A Comparative Study on Register Based on Chinese and International Studies: A Scientometric Analysis in CiteSpace (2010-2021)

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| ABSTRACT

This paper conducts a comprehensive review and comparative analysis of the research on register published in Chinese and international authoritative journals from 2010 to 2021 by employing CiteSpace 5.8.R3, a visual bibliometric software. It describes the number of publications, the keywords with the strongest citation bursts, research institutions, journals and influential authors, and pinpoints the principal frontiers of register. The results indicate that the number of publications of Chinese register research has shown a significant downward trend on the whole, while international register research has shown a significant upward trend on the whole. The journal of high-cited papers on register studies in China has a low impact factor, while international hot papers on register studies have a high impact factor. Chinese scholars focus on the different research perspectives of the register (systemic functional linguistics, multidimensional analysis and corpus), while international research pays attention to register variation, especially English variation and Spanish variation, and register in academic writing. Influential scholars leading the trend of register research include Biber and Rooy. The findings of this study would provide some academic and pedagogical implications on the register for Chinese scholars.

| KEYWORDS

Linguistics, register, CiteSpace, comparative study

1. Introduction

The notion of register, in the study of an institutional linguistic framework, was firstly proposed by Halliday *et al.* They held that changes in language vary lie in their function and defined register as a variety of a language distinguished according to use (Halliday et al., 1964: 87). For instance, a teacher lecturing to a group of students distinguishes himself from an orator delivering a speech to the audience since they are available to different registers. Research on the register has great enlightenment for language teaching(Nunan,1991; Wray & Lewis, 1997), stylistic analysis and translation(Baker, 1992; House, 1977; Si Xianzhu, 2016).

Recently, the study of the register has been continuously deepened in the dynamic development, and many research hotspots and trends have emerged. Existing studies have made quite full and useful discussions on the register from different study fields, while relatively few studies have systematically combed and reviewed the research progress of register-based on CiteSpace and discussed its future research trends. Therefore, this paper uses the visual analysis software CiteSpace to review and summarize the latest progress in register research from 2010 to 2021. It mainly discusses the following four aspects: a general review of Chinese register research trend and hotspot; a general review of the international register research trend and hotspot; a comparative analysis of China and foreign register studies; the implications for Chinese future register research.

2. Methodology

2.1 Data source

The data of this research come from two sources: the domestic papers are selected from the CNKI (China National Knowledge Infrastructure) database, and the international papers are obtained from the Web of Science database. The trend chart of papers

published in CNKI and Web of Science databases shows that 2010 was a watershed in the number of papers published. The number of related papers published by Chinese scholars was relatively large before 2011 and began to decline gradually in 2011. The number of papers published by foreign scholars was relatively small before 2009, but there has been an increasing trend since 2009 and 2010. Therefore, this study sets the starting time of the time span as 2010 and compares and analyzes the development trends of Chinese and international register studies. Register originated from register theory studies, so "Register" or "Register Theory" was selected as the keyword for advanced retrieval of core journals in CNKI. The publication time span of the paper is set from 2010 to 2021, and the papers that are not related to linguistics are excluded. In this way, 251 papers published between 2010 and 2021 were selected. In the Web of Science database, "Register" or "Register Theory" was chosen as the keyword to search in the core collection, and 111,343 papers were selected. Then those papers were refined in the research direction of linguistics. Finally, 536 papers related to the register in the field of linguistics were obtained.

2.2 Data analysis

CiteSpace 5.8.R3 is used for bibliometric analysis of the research on the register, which is designated by Dr. Chen Chaomei. This software is widely used to analyze the co-citation relationship between journals and authors, bibliographical identification and presentation of research frontiers (Chen, 2004; Chen, 2016). In this paper, firstly, the valid sample data of Chinese and international research on the register will be input into CiteSpace. Secondly, the appropriate parameters of CiteSpace would be set: the time span is from 2010 to 2021, the time slice year is 1 year, and the type of nodes include authors, research institutions, co-occurrence of keywords, co-citations of papers, co-citations of authors, etc., other parameters are default parameters of the software. Finally, the collected data would be drawn into a knowledge map, which is combed, summarized and analyzed so as to find out the current situation and development trend of register research.

