion of blockchain's applications, with two clear and dominant thematic orientations. The first is its foundational principle: "decentralization" (17 occurrences). The prominence and strong links of this keyword confirm its role as a core conceptual pillar of the field.

The second, and most developed, thematic area within this cluster is the application of blockchain to real-world systems, particularly in the realm of "sustainability". A cohesive and tightly interconnected subgroup is formed by the keyword's "sustainability" (11 occurrences), "environmental technology", and "circular economy". This demonstrates a significant stream of research focused on using blockchain as a tool to build more transparent and efficient physical systems, most notably in the supply chain. The research in this area also explores the design of "incentives" to promote sustainable economic behavior.

Finally, this cluster contains keywords that address the broader systemic and institutional implications of the technology. The presence of "power" and "uncertainty", which are strongly linked to blockchain and decentralization, highlights a research conversation about the governance challenges and risks associated with



A key economic outcome and driver of this research theme is "fractional ownership". Although a smaller node, its position and links to "tokenization", "real estate", and "regulation" are significant. This highlights that a core promise of the tokenization process is its ability to democratize access to traditionally illiquid and high-value assets by breaking them into smaller, more accessible units of ownership. The most prominent specific application of this concept within the cluster is "real estate", confirming its status as a primary use case for asset tokenization.

Cluster 4 (Yellow): Digital Money & The New Monetary Landscape

This cluster, situated in the upper-left, represents the research on the new world of digital money and native crypto-assets. It is dominated by the "cryptocurrencies" node (42 occurrences), which has very strong co-occurrence links to the foundational "blockchain" node and significant, though less strong, links to "tokenization" and "Tokenomics". This suggests that studies on cryptocurrencies are primarily grounded in the underlying technology, but are also intertwined with the process of creating new tokens and the economic theories that govern them.

The cluster's core theoretical language is "Tokenomics" (36 occurrences), which connects all the various forms of blockchain-based value, from decentralized crypto-assets to asset-backed stablecoins and state-issued CBDC. The presence of keywords like "risk" and "monetary policy" shows the cluster's focus on the economic properties, valuation, and systemic implications of these new financial instruments.

Cluster 5 (Purple): DeFi Market Structure & Trading

This cluster represents the decentralized financial markets where tokenized assets are traded. It is anchored by the keyword "defi" (24 occurrences). Visually, "defi" acts as a crucial interdisciplinary hub. It is strongly linked to the core technological spine of blockchain, tokenization, and smart contracts, demonstrating that DeFi research is built upon this foundational trio. Furthermore, despite being a relatively smaller node than cryptocurrencies, defi is highly connected, with links extending into nearly every other cluster on the map. This indicates that DeFi is not an isolated topic but a cross-cutting theme, representing the market layer for entrepreneurial finance (Cluster 2), the trading venue for new digital money (Cluster 4), and the application layer for new governance models (Cluster 7). The cluster also contains keywords like "bitcoin", "peer-to-peer", "markets", "automated market makers", and the econometric term "connectedness", confirming its focus on market microstructure and asset behavior.

Cluster 6 (Light Blue): Technical & Legal Infrastructure

This cluster focuses on the enabling infrastructure that underpins the token economy, with "smart contracts" (23 occurrences) as its largest and most central node. Similar to blockchain and tokenization, smart contracts functions as a core pillar of the entire map. Its visual centrality and strong links to nearly all other clusters signify its indispensable role as the programmable mechanism, from DeFi protocols to DAO governance. The cluster brings together the technical requirements for building decentralized systems, such as interoperability and digital transformation, with the conceptual outcomes they enable, like transparency.

Cluster 7 (Orange): The Web3 & Metaverse Economy



Located on the upper-right periphery, this cluster represents the "next generation" of applications, focused on the emerging economies of web3 and the metaverse. The key assets in this domain are "nfts", and the primary organizational form is "daos". While this cluster is on the edge of the map, signifying a new research front, it is anchored by a centrally located keyword "digital economy". Though small, this node sits directly between the main hubs of blockchain and tokenization, indicating its role as a fundamental concept that connects the core technology to these new virtual systems.

Cluster 8 (Brown): Financial & Economic Modeling

This cluster represents the quantitative and computational approach to analyzing tokenization. A key node in this cluster is "artificial intelligence" (10 occurrences). Its position on the map is highly significant; it is not on the periphery but is located centrally, directly between the core technological concepts of blockchain and tokenization. This centrality demonstrates that AI and "machine learning" are not niche methods but are being applied as analytical tools to understand the fundamental mechanics, markets, and assets of the token economy.

