

Supply Chain Power: A Bibliometric Analysis

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Abstract:

Supply chain power (SCP), as the interdependent relationship between enterprises and organizations in the supply chain relationship, has garnered much attention from researchers recently and is increasingly being investigated in the supply chain management (SCM) literature. Therefore, it is necessary to explore the development of SCP by bibliometrics. This paper focuses on tracking thematic evolution in SCP. A systematic literature review and bibliometric analysis was conducted, and 200 articles searched from the databases in web of science were analyzed through quantitative analysis and network analysis. By quantitative analysis, including the title, keywords, author, journal, publish year, literature content and citation information, this paper reveals the development history, research focus and future research direction of SCP. By network analysis, the paper identifies that the SCP researches focus on four main thematic areas, i.e., power and supply chain relationships, power and sustainable supply chain management (SSCM), the channel power structure in supply chains, power in the food supply chain and its practices. The four thematic areas were selectively read and summarized, and relevant conclusions were drawn. Then, based on the summarized content, some suggestions on the direction and content of future research on SCP were provided. This study comprehensively analyzes the knowledge structure and the development process of SCP research by using an evidence-based analysis method. The findings can be used by SCM researchers to position their research within SCP, which is useful for supporting further investigations of SCP.

Keywords: Supply chain power (SCP), Bibliometric analysis, Quantitative analysis, Network analysis.

I. INTRODUCTION

Supply chain power (SCP) refers to the interdependent relationship between enterprises and organizations in the supply chain relationship, and it reflects the ability of the dominant enterprises to influence the decisions of other enterprises [1-3].

Different forms of power have been proposed by French and Raven [4]. According to the existing literature, power is classified according to the dichotomy of non-media and media power [1-2,5]. Within

this grouping, reward and coercive power belong to media power, while expert, referent and legitimate power belong to non-media power.

SCP has a strong connection to sustainability. Three out of four themes in this paper are focused on or involve sustainability. The theme of power and sustainable supply chain management (SSCM) (the adoption and implementation of SSCM [6] and the popularization of sustainability initiatives [7-8] is closely related to sustainability. The theme of power in the food supply chain and its practices (corporate social responsibility [9], oligopolistic behavior [10], reducing food waste [8] is also closely related to sustainability. The theme of the channel power structure in supply chains, waste electrical and electronic equipment (WEEE) collection [11], and the environmental protection responsibilities transfer factor [12] is directly related to sustainability. The theme of power and supply chain relationships is weakly related to sustainability.

Several reviews have focused on power research in the supply chain. The impact of power on the adoption of eSCM [3] and supply chain integration [1] have been examined. However, there is a lack of a systematic review of the SCP literature. Because SCP plays a key role in supply chain sustainability initiatives [7], the food supply chain [13], WEEE collection [11], and the biochemical industry, the literature on SCP is developing rapidly. Therefore, systematically understanding the SCP knowledge structure is meaningful.

In developed countries, power and SCM have a long history; the resource-based view (RBV) and other similar mechanisms have been developed consistent with national economies. Different from mature economies, developing countries, such as China and India, have a special culture and an immature institutional environment. The tools and methods for power and SCM in these countries are immature and imperfect [14]. The research on SCP issues has become increasingly popular.

The remainder of the research is organized as follows. The methodology is presented in Section 2. The findings are provided in Section 3. A co-citation analysis is given in Section 4. The discussion and future research directions for SCP are given in Section 5. The conclusion is provided in Section 6.

II. METHODOLOGY

This literature review is conducted by following a systematic approach. This paper employs bibliometric tools [15] to obtain more objective results that locate the intellectual structure of knowledge in the research on SCP. Since bibliographic coupling shows weaknesses in clustering nonrecent publications, this paper adopts the citation and co-citation analyses approaches. Compared with less frequently cited articles, heavily cited articles have a greater influence on the topic. Citation analyses determine the growth of citations during the time period of interest, measure the impacts of scientific publications, and finally identify the roles of highly cited papers [15]. The co-citation method counts the number of times that two documents or authors are jointly cited and not only differs from but also supports citation analysis, as citation analysis provides only general insights into articles' popularity and any major changes in the

research direction based on the citation rates of cited references, while co-citation analysis illustrates the major themes of the field of knowledge based on the linkages among the text of the cited references [16].

We summarize the steps of the SCP literature review and analysis, including the data collection, citation analysis and co-citation analysis, as shown in Fig 1.