3. Research Results

3.1 Analysis of Chinese Literatures Volume and Published Journals

The research data show that register related research began to appear in China in the 1980s, and the research has shown a dynamic upward trend for a long time, while it showed a downward trend after 2011, which is statistically significant. Specifically, the number of register studies decreased from 2011 to 2013, and the number of papers published from 2013 to 2014 decreased sharply. After a one-year flat period, the number of papers published from 2016 to 2021 continued to decline, and the research heat disappeared (see Figure 1). On the whole, the average number of papers published on register-related topics shows a steady downward trend, which shows that there is still a large development space for register research in China, and researchers need to pay more attention to and explore new research perspectives and growth points.
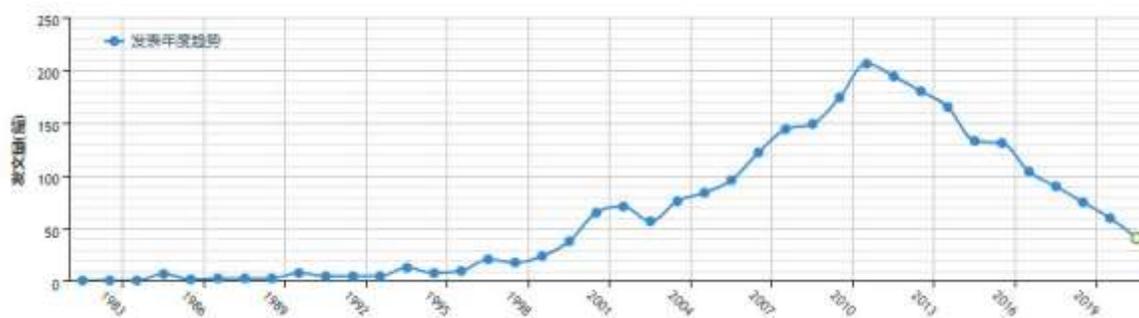

Figure 1 Annual distribution graph of Chinese register research

By organizing the graph information of CiteSpace and CNKI data, this study lists the top six journals with the greatest influence in the field of register research according to the number of publications, as shown in Table 1.

Table 1 Distribution of core journals in Chinese register research

Rank	Journal	Volume	Proportion	Impact Factor
1	外语教学(Foreign Language Education)	20	7.9%	2.586
2	外国语（上海外国语大学学报）(Journal of Foreign Languages)	15	5.9%	1.634
3	现代外语(Modern Foreign Languages)	15	5.9%	2.767
4	外语与外语教学 (Foreign Languages and Their Teaching)	12	4.7%	1.839
5	当代修辞学(Contemporary Rhetoric)	11	4.3%	1.814
6	外语研究(Foreign Languages Research)	11	4.3%	1.294

The top six Chinese journals in terms of the number of published papers on register research are *Foreign Language Education*, *Journal of Foreign Languages*, *Modern Foreign Languages*, *Foreign Languages and Their Teaching*, *Contemporary Rhetoric and Foreign Languages Research*. The study found that the top three are all core journals in foreign languages study. According to the overall data of CNKI, the journals with the highest number of publications are mainly composed of the following two types of journals: teaching journals and foreign-language journals. As a journal focusing on the study of teaching in foreign languages, *Foreign Language Education* ranks first in the number of related publications. In recent years, the journal has been paying attention to the study of register, especially the study of register combined with multi-dimensional analysis, which not only provides Chinese scholars with a platform for register research but also promotes the dissemination of register research, attracting more research scholars to pay attention to related research. However, the number of core journals on register research in a foreign language and teaching field is generally small.

3.2 Analysis of Chinese Co-Citation and Citation Bursts
Keywords are the embodiment of the main content of the paper and a summary of the key points of the paper. Usually, research hotspots in a certain field are presented by keywords with high frequency, so the analysis of keyword co-occurrence can directly reflect research hotspots of register. Based on CiteSpace, this research analyzes the keywords of Chinese register research in the past ten years and draws a keyword co-occurrence knowledge map (see Figure 2). In the visualization map, the importance of keywords is presented by frequency and betweenness centrality. The size of the nodes in the graph can reflect the frequency of keywords. That is, the larger the node, the more frequently it appears, indicating that the stronger its betweenness centrality is and the more likely it to appear in the center of the knowledge map. On the basis of further sorting out the keyword data, this paper also summarizes the keywords whose frequency is not less than 5 times in the Chinese register research in the past ten years (see Table 2).