To analyze the evolution of research topics over time, the keyword co-occurrence map was overlaid with the average publication year for each keyword, as shown in **Error! Reference source not found..** The color gradient, ranging from blue (older topics, avg. year ~2022.0) to yellow (newer topics, avg. year ~2024.0), reveals a thematic shift in the literature.

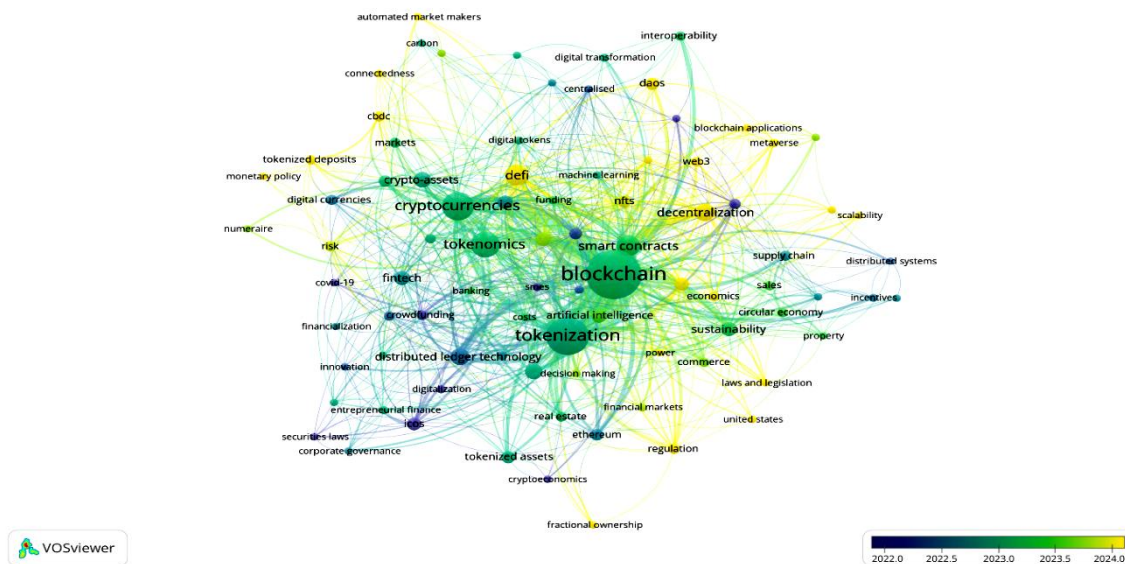


Figure 5. Thematic Evolution of Keywords (Overlay View by Publication Year)

Source: Generated using VOSviewer based on co-occurrence analysis of keywords (minimum 5 occurrences), overlay by average publication year.

The analysis shows that the foundational concepts of the field are the oldest. Keywords like "icos" (avg. year 2021.6), "iot" (2021.5), and "fintech" (2022.7) appear in darker blue and green hues, confirming their role



as the earlier building blocks of the field. The core technological terms, including "blockchain" (2023.1) and "tokenization" (2023.0), are positioned in the middle of the temporal spectrum (green), representing the established central themes upon which newer research is built.

The most significant finding from the temporal map is the clear emergence of a "yellow frontier" of very recent research topics. The map is dominated by yellow nodes on its periphery, indicating a rapid expansion into new research fields. Specifically, themes related to the application of tokenization to new markets and organizational forms are the most current. Keywords such as "defi" (2024.0), "daos" (2024.3), "web3" (2024.4), and the "metaverse" (2024.3) are all bright yellow, signifying that they are the "hot topics" of 2024 and 2025.

Similarly, the research on the new monetary landscape is also part of this recent wave, with "cbdc" (2024.2) and "tokenized deposits" (2024.2) appearing in yellow. This temporal trend demonstrates a clear evolutionary path for the field: from its roots in ICOs and foundational technology, the research front has rapidly moved towards analyzing decentralized financial systems and new organizational structures.

Collaboration Network Analysis

Author Co-authorship

To investigate the social structure and collaborative patterns within the field, an author co-authorship analysis was conducted. The analysis was set to include authors with a minimum of two publications to focus on the most active researchers in the domain. After a rigorous process of standardizing author names via a thesaurus file, the resulting collaboration network was generated (Figure X).

