

MAPPING THE GOVERNANCE GAP IN SUSTAINABLE VALUE CHAINS: A BIBLIOMETRIC ANALYSIS

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Abstract

Governance and inter-organizational coordination are essential for translating sustainability objectives into aligned action across value chains, yet the relevant literature is dispersed across concepts such as coordination, collaboration, contracts, responsibility, information sharing, policy, and technological traceability. This study maps the governance gap in sustainable value chains through a sequential design combining qualitative research-gap identification with bibliometric science mapping. In the first stage, Data Sweep was used to examine the Limitations and Future Research sections of five relevant studies and to identify three recurrent gaps: governance and inter-organizational coordination; empirical validation and contextual diversity; and digitalization, data, and decision support. With the support of this Data Sweep analysis, governance and inter-organizational coordination was identified as the focal gap for further investigation. In the second stage, a Web of Science Core Collection search produced a corpus of 331 publications retrieved on 18 August 2026. The search window was 1975–2026, while the publications in the corpus span 2002–2026. Keyword co-occurrence analysis was conducted in VOSviewer 1.6.21 using all keywords, full counting, and a minimum threshold of five occurrences. Of 1,456 identified keywords, 131 met the threshold and formed seven clusters, with 3,235 links and total link strength of 6,979. The results reveal a pronounced coordination–governance asymmetry: coordination is the dominant network hub (125 occurrences; 124 links; TLS = 822), whereas governance is comparatively peripheral (13 occurrences; 21 links; TLS = 38). Governance-related mechanisms are distributed across all seven thematic clusters rather than concentrated around the explicit governance concept. Temporal analysis further shows that the most recent research frontier is associated with technological and circularity-related mechanisms, including blockchain, traceability, closed-loop supply chains, reverse logistics, and remanufacturing. The findings refine the governance gap as a problem of conceptual fragmentation rather than an absence of governance-relevant research and suggest the need for a more integrated sustainable value-chain governance framework.

Keywords: sustainable value chains; governance; inter-organizational coordination; circular economy; traceability

JEL Classification

Q01 – Sustainable Development

Q56 - Environment and Development; Environment and Trade; Sustainability; Environmental Accounts and Accounting; Environmental Equity; Population Growth

M11 – Production Management

1. Introduction

Sustainability challenges increasingly cross organizational boundaries. Environmental impacts, resource use, emissions, circularity, product design, waste generation, and responsible consumption are shaped by interconnected decisions made by producers, manufacturers, suppliers, retailers, consumers, public institutions, and other actors operating along value and supply chains. Sustainable performance therefore depends not only on firm-level practices, but also on the mechanisms through which actors coordinate decisions, allocate responsibilities, exchange information, resolve tensions, and align incentives.

Research on sustainable supply chains has consequently moved from an isolated firm perspective toward inter-organizational approaches. Ülgen et al. (2019) describe research on inter-organizational supply-chain interaction for sustainability as fast-growing but fragmented and emphasize that the sustainability of firms depends on the behaviour and interaction of other actors in the chain. Saeed and Kersten (2019) similarly show that sustainability drivers extend beyond organizational boundaries and include external stakeholders, particularly consumers. Medina-Serrano et al. (2020) place collaboration at the centre of sustainable supply-chain design, while

Appiah (2019) highlights the joint relevance of collaboration and power for sustainability performance.

In this study, governance is used as an umbrella concept for the rules, mechanisms, and relationships through which actors coordinate decisions, distribute responsibility, manage power and dependency, exchange information, build trust, monitor performance, and address conflicts. Coordination and collaboration are therefore treated as important manifestations of governance rather than as perfect synonyms. This distinction is important because a literature can be extensive in contracts, pricing, coordination, cooperation, policy, or information sharing while still lacking an integrated governance framework.

The purpose of this article is to identify how governance is positioned within the conceptual structure of sustainable value-chain research and to determine whether governance-related knowledge is consolidated or dispersed across specialized mechanisms. The study follows a sequential logic: Data Sweep is first used to support the identification of the research gap from limitations and future-research recommendations reported in prior studies; a Web of Science corpus is then constructed; and VOSviewer is used to map conceptual centrality, thematic clusters, and temporal evolution. This design allows the initial qualitative gap to be assessed and refined quantitatively rather than inferred retrospectively from a bibliometric map.

1.1. Research-gap identification through Data Sweep

Data Sweep was used as a structured preliminary approach to identify recurrent research gaps in the literature relevant to sustainable value chains. Rather than defining governance as a priori as the focal research problem, the approach was used to examine how previous studies themselves described the limitations of existing knowledge and the directions requiring further investigation.

Five studies addressing sustainability, collaboration, inter-organizational relationships, and supply-chain management were selected for this preliminary stage: Giuffrida and Mangiaracina (2020), Medina-Serrano et al. (2020), Ülgen et al. (2019), Appiah (2019), and Saeed and Kersten (2019). Particular attention was given to the Limitations and Future Research sections, because these sections explicitly identify unresolved theoretical, methodological, and empirical issues acknowledged by the authors.

The identified research needs were extracted from each study and subsequently compared across the five papers. Similar or conceptually related limitations and future research directions were grouped into broader categories. The purpose of this step was to distinguish isolated recommendations from issues recurring across several studies.

This comparative screening resulted in three overarching research gaps: (1) governance and inter-organizational coordination; (2) empirical validation and contextual diversity; and (3) digitalization, data, and decision-support mechanisms.

The first category emerged from recurring calls for a better understanding of collaboration, cooperation, decision-making, power relationships, trust, stakeholder interaction, and coordination across organizational boundaries. Although the terminology differed among the selected studies, these issues share a common concern: how relationships and decisions among multiple supply-chain actors are organized and coordinated in pursuit of sustainability objectives.

Table 1. Data Sweep synthesis used to identify and group recurrent research needs.

Study	Research needs identified with Data Sweep	Higher-order grouping	Relevance to gap selection
Giuffrida & Mangiaracina (2020)	Further research on cooperation and decision-making mechanisms; broader global/circular settings; stronger empirical development.	Governance & coordination; empirical/contextual diversity	Supports investigation of coordination mechanisms and their applicability across contexts.
Medina-Serrano et al. (2020)	Need to deepen collaborative and sustainable supply-chain	Governance & coordination;	Highlights inter-organizational collaboration

	practices and their implementation.	empirical validation	as a mechanism for sustainability.
Ülgen et al. (2019)	Fragmented inter-organizational sustainability knowledge; need for research on power, trust, interaction, and broader actor configurations.	Governance & coordination; contextual/actor diversity	Provides direct support for an integrative governance perspective beyond isolated relationships.
Appiah (2019)	Further investigation of collaboration, power, and sustainability outcomes in supply-chain relationships.	Governance & coordination; empirical validation	Links partner collaboration and power to the governance of sustainability.
Saeed & Kersten (2019)	Need to examine sustainability drivers across stakeholders and organizational boundaries and to extend empirical/contextual coverage.	Governance & coordination; empirical/contextual diversity	Supports a multi-actor perspective on sustainable supply-chain governance.