Figure 2 Keyword Co-Occurrence analysis from 2010-2021

Table 2 High-frequency keywords from 2010-2021

High-frequency Keywords（2010-2021）			
Keyword	Count≥5	Year	Proportion
语域(register)	34	2010	13.5%
系统功能语言学 (systemic functional linguistics)	19	2011	7.5%
多维分析 (multi-dimensional analysis)	8	2015	3.1%
语料库(corpus)	8	2012	3.1%
翻译(translation)	6	2010	2.3%
语境(context)	6	2011	2.3%
语域变异(register variation)	6	2015	2.3%
专门用途英语(ESP)	5	2011	1.9%

From the information in Figure 2 and Table 2, it can be concluded that the high-frequency keywords of Chinese register-related research in the past decade include register, systemic functional linguistics, multidimensional analysis, corpus, translation, context, register variation and English for specific purposes(ESP). In addition, in order to further explore the latest trends and research frontiers of Chinese register research in recent years, this paper continues to run the CiteSpace burst detection and then obtain its burst word based on the title, abstract, keywords and other information and further sorted out the mutation keyword vocabulary (see 3). In addition, in order to further explore the latest trend and research frontier of domestic register research in recent years, this paper continues to run CiteSpace burst detection and then obtains its mutant words based on the title, summary, keywords and other information of the selected data, and further sorts out the list of burst words (see Figure 3).

Figure 3 Keywords with the strongest citation bursts in Chinese register research

Top 1 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2010 - 2021
多维分析	2010	2.58	**2018**	2021	

Based on Figure 3, we can see that there is only a multi-dimensional analysis of burst words from 2010 to 2021. If the frequency of or use of burst words increases suddenly over a period of time, it can reflect the latest research trends in a certain research field to a certain extent. In recent years, multi-dimensional analysis has begun to be applied to register research, which has increased sharply since 2018. The method of multi-dimensional analysis was proposed by Douglas Biber in his doctoral thesis in 1984. However, this method requires corpus labeling, retrieval, frequency sorting and factor analysis, so it brings great technical obstacles to researchers. In 2013, Dr. Andrea Nini of Manchester University developed MAT (Multidimensional Analysis Tagger), which broke through the technical bottleneck and realized the automatic analysis of data, which has greatly promoted the research of register on multi-dimensional analysis. In recent years, multi-dimensional analysis has been mainly used in different fields such as comparative analysis, ESP, corpus research and register analysis, mainly involving the comparative analysis of different registers such as business English, EGP (English for General Purposes) and customs English news, corpus-based analysis of discourse function, language features, the accuracy of the translation, register variation and metaphor-based multi-dimensional approach of register analysis.

3.3 Analysis of Chinese Authors and Institutions

The degree of cooperation between authors in the knowledge map can reflect the cooperation of authors in a certain research field and the research scale, depth and breadth of the theme. Tracking the author groups and cooperative institutions with certain academic influence through CiteSpace will help us better grasp the research trends in a certain discipline field. Therefore, this study selects the author and the institution as the node so as to draw the network knowledge map of authors and cooperative institutions (see Figure 3) and make an overall analysis of it.
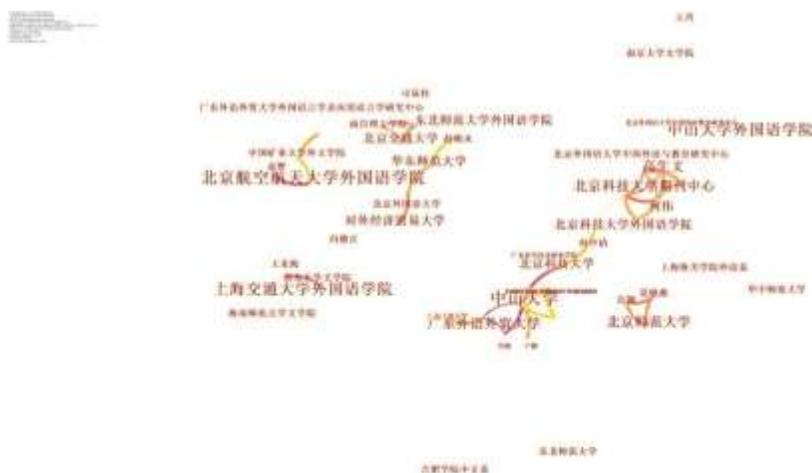
Figure 3 Knowledge map of authors and institutions in Chinese register research

