

Review article

Advancements and trends in cooperative economy research — A Knowledge Map analysis based on CiteSpace and Bibliometrix

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ABSTRACT

Given the rapid development and widespread application of the cooperative economy, an in-depth understanding and continuous focus on its research has become necessary. This study utilizes bibliometric analysis tools, CiteSpace and Bibliometrix, along with visualization techniques, to systematically analyze the progression and trends in cooperative economy research. Each of these tools has its unique advantages and functionalities that supplement each other in the application of bibliometric analysis, enhancing the comprehensiveness and effectiveness of the research. The aim of this study is to reveal the core themes, knowledge structure, and academic influence of cooperative economy research, providing valuable insights and references for future studies. Furthermore, this study explores the application and combination of CiteSpace and Bibliometrix in bibliometric analysis, offering a new perspective for research methodology. The findings are anticipated to contribute to the further development of cooperative economy research, providing theoretical and practical references for the sustainable development of society and economy.

1. Introduction

Social Solidarity Economy (SSE) has been widely recognized as a useful tool for achieving Sustainable Development Goals (SDGs). In recent years, the Social Solidarity Economy, also known as Solidarity Economy or Cooperative Economy, has gradually caught the attention of the academic community and policy makers. As an emerging economic model, it advocates social harmony, sustainable development, and environmental protection (Coraggio, 2011) [1]. Practices under the Social Solidarity Economy model include various forms such as cooperatives, public interest enterprises, and more, with its core values emphasizing fairness, inclusivity, and solidarity (Utting, 2015) [2]. Among these, the Cooperative Economy is the most mature and principal form within the SSE (Filippi M et al., 2023; Iyer, B et al., 2021) [3,4]. Therefore, the cooperative economy can be seen as an effective approach to achieving social and economic sustainable development in the context of globalization, consumerism, and free market economics (Matarrita-Cascante & Brennan, 2012) [5].

Furthermore, the potential of the cooperative economy in sustainable development has also been widely recognized. Many studies have found that the cooperative economy can improve resource utilization efficiency, reduce carbon emissions, and promote the

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development of the circular economy (Bauwens & Kostakis, 2014; Schor, 2014) [6,7]. Moreover, in the local supply and consumption of agricultural products, the cooperative economy also contributes to the realization of sustainable agriculture and food security (Hinrichs, 2014) [8]. Cooperatives play a crucial role in the sustainability and environmental friendliness of agricultural economics (Candemir et al., 2021) [9]. Zhang et al. (2023) [10] and Zhang et al. (2022) [11] explored carbon neutrality's surge in research, focused on emission reduction and carbon capture, and AI's critical role in renewable energy integration for enhanced solar and wind forecasting, respectively, highlighting China's research dominance.

1.1. Historical context of cooperatives and the cooperative economy

The Cooperative Economy is an economic system based on cooperative principles, emphasizing the collective participation and mutual control of enterprise operations by internal group members. Cooperatives, as the core organizational form of the cooperative economy, are democratic operating enterprises based on member ownership, sharing, and sharing of profits and risks. The following is the theoretical development process of the cooperative economy and cooperatives, as shown in Fig. 1:

Robert Owen and the Socialist Experiment (early 19th century) - Owen was a social reformer during the British Industrial Revolution who conducted a series of socialist experiments in New Lanark, aiming to improve the living conditions of workers. Owen's ideas laid the foundation for the later cooperative movement (Owen, 1816) [12].

The Rochdale Pioneers (mid-19th century) - The Rochdale Pioneers, established in 1844, are the founders of the modern cooperative. They formulated a series of cooperative principles, such as voluntary joining, democratic management, and profit distribution, which were later accepted and promoted by the International Cooperative Alliance (ICA) (Birchall, 1997) [13].

Criticism of cooperatives by Friedrich Engels and Karl Marx (mid-late 19th century) - Engels and Marx criticized the limitations of cooperatives in their works, arguing that cooperatives could not achieve widespread social change under the capitalist system. However, they also recognized that cooperatives had certain reform potential and could provide practical experience for the socialist system (Engels, 1880; Marx & Engels, 1848) [14,15].

Émile Durkheim's Theory of Social Solidarity (late 19th-early 20th century) - French sociologist Durkheim proposed the theory of social solidarity, emphasizing the importance of interaction and shared values among social groups for social order. This theory provided support for the theoretical development of the cooperative economy, especially in explaining how cooperatives achieve social integration (Durkheim, 1893) [16].

Modern Research on the Cooperative Economy (late 20th-early 21st century) - In recent years, research on the cooperative economy has involved various fields, such as environmental protection (Baland & Platteau, 1996) [17], sustainable development (Matarrita-Cascante et al., 2016) [18], community development (Phillips, 2003) [19], and globalization (Hirst et al., 2010) [20]. In addition, the practice of the cooperative economy theory has achieved significant results in different countries and regions, such as the Mondragon Group in Spain (Errasti et al., 2003) [21], India's SEWA (Self Employed Women's Association) (Chen et al., 2007) [22], and the Evergreen Cooperative in the United States (Alperovitz et al., 2013) [23].

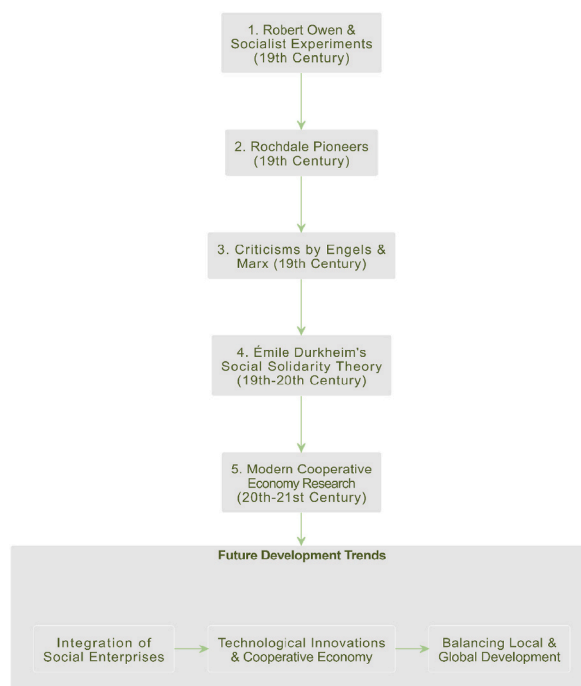


Fig. 1. Historical context of cooperative economy.

Although early social reformers like Robert Owen made key contributions to the cooperative movement, their idealism faced substantial challenges within the capitalist framework of the time, highlighting a significant gap between ideals and reality. The cooperative principles established by the Rochdale Pioneers paved the way for the modernization of the cooperative movement, yet the global expansion of this model encountered multiple difficulties. The critiques by Friedrich Engels and Karl Marx further emphasized the complexity of achieving social change within the capitalist system, highlighting the systemic limitations cooperatives face in realizing their reform potential.

1.2. Distinction between social solidarity economy (cooperative economy) and the sharing economy

In the 20th century, despite Émile Durkheim's social solidarity theory providing theoretical support for how cooperatives promote social integration, these theories proved insufficient in addressing the challenges of rapid globalization. Recent research demonstrates the considerable potential of the cooperative economy in fields such as environmental protection and sustainable development, yet also reveals challenges in implementing cooperative models on a global scale. While localized successes like the Mondragon Corporation and SEWA offer valuable practical experiences, extending these achievements globally remains an unresolved issue. This critical analysis of both the historical and contemporary practices of the cooperative economy not only highlights the close link between practice and theoretical development but also outlines the key challenges that future research must address in the global promotion of the cooperative economy model.

In the past decade, the rise of the sharing economy globally has sparked extensive academic and practical discussion, especially concerning its impact on the environment, society, and the economy (Frenken & Schor, 2017) [24]. Simultaneously, community resilience has become a central topic of sustainable development research (Matarrita-Cascante & Trejos, 2017) [25]. The sharing economy is a model that connects resource owners and users through digital platforms, where resource owners share their unused resources (such as vehicles, houses, or skills) with users in need. Typical examples of this model include Uber and Airbnb. A key feature of this model is that it relies on "temporary leasing" of idle assets, with transactions occurring through the platform. In capital theory, these idle assets are viewed as a form of "physical capital", which are converted into cash flows through the operation of the sharing economy platform.

The intersection between the two lies in the potential impact of the sharing economy on community resilience and how it might affect how communities respond to economic and environmental pressures. However, this potential link is rarely explored in academic literature. As shown in Fig. 2, the cooperative economy model emphasizes fair sharing and democratic decision-making. In this model, workers, consumers, or producers unite to jointly own and operate enterprises. A key feature of this model is its emphasis on community participation and fair distribution of profits. In capital theory, this model views capital as a shared public resource, and through the cooperative economy, the returns of capital are evenly distributed among all participants. Therefore, the sharing economy will not be included in this research.

Within the context of economic globalization, the cooperative economy, due to its unique value, commitment, and structure, faces several challenges such as inadequate competitiveness, and may entail substantial trade-offs. This necessitates choices to be made by cooperatives between adhering to principles of member ownership and control, and maintaining economic viability (McMurtry et al., 2008) [26].

