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Green Supply Chain Management and Performance: A Bibliometric Analysis Based on CiteSpace

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Abstract. Environmental problems make green supply chain management become a new enterprise strategic management mode. At the same time, whether the implementation of green supply chain management can improve performance has been widely concerned by the academics, so it is particularly important to clarify the relationship between green supply chain management and performance. This paper first uses bibliometric to summary the hot issues between green supply chain management and performance. Secondly, the relationship and internal mechanism between green supply chain management and performance are sorted out based on 57 literatures. Finally, the existing research on the relationship between them is reviewed and prospected, so as to provide theoretical reference for further research.

Keywords: Green supply chain management; performance; bibliometric analysis

1. Introduction

Under the background of green development, the competition between environment and resources has gradually become a key factor to restrict the sustainable development of national social economy. Countries are increasingly aware of the inseparable relationship between environmental resources and human sustainable development. As a modern management mode that fully considers environmental factors, Green supply chain management has attracted great attention from the practice and theory around the world. In practice, some large international enterprises (such as P & G, Wal-Mart) have achieved good economic and environmental benefits through the implementation of green supply chain management. In recent years, China ' s government has enacted a series of policies and regulations to promote the pilot implementation of green supply chain management in China on the basis of drawing lessons from foreign development experience, prompting enterprises to improve the level of green manufacturing and accelerate the pace of ecological civilization construction.

In theory, scholars discuss the impact of green supply chain management on performance. Santos [1] has studied Brazilian manufacturing and finds that green supply chain management has a positive impact on economic performance. However, some researchers believe that the implementation of green supply chain management increases operating costs and reduces economic performance [2]. Zhu and other scholars [3] have found that there is no linear relationship between the implementation of green supply chain

management and economic performance. Existing research on the relationship between green supply chain management and performance has not been consistent conclusions, there may be the following reasons:

(1) The existing research results are not systematically combed. Up to now, we have not found a literature review on the relationship between green supply chain management and performance.

(2) The relationship between green supply chain management and specific performance categories is not distinguished. The existing research lacks systematic description and analysis of the specific performance and the relationship between the green supply chain management and performance.

(3) The mechanism between green supply chain management and performance has not been discussed in depth. In the field of green supply chain management and performance research, the existing research focuses on the evaluation of performance results [4], ignoring the in-depth analysis of how and when green supply chain management affects performance.

In view of this, this paper adopts the method of systematic review to summary the research hotspots of existing research with the help of CiteSpace analysis software. Besides, we sort out and induct the relationship and mechanism between green supply chain management and performance, and puts forward the direction that can be extended and expanded in future research.

2. Data sources and methodologies

The literature retrieval time range is from 1998 to 2021. We select 1998 as the starting year, because in this year Sarkis [5] first proposes that green supply chain management is an important strategic part of environmental protection commercial behavior (ECBP), and ANP method is used to establish the decision evaluation model of environmental protection commercial behavior which includes green supply chain management. In addition, in order to ensure the comprehensiveness, adequacy and rigor of resources, Chinese retrieval is based on CNKI, Wan Fang and Wei Pu databases, and English retrieval is based on Web of science, EBSCO / Host and Elsevier databases. Taking “supply chain management and environment,” “green products” and “green supply chain management,” “GSC,” “green supply chain management,” “environment and supply chain management and green” as Chinese and English search terms. Then we search the title, abstract and keywords respectively. There are 16970 Chinese publications (CNKI had 6859 publications, Wan fang had 4698 publications, Wei Pu had 5413 publications) and 15555 English publications (Web of science had 6248 publications, EBSCO had 3055 publications, Elsevier had 6252 publications) reserved.