Based on Figure 3, it can be seen that there are a few research scholar groups with certain academic influence in register research, but the authors and publishing institutions are generally small. Zhongshan University and the School of Foreign Languages of Beihang University are the most prominent institutions. Gao Shengwen and He Wei from the University of Science and Technology Beijing and Xia Xiaoyan and Yue Ying from Beijing Normal University have made some contributions to the register-related research.

Table 4 Distribution of core authors and institutions in Chinese register research

	Rank	Institutions/Authors	publications
Institutions	1	中山大学 (Zhongshan University)	11
	2	北京航空航天大学 (Beihang University)	6
	3	上海外国语大学 (Shanghai International Studies University)	5
	4	上海交通大学 (Shanghai Jiao Tong University)	5
	5	北京师范大学 (Beijing Normal University)	4
Authors	1	王东海(Wang Donghai)	5
	2	高生文(Gao Shengwen)	5
	3	袁野(Yuan Ye)	4
	4	赵朝永(Zhao Chaoyong)	3
	5	孙亚(Sun Ya)	3

3.4 Analysis of International Literatures Volume and Published Journals

It shows that the relevant research on the register has begun to appear internationally in the 1980s, which has increased sharply since 2009, and has been showing a dynamic upward trend on the whole, which is statistically significant. Specifically, the number of studies was basically stable from 2009 to 2013; the number of published papers increased sharply from 2014 to 2015 and continued to increase after a slight decrease in 2016 (see Figure 4). On the whole, the average number of papers published on international register-related topics has shown a steady upward trend. As a research hotspot on the rise, it shows that international register-related research is in the ascendant, and scholars need to pay more attention and explore its new research points.
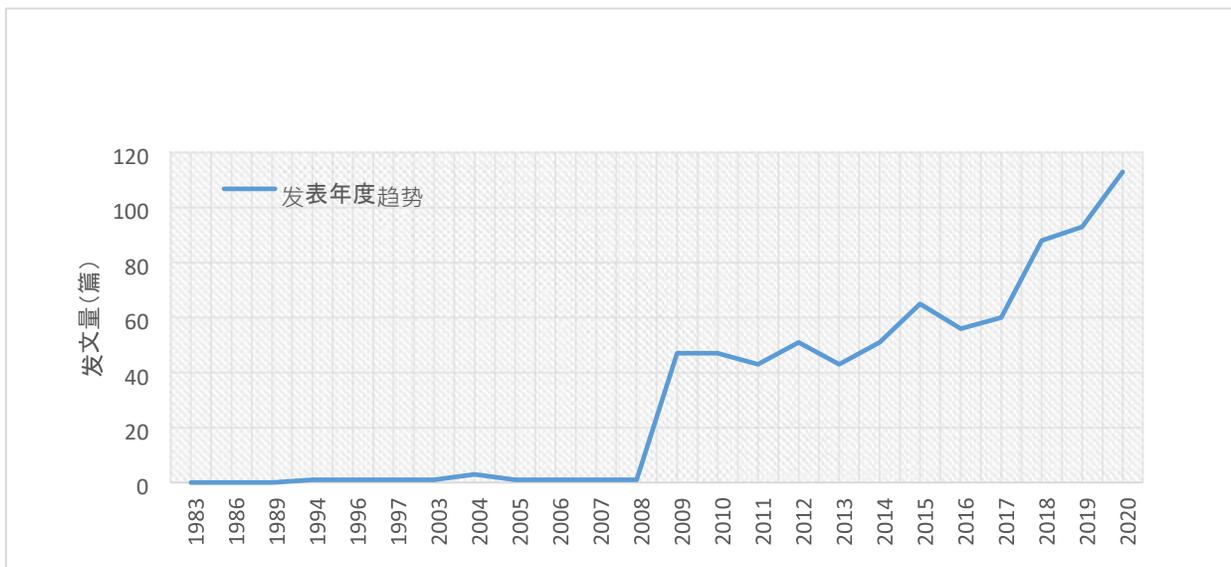

