Time Series Analysis of Policy Discourse on Green Consumption in China: Text Mining and Network Analysis

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Abstract: Green consumption in China is a major promotion strategy for achieving sustainable development goals. It should be promoted from a long-term perspective based on cooperation from all levels of society. In addition, constantly revising the policy direction using policy discourse as feedback is necessary. This study analyzes policy discourse on green consumption in China from the long-term and time series perspectives. It employs text mining and network analysis by collecting Chinese online portal data on policy discourse over a period from 2000 to 2020. Using text mining, the study finds that green consumption develops through four stages, namely awareness, practice, diffusion, and social responsibility. From a long-term perspective, policymaking and the preparation of government guidelines take place during the awareness stage, the distribution of action plans and related guidelines from central to local governments takes place in the practice stage, and participation in green consumption in the different classes of society occurs in the diffusion stage. The conscious transition to green consumption by the government, the business sector, and the public can be found in the social responsibility stage. The results of the convergence of iterated correlation analysis reveal that policy discourse on green consumption initially transitions from a specific to a diversified topic. This means that, since there are many complex policy and social issues related to green consumption, it is necessary to select and focus on appropriate topics when setting policy directions. Lastly, core–periphery analysis indicates that growers related to global environmental issues, such as carbon neutrality and climate change, are leading green consumption in China. This confirms that green consumption is a key issue that the government and the public must practice to support the sustainable development of mankind, transcending constraints of time, space, class, and ideology. On the basis of its results, the study proposes a development strategy that can strike a balance between the universality and specificity of green consumption in China.

Keywords: green consumption; policy discourse; time series analysis; text mining; CONCOR; core–periphery analysis; eco-friendly life

1. Introduction

Rapid population growth and industrialization have significantly changed the consumption patterns of individuals [1]. Consumption habits, such as the consumption of fast food, which is based on mass production, have brought convenience to life. However, it has hindered sustainable development by causing environmental problems due to the large amount of carbon emissions [2]. Environmental problems, such as global warming and climate change, have emerged since the 1980s, and many countries have been adopting eco-friendly development methods to address these challenges [3]. In addition, China has been the center of topics on industrialization, economic growth, and environmental issues. In recent years, China has faced serious threats, such as resource depletion and environmental destruction, due to rapid industrialization and
urbanization. Therefore, China has endeavored to maintain the flow of sustainable development by shifting growth methods, such as eco-friendly policies, industrial restructuring, and social activities [1].

Among the various changes in growth methods, the most notable field is the change in the structure of consumption. China is improving its irrational consumption structure by converting its previous consumption behavior, which tended to deplete resources and damage the environment, into green (typically, eco-friendly and sustainable) consumption. The country is promoting an eco-friendly lifestyle and practicing green consumption through practical measures, such as eco-friendly certification, energy conservation certification, green supply chains, green design, and green buildings [4]. The spread of green consumption in China is an important driving force for sustainable development and plays a critical role in the construction of an ecological civilization in the country. It is also an effective method for addressing the serious environmental pollution problems that China is currently facing. Therefore, the Chinese government aims to address environmental problems by fostering eco-friendly manufacturing and changing the social structure of consumption and related behavior through various policy measures to encourage green consumption.

Alternatively, when examining the formation and practice of green consumption policy, China has advocated for a transition to an eco-friendly consumption structure for approximately 20 years. However, the establishment of specific strategic goals and action plans for green consumption has remained insufficient. The regional economic differences in China have not been sufficiently considered, and green consumption has been limitedly included in important national laws and systems, such that the control and management of its operation have been inefficient [5]. In particular, to achieve the national sustainable development goal, a rational consumption structure system and clear distribution of responsibilities among green consumers are required; however, the authority and responsibility between ministries remain unclear. Spreading awareness about green consumption through social education and forming a social consensus on the benefits of practicing green consumption are also in the rudimentary stages. Nevertheless, the government, businesses, and civil society recognize that green consumption is an important axis for maintaining the continuity of social development in China.

Accordingly, various studies in China are mainly focused on the concept and development of green consumption [6,7], consumer behavior [8–13], the economic perspective [14,15], comparative aspects [16–18], and case studies [19,20]. However, the majority of the existing studies remain at the micro level, and analysis of the macro-development trend of overall green consumption in China remains insufficient. In addition, green consumption policies have received some attention in the above studies. However, pure green consumption policy research that takes into account the long-term perspective or time division is rare. Green consumer-related policies are generally investigated within the scope of consumer protection laws [21], and the main direction of research is focused on measuring and predicting changes in consumer psychology and behavior, rather than on policies [19,22,23]. Examined from a methodological perspective, previous works have taken the form of literature studies, case studies, and regression analyses, but they do not sufficiently embrace the diversification of modern research methodologies [24]. Therefore, we here consider the content and methodological gaps of existing studies from a new perspective and approach them with an evolved methodology.

Green consumption is a solution that addresses major national/social/environmental problems along with the transformation of the development method of China. Therefore, viewing it from a long-term and integrated perspective instead of a fragmentary perspective is necessary. In addition, analyzing which policy keywords play a leading role in the implementation of green consumption policy can provide significant implications, in that the overall change in social structure is key to maintaining a sustainable ecosystem for green consumption. Therefore, this study analyzes the policy discourse related to
green consumption in China at the macro level to elucidate its development flow and examines the green consumption-leading competency that emerges from the development process. In this regard, we discuss the patterns for the sustainable development of green consumption in China, the roles of each subject, and directions for future studies.

