



RESEARCH ARTICLE

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A SCIENTOMETRIC STUDY ON TECHNOLOGY-ENABLED FINANCE AND ITS GLOBAL IMPACT

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ABSTRACT

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The rapid emergence of technology-enabled finance has reshaped global financial systems, creating new opportunities for growth, sustainability, and inclusion while introducing unprecedented risks and regulatory challenges. Financial innovation, ranging from blockchain applications and digital payments to green finance and risk analytics, has attracted increasing scholarly attention. Yet, despite the proliferation of case-based and empirical studies, there remains limited systematic understanding of how this knowledge domain has evolved and diffused globally. This article undertakes a scientometric study of technology-enabled finance to map its intellectual structure, thematic clusters, and international impact. Drawing upon a dataset of 456 influential publications indexed in leading academic databases, the study employs bibliometric software VosViewer to identify citation patterns, co-authorship networks, and thematic evolution across key subfields such as fintech, green finance, financial inclusion, systemic risk, and sustainable development. The findings reveal that while technology-enabled finance is inherently interdisciplinary, its scholarship converges around three dominant trajectories: (1) financial innovation as a driver of sustainability and green transition; (2) fintech as an enabler of financial inclusion and entrepreneurial growth; and (3) digitalization as a double-edged sword for systemic stability and risk management. The scientometric evidence highlights the global distribution of research contributions, with significant clusters in emerging markets that underscore the role of financial technology in fostering inclusive development. At the same time, the analysis underscores persistent gaps in regulatory governance, methodological integration, and the alignment of financial innovation with long-term sustainability goals. By providing a structured overview of the intellectual landscape, this study contributes to advancing theoretical, empirical, and policy-oriented debates on the global impact of technology-enabled finance. The results are expected to guide future research, inform policy frameworks, and support the development of more inclusive, resilient, and sustainable financial systems worldwide.

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INTRODUCTION

The rapid advancement of digital technologies has profoundly reshaped the financial sector, giving rise to what is broadly recognized as technology-enabled finance or "fintech." Financial innovation, encompassing the development of novel products, services, and infrastructures, has historically been a crucial driver of economic growth and competitiveness (Aghion, Hemous, & Kharroubi, 2005; Rajan & Zingales, 1998). In recent years, however, the scope of financial innovation has expanded beyond traditional banking structures to incorporate digital platforms, blockchain applications, artificial intelligence, and big data analytics (Sharma, Tiwari, Chopra, & Dev, 2024; Choi & Lee, 2022). These developments have accelerated financial inclusion, promoted cleaner investments, and fostered new approaches to sustainability (Emara & Chiu, 2021; Paramati, Ummalla, & Apergis, 2021), while simultaneously raising concerns about risk management, systemic stability, and the unintended social consequences of financial disruption (Laeven, Levine, & Michalopoulos, 2015; He, Liu, & Wu, 2022). As such, an integrated scientometric analysis is warranted to map the knowledge structure of this field and to evaluate its global impact. Historically, financial innovation has been viewed as both a facilitator of growth and a potential source of fragility. Earlier contributions highlighted how credit market developments and technological advances enable firms and industries to overcome financial constraints and improve productivity (Aghion *et al.*, 2005; Petersen & Rajan, 2002). At the same time, episodes of financial instability such as the global financial crisis underscored the dual nature of innovation, where complex financial products and excessive leverage contributed to systemic vulnerabilities (Laeven *et al.*, 2013). This tension has become even more pronounced with the rise of digital financial ecosystems,