The analysis reveals a profoundly fragmented social structure, which is a hallmark of a nascent research field. The network map is characterized by a large number of disconnected nodes and very small, isolated components. This visually confirms that the research community lacks a central, cohesive "invisible college" that connects the majority of active scholars.

The largest connected set of collaborating authors consists of only three individuals: Wang, Shibo; Yang, Jinqiang; and Shen, Zhuyi (Blue Cluster). Several other small, disconnected pairs and trios are visible, such as Srinivasan, Kandaswamy Sakthi and Bose, D. (Light Blue Cluster), and Goodell, Geoffrey and Sadykhov, R. (Green Cluster). However, the overwhelming majority of the 31 authors who met the publication threshold appear as isolates, with no co-authorship links to other researchers in this dataset.

To understand the geographic landscape of tokenization research, a country co-authorship analysis was conducted. The resulting network map reveals a global field with a clear center of gravity in the United Kingdom, which is flanked by the United States and Germany and connected to several distinct regional clusters.

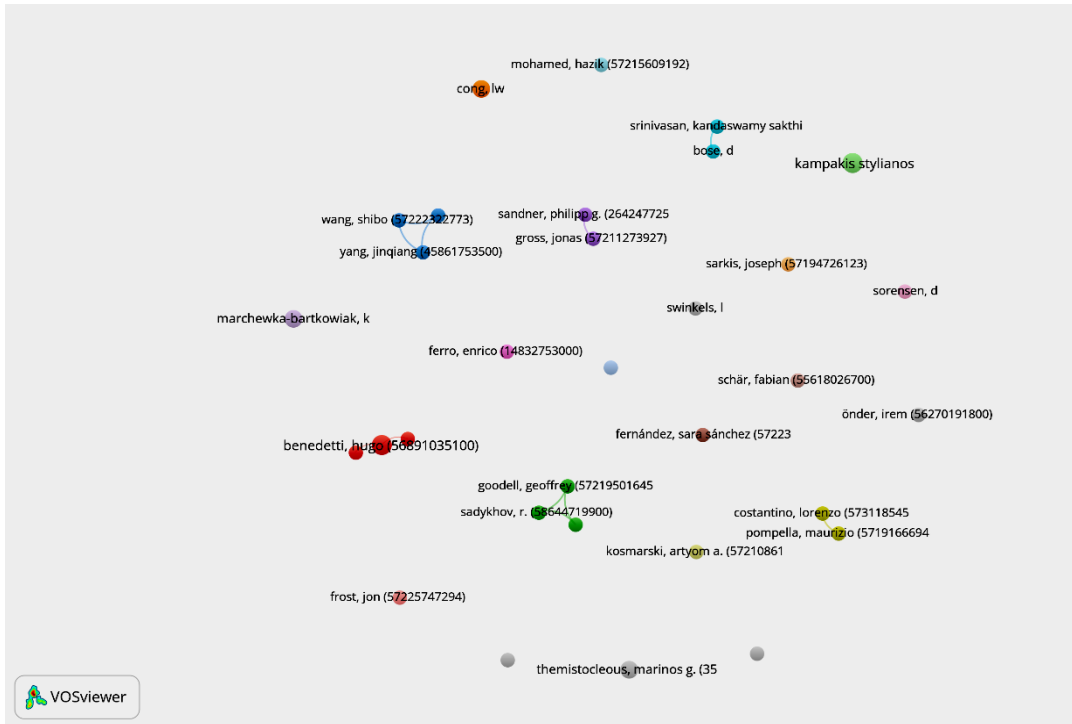


Figure 6. The Social Structure of Tokenization Research: An Author Co-authorship Network
Source: Generated using VOSviewer based on co-authorship analysis (minimum 2 documents per author)