Moreover, the cooperative economy, while promoting social and economic development, also grapples with a series of environmental issues and challenges. Martinez-Alier and colleagues (2010) [27] pointed out that despite the emphasis on environmental protection and social justice in the cooperative economic model, there could be practical challenges in balancing the demands of economic development and environmental protection. Issues of social justice, especially tackling gender inequality and enhancing critical consciousness among young people, also demand attention in the cooperative economic model (Campbell & MacPhail, 2002) [28]. Lastly, establishing effective cooperative relationships and addressing unequal power relations also pose challenges to the cooperative economic model (Gillies, 1998) [29]. Thus, future research needs to delve deeper into the strengths and limitations of the cooperative economy, and how to attain its goals of sustainability, low carbon footprint, and regeneration at the policy and practical levels, grounded in empirical evidence.

Simultaneously, within global sustainability assessments, the cooperative economy is seen as an alternative mode capable of reshaping production and consumption systems. It has garnered widespread attention in the industry as a driver of sustainability transformations (Ziegler et al., 2023) [30]. Furthermore, in current research, the cooperative economy is considered a crucial instrument for promoting sustainable development, particularly in terms of resource sharing and responsibility sharing. The cooperative economy can contribute not only in downstream areas like recycling and reuse but also in upstream areas, like rethinking production and consumption, sharing, and long-term use (Ziegler et al., 2023) [30].

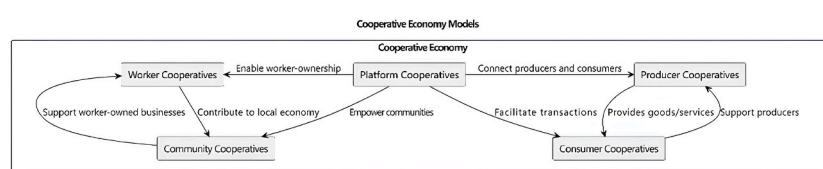


Fig. 2. Cooperative economy model.

Even though research on the cooperative economy in areas like the circular economy is increasing, overall, there are still gaps in knowledge and deficiencies in research perspectives within the current field of cooperative economy research, and a comprehensive research system has yet to be established (Camargo et al., 2021) [31]. Hence, considering the diversity of the cooperative economy and its critical role in sustainable development, low-carbon economy, and circular economy, comprehensive and in-depth research on the cooperative economy is especially important. Without a timely arrangement and establishment of the theoretical framework of the social solidarity economy, the following issues may arise:

Lack of theoretical support: The incomplete research system on the cooperative economy may lead to a lack of comprehensive understanding and support for the cooperative economy theoretically. This may hinder policymakers, entrepreneurs, scholars, and community leaders from effectively promoting and applying the cooperative economy.

Inappropriate policies: Formulating inappropriate policies is a significant challenge facing the cooperative economy. Wehn and Almomani (2019) [32] noted that environmental protection policy formulation could be impacted by information and participation barriers. Israel et al. (1998) [33] stressed that community participation policies need to overcome challenges such as establishing effective cooperative relationships and dealing with power inequalities. Additionally, Cella et al. (2007) [34] posited that public health policy formulation needs to overcome the challenge of making information relevant, credible, and legitimate in the eyes of both researchers and decision-makers. In essence, comprehensive research and understanding are needed when formulating policies to avoid creating policies that do not meet actual demands or hinder the development of the cooperative economy.

Failing to fully exploit the potential of the cooperative economy: Due to the lack of comprehensive research, our understanding and exploitation of the full potential of the cooperative economy may be limited, missing out on opportunities in sustainable development, social fairness, and environmental protection. In the context of sustainable development, Hopwood, Mellor, and O'Brien (2005) [35] emphasized the need for clearer meanings, more focus on sustainable livelihoods and well-being rather than just material possession, and long-term environmental sustainability. Kale, Singh, and Perlmutter (2000) [36] proposed that the integrated approach to building relational capital and managing conflicts can help companies achieve a win-win situation in learning and protecting proprietary assets. The research of Berkes (2004) [37] and Allison and Ellis (2001) [38] highlighted the importance of community participation and traditional ecological knowledge in resource management and poverty alleviation. Lastly, Liu (2003) [39] reminded us that research on sustainable tourism needs a systemic perspective and interdisciplinary approach, which also applies to understanding and exploiting the full potential of the cooperative economy.

Lack of effective implementation strategies: Without a complete research system, we may struggle to find the most effective ways to promote and implement the cooperative economy, leading to potential resource waste and efficiency reduction. Geissdoerfer, Savaget, Bocken, and Hultink (2017) [40] stressed the importance of clear concepts and effective implementation strategies in driving the circular economy and sustainable development. From the perspective of cities and geographical spaces, Brenner and Theodore (2002) [41] revealed the process of neoliberalism reshaping political-economic spaces, which is insightful for understanding and implementing cooperative economy strategies. In rural areas, Jasiński, Kozakiewicz, and Soltysik (2021) [42] showed that the development of energy cooperatives needs to consider various factors, including legal, economic, and community participation. Lastly, Tang et al. (2008) [43] pointed out that China, while pursuing economic development, also faces the challenge of health equity, requiring a concerted effort from the government and society to formulate and implement effective strategies.

Research duplication and resource wastage: In the absence of a comprehensive research system, different researchers might conduct duplicate research on the same issues, resulting in not only a waste of research resources but also potentially slowing down the progress of research. Kotzab and Teller (2003) [44] highlighted the importance of implementing cooperative strategies to meet consumer demands in retail, proposing multiple strategies ranging from simple value-adding partnerships to complex cooperation models. In agriculture and food supply chains, Kamilaris et al. (2019) [45] identified blockchain technology as a promising one that can promote food supply chain transparency, but there are still many technological, educational, policy, and regulatory challenges. In community health services, Greenhalgh et al. (2016) [46] emphasized the importance of co-generating knowledge with other stakeholders, positing that this cooperative innovation approach can enhance the impact of research.

Therefore, this study plans to utilize both Citespace and Bibliometrix, two bibliometric analysis tools, combined with visualization technology, to systematically comb through the research progress and trends of the cooperative economy. This will reveal its core themes, knowledge structure, and academic influence, providing valuable insights and references for future research. Citespace and Bibliometrix each have unique strengths and functions. Their applications in bibliometric analysis can complement and support each other, improving the comprehensiveness and effectiveness of the research. Citespace primarily focuses on the network structure and evolution process of literature data, able to reveal research hotspots, interdisciplinary studies, and knowledge innovation within the field. Bibliometrix provides a wealth of statistical indicators and analysis methods, aiding in examining the development status and influencing factors of cooperative economy research from multiple levels such as quantity, quality, and time sequence.

Through this study, we aim to provide the following marginal contributions to the academic research of the cooperative economy field.

1. Combing through the overall pattern and development process of cooperative economy research from a macro perspective, assisting researchers in understanding the current status and future trends of this field.
2. Revealing the core themes and key literature of cooperative economy research, providing valuable reference materials and research inspiration for researchers.
3. Analyzing the academic impact and knowledge dissemination pathways of cooperative economy research, providing scientific bases and decision-making references for policymakers and practitioners.

4. Exploring the application and combination of Citespace and Bibliometrix in bibliometric analysis, enhancing the innovation and practicality of research methods.

Conducting an in-depth analysis of the literature in the cooperative economy field, with the aim to provide beneficial theoretical guidance and practical references for relevant researchers. By revealing the development status, key themes, and academic influence of cooperative economy research, it helps to promote further development and improvement of cooperative economy research, providing strong support for achieving social and economic sustainable development. Simultaneously, this study attempts to combine Citespace and Bibliometrix in methodology, providing a new research paradigm for bibliometric research, which will assist in more comprehensively understanding the research dynamics and knowledge structure of the cooperative economy field.

In this study, we specifically examine the cooperative economy's contribution to sustainable social and economic development within the context of globalization, consumerism, and free market economics. Our research focuses on how the cooperative economy enhances resource efficiency, reduces carbon emissions, and fosters circular economy development. Additionally, we explore its impact on sustainable agriculture and food security through local agricultural supply and consumption. Through this investigation, we aim to provide a comprehensive understanding of the cooperative economy's role in promoting sustainability and offer valuable insights for policymakers and the academic community. The comparative analysis of the social solidarity economy against the recently emerged sharing economy underscores the unique value of the cooperative economy in promoting fair sharing, democratic decision-making, and community participation. Moreover, this comparison highlights how the cooperative economy can contribute to community resilience and the achievement of sustainable development goals in the face of economic globalization and environmental challenges.

2. Data and research methods

To further explore the profound impacts and current trends of the cooperative economy, we will employ a bibliometric research method to systematically review and analyze the academic literature in the field of the cooperative economy. Through this methodological framework, we aim to reveal the core themes, development trajectory, and academic influence of cooperative economy research, offering new perspectives and theoretical support for future studies.

2.1. Data sources

The data for this study come from the Web of Science (WoS) Core Collection retrieval platform. To ensure the data's authority and representativeness, the citation indexes used are mainly the Science Citation Index Expanded (SCI-Expanded) and the Social Sciences Citation Index (SSCI). The search time range is set from 1900 to 2023. The search term is "Title=(\"cooperat* econom*\") OR Abstract=(\"solidarityecon*\")" for precision retrieval. According to the rules of web of science, an asterisk (*) represents 0 ~ multiple characters. For example, "cooperat*" can be found as "cooperat ion", "cooperative", "cooperatively", and so on. The selected literature type is Article, the language of the literature is English, and the time of retrieval is February 6, 2023. A total of 2502 records were obtained, exported in the plaintext file format "Full record and cited references." Each record includes information such as the article title, authors, institutions, abstract, keywords, and publication years.