where innovations in blockchain, peer-to-peer lending, and digital currencies have challenged the regulatory capacity of states while promising greater transparency and efficiency (Sharma *et al.*, 2024; Laretta & Santamaria, 2025). The coexistence of opportunity and risk makes technology-enabled finance a critical domain of inquiry for policymakers, investors, and scholars. A growing body of literature emphasizes the transformative role of financial innovation in advancing sustainability and environmental performance. Studies show that green finance and innovation-oriented policies can enhance energy efficiency, facilitate renewable energy adoption, and mitigate carbon emissions (Acheampong, Adams, & Boateng, 2020; Paramati, Apergis, & Ummalla, 2021; Steffen, 2018). For example, Yuan, Ye, and Sun (2021) demonstrated how financial innovation strengthens industries' green innovation capacity in OECD countries, while Zhang, Wu, and Chen (2023) revealed positive linkages between green credit programs and firms' environmental performance. Similarly, Zhu and Li (2022) and Zeng and Xu (2021) highlighted how financial innovation coupled with environmental regulation significantly reduces pollution and enhances corporate environmental performance. These findings align with Porter and van der Linde's (1995) proposition that innovation-driven competitiveness can simultaneously improve economic and ecological outcomes. Collectively, such insights underscore the global relevance of financial innovation for achieving the twin goals of economic growth and sustainability.

Parallel to sustainability, technology-enabled finance has become a cornerstone of financial inclusion and global equity. Digital platforms, mobile banking, and peer-to-peer credit systems provide access to underserved populations, bridging gaps in traditional financial systems (Emara & Chiu, 2021; Murinde & Mlambo, 2022). The role of fintech in fostering inclusive growth is particularly evident in emerging markets, where innovations in digital payments and micro-lending have expanded opportunities for entrepreneurship and small business financing (Guerrero & Santamaria, 2020; Shang & Zhou, 2023). Moreover, Xiang and Wu (2022) identified how fintech can exacerbate income inequality if left unchecked, suggesting a nuanced balance between inclusion and fairness. Thus, understanding the social dimensions of fintech adoption is integral to assessing its global impact. Financial innovation also intersects with risk management and systemic stability, presenting both advantages and challenges. On one hand, innovations in enterprise risk management, such as digital auditing and big-data analytics, enhance firms' resilience and decision-making capacity (Guo, Ge, Liao, Hu, & Huang, n.d.; Wei, Jiang, Pan, & Cai, 2023). On the other hand, Huang, Xu, and Du (2025) revealed that while financial innovation can reduce criminal activities by upgrading industrial structures, it can simultaneously create new avenues for financial crime and cyber-risks. Furthermore, Beck, Chen, Lin, and Song (2016) found that while financial innovation fosters efficiency, it may undermine banking stability if regulatory frameworks lag behind technological developments. The interplay between innovation and risk thus remains a focal point of academic debate and policy design. At the macroeconomic level, financial innovation and digitalization contribute significantly to long-term growth trajectories and competitiveness. Studies suggest that innovation-driven credit markets support entrepreneurship, venture capital, and technological upgrading (Chang, Chen, & Zeng, 2019; Hsu, Tian, & Xu, 2014; Yue & Zhang, 2021). Empirical evidence further highlights the role of fintech and digital innovation in shaping national competitiveness, particularly through their contributions to productivity and energy transitions (Khan & Ozturk, 2019; Kim & Park, 2016). For example, Li and Zhang (2022) demonstrated the importance of financial innovation in improving carbon emission efficiency among Chinese enterprises, while Xing and Liu (2021) identified positive correlations between financial innovation and provincial energy efficiency. These findings reinforce the broader literature linking finance, innovation, and economic growth (Li, Hall, & Lopez, 2014; Frame & White, 2001). While the transformative capacity of technology-enabled finance is undeniable, it remains accompanied by regulatory, ethical, and methodological challenges. As Rognone, Choudhry, and Fuertes (2020) argue, innovation in portfolio diversification can enhance investment efficiency, but excessive complexity often obscures transparency. Policymakers thus face the dual imperative of encouraging innovation while ensuring systemic resilience and social equity. This dilemma has prompted scholars to advocate for evidence-based policymaking supported by scientometric studies that map the intellectual structure and evolution of research fields (Laretta & Santamaria, 2025; Achim, Borlea, & Văidean, 2021). Despite the burgeoning literature, gaps remain in understanding the global knowledge networks and thematic clusters within technology-enabled finance. Although fragmented case studies and empirical analyses abound, few systematic efforts have been made to evaluate how research on fintech, green finance, financial inclusion, and systemic risk intersect. Scientometric methods, leveraging bibliometric data and citation networks, offer a robust approach to addressing this gap. They allow scholars to identify influential works, trace the evolution of research fronts, and uncover emerging themes that shape policy and practice worldwide (Ye & Li, 2020; Qu & Zhang, 2020). By applying these tools, it becomes possible to capture not only the breadth of scholarship but also the global impact of technology-enabled finance.

