US-China Law Review, March 2025, Vol. 22, No. 3, 121-138
doi:10.17265/1548-6605/2025.03.003

CiteSpace Knowledge Graph Analysis of Chinese Government Investment Fund Research in the Past Two Decades and Prospects

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As a combination of government and market forces for investment, government investment fund plays the role of promoting the development of key areas and supporting the weakness of market economy. The study takes 783 Chinese Social Sciences Citation Index (CSSCI) literatures on the topic of government investment funds that published in CNKI database as samples, from 2000 to 2022. This paper analyzes the literatures of government investment funds with the method of bibliometrics and CiteSpace visualisation software, showing the overall development of government investment funds in China in the form of a visual map. The results show that a cooperative network of authors and institutions has been built. On the one hand, a comprehensive study of government investment fund itself has formed research themes such as industrial funds, venture capital funds, guidance funds, venture capital, science and technology innovation, and small-and-medium-sized enterprises. On the other hand, by analyzing the research trends, it is found that venture capital and enterprise innovation will be the possible trend of government investment funds research in the near future. We should pay attention to the social effects of government investment funds, and study how to establish and operate the government investment funds rationally.

Keywords: government investment funds, knowledge map, CiteSpace, bibliometrics

Introduction

In China, government investment funds (GIFs) are policy funds set up by governments at all levels individually or jointly with social capital, and operated in a market-oriented manner. GIFs in a general sense have the guiding objectives set by the government. That means the funds should take the financial strength as the base

This work was supported by (1) "Research on Legal Regulation of Government Investment Funds and Institutional Protection" (Project No. 2021BFX012), a general project of Shanghai Philosophy and Social Science Planning in 2021. (2) General Project of Humanities and Social Sciences Research of the Ministry of Education in 2023: "The Collaborative Governance of Multiple Subjects in Government Guided Funds and Its Rule of Law Path" (Project No. 23A118365012). (3) "Rule of Law in Government Investment: Normative Construction Under the Perspective of Smart Finance" (Project No. X2024xscx004) 2024 Anqing Normal University School-Level Graduate Student Academic Innovation Project.

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point, and drive social capital to invest in key areas or weak links of economic and social development through the leverage effect, ultimately achieving the optimization and upgrading of industrial structure, promoting innovation and entrepreneurship, coordinated and sustainable economic development. As a new type of fiscal and financial instrument, the GIF has changed the previous government investment model with local debt as the main source of funding and fiscal budget allocation as the main form of investment, which has profoundly influenced the development pattern of market economy. In the report of the 20th National Congress of the Communist Party of China, General Secretary Xi Jinping pointed out that the decisive role of the market in resource allocation should be given full play, while the government should be built as a contemporary "government with a purpose", and unwaveringly support and guide the development of the non-public economy. The GIF is an important platform for the organic integration of government and market-based mechanisms, promoting economic efficiency. It is essential to explore the internal logic and development path of GIFs, so as to deepen the reform of the fiscal and financial system.

Currently, the cumulative number of GIFs in China has reached 1,531, and the capital scale has reached about RMB 2.74 trillion[1]. After the rapid development from 2015 to 2018, it gradually entered the stock optimization stage in the past five years. The knot of homogenization of investment planning development, risk of capital precipitation, insufficient financial support capacity, internal management problems, and external regulation problems have become more and more obvious at this stage (Yu, 2017). Accordingly, the research on the governance effect, philosophy, and methods of GIFs has become an academic hotspot. Chinese scholars have rich research results on GIFs and have formed a more complete research system, but there is still a lack of systematic sorting and summarization of the literature. How to deeply understand the current situation of research in the field of GIFs in China, how to objectively and comprehensively summarize the hot directions of GIFs research, and how to clarify the development of GIFs research and look into the future research trends are the questions that this paper intends to answer. The bibliometric method and CiteSpace software will be used in this research, to make a macro retrospective and forecast of GIF research in China.

Literature Data Sources and Analysis Methods

Data Source

CNKI, Chinese Social Sciences Citation Index (CSSCI), Chinese Science Citation Database (CSCD), and Peking University Core Journals were selected as the data sources. The search was conducted with the keywords "government investment fund", "government-guided fund", "industrial fund", "venture capital fund", etc. The time range was set from 2000 to 2022, and a total of 783 documents were obtained and a sample literature database was formed. In this paper, based on this literature base, statistics and analysis of literature related to GIFs will be conducted.

Analysis Method

In this paper, we will use bibliometric and content analysis methods to dissect the issue of Chinese GIFs. In the bibliometric approach, using CiteSpace software, key information can be extracted and formed into a visual map by co-occurrence analysis of node types such as authors, institutions, and keywords to show the relationship

[1] Data from Investment Central Research Institute, "2022 Government Guidance Fund Special Research Report", January 2023.

between the elements in each node type. In addition, through the cluster analysis of CiteSpace software, the keywords of government-investment-fund-related literature are arranged according to certain scientific rules, and then the high-frequency keywords are categorized and organized, so that the intrinsic correlation between them can be searched for. Then the general picture of the GIF research field and the trend of academic hotspots can be explored. Based on the bibliometric study, this paper will also consider the content of the relevant literature to reveal important details of the research results of GIFs.

Literature Characterisation

The Number of Literature Publications Shows a Phased Pattern

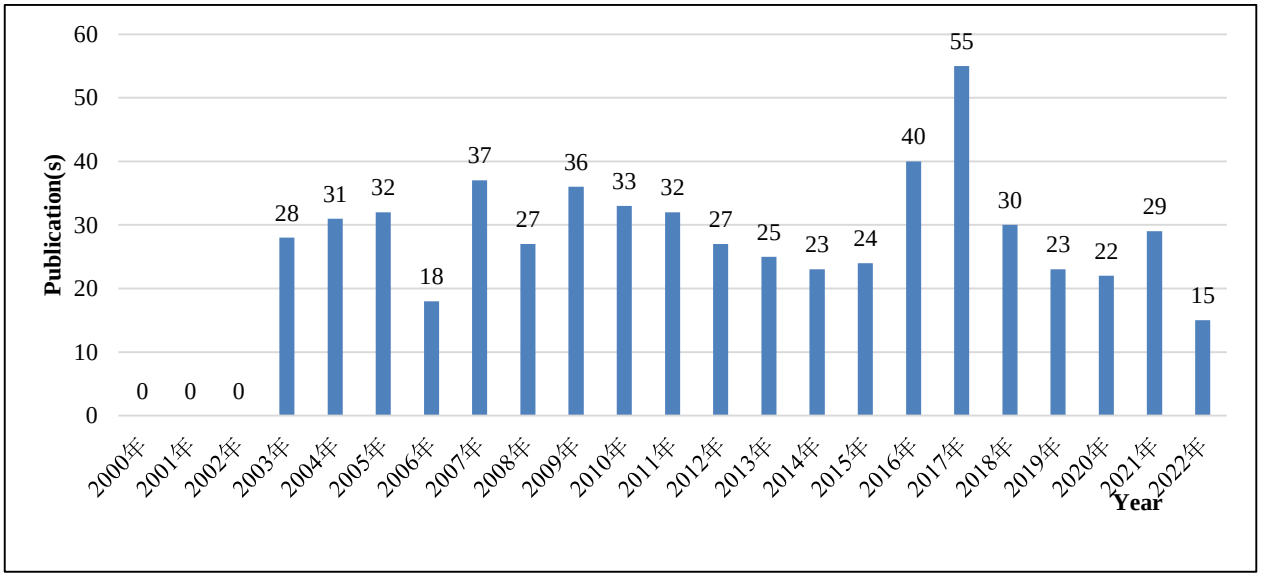

Figure 1. Distribution of research publications of Chinese GIFs.
Data source: CNKI database of China Knowledge Network.