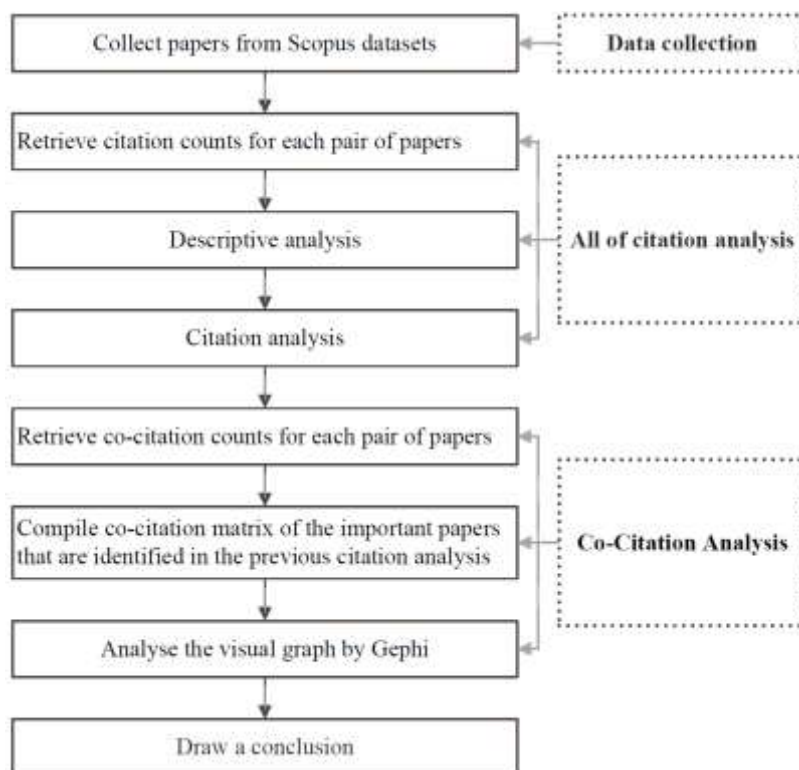


Fig 1: Steps for the literature review

2.1 Literature Search and Screening Process

This systematic literature review was conducted through steps that include the identification of keywords, the selection of inclusion criteria, the assessments of quality, and the process of data extraction. In addition, we conducted manual filtering based on the earlier steps.

The term ‘power’ includes keywords such as ‘power’, ‘non-media power’, ‘media power’, and ‘power regime’. We searched the ‘title’ domains in the databases in web of science, and then selected the articles related to supply chain, which yielded 200 articles. In these documents, certain restrictions were formulated based on the following requirements: (1) the date of the study is before and includes 2019; (2) the types of documents are articles and articles in press; (3) the source type of the document is journals; and (4) the language of the literature is English. The search period was defined as before and including 2019 to allow a more comprehensive analysis of the topic. We restricted the types of documents to retain only articles and articles in press and to exclude conference papers, books, reviews, etc., because articles

and articles in press systematically research a topic, such as analyzing SCP. These articles offer the most support to current researchers. The source type of the literature is defined as journals because journals are more likely to be read and journals are evaluated by authoritative institutions, which makes them more authoritative than other sources. After these restrictions, the search resulted in 200 articles.

2.2 Initial Data Statistics

The distribution of the 200 documents selected in the previous step is shown in Fig 2. As seen in the Fig 2, there were few studies on SCP before 2010. However, the relationships between the buyer and supplier [17-18] and between power and trust in supply chain management [19] were well developed during this period.

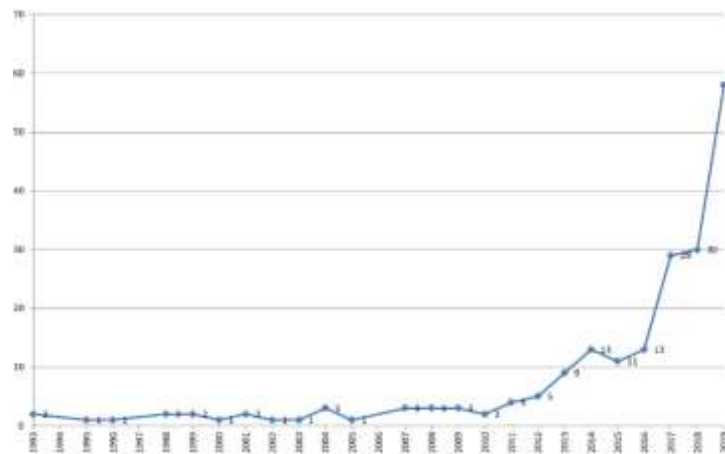


Fig 2: Number of Documents from 1993 to 2019

When the impacts of sustainability risks began to be felt globally, these impacts were enormous. From these sustainability risks, people began to realize that sustainability risks have an important impact on the supply chain sector.

The year 2010 was a turning point for the SCP literature. Beginning in this year, a large number of articles were published that focused on why companies should adopt sustainability and how companies implement sustainability with power [20]. As a result, scholars became interested in this topic and began to conduct research.

2.3 Bibliometric Analysis Procedure

In our research, we used the knowledge domain software BibExcel [21] and the visualization software Gephi to conduct citation and co-citation analyses. Science publications do not simply accumulate in the citation network, but a distributed information network system is formed by the subjects of active research scholars. In terms of the co-citation analysis, this paper investigated the Scopus datasets with BibExcel software and performed a visual analysis with VOSviewer software. BibExcel is designed to help users

analyze bibliographic data. The generated data files are imported to Excel for further analysis [21]. Gephi is open source software, which is mainly used for an interactive visualization of various network graphs [22]. This technique, which can address large networks and takes advantage of multicore processors, uses the computer graphics card [22].

III. QUANTITATIVE ANALYSIS

3.1 Document Influence

When analyzing the influence of the literature, BibExcel is used for the corresponding experiment. First, 200 pieces of document data are selected in Scopus, downloaded and imported into BibExcel. Then, the reference fields of the literature are identified and extracted. Next, the relevant information is recorded, and the extracted information in Excel is presented. Finally, the number of times the documents are cited is sorted. The results obtained are shown in TABLE I. (the top ten documents with the most citations).