Author's elaboration based on the Data Sweep analysis.

The comparison did not retain every recommendation as a separate gap. Instead, conceptually related recommendations were aggregated into three higher-order categories. Governance and inter-organizational coordination captured recurring concerns related to collaboration, cooperation, power, trust, decision-making, stakeholder interaction, responsibility, and coordination. Empirical validation and contextual diversity captured calls for broader geographical, sectoral, organizational, and methodological validation. Digitalization, data, and decision support captured the emerging need to understand the role of information, technology, analytical tools, and digitally enabled coordination.

Governance and inter-organizational coordination was selected from the three categories because it was recurrent across the reviewed studies, directly concerned interactions among value-chain actors, was conceptually aligned with the sustainable value-chain research problem, and could be operationalized through bibliometric network indicators. The selection was therefore based on recurrence, conceptual relevance, alignment with the multi-actor value-chain perspective, and methodological feasibility rather than solely on the author's thematic preference.

On this basis, governance and inter-organizational coordination were identified as the focal research gap for the present study. Governance was considered an appropriate integrative concept because it encompasses not only coordination and collaboration, but also the mechanisms through which responsibilities, decision rights, power, information, incentives, and accountability are distributed among value-chain actors.

The gap was consequently formulated as follows: it remains insufficiently understood how governance and coordination are structured and have evolved in the scientific literature on sustainable value chains, particularly in research involving producers, retailers, and consumers.

Data Sweep therefore served as the gap-identification stage of the research, while the subsequent bibliometric analysis was designed as the gap-investigation stage. The Web of Science and VOSviewer analyses do not retrospectively generate the governance gap; instead, they examine whether and how the gap identified in the preliminary stage is reflected in the broader conceptual structure and evolution of scientific literature.

1.2. Research question, objectives and hypotheses

Research question: How has the scientific literature on governance and coordination in sustainable value chains evolved, and how is it conceptually structured over the 1975–2026 search period?

O1. To evaluate the position and centrality of governance and coordination through keyword co-occurrence, occurrences, links, and total link strength (TLS).

O2. To examine whether governance-related mechanisms are concentrated around the explicit governance concept or distributed across multiple thematic clusters.

O3. To analyse the temporal evolution of governance-related concepts and identify mature, transitional, and emerging research themes through average publication year (APY) and overlay visualization.

H1. Governance and coordination occupy central positions in the conceptual structure of the literature on sustainable value chains.

H2. Governance-related mechanisms are distributed across multiple thematic clusters rather than being concentrated around the explicit concept of governance.

H3. Recent research increasingly emphasizes technological and circularity-related mechanisms associated with sustainable value-chain governance.

2. Conceptual Background

2.1. Sustainable value chains and inter-organizational interaction

Sustainable supply chain management has been conceptualized as the integration of environmental, social, and economic objectives into the systemic coordination of inter-organizational processes (Carter & Rogers, 2008; Seuring & Müller, 2008). This perspective shifts the analytical focus beyond individual firms toward the relationships and mechanisms through which sustainability requirements are transmitted and managed across supply chains. Sustainable value-chain research addresses environmental, social, and economic outcomes that are produced through interconnected activities rather than within a single organizational boundary. This interdependence makes relationships among actors central to sustainability implementation. This inter-organizational perspective becomes particularly important in multi-tier supply chains, where sustainability challenges extend beyond direct buyer–supplier relationships and require consideration of actors positioned across multiple levels of the chain (Tachizawa & Wong, 2014). Ülgen et al. (2019) show that inter-organizational interaction for sustainability encompasses strategic collaboration and partnership as well as more operational forms of cooperation and coordination. Their review also identifies fragmentation across sustainability dimensions, actor categories, and empirical scopes.

Giuffrida and Mangiaracina (2020) emphasize the need to deepen knowledge of cooperation and decision-making mechanisms suitable for global and circular supply chains. Medina-Serrano et al. (2020) similarly argue for collaborative supply-chain management systems capable of reconfiguring internal and external competences. These contributions suggest that sustainable outcomes depend on relational and decision mechanisms, but the terminology used to describe those mechanisms is heterogeneous. This relational perspective is further supported by Ni and Sun (2020), who examine collaborative mechanisms for sustainability-oriented supply-chain initiatives and emphasize the role of collaboration in implementing sustainability across organizational boundaries.

2.2. Governance as an integrative concept

Governance provides a broader perspective for understanding how sustainability responsibilities are organized across supply chains. Boström et al. (2015) frame sustainable and responsible supply-chain governance as a multi-actor challenge involving the organization of responsibilities and relationships across complex supply-chain structures. For the purposes of this study, governance extends beyond coordination. Coordination concerns the alignment of activities, decisions, incentives, and flows, whereas governance additionally concerns the architecture within which such coordination takes place: rule-setting, decision rights, accountability, power, responsibility, transparency, monitoring, and conflict resolution. This broader interpretation is especially relevant to sustainable value chains, where actors may have different objectives, resources, information, and levels of influence. Governance can also be operationalized through

different mechanisms and sustainability approaches. Formentini and Taticchi (2016) show that governance mechanisms play an important role in the implementation of sustainability across supply chains, reinforcing the need to examine governance not as a single practice but as an architecture connecting multiple organizational mechanisms.

More recently, Nguyen and Zuidwijk (2025) have consolidated this perspective through a literature review specifically focused on sustainable supply chain governance, further demonstrating the relevance of governance as a distinct analytical domain within sustainable supply-chain research. The analytical expectation is therefore not that every governance-related study explicitly uses the keyword governance. Instead, governance may be expressed through concepts such as contracts, channel coordination, policies, power structures, responsibility, information sharing, cooperation, traceability, or transparency. If these mechanisms are dispersed across different clusters while the explicit governance term remains peripheral, the bibliometric evidence would indicate conceptual fragmentation rather than a complete absence of governance-related research.