In order to ensure the consistency of research objectives and contents, the following criteria should be met in depth screening of literature resources:

(1) For the initial retrieval results, duplicate literature，literature with similar research contents, significantly unrelated to research issues and other meanings that “GSCM” may represent (non-green supply chain management abbreviation) between Chinese and English databases should be excluded;

(2) The literature classification catalogue is concentrated on the economic and management categories, excluding literature in other fields;

(3) The selected literature resources should be published in public and influential

journals with strong professionalism, deleting non-research items such as dissertations, solicitation notices and conference results;

(4) The selected literature should involve the literature resources of empirical research and theoretical research about the relationship between specific variables (namely, the relationship between green supply chain management and performance). According to the above criteria, 57 valid data are left, including 10 Chinese publications and 47 English publications.

3. Keywords co-occurrence analysis

Keywords can reflect the focus and subject structure of a paper. Keyword co-occurrence analysis is to refine the main objectives and core content of existing research results. We select keyword analysis in CiteSpace to obtain keyword co-occurrence network diagram (Figure 2).

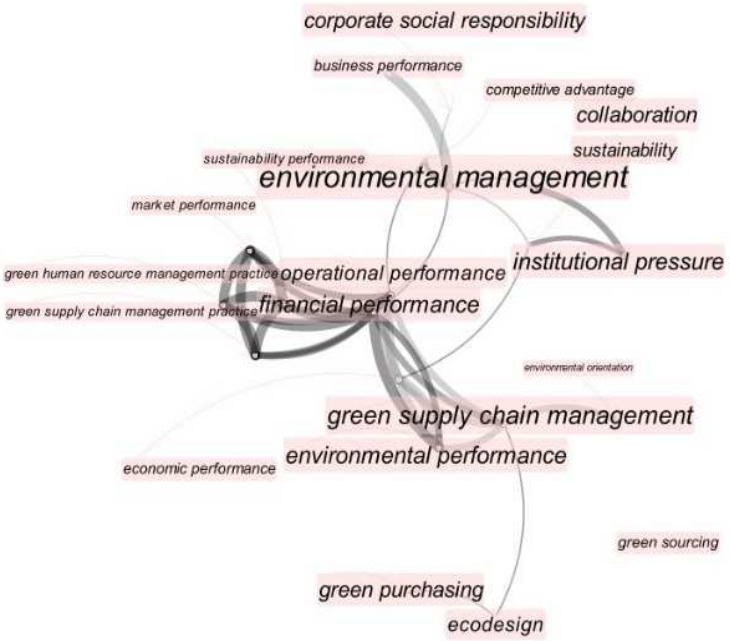

Figure 1: Research on the relationship between green supply chain management and performance keywords co-occurrence network diagram

Combined with Figure 2 and according to the attribute characteristics of high-frequency keywords, the research on the relationship between green supply chain management and performance can be divided into three categories: the first category includes five items, corporate social responsibility, institutional pressure and cooperation are relatively large among them. This category involves the antecedent variables that promote enterprises to implement green supply chain management. The second category contains seven items, among which environmental management, green supply chain management and green procurement appear most frequently. This category reflects the specific implementation process of green supply chain management. Combined with the

essential attribute of sustainable development, and coordination of economic development strategic objectives are established in long-term regulation and control, as well as the development mode of green supply chain management is studied. The third category contains eight items, the frequency of environmental performance and financial performance is higher among them, indicating that environmental performance and financial performance are the focus of performance results. This category reflects the specific performance results generated by the implementation of green supply chain management.

Keyword co-occurrence analysis results show the hot issues of the existing research about the relationship between green supply chain management and performance. However, this part of the analysis cannot present the mechanism of action between green supply chain management and performance, and the three categories summarized according to the keyword collinear network do not necessarily fully reflect the research status of the relationship between them. In the following part, the relevant research on the relationship between green supply chain management and performance will be interpreted in detail combined with specific literature resources.