TABLE I. The 10 most frequently cited publications

	Year	Author	Main contribution	Global citation	Local citation
1	2005	Benton and Maloni [6]	Constructs the empirical evidence to measure the supplier satisfaction that is first driven by power.	398	40
2	2008	Zhao et al. [1]	Verifies the influence of customer power on the manufacturer's relationship commitment.	458	27
3	2007	Ireland and Webb [19]	Discusses four strategies that are used to balance a climate of trust and power.	299	20
4	2013	Shi et al. [23]	Assesses the impacts of a power structure with an uncertain demand.	69	15
5	2004	Cox [24]	Concludes that the buyer and supplier can properly manage their relationship by understanding the power regime.	224	13
6	2009	Ke et al. [2]	Examines how power affects the adoption of an electronic supply chain management system.	122	10
7	2016	Chen et al. [25]	Investigates the impact of the power structure on an O2O mixed channel.	83	9
8	2016	Gao et al. [26]	Explores the impact of power structures on the CLSC.	93	8
9	2013	Cai et al. [27]	Finds that compared with power, trust has a more significant impact on technology exchange and technology transfer.	122	8
10	2014	Touboulic et al. [6]	Investigates sustainable relationships in supply chains from a power perspective.	80	7

It can be observed from the table that the first few documents that are cited the highest number of times are related to the establishment of the research and SCP models, which shows that scholars pay more attention to the empirical study of SCP.

TABLE I. indicates that SCP has attracted widespread attention. Furthermore, the article order based on the local citation is inconsistent with the order based on the global citation, for example, Cai et al. [27] is ranked 9th locally but 5th globally. This shows that Cai et al. [27] seems to be receiving more attention outside the SCP domain.

3.2 Keywords Statistics

The statistics for the keywords in the 200 articles can be used to understand the general content of these articles. By extracting the information in the keywords and processing the data in BibExcel, information is obtained and exported to Excel for sorting (TABLE II).

TABLE II. The 10 most frequent keywords

Keywords	Frequency	Keywords	Frequency
Supply chain management	64	Manufacture	26
Power	48	Costs	24
Supply chains	47	Supply chain	21
Game theory	36	Profitability	20
Sales	31	Power structures	19

The above table provides some interesting results. The highest frequency of keyword occurrence is undoubtedly supply chain management. The frequency of power immediately reached 48, which indicates that scholars attach great importance to how to manage and respond to power. The frequency of game theory (Manufacture) is also very high, which indicates that there is a close relationship between game theory and SCP.

3.3 Country Statistics

Statistics on the publishing countries or regions of the 200 articles can be used to understand which countries or regions are more concerned about SCP and power relation issues. By extracting the information for the country in which each article is published and processing the data in BibExcel, the obtained information can be exported to Excel for sorting. TABLE III. shows the 10 most frequent countries/regions.

TABLE III. The 10 most frequent countries/regions

Country/region	Frequency	Country/region	Frequency
China	133	India	11
United States	69	France	10
United Kingdom	55	Canada	9
Germany	17	Italy	9
Australia	14	South Korea	9

As seen from the above table, China published the most studies on SCP and accounts for 66.5%. The United States published the 2nd highest number of studies on SCP, which accounts for 34.5%. On the one hand, due to the increasing comprehensive strength of China in recent years, it still experiences many problems in SCM. Chinese scholars are also increasingly concerned about SCP issues: power and SSCM. Further, the United States is a developed country with good research institutions and resources that has attracted many promising scholars. It can also be observed from the table that many countries in Europe also attach great importance to SCP- related issues.

3.4 Affiliation Statistics

Statistics on the affiliates of the 200 articles can be used to understand which institutions are more concerned about SCP and power relation issues and therefore choose to invest in more research. By extracting the information on articles' affiliates and processing the data in BibExcel, the obtained information is exported to Excel for sorting. TABLE IV. shows the top 10 contributing affiliations and the number of publications.

TABLE IV. lists the organizations that published 3 or more articles. As seen in the following table, the studies published by these institutions are widely distributed, and the institutions with more published literature are concentrated in China and the United States. The top 10 contributing affiliations that published literature are universities, and the institution with the most publications is Tianjin University in China, which explains the importance that Chinese government agencies attach to the topic.