Through CiteSpace, the 2502 records are deduplicated. The time range is set from January 1994 to December 2022, with a time slice of 1 year. After excluding duplicate and invalid data, the remaining effective data total 1996 records, which serve as the subjects of analysis for this study. Although the Web of Science includes literature in multiple languages, we particularly focused on English-language publications for our bibliometric analysis. This approach was driven by the need for a homogeneous language database to ensure consistency and accuracy in our analysis. It's important to note that English publications constitute 83.12 % of the database, demonstrating a substantial presence of English-language research in the field of cooperative economy. This extensive use of English, even by researchers from non-English-speaking countries, highlights the global academic community's preference for English as the lingua franca for scholarly communication in this area. These publications cover a wide range of topics and global perspectives, offering a comprehensive view of the cooperative economy research landscape. This indicates a minimal language bias, allowing us to effectively capture the main trends and developments. The predominance of English publications in our dataset not only facilitates a streamlined and coherent analysis but also reinforces the reliability of our findings by ensuring a broad and inclusive representation of global research trends in the cooperative economy.

Having established the source and method of data collection, we will delve deeper into analyzing this data, utilizing the powerful capabilities of CiteSpace and Bibliometrix tools for visualizing and comprehensively analyzing the literature in the field of the cooperative economy. This step will not only help identify research hotspots and knowledge structures but also provide us with essential perspectives on how the cooperative economy has developed and transformed on a global scale. These combinations were meticulously designed to capture the breadth and depth of the field, ensuring all relevant documents from the Web of Science (WoS) database were retrieved. After the initial retrieval, we merged all datasets associated with each keyword combination and conducted deduplication. This step is crucial for maintaining the integrity of our analysis and avoiding redundancy.

2.2. Research methods

The research method of this study is based on the theory of bibliometrics (Alan Pritchard, 1996) [47]. Bibliometric analysis is a commonly used and effective method to comb through the development context and trends of a certain field. Its feature is that it can

objectively and comprehensively present research results (Donthu N et al., 2021; Lei Fan et al.,2022; Xu wei et al.,2022; Zhong et al. 2022)) [48,49,50,51]. Additionally, recent bibliometric studies showcase environmental science and technology's pivotal roles in sustainability and economic resilience. Chen et al. (2022) [52] emphasized wastewater treatment's evolution, particularly through ozonation and membrane filtration against pharmaceutical contaminants, with significant input from China and the US.

Citespace Workflow for Bibliometric Analysis

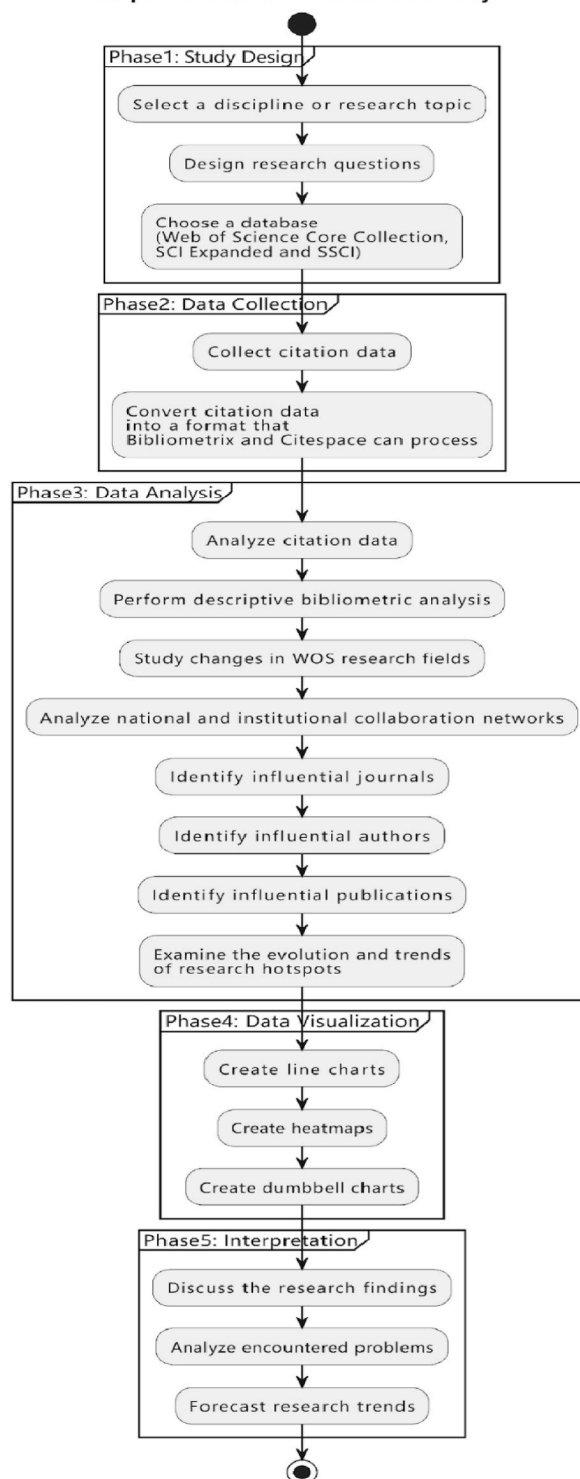


Fig. 3. Flow chart of the study.

Since the CiteSpace software has excellent literature analysis processing and data visualization capabilities, this study chooses CiteSpace V.5.7.R5 version as the data processing software. According to Professor Chen Chao Mei's operation use of CiteSpace software (Chen Yue et al., 2014; Chen Yue et al., 2015) [53,54], the deduplicated 1996 records are imported into the CiteSpace software for visualization and chart analysis. This generates corresponding charts for annual publication volume, authors, institutions, countries, keyword time series, and highly cited literature, intuitively displaying the research development context in the field of solidarity economy and cooperative economy.

In this study, when analyzing the literature on cooperative economics, CiteSpace is first used to complete data processing, cleaning, and preliminary analysis. The processed data are then imported into Bibliometrix and CiteSpace software for visualization analysis. In this way, we can more intuitively understand the key literature, research topics, and trends in the field.

Our methodology distinguishes this study from previous bibliometric analyses in the cooperative economy field through the combined use of CiteSpace and Bibliometrix tools, advanced visualization techniques, an interdisciplinary research perspective, and the identification of emerging research themes. The innovative dual-tool strategy enhances both the depth and breadth of our analysis, leveraging the unique strengths of each tool to provide a more comprehensive understanding of the field. Advanced visualization techniques, including timeline clustering and document coupling, offer intuitive insights into the evolution and core issues of cooperative economy research. By adopting an interdisciplinary approach, we enrich the theoretical foundations and broaden the scope of cooperative economy studies. Additionally, our focus on emerging themes and trends, such as sustainability and technological integration, identifies cutting-edge research directions. This novel methodological approach not only strengthens our contribution to the literature but also sets a new standard for future bibliometric analyses in this and other fields. The flow of our research is shown in Fig. 3.

3. Data analysis results

3.1. Number of articles published per year

The global research trends in the field of cooperative economics can be broadly divided into three stages: the budding stage (1994–2000), the slow growth period (2001–2015), and the research explosion period (2016–2022).

From 1994 to 2000 was the budding stage, during which research on cooperative economics was extremely scarce. Only one article on the relevant theme was published in 1994, and the annual publication volume from 1995 to 2000 was zero, indicating that few researchers were involved in the study of cooperative economics during this period. The period from 2001 to 2015 was the slow growth period. Compared with the budding stage, research during this stage saw a significant increase. In 2001, there were 12 SCI/SSCI indexed journal articles published, and by 2015, the annual publication volume had reached 86, an increase of 7.16 times, indicating that cooperatives and cooperative economics began to attract the attention of some researchers.

The period from 2016 to 2022 was the research explosion period for the topic of cooperative economics. In 2016, the annual publication volume in the field of cooperative economics broke through 100 for the first time, reaching 102. Afterwards, it increased by about 30 papers per year, and by 2022, the annual publication volume had reached 256. By the end of 2022, the cumulative annual publication volume for this stage had reached 1,264, 1.96 times that of the slow growth period (646 papers). This suggests that there is a high level of research heat for the related research on cooperatives, cooperative economics, and solidarity economics. This is shown in Fig. 4.

3.2. Publication status by country

The visualization of the main countries publishing research related to cooperative economics on WoS from 1994 to 2022 consists of 657 nodes and 683 relationship lines, with a density of 0.0032, as shown in Fig. 5. The size of the nodes indicates the number of

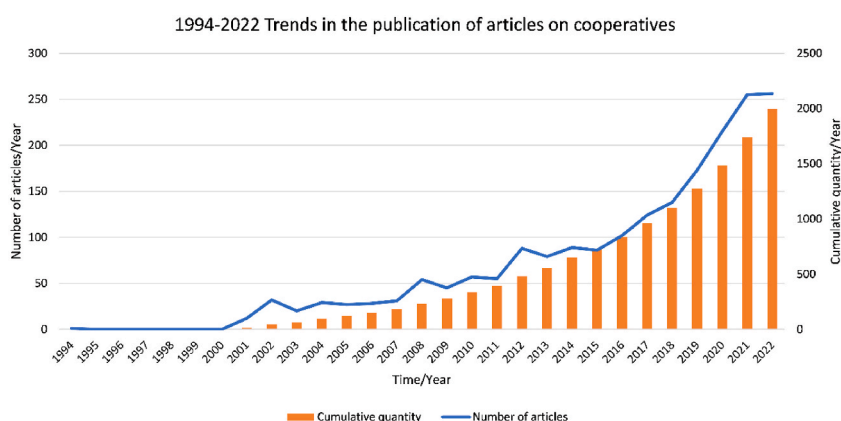


Fig. 4. Trends in annual publication volume in the field of cooperative economy, 1994–2022.

journals published by the country, the larger the node of a country, the more papers are published by that country. The United States ranks first with 446 papers, followed by the United Kingdom with 141 papers in second place, and China in third place with 114 papers. The countries ranked four to ten are Germany (95 papers), Canada (67 papers), Italy (58 papers), France (57 papers), Spain (51 papers), Australia (48 papers), and the Netherlands (39 papers), as shown in Table 1.

