

Citespace-Based Visual Analysis of Green Consumption Research in China

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Abstract. In order to cope with the rapid economic development and the continuous deterioration of ecological environment, it is necessary to promote green consumption so that the whole society can move toward sustainable development. Based on a large number of scholars' studies, this study provides a systematic review of core journals on green consumption in China through Bibliometric analysis and the visualization and analysis software CiteSpace. The research results show that the research hotspots of green consumption in China are "green consumption", "green marketing", "circular economy", "consumer". The research focuses on consumer behavior patterns of green product purchases, reflecting the convergence of consumer behavior research themes in the development of green consumption. There is less cooperation between authors and institutions, and academic cooperation in the field of green consumption research is far from sufficient. The research on green consumption in China can be divided into three stages: the initial period, the growth period, and the ebb and flow period. From studying consumption patterns and researching government policies, the research gradually focuses on the human psychological level and studies the influencing factors of green consumption from the consumer psychological factors, and the research on the micro consumption behavior level becomes more and more in-depth, and the research in the field of green consumption in China becomes increasingly mature.

Keywords. Green consumption; Literature visualization; Citespace; Green marketing

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1. Introduction

With the development of economic globalization and the prevalence of consumerism, excessive consumption has gradually caused ecological degradation and endangered the health of life on earth. In March 2020, the Ministry of Justice of the National Development and Reform Commission issued the "Opinions on Accelerating the Establishment of Green Production and Consumption Regulations and Opinions on Policy System", the document requires that by 2025, green consumption policy standards will be more perfect and the incentive system framework will be basically completed to

improve the level of green development in China.

Green consumption advocates that consumers choose to buy green products, establish the concept of environmental protection, pay attention to environmental protection, save resources and energy, and pay attention to the disposal and recycling of waste in the process of consumption.[1]. This is conducive to raising people's awareness of environmental protection and building an ecological civilization and a beautiful China. The Research Report on the Current Situation of Green Consumption of the Chinese Public (2019 Edition) shows that 83.34% of respondents support green consumption behavior, and green development is expected to become a new driving force to promote sustainable economic growth. Domestic research on green consumption is currently more mature, however, an overall review of green consumption research is still lacking. A bibliometric analysis of domestic green consumption research visualization can provide a comprehensive understanding of the evolutionary development process of research on the topic in this area. Therefore, this study uses CiteSpace software to conduct a systematic review of core journal research on green consumption in China from 1994 to 2021, in terms of authors, institutions, keywords, mutation words, and time zones, to grasp the key features of green consumption research, reveal the frontier hotspots of green consumption research, and explore the development trends of green consumption research, as it is intended to serve as a reference and reference for the development of green consumption research and related disciplines.

With the prevalence of consumerism and the great abundance of material goods, excessive consumption has led to the exploitation of the natural environment and the overuse of natural resources, which has seriously damaged the ecological balance and led to the destruction of nature and the deterioration of the ecological environment, even threatening the health and safety of the earth. The concept can be divided into a broad sense and a narrow sense, and has been continuously improved and enriched with the changing times. The broad concept is represented by Caroline Moraes (2012) and others who consider green consumption as an environmentally friendly consumption behavior.[2] J. Connolly (2008) and others consider green consumption as an environmentally friendly behavior based on the responsibility of consumers to solve environmental problems.[3] L. Steg (2009) and others consider green consumption as a pro-environmental way of consumption that minimizes damage to the natural environment and even benefits the environment.[4] Xu (2020) considers green consumption behavior as a pro-social behavior that contributes to the sustainable development of the environment and society.[5] Testa (2021) considers green consumption as a form of consumption that is compatible with environmental protection for the present and the next generation.[6].