TABLE IV. The top 10 contributing affiliations and the number of publications

Affiliation	No. of publications	Affiliation	No. of publications
Tianjin University	7	Zhongnan University of Economics and Law	4
University of Birmingham	5	City University of Hong Kong	3
National University of	4	Clarkson University	3

Singapore			
University of Electronic Science and Technology of China	4	North China Electric Power University	3
Zhejiang University	4	Pennsylvania State University	3

3.5 Journal Quality

In total, 200 papers on SCP were published in 138 journals. The top 20 journals ranked in terms of the most published papers on SCP were selected to analyze the quality of their articles. In this paper, we selected the three indicators of citescore, SJR and SNIP to analyze the quality of the journal. CiteScore is the average number of citations of articles in the first three years of the journal, and the coverage period is increased by one year compared with the impact factor. Simultaneously, CiteScore considers the characteristics of the impact factor and the five-year impact factor. SJR is an indicator that considers both the number of journals cited and the quality of journal citations. It uses Google's PageRank algorithm to give higher-reputation journals a higher weight, and iteratively calculates the weight until convergence is achieved [28]. SNIP was proposed by Moed in 2010 as the ratio between the average number of citations for each paper in a source publication in a three-year citation window and the citation potential of the subject area. SNIP can directly compare journals in different subject areas and achieve better evaluation results to some extent [28]. The SNIP value is referenced to 1: when the value of SNIP is higher than 1, the journal's quality is higher than the journal's average level; otherwise, its quality is lower than the average level. Therefore, when the three indicators of a journal are higher, the quality of the articles is better in this journal. TABLE V. shows the specific results.

As seen in the table below, most journals are of a higher quality than average, and most journals are strong in finance and economics. That is, the literature published in these journals is of a higher quality and more authoritative.

TABLE V. The top 20 journals

Source Title	No. articles	CiteScore	SJR	SNIP	Discipline
Sustainability (Switzerland)	12	2.592	0.549	1.169	S,SS,E
International Journal of Production Economics	8	7.13	2.475	2.486	DS,B,M/A ,E/F, En
Computers and Industrial Engineering	6	4.68	1.334	1.755	En,CS

International Journal of Production Research	6	4.34	1.585	1.720	DS,En,B, M/A
Journal of Supply Chain Management	6	7.04	5.015	2.934	B,M/A,E, E/F
Supply Chain Management	6	0.58	0.26	0.595	B,M/A, CS, DS
Journal of Business Ethics	4	2.91	1.276	1.639	B,M/A, A/H, E, E/F, SS
Journal of Cleaner Production	4	7.32	1.620	2.308	ES,En,E,B ,M/A
Agribusiness	3	1.98	0.646	1.249	A/B,SS,E, E/F
British Food Journal	3	2.08	0.485	0.885	A/B
European Journal of Operational Research	3	4.98	2.204	2.455	M,CS,DS
Journal of Operations Management	3	9.87	6.481	3.661	DS,En,B, M/A
Journal of Purchasing and Supply Management	3	4.55	2.003	1.746	B,M/A,
Omega (United Kingdom)	3	7.54	3.292	3.009	DS,B,M/A
Annals of Operations Research	2	2.58	1.032	1.334	DS
Applied Economics	2	0.8	0.445	0.653	E,E/F
Global Food Security	2	5.90	1.927	2.081	En,SS,A/B ,ES
Health Care Management Science	2	1.93	0.834	1.422	Me, HP
Industrial Management and Data Systems	2	4.95	1.137	1.706	B,M/A,En, CS
Industrial Marketing Management	2	3.76	1.663	1.722	B,M/A,

Note: A/B: Agricultural and Biological Sciences; A/H: Arts and Humanities; CS: Computer Science;

B,M/A: Business, Management and Accounting; DS: Decision Sciences; E: Energy; Ec: Economics; E,E/F: Economics, Econometrics and Finance; E/F: Econometrics and Finance; En: Engineering; ES: Environmental Science; HP: Health Professions; M: Mathematics; Me: Medicine; SS: Social Sciences.

IV. NETWORK ANALYSIS

4.1 Data Clustering: Topical Literature Classification

The ForceAtlas2 algorithm is applied to determine the optimal number of clusters in Gephi [29]. Four major research clusters were obtained based on the ForceAtlas2 algorithm from the 91-node co-citation network. Cluster 1 has 25 articles, cluster 2 has 13 articles, cluster 3 has 38 articles, and cluster 4 has 15 articles. The modularity index in Fig 3 is equal to 0.326, which indicates a close relationship between the nodes in each cluster. Fig 3 and Fig 4 shows the configurations with and without the title.

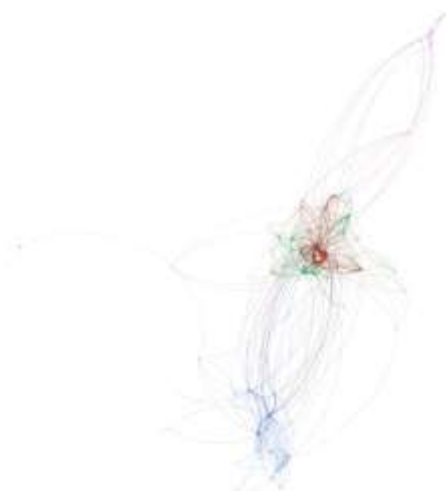


Fig 3: The layered configuration of the four clusters.

The lead articles (TABLE VI) [30] are identified by PageRank. Then, the themes of the four clusters (TABLE VII) are determined. The next section gives a detailed analysis of the four clusters.