Figure 4 Annual distribution graph of International register research

By processing the graph information of CiteSpace and Web of Science data, this study lists the top six journals with the greatest influence in the field of register research according to the number of publications, as shown in Table 5.

Table 5 Distribution of core journals in international register research

Rank	Journal	Volume	Proportion	Impact Factor
1	JOURNAL OF PRAGMATICS	31	5.7%	1.476
2	JOURNAL OF ENGLISH FOR ACADEMIC PURPOSES	25	4.6%	2.171
3	INTERNATIONAL JOURNAL OF CORPUS LINGUISTICS	22	4.1%	1.059
4	JOURNAL OF LINGUISTIC ANTHROPOLOGY	16	2.9%	1.872
5	LINGUISTICS AND EDUCATION	16	2.9%	1.592
6	JOURNAL OF ENGLISH LINGUISTICS	13	2.4%	0.846

Statistics suggest that the top six journals in terms of the number of published papers on international register research are *Journal of Pragmatics*, *Journal of English for Academic Purposes, International Journal of Corpus Linguistics*, and *Journal of Linguistic Anthropology*, *Linguistics and Education*, and *Journal of English Linguistics*. Among them, linguistic journals account for the highest proportion of 12.3%, and the total number of relevant papers is 66, such as; the *Journal of Pragmatics, International Journal of Corpus Linguistics, and Journal of English Linguistics.* Others include teaching journals: *Journal of English for Academic Purposes and Linguistics and Education.* A total of 125 register research papers were included in the above journals, accounting for 23.3% of the total.

3.5 Analysis of International Keyword Co-Occurrence

The keyword co-occurrence map of international register research (see Figure 5) was drawn by selecting keywords as nodes. As mentioned above, the size of a node reflects the frequency of keywords, and the stronger the betweenness centrality, the more likely it is to appear in the center of the map. At the same time, according to betweenness centrality and keyword frequency, this study also summarizes a list of high-frequency keywords that appeared at least 10 times in foreign language studies in the past decade (see Table 6).

Figure 5 Keyword Co-Occurrence analysis from 2010-2021

Table 6 High-frequency keywords from 2010-2021

High-frequency Keywords（2010-2021）

Keywords	Count≥10	Year	Proportion
language	71	2010	13.2%
register	66	2010	12.3%
English	59	2011	11.0%
discourse	23	2010	4.2%
register variation	20	2012	3.7%
Spanish	17	2011	3.1%
corpus	15	2013	2.7%
academic writing	14	2010	2.6%
perception	12	2012	2.2%
speech	11	2011	2.0%
acquisition	11	2012	2.0%
corpus linguistics	11	2011	2.0%
identity	10	2015	1.8%
Multidimensional analysis	10	2016	1.8%
pragmatics	10	2015	1.8%

As can be seen from Figure 5 and Table 6, the main topics of international register research are; language, register, English, discourse, register variation, Spanish, corpus, academic writing, perception, speech, acquisition, corpus linguistics, identity, multidimensional analysis and pragmatics.

It is found that the hotspots of international register research in recent ten years can be summarized as follows: 1) analysis of the characteristics of the language itself in the field of second language acquisition (Kruger & Rooy, 2016; Kruger *et al.*, 2019); 2) the stylistic study of academic English writing in ESP (Monaco & LM, 2016; Kruger & Rooy, 2018); 3) the study of combining corpus and multi-dimensional analysis (Aguado-Jiménez *et al.*, 2012; Kruger & Smith, 2018; Muhammad & Dagmar, 2019); 4) multidimensional analysis of special registers (Berber & Pinto, 2019; Zhang, 2019).