Country Co-authorship

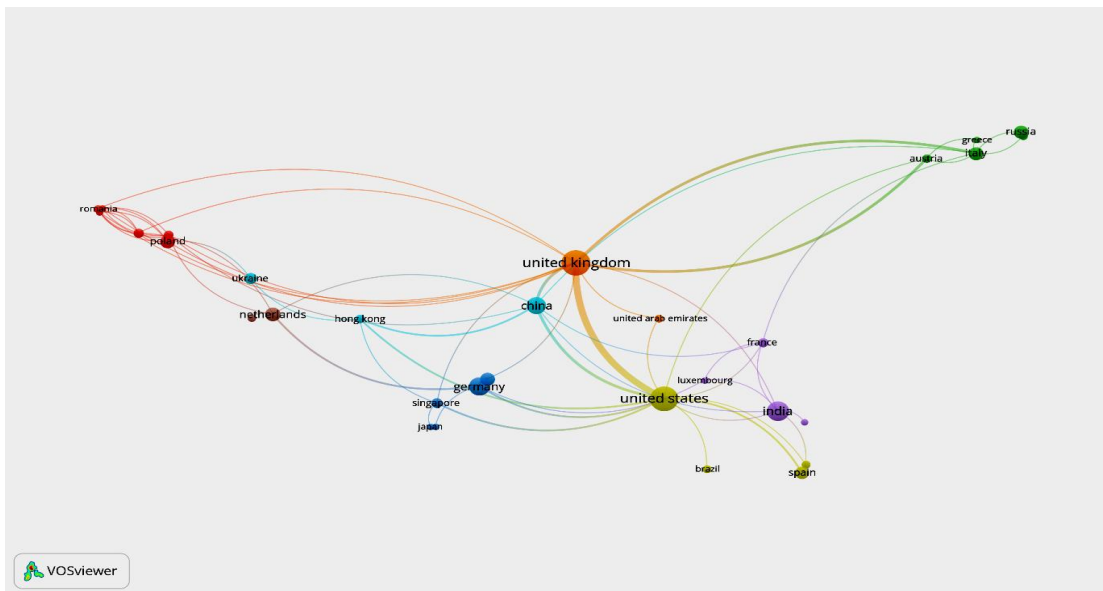


Figure 7. International Collaboration Network of Country Co-authorship
Source: Authors' analysis based on the Scopus and Web of Science dataset

The map is dominated by the United Kingdom (Cluster 7), which stands out as the most central and well-connected hub in the network. The UK leads in total document production with 42 articles and possesses the



highest total link strength, demonstrating its role in international collaboration by connecting strongly to nearly every other country. Two other nations form the rest of the central triad. The United States (Cluster 4) is a major hub, notable for its exceptionally high citation impact, leading all countries in both total citations (1153) and average citations per document (28.12). Germany (Cluster 3) is the third key player, showing a strong balance of high productivity with 23 documents and significant international linkages.

Beyond this core, the map shows several distinct regional and thematic clusters that connect to the main hubs. An Eastern European research bloc (Cluster 1) is visible, with collaborations between Poland, Romania, and the Czech Republic. Another significant group is the Asian cluster (Cluster 6), anchored by strong collaboration between China and Hong Kong. A third cluster (Cluster 5), notable for its high-impact research, connects emerging finance hubs like France, Luxembourg, and India, with France and Luxembourg showing exceptionally high average citations per document.

Research trends

To further understand the conceptual structure and strategic direction of the field, a thematic map was generated, plotting thematic clusters on a two-dimensional strategic diagram based on their centrality and density. The map identifies the field's motor, basic, niche, and emerging themes, providing a clear picture of its current state and evolutionary trajectory.