3. Materials and Methods

3.1. Sequential research design

The study follows four sequential stages: identification of the research gap with the support of Data Sweep → Web of Science → VOSviewer → interpretation of the governance gap. In Stage 1, Data Sweep supports the identification of the research problem by comparing recurring limitations and future-research recommendations reported in selected studies. Stage 2 constructs the bibliographic corpus. Stage 3 maps the conceptual structure and temporal characteristics of the literature. Stage 4 compares the bibliometric evidence with the initially identified gap and evaluates the three hypotheses.

3.2. Data Sweep gap-identification procedure

The sequential design is intended to avoid circular reasoning: Data Sweep provides an independent, qualitative rationale for selecting governance as the focal concept before the bibliometric network is constructed or interpreted, so that the subsequent WoS/VOSviewer stage can support, qualify, or challenge — rather than simply confirm — the initial gap.

Procedure. Data Sweep was operationalized as a structured qualitative screening protocol applied by the author in five steps. First, candidate studies were identified through a targeted search combining “sustainable supply chain,” “sustainable value chain,” “collaboration,” and “inter-organizational” in title/abstract fields, restricted to peer-reviewed literature reviews or empirical studies published 2019–2020 with an explicit Limitations and Future Research section. Second, five studies meeting these criteria and offering the clearest coverage of inter-organizational sustainability relationships were retained: Giuffrida and Mangiaracina (2020), Medina-Serrano et al. (2020), Ülgen et al. (2019), Appiah (2019), and Saeed and Kersten (2019). Third, the Limitations and Future Research section of each study was read in full and every explicitly stated unresolved issue or future-research recommendation was extracted verbatim into a working table. Fourth, extracted statements were compared across studies and grouped into higher-order categories on the basis of shared conceptual content (e.g., calls for research on collaboration, power, trust, and coordination were grouped together regardless of the specific term used). Fifth, only categories recurring across at least three of the five studies were retained as candidate gaps; single-study recommendations were noted but not carried forward. This process yielded the three higher-order categories reported in Table 1.

Scope and reliability. The five-study base is intentionally a seed sample rather than a systematic review: its purpose is to surface a plausible, literature-grounded candidate gap for bibliometric investigation, not to establish gap prevalence across the field. The grouping in step four was performed by a single coder (the author); no second coder or inter-rater check was used,

which is a limitation addressed in Section 6. Because the sample is small and single-coded, the resulting gap functions in this study as a hypothesis-generating input, and its validity rests on whether it is corroborated by the independent, larger-scale bibliometric evidence in Stages 2–4 — not on the representativeness of the five-study screening itself.

Note on operationalization. Section 2.2 argues that governance is conceptually broader than the single keyword “governance” and may be expressed through contracts, policies, power, information sharing, or traceability. This means the headline network statistics for “governance” (13 occurrences, 21 links, TLS = 38) may underrepresent governance-relevant content — the keyword-level analysis can only detect the explicit label, not its distributed proxies. This is treated as a finding in its own right (Section 4.2’s fragmentation interpretation) rather than a flaw, but it means H1 should be read narrowly, as a statement about the centrality of the explicit governance keyword, not about the presence of governance-relevant content overall.

3.3. Web of Science search strategy and corpus

The bibliographic dataset was retrieved from the Web of Science Core Collection on 18 August 2026. The search window was 1975–2026. Although the search allowed publications from 1975 onward, the observed publication years in the final corpus span 2002–2026. The final export contains 331 records.

The final Topic search was:

("value chain*" OR "supply chain*") AND (sustainab* OR circular*) AND (governance OR collaborat* OR coordinat* OR cooperation* OR partnership*) AND (retail* OR store*) AND (consumer* OR customer*) AND (producer* OR supplier* OR manufacturer*)

The corpus consists of 295 Articles, 15 Articles/Early Access, 14 Proceedings Papers, and 7 Reviews. The language distribution is strongly dominated by English (327 records), with two Russian-language records, one German-language record, and one Chinese-language record. The export includes bibliographic metadata required for science mapping, including titles, abstracts, author keywords, Keywords Plus, source information, affiliations, cited references, citation counts, document types, and Web of Science categories.

The use of the simultaneous producer/supplier/manufacturer, retailer/store, and consumer/customer blocks means that the corpus is intentionally focused on literature in which all three actor categories are represented at the Topic-search level. The present article therefore does not attempt a separate dyadic-versus-triadic comparison; its focus is the conceptual structure of governance-related research within this deliberately multi-actor corpus.

3.4. VOSviewer analysis

The bibliometric network was created in VOSviewer version 1.6.21 (van Eck & Waltman, 2010). A co-occurrence analysis was performed using All keywords and Full counting. The minimum number of occurrences of a keyword was set to five. VOSviewer identified 1,456 keywords, of which 131 met the threshold and were included in the final map. The resulting network contains seven clusters, 3,235 links, and total link strength of 6,979.