We continued to run the burst detection of CiteSpace, but no burst words were detected, which indicates that the international register research in recent years lacks new hotspots on the basis of the traditional research perspective, remaining the previous hot research area, and the number of papers has shown a steady upward trend.

3.6 Analysis of International Authors and Institutions

In CiteSpace, two nodes (author and institution) were selected from the imported data for analysis. However, the knowledge map of the author and institution in Web of Science can only be presented separately (see Figure 6 and Figure 7) because the data of WOS cannot form the networks of knowledge maps like CNKI. Therefore, this paper analyzes the core authors and important institutions, respectively. Finally, based on the knowledge map information of authors and institutions, this research lists the topcited five authors and institutions in the field of international register research according to the number of published papers, as shown in Table 7.

Figure 6 Knowledge map of authors in international register research

Figure 7 Knowledge map of institutions in international register research

Table 7 Distribution of core authors and institutions in international register research

	Rank	Institutions/Authors	Volume
	1	Macquarie University	18
Institutions	2	Northern Arizona University	12

	3	Hong Kong Polytechnic University	9
	4	North West University	9
	5	Catholic University of Louvain	6
Authors	1	Douglas Biber	11
	2	Bertus van Rooy	8
	3	Haidee Kruger	7
	4	Jesse Egbert	5
	5	Bethany Gray	4

According to Figure 6, there are few connections between authors. Generally speaking, there is not much cooperation between authors. Douglas Biber of Northern Arizona University and Jesse Egbert of Brigham Young University are core and influential authors among them. Haidee Kruger of Macquarie University and Bertus van Rooy of North West University also show a close cooperation relationship. Those institutions provide a platform, resources and intellectual support for scholars for in-depth research in the field of register.

According to Figure 7, the research institutions in the chart showing relatively close cooperation are Macquarie University and North West University, Northern Arizona University and Catholic University of Louvain, as well as Hong Kong Polytechnic University and University of Melbourne. Other institutions are relatively independent, and they seldom collaborate with each other, which is not conducive to the in-depth interaction of research scholars and the sharing of research results, and it will also hinder the formation of new research hotspots, core researchers and institutions. From Table 7, it can be seen that among the international register research institutions, Macquarie University has the highest number of publications, and its research focus is clear and fixed, which indicates that it has research capabilities and strengths in the field of register research.

4. Discussion

From the perspective of research trends, Chinese register-related research generally shows a downward trend, especially since it reached its peak in 2011 and has declined year by year. Before 2011, Chinese research scholars mainly focused on the situational context in the register and the discourse analysis of translation from the perspective of Halliday's systemic functional linguistics, the reflexive pronouns in English and Chinese from Chomsky's binding theory, and corpus-based comparative analysis. There are also a few scholars who have explored multi-dimensional analysis methods, but they introduce and estimate the multi-dimensional analysis method in the absence of empirical research. Since 2011, its research enthusiasm has gradually weakened. However, the trend of register research is on the rise internationally. Many research hotspots and topics have been formed over recent years. Different from Chinese research, relevant research papers have been continuously published since the sharp increase of research results in 2008, especially the second peak of research results in 2013-2015. The reason for this phenomenon is that Dr. Nini developed the MAT (Multidimensional Analysis Tagger) in 2013, which greatly promoted the research of multi-dimensional analysis in the register.

From the perspective of journal distribution, the overall number of journals with the highest number of Chinese register research is not high with low impact factors, which dramatically hinders the dissemination and acceptance of register-related research. The categories of journals are only limited to teaching and foreign language research. Compared with Chinese research, international register-related research accounts for a relatively high proportion in linguistics core journals. 111,343 papers related to register are obtained in all categories of Web of Science. It can be found that journals with a high volume of register publications cover a wide range of fields. Register research is also studied by scholars of medical science, economics, psychology and so on.