Looking at the geographical distribution, current research on cooperative economics is mainly concentrated in Europe and North America, indicating that Western countries have paid more attention to cooperative economics in recent years. In the Asian region, the only country ranked in the top ten worldwide is China, indicating that current research in the field of cooperative economics in Asian countries is still relatively scarce. This may be closely related to factors such as national policy, level of economic development, and environmental awareness.

In the field of cooperative economics research, the close cooperative relationships between China and the United States, China and the UK, the US and South Korea, and the UK and the US have received wide attention (as shown in Fig. 6, and Table 2). As some of the world's largest economies, these countries possess strong economic capabilities, and cooperation aids in maintaining global competitiveness and influence (IMF, 2020) [55]. Each of these countries has its own strengths in areas such as technology, talent, and markets, and through cooperation, they can achieve resource complementarity and improve overall benefits (Rodrik, 2006) [56]. Simultaneously, the close cooperative relationships among these countries may be due to their common interests in geopolitics, security, and other areas (Drezner, 2014) [57].

Regarding historical and cultural backgrounds, these countries have many commonalities, facilitating exchanges and cooperation (Segal, 2011) [58]. Moreover, in education and scientific research fields, these countries have a strong foundation of cooperation. Many top universities and research institutions have established cooperative relationships between these countries, providing support for cooperation in the field of economic research (Wagner, 2008) [59].

In summary, the close cooperative relationships among these countries in the field of cooperative economics research reflect their mutual connections and dependencies in multiple aspects such as economics, politics, strategy, history, and culture. This cooperative relationship aids in promoting global economic prosperity and development.

3.3. Research institutions and core authors

From 1994 to 2022, the visualization of the main research institutions involved in cooperative economics research in the Web of Science consists of 591 nodes and 207 relationship lines, with a density of 0.0012. As indicated in Fig. 7, the University of Amsterdam, the University of Oxford, and the University of Toronto are the leading contributors, each having contributed 14 journal articles on the subject of cooperative economics. Following them, the Chinese Academy of Sciences and Harvard University have respectively contributed 11 and 10 journal articles. Other institutions have contributed fewer than 10 articles. This analysis reveals that universities are still the primary research institutions in the field of cooperative economics. Moreover, the relationship lines between these institutions are relatively weak, suggesting a lack of inter-institutional communication in this field.

Particularly after 2008, these institutions experienced a rapid growth in their research outputs, as shown in Fig. 8. Notably, Avelino et al. (2017) [60] from the University of Amsterdam investigated how transformative social innovations impact (empower and dis-empower) and their role in promoting cooperative economics and sustainable development.

Connelly (2011) [61] from the University of Oxford proposed a social learning framework aimed at facilitating community transitions by connecting sustainability and socio-economics.

Mook (2015) [62] from the University of Toronto provided a comprehensive discussion on how non-profit organizations and co-operatives engage in social accounting to measure and report their impacts on society and the environment. It highlighted the key role

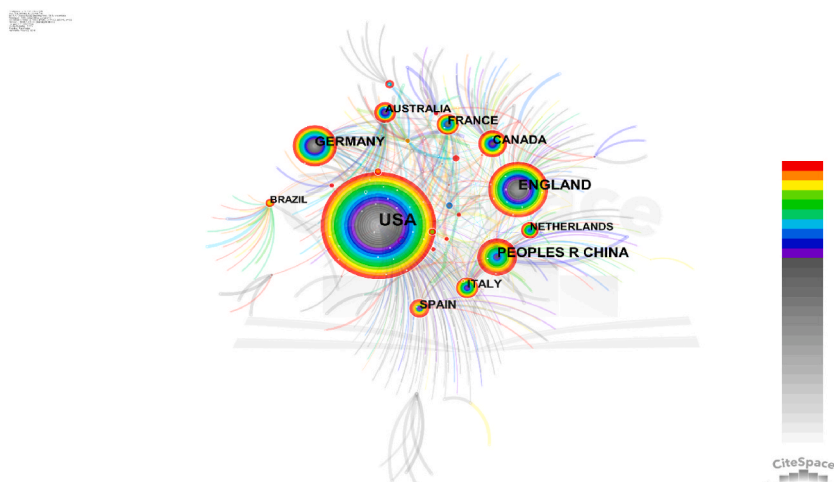


Fig. 5. Top countries for cooperative economy research.

Table 1
Top 10 countries in terms of research publications in the field of cooperative economy.

Serial No.	Number of articles	Country
1	446	USA
2	141	ENGLAND
3	114	PEOPLES R CHINA
4	95	GERMANY
5	67	CANADA
6	58	ITALY
7	57	FRANCE
8	51	SPAIN
9	48	AUSTRALIA
10	39	NETHERLANDS

Country Collaboration Map

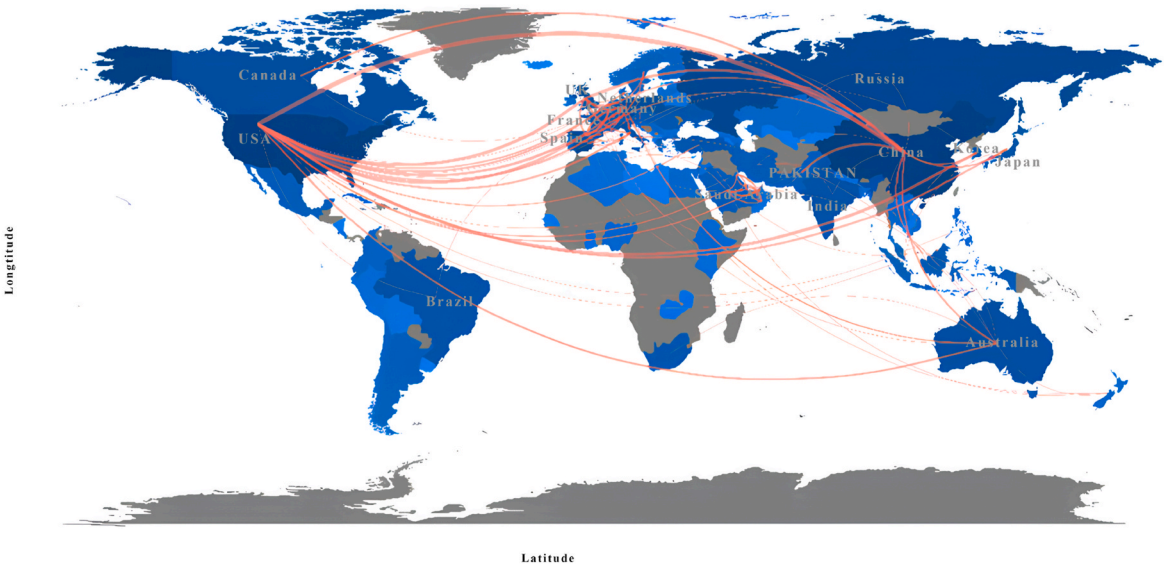


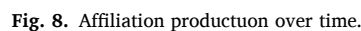
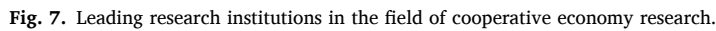
Fig. 6. Country collaboration map.

Table 2
Country collaboration.

From	To	Frequency
CHINA	USA	19
CHINA	UNITED KINGDOM	9
USA	KOREA	9
USA	UNITED KINGDOM	9
CHINA	PAKISTAN	7
USA	FRANCE	7
USA	GERMANY	7
GERMANY	FRANCE	6
UNITED KINGDOM	NETHERLANDS	6
CHINA	AUSTRALIA	5

of social accounting in promoting cooperative economics and sustainable development.

Lotka’s Law suggests that in a specific research field, only a few authors have high research productivity, while the majority of authors have lower productivity,as shown in Fig. 9. In terms of research in the field of cooperative economics, the distribution of author productivity is analyzed using a Lotka’s Law graph. The horizontal axis represents the productivity of authors (i.e., the number of published papers), and the vertical axis represents the proportion of authors with productivity at that level to the total number of authors. The curve in the graph represents the distribution law of author productivity, with its slope (i.e., the Lotka’s Law index) reflecting the degree of productivity concentration. The solid line reflects the concentration of authors in the field of cooperative



Observing the proportion of authors with higher productivity in the graph suggests that research in the field of cooperative economics demonstrates a distinct "Matthew Effect", as shown in Fig. 10. The high proportion of productive authors indicates that the research competition in this field is intense, with some leading figures or core teams. For example, Julie Graham and Katherine Gibson (2006) [63] provided a post-capitalist political perspective and focused on cooperative economics, community currencies, and other alternative economic practices. Albert, M., & Hahnel, R. (1991) [64] proposed the theory of participatory economics, emphasizing the role of cooperation and resource sharing in building fair, democratic, and sustainable economic systems. Michel Bauwens (2014) [65] expressed views on a new economic system based on sharing and cooperation, focusing on the potential of decentralized production and communication methods to promote social innovation and environmental sustainability. Schor, J. (2010) [66] explored emerging cooperative economic practices such as the sharing economy, local currencies, and community-supported agriculture. Her research focused on the potential changes to consumer behavior, labor markets, and the environment brought about by cooperative economics.