At a narrow level, green consumption refers to green purchasing behavior, i.e., the behavior of consumers who tend to choose to buy environmentally friendly products. Ning, Xue-Ping (2008) considers green consumption as the behavior of consumers who focus on protecting the ecological environment[7] Connolly (2008) considers green consumption as the behavior of consumers who adopt environmentally friendly behaviors to solve environmental problems through the use of organic products, clean and renewable energy.[8]. Wang Jingjing (2015) considers green consumption behavior as an environmentally friendly behavior concerning individuals' purchase and use of environmentally friendly and pollution-free products, etc.[9]. Wen Hui (2017) considers green consumption as a new consumption model that reflects the harmonious relationship between economic growth and ecological environment.[10]. Zhan Yong (2018) believes that green consumption is a consumption model that leads consumers to buy safer and cleaner products.[11] Li Yan (2019) believes that green consumption behavior is the behavior of consumers who choose to buy green products.[12]. Zhao Xiaodi (2020) believes that green consumption is the consumer's awareness of environmental issues and the realization of the purpose of purchase while taking into account the green performance of the product.[13]. Hou Haiqing (2021) believes that green consumption behavior is a new consumption pattern in which consumers are more willing to purchase resource-saving and

environment-friendly goods by combining their own needs and environmental awareness.[14].

To sum up, green consumption is a way of consumption that tends to purchase resource-saving and environment-friendly products, which can satisfy one's own needs and improve the quality of life, but also has the function of reducing and improving the negative impact on the ecological environment.

2. Method

There are more existing literature reviews in the field of green consumption, but they all focus on qualitative research, and the research progress of green consumption in China is quantified through literature visualization, only Nan Ye et al. (2018) studied the research theme of sustainable consumption through literature visualization methods, and concluded that sustainable consumption in China is divided into three stages: green and sustainable concept-oriented, recycling and saving path-oriented, and low-carbon and green consumption-oriented[15].

In order to more comprehensively and systematically understand the development history, current situation and development trend of research, and to explore the research laws and characteristics of green consumption, this paper uses the literature visualization analysis method to quantitatively analyze the green consumption research. Mapping knowledge, citespace knowledge mapping can open up the researcher's vision, change the cognitive perspective, and understand the evolution of research in the subject area[16] The data of this thesis came from the Chinese core journals of Peking University and CSSCI source journals included in China Knowledge Network (CNKI), and "green consumption" was used as the keyword. We analyzed the data and drew a knowledge map to reveal the current status, evolution and future trends of green consumption research, and provide reference for subsequent experimental research.(5)Mental rotation ability test, which functions as a distracting.

3. Results

3.1. Analysis of the volume of green consumption articles

The number of articles is an important indicator of the development of a research field.[17]. Through multivariate statistical analysis, the temporal distribution of green consumption research literature can be understood intuitively. The progress of core papers related to green consumption published on China Knowledge Network is shown in Figure 1, as shown in the figure, with the passage of time, it can be seen that domestic research on green consumption shows an upward trend, which indicates that the role of scientific research in green consumption behavior is increasing and academics are paying more and more attention to the field of green consumption. The research stages can be divided into the following three phases: the first phase is the initial phase (1994-2000), which is a phase where research on green consumption is on the low side and shows a slow growth trend, with 127 articles published in this phase, accounting for only 5.7% of the total. The research on green consumption by Chinese scholars at this stage was very little, mainly on theories of green consumption behavior and business management issues. The most influential article in this stage is "Green Supply Chain Management: Trends in Business Management" published in 2000, in which Jiang Hongwei (2000) proposed the innovative concept of green supply chain management based on the concept of green consumption and discussed the prospect of implementing its application[18]. The second phase is the rapid growth period (2001-2010), the number of papers in this phase has increased dramatically, with 1119 core journals on green consumption, accounting for 49.9% of the total, from 42 papers per year in 2000 to 157 papers per year in 2007, a three-fold increase, showing a spurt growth trend. The Chinese government released many policies related to green consumption during this period, such as the report of the 17th National Congress, which proposed, "To build an ecological civilization and consumption pattern." This phenomenon is probably due to the fact that 2001 was designated as the year of "green consumption" by the Chinese Consumers' Association, and Chinese scholars have

become more and more aware of the importance of green consumption research since then. Since then, Chinese scholars have become increasingly aware of the importance of green consumption research, and green consumption has received widespread attention and research from the academic community. The third phase is the fluctuating and fluctuating period (2015-2021), with 996 articles published until December 13, 2021, accounting for about 44% of the total. In this period, the most important article in the field of green consumption was published, "Green Development: Function Definition, Mechanism Analysis and Development Strategy", which constructed the "Three Circles Model" and proposed that green finance and green fiscal policies should be used in conjunction with the concept of green development to guide green production and green consumption.[19] The "Three Circles Model" was constructed, proposing that green finance and green fiscal policies should be used in conjunction with the concept of green development to guide green production and consumption. As the research progresses, the research in the field of green consumption in China is becoming more and more mature, and the research and application of green consumption will continue to develop.