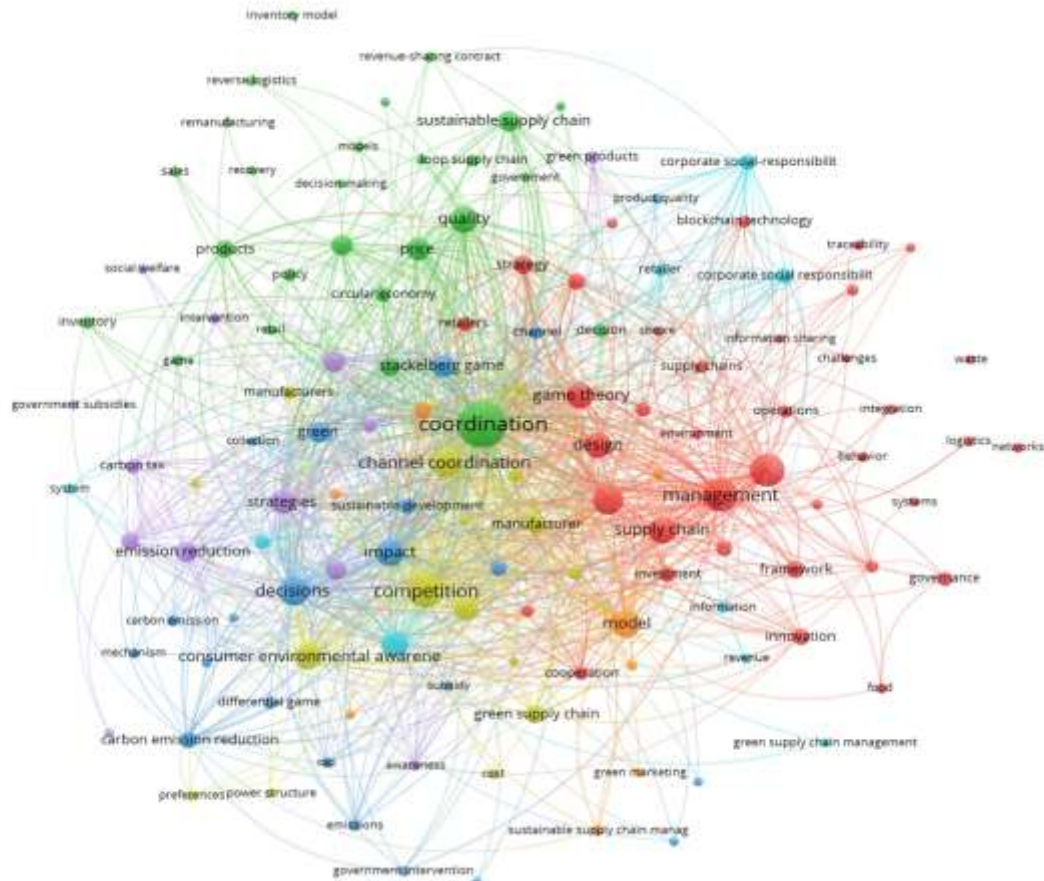
Occurrences indicate the number of documents in which a keyword appears. Links represent the number of distinct connections between an item and other items, while total link strength measures the cumulative strength of those connections. Cluster membership identifies algorithmically detected communities of closely related terms. Average publication year (APY) is used to examine temporal positioning. Network Visualization is used to assess conceptual structure, Overlay Visualization to identify temporal change, and Density Visualization to assess areas of concentration. These measures describe patterns in scientific discourse and should not be interpreted as evidence of causal relationships or effective governance in real-world value chains.

4. Results

4.1. Central structure of the keyword network

The network is strongly organized around coordination and related operational and strategic mechanisms. Coordination is the dominant item, with 125 occurrences, 124 links, and TLS = 822. Other highly connected terms include competition, management, decisions, sustainability, channel coordination, performance, consumer environmental awareness, and supply chain. Governance, by contrast, records only 13 occurrences, 21 links, and TLS = 38.

Figure 1. Keyword co-occurrence network of sustainable value-chain governance research.



Source: Author's analysis based on Web of Science data using VOSviewer 1.6.21.

Table 2. Central network concepts and the position of governance

Concept	Occurrences	Links	TLS	Cluster	APY
coordination	125	124	822	2	2021.8
competition	62	115	475	4	2021.52
management	65	109	451	1	2021.17
decisions	49	104	397	3	2021.98
sustainability	65	104	359	1	2021.32
channel coordination	47	97	351	4	2021.0
performance	49	111	339	1	2021.53
consumer environmental awareness	39	86	313	4	2021.87
supply chain	42	88	214	1	2021.6
governance	13	21	38	1	2020.38

Author's analysis based on Web of Science Core Collection data using VOSviewer.

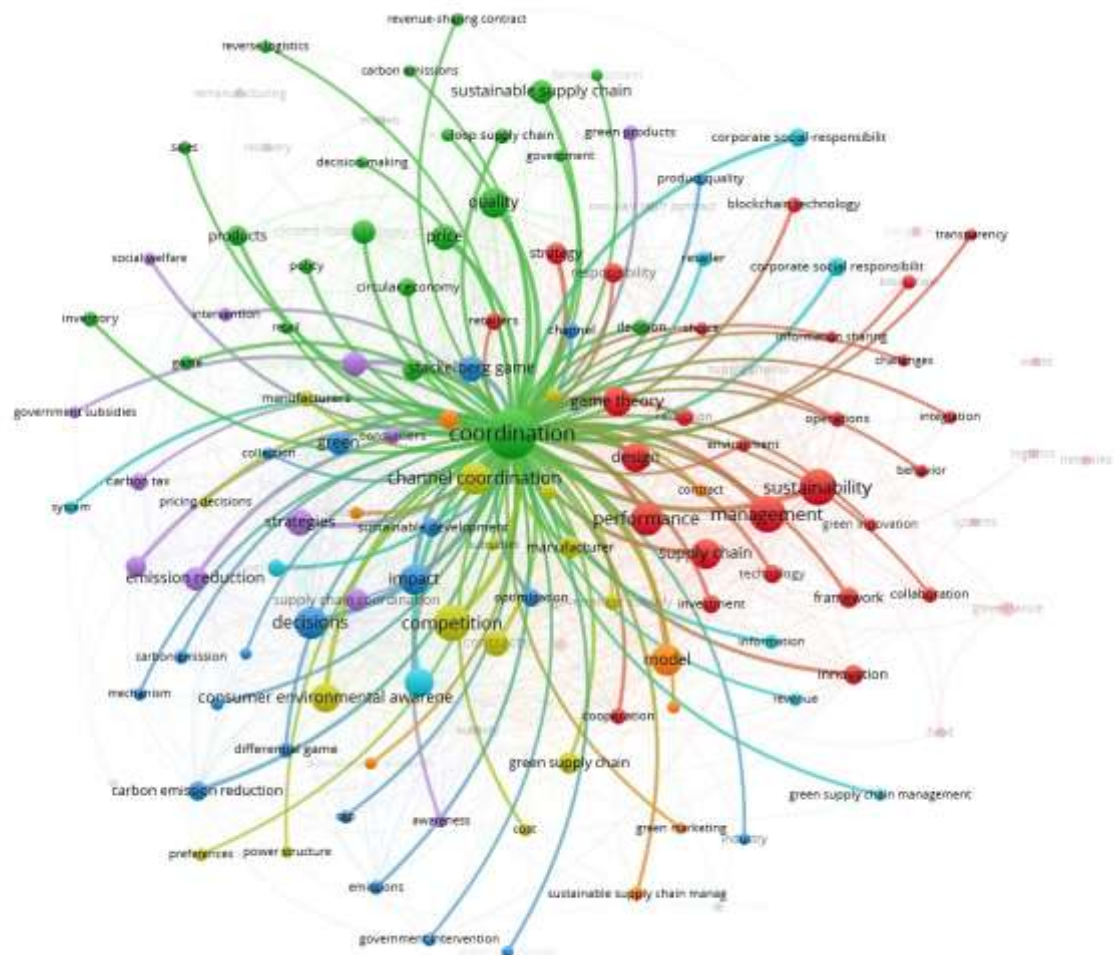
4.2. The coordination–governance asymmetry

The strongest result is the contrast between coordination and explicit governance. Coordination is approximately 9.6 times more frequent than governance (125 versus 13 occurrences) and its total link strength is approximately 21.6 times higher (822 versus 38). Coordination is also connected to 124 other items, compared with only 21 links for governance.