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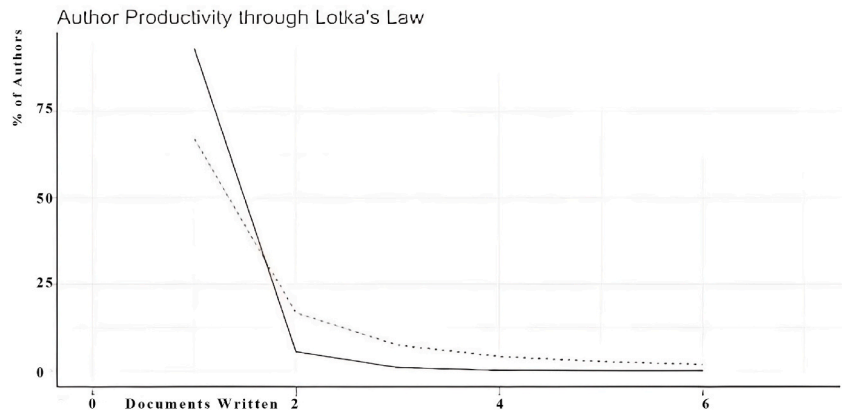


Fig. 9. Author productivity through Lotka's law.

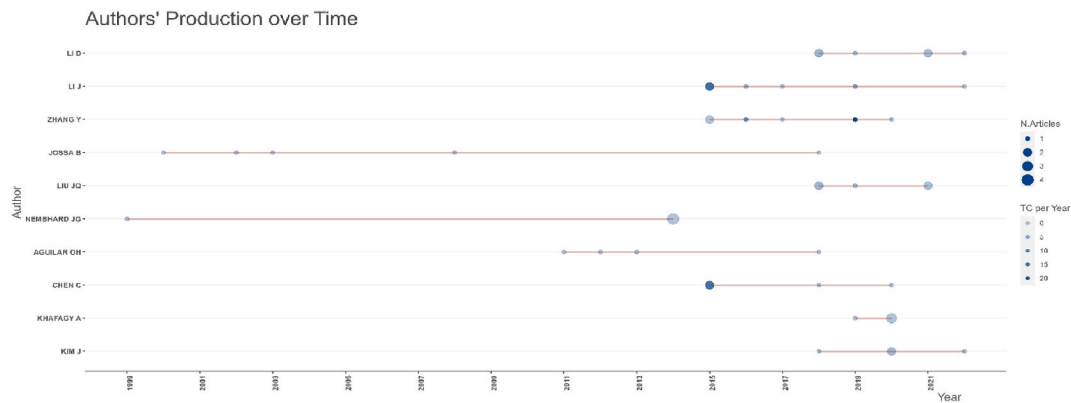


Fig. 10. Author Production over time.

KOOS stand out with the highest publication count, each with four papers. Notably, Li and Liu (2019) [67] primarily explored behavioral economics in social networks, especially dynamic cooperation based on altruism. The core of their research lies in proposing a new model to understand and depict dynamic cooperative behaviors based on altruism within social networks, providing a new way to understand and interpret cooperative behaviors in cooperative economic social networks. Following them are ANIL KUMAR and BRIAN BURGOON, each with three publications, while other authors have published two or fewer papers. This suggests that the field of cooperative economics remains relatively unexplored, awaiting further cooperation, exploration, and development by researchers, as shown in Table 3.

The alluvial diagram is able to express the correlation between various types of nodes, and it is often effective in visualizing the evolution and flow of clusters. Fig. 11 illustrates how the theme of cooperative economy has evolved over time through research at different universities to the finalization of different keywords.

Table 3
Top 10 core authors of research articles in the field of cooperative economy.

Serial No.	Number of articles	Author
1	4	DENG LI
2	4	JIAQI LIU
3	4	SEBASTIAN KOOS
4	3	ANIL KUMAR
5	3	BRIAN BURGOON
6	2	A LOWENSTEIN
7	2	ADANELLA ROSSI
8	2	ADELLE BLACKETT
9	2	ALAIN SUPIOT
10	2	ALCIDES COSTA VAZ

3.4. Citation analysis

Fig. 12 depicts the distribution of cited literature in the field of cooperative economics from 1994 to 2022. The number of citations a paper receives can to some extent reflect whether a certain field is a popular area of research. The more often a paper is cited, the more attention the field attracts, indicating greater academic influence (Hou Yaojun et al., 2023) [68]. The distribution of cited literature in the field of cooperative economics from 1994 to 2022 comprises 809 network nodes and 1331 relationship lines, with a density of 0.0041. The five most frequently cited papers are by Peter Utting (2015) [2] with 11 citations, Arianna Tassinari (2020) [69] with 10 citations, Craig Borowiak (2018) [70] and Jeff Y-J Chen (2018) [71], each with 9 citations, and Thomas Piketty (2014) [72] with 8 citations. All other papers on cooperative economics have been cited 8 times or fewer. This indicates that the field currently lacks the publication of authoritative experts and authoritative papers.

As shown in Fig. 13 Reference Publication Year Spectroscopy (RPYS) is used to analyze the distribution of publication years of references. RPYS can help researchers identify classic literature and knowledge schools within a field, thus understanding the field's foundational research and evolution. By observing the RPYS graph, it can be seen that there is a peak representing a high frequency of citations for literature published in 2017, implying that literature from 2017 had a significant impact on the field. It also reveals different knowledge schools in various periods. For example, high scores between 1993 and 2017 also indicate that cooperative economics research is directed towards specific research directions or themes.

In 2017, important progress was made in the field of cooperative economics. Pecl et al.'s research (2017) [73] emphasized the importance of environmental sustainability for socio-economics, which is consistent with the core concept of cooperative economics—sharing and sustainable use of resources. Additionally, Geissinger et al. (2017) [74] described the rise of the circular economy, a new framework designed to extend the productivity of resources, which aligns with the concept of cooperative economics. Finally, Fazey et al. (2017) [75] provided theoretical and practical foundations for understanding and implementing the cooperative economy. The research of this year indeed emphasized the core ideas of cooperative economics—sharing and sustainable use of resources, and the application of these ideas globally.

When the trends of "Number of Cited References" and "Deviation of the 5-year Median" are roughly the same, this signifies that the number of citations in the entire research field presents a similar trend over time. This might suggest that the research themes, methods, or researchers in the field have a certain continuity across different periods. On the other hand, if the trends of these two indicators show significant differences, it could suggest major changes in the field's research at different stages, such as the emergence of new research topics or the publication of important literature.

3.5. Keyword analysis

In keyword emergence analysis, keyword emergence signifies the rise and fall of a research area, reflecting hot research trends (Dong S L et al., 2023; He Ai-hua et al., 2023) [76,77]. The top 13 emerging keywords are displayed (as shown in Fig. 14), the earlier a keyword appears, the sooner it is noticed. As shown in the figure, the earliest emerging keyword is "cooperation" in 2002, which is also the keyword with the strongest emergence, with an emergence strength of 7.96, indicating that cooperation is the hottest issue in the field of cooperative economy. The keyword with the longest emergence time is "globalization" for 11 years, indicating that globalization has been an important component of cooperative economy research for the past 11 years. Globalization has consistently been a major theme in the research of the cooperative economy field from 2003 to 2014. Vogel's (2008) [78] research unveiled the privatization of global business rules, introducing a new dimension to global business norms. This voluntary "civil rule" reflects the expansion of legitimate authority in the global economy and the use of alternative regulatory tools such as self-regulation, market-based tools, and soft law. In addition, Luderer et al. (2013) [79] used an integrated energy-economy-climate model system to examine how further delays in cooperative action and technology availability would impact the climate mitigation challenge. Bernauer et al.'s (2010) [80] study compared the sources of international and domestic governance dynamics, finding that international factors had a larger and

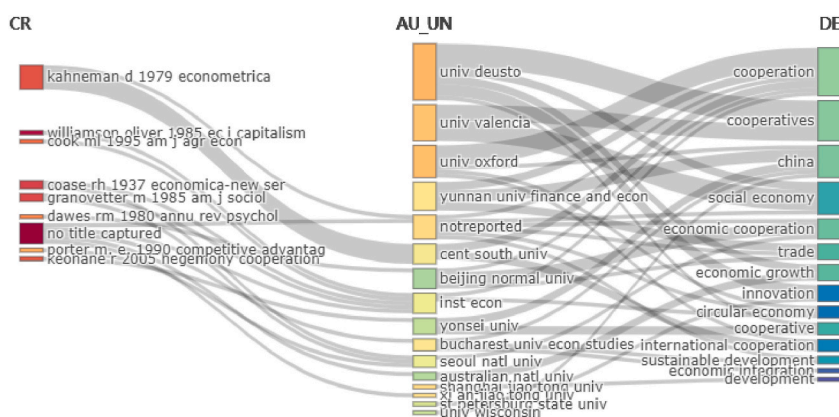


Fig. 11. Alluvial diagram.