Figure 1. Statistics of core journal papers published on the topic of green consumption

3.2. Author cooperation analysis

The development of a research field is inseparable from the experts and scholars in the field. Author co-occurrence mapping can be used to find authors who have published a large number of articles. The number of published articles is an indicator of the author's ability to produce knowledge, and the author's citations can also indicate the author's academic level and influence[20]. The co-occurrence between authors in the field of green consumption can be identified through visual analysis by CiteSpace software. CiteSpace software is opened, the operation window is set to analyze authors, the time window is set to 1994-2021, the time slice is set to 1, and the network crop is set to Pathfinder, and the visual analysis is performed to obtain the author co-occurrence map (Figure 2), as shown in the figure, there are 698 nodes, 174 links, and the network density is 0.0007. The font size of authors is positively correlated with the number of their publications. The number of authors' font size is

positively correlated with the number of their publications, and the connected lines indicate cooperation. From this, we can see that Sheng Guanghua scholars have published the most literature on green consumption research in China, with a total of 19 publications in core journals on the topic of green consumption, among which the most cited is his publication in 2019, "Theoretical basis and empirical test of the formation of Chinese consumers' green purchase intention- -TPB expansion model based on ecological values, personal perception relevance", which found that ecological values positively influence green consumption perceptions[21]. The next most published article is by Chen Kai scholars, with 18 articles in core journals on the topic of green consumption, in which he constructed a mechanism model of the role of psychological factors of green consumption behavior by studying subjective norms and perceived behavioral control factors[22]. According to the formula in the bibliometric analysis.

$$M = 0.749 \times (N_{max})^{1/2}$$

N_{max} This refers to the number of articles published by the most productive authors.[23]. The authors who have published the most articles in green consumption research are 19, and the threshold value 3.2 is obtained by substituting into the formula. by selecting authors who have published at least 3 articles as effective authors, 52 authors with 249 articles in total are obtained as effective authors, accounting for 11.1% of the total number of articles in core green consumption journals. According to the chart, there are fewer authors connected and less cooperation among scholars, while the number of articles published by researchers from different institutions in common is low, and only 14 authors have cooperative relationship with each other, and most of them are mainly teacher-student relationship. In summary, it can be seen that Chinese green consumption research articles are mainly published independently, and there is a lack of articles co-authored by scholars from different institutions. Therefore, encouraging more academic collaboration among scholars from different institutions to share relevant knowledge and experiences is crucial to further promote green consumption research.