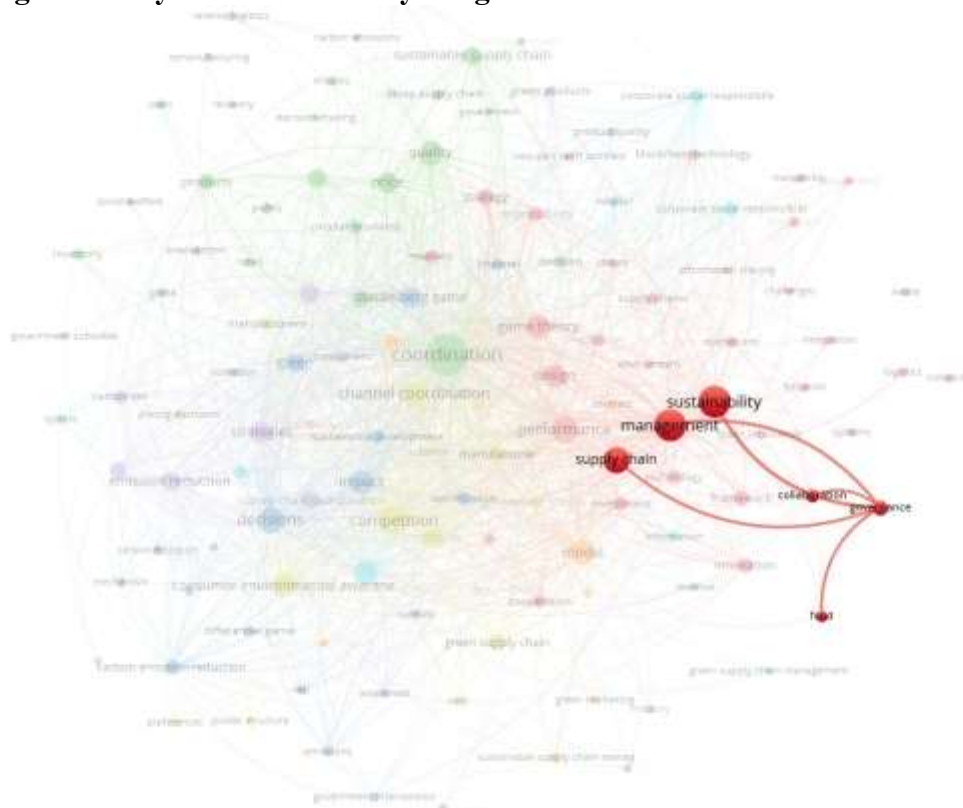
This pattern indicates that the literature contains a dense body of knowledge on how value-chain actors coordinate prices, contracts, competition, channel decisions, supply-chain decisions, environmental actions, and operational flows, yet these mechanisms are much less frequently consolidated under the explicit label of governance. The governance gap should therefore not be interpreted as an absence of relational research. A more precise interpretation is that coordination mechanisms are substantially more developed and connected than explicit integrative governance conceptualization.

H1 is therefore partially supported. Coordination clearly occupies a central position, but governance does not exhibit comparable centrality. Treating governance and coordination as interchangeable would conceal this asymmetry, which is one of the main empirical findings of the study.

Figure 2. Keyword connectivity of “coordination” within the co-occurrence network.



Source: Author's analysis based on Web of Science data using VOSviewer 1.6.21.

Figure 3. Keyword connectivity of “governance” within the co-occurrence network.

Source: Author's analysis based on Web of Science data using VOSviewer 1.6.21.

4.3. Thematic cluster structure

Cluster 1 is the largest cluster, with 37 items. Its core is formed by management (65 occurrences; TLS = 451), sustainability (65; 359), performance (49; 339), game theory (38; 290), design (39; 257), and supply chain (42; 214). Governance belongs to this cluster but is much less connected (13 occurrences; TLS = 38). The cluster also includes cooperation, collaboration, information sharing, responsibility, transparency, integration, innovation, and technology. It therefore represents a broad managerial and sustainability domain in which governance is present but not dominant.

Cluster 2 contains 26 items and is organized around coordination (125 occurrences; TLS = 822). Other important concepts include quality (41; 265), price (30; 206), demand (21; 171), sustainable supply chain (24; 160), and closed-loop supply chain (24; 148). The cluster combines mature coordination mechanisms with newer circular-economy concepts such as recycling, reverse logistics, remanufacturing, and closed-loop systems.

Cluster 3 contains 22 items and is dominated by decisions (49 occurrences; TLS = 397), impact (41; 312), Stackelberg game (30; 197), green (24; 186), carbon emission reduction (17; 123), and optimization (15; 107). It represents the analytical and decision-oriented stream of the literature, including policy intervention, subsidies, contract coordination, and environmental performance.

Cluster 4 contains 16 items and is particularly relevant to governance mechanisms. Competition (62 occurrences; TLS = 475), channel coordination (47; 351), consumer environmental awareness (39; 313), contracts (31; 257), and manufacturer (23; 189) form its core. Power structure, pricing decisions, fairness concerns, government subsidy, and green supply chain

also appear. This cluster captures channel governance through market, contractual, and actor-specific mechanisms without relying on the explicit governance label.

Cluster 5 contains 13 items and links supply-chain strategy to environmental policy and consumer response. Strategies (34 occurrences; TLS = 249), supply chain management (27; 183), emission reduction (26; 180), supply chain coordination (23; 135), and cap-and-trade (18; 125) are central. Consumers, green products, carbon tax, government subsidies, and social welfare connect coordination to public policy and downstream market behaviour.

Cluster 6 contains nine items and combines policies (39 occurrences; TLS = 298), corporate social responsibility, dual-channel structures, retailer, information, revenue, and system. This cluster is especially relevant to the retail dimension of governance. It also exposes a vocabulary issue: corporate social responsibility and corporate social-responsibility appear as separate items, illustrating how lexical variation can fragment bibliometric maps.