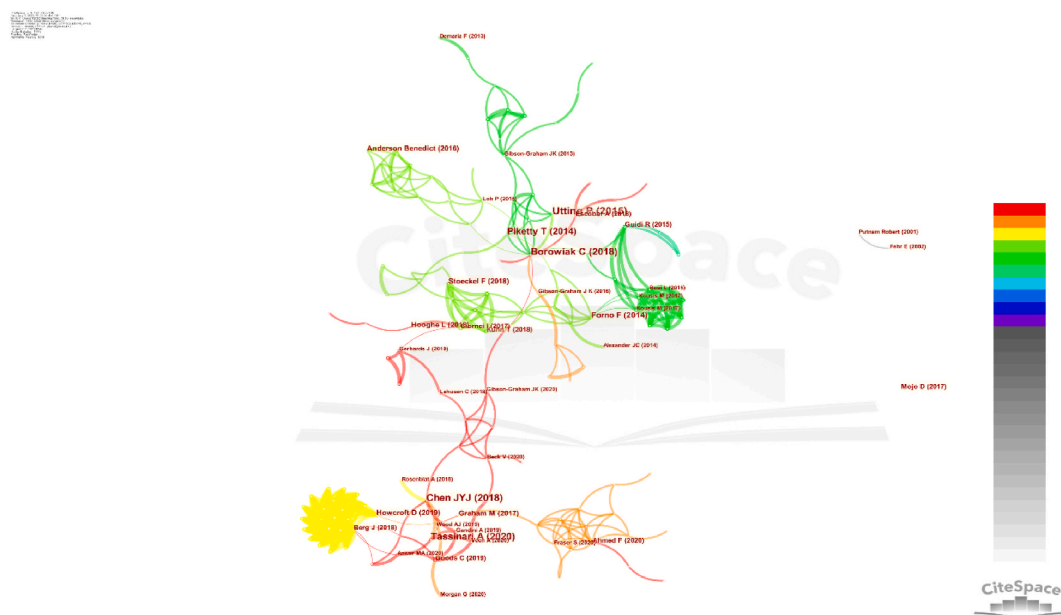


Fig. 12. Distribution of cited literature in the field of cooperative economy.

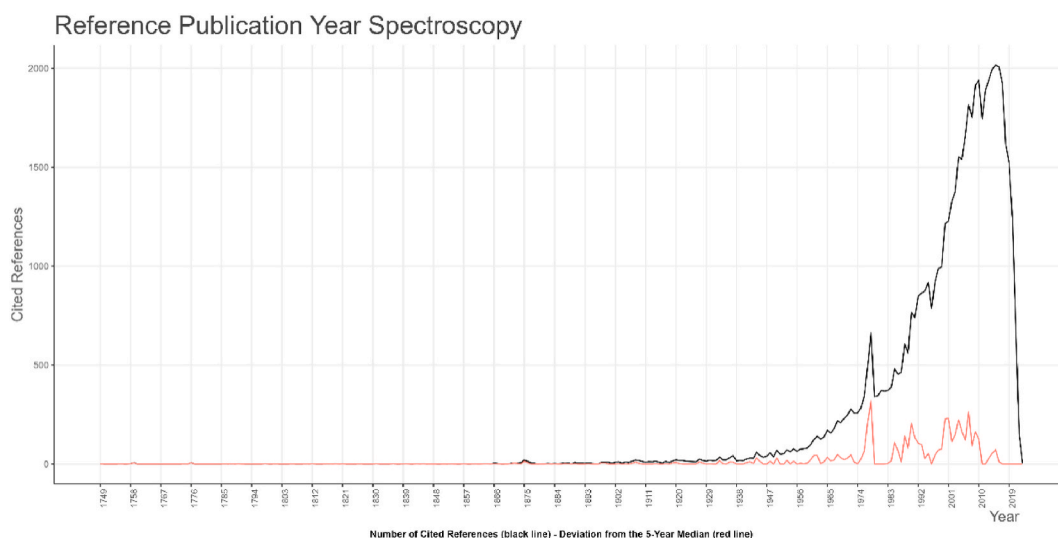


Fig. 13. Reference publication year spectroscopy.

more positive impact on cooperative behavior than domestic factors. Üstüner and Thompson's (2012) [81] research explored how market performances generate interdependent status games and contested forms of symbolic capital, especially within the relationships between affluent consumers and bottom-tier service workers. These studies all explore to some extent the relationship between globalization and the cooperative economy, and how this relationship impacts global governance, the challenges of climate change, market performances, and other issues.

In recent years, the most attention-grabbing keywords have been "economic crisis" and "integration", which indicate that after the occurrence of an economic crisis and economic recession, the emphasis on mutual aid, the beneficial social solidarity economy, and the cooperative economy has become particularly important.

3.6. Keyword clustering

The timeline cluster of keywords combines time with keywords, accurately reflecting the research focus and trend changes in each period. As shown in Figs. 15 and 16, the markers #0~#7 represent the order of clustering. These include "cooperation", "covid-19",

Top 13 Keywords with the Strongest Citation Bursts

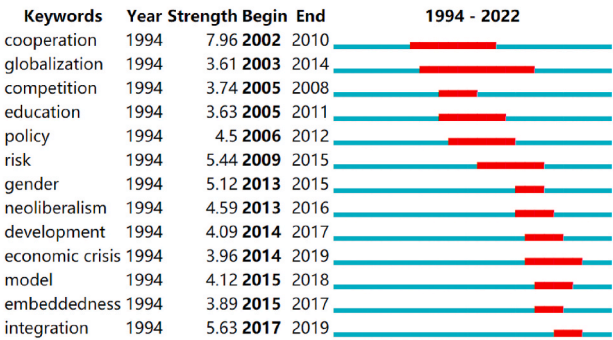


Fig. 14. Top 13 emerging keywords.

"greece", "social innovation", "European Union", "social capital", "solidarity economy", and "renewable energy" which are the main research topics in the field of cooperative economy. Among them, the research topic with the longest duration is "cooperation", and the keyword with the highest frequency is "solidarity", appearing 145 times. This indicates that cooperatives and the solidarity economy are the focal points of researchers' attention, especially after the pandemic, their importance is further highlighted.

In the field of cooperative economy research, the "clusters by documents coupling" graph generated in this paper provides researchers with insights about different research topics and areas (as shown in Fig. 17). According to Aria & Cuccurullo (2017) [82], the horizontal axis of this type of graph represents centrality, while the vertical axis represents influence. The second quadrant (low centrality, high influence) contains innovative research themes (such as redistribution, support, and immigration) that may lead new research directions, despite their relatively marginal positions in the overall research network (Bornmann & Leydesdorff, 2014) [83].

In contrast, the fourth quadrant (high centrality, low influence) encompasses traditional research areas (such as reciprocity, globalization, etc.) that hold central positions in the research network, but have a lower influence in the current research environment (Waltman & Van Eck, 2013) [84]. Within this quadrant, topics like politics, globalization, and growth may seem relatively unremarkable due to their lower recent attention or diminished influence compared to other emerging areas. This suggests that researchers may need to explore new methods, technologies, or theories to invigorate these areas to increase their future impact (Glänzel & Schubert, 2005) [85].

3.7. Academic and journal development status

The overlay of the journal's dual-map shows the position of the research topic relative to the major research disciplines, as shown in Fig. 18. The left side represents the citing map, while the right side represents the cited map, with the curve serving as the citation link, comprehensively displaying the context of citation relationships. In the map on the left, the oval shapes represent the number of publications for a particular journal. The length of the oval represents the number of authors, while the width indicates the number of papers published. As can be seen from the figure, publications in the fields of Mathematics, Systems, Mathematical Physics, and

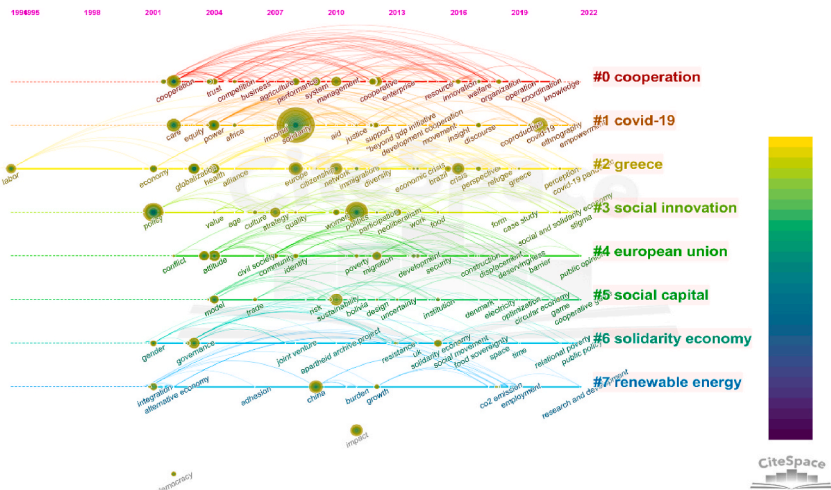


Fig. 15. Timeline cluster of keywords.

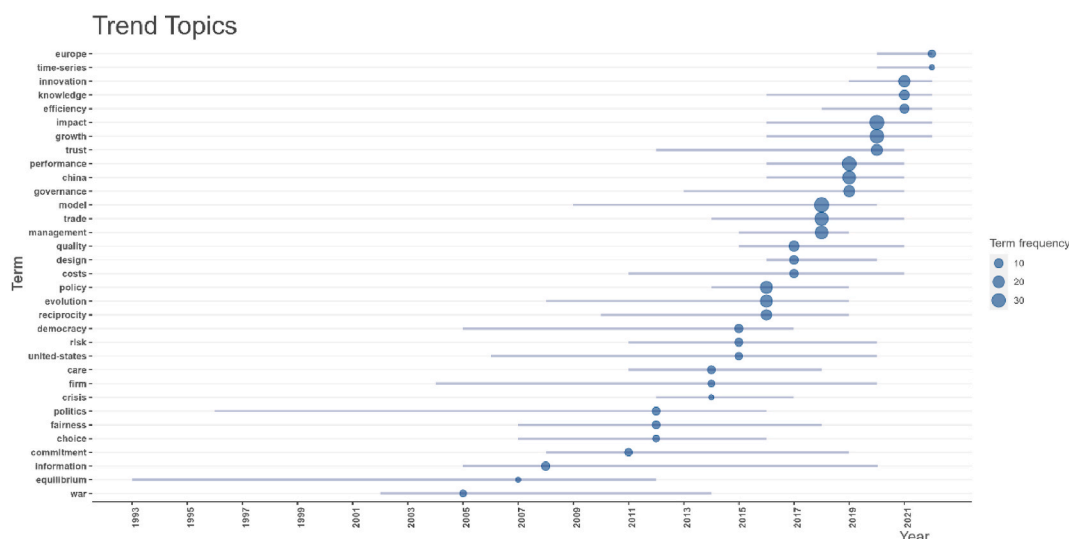


Fig. 16. Trend topics.