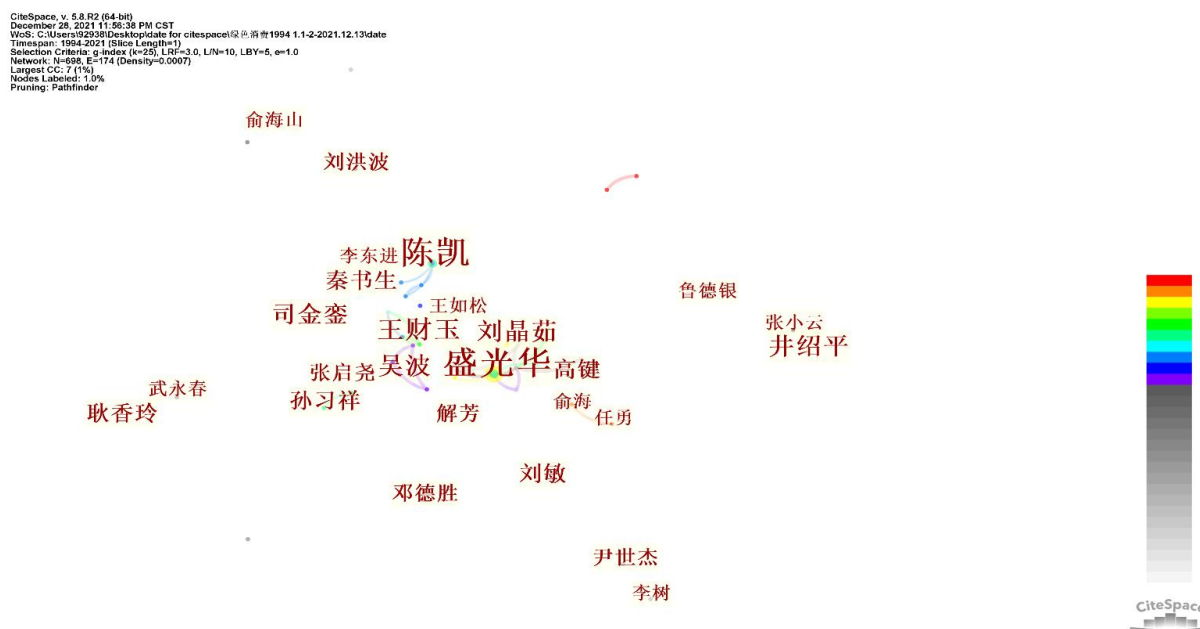


Figure 2. Graph of author cooperation on green consumption research

3.3. Institutional cooperation mapping

By analyzing the network of research institutions, we can clearly see the distribution of the most important research institutions in the field of green consumption. Visual analysis of research institutions gives the distribution of institutions and cooperation mapping in the field of green consumption in China (Figure 3). As shown in the figure, there are 639 nodes in this collaborative network with 182 links and a density of 0.0009. This reflects that the green consumption research field is relatively isolated, with most of the research institutions focusing on independent research, less inter-institutional collaboration, and a lack of joint research. Therefore, the focus is on promoting collaboration among research institutions, and we hope that more and more inter-institutional and interdisciplinary collaboration groups will be established in the future. According to the word frequency, there are 20 institutions with more than 5 publications, among which the School of Economics and Management of Beijing Forestry University is the most productive research institution in the field of green consumption, with 22 papers published in the field of green consumption. This is followed by research institutions such as School of Business, Jilin University, School of Grammar, Northeastern University, and School of Management, China University of Mining and Technology.

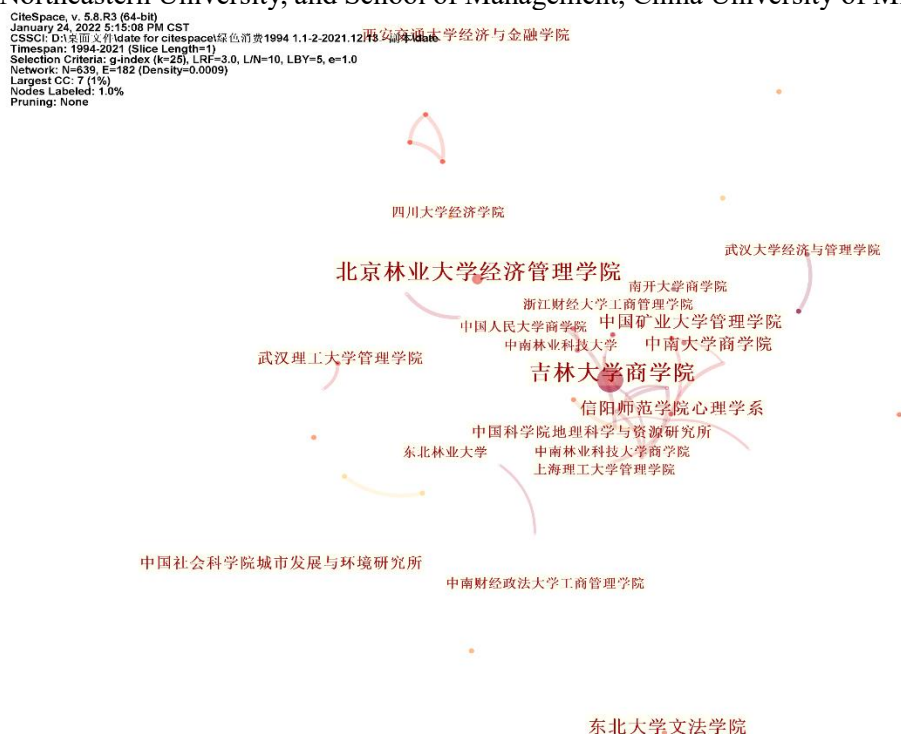


Figure 3. Cooperation Map of Green Consumption Research Institutions

3.4. Analysis of research hotspots

Since keywords are a high summary of the core content of the literature, they are a concentrated expression of the research topic. The analysis of keywords can sort out the research focus of a certain field, and the frequency of keywords is positively correlated with the research hotspots[24]. The frequency of keywords is positively correlated with research hotspots. According to the theory of co-occurrence analysis, the co-occurrence of keywords is closely related to the topic of the literature.[25] In CiteSpace, keywords are used as the keywords of the literature. In CiteSpace, the keywords are