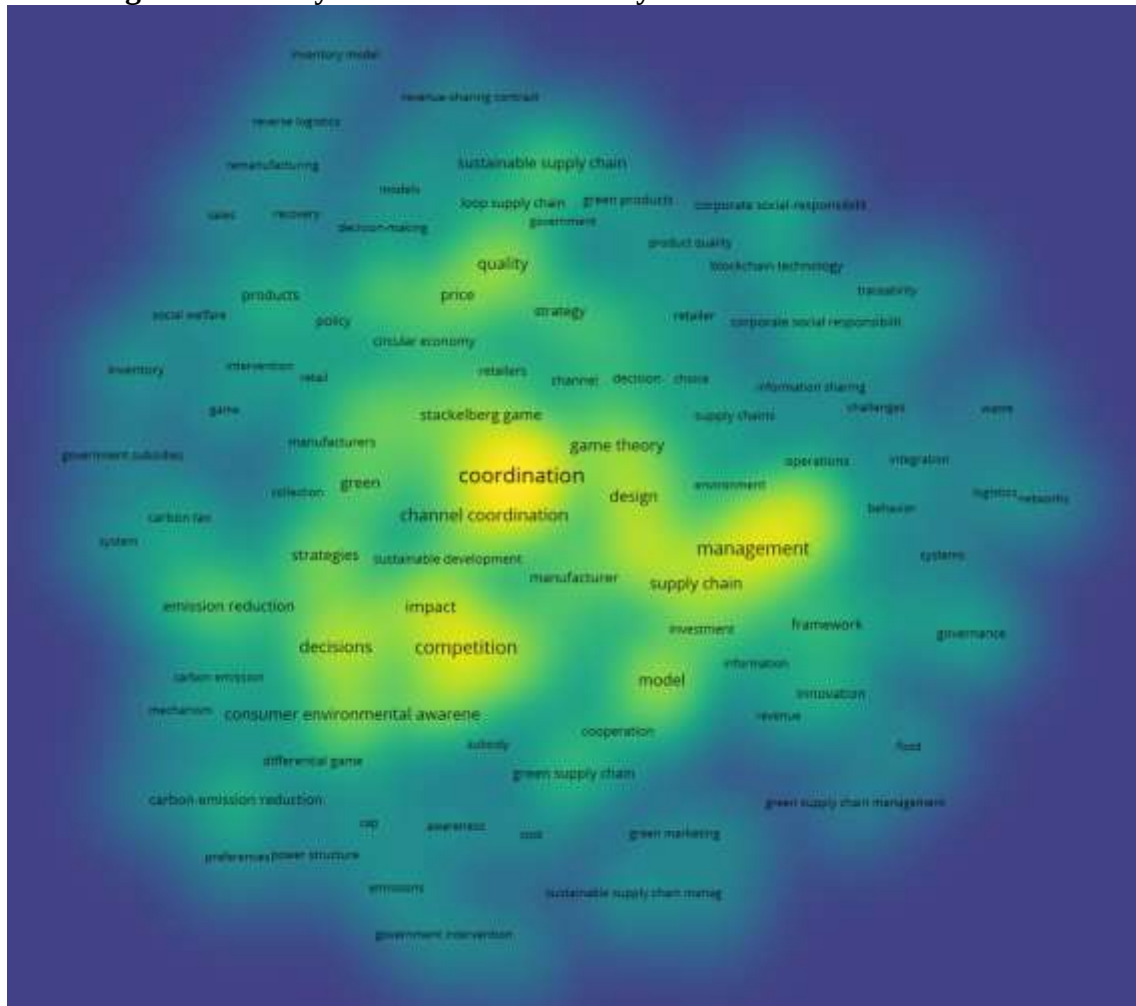
Cluster 7 is the smallest, with eight items, and is dominated by model (45 occurrences; TLS = 333) and pricing (16; 149). Sustainable supply chain management, green product design, contract, uncertainty, green marketing, and substitutable products complete the cluster. It represents economic and analytical modelling of sustainability-oriented supply-chain decisions.

Taken together, the seven clusters support H2. Governance-related mechanisms are not concentrated around the explicit governance concept. Instead, they are distributed across management and responsibility (Cluster 1), coordination and circular operations (Cluster 2), contract and policy mechanisms (Cluster 3), competition and channel contracts (Cluster 4), low-carbon policy and supply-chain coordination (Cluster 5), retail policy and information structures (Cluster 6), and pricing/contract models (Cluster 7). H2 is therefore supported by the thematic structure of the network.

Table 3. The seven thematic clusters. Cluster labels are interpretive labels assigned by the author based on dominant terms.

Cluster	Items	Leading terms	Interpretive label
1	37	management; sustainability; performance; game theory; design; supply chain; governance	Sustainability Management, Governance and Performance
2	26	coordination; quality; price; demand; sustainable supply chain; closed-loop supply chain	Supply Chain Coordination and Circular Operations
3	22	decisions; impact; Stackelberg game; green; carbon emission reduction; optimization	Decision-Making, Optimization and Environmental Impact
4	16	competition; channel coordination; consumer environmental awareness; contracts; manufacturer	Channel Coordination, Competition and Consumer–Manufacturer Relations
5	13	strategies; supply chain management; emission reduction; supply chain coordination; cap-and-trade	Low-Carbon Strategies and Supply Chain Coordination
6	9	policies; CSR; dual-channel; retailer; information	Retail Policy, CSR and Information Governance
7	8	model; pricing; sustainable supply chain management; green product design; contract	Pricing and Sustainable Supply Chain Models

Author's analysis and interpretation based on Web of Science Core Collection data using VOSviewer.

Figure 4. Density visualization of the keyword co-occurrence network.

Source: Author's analysis based on Web of Science data using VOSviewer 1.6.21.

4.4. Temporal structure: mature and emerging concepts

Overlay Visualization and APY values reveal substantial temporal heterogeneity. Governance has APY = 2020.38 and therefore belongs to the older part of the analysed conceptual structure. Coordination has APY = 2021.80, management 2021.17, sustainability 2021.32, and supply chain 2021.60. The newest terms are concentrated primarily in technological and circularity-related themes.

Table 4. Selected recent/emerging concepts based on APY.