The remainder of the article unfolds as follows. Section 2 provides a literature review. Global research related to green consumption and Chinese research are generally reviewed. Section 3 describes the data and methodology. Data and processing used for analysis, text mining, and network analysis are explored. Section 4 interprets the analysis results in macroscopic and time series dimensions. Finally, Section 5 discusses the main findings and concludes the article.

2. Literature Review

2.1. Green Consumption at the Global Scale

The International Consumers Union (IOCU), in 1963, first proposed the concept of green consumption; in the 1980s, the term was used in a general sense, in that the purchasing choices of consumers can affect the environment [1]. Since then, many consumer groups have presented the definition of green consumption more clearly. Scholars have argued that consumers should purchase products with a consideration not only of the quality of the product but also of the manufacturing process. Moreover, consumers should make rational/reasonable purchases instead of lustful ones.

As the concept of green consumption became clearer, initial countries under the Organization for Economic Cooperation and Development (OECD) actively developed green consumption practices and movements related to product dissemination. They deemed that sustainable development and green consumption share the same goal—that is, environmental protection. As such, simultaneously changing consumption patterns and ideologies in various fields, such as politics, economy, society, and culture, is important [25]. Therefore, to achieve a balanced relationship between environmental protection and the goals of sustainable development, the concept of green consumption endeavored to expand ideological extensions, such as consumption saving, re-evaluation, reuse, recycling, and sustainable use [26]. The traditional consumption pattern of the past is consumption for human physiological/psychological satisfaction, whereas the current green consumption lies within a range that exerts a minimal negative impact on the ecological environment [27]. Currently, various forms of consumption, such as low-carbon, environmentally friendly, sustainable, and ecological consumption, are used interchangeably. The important aspect is that any form of green consumption advocates for appropriate consumption and emphasizes a harmonious coexistence between nature and humans based on low-pollution/-energy consumption.

From the academic point of view, Elkington and Hailes [28] first explained the concept of green consumption in a relatively systematic manner. They defined green consumption as the absence of the pollution of products, waste of resources, and harm to human safety and national development. In the Green Consumption Guide, the authors argued that green consumption is the negative of six products—namely, those that harm the health of consumers and others, are over-packaged, exceed the value of the product itself or consume unnecessary products due to an extremely short life cycle, use rare animals or resources excessively, are harsh and unnecessarily predatory towards animals, and are unfavorable to developing countries.

Afterward, the 21st Century Agenda, which was adopted at the Environment and Development Congress held in Rio de Janeiro in 1992, stated that “environmental deterioration, deepening poverty, and development imbalance due to inappropriate consumption and production patterns are serious problems facing the planet” and “all countries should adopt a strategy to promote sustainable consumption patterns.” Since then, the concept of green consumption has been widely proposed and spread around the
world. In 1994, the United Nations Environment Program published, in Nairobi, the Report on Policy Elements of Sustainable Consumption and stated that “products and services in the market should be produced/consumed in a way that satisfies basic human needs and improves the quality of life, while reducing the use of natural resources and harmful substances.” Furthermore, waste and pollutants generated in the life cycles of products and services must not endanger the lives of future generations. In response to the request of the UN Commission on Sustainable Development to establish an actionable plan for the green consumption/production model, the meeting of the OECD prompted countries to focus on green consumption as a strategic goal for sustainable development and the beginning of relevant research. Since 1997, the international community has conducted a series of activities and research on the theme of sustainable development and green consumption. In 1999, the UN Economic and Social Council officially included green consumption in the guidelines for consumer protection. This initiative holds an important meaning as an international agreement that requires governments to establish and implement strategies for promoting green consumption in cooperation with the business community and private organizations.

Sustainable consumption, dematerialization, and changes in the eco-friendly production/consumption system have introduced many challenges to the traditional infinite growth economic development model [29]. In the past, the pursuit of profit in various dimensions was the top priority in economic growth; currently, however, green consumption must achieve the goal of minimizing natural destruction and resource consumption while pursuing profit. The national policies of advanced countries have provided a great driving force in this process. For example, Sweden and Germany have promoted strategically sustainable changes in consumption and behavior patterns at the government level and pursued a 10-year long-term policy agenda. Alternatively, Japan is implementing a “sustainable lifestyle and education program” [30]. Among developing countries, Indonesia promoted the “International Consumer Information Project” [31]. In addition, Austria, the Czech Republic, Finland, the United Kingdom, Korea, Norway, France, and Poland formulated and actively pursued long-term policies related to green consumption.

As such, the awareness of green consumption by the international community and countries has increased over the past 20 years, as well as the interest of society in the concept and practice of green consumption. In addition, researchers are actively conducting studies on green consumption from various dimensions and are mainly focused on three fields, namely economics, consumer behavior, and psychology. First, research on green consumption related to economics mainly analyzes green consumption based on the rational consumption theory of the mainstream economy [32]. Research in the marketing field related to green consumption is also active and focuses on the effects of economic factors such as product models, prices, and preferences on green consumption and marketing [33].

In the field of consumer behavior, the term “green consumption” denotes a nature-friendly and eco-protective act of environmental responsibility and has recently attracted the attention of companies and consumers [34–36]. Stern [37] and Lee [38] found that educational background influences the green consumption behavior of consumers and suggested that green consumption-related content should be included in educational programs at the national level. Sheehan and Atkinson [39] stated that consumer participation in environmental issues presents an important meaning for green consumption and examined various factors that influence the participation of consumers in green consumption. Moreover, Bickart and Ruth [40] suggested that the causes of the interest (at the public level) and social responsibility of consumers are more likely to urge them to purchase eco-friendly products.