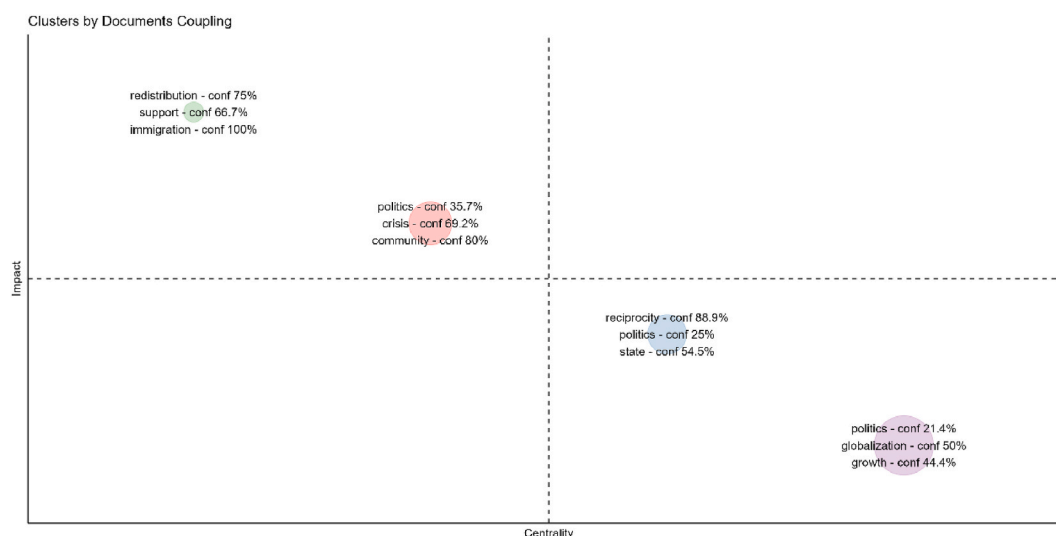


Fig. 17. Clusters by documents coupling.

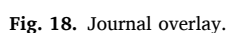
Ecology appear to be significantly influenced by publications from the Chemistry, Veterinary, Plant, and Environmental science fields.

According to Bradford's Law analysis (as shown in Fig. 19), journal publications in this field conform to Bradford's Law, indicating a certain regularity in the distribution of research in the field of cooperative economics. Journals such as "Journal of Rural Studies" and "Globalizations" are representative in the research of cooperative economics and have published many influential articles.

In the "Journal of Rural Studies," the focus of research on cooperative economics lies in the cooperative models in rural communities and their impact on social and economic development. For instance, Maye et al.'s (2017) [86] study explored how rural cooperative enterprises promote local economic development and social cohesion. This research provides robust empirical support for the role of cooperative economics in rural communities.

In the "Globalizations" journal, research on cooperative economics covers cooperative models and strategies in the context of globalization. For example, Utting (2015) [2] analyzed the potential of cooperative economic models in reducing poverty and promoting sustainable development under globalization. This study provides in-depth theoretical and practical insights into the roles and challenges of cooperative economics in the context of globalization.

In summary, through a literature review of journals such as "Journal of Rural Studies" and "Globalizations," researchers can gain a better understanding of the practical applications and impacts of cooperative economics in various contexts. These studies provide rich knowledge and experience for the theoretical development and practical exploration in the field of cooperative economics, contributing to further promoting the development of cooperative economics worldwide.



In the "Sustainability" journal, research on cooperative economics covers sustainable development goals at social, environmental, and economic levels. Zhang et al.'s (2021) [90] study evaluated the application of cooperative economics in agriculture, particularly

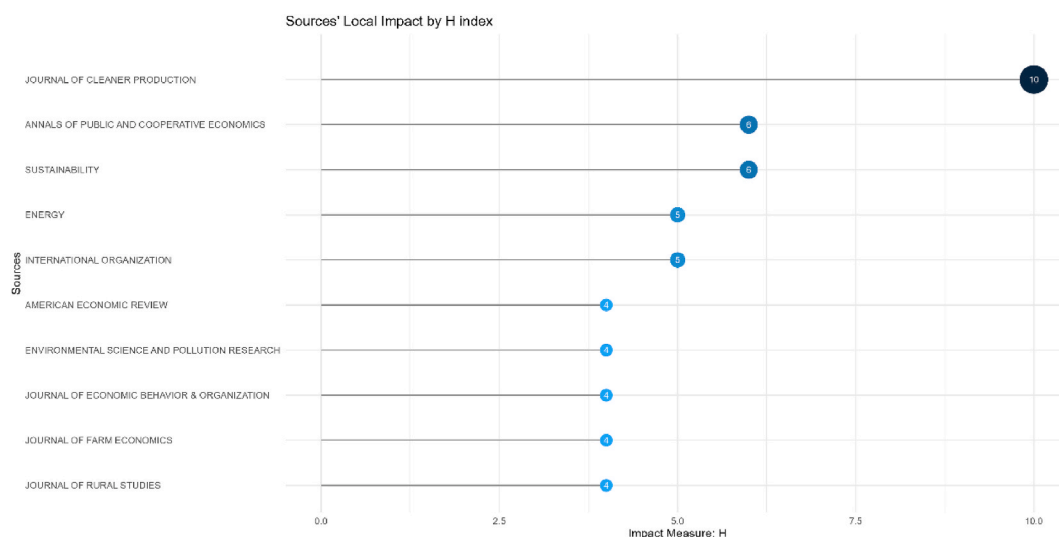


Fig. 20. Sources local impact by H index.

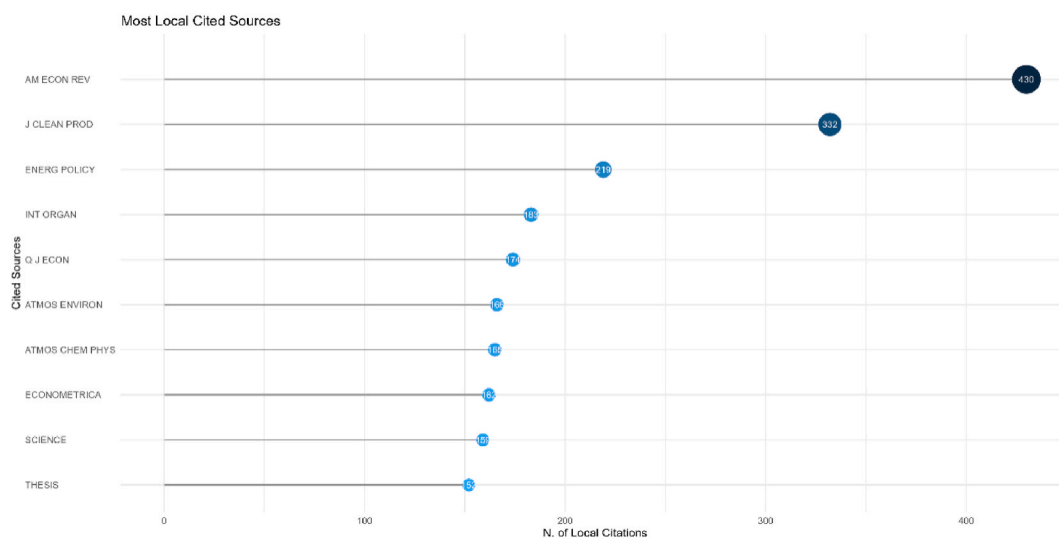


Fig. 21. Most local cited sources.

its role in promoting economic sustainability for small farmers. This research provides empirical support for the significance of cooperative economics in promoting sustainable agricultural development.

In summary, these highly-cited journals offer a wealth of knowledge and practical cases for research in the field of cooperative economics. By synthesizing the research outcomes of these journals, researchers can better understand the roles and potential of cooperative economics at environmental, social, and economic levels, providing a theoretical and empirical foundation for future research and practice.

Research in the field of cooperative economics also spans many top-tier journals, such as the "American Economic Review," "Quarterly Journal of Economics," and "Energy Policy," all of which have published representative research articles in the realm of cooperative economics.

In the "American Economic Review," studies pertaining to cooperative economics often focus on theoretical models and the impact of economic policies. Dal et al.'s (2011) [91] research offered insights into the conditions under which cooperation holds an advantage in indefinitely repeated games. This information can be employed to design cooperative economic systems that encourage collaboration among participants. The study provides robust theoretical support for understanding the potential of cooperative economics in the area of financial risk.

Research on cooperative economics in the "Quarterly Journal of Economics" often involves macroeconomic policies and development strategies. For example, Acemoglu et al.'s (2017) [92] study revealed the impact of cooperative political systems on economic

growth and income distribution, offering researchers a new perspective on the relationship between cooperative economics and macroeconomics.