From the time distribution of literature publication, Chinese GIF research can be roughly divided into three stages. In the first stage (2003-2007), the number of publications in the field of GIF research increased abruptly, with an average annual number of 29.2 publications. In the second stage (2008-2017), the number of literature publications firstly showed a stable decreasing trend, and then gradually rebounded after 2015, and reached a historical peak of 55 publications in 2017, which corresponds to the rapid development of GIFs in China in reality. In the third stage (2018-), the number of literature publications declined in each year, with an average annual number of 23.8 publications, which has been significantly less than the previous two stages. This indicates that the GIF research fades, or the research results tend to be streamlined.

Analysis of the Collaboration Characteristics of Highly Cited Authors and Institutions

By analyzing the number of papers published by each scholar in CSSCI, CSCD, and Peking University core journals and the frequency of citations, we can roughly determine the academic influence of the scholar in the field of GIF research. In the software CiteSpace, node types can be set to author for the visualization of author collaboration graphs. Since the data selected by the author are all authors of highly cited literature, the threshold value is set to three to generate the core author group clustering knowledge map (Figure 2) in order to fully reflect

the author collaboration. From the details of Figure 2, there are 609 nodes and 297 connecting lines in the author cooperation map, and the network density is 0.0016, which indicates that there is a relatively large number of productive authors in the GIF research field. It is common for several scholars to cooperate in publishing literature, but the cooperation network is not close enough. Therefore, it is necessary to further strengthen the research synergy and achieve higher-level academic linkage.

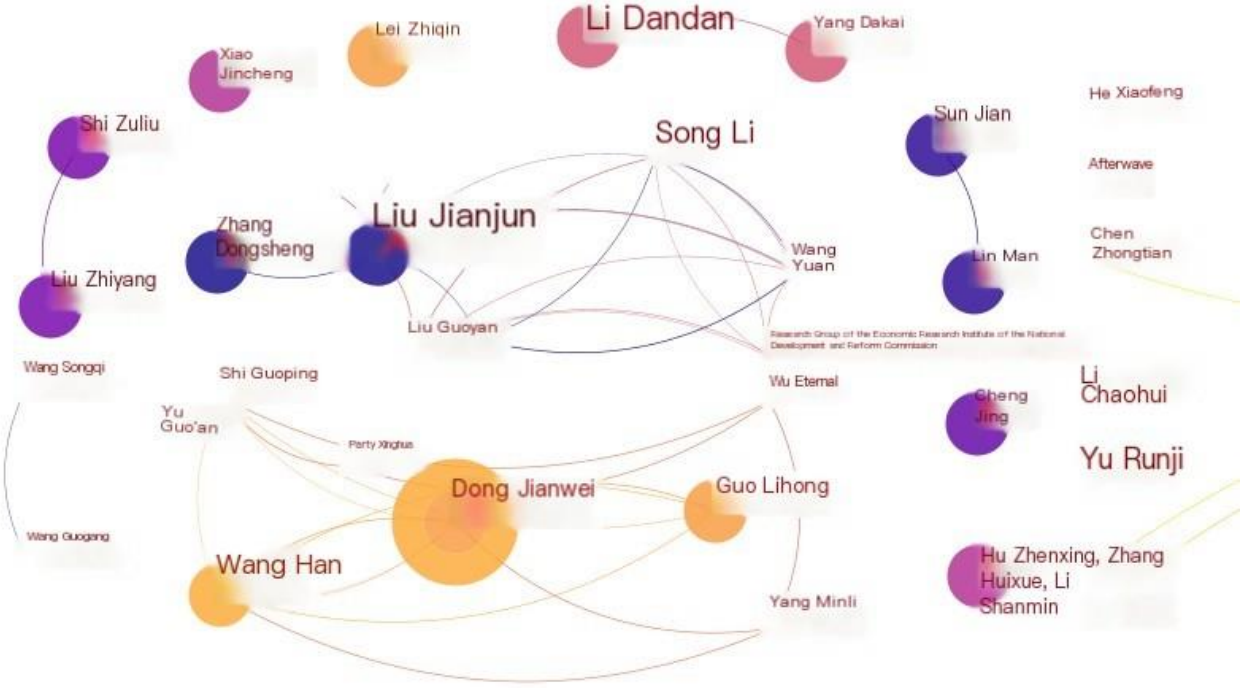

Figure 2. Collaborative analysis of highly cited authors of GIF research (screenshot).

Among the highly cited authors, the team of Liu Jianjun and Zhang Dongsheng and the team of Dong Jianwei, Wang Han, and Guo Lihong are more prominent. The scholar Liu Jianjun has already proposed "developing industrial investment funds in a planned and step-by-step manner" as early as 1996 (Liu, 1996). He was the earliest scholar who carried out research on industrial investment funds and venture capital funds in China, and successively published more than 100 relevant papers on behalf of the Department of Economic Policy Coordination, National Development Planning Commission, and the Venture Capital Research Center of Peking University. Among them, from 1998 to 2002, Liu Jianjun and Zhang Dongsheng co-authored nine papers on behalf of the National Development Planning Commission, with an average of 54 citations per paper. Firstly, the team analyzed the operation mechanism of venture capital funds from the perspective of institutional economics, and concluded that the concept of "entrepreneurship" has evolved. Venture capital funds provide financial support, entrepreneurial management services, and social credit for "individual entrepreneurship". They have institutional advantages because they can reduce the transaction costs of venture capital (Zhang & Liu, 2000a). Secondly, in his study, Liu Jianjun explored the organizational structure and legislative model of China's venture capital funds in comparison with the overseas practice of venture capital funds, and proposed that "China's venture capital funds should start from the corporate type" in light of the actual development of investment funds in China (Zhang & Liu, 2000b). Since China's Partnership Law formally provides for the limited partnership

system, Liu Jianjun et al. (2008) point out that although the limited partnership system can be applied to the operation of venture capital funds in China, it should not be used with a superstitious mindset when the connotation of the limited partnership system is not fully understood (Liu, 2008). In a joint study with the Chinese ministry's joint venture capital mission to Europe, as well as in a collaborative study with Liu Guoyan and Wang Yuan, Liu Jianjun draws on the venture capital development model of European countries represented by the UK to provide feasible solutions for improving the venture capital fund system in China (Venture Capital Mission of China Ministries to Europe & Liu, 2012; J. J. Liu, G. Y. Liu, & Wang, 2014). They conducted a detailed and in-depth study of the tax incentives involved, analyzed the tax burden dilemma faced by enterprises, and also showcased the various tax policies adopted by European governments to support corporate entrepreneurial investment.