Lastly, the study discusses the research on green consumption from the psychological perspective. Many researchers have explored the mechanisms of the green consumption psychology of consumers on the basis of classical theories of consumer
behavior (e.g., [41–46]). In general, studies related to green consumption are actively conducted by adding/transforming new psychological variables based on the theory of planned behavior (e.g., [47–51]). In particular, researchers such as Marguerat and Cestre [48] and Frick et al. [49] pointed to the significant effects of psychological factors, such as values, environmental protection attitudes, the effects of consumer perception, individual ethical norms, and environmental protection knowledge, on green consumption.

2.2. Green Consumption in China

Many countries are adopting the direction of eco-friendly and sustainable development [3] to respond to the new challenges of mankind due to global warming and climate change. Green consumption in China has attracted attention from the government, businesses, and citizens since the 2000s, in line with the international trend for environmental protection and sustainable development. Evidently, it is a slow move compared to those of advanced countries; however, Chinese society is undergoing a systematic and integrative transformation through various policy measures and the participation of businesses and citizens.

In 1994, China deliberated and decided on the 21st Century China Agenda, where Chapter 7 specified the goal of leading a sustainable consumption model. Eventually, content related to green consumption appeared successively in laws on energy conservation, environmental protection, and the circular economy, among others. Related regulations can be found in the Constitution and Consumer Rights Protection Act. In 1999, six ministries promoted the “Three Green Projects,” which aim to open new green growth routes, foster green markets, and encourage green consumption, to induce the public consumption of green, low-carbon products and to form an ideology and habits related to green, low-carbon consumption. This initiative was undertaken under the leadership of the Environmental Protection Administration (currently the Ministry of Ecology and Environment). In 2005, the State Council announced the Decision to Strengthen Environmental Protection for the Practice of Science and Development and widely promoted an eco-friendly consumption method in the consumption process. Moreover, it proposed environmental labeling, environmental certification, and the implementation of the green purchasing system of the government.

Then, during the period of 2011–2015, the government, market, and private sector clearly held a favorable attitude toward ecology and the environment and constantly developed green consumption for this purpose. In 2016, 10 ministries, including the National Development and Reform Commission, jointly announced the Guidance Opinion on Promotion of Green Consumption. Its main focus was to promote green consumption in China by proposing 17 measures to practice green consumption, such as actively fostering a green consumption ideology, expanding the supply of green products and services, as well as the eco-friendly lifestyles of residents, campaigning against waste, and prolonging green consumption.

In recent years, the Chinese government has expressed a strong political inclination towards the transition to green consumption. As such, special measures were presented to promote green production and consumption at the 19th National Congress of the Communist Party of China in 2017. The focus of the direction is to expand the concept of sustainability and eco-friendly consumption. It highlights the quantitative appropriateness and reduction of consumption. Moreover, it intends to promote the transformation of the consumption structure. It also focuses on greening the entire production and distribution process for conscious environmental protection in daily life. In other words, it suggests a direction for promoting green consumption based on a green lifestyle.

At this point, scholars propose that the time is right for China to fully promote the development of green consumption, which has established a relatively reliable social foundation and practical support. The reason is that public consumption is fully developing from survival to one of advanced consumption, and the effect of consumption
in driving the economy is remarkably increasing. Accordingly, new consumption habits and patterns are becoming crucial to the achievement of the sustainable development goals of China, where green consumption lies at the center of these goals [5]. Correspondingly, green consumption is becoming a key axis as a new method for political, economic, and social development; thus, studies related to green consumption in China have been actively conducted in recent years. Previous studies analyze the green consumption behavior of Chinese consumers and find that, in general, Chinese consumers exhibit a positive attitude toward green consumption [52], which is an important basis for forming social norms for green consumption [53]. In addition, if the public possesses an active awareness of green consumption [4], then the likelihood of practicing green consumption is relatively high. Notably, Yan [54] classified Chinese green consumers into three groups and suggested that beginner green consumers pertain to individuals with vague eco-consciousness. In addition, the majority of Chinese consumers belong to the beginner level. Mid-level green consumers are a group that displays strong environmental awareness but lacks comprehensive awareness of green consumption. This group is characterized by their selective purchase of eco-friendly products closely related to their interests, such as green food and building materials. Lastly, upper-class green consumers are assumed to be genuine green consumers—that is, a group that consciously, voluntarily, and comprehensively considers and practices environmental issues throughout their lives. Additionally, other researchers explain that green consumption is a win–win business model from the economic point of view and an important method for preventing environmental degradation; therefore, it will attract a lot of attention and investment in China [55–57]. This perspective is evident in line with recent investments made by China in environmental and natural resource protection [58,59].

In summary, the research on green consumption in China made a slow start compared with that of advanced countries; nevertheless, it is developing rapidly. Moreover, studies on green consumption in China are mainly conducted from a fragmentary perspective (e.g., concept definitions, cases, regulations, and consumption behavior studies) instead of from the macro level compared with the global research trend. Green consumption in China is an important policy, promoted based on the various sustainable development goals of the country. Therefore, examining the flow from the macro level and determining the policy keywords that lead the practice of green consumption in the flow are necessary aspects. In particular, the consensus and cooperation of various social classes are required to achieve the transition to an eco-friendly society through green consumption and long-term development goals based on this society. The flow of consensus and cooperation can determine important signals by analyzing policy discourse. In the case of China, where the central government has led the policy for 40 years after the reform and opening up, flexible policy establishment and execution based on such discourse analysis and feedback is crucial.