In the "Energy Policy" journal, the focus of research on cooperative economics lies in the relationship between energy cooperation and sustainable development. For instance, Hoffman et al.'s (2016) [93] research explored how energy cooperation provides funding and technical support for renewable energy projects to achieve a more sustainable energy system. This study offers empirical support for the role of cooperative economics in promoting energy transition.

In summary, these top-tier journals provide a wealth of theoretical and empirical basis for research in the field of cooperative economics. By integrating the research results from these journals, researchers can better understand the practical application and impact of cooperative economics in different fields, providing valuable knowledge and experience for future research and practice.

4. Conclusion

This study has combed through the research hotspots, frontiers, and development patterns of the cooperative economy and cooperatives in the early stage, with a particular focus on global research results. In the past few decades, the number of articles on the cooperative economy has increased, indicating that this new topic is gaining attention. The results of our research outline the current status of research on the cooperative economy and its mechanisms, and are of significant importance for future research directions. From the research results, the following main features are presented:

The global trend of publications in the field of the cooperative economy has shown a curve from slow to rapid growth, which can roughly be divided into three stages: the budding period (1994–2000), the growth period (2001–2015), and the outbreak period (2016–2022). This trend shows that the heat of research on the cooperative economy is gradually increasing. In addition, from the Sankey diagram (Fig. 22), it can be seen that between 1992 and 2008, frontier research related to the cooperative economy was the most divergent. Since then, more papers on the cooperative economy have adopted the economic research paradigm. In international research, the main participants in global cooperative economic research include the United States, the United Kingdom, China and other countries, among which the United States is the most active participant. These countries' multi-faceted connections have promoted the in-depth development of cooperative economic research.

From 1994 to 2022, the main institutions of cooperative economic research were mainly concentrated in the University of Amsterdam, the University of Oxford, and the University of Toronto, with high-yielding authors including Deng Li, Jiaqi Liu, and Sebastian Koos. These studies basically comply with Lotka's Law, showing that research in the field of the cooperative economy is still relatively concentrated and needs the participation and development of more researchers. In addition, the RRY chart shows that the field of cooperative economy research has been cited many times during this period, but there is a lack of authoritative experts and authoritative papers, showing that the research topics, methods, or researchers in this field have a certain continuity at different times.

In keyword research, "cooperation" and "solidarity" have been identified as the focus of research, especially after the pandemic, the importance of these topics is even more prominent. However, although "globalization" has been an important part of cooperative economic research for the past 11 years, its influence is relatively low in the current research environment. This shows that researchers need to explore new methods, techniques, or theories to refresh these fields to enhance their future impact. In addition, research in the field of the cooperative economy has received wide attention and discussion in multiple disciplines and journals. These studies reveal the role and potential of the cooperative economy at the environmental, social, and economic levels from different perspectives, and provide theoretical and empirical foundations for future research and practice.

Through the analysis above, this study has identified several core themes within cooperative economy research, which not only highlight the focus areas of research but also indicate potential directions for future studies. These core themes include sustainability and environmental protection, social innovation, technological integration, impacts of globalization, and transformation of cooperative economy models post-pandemic. These themes collectively reflect the current status of cooperative economy research and its potential role in the sustainable development of society and the economy.

By analyzing keywords and clustering literature, this study has not only determined these core themes but also revealed key literature in cooperative economy research, providing valuable reference materials and inspiration for researchers. For instance, under the theme of sustainability and environmental protection, studies have shown that cooperative economic models can support

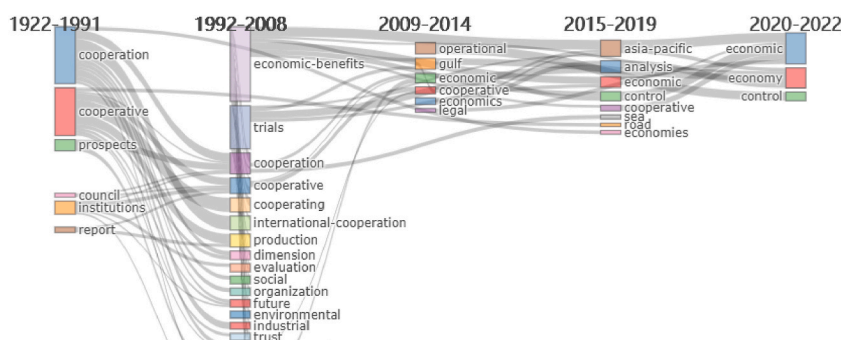


Fig. 22. Alluvial diagram of cooperative economy.

environmental sustainability goals by promoting efficient use of resources and reducing carbon emissions (Bauwens & Kostakis, 2014 [6]; Schor, 2014 [7]). In terms of social innovation, the cooperative economy is regarded as a significant force in driving societal change and innovation, especially in addressing global challenges such as climate change and economic inequality (Avelino et al., 2017 [60]).

Furthermore, technological integration is identified as a key area for the development of the cooperative economy, particularly regarding digital and blockchain technologies, which offer new possibilities for transparency, efficiency, and democratization in cooperative economies (Scholz & Schneider, 2017 [95]). The theme of impacts of globalization explores the challenges and opportunities of global economic integration for cooperative economic models, especially in promoting local development and international cooperation (Rodrik, 2006 [56]). Lastly, the transformation of cooperative economy models post-pandemic focuses on how the COVID-19 pandemic has accelerated innovation and adaptation within the cooperative economy, especially in enhancing community resilience and supporting the economic recovery at the local level (Tassinari & Maccarrone, 2020 [69]).

Based on the above conclusions, this study proposes the following policy references based on modern management theory:

Promote international academic exchanges and cooperation: According to organizational learning theory, organizations can improve their innovation capabilities and efficiency through learning and knowledge sharing. Policymakers can promote international academic exchanges and cooperation to promote the sharing of knowledge and the in-depth development of cooperative economic research.

Provide research resources and financial support: According to resource dependence theory, organizational behavior and strategy are affected by the resources it depends on. Policymakers can provide more research resources and funds to encourage the participation of more researchers and improve the quality and impact of research.

Encourage innovative research topics and methods: According to diffusion of innovation theory, the process of adopting new ideas and technologies is a process of social influence. Policymakers can encourage researchers to explore new research topics and methods to enhance the future impact of the field of the cooperative economy.

Promote interdisciplinary research and practice: According to systems theory, an organization is an open system, and its behavior is affected by the internal and external environment. Policymakers can encourage interdisciplinary research and practice to provide a more comprehensive perspective to understand and solve problems, and promote the practical application and practice of the cooperative economy.

5. Future development trends

Integration of Social Enterprises and Cooperative Economy: As social enterprises are gaining more attention, cooperatives, as an economic organizational form with social responsibility and environmental awareness, may integrate more closely with social enterprises. This integration can not only promote social and economic sustainable development (Borzaga & Galera, 2012) [94], but also stimulate environmental protection and low-carbon development. For instance, cooperatives can reduce carbon emissions and promote a circular economy through the adoption of environmentally friendly technologies and practices.

Integration of technological innovation and the cooperative economy: The development of digital technology provides new development opportunities for the cooperative economy. For example, Decentralized Autonomous Organizations (DAOs) based on blockchain technology can achieve more democratic and transparent cooperative governance (Scholz & Schneider, 2017) [95].

Balance between local and global development: The cooperative economy needs to deal with the challenges brought about by globalization, such as market competition, resource integration, etc., while also focusing on local development, enhancing community cohesion, and regional economic development (Woods et al., 2019) [96].

By integrating these areas, the cooperative economy can continue to evolve and adapt to the ever-changing social and economic environment, ensuring its continued relevance and ability to contribute positively to sustainable development.

Based on the above development history and trends, the cooperative economy and cooperatives will continue to focus on the sustainability of society and the economy in their future development, and strengthen the integration with social enterprises, technological innovation, and global development. This will help the cooperative economy maintain its competitiveness and influence in the ever-changing global environment and make greater contributions to social and economic development.

In summary, the cooperative economy is seen as an important means to achieve sustainable development. This study applies Citespace and Bibliometrix to the bibliometric analysis of the cooperative economy, improving the innovativeness and practicality of the research method. It sorts out the overall pattern and development history of cooperative economic research from a macro perspective, presenting the current state and development trends of cooperative economic research in a clearer way. Through the discussion of core topics and key literature, this study enhances the value of the reference materials. Meanwhile, the academic impact and knowledge dissemination path analysis of cooperative economic research provide scientific basis and decision-making references for policy makers and practitioners.

Despite valuable insights provided in this study regarding the global development trends and research priorities in the cooperative economy field, we also face certain limitations. Firstly, due to the diversity of cooperatives and limited sample size of available data, it becomes challenging to carry out in-depth quantitative empirical analysis. Secondly, due to the accessibility of literature and language calculation restrictions, we were unable to include literature from regions like the Chinese and Japanese regions, which have practical and research experiences with cooperatives, into our analysis sample. This may lead to a lack of a global perspective in the study. Finally, our study primarily relies on published literature, and publication bias may exist. Despite these limitations, our study still provides valuable references for understanding and promoting the development of the cooperative economy field, and offers new directions and opportunities for future research.

CRedit authorship contribution statement

Cong Xu: Writing – review & editing, Conceptualization. **Feng Wu:** Writing – original draft, Validation, Software, Data curation. **Yie-Ru Chiu:** Writing – review & editing, Conceptualization.

Data availability statement

Research data collected for this study will be made available if requested by contacting the corresponding author.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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