Therefore, the present study seeks to conduct a scientometric analysis of technology-enabled finance, examining its intellectual foundations, global diffusion, and thematic trajectories. By analyzing publications indexed in international databases, this research aims to provide a comprehensive map of the field's evolution, highlight its interdisciplinary intersections, and assess its policy relevance in the context of global challenges such as climate change, inequality, and financial stability. In doing so, this article contributes to the growing discourse on how technological innovation in finance is reshaping economies and societies, offering insights for scholars, practitioners, and policymakers concerned with building sustainable and inclusive financial systems.

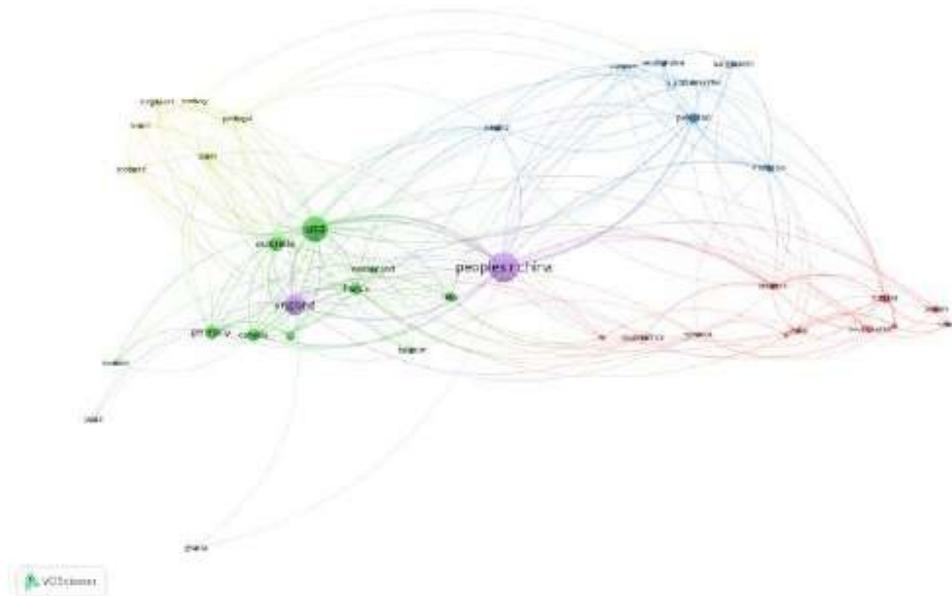
## RESEARCH METHODOLOGY

**Data and Methodology:** This study employs a bibliometric approach to examine the intellectual structure and global impact of research on technology-enabled finance. Bibliometric analysis has become a widely accepted method for mapping scientific production, uncovering thematic trends, and identifying collaboration networks across disciplines. It provides a systematic and quantitative framework to assess research output, offering insights that complement traditional literature reviews by highlighting patterns of growth, citation dynamics, and knowledge diffusion over time.