2.3. Sustainable Development Goal and Green Consumption

The overall upgrade of the Chinese consumption ecosystem and the transition to an eco-friendly concept provide a favorable environment to foster green consumption [60]. Green consumption is an important axis of sustainable development, and integrating it into the institutional framework will aid coordination and integration among government departments. At the same time, it plays a positive role in realizing a political promise to promote high levels of green consumption. In this respect, green consumption can only be achieved when not only the consumer but also the surrounding consumers or society as a whole pursue eco-friendly consumption [61]. Therefore, the policy practice of green consumption should be pursued with a certain degree of spontaneity in each class of society. It requires a joint effort by the government, businesses, and the public, and the interaction mechanism in the implementation process can provoke the expansion of broad thinking and awareness in people from all walks of life [62].
The Government Purchase Plan, which is considered the most important driver of green consumption in many countries, points out that the policy direction of the government should fulfill its social responsibilities and consider the transition of the green system to social norms as the duty of public authorities. The government is a standard of green consumption and plays a leading role in transforming traditional consumption into green consumption. The reason is that the government can increase the awareness of consumers about green consumption by emphasizing the obligations of consumers through intervention as policymakers at the macro level.

In addition, business behavior plays an important role in guiding and motivating the green consumption behavior of consumers. In modern society, companies must act responsibly to stimulate green consumption. They should play the role of a medium for the inclusion of an eco-friendly philosophy in each stage of manufacturing, such as technology, manufacturing, and logistics. Companies should actively promote the benefits of the ideology and management patterns of green consumption to consumers and the society. Furthermore, they should implement efforts to increase the confidence of consumers in green products.

As another major practical capacity, the public (in general, consumers) is recognized to play a revolutionary role in green consumption. Their innate perceptions and attitudes are an important basis for determining consumption behavior. Green consumption is occasionally accepted by consumers as a method that lacks utility, a single function/price, and diversity due to these stereotypes. In other words, consumers possess a strong tendency to be wary of new products or refrain from trying them due to unfamiliarity. Therefore, the active selection of green consumption patterns in daily life and various practical methods must be combined to promote the progressive role of consumers as the subject of green consumption. At the individual level, interest and practice in the environment are important aspects. At the social level, an eco-friendly/green consumption community, green consumption knowledge education, and changes in consumption awareness through the spread of green consumption discourse are necessary. In particular, in OECD countries, education on green consumption is considered one of the most important methods for providing appropriate skills and abilities to enhance sustainable consumption.

In summary, green consumption is an important policy area for achieving sustainable national development goals. In addition, it is a social goal that can be truly realized only when policy promotion is stimulated through a broad social consensus/cooperation. These areas need to maintain continuity in line with the times and pace of development by utilizing macroscopic perspectives and policy discourse feedback. As such, policy discourse is advantageous in reflecting the opinions of various members of society and confirming the universality and diversity of the green consumption policy in China in the process of policy implementation. Therefore, maintaining a sustainable green consumption ecosystem is vital for examining policy discourses related to green consumption in China and for identifying meaningful macro-currents, patterns, and policy promotion keywords in these discourses. Against this background, the study poses the following research questions.

RQ 1: How is the flow of macro-policy discourse on green consumption in China changing?

RQ 2: What are the policy keywords leading green consumption in China, and how are they changing?

We base the theoretical background to answer both questions on discursive institutionalism, a neo-institutionalism approach. Specifically, this study uses the concept of policy discourse to analyze a typical explanatory system for green consumption in a macroscopic and time series context. It traces historically the semantic structure of
policy discourses on green consumption in China and the results that they produced. In addition, the reorganization of the forces that institutionalism pays attention to, namely the reorganization of policy actors who lead the discourse, is viewed as an important factor in institutional/policy change. Policy discourse is used as a category of analysis among the various concepts suggested by discursive institutionalism [79] because it is generated as a product of communication between the government and society. In general, policy discourse is produced and accumulated in communication spaces inside and outside of institutional politics, where political elites, expert groups, and ordinary citizens can participate. It includes not only the concepts used in policy documents and the purpose of a policy as revealed by the policymakers, but also the interpretive responses and criticisms of the policy, anecdotes about events that occur in the process of policy implementation, and debates on issues. Therefore, the scope of the analysis of policy discourse includes not only internal discussion within the institutional system but also dynamic feedback and communication with non-institutional institutions.

On this theoretical basis, we use text mining and network analysis, which are the most suitable methodologies for analyzing China’s green consumption policy discourse. The former promotes historical policy discourse and finds meaningful patterns in the flow, and the latter is advantageous in revealing the forces leading the green consumption policy and changes in core keywords [80].

3. Data and Methodology

3.1. Data

In this study, text data related to green consumption in China were collected and analyzed using Python. To discover the flow and direction of policy discourse and main policy keywords at the macro level, we collected data for every year from 2000 to 2020 using the terms “green consumption” and “sustainable consumption.” The collection channels were set to Baidu and CNKI, and documents collected by year were merged according to the China Five-Year Plan (FYP). Baidu is the largest online portal in China that can comprehensively collect green consumption policy discourses, and CNKI allows the researcher to check the knowledge discourses of expert groups. Both data channels can be viewed as important analysis targets in discourse institutionalism [81]. We obtained 17,072, 15,711, 15,428, and 18,833 documents for each period, excluding duplicate documents. Next, we cleaned the text data obtained from the document. Text data require preprocessing due to their unstructured, ambiguous, and polymorphic characteristics. The collected text was tokenized, and stop words were removed. Then, the words were classified through morpheme analysis and POS tagging, and the data set required for the analysis was created.