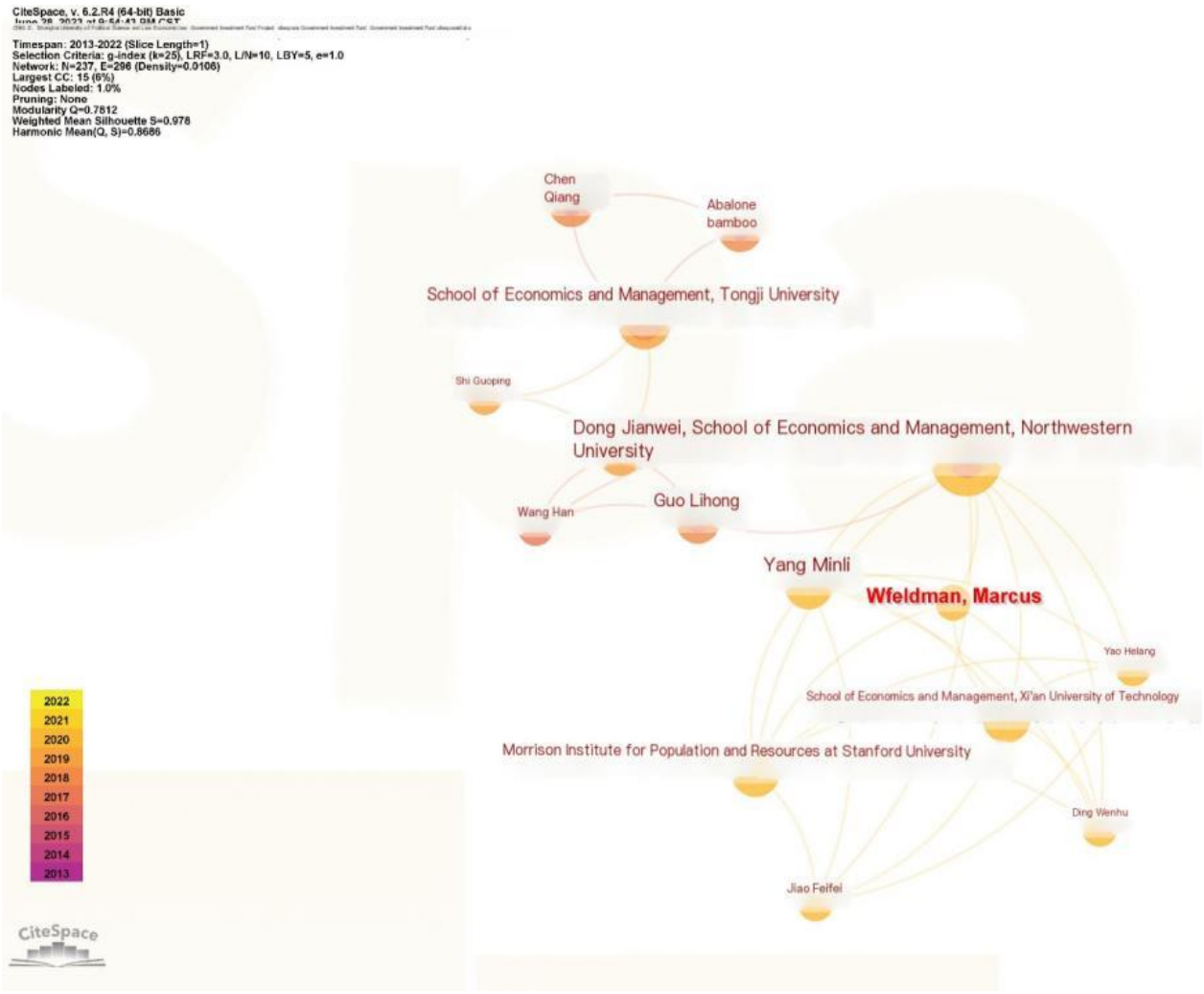

Figure 3. Author and institution relationship network map (2013-2022).

Dong Jianwei, a scholar from Northwest University, has led scholars such as Dang Xinghua, Yang Minli from Xi'an University of Technology and Guo Lihong, Wang Han from Northwest University to form an academic research team (Figure 3), and the team outputs have helped Northwest University become one of the

highly cited research institutions. The team used empirical analysis methods such as difference-in-differences (DID) model (Shi, Dang, & Dong, 2016), difference-in-differences method based on propensity score matching (PSM-DID) (Yang, Wang, & Dong, 2015), and the negative binomial model (Dong, Wang, Shi, & Guo, 2018) to assess the guiding effect of government-guided funds on social capital and the difference in leverage effect. They have found that although the establishment of government-led funds helps to increase the scale of venture capital investment in their cities, the funds' leading effect is still not obvious. The leverage effect of inducing funds to participate in VCs with low reputation, non-state background and mature VC regions is higher (Dong & Guo, 2016). The team also suggested that improving the loss-compensating and fault-tolerant mechanism, or setting an incentive system is the key for government-guided funds to promote enterprise innovation (Dong et al., 2018).

Since 2005, Yu Bo, a scholar at Chinese Academy of Fiscal Sciences, has explored the development of venture capital funds in the United States and the innovative model of China's bootstrap funds. He revealed risks faced by government-guided funds in terms of macro policy-making, industrial development, financial operation, fund management, and capital utilization efficiency. His highly cited papers have propelled Chinese Academy of Fiscal Sciences to become a highly cited institution. Scholar Liu Zhiyang has published several research papers on venture capital funds on behalf of Fudan University and Shanghai University of Finance and Economics respectively. He summarized the technical and institutional route of foreign venture capital operation. Methods such as measurement of VC networks are applied to analyze the characteristic variability and economic efficiency of venture capital funds. The conclusions show that the change in the organizational structure of venture capital funds to limited partnership is the result of adapting to the changes in the supply and demand of venture capital and the legal environment. On behalf of the National Development and Reform Commission, scholar Song Li examined the positive role of industrial investment funds in the development of China's western region. He argued that labor, land, or technology is not the main lacks of resources in the western region, but "capital and entrepreneurs who use capital, combine factors and form a system that is conducive to the full use and effective allocation of factors".

Scholar Li Zhaohui has published literature on behalf of the School of Finance and Economics of Renmin University of China and Central University of Finance and Economics, and is one of the first scholars in China to suggest that government-guided funds could be applied to the financing guarantee model. There are usually two organizational models for lead funds, the principal-agent model (or corporate model) and the trust deed model. According to Li Zhaohui, by designing a capital entrustment contract, entrusting a professional management organization to operate the fund, and setting up an incentive mechanism, the government-guided funds are certainly able to save management costs under the principal-agent model. Financing guarantee is a new model of guided funds operation based on the financing demand gap of medium-sized enterprises (SMEs), pioneered by the United States, Germany, and other developed countries in Europe and the United States. The government provides financing guarantees for enterprises with good credit and asset status, while usually indirectly participates in investment. Moreover, financial guarantee has the outstanding advantages of avoiding inefficiency and rent-seeking problems in direct government investment, preventing and timely resolving financing risks of entrepreneurial enterprises, amplifying the leverage of financial funds, and attracting more private capital into the field of venture capital.

In studying the mechanism of GIFs on private capital, Chinese scholars have mainly used two theoretical models: the "virtuous circle" hypothesis and the incentive hypothesis. Zhang Huixue from Nankai University, Li Shanmin from Sun Yat-sen University, Yang Minli from Xi'an University of Technology, and other scholars have studied the impact effect of guided funds. They analyzed the enterprises' production performance, investment motives and economics of VCs, mechanisms of the impact of guided funds on VC follow-on financing, using NSS or GEM, domestic private equity fund and inter-provincial VC capital raising data. The results of the empirical study show that there are significant differences in the bootstrap effect of GIFs for regions with different levels of venture capital development or for enterprises with different qualifications. In other words, the magnitude of the bootstrap effect is positively related to the advantages and disadvantages of the regional venture capital development environment. Moreover, compared with state-owned venture capital enterprises, private venture capital enterprises receive stronger gain effect from the guidance fund.