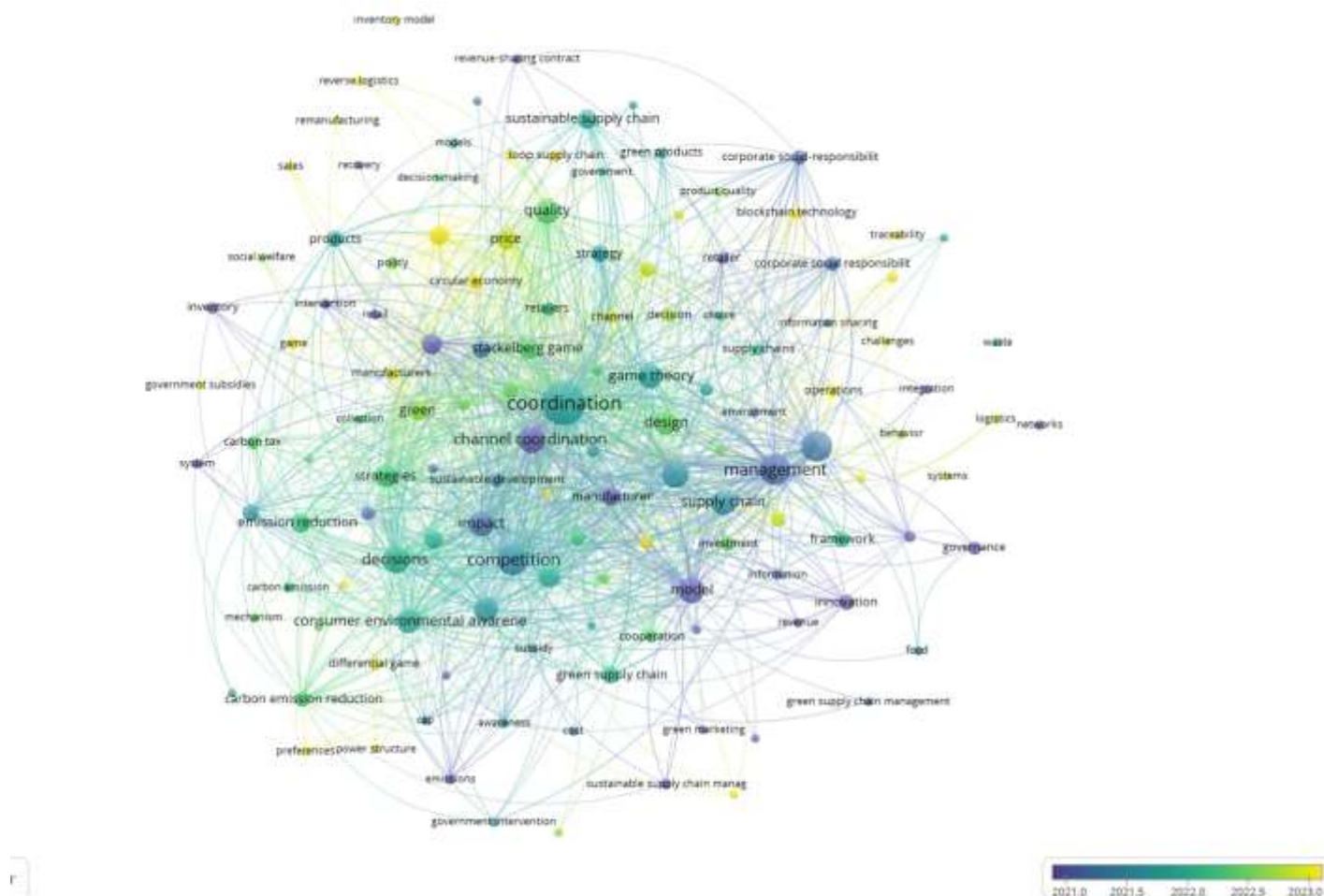
Concept	Occurrences	TLS	APY
circular economy	14	64	2023.14
green innovation	6	36	2023.67
recycling	7	55	2023.71
reverse logistics	7	45	2024.0
closed-loop supply chain	24	148	2024.08
traceability	6	32	2024.17
inventory model	5	15	2024.6
blockchain	8	43	2024.63
blockchain technology	9	46	2024.89
remanufacturing	5	25	2025.4

Author's analysis based on Web of Science Core Collection data using VOSviewer.

The temporal pattern suggests that the recent frontier is not governance as a newly emerging label. Instead, recent research increasingly focuses on mechanisms that can enable or reshape governance: blockchain, traceability, circular economy, closed-loop supply chains, reverse logistics, recycling, and remanufacturing. These concepts can support transparency, information integrity, circular flows, accountability, and coordination across organizational boundaries.

H3 is therefore supported. Recent research increasingly emphasizes technological and circularity-related mechanisms associated with sustainable value-chain governance. This result is more precise than claiming that governance itself is new: the explicit governance term is relatively older and weakly connected, whereas governance-enabling infrastructures and circular mechanisms constitute the emerging research frontier.

Figure 5. Overlay visualization of keyword co-occurrence by average publication year (APY).



Source: Author's analysis based on Web of Science data using VOSviewer 1.6.21.

4.5. Hypothesis assessment

Table 5. Assessment of the three hypotheses.

Hypothesis	Evidence	Status	Interpretation
H1	Coordination: 125 occurrences, 124 links, TLS 822; governance: 13 occurrences, 21 links, TLS 38.	Partially supported	Coordination is central; explicit governance is peripheral by comparison.
H2	Governance-related mechanisms occur across all seven clusters: coordination, contracts, policies, responsibility, information, pricing, power, and circular mechanisms.	Supported	Governance knowledge is thematically dispersed rather than consolidated around the governance keyword.

H3	Recent APY values are concentrated in blockchain, traceability, closed-loop supply chains, reverse logistics, circular economy, and remanufacturing.	Supported	The emerging frontier concerns technological and circular governance-enabling mechanisms.
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Author's assessment based on bibliometric analysis.

5. Discussion

The relationship between the Data Sweep findings and the bibliometric results is central to the contribution of this study. Data Sweep initially identified governance and inter-organizational coordination as a recurrent unresolved issue. The bibliometric analysis, however, shows that coordination itself is not underdeveloped: it is the strongest concept in the network. What remains comparatively weak is the explicit consolidation of governance, while governance-related mechanisms are dispersed across coordination, contracts, competition, policies, responsibility, information sharing, and emerging technological and circular mechanisms. Accordingly, the initial gap is refined as a governance-consolidation or conceptual-fragmentation gap rather than a general lack of coordination research.

The central contribution of this study is the identification of a structural mismatch between the prominence of coordination and the comparatively limited explicit use of governance. This finding refines the gap identified through the Data Sweep. Sustainable value-chain research is not devoid of governance-relevant mechanisms. On the contrary, it contains a dense body of work on coordination, contracts, competition, policies, responsibility, collaboration, information sharing, pricing, and decision mechanisms. The gap lies in the limited conceptual consolidation of these mechanisms under a broader governance architecture.