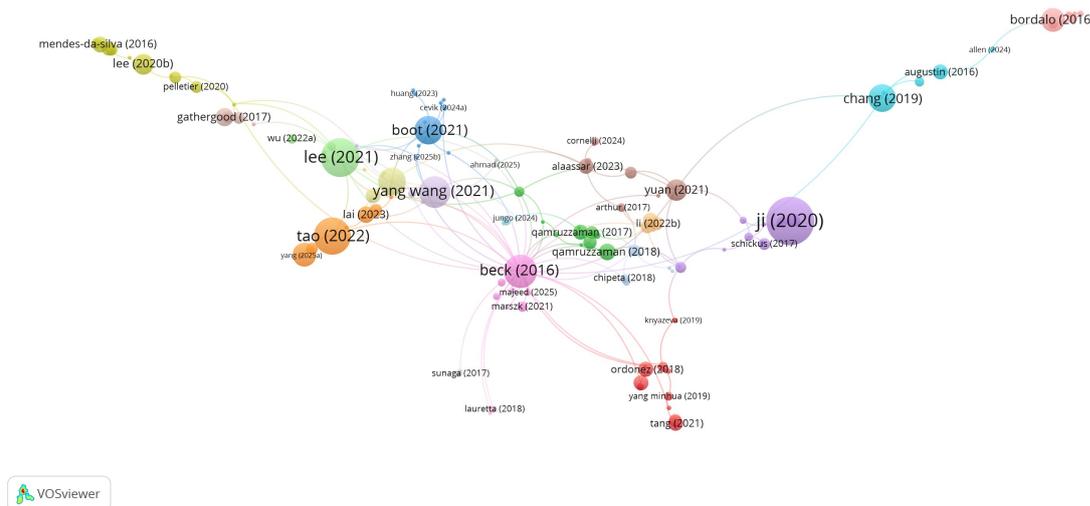
financial innovation integrates technology, policy, and investment, while rising attention to inclusion, sustainability, and renewable energy reflects growing alignment with sustainable development goals.

### Country co-authorship network



The VOSviewer co-authorship network highlights global research collaboration in financial innovation and technology-enabled finance. China leads as the most prolific contributor, collaborating extensively with both developed (USA, UK, Germany) and emerging economies (India, Malaysia, Pakistan), acting as a global hub and bridge. The USA forms a central Western network, strongly connected to Europe, Australia, and Canada, while the European cluster (England, Germany, France, Switzerland, Spain) shows dense intra-regional collaboration, with England and Germany linking Europe to the USA and China. Asian countries like India, South Korea, and Taiwan are emerging contributors, especially in partnership with China. Middle Eastern nations connect with both South and East Asia, and African representation, primarily South Africa and Ghana, links mainly with China and Europe, reflecting growing engagement in financial inclusion and digital finance initiatives.

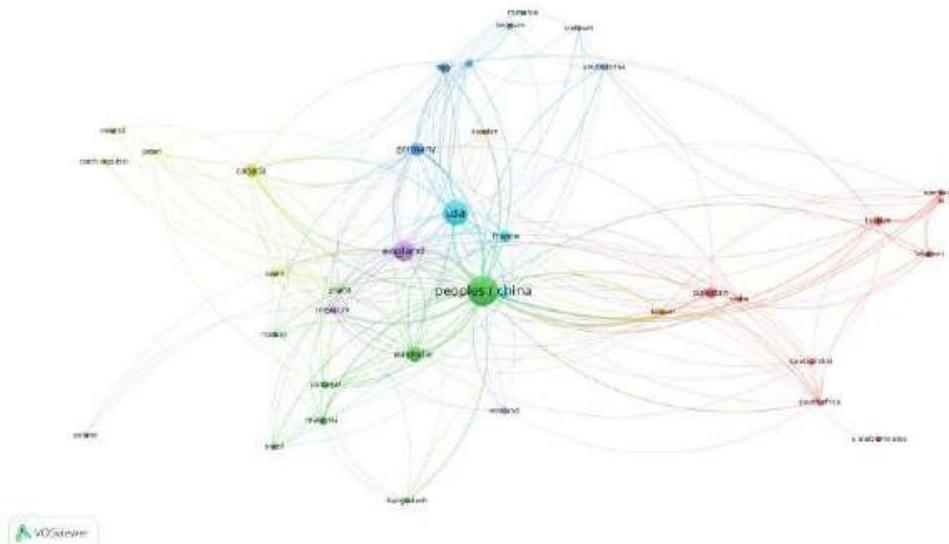
### Influential authors co-citation network