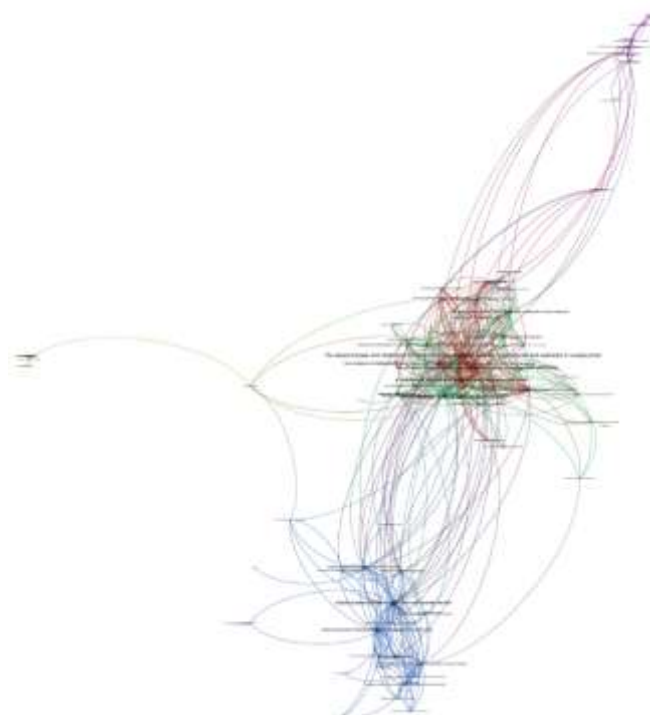


Fig 4: The layered configuration with titles between the nodes.

TABLE VI. The lead articles of each cluster

Cluster 1	Cluster 2
Benton and Maloni [5]	Ogbonna and Wilkinson [31]
Zhao et al. [1]	Liu et al. [32]
Ireland and Webb [19]	Cheng et al. [12]
Cox [18]	Sridharan and Simatupang [33]
Cox et al. [24]	Li et al. [34]
Ke et al. [2]	Hingley et al. [35]
Touboulic et al. [6]	Swinnen and Vandeplass [36]
Cox et al. [17]	Devin et al. [9]
He et al. [3]	Choksy [37]
Cai et al. [27]	Niu et al. [38]
Cluster 3	Cluster 4
Wang et al. [39]	Wang et al. [40]
Froud et al. [41]	Madau et al. [10]
Webster [42]	Cacchiarelli and Sorrentino [43]
Cool and Henderson [44]	Ghosh and Eriksson [45]

Yu et al. [46]	Sexton and Xia [47]
Lee and Gereffi [48]	Grabs and Ponte [49]
Haslam et al. [50]	Meckling and Hughes [51]
Williams and Moore [52]	Assefa et al. [53]
Wang et al. [54]	Kim et al. [55]
	Müller et al. [56]

TABLE VII. The 4 major research clusters determined by the co-citation analysis (N = 91)

Cluster	No. of Articles	Area of Research Focus
1	25	Power and supply chain relationships
2	13	Power and sustainable supply chain management
3	38	The channel power structure in supply chains
4	15	Power in the food supply chain and its practices

The .net file generated in BibExcel can be opened directly in Gephi. By processing and screening 91 nodes from 200 documents, 4 clusters are ultimately formed. To analyze the research focus of each cluster, the most important articles, that is, the larger nodes in the graph, were each selected. The paper title represented by the node was identified, and after returning to the Scopus database to find the article, it was read and analyzed. The experimental results created in Gephi are shown in Fig 3. TABLE VIII. shows the four clusters as determined by the co-citation analysis and their evolution.

TABLE VIII. The number of published papers in each cluster

Year	Cluster 1	Cluster 2	Cluster 3	Cluster 4
1995			1	
1998		1	1	
1999			1	
2000	1			
2001	2			
2002				
2004	2			
2005	1			
2006				
2007	1		1	
2008	1		1	
2009	1			
2010		1		
2011	1		2	1
2012		1	1	
2013	4	1	1	

2014	2		5	3
2015	2	3	2	1
2016	2		4	1
2017	4	5	8	3
2018	1	1	7	4
2019			3	2
Total	25	13	38	15

4.2 Cluster 1: Power and Supply Chain Relationships

Cluster 1 consists of 25 articles; the study of Cluster 1 began in 2000. In this cluster, power (regime) and relationship management is discussed, as well as how power promotes supply chain relations. Three relative subthemes are given as follows:

The first subtheme concerns power regime and relationship management in supply chains. Cox et al. [24] give four basic power regimes: buyer (supplier) dominance and in(inter)dependence. Integrated supply chain management may be possible when (1) buyers and suppliers are interdependent or (2) a buyer is the focal organization (which undertakes final assembly and closes with the end customer). Integrated supply chain management is difficult to operate effectively without these power regimes [18]. When power regimes are independent or supplier dominant, the buyers' appropriate choice is the supplier selection. Conversely, when power regimes are interdependent or buyer dominant, the buyers' appropriate choice is the sourcing supplier development [18]. Only by analyzing the power regimes that operate within supply chains can buyers make appropriate choices between alternatives [24].

Coercive (non-coercive) power affects suppliers' decisions to adopt and expand sustainability initiatives; however, non-mandatory power has a greater influence on suppliers and expands initiatives further within the supply network [57].

The second subtheme concerns the impact of power on supply chain relationships. The power sources were divided into two groups [58], specifically, coercive and non-coercive power (expert, referent, legitimate and reward power). Benton and Maloni [5] divided it into two groups: media power (mandatory, rewarding and compliance) and non-media power (professionalism, relevance and information provision).