4. Relationship between green supply chain management and performance

4.1. Concept and measurement index of green supply chain management

Different scholars put forward their own understanding of the concept of green supply chain management. Based on the integration perspective, Zhu [3] defines the green supply chain management as a modern management mode that makes the internal and external environmental management of the supply chain achieve optimal coordination through the close cooperation of enterprises and departments in the supply chain. Based on the perspective of multi-stage management, Khan [6] believes that green supply chain management is based on the triple bottom line principle, which manages a series of green practice activities, and pays attention to environmental and social aspects while obtaining economic benefits. Sezen [24] believes that green supply chain management includes environmental thinking, product design, material procurement, manufacturing, product delivery and product recovery activities in supply chain management.

Since the concept of green supply chain management is not unified, scholars evaluate green supply chain management from different dimensions. Choi [8] uses Zhu's definition to divide green supply chain management into green procurement, internal environmental management, ecological design, consumer cooperation and reverse logistics. Khan believes that green supply chain management should include green procurement, green manufacturing, ecological design, green distribution and consumer collaboration [6]. Sezen [24] measures green supply chain management by seven indicators: green procurement, green manufacturing, green distribution, green packaging, green market, internal environmental management and investment recovery.

4.2. Research on the direct effect of green supply chain management on performance

1. Economic performance. Economic performance refers to the efficiency of resource allocation and utilization [6]. Green supply chain management has a positive impact on economic performance. Green procurement, green manufacturing, eco-design and consumer collaboration have a positive impact on economic performance, but the effect of green distribution is not obvious [6,7]. Some scholars believe that green

supply chain management negatively affects economic performance, such as Azevedo [2] finds that green procurement will increase the cost of enterprises and reduce economic performance.

2. Financial performance. Financial performance refers to whether the enterprise strategy and its implementation are contributing to the final operating performance [28]. Choi [8] believes that green procurement, internal environmental management and eco-design practice can improve corporate financial performance, among which green procurement has the greatest impact. Similarly, Yijun [9] finds that green procurement practice has a positive impact on financial performance through the study of China's Changzhutan manufacturing enterprises.
3. Business performance. Business performance refers to the operating efficiency and performance during a certain operating period [47]. Abbas [10] finds that creating a green atmosphere in restaurants and putting green equipment into restaurants are more conducive to business performance. Khan [11] studies manufacturing in Pakistan and finds that green manufacturing and eco-design practices can improve business performance, while the impact of green procurement on business performance is not significant.
4. Operational performance. Operational performance refers to the degree of realization of strategic objectives [12]. The practice of green cooperation among enterprises, suppliers and consumers has a significant positive impact on operational performance [1,12,13] However, Altaf [14] believes that consumer collaboration has a negative impact on operational performance. Taking China's automobile industry as the research object, Mou Fangzhou [15] believes that eco-design practice has a positive impact on operational performance. Sahoo [16] surveys Indian manufacturing companies reaching a unanimous conclusion.
5. Environmental performance. Environmental performance refers to the environmental consequences related to the degree of work effort and quality of work [17]. Consumer collaboration has a positive impact on environmental performance in green supply chain management [17,18]. In addition to cooperation with consumers, some scholars have explored the impact of cooperation between enterprises and suppliers on their environmental performance, such as Stefanelli [19] who believes that cooperation with suppliers in green packaging can improve environmental performance. In addition, internal environmental management and eco-design practice have a positive impact on environmental performance [20,21].
6. Green performance. Green performance means that enterprises meet the needs of enterprise growth and development through green operation [23]. Internal environmental management and external green cooperation in green supply chain management have a positive impact on green performance [22]. However, Ahmed [23] explores the impact of them on green performance, arguing that the impact of external green cooperation on green performance is not significant.
7. Sustainable performance. Sustainable performance is used to evaluate the economic and environmental benefits of enterprises in the green development process. [24] Sezen [24] finds that green manufacturing, green distribution, green packaging, green market, internal environmental management and investment recovery have a positive impact on sustainable performance, but the impact of green procurement on sustainable

performance is not significant. Fernando [25] believes that internal environmental management and investment recovery have no significant impact on sustainable performance.