The VOSviewer co-citation network of authors maps the intellectual foundation of financial innovation research. Central figures like Ji (2020), Boot (2021), Yang Wang (2021), and Beck (2016) form the core, shaping key themes such as banking transformation, FinTech adoption, financial inclusion, and market efficiency.

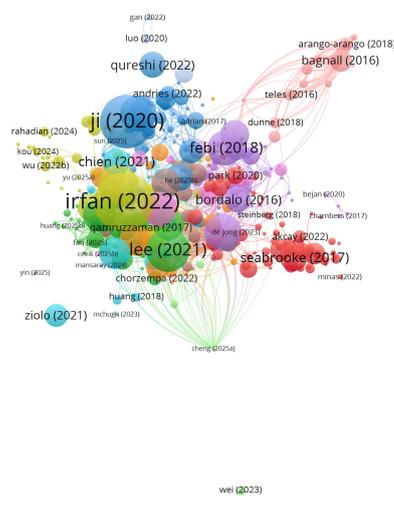
Technology-driven finance and digital banking are emphasized in the green and blue clusters, while the purple cluster focuses on financial stability, risk management, and regulatory implications. The red cluster highlights behavioral finance and capital markets, providing insights into investor behavior and market anomalies. Niche areas, represented by the yellow and brown clusters, explore crowdfunding, microfinance, and sustainable development, linking innovation to emerging economies and social impact.

## Country-level collaboration network



The VOSviewer country collaboration map reveals a highly interconnected research network with the People's Republic of China at its centre. The large node size and dense web of green links show that China produces the highest volume of publications and maintains extensive collaborative ties with a broad range of countries, especially in Asia–Pacific and parts of the Global South (Australia, Malaysia, Bangladesh, Brazil, and Portugal). The USA, England, and Germany form additional hubs, acting as bridges between the Chinese cluster and the European and North American research communities. Distinct colour-coded clusters illustrate regional collaboration patterns: a China-centred Asia–Pacific cluster; a transatlantic cluster linking the USA with European countries; a European–East Asian cluster connecting Germany, Italy, and South Korea; a Middle East–South Asia cluster led by Turkey, Pakistan, and Saudi Arabia; and smaller groups such as Canada–Japan–Ireland. The thickness of the connecting lines reflects strong co-authorship links—particularly between China and Australia, the USA and Europe, and England with several African and Asian partners—while peripheral nodes such as Poland show more limited connections. Overall, the map demonstrates both the concentration of research capacity in a few key hubs and the emergence of multiple regional collaboration networks, underscoring the importance of cross-regional partnerships in expanding the global research landscape.