3.2. Text Mining

Text mining is a representative methodology that has benefited from IT development. Information is extracted from unstructured text data. In this process, various keywords and indicators of keywords are derived, and their meanings are analyzed [82–84]. Text mining is mainly useful for finding the trends, patterns, and rules of keywords in large amounts of text data; as such, it is used in various fields, such as the macroscopic flow of policy, policy discourse, social discourse, and consumer responses. Accordingly, this study uses text mining to examine the macroscopic flow and change trend of the green consumption policy discourse in China from the time series perspective. First, stop words were removed from the data set organized by period, and nouns and adjectives were extracted. For each period, 6832, 8212, 6720, and 6989 words were derived, and the term frequency-inverse document frequency (TF-IDF) and degree of centrality of the words were measured [85]. The importance of frequency of each word and the strength of connection between words were then derived, which provided the basis for determining the actual importance of a specific word to derive text mining results. In
addition, the study constructed a correlation matrix data set of the co-occurrence of words, which was used for network analysis.

3.3. Network Analysis

Network analysis is a method for quantitatively analyzing the structure, diffusion, and evolutionary processes of individuals and groups by modeling the relationships between nodes and links. In contrast to the existing methods for statistical research that focus on the properties of objects, this method focuses on the interrelationships between objects. Recently, various fields have used network analysis; however, this method is particularly effective for analysis using huge text data. The reason is that the flow of specific patterns and keyword changes in data can be examined through the simultaneous appearance and overlapping of words. In particular, network analysis can conduct various forms of analysis, such as network structural characteristics, subgroup cluster analysis, and status/role analysis, by utilizing attribute values such as the strength and direction of relationships. The study uses one of the network analysis methods, namely convergence of iterated correlations (CONCOR) analysis, to examine keyword clusters and change patterns by period [85]. This process reveals relationships among similar keywords through cluster formation and is suitable for examining macro-policy trends related to green consumption in China.

The study then derives policy keywords leading green consumption in China by period through core–periphery analysis [80]. In this type of analysis, a random word in the network is placed at the center; correlation values with other words are calculated. Words with high correlation values are placed at the center, and the rest are placed in the periphery. In this manner, the study intuitively examines the leading role of words. Through this process, analyzing the roles of various policymakers to achieve the policy goals related to green consumption in China and comparing differences by period are possible. The methodological research roadmap of this article is presented in Figure 1.

![Figure 1. Research roadmap.](image)

4. Result

4.1. Text Mining Results

The text data were refined, classified, and POS-tagged, and the top 50 words were derived based on word centrality and TF-IDF values. The frequency significance of the TF-IDF and centrality values indicates the strength of connections between words. If the centrality ranking of a word is relatively higher than its TF-IDF ranking, then the word is assumed to possess a substantially more important meaning than the frequency of its
appearance in policy discourse. In this study, a word for which the centrality value ranking is more than five steps larger than the TF-IDF value ranking is considered to hold a high level of practical importance in the policy discourse on green consumption in China [80,85]. Table 1 summarizes the results.

Table 1. Results of text mining.

<table>
<thead>
<tr>
<th>Subject Words</th>
<th>Green Consumption, Sustainable Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant Words</td>
<td>Green Food (6/20), Green Product (7/15), Society (11/17), Government (22/39), Technology (24/38), Tradition (26/35), Agriculture (28/44), Safety (30/40), Science (34/42), Base (39/49), Challenge (40/47)</td>
</tr>
</tbody>
</table>

Note: ① and ② refer to the degree of centrality and TF-IDF rankings, respectively. Significant words are indicated when the ranking of ① is five places higher than the ranking of ②.

Examining the word change by period, the study finds that “government” and “policy” were ranked higher in centrality than TF-IDF values in all periods. This result indicates that the government (within its guidelines) mainly leads the new policy formulation and implementation in China under the socialist political system. In other words, the Chinese government is preparing macro-level policy guidelines for practicing green consumption and implementing corresponding various strategic administrative measures (e.g., regulations, support, and subsidies).

According to period, in the 10th FYP (2000–2005), the centrality values of words such as green food, green product, society, technology, tradition, agriculture, safety, science, base, and challenge were found higher than their frequency values. In the early stage of the development of green consumption, the study observes that green consumption was prioritized in the livelihoods of the people and eco-friendly food and products. Moreover, the technology and science for producing green food and products were considered important. At the same time, public attention is focused on food safety along with green consumption. In addition, the transition to a green consumption structure is recognized as a new challenge to break tradition. The notable words in the 11th FYP (2006–2010) are resources, green management, health, culture, energy, activity, and internationality. Beyond the initial promotion stage of green consumption policy in the 10th FYP, green consumption is expanding to diverse fields as of the 11th FYP. Companies present green management as a hot topic, and citizens pay attention to health and energy conservation through green consumption. Moreover, the results demonstrate that they take actions that exceed a simple understanding and recognition of green consumption, which has begun to reflect a new culture.

In the 12th FYP (2011–2015), the results point to two notable words, namely education and responsibility. Green consumption in China, which has been promoted for more than 10 years, is developing into a strong movement toward social responsibility, which has been spread through education, after undergoing the initial recognition and implementation stages of the policy. The fields are also diversified, and green design and green tourism emerge. In the 13th FYP (2016–2020), the emerging words are enterprise, system, and consciousness. During this period, various actors in green consumption emphasize enterprise. In other words, the rapid economic development of China accelerates social polarization, and the various measures and social responsibilities of
companies become important at a time when environmental destruction is rapidly threatening the life of the people. In addition, green consumption is viewed as being established as a system that penetrates society as a whole, beyond a simple movement or policy measure. Importantly, a wide consensus on green consumption is formed, and an increasing number of people are voluntarily and consciously practicing green consumption. In particular, during this period, 10 ministries, including the National Development and Planning Committee, jointly announced the Guidance Opinion on Promotion of Green Consumption to support the consensus on green consumption at the government level. The guidance opinion explains the role of the public sector and corporations in leading the eco-friendly lives and green consumption practices of citizens based on the green growth philosophy. In this manner, the study infers that efforts were made to identify a green consumption system with Chinese characteristics through the transformation of the entire social structure of green consumption.