Chen Zhongtian has published several research papers on GIFs on behalf of Ocean University of China. He examined the development history of the domestic government's financial fund management policy for funding enterprise R&D, explored the effective mechanism for collaborative management of GIFs, and proposed to establish a GIF information disclosure system centered on the GIF Report. In addition, Chen used the method of rolling window causality test of boots and sub-samples. The time-varying characteristic of the guiding effect of GIFs on private investment was found. This can be used as a scientific basis for designing the optimal path of the guidance policy.

In addition to the above scholars and research teams, scholars such as Sun Jian, Yang Dakai, Li Dandan, Xiao Jincheng, and Lei Zhiqin in the field of GIF research have also produced several papers. Among them, Sun Jian, a scholar from Qingdao Ocean University, conducted research on marine high-tech industry based on the advantages of his institution and pointed out that the state should set up a special venture capital fund for marine high-tech industry. Yang Dakai and Li Dandan from Shanghai University of Finance and Economics cooperated to study the impact of government-guided funds in various regions of China on the domestic venture capital industry. After empirical analysis, they found that the number of venture capital projects was inhibited by the guided funds, but the policy of guided funds could still promote the overall development of venture capital.

Switching the perspective of bibliometric analysis to research institutions, we use the institutional cooperation mapping analysis function of CiteSpace software to rank the frequency of highly cited research institutions. The results are shown in Table 1. We can observe from the table that institutions such as China Academy of Financial Sciences, School of Management of Ocean University of China, School of Environment and School of Finance and Economics of Renmin University of China, School of Economics and Management of Northwest University, and Shanghai University of Finance and Economics have richer academic achievements and are relatively leading in the field of GIF research. Highly cited authors such as Yu Bo, Chen Zhongtian, Li Zhaohui, Yang Minli, Yang Dakai, and their research teams have promoted their institutions to become highly cited research institutions. From the list of highly cited research institutions, we can also find that domestic GIF research is mainly concentrated in several disciplines such as finance, management, finance, and law. Among them, management disciplines are the mainstay of the GIF research.

Table 1

Frequency Ranking of Highly Cited Institutions

Number	Name of research institution	Frequency	Number	Name of research institution	Frequency
1	China Academy of Fiscal Science	11	8	Peking University Venture Capital Research Centre	5
2	School of Management, Ocean University of China	8	9	Nankai University Business School	4
3	School of Environment, Renmin University of China	9	10	Institute of Finance, Chinese Academy of Social Sciences	4
4	School of Economics and Management, Northwest University	6	11	School of Economics and Management, Southeastern University	4
5	School of Finance and Economics, Renmin University of China	6	12	Zhongnan University of Economics and Law	4
6	Shanghai University of Finance and Economics	5	13	School of Management, Sun Yat-sen University	4
7	School of Management, Shanghai Jiao Tong University	5	14	School of Economics and Management, Tongji University	4

In addition, CiteSpace was used to combine author and institution information to form a network diagram of author and institution relationships over the last decade (Figure 3). Accordingly, it can be seen that the School of Economics and Management of Northwest University, the School of Economics and Management of Tongji University, Morrison Institute for Population and Resource Studies of Stanford University, and the School of Economics and Management of Xi'an University of Technology have formed a collaborative network of research institutions with greater intensity in recent years. Highly cited authors such as Yang Minli, Guo Lihong, Dong Jianwei, Chen Qiang, and Bao Zhu are likewise closely associated with all these institutions.

The Timeline of GIF Research

Analyzing the keywords contained in the literature on a research topic can provide insight into the hot research directions in the field, the focus of scholars, and the research methods they have adopted, so that subsequent researchers can draw on them. Using CiteSpace, node types was set to keyword, and the keyword visualization map of GIF literature was drawn, and then clustering operations were performed to obtain the keyword clustering timeline map (Figure 4). Setting the threshold value of the graph to three shows that the graph contains 457 nodes and 743 connected lines with a density of 0.0071, which indicates that the distribution of keywords in GIF literature is relatively scattered and there are many subdivided research directions in the field. As seen in Figure 4, keywords related to GIFs constitute 10 major clusters, which are #0 venture capital, #1 industrial funds, #2 venture capital funds, #3 entrepreneurship funds, #4 venture capital, #6 investors, #7 investment, #8 mother funds, #9 corporate innovation, and #10 entrepreneurship. Each cluster consists of similar or related keywords, and the number of keywords in the clusters decreases as the numbered number of clusters increases. Among them, Cluster #1 industrial funds has appeared in the initial stage of this paper's bibliometrics and is at the peak of the number of literature publications; fund size, bond financing, investment and financing, corporate performance, SOE reform, industrial clusters, industrial policy, fund regulation, and corporate transformation are the keywords included in this cluster, which are presented below the cluster timeline. In addition, the knowledge map can be observed with a longitudinal view in order to analyze the temporal distribution of the clustered keywords. For example, in #2 venture capital funds, the first literature with keywords such as venture capital and second board market appeared around 2000. From venture capital companies to

investment characteristics and international comparison, and partnership, angel fund around 2010, the time interval between keywords has narrowed, representing the tendency of literature publication in this cluster. In 2019, the last literature with the keywords of talent absorption and development model appeared, indicating that scholars' research on the direction of venture capital funds came to an end for the time being.

Overall, the recurrence of the same or similar keywords indicates the depth and continuity of scholars' research on GIFs. From 2015 to the present, the distribution of keywords shows a slightly sparse trend, indicating that the research on GIFs has matured. 2003-2006 was the initial period when GIFs entered the academia, and topics such as industrial banking, decision revenue, bond financing, delayed option, real option, public-private partnership (PPP), development strategy, and fund supervision emerged one after another. From 2008 to 2012, the academic community launched the research on the relationship between GIFs and local industrial development, mainly focusing on the issues of industry-financing integration, local hedge funds, local government-guided funds, entrepreneurship and innovation, talents' city, talents' province, talents' apartment, industrial clusters, and development strategies, etc. From 2015 to 2016, GIF research showed an obvious trend of concentration, with nodes such as industry-financing integration, industrial excess, industry innovation, and special bonds taking over the focus of the previous two stages. Authors conducted more in-depth research on them. And from 2018 to the present, issues regarding the management system of GIFs—failure tolerance, loss compensation, interbank investment, and structural mismatch—have received extra attention, and researches about GIFs has entered a new stage of maturity and reflection.