Trust is negatively affected by mediated power, whereas trust is positively affected by non-mediated power [2]. No type of trust is affected by reward-mediated power. Contract trust supports the intention to actively adopt eSCM [3]. There is a positive correlation between power asymmetry and cooperative norms. Interfirm trust can be promoted by cooperative norms that interact [33]. Mediated power makes commitments in relationships difficult, while non-mediated power shows a greater relationship orientation and contribution to chain integration [59].

The third subtheme concerns the influence of detailed power practices on supply chain relationships.

Manufacturers' normative relationship commitment can be improved by reward power, referent power and expert power, while instrumental relationship commitment can be enhanced by reward power and coercive power [1]. Sanfiel-Fumero et al. [59] found that non-mediated power sources have a greater effect on supply chain integration.

The implementation of socially responsible management, which considers the unbalanced power relationship, can use geographical distance to moderate the effect on these power positions [60].

4.3 Cluster 2: Power and Sustainable Supply Chain Management (SSCM)

Cluster 2 consists of 13 articles; the study of Cluster 2 began in 1998. In this cluster, the power (structure) and sustainable initiative in the supply chain is discussed. Additionally, how to gain the advantages of sustainable development by flexibly using power in the global value chain and how power promotes the performance of SSCM are also discussed. Four relative subthemes are given as follows:

The first subtheme concerns the impact of the power structure on sustainability initiatives. The party with power obtains more economic benefits with a less sustainable investment [61]. Compared with an equal power structure (i.e., a vertical Nash power structure), an unequal power structure (i.e., manufacturer Stackelberg power structures and retailer Stackelberg power structures) has more significant effects on sustainability initiatives (such as reducing emissions) [61].

Sustainable investment is beneficial to both manufacturers and retailers, but they often use their greater power to obtain more economic benefits with less sustainable investment [61].

The second subtheme concerns the impact of power on SSCM. The performance of SSCM can be significantly affected by the power type [7-8].

Six articles in this subtheme focus on the following: In the UK food sector, Touboulic et al. [6] note that buyer dominance (supplier dominance) promotes (weakens) the adoption and implementation of SSCM. Meqdadi et al. [7,8] indicate that coercive (non-coercive) power and trust significantly influence whether suppliers expand the sustainability initiative. Because of the strong role of supermarkets in corporate social responsibility and food waste, supermarkets can push problems elsewhere [9]. Mediated power makes relationship commitments difficult; to the contrary, non-mediated power promotes relationship commitments and active traceability [59].

The third subtheme concerns the impact of power on global value chains. Some articles discuss financial success by variably using power in global value chains. The power position can be strengthened by the international expansion of downstream activities. (1) Apple's financial success can be achieved by variably using power in global value chains [50-51]. (2) The power position of emerging market suppliers

can be strengthened by the international expansion of downstream activities, which enables them to dispense with low value-added positions and play a power role in the global value chain [62]. Murphree and Anderson [14] show how dependent enterprises cope with the pressure induced by the global value chain. Large companies accept smaller and more diversified orders. Small companies realize extensive batch flexibility through information suppression and large-scale subcontracting, improve their ability to cope with uncertainties, and weaken the control influence of overseas buyers.

The fourth subtheme concerns the impact of power on the implementation of SSCM. SSCM can be improved with power through geographical distance, contractual clauses, the wholesale price (the transfer price), and an acquiescence strategy (an avoidance strategy).

Four articles in this subtheme have focuses as follows: Ulstrup et al. [60] consider that power positions can be moderating through the role of geographical distance. Müller et al. [56] show that contractual clauses could exert explicit pressure on their suppliers' companies to increase their corporate social responsibility (CSR) engagement. Moreover, the wholesale price (the transfer price) can be used to transfer remanufacturing (recycling) responsibilities between the original equipment manufacturer (OEM) and the retailer [12].

4.4 Cluster 3: The Channel Power Structure in Supply Chains

Cluster 3 consists of 38 articles; the study of Cluster 3 began in 1995. In this cluster, the impacts of the power structure are discussed, and the stability and performance of the power structure is analyzed. Three relative subthemes are given as follows:

The first subtheme concerns the impact of the power structure in a CLSC. A CLSC that is dominated by retailers is the most profitable [26]. Compared with OEMs, retailers determine the responsibility transfer factor, and the environmental and economic performance is higher [12]. With the relative position of retail channels becoming increasingly stronger, the order of modes ranked by the strength of their effect on the performance of the whole CLSC is as follows: collector dominated, manufacturer dominated and retailer dominated [63].

The second subtheme concerns the impact of the power structure on decisions in the supply chain. The best economic performance of the global supply chain can be realized when there is no dominance power structure [64]. The equilibrium pricing strategy depends on the competition level between supply chains [54]. The manufacturer should offer customer satisfaction assistance but not a customer satisfaction index bonus to the retailer [40]. The retailer's profit increases when dominant power is shifted from the manufacturer to the retailer [26].