4.2. Network Analysis

Network analysis is useful for finding meaningful patterns based on connections between words derived from text mining. First, the study formulated a correlation matrix of the top 50 words according to centrality values by period, and then verified the significance of the data in the network visualization process. Network density was calculated by performing bootstrapping, in which words were randomly rearranged 5000 times, and the average bootstrap density was measured. For each period, the values are 55.0547, 30.0851, 9.9942, and 9.2365, which suggest an overall decrease. Z-scores are 5.4324, 5.1656, 4.5421, and 5.0039, which indicate that they were maintained relatively evenly. In addition, the difference between absolute and observed values is 0.0002, which indicates that the relationship between data was statistically significant at a significance level of 5%. Table 2 provides the results of the statistical significance testing of the entire network.

Table 2. Result of the statistical significance testing of the network.

<table>
<thead>
<tr>
<th>Hypothesis Testing for Density</th>
<th>10th FYP</th>
<th>11th FYP</th>
<th>12th FYP</th>
<th>13th FYP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of bootstrap samples</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Estimated standard error for density</td>
<td>9.7349</td>
<td>5.637</td>
<td>2.1268</td>
<td>1.7872</td>
</tr>
<tr>
<td>Z-score</td>
<td>5.4324</td>
<td>5.1656</td>
<td>4.5421</td>
<td>5.0039</td>
</tr>
<tr>
<td>Average bootstrap density</td>
<td>55.0547</td>
<td>30.0851</td>
<td>9.9942</td>
<td>9.2365</td>
</tr>
<tr>
<td>Proportion of absolute differences as large as observed</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Next, CONCOR was performed to analyze the clusters and patterns of words that appeared in the network. The study found five clusters in the first 10 years and seven clusters in the latter 10 years; the average degrees were 41.32, 40, 29, and 29.08, and the clustering coefficients were 62.314, 35.114, 14.816, and 13.398 for the four periods, respectively. In general, the average degree value indicates the size of the structural position of nodes (words); the higher the value, the higher the actual influence in the network relationship [86]. The reason is that policy discourse related to green consumption formed a strong social movement based on the strong will of the early government; over time, however, they were integrated into larger topics (e.g., environment, ecological civilization, climate change, and carbon neutrality) or developed into diversified forms (e.g., green travel, services, and education).

The clustering coefficient is an index that indicates the degree to which nodes are clustered with structural equivalence. The higher the index, the larger and the stronger the clusters formed in the network and vice versa. The result indicates that the clustering coefficients demonstrated a downward trend by period. In brief, discourse on green consumption in China is gradually diversifying, from large and strong clusters in the
beginning to clusters with equal size and cohesion. In other words, other diverse themes related to green consumption are attracting attention from society as a whole, and discourse clusters are formed according to topics with similar interests. In the early days of policy promotion, the government and companies promoted the development of green consumption in the direction of enhancing the circulation economy and building a green ecosystem, which then expanded to other subdivided topics (e.g., industrial chain, supply chain, science and technology, and education).

In detail, the 10th FYP depicted one large cluster and five small clusters. The main hub nodes are the circular economy and ecosystem, and the notable keywords in the cluster are resource, green production, green industry, green lifestyle, society, and green marketing. This period denoted the initial stage of the green consumption policy in China, and new changes were made in the life patterns of residents. Using the term “green” in various processes, the study inferred that the government endeavored to implement its intention to promote green consumption in society. In the 11th FYP, the clustering was similar to that of the previous period. The hub nodes in the clusters are eco-development and circular economy. Ecological civilization, green logistics, green tourism, green hotel, and green management should be viewed with interest as meaningful words within the cluster. Through the three hub words, the study found that the social transformation for green consumption progressed in combination with more macroscopic policy keywords. Thus, green consumption in China during this period was characterized by a more subdivided topic than that of the initial period, which expanded into service fields and active business orientation based on rapid economic growth. In particular, an ecological civilization indicates that green consumption is developing in a direction that emphasizes rational/reasonable/eco-friendly consumption as mature citizens in line with the construction policies for environmental protection/ecological civilization.

At the 12th FYP, which is a relatively large cluster, the study observed four medium-sized and two small clusters. The hub nodes were eco-development and green economy. The circular economy in the past decade evolved into a green economy after the 12th FYP, which indicated that the two core ideologies of sustainability and the environment should be included in the process of achieving the goals of China for economic growth. In addition, the notable words within the cluster are society, value, consumer ethics, educate, low carbon, and responsibility. During this period, China attempted to strike a balance between sustainable economic growth and global environmental issues. In addition, green consumption gained momentum from the policy implementation of the past 10 years, and a huge change occurred that led to maintaining a more social balance between green consumption and green development policy. Based on words such as value, ethics, and responsibility, the study proposes that the awareness of the public about green consumption has settled during this period. At the same time, it is intended to spread these values to future generations through education. In addition, the study found that China has implemented increasingly specific policy keywords, such as low carbon, along with green consumption, because it was subject to international responsibility for environmental problems. Finally, at the 13th FYP, the study noted seven clusters of relatively uniform sizes. The main hub nodes were identified as eco-development and consumption upgrade. These nodes indicated that green consumption in China is progressing with sustainable eco-friendly development and transformation of the consumption structure at the core. In detail, the emergence of the words mechanism, consciousness, and value was considered a result of the intense changes in the overall consciousness of green consumption. In addition, as an eco-friendly product, the new energy vehicle increased its market share in the Chinese automobile market, and it emerged as a representative consumer product for green consumption. Financial services also represent green finance by combining various derivatives with environmental problems. Table 3 presents the results of the CONCOR analysis.
Table 3. Result of CONCOR analysis.