From the perspective of keyword co-occurrence and burst words, the Chinese research focus in the past ten years has been on systemic functional linguistics, multi-dimensional analysis, corpus, translation, context, register variation and ESP, etc. Since 2018, the research on multi-dimensional analysis has increased sharply to form burst words. Although those studies were relatively more extensive than before 2011, there is a lack of concentrated research and in-depth exploration of a certain research point, which

also led to a decline in the research trend since 2011. The international research on the register in the past decade has shown diversification, mainly focusing on language, discourse, register variation, corpus, academic writing, perception, acquisition, identity and multi-dimensional analysis, which is broader and deeper than Chinese research.

From the perspective of core authors and publishing institutions, there is generally less cooperation and communication between authors and institutions of Chinese and international register-related research, especially the overall number of Chinese core authors is not high and in the absence of research continuity. There are several core authors and research institutions with close cooperation internationally, forming a relatively fixed research direction and topic and yielding abundant findings related to the register.

5. Prospects

By comparing the development status and research hotspots of register research in China and abroad in the past decade, this paper puts forward the following prospects and suggestions for the future direction of Chinese register research. The research believes that Chinese register research should be further explored and developed in the following three key directions.

First of all, scholars should pay more attention to the study of language itself. Chinese scholars can divert attention to the register analysis of other languages, such as French, German, Japanese, Korean, Russian, etc., and the comparative analysis of language characteristics between Chinese and other languages, as well as the register research of teaching, translation and cultural differences.

In addition, corpus-oriented research combined with multi-dimensional analysis will become the focus of register research. With the application of corpus technology and MAT in the field of linguistics becoming increasingly sophisticated, register research can make full use of various corpora to explore the online corpus platform. It can also collect research data and establish corpus independently, and analyze texts of different registers with MAT.

Furthermore, it is necessary to take objective analysis and teaching research on language features in ESP. It consists of EOP (English for Occupational Purposes) and EAP (English for Academic Purposes). International research on ESP from the perspective of the register has formed a complete system, mainly including the characteristics of grammar and vocabulary usage. Chinese research on ESP is limited to a few aspects, such as customs English, news and business English. There are few studies related to the academic English register. Chinese scholars can focus on medical English, engineering English, economic English and other highly professional registers to analyze and summarize linguistic features so as to better promote the development of teaching and related fields.

Finally, Chinese authors and institutions need to further strengthen cooperation, provide strong intellectual support and research platforms for the promotion of register-related research, and promote the sustainable and stable development of register research.

6. Conclusion

This paper comprehensively combs and summarizes the research progress of register in China and abroad in the past ten years based on CiteSpace visual bibliometric analysis. By collecting and sorting out 251 research papers published in core journals of CNKI from 2010 to 2021 and 536 papers in the linguistics category on the Web of Science, this study analyzes the number of publications, the keywords with the strongest citation bursts, research institutions, journals and influential authors, and pinpoints the principal frontiers of Chinese and international register research. The study found that Chinese register research mainly focuses on systemic functional linguistics, multi-dimensional analysis and corpus, while international register research pays more attention to language itself, especially English and Spanish, which is more diversified and comparatively well.

Although the present study is carefully designed and implemented, there are still some limitations. Firstly, with the help of CiteSpace software, this research summarized the Chinese and international register research from the perspectives of the number of publications, the keywords with the strongest citation bursts etc., but the software also has other functions, such as the Timeline and Time Zone, which will need to be further explored in follow-up research. Secondly, the selected papers are limited to core collections of Web of Science and CNKI so that it can ensure the accuracy and representativeness of these papers. However, this extraction method is so constrained that it will exclude some studies that should belong to the register-related research. Therefore, future studies can improve the method of data collection and involve more related studies.

On this basis, this paper puts forward suggestions and prospects for future key directions and themes of register research. The research believes that the following key directions or topics can be clarified in the future of Chinese register research: languageoriented inquiry, corpus-oriented register research combined with multi-dimensional analysis, objective analysis of language features in ESP and teaching research, etc. In recent years, international register research has been in the ascendant, forming a relatively fixed research hotspot and direction. In the future, Chinese register research needs to be further integrated with international research on the basis of Chinese research practice, which will not only provide a strong academic basis for registerrelated research but also contributes to the Chinese program for international register research.

Conflicts of Interest: The author declares no conflict of interest

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