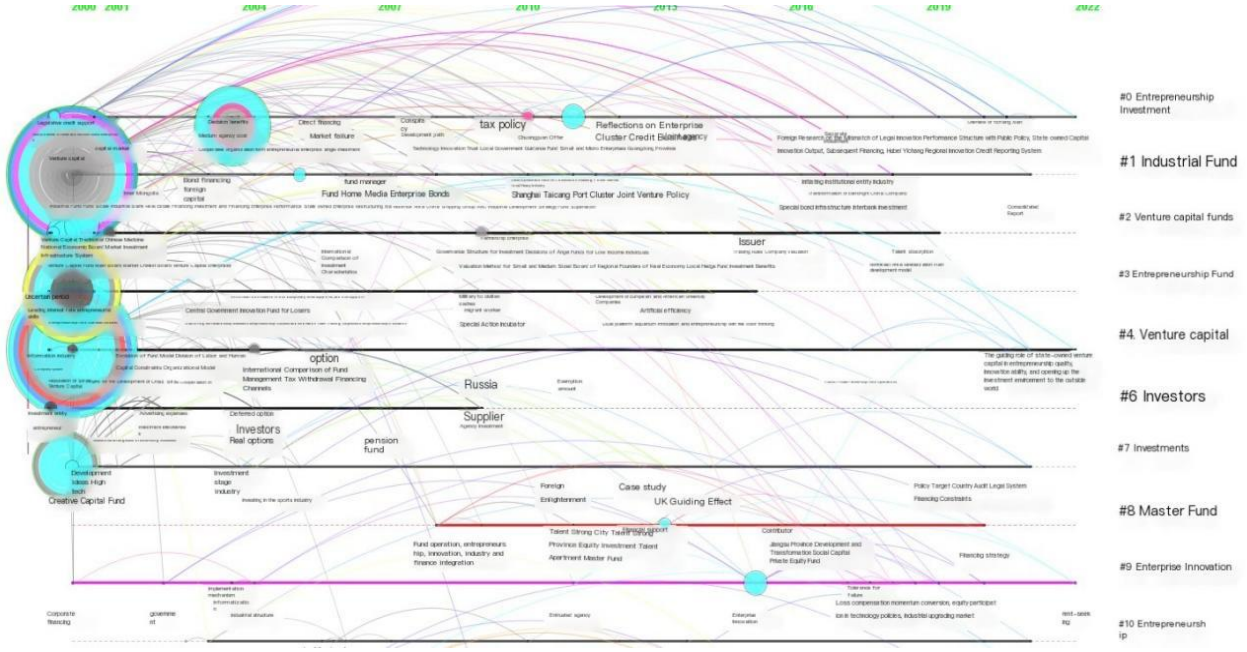

Figure 4. Keywords clustering timeline.

A comprehensive analysis of the hot keywords and clusters in the last decade (Figure 5) reveals that entrepreneurial investment, science and technology innovation, and innovation drive are the preferred research topics in recent Chinese academia. Keywords such as guided funds, industrial poverty alleviation, and venture capital institutions are the most frequent in the above clusters.

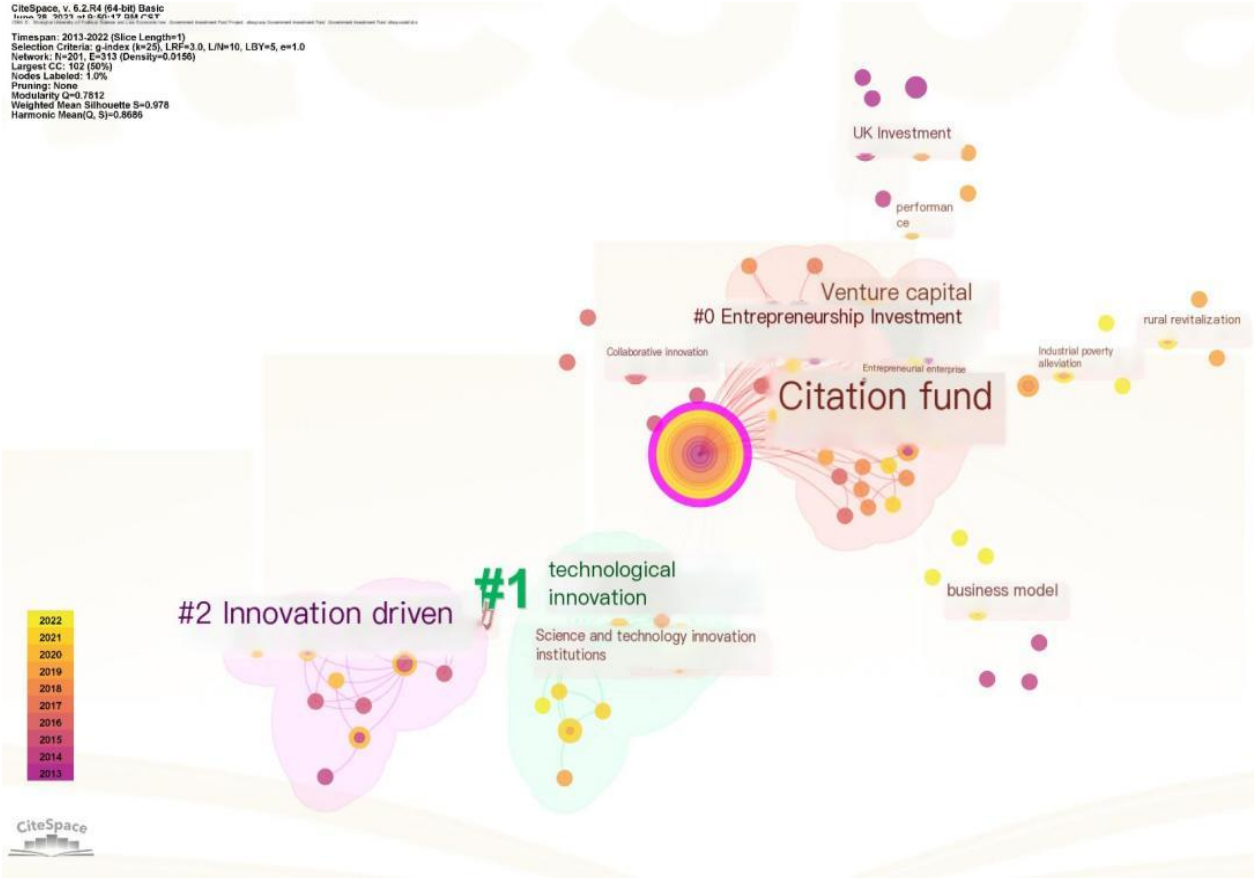

Figure 5. Associated keywords and clusters map (2013-2022)

Hot Topics in GIF Research

With the help of the study of keyword centrality in a field of literature, the distribution of hotspots in the field can be analyzed. Using CiteSpace, based on the visualization of keywords, the high and medium centrality keyword ranking table was further organized according to centrality values and frequency of occurrence (Table 2). The top 12 keywords with the highest centrality were ranked in descending order according to the centrality values. Among them, the cognates of government investment fund, industrial fund, and venture capital fund have centrality of 0.24 and 0.19, respectively, indicating that they are strongly related to other hot keywords. The centrality of venture capital is 0.24 and 0.19 respectively. The citation frequency of venture capital is the highest among all keywords, 62 times, but the centrality value is only the third among all keywords, which indicates that its connection with other keywords is weak. Although the frequency of investors is relatively low, the centrality still reaches 0.15, which is higher than that of venture capital. Other high centrality keywords include venture capital fund, SMEs, corporate innovation, venture capital, bootstrap fund, second board market, and business fund. On the whole, the keywords in the field of GIF research are not closely enough related to each other. The main reason is that there are many concepts related to GIFs and their meanings are close to each other, so scholars generally only use one or two concepts in the literature in order to explain the issues under study clearly. Thus, these one or two conceptual expressions become associated with many non-synonymous words, which objectively increases their centrality.

Table 2

Sorting of High Centrality Keywords

No.	Keyword	Centrality	Frequency	No.	Keyword	Centrality	Frequency
1	Industrial funds	0.24	56	7	Small and medium-sized enterprises	0.05	14
2	Venture fund	0.19	50	8	Enterprise innovation	0.05	10
3	Venture capital	0.17	62	9	Entrepreneurial capital	0.05	10
4	Investor	0.15	34	10	Introductory fund	0.03	15
5	Entrepreneurial investment	0.14	51	11	Secondary market	0.03	14
6	Venture capital fund	0.07	21	12	Business fund	0.01	30

The next part of the article will examine five hot topics related to GIFs: industrial funds, venture capital, guided funds, science and technology innovation, small and medium-sized enterprises (SMEs), in the context of previous research literature.