node types, the time window is set to 1994-2021, and the time slice is 1, and the co-occurrence map of objective simplicity is obtained (as shown in Figure 1), as shown in Figure 1. There are 769 nodes and 1152 links in the map, and the network density is 0.0039. The analysis of nodes and links is significantly higher than that of authors and institutions, and the co-occurrence relationship between keywords is stronger.

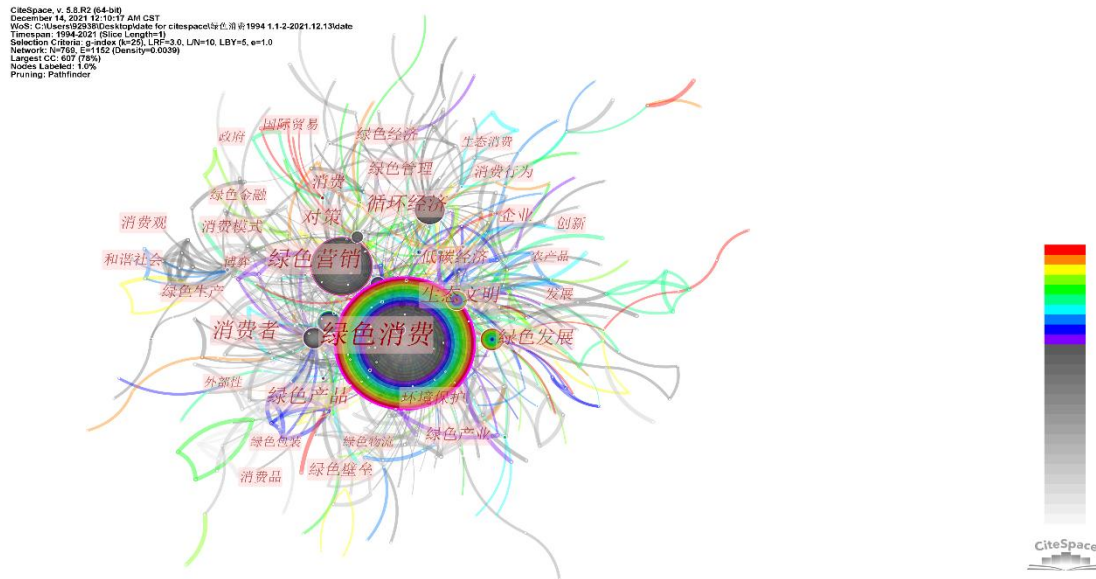


Figure 4. Green consumption keyword co-occurrence map

The keyword co-occurrence frequency clustering view can highlight the key nodes and important links, reflecting the structural features among clusters. As seen from Figure 2, the largest node in the graph is green consumption, followed by green marketing, circular economy, consumers, ecological civilization, green products, green development, countermeasures, consumption, and environmental protection in that order. The larger the circle indicates the higher frequency of the topic, which to some extent reflects the hotspot of research in this field[26]. Table 1 shows that the top 5 keywords in the research literature of "green consumption" in China are "green consumption", "green marketing", "green marketing" and "green marketing". ", "green marketing", "circular economy", "consumer", and "ecological civilization". ", indicating that the current research on green consumption in China focuses on green marketing approaches that fit consumers, and the centrality of these five keywords is also high, indicating that they are important intermediary nodes in the knowledge map of green marketing research. Second, the frequency of "consumer", "green product", "consumption", "green logistics" and "consumption mode" appear in the top 20. The keywords "consumer", "green product", "consumption", "green logistics", "consumption pattern", "consumption behavior", etc. show that Chinese scholars' research on green consumption is focused on the consumer behavior pattern of green product purchase, reflecting that the research on consumption behavior in the field of green consumption has been in the process of development. In the process of development, the research themes on consumption behavior have gathered.