## Influential authors

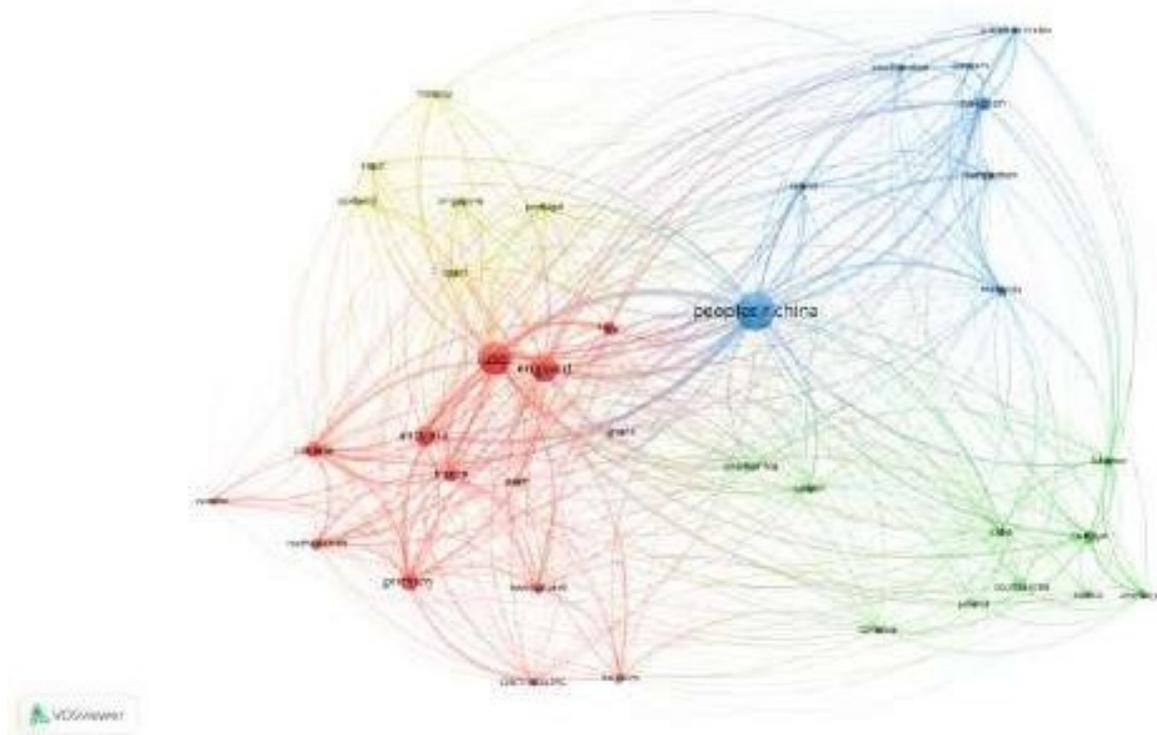


The VOSviewer bibliographic coupling map highlights the intellectual structure of research in the selected domain by clustering influential authors based on shared references. Each node represents an author, with node size reflecting the number of publications or citation weight. The dense, multicoloured clusters reveal several core groups of scholars who are frequently co-cited or work on closely related themes. Central figures such as Irfan (2022), Ji (2020), Lee (2021), Qureshi (2022), and Chien (2021) appear as large nodes at the centre, indicating their high influence and extensive overlap in cited literature. The green and blue clusters form the largest communities, suggesting a strong concentration of recent studies (2020–2023) focusing on similar topics, while peripheral nodes such as Wei (2023) or earlier works like Bagnall (2016) and Seabrooke (2017) represent either emerging or foundational but less interconnected contributions.

The map also shows a temporal evolution of scholarship: newer works (2020 onwards) dominate the central area, signalling growing interest and a convergence of research themes, whereas older foundational studies (2016–2018) form smaller, outer clusters that still inform but are less central to the current research conversation. The link density among core authors suggests a cohesive body of literature with overlapping theoretical or methodological bases, while weaker links at the edges indicate niche or