The third subtheme concerns the optimal channel power structure. The structure with an equal distribution of power among agents provides the best stability and performance, except in a dual-channel supply chain, where the opposite is true. Symmetric channel power makes it easier for the market to plunge

into chaos [65]. An unequal power structure among supply chain members, whether dominated by manufacturers or retailers, is not a stable structure; an equal power structure provides the best stability and performance [66]. A CLSC that is dominated by retailers is the most profitable [26].

4.5 Cluster 4: Power in the Food Supply Chain and its Practices

Cluster 4 consists of 15 articles; the study of Cluster 4 began in 2011. In this cluster, the impact of power in the food supply chain (relationships) is discussed, as well as how power promotes food supply chain management. Three relative subthemes are given as follows:

The first subtheme concerns the market power in the food supply chain. Oligopsony power effects and intensifies the difference between downstream and upstream prices [10,13], as well as the abuse of market power caused many problems [47].

The second subtheme concerns the impact of power on food supply chain relationships. Compared with coercive power, non-coercive power can more easily improve the quality of supply chain relations [59]. Coordination and cooperation are negatively related to coercive power [67]; non-coercive power (coercive power) can promote (weaken) the supplier's relationship success [68]. The strong role of supermarkets in corporate social responsibility and food waste can push problems elsewhere in the supply chain [9].

The third subtheme discusses detailed power practices in the food supply chain. Belaya and Hanf [67] note that power can be graded, and then, the manager can select the appropriate type of power according to the coordination purpose to successfully manage the supply chain network. Industry self-discipline and corporate social responsibility statements have little effect on reducing food waste. Therefore, stronger government supervision and intervention is a necessary condition to embark on a more sustainable path (Devin et al. [9]).

V. DISCUSSION

This section analyses the different directions and content of SCP research within the four clusters. However, in each cluster, the research on SCP is still not complete, and there are many directions and content that have not been incorporated. In this section, in addition to summarizing the content of the above four clusters, some directions and subjects for future research on SCP are presented (TABLE IX).

TABLE IX. Directions for future research on SCP derived from the individual clusters

Clusters	Gap/Issue	Research Direction
Cluster 1	differences in economic development and cultural differences/ single and multiple perspectives/ limit the quality	verify the theory of power and supply chain relationships established in mature economies/ multiple perspectives/ social-network analysis

	and interpretability of the results/ power dynamics/ lack of detail regarding focuses on the dynamic view of power	/longitudinal study or qualitative study/ longitudinal research
Cluster 2	little theoretical basis/ few details on implementing sustainable initiatives/ a lack of detail regarding random demand/ simple structures of supply chains/ a lack of other business relationship characteristics	dynamic capabilities, agency theory, social network theory/ incorporate sustainable criteria into supplier selection, adoption of certification/ regarding random demand/ the complex structure of supply chains/ cooperation, conflicts, commitments, and cultural differences
Cluster 3	a lack of detail regarding random demand/ simple structures of supply chains/ a lack of investigation of uncertain demand	regarding random demand/ the complex structure of supply chains/ uncertain demand forms
Cluster 4	a lack of detail in any role information of power	explore any role information

5.1 Directions for Future Research on SCP Derived from the Individual Clusters

In Cluster 1, the power and supply chain relationship yielded rich results in developed countries. For example, the interaction between power and trust is helpful for value creation and simultaneously reduces transaction costs and opportunistic behavior [33,69]

Huo et al. [70] found that intermediary power has a negative effect on normative relationship commitments. However, due to the differences in economic development and cultural institutional differences, Zhao et al. [1] reached some conclusions for China regarding power and relationship commitments that differ from the conclusions of Brown et al. [71], and reward power has a positive effect on normative (instrumental) relationship commitments. Therefore, whether the theory of power and supply chain relationships established in mature economies is applicable to developing countries needs to be verified, which is also a direction worthy of research.

Second, few studies have investigated the dynamic view of power in supply relationships. What types of factors promote or weaken the changing of power-based behaviors? In the future, solid longitudinal research is also a worthy research direction [72].

Third, there is a lack of detail regarding focuses on the organizational drivers to enter into an interorganizational relationship, such as how the initial level of trust and power come into being [19]. Few studies have determined the roles of these relationship-related factors (such as the age of relationship) [3].

Therefore, in the future, this is also a direction worthy of research.

Finally, most studies represent only one less powerful side's perspective. Therefore, in the future, studies from other supply chain members' perspectives or global supply chain perspectives are also a key research direction [70].

In Cluster 2, companies with large power can obtain more resources to participate in the sustainable development agenda, but companies with smaller power have made important contributions in ensuring the achievement of sustainable development goals.

First, integrating other theories (resource dependence theory, organizational learning theory, etc.) into the SCP research is very meaningful. Understanding the stakeholder dependency relationships and exploring the degree of the power imbalance in relationships can lead to an exploration of the political mechanisms. This is also a key direction that is worthy of research [6].

Second, in the real world, the actual demands of supply chains are usually much more random and complex than they appear in theory. There is a lack of detail and study of sustainable investment performance under different power structures from the perspective of random demand. This is also a key direction worthy of research [61].

Third, the supply chain structure is usually more complex in the real world than in theory. Some authors [61] have begun to focus on the complex structure of multiple retailers and/or multiple manufacturers, and further research can explore these complex structures.

In Cluster 3, it is generally agreed that some power structures have better profitability under linear demand, but when the demand condition changes to non-linear, profitability decreases significantly.