Research of industrial funds. Industrial investment fund, or industrial fund, is one of the forms of GIF. The opposite concept is “non-industrial funds”. The focus of industrial funds is on “industry”. Such funds will be established to support the development of certain industries, such as agriculture, public service infrastructure construction, medical and pension industry, cultural tourism industry, industries with regional characteristics and advantages, national strategic emerging industries, high-tech enterprises and enterprises transforming scientific and technological achievements, etc. While “Non-industrial funds” are invested in unspecified industries. In a broad sense, the establishment or investment subjects of industrial funds can be either central or local governments, or social and private capital. The government and social capital can also cooperate to establish industrial funds. There is a crossover relationship between GIFs and industrial funds. A significant portion of industrial funds are also government-led, with the government funding the establishment of a mother fund to support the development of specific industries. The proportion and amount of the mother fund’s participation in sub-funds are always limited. The crossover part is the industrial fund in a narrow sense. When scholars study industrial funds, they usually use the concept of industrial funds in a narrow sense, focusing more on the performance of government public capital and its influence on the market.

Around 2000, industrial funds have become a hot spot for GIF research, and sub-topics such as concept identification, role mechanism exploration, and fund governance have been differentiated in this topic. At the early stage of research, Ma Jianxin (2000) and other scholars identified the concepts of industrial investment funds and venture capital funds and proposed a new idea of establishing an industrial investment system. In terms of the mechanism of the role of industrial funds, Liu Ruibo and Jia Xiaoyun (2006) and Xu Lin et al. (2018) compared the development and operation modes of industrial funds in the UK, the US, Japan, and other countries in their research, and proposed a path of industrial fund development that is consistent with the actual situation in China. On the path of promoting the development of industrial funds, they believe that the leverage effect of government funds should be given full play, and the limitations of geography and industry can also be broken, and the scope of investment can be expanded moderately. In terms of industrial fund governance, Chen Feiqiong et al. (2015) conducted a multi-group structural equation model empirical test on industrial fund and industrial structure data in order to explore the influence mechanism and path of industrial investment funds to promote industrial restructuring. The study found that industrial funds promote industrial restructuring at the micro level,

while at the macro level, although they drive employment growth, their role in promoting industrial restructuring is not yet obvious. Liu Yong (2017) studied the effect of the implementation of industrial guidance funds in local counties and cities, and found that although local industrial funds can promote local economic development, the low efficiency of fund use and slow investment progress are still problems that need to be solved. Lin Saiyan and Xie Hong (2014) and Cheng Dan (2017) explored the way out for the efficiency improvement of industrial funds from the perspective of market-oriented mechanisms and internal and external governance mechanisms, respectively. Cai Shenyuan and Yu Yan (2011) and Cao Fei (2020) studied the risk assessment and prevention of industrial funds in China. Shen Qian et al. (2017) analyzed the regional characteristics of industrial funds, summarized the common features of industrial funds, and pointed out the problems in the operation process of industrial funds in less developed regions. Zhou Li (2017) and others proposed the hidden risks in the "PPP+B" model industrial funds from the perspective of the principal-agent and game relationship between investment subjects. In addition to the above sub-themes, some scholars also put forward original ideas, for example, E. Libin (2013) argued that industrial funds have the role of inhibiting multinational enterprises from crowding out domestic investors' equity, while Zhu Jin and Zhao Yan (2017) pointed out the new development direction of industrial funds under green policy objectives. The academic achievements on the topic of industrial funds are abundant, and scholars have conducted in-depth discussions on the theoretical construction and practical operation of industrial funds from multiple perspectives from their respective research directions.

Research on venture capital fund. Broadly speaking, venture capital funds can be divided into commercial venture capital funds and government-led venture capital funds according to the difference in the composition of their investment entities. The government-led venture capital fund is established by the central or local government as a co-funder. By using government investment as a demand-side fiscal policy, a small amount of government capital can be used to leverage a large amount of social capital to invest in entrepreneurship and innovation, thus promoting the development of high-tech and other new industries. This paper focuses on the literature measurement and analysis in the area of GIFs, so the venture capital funds discussed here refer to government-guided venture capital funds only.

From the research results produced by the academic community, the similar clustering of venture capital and venture capital fund has always been the biggest hot issue in the field of GIFs. Since the emergence of this topic, scholars have been studying it without interruption. After sorting out and summarizing, the topic of venture capital funds can be divided into sub-topics such as the study of guidance effect of venture capital funds, the study of performance, the study of operation mode, the study of principal-agent mechanism, the study of risk prevention, and the study of legislation.

First, in terms of the bootstrap effect of venture capital funds, Zhao Weijiu (2016), Ni Xuanming et al. (2018), and Cong Feifei et al. (2019) all analyzed in depth the bootstrap effect or crowding out effect of government capital on social capital, and on this basis, they proposed a development path that balances the strategic goals of the government and the realization of the interests of private subjects.

Second, in terms of research on the performance of venture capital funds, several scholars, including Li Hongjiang (2010), Liang Juan and Kong Liuliu (2011), Zhu Yunhuan and Zhang Mingxi (2018), and Zhao Bin (2020), based on the results of empirical analysis, suggested that venture capital funds operating according to

market-based principles should improve their fund management and ability to tap high-quality projects if they want to drive private capital to a greater extent. In order to form a benign and efficient chain of financial fund use, it is necessary to set up a performance evaluation index system for government-guided venture capital funds. It should be centered on achieving the expected objectives of the policy, with the indicators of management capability, effectiveness, and performance of supported institutions as the main assessment indicators. And the effectiveness of venture capital funds can be improved in multiple directions, such as policy, economic, social, management, and risk control.

Third, in terms of operation models, scholars such as Chen Minling (2010) and Pang Yuehua and Zeng Linghua (2011) have studied and summarized the foreign government support models for venture capital funds, including the financing guarantee model represented by the United States and Germany, the fund participation model represented by Australia and Israel, and the compound support model represented by the United Kingdom. And China's domestic economically developed regions have also developed their own government-led venture capital fund organization and operation models. Li Yihui (2013), Pan Qinyan and Zhu Weiping (2012), Wang Zhimin et al. (2012), and Li Hongrun (2014) further analyzed the organizational structure and internal governance issues of domestic venture capital funds and proposed a path to improve the practice of venture capital funds.

Fourth, in terms of the principal-agent mechanism of venture capital funds, Guo Jianluan (2004) and Chen Lei (2011) used game theory and incentive modeling analysis to study the economic effects of venture capital funds, respectively, and pointed out the dual principal-agent relationship that exists in the operation of government-guided venture capital funds. In the principal-agent relationship between the government and its guided venture capital funds, the government side, as the principal, can effectively isolate and reduce the financial investment risk caused by information differences by using the limited partnership system. In contrast, in a principal-agent relationship between a venture capital fund and its sub-funds, a contribution in the form of convertible bonds is a viable solution to cope with the information gap.

Fifth, in terms of risk prevention, Zhang Yong (2012) and Han Aihong and Fu Guiyan (2016) both studied the risk factors of government-guided venture capital funds from a microscopic perspective and attempted to construct a more comprehensive risk prevention mechanism.

Sixth, in terms of venture capital fund legislation, Zhang Dongsheng and Liu Jianjun (2000a; 2000b) assessed the legislative environment of venture capital funds and proposed legislative suggestions, while Jiang Jianxiang (2011) explored the legal regulation of venture capital funds.

