

A Comprehensive Bibliometric Analysis of China's Free Trade Zones: Status and Evolutionary Trends

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The China free trade zone, crucial for advancing a new open economy, has gained significant attention lately. We analyzed 885 papers from Peking University Core and CSSCI journals (2012-2023) using CiteSpace for visualization. Our research results indicate that the literature on China's free trade zone peaked with 171 articles in 2015, and gradually returned to an average of 45 articles per year. The main research focuses in this field include "institutional innovation", "negative list", "financial innovation", "financial openness", "opening up to the outside world", and "economic growth". In addition, cutting-edge analysis indicates that "dual circulation" and "blockchain" are future research trends. The main authors of the literature include Yang Bin, Zhu Xiaolin, Yuan Bo, Li Meng, Zhao Liang, and others. Their affiliated institutions, research institutes, and universities have not yet formed a clear core circle of authors; The top three research institutions with the highest number of publications are the International Trade and Economic Cooperation Research Institute of the Ministry of Commerce, Kaiyuan Law School of Shanghai Jiao Tong University, and the Comprehensive Research Institute of the Free Trade Zone of Sun Yatsen University. This article delves into the current hot topics and progress in the research of China's free trade zones, providing important references and inspirations for future scholars in this field.

Keywords: China's free trade zone, bibliometric analysis, CiteSpace

Introduction

A free trade zone offers tax and regulatory benefits for foreign investments within a country. China's zones lead in trade and financial reforms, with State Council approval, enhancing trade and investment. As of December 2023, China has established 22 free trade zones, each with its own mission and different economic functions. The establishment of free trade zones has had a significant impact on economic development, not only promoting trade liberalization and facilitation within the region, but also attracting a large amount of foreign investment, accelerating technological innovation and industrial upgrading, and effectively promoting the diversified development of the local economy. Since 2012, Chinese scholars have explored the significance, role, economic and trade effects of establishing free trade zones in China, and have achieved profound results, providing a solid theoretical basis and

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methods for future research on free trade zones. The free trade zone is based on building a high-level open economic system and a new high-level open economic system, with institutional innovation as the core, enhancing the level of openness within the zone, fully leveraging the radiation effect, siphon effect, and trade creation effect of the free trade zone, and promoting high-quality economic growth in the zone and surrounding areas.

At present, there is a lack of literature review and bibliometric analysis on the research of free trade zones. Based on this, this article takes literature analysis as the starting point to conduct an in-depth analysis of the research progress of China's free trade zones. We collected literature data from the authoritative domestic database CNKI, Peking University Core, and CSSCI databases, and CiteSpace visualization literature analysis software is used to conduct quantitative analysis of China's literature on China's free trade zones from 2012 to 2023, and a scientific knowledge graph is drawn. The purpose is to clearly and vividly describe the current status of research on free trade zones, examine their development trajectory, identify key research points, summarize research progress, and predict future development directions, aiming to provide reference basis for future researchers.

Data Sources and Research Methods

Research Methods

Professor Chen Chaomei developed CiteSpace software, an advanced literature data mining and analysis tool for processing and visualizing scientific literature information. This software can effectively process data from various databases, extract and classify key information such as literature authors, institutions, nationalities, keywords, cited references, cited authors, and cited journals, and reveal the deep connections between different literature under the same research topic. We employed CiteSpace 6.2R6 for bibliometric analysis, offering insights into publication trends, authorship, and keywords networks. This facilitated a comprehensive understanding of the field's knowledge structure, evolution, and trends. In addition, this article also analyzes the research hotspots, evolutionary paths, and development trends in this field, aiming to provide clear guidance and understanding for future research directions.