Table 1. Green consumption hot words

Serial number	Frequency	Centrality	Year	Keywords	Serial number	Frequency	Centrality	Year	Keywords
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1	538	0.78	1994	Green consumption	11	30	0.05	2009	Low Carbon Economy
2	228	0.23	1996	Green Marketing	12	25	0.05	1999	Green Management
3	91	0.12	2003	Circular Economy	13	25	0.01	2004	Green Logistics
4	74	0.18	1996	Consumers	14	24	0.04	1998	Consumption pattern
5	73	0.08	2003	Ecological Civilization	15	24	0.05	2001	Green Barrier
6	68	0.08	1995	Green Products	16	21	0.03	2001	Enterprise
7	59	0.09	2012	Green Development	17	20	0.02	2001	Consumer Behavior
8	52	0.08	2000	Countermeasures	18	19	0.03	2002	Green Economy
9	38	0.06	2000	Consumption	19	17	0.03	1998	Green Production
10	32	0.04	1998	Environmental Protection	20	17	0.01	2002	Agricultural Products

3.5. Research trend analysis

The emergent terms are terms that are frequently used in a short period of time. the CiteSpace software can get the hot spots and trends in the research field based on the frequency changes. As shown in Figure 2, "influence factors", "green development", "green transition", "green finance", "environmental attitudes", and "subjective norms" are the most frequently used terms in the field of green development in recent years. "environmental attitudes" and "subjective norms" are the research hotspots in the field of green development in recent years, among which "green development" is the most intense and popular research topic, which started in 1994. More and more scholars started to pay attention to green development in 2012-2021, "circular economy" is the second strongest research theme, which is reflected in the rapid increase in the number of studies in 2004-2010, but in recent years, this theme has not been studied much, "impact factors " is reflected in 2011-2021, "green transition" is reflected in 2014-2021, "green finance", "environmental attitudes " and "subjective norms" are reflected in 2016-2021, and these research trends are increasing year by year. In fact, the top20 emergent words in the pre-2010 emergent words are more related to consumption behavior, and after 2010, the research has shifted more to the exploration of the influencing factors of green consumption, among which specific influencing factors include: environmental attitudes, subjective norms, which are also more researched in recent years, all the current frontiers of green consumption research in China mainly focus on areas such as consumption behavior and influencing factors.