<table>
<thead>
<tr>
<th>Subject Words</th>
<th>Green Consumption Policy and Sustainable Consumption Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>10th FYP</td>
</tr>
<tr>
<td>Number of Clusters</td>
<td>5</td>
</tr>
<tr>
<td>Average Degree</td>
<td>41.32</td>
</tr>
<tr>
<td>Overall Clustering Coefficient</td>
<td>62.314</td>
</tr>
<tr>
<td>Major Hub Nodes</td>
<td>Circular Economy and Ecosystem</td>
</tr>
</tbody>
</table>

4.3. Core–Periphery Analysis

Core–periphery analysis is a visual representation of the structural distribution of major keywords in the network. By classifying core keywords and surrounding keywords related to green consumption by period, the study tracked the changes in nodes leading policy discourse. The top 11, 2, 7, and 9 nodes with high correlation coefficients were recommended as core words per period. The study then created matrix data sets using the central value products of the nodes, which were visualized using two-dimensional multidimensional scaling. This process enabled the nodes located at the core of the network to be distinguished from those located around the network; thus, observing whether or not the nodes are located at the center boundary or around the center on the continuous line was possible.

First, in the 10th FYP, 11 words—namely green industry, enterprise, green product, circular economy, resources, cleanliness, eco-friendliness, consumer, consumption pattern, and ecological environment—were located at the center of the network, which led to policy discourse. This period was the early stage of the green consumption policy, where various eco-friendly industries and products emerged. Thus, eco-friendly keywords played an important role in the circular economy. In particular, enterprise aimed to apply the concept of “eco” to resource utilization and the manufacture of products and intended to induce lifestyles and patterns related to green consumption to protect the ecological environment. This series of efforts will contribute to the spread of green consumption in the future as major nodes that lead the initial stage of the green consumption policy in China.

In the 11th FYP, two words, namely circular economy and green growth, were at the core of the network. The early government/company activities related to green consumption were being practiced in the larger issue of green growth. In particular, technologies and policies related to green growth during this period were designated as one of the seven new growth industries in China. In this manner, green growth and the circular economy were emphasized to provide solutions to the increasingly serious environmental problems and to realize harmonious development between economic growth and environmental protection. Green consumption was also promoted using these two core keywords.

In the 12th FYP, values, ecological civilization, society, green growth, green economy, enterprise, and consumers were the main keywords leading green consumption. Compared with the previous embryonic (10th FYP) and exploration (11th FYP) stages, this period marked a period of rapid development of green consumption. The value of emphasizing ecological civilization was reflected in the overall policy/society, and enterprise and consumers pursued the same direction in eco-friendliness. A green-based socio-economic framework was gradually formed, and enterprises linked with consumers...
to take the lead in the preservation and construction of an ecological civilization, which created an atmosphere of harmonious coexistence with people.

Finally, in the 13th FYP, the study observed nine words—namely influence, green product, consumption upgrade, circular economy, ecological civilization, green development, green production, enterprise, and environmental protection—at the center that led the surrounding words. During this period, green consumption was considered to have developed under the influence of domestic and foreign issues such as stronger environmental protection, carbon neutrality, and the climate crisis. The field of green consumption was expanded to all societies/markets, such as products, production, consumption, and development goals. In addition, the study found that consumers are divesting from traditional consumption methods and aiming for rational consumption, ethical consumption, and eco-friendly consumption through a consumption upgrade.

In summary, keywords that lead issues at the center of the discourse evolved from detailed words to larger concepts in the process of promoting green consumption in China. In particular, a change in the recognition of the environment occurred in the process of setting the goal of industrial structure–production–consumption as a virtuous cycle and ecosystem of green consumption. An important aspect is that various experiences in policy promotion, which were accumulated in the process of the development of green consumption, across 20 years, can be expected to generate a synergy with more macroscopic goals, such as carbon neutrality and the climate crisis, in the future. This result can be viewed as a common notion of the government and citizens; that is, China should pursue not only blind growth but also the global climate crisis to maintain the sustainable development of mankind. In other words, China is creating a "green economy circulation structure" in which eco-friendly products become the mainstream of society by combining ecological protection and green industry development. In this manner, green consumption—that is, the appropriate and rational consumption of the abovementioned products—is realized within the entire society. Figure 2 presents the results of the core–periphery analysis.

<table>
<thead>
<tr>
<th>Period</th>
<th>Multi-Dimensional Scaling</th>
</tr>
</thead>
<tbody>
<tr>
<td>10th FYP</td>
<td></td>
</tr>
</tbody>
</table>
5. Discussion and Conclusion

Green consumption in China has laid the foundation for the green development plan led by the government for more than 20 years. At the global level, China introduced the concept of green consumption and endeavored to spread it to the government, market, industry, and civil society after converting the concept of traditional consumption into eco-friendly consumption. China is a strong policy-promoting country; thus, green consumption also proceeded rapidly under the leadership of the government. However, the social transition to green consumption is a long-term goal that can only be achieved when the government, businesses, consumers, and the market collaborate. In the midst of rapid economic growth and social change, China has entered an important turning point in which it must simultaneously achieve three goals, namely growth, stability, and the environment. Green consumption is one of the key strategies for achieving these goals. In terms of the sustainable development of the country based on the macro-circular economy, the country must ensure the alignment between the ideology of green consumption and green actions. In addition, the maturation of civil society and the development of ICT served as the major basis for the widespread dissemination and communication of green ideology and actions. In other words, green consumption in China underwent a shift from quantitative to qualitative development. As such, the study found that green consumption in China is evolving. Accordingly, the study noted that the policy discourse of green consumption in China has changed in the long term and identified its main driving forces. Moreover, the study proposed the role of green consumption in the future sustainable development of China. We endeavored to seek answers to the research questions through text mining and network analysis. The results are summarized as follows.