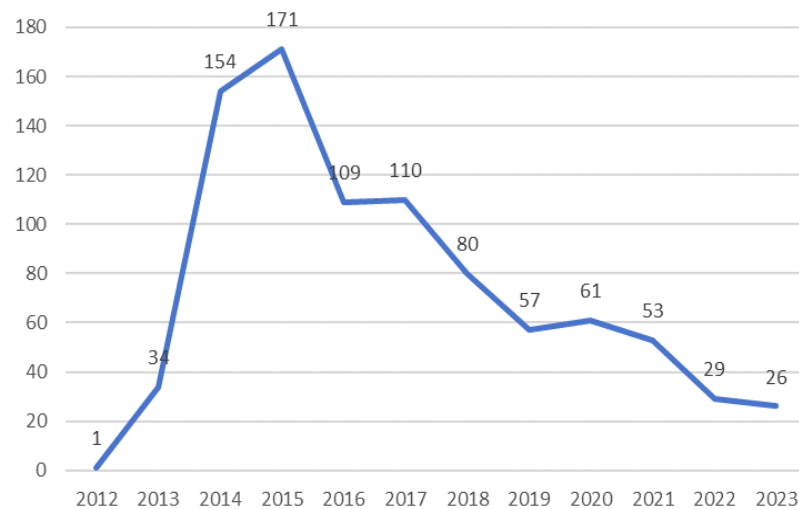
Research Methods

We use the Peking University core and CSSCI database in CNKI as the data source, and search for content with the keywords "free trade zone". The first batch of free trade zones in China was approved in 2013, so the search time span is from 2012 to 2023, and the search date is December 10, 2023. After excluding literature with low relevance such as news, reports, and conference notices, 885 relevant literature were obtained. We export relevant literature in Refworks format, save it as "download_2. Txt", and then import it into CiteSpace software.

Results and Analysis

Changes and Temporal Distribution of Research Publications in Free Trade Zones

The annual publication volume of research on free trade zones can reflect the research enthusiasm of this topic. Analysis reveals a sharp rise in publications after the expansion of the Shanghai FTZ in 2014, peaking in 2015 (see Figure 1). Despite a subsequent decline, the sustained interest reflects the zones' evolving impact on trade and economic policy. In 2015, the State Council approved the establishment of three free trade zones, Guangdong, Tianjin, and Fujian. The free trade zones became a research hotspot, and since then, the number of publications has been decreasing year by year. Influenced by TPP and RCEP, research heat has shifted to the China ASEAN Free Trade Zone. But the average number of articles published in the past five years has been 45, maintaining a certain level of popularity.



Keywords Collinearity Analysis



According to the further analysis of the keywords that appear more frequently in the keywords co-occurrence chart (Table 1), the free trade zone has the highest frequency, up to 223 times, and is a research hotspot. The negative list of other high-frequency words, institutional innovation, and financial innovation are discussed around the free trade zone, and the free trade zone is studied in the context of the Belt and Road and the dual cycle. The free trade experiment improves the business environment through financial openness and external openness, and promotes regional economic growth through spillover effects.

Table 1

Frequency Ranking of High-Frequency Keywords in the Study of Free Trade Zones

Order number	Keywords	Count	Centrality	Order number	Keywords	Count	Centrality
1	Free trade zone	223	0.76	10	Economic growth	6	0.01
2	Negative list	33	0.05	11	Regional economies	3	0
3	Institutional innovation	29	0.04	12	Business environment	3	0
4	Financial innovation	20	0.02	13	Double difference	3	0
5	The Belt and Road Initiative	14	0.02	14	Innovate	3	0
6	Financial openness	9	0.01	15	Finance lease	3	0.01
7	Opening to the outside world	8	0.01	16	Overflow effect	3	0
8	Dual circulation	7	0.02	17	Offshore finance	3	0
9	Financial reform	6	0.01	18	Financial regulation	3	0.03

Analysis of Research Hotspots and Themes

In order to deeply explore the scientific connotations implied by keywords and ensure the accuracy and reliability of the analysis results, this article adopts the Find Clusters function in Citespace software for advanced keywords analysis while keeping other parameters unchanged. The log likelihood ratio (LLR) algorithm was used to process the keywords dataset and generate a clustering graph (see Figure 3). The modular value Q (abbreviated as Q value) in the graph is used to evaluate the modularity of clustering networks. It is generally believed that if the Q value is higher than 0.3, the clustering results are significant. Meanwhile, the Weighted Mean Silhouette (abbreviated as S value) is used to quantify the consistency among members within a cluster. When the S value is between 0 and 1 and exceeds the critical value of 0.5, it indicates that the homogeneity of nodes within the cluster is high, indicating that the clustering is more reasonable.