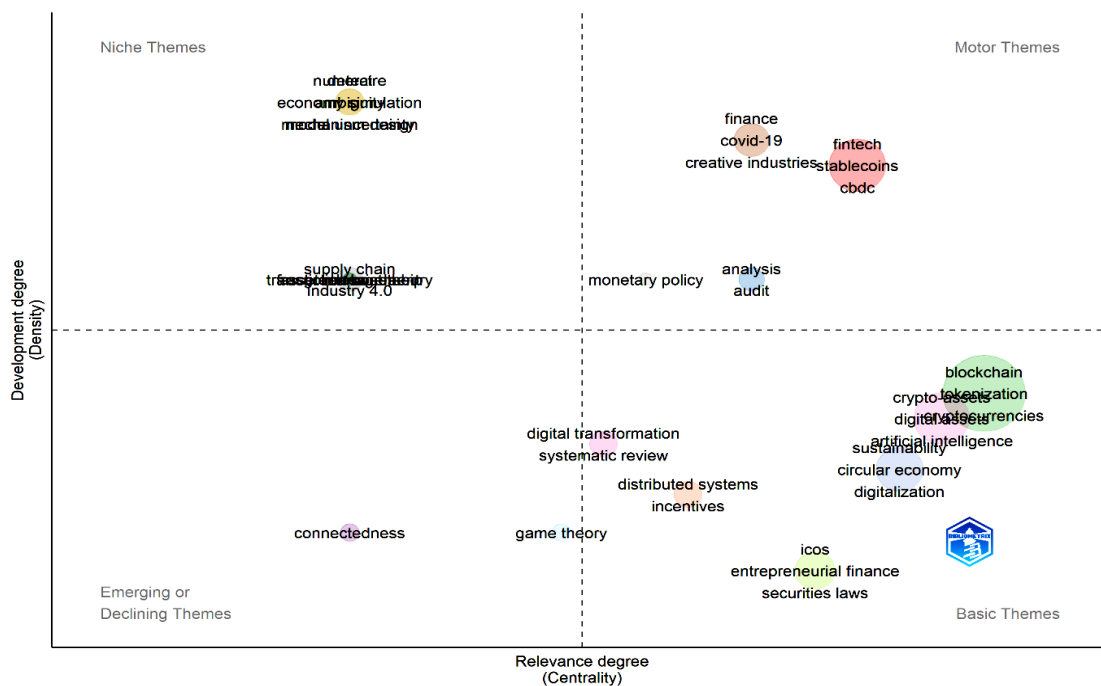


Figure 8. Thematic map of the tokenization field

Source: Authors' analysis based on the Scopus and Web of Science dataset

The motor themes quadrant, which signifies well-developed and important topics, is primarily driven by a single, coherent theme focused on Fintech & The New Monetary System. This cluster, containing keywords such as fintech, stablecoins, and cbdc, represents the most mature and impactful intersection of tokenization



with the established financial industry and central banking. Its high centrality and density confirm that this is a core driving force of the research.

The basic themes quadrant is the most populated, containing the foundational building blocks of the entire field. A massive cluster containing the most central and frequent keywords: blockchain, tokenization, tokenomics, and cryptocurrencies, representing the transversal concepts that connect to nearly all other topics. Alongside this core, a second basic theme centered on icos and entrepreneurial finance highlights the role of token-based capital raising. A third theme in this quadrant, focused on sustainability and circular economy, demonstrates that tokenization is applied to solve environmental challenges is a core question in the field.

The niche themes quadrant reveals specialized but peripheral topics. A cluster focused on supply chain and industry 4.0 represents a coherent but distinct conversation separate from the core financial debates. This quadrant also contains several small, specialized theoretical clusters, such as the one containing numeraire and model uncertainty, which represent formal economic modeling approaches that are internally cohesive but not yet widely integrated.

Finally, the emerging themes quadrant contains topics that are currently on the periphery and are less internally developed. Given the newness of the entire field, these are almost certainly emerging rather than declining areas. The cluster around digital transformation suggests that broader conceptual work framing tokenization within the larger trend of digitalization is an emerging area of interest.

DISCUSSION

Discussion of results

The structural analysis of authorship and citation networks reveals that the economics of tokenization is a nascent, pre-paradigmatic field. Despite exponential growth in publication volume since 2021, the social and intellectual fabric of the domain remains fragmented. The co-authorship network is characterized by small, isolated research teams with no central "invisible college," while the internal citation network is sparse, with only a handful of documents receiving citations from their peers. This pattern indicates that knowledge is being generated in parallel silos rather than through a cumulative, self-referential academic conversation. Researchers are currently tackling distinct problems, such as DeFi mechanics, real estate liquidity, and supply chain transparency, by drawing on external disciplinary foundations rather than a shared internal canon. This fragmentation is a defining feature of the field's current developmental stage, reflecting a "gold rush" phase of broad exploration triggered by technological shocks rather than theoretical consensus.

The field's intellectual base is not self-contained but is built upon three distinct external pillars. First, the research is technologically exogenous, rooted directly in the computer science of the Bitcoin and Ethereum whitepapers. Economic analysis is largely reacting to these protocols as given constraints. Second, the field is the intellectual successor to the empirical study of Initial Coin Offerings (ICOs). The analytical frameworks used to assess token success (signaling, information asymmetry, and governance) were forged during the ICO boom of 2017–2019 and have since been adapted to broader asset tokenization. Third, the recent emergence



of formal "Tokenomics" represents a turn toward theoretical legitimacy. Anchored by dynamic asset pricing models, this pillar signifies the integration of tokenization into mainstream financial economics, moving the field beyond descriptive case studies toward rigorous mathematical modeling of incentives and network effects.