First, green consumption in China, according to the results of text mining, has developed in the direction of ensuring consumer health and safety in the early stages, with appropriate allocation; reducing the use of social resources in the next stage; and fairness and sustainability of consumption in the final stage. Notably, green consumption,
combined with education, values, and environmental protection, has become a policy that all members of society aim to achieve with the one-way promotion of the government. Enterprises, the government, and consumers have been promoting cooperation in terms of production and resource utilization; guidelines, such as laws/systems; and the propagation of ideas and practices toward appropriate/ethical/reasonable/eco-friendly consumption.

Second, the CONCOR analysis revealed that the macro-direction of policy discourse related to green consumption is changing from a single topic to a diversified topic. Conserving resources and ensuring stable economic growth are important goals of green consumption. The reason is that a high-quality structure for economic growth can be realized through a virtuous cycle that begins with the appropriate use of resources and eco-friendly production and leads to green distribution networks and green consumption among consumers. In addition, the study observes a change in the policy discourse for green consumption in China, building a sustainable governance system while fostering eco-cultural values.

Third, the study used core–periphery analysis to analyze the time series changes in policy keywords leading to green consumption per period. During the entire period, green consumption in China displayed a transition process from nascent, explorer, and high-speed generators to stable generators. In the early days, policy keywords that led green consumption were products, industries, and eco-friendliness. However, the study confirmed that they converged to larger concepts and policy words over time. In particular, ecological civilization, green growth, and green economy played a major role in penetrating the discourse and leading green consumption. Another notable aspect was that green consumption is being promoted in combination with words related to global issues such as carbon neutrality and climate change. This finding can be considered a point that illustrates the responsibility and leadership of China in global environmental issues, which exceed the issues of a single country. In brief, keywords, such as eco-friendly/sustainable development/climate change, became important values to consider when revising the direction and goals of the development of consumption-based policy in China.

In summary, the study found that green consumption in China is currently on the path of active change through policy measures. However, the subdivided laws and systematic operation mechanisms for each field still need to be supplemented. From the global perspective, developed countries, such as the United States, Japan, and Germany, are developing green consumption while enacting and supplementing systems and laws. China also needs to establish institutional robustness to achieve the goals of sustainable development, such as effective environmental protection and the construction of an ecological civilization through green consumption. Through the renewal and continuous supplementation of the Consumer Rights Act, the public should be encouraged to use eco-friendly products, and systematic laws should be prepared as a reference for the guidance, rights, and policies of green consumers.

In addition, as the core of the economic virtuous cycle structure, ecosystem establishment should be promoted to produce, distribute, and consume green products as the mainstream of the market. The government should use various methods for spreading or controlling green consumption through various subsidies or penalties. Moreover, industries and companies need to enhance their corporate image/social responsibility by producing eco-friendly products. In addition, consumers should play a role in leading green consumption by practicing appropriate/rational/ethical consumption instead of resorting to resource waste. In addition, an important aspect is the idea/practice of green consumption through education and community, for the sustainable implementation of green consumption.

The consumer market in China is characterized by a large and wide regional distribution, with a population of 1.4 billion. Various policy measures for practicing green consumption should be pursued in a balanced manner, with universality at the central
government level and specificity at the local government level. In accordance with the industrial structure and economic development goals per region, cooperation at the government–business–private level is important, such that the green consumption and practices of consumers can be spread. In addition, the use of media at the government level is crucial given that the ideology/value/promotion of green consumption by the media is an indirect factor in the development of green consumption. Among various efforts, the most important ones are those of the public and consumers in practicing green consumption. The reason is that they are the core agents in recognizing, sharing, educating, and practicing the value of green consumption. Social transformation in terms of green consumption has its limits when promoting national policies, and its levels of efficiency and effectiveness are low. To enable China, which is at the center of global environmental issues, to implement green consumption fully and responsibly, consumers should become environmentalists who design their lives according to environmental responsibility and action.

Green consumption can also be considered through discursive institutionalism, which is the theoretical basis of this study. Policy discourse consists of cognitive, normative, and behavioral dimensions. Green consumption in China requires active presence in the media and the diffusion of concepts in educational institutions along the cognitive dimensions. In addition, at the normative level, detailed laws/regulations/guidelines that can be practiced at the national, local government, business, and private levels should be prepared. Finally, at the behavioral level, a public incentive system that can encourage green consumption or the development of various marketing strategies that enhance private green consumption should be universalized. The expansion of green consumption policy discourse, the practice of green consumption, and sustainable development are goals that can only be achieved when the three elements work together as gears in the social structure. At present, China’s green consumption remains in a transitional period of evolution and development. Of course, the reality is that it is difficult to shift away from the focus of economic growth and consumption and change one’s thoughts and practices to eco-friendly ones. However, the Chinese public has the strength to adapt more rapidly than expected to the changing social system. Whether it is intentionally led by the government or achieved through voluntary change by civil society, institutions and practices are still changing in the direction of green consumption. The role of discourse should be positive. Green consumption in China will develop in a sustainable direction only when it works in a direction that induces changes in ideology, education, and practice.

This study has its limitations. First, data could not be collected from channels that could directly provide the discourse of individuals, such as Sina Blog and WeChat. In other words, the policy evaluation and value evaluation of green consumption by the public cannot be grasped in detail. We expect these data to be supplemented and analyzed in future studies.

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