According to the analysis results of the graph established in this article (Figure 3), the Q value and S value are 0.6396 (significantly higher than 0.3) and 0.9744 (much higher than 0.5), respectively, indicating that the clustering analysis results of the research keywords in the free trade zone from 2012 to 2023 are stable and reasonable, and have strong guidance and reference value. The graph reveals that the main research keywords of the free trade zone are concentrated in seven core categories, including # 0 free trade zone, # 1 institutional innovation, # 2 innovation, # 3 financial innovation, # 4 negative list, # 5 temporary arbitration, # 6 financial regulation, etc. Based on the clustering results of these keywords, this study summarizes the main research hotspots on free trade zones and provides a detailed sorting and interpretation of these hot areas.



The impact of the free trade zone system and policies on the economy. As an important engine for China's economic reform and high-quality development, free trade zones play a crucial role in promoting domestic and international dual circulation and enhancing the level of economic openness. Research has shown that free trade zones not only serve as experimental fields for reform, but also build important windows for open economic development through differentiated development models and pilot policies, effectively linking domestic and international markets. In terms of institutional innovation, the free trade zone has constructed a reproduction model of "subject autonomy action trial and error institutional creation" through independent authorization and exploratory actions, which has a direct and sustained impact on innovation quality and industrial upgrading (Huang, 2021). Especially in the Shanghai Lingang New Area and other free trade zones, in terms of institutional connotation and implementation path, traditional industries are reformed and emerging industries are developed to shape new industrial upgrading momentum, and institutional breakthroughs are made in areas such as trade facilitation and tax policies. The construction and institutional innovation of free trade zones have played a significant role in improving GDP, investment, and imports and exports, reflecting long-term economic effects. In addition, the transformation and upgrading of the functional positioning of free trade zones, such as the introduction of negative lists and the reform of market access rules, have become a new path

for China to respond to international economic and trade rules. The integration of local development strategies is also an important aspect of enhancing the influence of FTZ. For example, Changshu can undertake industrial transfer and enhance the level of economic internationalization through effective cooperation and resource sharing with the Shanghai free trade zone. The free trade zone is not only a transformation and innovation node that promotes high-quality domestic economic circulation, but also an important platform for promoting comprehensive opening up and participation in international economic cooperation of countries. In its future development, it should further strengthen innovation-driven and open cooperation, achieve linkage within and outside the region, and provide strong support for China's economy to move towards a high-quality future.

The implementation effect of the negative list system in free trade zones. The negative list system and China's market access law exhibit a dynamic relationship between special law and common law. With the implementation of this system in the Shanghai free trade zone and a significant increase of over 30% in capital flow in the service industry, the Chinese government has continuously adjusted regulatory measures for foreign investment access and is committed to further opening up the market and promoting the transformation and upgrading of market access laws and regulations. At the same time, this system is of great significance in enhancing management transparency and building a fair competitive environment, especially in promoting the opening up of the service industry and rapid capital flow (Zhuang & Wang, 2019). However, the synthetic control effect of other provinces is not significant compared to the Shanghai free trade zone, indicating regional differences in its implementation effect (Tan, Cui, & Yang, 2019). Taking the Nansha free trade zone in Guangdong as an example, after implementing the negative list, not only has foreign investment increased and international high-end production capacity projects gathered, but the rapid development of the financial industry has also provided strong guarantees for capacity transfer, further promoting the development of industrial agglomeration and transformation and upgrading. Therefore, in order to carry out international production capacity cooperation under the embedding of the negative list system, it is necessary to improve institutional arrangements, streamline cooperation mechanisms, and innovate cooperation models. Overall, the negative list system of the free trade zone has achieved significant results in market access, increased capital flow in the service industry, and international capacity cooperation. However, it still needs to be gradually adjusted and innovated in different regions to achieve optimal benefits.

The financial innovation system of the free trade zone. The establishment of free trade zones has had a significant impact on corporate financial services and their level of financialization. According to existing literature, free trade zones have a suppressive effect on the financialization level of physical enterprises, and this inhibitory effect is sustainable (Wang, S. H. Hu, & Y. L. Hu, 2022). The mechanism of profit margin equalization and financing constraint relief in free trade zones affects enterprises, especially in key inland cities, small enterprises, and private enterprises, but there is ownership bias. On the other hand, the implementation of free trade zone policies has significantly increased the value of enterprises, mainly through expanding their investment and financing scale through the form of "external financing and internal investment", and promoting the transformation and upgrading of their business models, thereby enhancing their value. In terms of financial reform, free trade zones have significantly improved the efficiency of financial services to the real economy, and this efficiency has been increasing year by year with the extension of free trade zone construction time and the gradual implementation of financial reform measures. The financial agglomeration effect, financial openness effect, and financial structure optimization effect brought about by the financial reform of the free trade zone have played a regulatory role in improving the efficiency of financial services for the real economy. It is worth