Research on guided fund. Government-guided fund is a special kind of GIF, which is funded by the government alone to establish a parent fund, and then invest in specific projects by way of equity participation in sub-funds or follow-up investment, and there are often special legal documents to strictly limit the proportion and scale of contribution of the parent fund in sub-funds. The focus of the research on guided funds is on "guided", which is different from "industry" and "venture capital" in the aforementioned two themes. Scholars' research focuses on the effect of guidance, problems and difficulties of the operation mode, performance evaluation, risk control, entry and exit mechanisms of guidance funds, policies and regulations, etc.

First, in the study of the bootstrap effect, it is generally agreed in the academic community that bootstrap funds can effectively promote economic growth, and the growth model takes diverse forms. Yang Minli et al.

(2014), Fan Yan and Bao Xinzhong (2016), Chen Xudong and Liu Chang (2017), Li Shanmin et al. (2020), and Cheng Yusi et al. (2022) all tested the regional differences in the bootstrap effect of government bootstrap funds through empirical methods. In regions with a more developed capital market and venture capital environment, the promotion of venture capital and innovation investment by bootstrap funds is greater, but government funds have a crowding-out effect on social funds, which is consistent with the "virtuous circle" hypothesis. Based on the study of Yang Minli's team, Feng Bing et al. (2019) pointed out the limitations of the bootstrap fund in the subsequent financing of enterprises. Conghui Cheng and Siliang Wang (2018), Song Huang et al. (2020), and Bin Wu et al. (2022) explored the role of bootstrapping funds in enhancing technological innovation output as well as entrepreneurial quality, and found that the government's indirect participation in investment projects with bootstrapping funds is better than direct investment. Jiang Bo (2009), Wu Yingning (2010), and other scholars analyze that the reason why the fund guidance effect fails to meet expectations is that the policy objectives and mechanisms of the guidance fund are not set reasonably, resulting in the fund facing many restrictions in the actual operation process.

Second, in the study of the problems and difficulties of the operation mode of guidance funds, scholars such as Tan Zhongming and Zhu Zhongwei (2013), Li Yan and Chen Jinhuang (2017), and Zhang Jie and Yan Chunying (2019) argued that the operation of government guidance funds is influenced by many factors such as the coincidence of policy objectives, professional talent team, supervision and management, risk control, efficiency of capital use, and market environment; Du Chaoyun and Zheng Yu (2009) and Qin Zisheng and Shu Ying (2014) comparatively studied the operation mode of guidance funds in foreign countries as well as in Taiwan, China, and pointed out that the development direction of guided funds lies in improving the supervision mode and strengthening the review.

Third, in the study of performance evaluation of guidance funds, Li Hongjiang and Bao Xiaoyan (2012) examined the performance level of foreign guidance funds and found that the institutional system, environment and cultural factors all contribute to the differences in the performance of guidance funds across countries. Liu Quanshan and Zhao Tuanjie (2020) and Yue Hongjiang (2021) analyzed the logical basis for the construction of the performance index system and made suggestions for the improvement of the performance system of government-guided funds in China.

Fourth, in the study of risk control of bootstrap funds, Chen Shaoqiang et al. (2017) analyzed the need to seek a balance between the value of financial efficiency and the value of financial security at the macro level, taking into account factor matching and risk prevention. He Jianhong and Ma Ling (2008) and Zhang Lei et al. (2011) analyzed the causes and manifestations of the risks of "rent-seeking" and collusion with enterprises by the managers of guidance funds, and the research group of the Nanchang Central Branch of the People's Bank of China and Zhang Zhifu (2017) verified that the financial risks in the issue of guidance funds may be transformed into financial risks. Liu Quanshan (2018) constructed a risk management model of the bootstrap fund under the framework of principal-agent theory and explained its operation mechanism from a practical perspective.

Fifth, in the study of the access and exit mechanism of guidance funds, Zhao Guangming and Guo Jintong (2010) conducted an analysis of the necessity and possibility of establishing an access mechanism for management companies. Wei Zhimin and Hu Hao (2020) pointed out the problems of management regulation and lack of market maturity of the exit mechanism of the guidance funds.

Sixth, in the research on the policy and regulations of guidance funds, based on the empirical analysis of the policy texts, Tan Jageng (2021) and Cheng Conghui and Chu Qingqing (2022) clarified the proliferation mechanism of the guidance fund policy and the motives of policy revision. Wang Zhimin (2011), Yan Hai (2019) and He Jianghua (2020), on the other hand, explore the legal regulation of guidance funds from a theoretical perspective, with a view to establishing a scientific and perfect legal system for government guidance funds with a focus on regulating government behavior and improving regulatory mechanisms.

Research on science and technology innovation. Innovation is an important strategy for China's economic and social development. In the science and technology innovation system with theoretical innovation as the root, institutional innovation as the guarantee and scientific and technological innovation as the key, the government and enterprises are the two leading forces. Although under China's market economy system, the government is not suitable as the main body of science and technology innovation, it plays a pivotal role in all aspects of science and technology innovation. The GIF is one of the tools for the government to regulate the cause of science and innovation. Scholars such as Huang Guoping and Kong Xinxin (2009), Liu Liang (2012), Guo Lihong (2014), and Xia Siying (2021) analyzed the effect of fiscal guidance and science and technology finance on science and technology innovation and formed a unanimous view that GIFs play a significant role in promoting science and technology innovation and industrialization of science and technology achievements. And Lv Liansheng and Lv Yingjie (2015) took the construction of a science and technology collaborative innovation platform in Hefei, Anhui Province as an example to study the breakthrough achievement of GIFs as a financing method.

SME research. Although there is less literature on the topic of SMEs compared to the first five topics, there is still a need for a separate discussion. GIFs themselves have the purpose of promoting industrial development and driving entrepreneurial investment. Its positioning is to play a guiding role through the operation of financial funds to adjust the macroeconomic structure and deepen market development. The ultimate purpose of GIFs is to benefit the majority of market players. And the group of SMEs is an integral part of the market players. The difficulty of financing has been a serious problem plaguing SMEs, and scholars such as Hai Ming (2010), Zhang Jie (2012), Zhou Zhangyue and Jiang Xin (2014) envisioned that through the linkage of finance and finance, the policy means of establishing GIFs can provide financial support for the development of SMEs and drive more social capital to solve the financing problems of SME clusters.

Research Trends Summary and Outlook

Trends in GIF Research

Following is the above exploration of the timeline and clustering research themes of keywords in GIF literature, further using the keyword-burst analysis in CiteSpace to form a graph. The burst period of each keyword and the research hot spots in each time period can be observed, and the future research trends can also be predicted. In this paper, we analyzed the keywords of GIF research literature, collected 25 burst keywords, and arranged them in the order of their beginning of burst (Figure 6). Three patterns of past GIF research can be summarized.