In the real world, the actual demand of supply chains is usually much more random. There is a lack of detail regarding the study of product choice and pricing decisions from the perspective of stochastic demand. This is the first key future direction worthy of research [11,63,64,66].

Second, few studies have studied the SCP of complex supply chain network structures, in which multiple retailers obtain alternative products from multiple manufacturers for sale. Therefore, in the future, this is also a direction that is worthy of research [64].

Third, some articles discuss the power structure of CLSCs. There is a lack of detail regarding not only the difference between remanufactured and new brand products [63] but also the effects of information asymmetry [26]. Therefore, in the future, these are additional key research directions.

Finally, Edirisinghe et al. [66] provide an equilibrium analysis of imbalanced power structures where the demand forms are deterministic. The actual demand forms of customers are usually much more

uncertain. Thus, future research that addresses uncertain demand forms should be useful.

In Cluster 4, Madau et al. [10] estimated the presence of buyer power and found that buyer' power harmed the interests of milk producers and consumers. Some suggestions are proposed for policy makers and decision makers to support milk producers and reduce the negative impact of buyer power. However, there is a lack of role information about the entity that possesses this power. Therefore, in the future, this is the first key research direction.

Second, Belaya and Hanf [67] address managing the use of power from food processing companies' perspectives, and they graded the influence of different types of power on coordination and cooperation. The data in the analysis represent only one side's perspective. Therefore, in the future, collecting data from other supply chain member's perspectives is also a key research direction (Belaya and Hanf [67], Bandara et al. [68]).

Finally, existing traceability studies rarely consider factors such as the supply chain structure and relationship characteristics. Therefore, this is also a key research direction [59].

5.2 Future Research Directions based on General Categories

After reviewing the literature studied above, it can be observed that the research on SCP is inseparable from the establishment of a model and the understanding and integration of some theoretical methods. From the perspective of the countries and regions addressed in the literature, institutions and universities in China and developed countries are more concerned about SCP issues. In addition to the directions and content of the abovementioned four clusters, there are several suggestions for research directions.

5.2.1 Power and supply chain relationships with cultural differences

In the literature, some of the research on power and supply chain relationships are given in cluster 1. Due to the differences in economic development and cultural institutions, Zhao et al. [1] drew some conclusions for China regarding power and relationship commitments that differ from the conclusions of Brown et al. [71].

Therefore, one future direction for SCP researchers is to verify that the theory of power and relationship commitment established in mature economies is applicable to developing countries.

5.2.2 The study of power in complex supply chain models

In the literature, although authors briefly describe management and control when studying issues related to SCP, few studies perform a systematic study and summary of this aspect. The existing SCP research unit mainly focuses on the distribution sector and processing industry [13], food markets [47], food retailers [9], consumers [73], institutions, and government [74]. Systematic SCP research that

analyzes the supply chain as a whole is still scarce. In general, in the supply chain management research, multitier supply chains are a new research topic [75]; therefore, conducting systematic SCP research is needed and significant.

In the literature, there are a few studies on the coordination of mixed dual-channel supply chains that consider online to offline (O2O) [25]. Since the end of 2013, the promotion of information technology has enabled O2O to begin localization and integration with mobile devices, and O2O has entered an era of rapid development. Scholars could study the SCP of these complex models and may be able to provide experience and lessons for future SCM.

5.2.3 New theories

Although the traditional supply chain model has not disappeared and many theories and models handed down by earlier research still offer guidance, with development and changes in industry, many theories and models are no longer fully applicable to the current research and analysis. Scholars have been perfecting and improving some models and theories. In future studies, this should remain a research focus.

Scholars could study the SCP with new theories (such as longitudinal studies [46] and social-network analyses [55]), and may be able to provide experience and lessons for future SCM.

VI. CONCLUSION

Literature bibliometric and co-citation analyses were carried out on the selected 200 studies concerning SCP research. It offers a deep understanding of the current research status of SCP in the academic field, draws some conclusions and identifies some problems. By reading and summarizing these four clusters, some directions and content suggestions for further research and analyses on SCP are proposed.

This paper has contributed to the following aspects of the field. First, we systematically reviewed the literature on SCP before 2020, after screening for the relevant studies. Second, through quantitative analysis and network analysis, the identified documents were processed and analyzed with the BibExcel and Gephi software, and ultimately, four clusters were identified. The four clusters were selectively read and summarized, and relevant conclusions were drawn. Finally, based on the summarized content, some suggestions on the direction and content of future research on SCP were provided.

Although this study offers the above contributions, there are also deficiencies in this research. First, in the selection of the literature, a relevant analysis of all the literature on SCP was not conducted; therefore, there are limits to its comprehensiveness. Second, in the screening of the literature, the purpose of the bibliometric analysis was to conduct an objective comparative analysis of the field of SCP, but there was great subjectivity in the screening of the literature, although some approaches have been adopted to reduce the excessive screening of the literature; regardless, this problem still cannot be avoided. Finally, in the method, the literature and co-citation analysis are used only to conduct experiments on the literature.

Although the literature can be summarized to a certain extent, further experiments can be carried out to increase the reliability of the research, such as a content analysis of the literature.

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