noting that these reform effects exhibit significant regional heterogeneity, indicating that differences in geographical location and transmission mechanisms are important reasons for the heterogeneity of policy effects. However, there is still controversy over the functional positioning model of free trade zones. Some studies suggest that the current positioning of financial service trade and technology in free trade zones is ahead of actual conditions. It is recommended to focus on financial service innovation and investment facilitation, and promote financial reform and service trade development through technological innovation based on goods trade and manufacturing industry. Similarly, some voices have pointed out that the current financial regulatory model with account management as the core is difficult to achieve the original intention of free trade, and it is necessary to break path dependence through top-level design innovation (Li, 2017). The institutional design of financial reform in free trade zones is a major challenge, and the key lies in how to promote the reform under the premise of macro prudence and controllable risks. Through the financial reform process of the free trade zone, especially the Shanghai free trade zone, a periodic evaluation was conducted on the convertibility of RMB capital accounts, cross-border use, opening up of the financial service industry, construction of international financial markets, and financial supervision and risk prevention. The progress and existing problems of the reform were revealed, and corresponding policy recommendations were proposed (Han, Su, & Bai, 2020). Free trade zones, as experimental fields for financial reform and financial services to the real economy, not only have an impact on the financialization and value of enterprises, but also play a demonstrative role in financial agglomeration, openness, and structural optimization. Future research needs to focus on how to optimize the design of these policies, achieve healthy and sustainable development of the financial services industry, and enhance the systematic and integrated nature of financial reform.

The economic effects of free trade zones. Multiple studies have shown that the establishment of free trade zones has a positive effect on promoting economic growth. The study by He and Tang (2023) and Sun and Chen (2021) pointed out that the Western free trade zone has a significant positive effect on its regional economic growth, showing a trend of first strengthening and then weakening; Chen and Hu (2023) found that free trade zones significantly increased the GDP growth rate of their respective regions, especially in the free trade zones of Shanghai, Guangdong, and Fujian; Cai and Yang (2021) found that free trade zone policies not only promote urban economic growth, but also have a positive spillover effect on neighboring cities. There are regional differences in the economic growth effects of free trade zones, and not all free trade zones show significant positive effects. For example, the economic growth effect of Chongqing's free trade zone is not significant, and the role of Tianjin's free trade zone in GDP growth rate is also not significant. In addition to the direct impact of economic growth rate, free trade zones also indirectly affect economic growth through various mechanisms such as promoting capital flow, technological innovation, and industrial structure upgrading. The study by Zhang and Yu (2020) found that free trade zones rely on capital flows and technological innovation, while market-oriented reform variables do not exhibit a mediating effect. Some studies also specifically focus on the strategic planning and implementation of free trade zones. Zhang, Yan, and Feng (2019) proposed that the impact of coastal free trade zones on economic growth is smaller than that of inland free trade zones, and called for strengthening the spatial radiation mechanism and optimizing spatial layout of free trade zones; The study by Zhang, Yan, Feng, and Li (2018) shows that the economic growth effect of free trade zones shows a "U-shaped" trend as the number and time of established free trade zones increase. From the perspective of trade welfare, it is believed that free trade zones can drive economic growth through outward oriented economic activities and corresponding welfare effects (Zhao, 2017). The results of GTAP simulation indicate that free trade zones can indeed drive trade and

welfare growth, generating positive economic growth effects. In addition to the positive viewpoints mentioned above, there are also research warnings about the challenges and potential negative impacts of free trade zones. The construction practice of free trade zones needs to pay attention to the potential trade transfer and impact on vulnerable industries (Zhao, 2017). Most literature suggests that the establishment of free trade zones has a positive impact on economic growth, but the effects vary regionally, and free trade zones have indirect effects through various mechanisms. Note that these research findings are limited by their respective research methods and sample ranges, therefore these limitations should be considered when interpreting and generalizing.