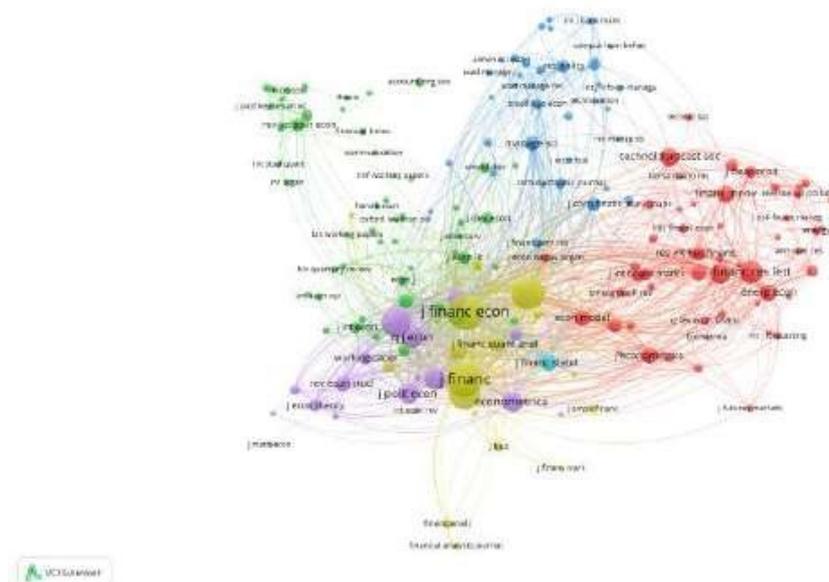
developing subfields. Overall, the visualization underscores the emergence of a core set of influential authors and papers shaping the field, surrounded by satellite or transitional contributions that bridge into adjacent or newer research directions.

### Global co-authorship



The network visualization map generated using VOSviewer illustrates global co-authorship patterns among countries, revealing distinct clusters of scientific collaboration. The USA and China emerge as the two central hubs, with the USA leading the red cluster that includes other Western and Anglophone countries such as England, Canada, Australia, and Germany, characterized by dense internal collaboration. In contrast, China anchors the blue cluster, connecting strongly with Asian and Middle Eastern nations like Pakistan, Malaysia, Saudi Arabia, and Vietnam, reflecting China's expanding role in South-South academic cooperation. The green cluster, centered around India, Turkey, Iran, and Russia, suggests a growing regional research network with moderate ties to both the Western and Chinese spheres. A yellow cluster comprising countries like Norway, Brazil, Singapore, and Portugal functions as a bridge across regions, facilitating cross-cluster collaborations. Node sizes indicate publication volume or collaborative strength, and the thickness of lines reflects the intensity of co-authorship ties, collectively demonstrating the geopolitical and regional dynamics shaping global research collaboration.

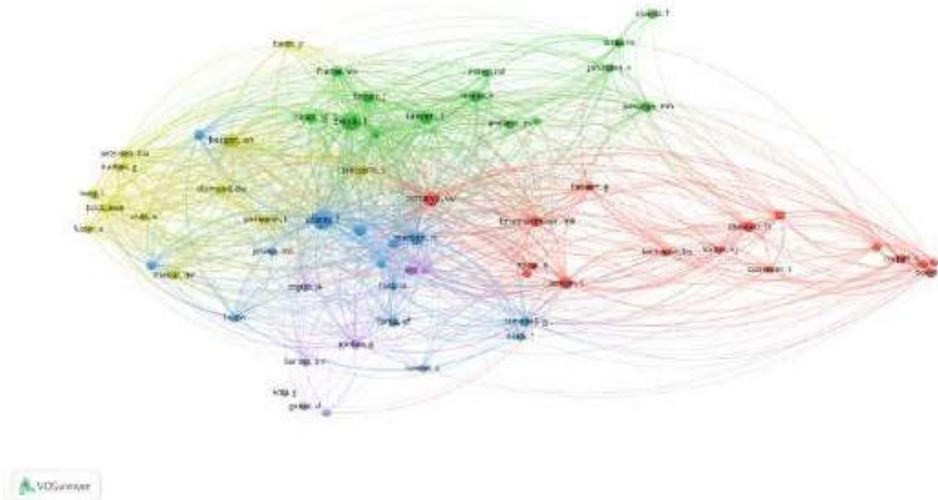
### Co-citation network



The bibliometric co-citation network generated using VOSviewer highlights the intellectual structure of finance and related fields, where node size reflects citation impact, links indicate co-citation strength, and colors represent distinct research clusters. The yellow cluster forms the core of mainstream finance and econometrics with leading journals such as *Journal of Finance*, *Journal of Financial Economics*, and *Econometrica*; the green cluster connects finance with macroeconomic policy and development

studies; the blue cluster emphasizes management, organizational behavior, and decision sciences; the red cluster represents emerging areas such as fintech, energy finance, and sustainability; and the purple cluster focuses on economic theory and political economy. Overall, the visualization demonstrates how traditional finance research serves as a foundation while increasingly integrating with policy, management, technology, and sustainability, underscoring the multidisciplinary and evolving nature of the field