In summary, through systematic review of relevant literature, it is found that the impact of green supply chain management on different performance results is different: green supply chain management has a positive impact on environmental performance and financial performance. It has both positive and negative impacts on economic performance and operational performance. For business performance, sustainable performance and green performance, some scholars believe that green supply chain management has a promoting effect. However, some scholars have found that there is no significant relationship between green procurement and business performance, as well as external green cooperation and green performance, green manufacturing, internal environmental management, investment recovery and sustainable performance.

4.3. Research on Intermediary effect between Green Supply Chain Management and Performance

How does green supply chain management affect performance? From the existing research, it is mainly realized through institutional path, practical path and effect path.

1. Institutional path. It is based on the analysis of the regulations or guidelines that all members abide by in the process of green supply chain management. Mitra [26] and other scholars believe that the sustainable system in the implementation of green supply chain management will restrict the production behavior of enterprises and improve economic performance. Zhiming [27] proposes that green supply chain management promotes enterprises to form environmental synergy with upstream and downstream subjects and environmental supervision system, which further positively affects economic performance. Zhang [28] believes that green supply chain management will affect corporate social control and improve environmental performance.
2. Practice path. It is based on the analysis of the management activities of the green supply chain. Enterprises implementing green supply chain management achieve economic performance by adopting sustainable logistics activities (such as product transportation path optimization) investment recovery practice [29] and also improve environmental performance on the basis of environmental cost savings [30]. Ahenkorah [31] believes that green supply chain management positively affects the sustainable performance of enterprises by improving the level of green human resource management. In addition, Seman [32] explores the relationship between green supply chain management and environmental performance of Malaysian enterprises, he believes that green supply chain management promotes green innovation and environmental performance. Similarly, Agustia [33] verifies the mediating role of green innovation between green supply chain management and business performance with Indonesian companies.
3. Effect path. It is based on the analysis of green supply chain management practice results. Studies have shown that economic performance, environmental performance and green performance are intermediary mechanisms between green supply chain management and operational performance and financial performance. For operational performance, Meacham [34] believes that green supply chain management improves

operational performance through the dual intermediary role of economic performance and environmental performance. For financial performance, Kalyar [35] studies Pakistani enterprises and finds that environmental performance plays an intermediary role in the relationship between green supply chain management and financial performance. However, Feng [36] finds that green supply chain management increases financial performance through the dual intermediary mechanism of environmental performance and operational performance.

In addition, the chain intermediary mechanism between green supply chain management and performance has been widely studied by scholars. For example, Yang [37] researches Taiwan shipbuilding industry and finds that green supply chain management improves green performance, further enhances the competitiveness of enterprises, and obtains financial performance. Hashmi [38] establishes a chain intermediary mechanism between green supply chain management, environmental performance, operational performance and financial performance, he believes that green supply chain management improves operational performance through environmental performance and then positively affects financial performance. In addition, Sang [39] examines the role of employee satisfaction, operational efficiency and relational efficiency in the relationship between green supply chain management and business performance, he finds that employee satisfaction plays a positive intermediary role in the process of green supply chain management affecting business performance, but the intermediary role of operational efficiency and relational efficiency in this process is not significant.

Green supply chain management. Some scholars regard green supply chain management as an intermediary variable, and use the path of "antecedent variable →green supply chain management→ performance" to explore the relationship between antecedents and results of green supply chain management. Based on the perspective of enterprise external environment, the existing research considers the influence of external pressure, external environment positioning, environmental synergy effect and manufacture's green innovation level on the relationship between green supply chain management and performance. First, external pressure includes customer pressure, institutional pressure and competitor pressure. Chavez [40] believes that customer stress has a positive impact on the implementation of green supply chain management, thereby improving operational performance. Vanalle [41] studies Brazil 's auto industry, and Jinsong [42] surveys China 's auto industry. They all believe that institutional pressure has a positive impact on environmental and economic performance by promoting green supply chain management. In addition, the pressure of external competitors promotes the implementation of green supply chain management and improves environmental performance. [3,43] Second, Chan[44] believes that external environment positioning helps to stimulate the enthusiasm of enterprises to promote green supply chain management. Rehman [45] proposes that environmental synergy can promote the coordination of green supply chain management to achieve financial performance. Third, Zhu [46] believes that enterprises with high level of green innovation tend to actively implement green supply chain management, and then obtain economic performance.