Frontier Analysis of Research on Free Trade Zones

Using the Citespace tool and keeping all parameters constant, this article selected the period from 2012 to 2023 as the detection period, thereby demonstrating the saliency of 20 keywords. The strong prominence of these keywords highlights the potential development foresight of the research field and to some extent foreshadows the development trend of the field. Figure 4 shows these keywords, including “Keywords” representing keywords, “Year” representing year, “Strength” representing burst intensity, “Begin” and “End” representing the start and end times of the burst, respectively. The red line segment in the figure depicts the time range of keywords emergence. Based on the information in Figure 4, we can divide the development of free trade zone research into three different stages.

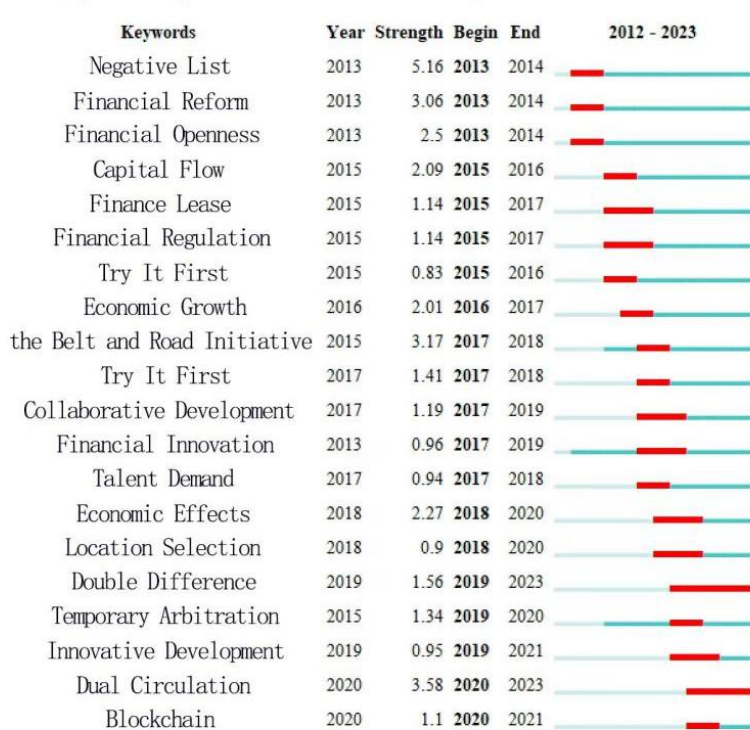


Figure 4. Keywords emergence map of free trade zones from 2012 to 2023.

The mutation interval of the first stage is from 2012 to 2015, with the strongest mutation intensity of keywords “negative list”, “financial reform”, and “financial opening”, which are “5.16”, “3.06”, and “2.5”, respectively. In the early stages of the Free Trade Zone, the region has become a pioneer for the government to promote a new open economic system. The policy orientation of these regions has had a broad and far-reaching

impact on domestic and foreign trade and investment. Especially the implementation of the negative list model marks a fundamental reform of the traditional administrative approval process. Under this model, except for the areas explicitly prohibited or restricted in the negative list, all other industries are automatically opened to foreign investors, which forms a sharp contrast with the previous positive list management model, and has attracted extensive attention and research in the academic community. Scholars have focused their research on reform measures within free trade zones, such as promoting the internationalization of the renminbi (Zhang, 2015), innovating management of cross-border capital flows, and opening up financial services (Wang, 2014). These measures aim to promote economic growth and structural optimization. The study of negative lists and financial system innovation not only reveals the current impact of these reforms, but also provides predictions of possible adjustment trends in future government policies.

The mutation interval of the second stage is from 2016 to 2019, with the strongest mutation intensity of the keywords “economic growth” and “economic effects” being “2.01” and “2.27”, respectively. As of August 2, 2019, the State Council has approved the establishment of 18 free trade zones, which belongs to the prosperous period of free trade zones. The free trade zone (FTZ) is a testing ground for economic policy innovation, aimed at promoting economic growth through expanding openness. The research focuses on exploring how these open policies can achieve a transition from quantitative to qualitative change, and evaluating their effectiveness in practical operation (Yin, Zhou, & Wang, 2019). Scholars analyze how FTZ affects regional and even national economic growth, with a focus on considering the sustainability of this growth. Further research focuses on the potential of FTZ in promoting industrial structure upgrading, high-tech industries, and modern service industry development, as well as its role in adjusting the existing economic landscape. In addition, scholars have explored the impact of emerging industries, innovation capabilities, and other growth drivers within FTZ (Ye, 2018), and analyzed their effects on foreign trade and foreign investment attraction. The research focus also includes how to improve import and export efficiency, attract foreign investment, enhance international competitiveness through FTZ, and how these activities can enhance overall economic benefits (Wang & Zheng, 2017). Finally, scholars are increasingly concerned about the comprehensive economic effects of FTZ, such as employment, income distribution, environmental protection, and social welfare (Ma & Yang, 2023; Yang & Li, 2019; Zhou & Han, 2018).