### Co-Citation Network of Influential Authors



The network visualization generated using VOSviewer presents a co-citation map of influential authors in the field of finance and economics, where node size reflects citation frequency, links indicate co-citation strength, and colors represent clusters of authors with shared intellectual influence. The green cluster, featuring authors such as Beck, Levine, Claessens, and Laeven, highlights research in banking, financial development, and institutional economics. The yellow cluster, with prominent figures such as Petersen, Berger, Thakor, and Diamond, emphasizes corporate finance, financial intermediation, and credit markets. The blue cluster, including Allen, Merton, Jensen, and Campbell, focuses on asset pricing, risk management, and financial theory, while the purple cluster, represented by scholars such as Barber and Fama, reflects capital markets, behavioral finance, and market efficiency. On the other hand, the red cluster, with influential scholars such as Brunnermeier, Bekaert, Diebold, and Corbet, represents emerging themes in systemic risk, financial contagion, econometric modeling, and market volatility. The visualization underscores the interdisciplinary and interconnected nature of finance research, where traditional streams of financial theory and intermediation (yellow and blue clusters) are strongly linked with applied areas of financial stability, macro-financial risks, and global crises (red and green clusters). Collectively, the map illustrates how the intellectual foundation laid by classical finance scholars has progressively expanded to address contemporary challenges in financial markets, global integration, and systemic risks.

## DISCUSSIONS

The bibliometric visualizations offer important insights into the intellectual and structural landscape of financial innovation and technology-enabled finance. The keyword co-occurrence map clearly positions “financial innovation” as the central node, connecting diverse thematic areas such as market efficiency, performance, and risk (Ji, 2020), macroeconomic policy and governance (Beck, 2016; Schich, 2017), monetary economics and systemic risk (Brunnermeier, 2009; Bekaert, 2014; Diebold, 2015), fintech and financial inclusion (Boot, 2021; Wang, 2021; Lee, 2021), and blockchain and cryptocurrency (Mendes-da-Silva, 2016; Tao, 2022). This distribution illustrates how traditional finance themes are increasingly intertwined with emerging areas like fintech adoption, crowdfunding, and digital assets, reflecting both the diversification and expansion of the field. The strong interlinkages among clusters demonstrate that research in this area is multidisciplinary and integrative, engaging simultaneously with economic growth, policy frameworks, technological innovation, and sustainability goals. The co-authorship and collaboration networks further emphasize the globalized nature of research in this domain. China and the United States emerge as leading hubs, with extensive partnerships extending to both developed and emerging economies, while Europe demonstrates strong intra-regional collaborations shaped by institutional and EU-funded initiatives. Asian economies such as India, South Korea, and Malaysia are gaining visibility as contributors, often linking regional research with broader international networks. The influential author co-citation analysis reinforces these trends, highlighting foundational scholars in banking and financial development (Levine, 1997; Claessens & Laeven, 2003), corporate finance and intermediation (Petersen & Rajan, 1994; Berger & Udell, 1995; Diamond, 1984), and financial theory (Merton, 1973; Jensen & Meckling, 1976; Campbell, 1991), while also identifying emerging clusters around fintech adoption (Boot, 2021; Wang, 2021), systemic risk (Brunnermeier, 2009; Corbet, 2020), and behavioral finance (Fama, 1970; Barber & Odean, 2001). Together, these findings underscore how the field has evolved from its classical theoretical roots toward addressing contemporary challenges of financial stability, technological disruption, and inclusive growth within a globalized research ecosystem.

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