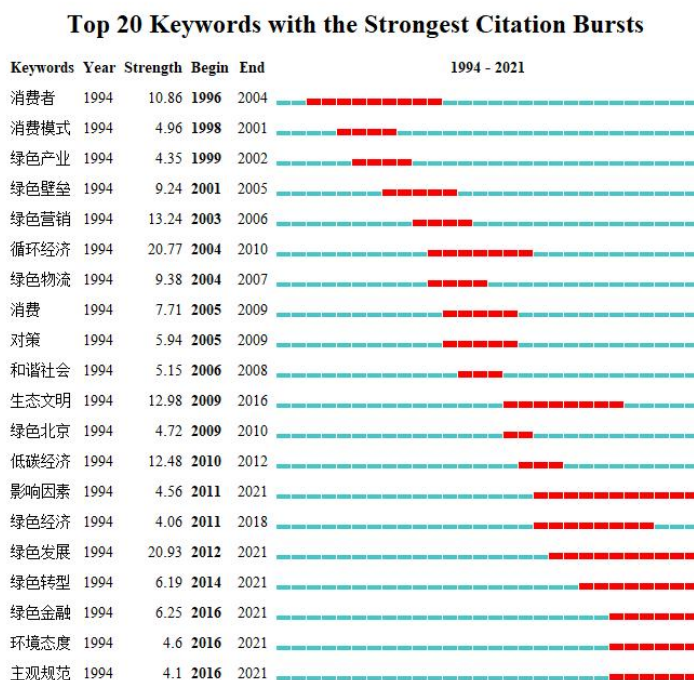


Figure 5. Green consumption emergent word mapping

The research themes change continuously in different periods, and the time-series diagram can observe the process of research theme evolution. The green consumption time series diagram (see Figure 3) shows the distribution characteristics of green consumption research in different time periods. Green marketing research in China has been divided into three periods. First, the initial period (1994-2000). During this period, a large number of high-frequency keywords emerged in this field, involving keywords such as "green consumption," "green marketing," "green product," "consumer," and "green marketing." "consumer", "consumption". The earliest research on green consumption was published in the Southern Economic Journal on January 15, 1994, "The wave of "green consumption" that has taken the world by storm", which considered that "green consumption" refers to the whole process from the initial design of a product to its production, marketing and finally consumption. The article argues that "green consumption" refers to the entire process from the initial design of a product to its production, marketing, and finally consumption, all of which meet the conditions and requirements of environmental protection.[27] This is the stage where green consumption has taken root in China. This is the period when green consumption was taking root in China and drawing nutrients from cutting-edge research abroad. Although Chinese scholars have made great contributions to the introduction and promotion of green consumption, they have mainly focused on the study of consumers' consumption patterns of green products, and their research has mainly focused on the business management of enterprises. The second is the period of rapid growth (2001-2010). The key words involved are "ecological civilization", "harmonious society", "circular economy", "low-carbon economy", "green logistics", etc. "Green logistics", etc. In June 2005, the "Opinions of the State Council on Accelerating the Development of Circular Economy" proposed to organize pilot projects in key industries, key fields, parks and cities to explore effective models for developing circular economy, and since then, the national pilot projects on circular economy have been formally implemented. Since

then, the national circular economy pilot work has been formally implemented. In 2006, China's 11th Five-Year Plan proposed for the first time the goal of energy saving and emission reduction, and launched a series of actions and policies. In that year, the National Development Commission jointly formulated the "Thousand Enterprises Energy Conservation Action Implementation Plan" and included the performance of "low-carbon economy" into the core content of the performance assessment of the government and civil servants, which further deepened the study of low-carbon economy. In 2007, the 17th Party Congress report proposed that "we should build an ecological and civilized consumption model." China's green consumption research has gradually shifted from the study of consumption behavior to the economic level of social civilization, and more research on ecological civilization and low-carbon economy has emerged and penetrated into all walks of life. At the same time, the academic field in this period also gradually recognized the importance of green consumption, and a large number of studies on green consumption emerged in core journals such as Ecological Economy, Business Research, and Consumer Economics in this period. The third is the period of fluctuations and ups and downs (2015-2021). The key words involved are "influence factors", "subjective norms", "green transformation", "green finance", "perceived value" and "green consumption". "perceived value", "environmental attitude", etc. This stage is the research on green consumption in China is becoming more and more diversified, not only studying the consumption side, but also starting to focus on other fields such as enterprise transformation, green finance, etc. The research on the influencing factors of green consumption is also increasing in this period, and perceived value, subjective norms, and environmental attitudes are also many influencing factors of green consumption. It can be seen that green consumption is not only studying consumption patterns and government policies in the second period, but also gradually It can be seen that green consumption is not only studying consumption patterns and government policies in the second period, but also gradually focusing on the psychological aspects of human beings and studying the influencing factors of green consumption from the psychological factors of consumers, and the gradually deepening research on micro-consumption behaviors represents the maturing research in the field of green consumption in China.

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 Largest CC: 607 (78%)
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 Pruning: Pathfinder