The third mutation interval is from 2020 to present, with the keywords “dual circulation” and “blockchain” becoming mutation words. Based on the background of the times, it can be seen that the dual circulation strategy, which promotes the new development pattern of domestic circulation and domestic and international circulation, is an important strategy for the current development of China's economy. The free trade zone, as an important platform for an open economy, is of great significance for achieving this strategy. The study focuses on the strengthening of domestic economic cycles and their interaction with global economic cycles through FTZ, and explores how to achieve optimal allocation of domestic and foreign markets and resources through FTZ. With the introduction of blockchain technology, its inherent advantages of transparency, security, and decentralization have brought new opportunities for trade facilitation and financial innovation to FTZ. This technology is being applied in FTZ to optimize supply chain management, improve cross-border payment security and efficiency, and enhance regulatory effectiveness. The academic community is also paying attention to the potential application of blockchain in optimizing the tax system, reducing tax management costs, and innovating tax management models in FTZ.

Author and Institution Analysis

In CiteSpace software, literature data are imported and converted into a format, and the conversion result is saved as a “download_x.txt” file. Set the “Timeslicing” time range to January 2012 to December 2023, and divide it into a time segment each year. Select “Author” and “Institution” as node types to establish a collaborative network of authors and institutions for publishing literature. The specific results are shown in Figure 5. In the obtained knowledge graph, the size of nodes maps and the word frequency of authors and institutions, indicating their criticality in the field, display the frequency of node font size display; The thickness of the circular ring at a node refers to the strength indicating centrality, indicating the structural position and influence of the item; The lines represent the cooperation between authors or institutions, and their thickness reflects the degree of closeness of cooperation.

The collaborative collinear graph of the author (Figure 5) shows that the number of nodes $N=232$, the number of connections $E=63$, and the network density $=0.0024$, indicating that the network density is at a low level with fewer connections between nodes. There are many scholars studying this topic, but there are few connections between scholars and no close research group has been formed. Since 2012, a total of 232 authors have appeared in the study of free trade zones, with closely collaborating research teams including Yang Bin and Zhu Xiaolin's team, Yuan Bo and Wang Rui's team, and Zhao Jinping's team. The top five in terms of publication volume are Yang Bin (seven articles), Zhu Xiaolin (seven articles), Yuan Bo (six articles), Li Meng (six articles), and Zhao Liang (six articles), accounting for a relatively small proportion of the total publication volume. We suggest team collaboration, more communication and communication among scholars, and collaborative research to create more research results for the free trade zone.