This distinction is theoretically important. Coordination can explain how particular activities or transactions are aligned, but governance additionally raises questions about who establishes the rules, how authority is distributed, how responsibilities are allocated, how accountability is enforced, how information asymmetries are managed, and how conflicts between economic and sustainability objectives are resolved. A field dominated by optimization and coordination mechanisms may therefore remain underdeveloped in its treatment of multi-actor governance even when relational research is abundant.

The seven-cluster structure reinforces this interpretation. Explicit governance is embedded in the broad management-sustainability cluster rather than forming a distinct thematic centre. Coordination forms the strongest hub in Cluster 2; channel coordination and contracts are embedded with competition and manufacturers in Cluster 4; supply-chain coordination is associated with environmental policy in Cluster 5; retail, CSR, policy, and information appear in Cluster 6; and contract/pricing mechanisms appear in Cluster 7. The conceptual ingredients of governance are therefore present but distributed across specialized research traditions.

This pattern is consistent with the concern expressed by Ülgen et al. (2019) that inter-organizational sustainability research is fragmented across dimensions, actors, and forms of interaction. It also complements Giuffrida and Mangiaracina's (2020) call for deeper investigation of cooperation and decision-making mechanisms in global and circular supply chains. The present analysis adds a bibliometric perspective by showing that coordination is highly consolidated as a network concept, while governance remains comparatively peripheral.

The temporal findings add a second contribution. Governance itself is not a new concept in this corpus, but the technological and circular infrastructures through which governance may be enacted are recent. Blockchain and traceability can support information transparency and verification; closed-loop supply chains, reverse logistics, recycling, and remanufacturing require coordination across organizational and consumer boundaries. The emerging research agenda therefore lies not simply in studying governance more often, but in explicitly connecting these mechanisms to questions of decision rights, accountability, power, transparency, participation, and responsibility.

5.1. Theoretical implications

First, governance should be conceptually separated from coordination. Coordination is a core mechanism of governance, but governance additionally includes institutional and relational dimensions such as authority, accountability, power, rule-setting, and responsibility.

Second, the findings suggest a need to integrate mechanism-level literatures. Contracts, policies, channel coordination, information sharing, CSR, traceability, circular systems, and pricing models should not be treated as isolated sustainability tools when they collectively shape how value-chain actors govern sustainability transitions.

Third, the results support the development of a sustainable value-chain governance framework capable of linking upstream producers and manufacturers, intermediary and retail actors, consumers, and relevant public or institutional actors. Such a framework would move beyond individual dyadic optimization toward explicit multi-actor governance.

5.2. Managerial implications

For practitioners, the findings imply that sustainability initiatives should not be designed only as bilateral coordination arrangements. Supplier requirements, contractual incentives, retailer policies, consumer engagement, circular flows, information systems, and performance metrics need to be embedded in governance arrangements that clarify decision rights, responsibilities, accountability, transparency, and dispute-resolution mechanisms.

The increasing prominence of traceability, blockchain, and closed-loop concepts also suggests that digital and circular solutions should be evaluated not only for technical efficiency but also for their governance effects. Technology can improve visibility and coordination, but its contribution to sustainability depends on who controls data, who bears costs and responsibilities, how information is shared, and how incentives are aligned across the chain.

6. Limitations and Future Research

The study has several limitations. First, the bibliographic corpus is based exclusively on Web of Science Core Collection records and therefore reflects the coverage and indexing practices of that database. Relevant literature indexed only in other databases may be omitted.

Second, keyword co-occurrence measures conceptual association in publications, not effective collaboration, coordination, or governance in real value chains. Bibliometric proximity should therefore not be interpreted as evidence of organizational integration or causal relationships.

Third, the results depend on the selected search query, the use of All keywords, full counting, the minimum threshold of five occurrences, and VOSviewer clustering parameters. Lexical variants such as manufacturer/manufacturers, retailer/retailers, and corporate social responsibility/corporate social-responsibility can fragment the network. A future robustness analysis may use a thesaurus to normalize clear singular/plural or orthographic variants while avoiding the inappropriate merger of analytically distinct concepts such as governance and coordination.

Fourth, APY should be interpreted cautiously for low-frequency terms, and 2026 is an incomplete publication year. Recent terms may therefore show unstable temporal values. Future research should complement bibliometric mapping with content analysis and empirical studies of sustainable value-chain governance, particularly research on power asymmetry, trust, accountability, information transparency, retailer governance roles, consumer participation, digital traceability, and circular-economy mechanisms.

7. Conclusions

The study also offers a methodological contribution by explicitly linking qualitative gap identification to quantitative science mapping. Data Sweep establishes why governance warrants investigation, whereas bibliometric analysis establishes how that gap is manifested in the wider literature. This two-stage logic makes the selection of the focal concept transparent and reduces the

risk of labelling a concept as a research gap solely because it appears peripheral on a bibliometric map.

This study mapped the governance gap in sustainable value chains by connecting qualitative gap identification with quantitative bibliometric evidence. With the support of Data Sweep, governance and inter-organizational coordination were identified as a recurrent unresolved issue in the selected literature; the subsequent Web of Science and VOSviewer analysis showed how this issue is manifested in the conceptual structure and temporal development of the broader literature.

The principal finding is not that coordination is missing. Coordination is the strongest concept in the network, with 125 occurrences, 124 links, and TLS = 822. The gap lies in the imbalance between this extensive coordination literature and the comparatively limited explicit conceptualization of governance, which records 13 occurrences, 21 links, and TLS = 38. H1 is therefore only partially supported.

The seven-cluster structure shows that governance-related mechanisms are dispersed across coordination, contracts, competition, policy, responsibility, information, pricing, CSR, and circular mechanisms. H2 is therefore supported. This fragmentation suggests that sustainable value-chain research possesses many of the components of governance without an equally consolidated integrative governance framework.

Finally, temporal analysis indicates that the recent frontier is increasingly technological and circular. Blockchain, traceability, closed-loop supply chains, reverse logistics, circular economy, and remanufacturing have among the most recent APY values. H3 is therefore supported. The next step for research is to connect these emerging mechanisms explicitly with accountability, transparency, power, participation, and coordinated responsibility across sustainable value chains.

Overall, the governance gap is best understood as a problem of conceptual fragmentation rather than absence. This interpretation provides a focused basis for subsequent empirical research on how producers, retailers, consumers, and other actors can jointly govern sustainable value creation and reduce environmental impacts.

8. References

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