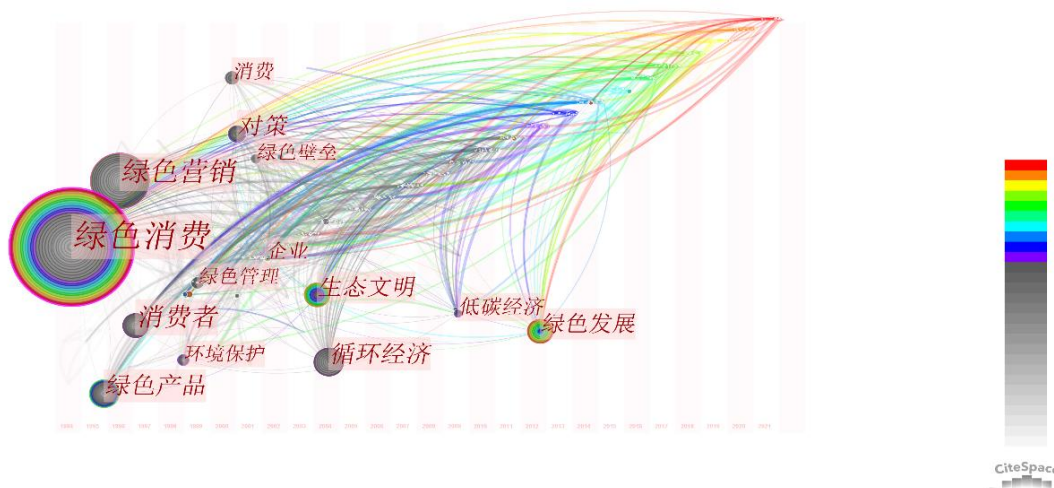


Figure 6. Time-series mapping of green consumption research frontiers.

4. Conclusion

Based on the synthesis of a large number of scholars' studies, this study uses the literature visualization and analysis software CiteSpace to visualize and analyze the graphs generated from the authoritative database China Knowledge Network for core journal literature on green consumption research from 1994-2021, and the findings are as follows.

The analysis of the number of publications shows that the research stages can be divided into the following three stages: the first stage of China's research on green consumption is on the low side, with an overall upward trend of slow development, focusing on theoretical and business management studies of green consumption behavior. In the second stage, the number of papers increased significantly, showing a spurt of growth. The Chinese government released many policies related to green consumption in this stage, and Chinese researchers gradually realized the importance of conducting research on green consumption, and green consumption received extensive attention and research from the academic community. In the third stage, China's research on green consumption is gradually deepening and maturing, and the research and application of green consumption is developing. Research results are abundant, and more scholars are expected to devote their research in the future.

The analysis of authorship and institutional cooperation shows fewer influential leaders and relevant institutions. Therefore, scholars from different institutions are encouraged to strengthen academic cooperation among themselves in order to share relevant knowledge and experiences, and academic conferences on green consumption research are advocated to deepen cooperative exchanges among different institutions and secure the research attention of authors and institutions.

Keyword co-occurrence analysis shows that "green consumption", "green marketing", "circular economy", "consumer". This indicates that the current research on green consumption in China is focused on the green marketing approach of consumers, and the keyword co-occurrence network structure is relatively scattered and low density. The current research themes focus on the consumer behavior patterns of green product purchases, reflecting the aggregation of consumer behavior research themes in the development process of the green consumption field.

The analysis of research trends shows that "influence factors", "green development", "green transition", "green finance", "environmental attitudes" and "subjective norms" have been the research hotspots in the field of green development in recent years. The research on green consumption in China is divided into three periods: the initial period, the period of rapid development, and the period of fluctuations and ups and downs. In the first period, many high-frequency keywords emerged in this field, including "green consumption", "green marketing", "green product", "consumer", "green product" and "green product". "consumer", "consumption". The research mainly focuses on the consumer's research on the consumption pattern of green products, and the research mainly focuses on the management of enterprises, but the research methods and localization of green consumption are less, and no systematic and in-depth research has been conducted. During the period of rapid development, we focus on "ecological civilization", "harmonious society", "circular economy", "low-carbon economy" and "green logistics". During this period, the Chinese government attached great importance to the construction of ecological civilization and increased the propaganda of green consumption, and gradually developed from theoretical research to application direction, following current events and gradually shifting from the study of consumer behavior to the economic level of social civilization, more research on ecological civilization and low-carbon economy appeared and penetrated into The research on ecological civilization and low-carbon economy has penetrated into various industries and trades. In the period of fluctuation and ups and downs, the research focuses on "influence factors", "subjective norms", "green transition", "green finance", "perceived value", and

"green finance". This period is a time of ups and downs for research on green consumption in China. In this phase, the research on green consumption in China has become more and more diversified, not only on the consumption side, but also on the transformation of enterprises and other fields such as green finance, and the research has become more refined and deeper, gradually focusing on the psychological level of human beings, studying the influencing factors of green consumption from the psychological factors of consumers, and studying the micro consumption behaviors more and more deeply, and the research on green consumption in China has become increasingly mature.

Conflicts of Interest

There is no conflict of interest in this paper.

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