The thematic map uncovers a tension in the research agenda between two competing ambitions. One pole of research focuses on "Real-World Optimization," utilizing blockchain to enhance the efficiency and transparency of existing physical systems, such as supply chains and energy grids. The opposing pole focuses on "Digital-Native Construction," aiming to build a self-referential economic system composed of DeFi protocols, DAOs, and native crypto-assets. The concept of "Tokenization" serves as the critical bridge between these two worlds, functioning as the mechanism that translates off-chain value into on-chain programmable assets. Furthermore, the centrality of "Smart Contracts" confirms that the field's focus has shifted from the distributed ledger as a database to the programmable logic that governs economic interactions.

Implications for Research and Practice

The heavy reliance on ICO literature as a foundational pillar is becoming a theoretical liability. While ICO models of signaling and information asymmetry remain relevant for primary market issuances (Kreppmeier & Laschinger, 2023), they are insufficient for understanding the modern token economy, which is increasingly driven by secondary market dynamics, collateral value, and DeFi composability (Moxoto et al., 2021). Future research must therefore move beyond treating tokens just as digital equity and start modeling them as "programmable inventory" or "active collateral." Furthermore, our analysis reveals a "missing middle" in institutional theory. While we have robust literature on protocols (computer science) and asset pricing (finance), there is a lack of theory explaining the organization in the token economy. Researchers should apply Transaction Cost Economics (TCE) and Property Rights Theory to smart contracts themselves, viewing them not just as code but as governance mechanisms that define the boundaries of the firm. Finally, the centrality of the AI/Machine Learning cluster indicates that standard econometrics are insufficient for high-frequency, on-chain data. "Crypto-econometrics" must become a methodological standard, requiring new best practices for entity resolution and data cleaning.

For practitioners, the empirical evidence (Swinkels, 2023), from the performance analysis of highly cited papers, presents a warning regarding the "Liquidity Paradox." The creation of a tokenized asset does not automatically generate liquidity; in fact, many Real-World Asset (RWA) tokens suffer from low trading volumes and concentrated holdings. Managers must therefore avoid tokenizing for liquidity alone. Successful strategies must prioritize utility and composability such as ensuring the token can be used as collateral or integrated into DeFi protocols, and secure necessary market-making infrastructure before issuance. Strategically, the value in the token economy is increasingly accruing to the infrastructure layer (interoperability protocols, bridging standards, and compliance frameworks) rather than to individual token issuers.



The keyword co-occurrence map visually shows the field split into two poles: "Real-World Systems" (Red Cluster) and "Digital-Native Finance" (Yellow/Purple Clusters). This structure implies a systemic risk lies not within these clusters, but at the points where they connect. The Tokenization node (Cluster 3) visually acts as the bridge linking the physical economy to the digital ledger. Therefore, regulators should prioritize the oversight of these "gateways". The data oracles that verify off-chain events and the custodians that hold the physical assets backing the tokens. By focusing enforcement on these specific interface points, ensuring that the digital token accurately reflects the real-world asset, policymakers can mitigate the risks of fraud and contagion without stifling innovation within the blockchain network itself.

CONCLUSION

The paper shows that the academic field of economic tokenization is in a nascent, pre-paradigmatic stage characterized by exponential growth in publications and a fragmented intellectual and social structure. The research is built upon three distinct pillars: the foundational blockchain protocols of Bitcoin and Ethereum, the economic precedent of Initial Coin Offerings (ICOs), and the emerging formal theory of "tokenomics."

Performance analysis reveals a surge in scholarly output since 2021, with foundational conceptual works and systematic reviews having the highest citation impact. However, the internal citation network is sparse, indicating a lack of a cohesive, self-referential academic conversation. The research landscape is geographically concentrated in the UK, USA, Germany, and China, with collaboration patterns showing distinct regional clusters rather than a fully integrated global network.

Science mapping of the field's intellectual structure confirms its reliance on the empirical study of ICOs, from which theoretical work on tokenomics and applied research on Real-World Asset (RWA) tokenization have emerged as distinct but connected streams. The conceptual structure is organized around the core technologies of blockchain and smart contracts, branching into key themes such as entrepreneurial finance, decentralized finance (DeFi), and the application of tokenization to sustainability and supply chains. Temporal analysis shows a clear research trajectory moving from foundational concepts toward newer frontiers like DeFi, DAOs, and CBDCs. The social structure is characterized by small, disconnected research teams, further evidencing the field's early stage of development. In summary, the research on the economics of tokenization is a rapidly expanding but still fragmented domain, building on established precedents while quickly advancing into new theoretical and applied areas. To advance beyond this pre-paradigmatic state, future research must bridge the gap between technical protocols and organizational theory, while practitioners should focus on addressing the liquidity paradox through better token utility design.

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