Based on the perspective of organizational internal factors, existing studies have explored the impact of internal environmental positioning, organizational structure, corporate social responsibility, organizational strategic direction, organizational size and

green human resource management. First of all, Chan [44] proposes that internal environment positioning has a positive impact on green supply chain management and improves enterprise performance. Shao [47] believes that the large board size and the high proportion of female members will hinder the implementation of green supply chain management, which is not conducive to the acquisition of business performance. Besides, CEOs with doctoral degrees will promote the choice of green suppliers and improve business performance. Secondly, Wang [48] believes that corporate social responsibility promotes the implementation of green supply chain management and thus positively affects economic performance. Kirchoff [49] finds that environmental efficiency oriented organizational strategy can promote the implementation of green supply chain management and positively affect environmental performance. Finally, the size of the organization also affects the process of green supply chain management. Gopal [50] believes that large and medium-sized enterprises are more inclined to adopt green supply chain management to improve environmental performance. In addition, Kevin [51] finds that green supply chain management plays a partial intermediary role between green human resource management and operational performance as well as environmental performance.

4.4. Research on the moderating effect between green supply chain management and performance

From the perspective of organizational external environment, institutional environment, cooperation with upstream and downstream supply chain subjects, customer communication is the boundary condition for the effectiveness of green supply chain management. Zhou Lixin [52] believes that institutional environment has a positive moderating effect in the process of green supply chain management affecting environmental performance. Thoo [53] believes that environmental cooperation can regulate the impact of green supply chain management on sustainable performance. Zhu [54] discusses the impact of customer relationship governance on the relationship between green supply chain management and performance, he concludes that effective relationship governance makes green supply chain management positively affect economic performance. Pan [55] believes that customer communication significantly moderates the relationship between green supply chain management and economic performance. Good communication atmosphere and appropriate communication frequency can positively affect economic performance.

From the internal point of view of the organization, quality management, punctual production mode has been widely concerned by researchers. Qinghua, Yong [56] studies Chinese manufacturing enterprises and finds that when the quality management level of enterprises is higher, green supply chain management can significantly improve the environmental performance of enterprises. However, Zhu and other scholars [57] believe that JIT mode negatively moderates the impact of green supply chain management on environmental performance through research on Chinese manufacturing industry. In addition, enterprise scale and type also affect the effectiveness of green supply chain management [58]. Large-scale enterprises are more willing to take the initiative to implement green supply chain management. Leading enterprises implementing green supply chain management have more mature means and methods [59]. The green supply chain management practice of these enterprises is more conducive to improving market performance and operational performance. Based on the above analysis and induction, the

relationship and mechanism between green supply chain management and performance are shown as follows:

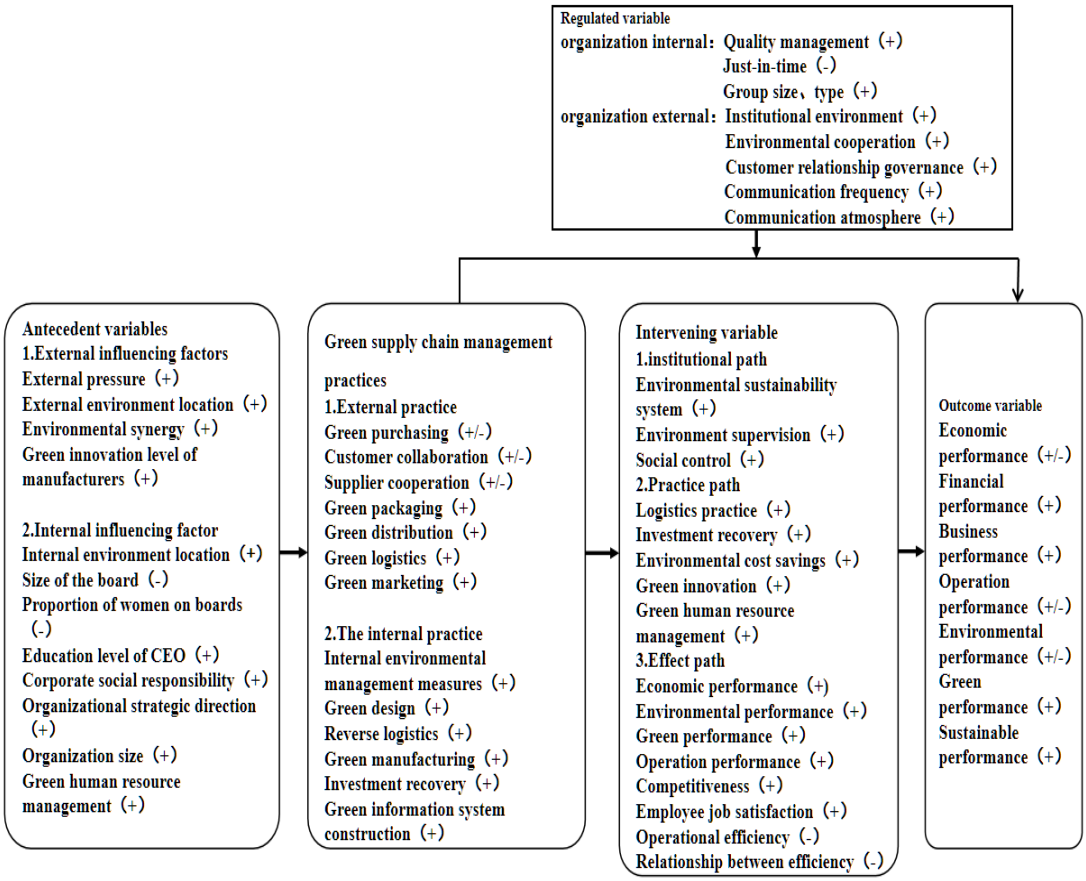

Figure 2: Framework of the Relationship between Green Supply Chain Management and Performance

5. Research conclusions and prospects

This paper systematically reviews research hotspots, influence effects and mechanism of the relationship between green supply chain management and performance. Future research can be carried out from the following aspects.

First, in terms of performance results, the results of keyword burst show that the economic performance and financial performance are the most prominent in the past three years, indicating that the recent research focus in academia is the acquisition of economic benefits in the implementation of green supply chain management, but it does not fully pay attention to other performance results, such as green performance and environmental performance. Future research can explore the relationship between green supply chain management and environmental performance and green performance.

Second，in terms of measurement standards, the measurements of green supply chain management are not unified. Scholars measure green supply chain management from

different dimensions [11,24] there has not formed a mature index system in academics, and the existing research is mainly based on the measurement standard of western organizational context. Further research needs to build a scientific and reasonable measurement system of green supply chain management based on Chinese organizational context.

Third, in terms of the internal mechanism, for the intermediary mechanism, the existing research focuses on the social system, organizational practice and effect, without considering the role of innovation at the organizational management level. Therefore, future research can explore the mediating mechanism between green supply chain management and enterprise performance from the perspective of organizational management innovation. For the adjustment mechanism, the existing research focuses on the role of organizational characteristics, internal management and external environment, ignoring the impact of supplier integration and value co-creation on the effectiveness of green supply chain management. Therefore, it is necessary to explore the boundary conditions of strategic supplier management strategy and value co-creation.

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