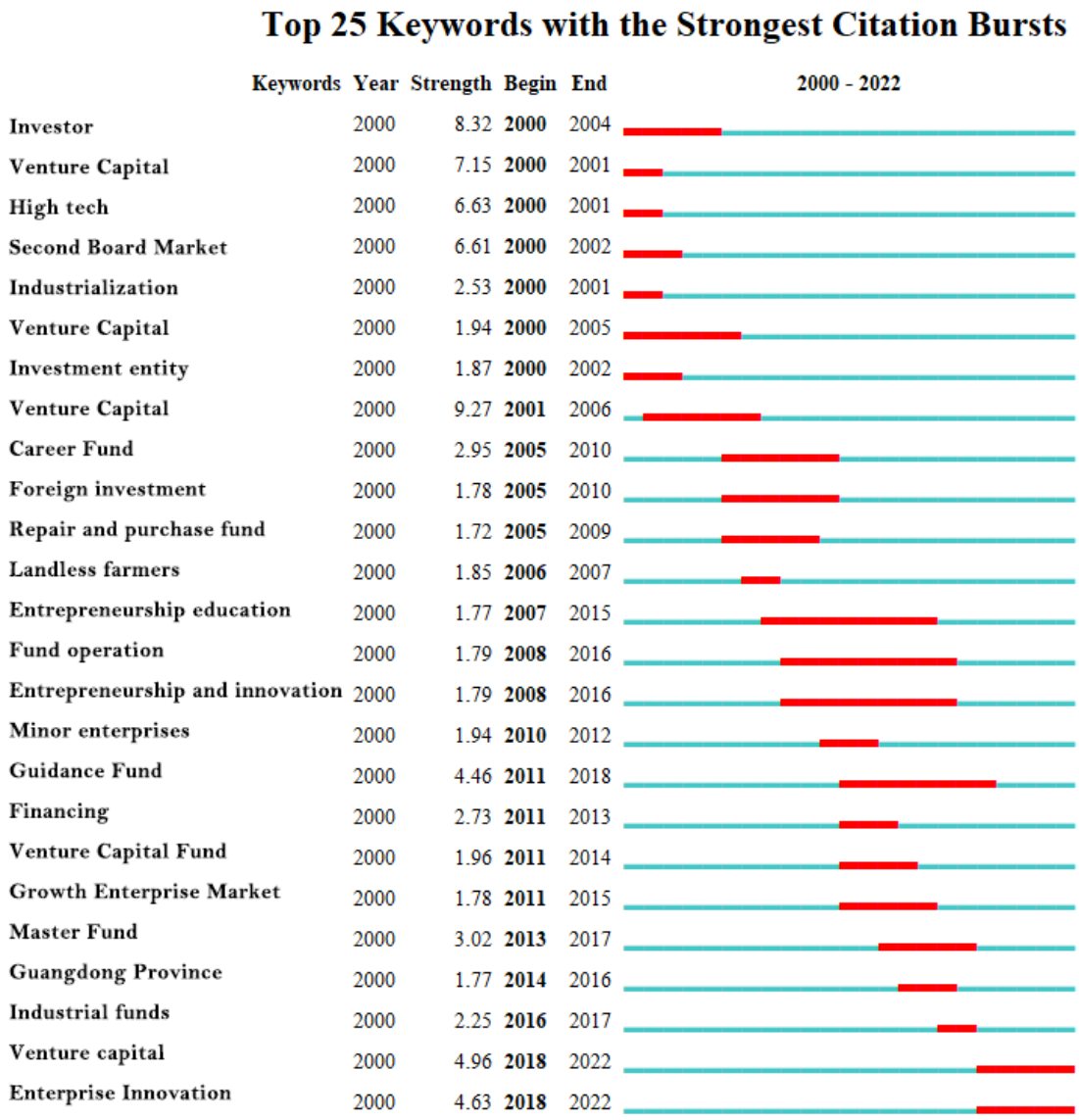

Figure 6. Keyword burst analysis.

First, analyzing the emergent content and emergent time nodes, we find that the stage characteristics of GIF research are not obvious. The reason for this is that the keywords of research hotspots in different periods have a homogeneous tendency. For example, investor and investment subject and venture capital, second board market, financing and GEM, industrialization and industrial fund, entrepreneurial innovation, venture capital and enterprise innovation, etc. It can be seen that the research on certain hotspots has continuity and a large time span. This indicates that the corresponding issues have considerable research value and scholars have explored them more deeply.

Second, analyzed from the perspective of emergent intensity, venture capital, investors, high-tech, second board market, enterprise innovation, and guided fund etc. burst most prominently in the 25 keywords. It reflects that the topic of venture capital and innovation and entrepreneurship has received more attention in a relatively short period of time, and the output of scholars in the field has increased significantly. The factors contributing

to this phenomenon may be the introduction of national support policies in this area or the drastic changes in the market environment. So scholars have made a re-examination of these important concepts in response to the current situation.

Third, the burst of venture capital and enterprise innovation is not over by 2022, indicating that innovation and entrepreneurship will continue to be a hot issue at the forefront of GIF research for some time to come. The GIF system will also be increasingly improved with the deepening of research in related fields.

Research Outlook of GIF

Because of the policy nature of the system purpose and the market-oriented operation mode, GIFs have the special function of playing the role of market allocation of resources under the premise of moderate government intervention in the market. Appropriate use of GIFs as a leveraged fiscal and financial tool can promote China's innovation and entrepreneurship, industrial upgrading, regional coordination and balance work in the new development pattern, and ultimately achieve common prosperity under the common governance of government and society. Future research in the field of GIFs should fully reflect on the shortcomings and omissions of existing research results and continue to improve the theoretical research and institutional construction research on GIFs, specifically from the following three aspects.

Research on the relationship between GIFs and fiscal system changes. On the one hand, the government is the most important participant in the GIF. If an investment fund is separated from the financial support, it will lose its policy and most likely deviate from the initial set development direction due to the profit-seeking nature of capital. At the same time, the social effect cannot be exploited. On the other hand, to study fiscal and financial instruments, it is necessary to place them back in the fiscal and financial market environment in which they were created and developed. In this way, the internal logic of the system can be thoroughly explained, and the research can be freed from the meaningless repetition of the "matter-of-fact" effect assessment. Based on this, deeper and more focused reform proposals can be made. The source of GIFs is closely related to the issue of fiscal revenue, while the investment model is a subordinate concept to the issue of fiscal expenditure. After decades of development, China's fiscal system, along with the establishment of the market economy system as a basic policy, has taken on strong local Chinese characteristics. It has created institutional differences between China's GIFs and the so-called GIFs abroad. Therefore, studying the relationship between GIFs and fiscal system changes can provide a deeper insight into the development of the former and the theoretical basis. It will make the subsequent research more contemporary.

Research on the coordination relationship between government and market interests in GIFs. In recent years, decentralization and "decentralization" have become familiar topics. The transformation of government functions and the construction of a "responsive government" are also important aspects of the new normal development of the domestic economy. In the past 30 years, local governments have been nurturing the market economy by reforming state-owned enterprises, and competition among local governments has emerged. The drawbacks of such competition are reflected in the establishment of various local GIFs, mainly in the form of duplicate investments and blind investments that ignore local endowments. This will lead to a possible conflict of interest between the government and the market. Specifically, the enthusiasm of private capital to participate in investment will be reduced and the effectiveness of market allocation of resources is going to be weakened. In

the follow-up study, the academic community should pay more attention to the coordination of interests between the government and social capital in GIFs on the basis of studying the guiding role of GIFs.

Research on the legal regulation of GIFs. Market economy is a "rule of law economy". As an important means of fiscal and financial regulation, GIFs need to operate under the authorization and guarantee of the law, which involves the security of financial funds and social public interests. However, the current focus on the issue of GIFs in the field of jurisprudence is insufficient. At present, jurists' exploration of GIFs has always remained at the periphery of this thing. This may lead to unclear legal status of GIFs, confusion in legal relations, lack of risk control and supervision mechanisms, and inadequate dispute resolution mechanisms. Future research on the legal regulation of GIFs should focus on distinguishing GIFs from other related concepts in order to facilitate specialized, precise, and scientific legislation. Then, the establishment and operation of the fund will return to rationality and perform the proper function of the system. In addition, in terms of risk control and supervision as well as dispute resolution, elements such as the causes of risk, authority and responsibility subjects, and implementation procedures need to be clarified.

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