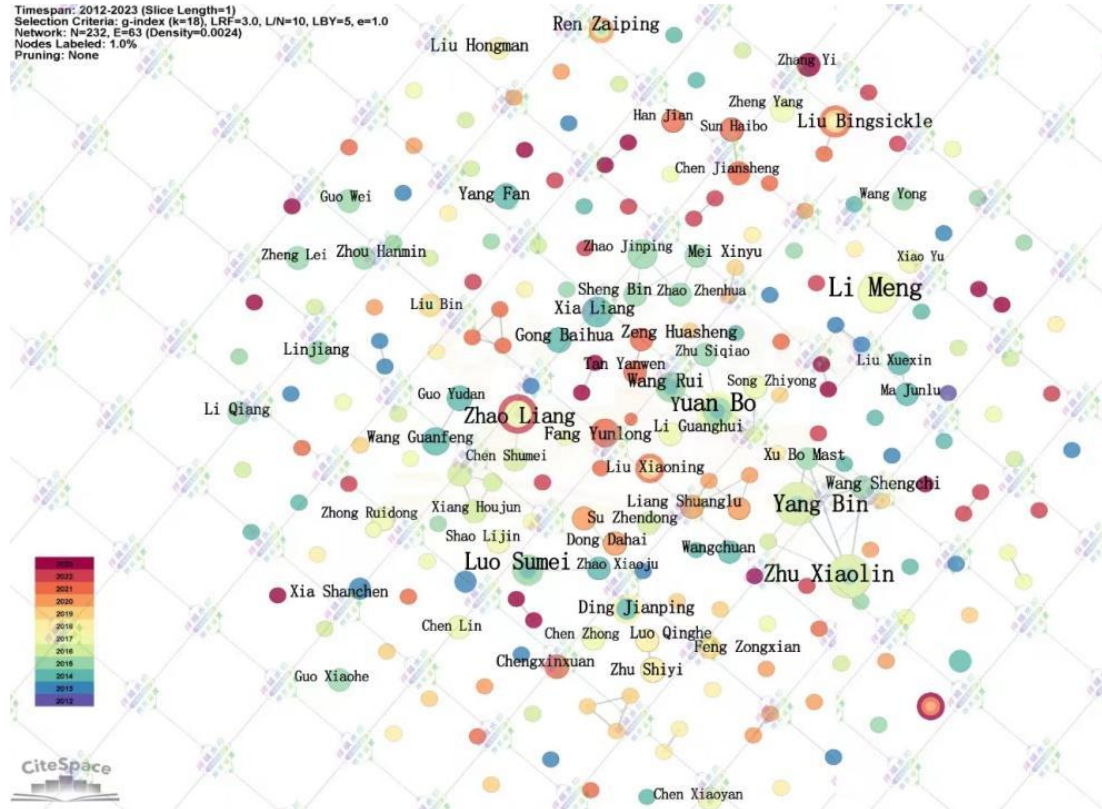


Figure 5. Collaborating collinear graph of main authors in the study of free trade zones from 2012 to 2023.

According to the statistics of the publishing institutions, the main focus is on universities and research institutes, and the number of papers related to the free trade zone is relatively small and scattered. The International Trade and Economic Cooperation Research Institute of the Ministry of Commerce has the highest number of publications, followed by the Kaiyuan Law School of Shanghai Jiao Tong University and the Comprehensive Research Institute of the Free Trade Zone of Sun Yatsen University. The research institute has a high academic level and a strong research team, resulting in more achievements. It is recommended that universities strengthen academic exchanges, break down barriers between universities, form common academic groups, and carry out relevant research.

Table 2

Main Publishing Institutions of Journal Free Trade Zone Research From 2013 to 2023

Institution name	Number of publications	Institution name	Number of publications
International Trade and Economic Cooperation Research Institute of the Ministry of Commerce	13	Fudan University Law School	7
Kaiyuan Law School of Shanghai Jiao Tong University	9	Logistics Research Center of Shanghai Maritime University	6
Sun Yatsen University Free Trade Zone Comprehensive Research Institute	9	Shanghai Headquarters of the People's Bank of China	6
Shanghai University of Finance and Economics School of International Business Administration	8	International Law School of East China University of Political Science and Law	6
Xiamen University Law School	7	School of Economics, Shanghai University	5

Conclusion

This article uses Citespace software to create a knowledge graph and visually analyzes the main researchers, institutions, research hotspots, and frontiers in the research field of China's free trade zone from 2012 to 2023. The ensuing conclusions have been deduced: Investigative development trajectory:

(1) Research development trend: Since 2012, the annual publication volume of research on China's free trade zones has fluctuated and increased, then gradually decreased and remained stable. This indicates that the research activities of free trade zones are consistent with the trend of China's free trade zone establishment and national macro policies, showing a sustained and stable trend.

(2) Keywords and research hotspots: Through keywords analysis, it was found that words such as "free trade zone", "institutional innovation", "negative list", "financial innovation", "financial opening up", "opening up to the outside world", "economic growth", and "spillover effects" frequently appear, reflecting the main research focus in this field. The research hotspots of China's free trade zone focus on the functions of free trade zones, institutional innovation of free trade zones, and so on. The financial development of free trade zones and their impact on economic growth are in line with the trend of China's free trade zone development. In addition, under the background of dual circulation, the development of free trade zones and blockchain under free trade zones have become current research hotspots and frontiers, mainly due to the guidance of national policies on free trade zones and the unique potential of free trade zones.

(3) Collaboration between research authors and institutions: The research on China free trade zone has not yet formed a stable and fruitful research team, and the connections between authors are also weak. There is less cooperation between different publishing institutions, and there are fewer university teams and research institutes with relatively more achievements.

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