

SPECIAL ISSUE

Sustainable supply chain governance: A literature review

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Abstract

Governance is one of the core concepts underlying sustainable supply chain (SC). Although governance practices are widely acknowledged and implemented, literature discussing those practices is not as thoroughly organized. The purpose of this paper is therefore to investigate the forms, dynamics, and development of sustainable supply chain governance (SSCG). We reviewed a total of 126 articles in operations and SC management peer-reviewed journals spanning 15 years of recent research. Our literature analysis unveils several key themes concerning the popularity of contractual and relational governance, the role of SC lead firms, the network perspective, and the dynamics of governance mechanisms. At a higher conceptual level, we conclude that there exists a mutually dependent relationship between SSCG and SC complexity. The study summarizes and conceptualizes the recent scholarly conversations about SSCG and offers an agenda for further research.

KEYWORDS

complexity, governance, literature review, supply chain, sustainability

1 | INTRODUCTION

Agricultural commodities, fashion, and manufacturing supply chains (SCs) are of utmost importance to the livelihood of the world population. Ironically, they are also associated with a wide range of sustainability problems, including but not limited to deforestation, biodegradation, child labor, poor labor conditions, and poverty. Such alarming issues require action from the parties involved, namely consumer brand manufacturers, NGOs, and the governments in both producer and consumer countries. These actors, either independently or collaboratively, have been setting up and implementing multiple sustainability arrangements to target the acknowledged concerns (Lambin & Thorlakson, 2018). To set up these sustainable programs, the leaders of those schemes need to create or choose a set of rules of exchange with other SC participants, either explicitly or implicitly, according to which designated activities are executed. Such a framework is termed as

sustainable supply chain governance (SSCG), which is the object of research in our study. Following prior literature, we categorize SSCG into two types: contractual and relational governance (Roehrich et al., 2020). While contractual governance materializes into “explicit, formal, and usually written contracts” with legally binding power, relational governance leans on the informal and socially based arrangements (Roehrich et al., 2020; Vandaele et al., 2007). This categorization is further identified and discussed in our review.

In Operations and Supply Chain Management (OSCM) literature, SSCG mechanisms have been a growing topic of discussion. Gereffi et al. (2005) presented a five-type categorization of global value chain governance (market, modular, relational, captive, and hierarchy), upon which multiple subsequent studies elaborate on how governance structure affects sustainability outcomes (Gereffi & Lee, 2016; Vellema & Van Wijk, 2015; Von Geibler, 2013). Network governance is a specified aspect of interest that OSCM researchers

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employ to discuss advances in SC sustainable progress (Tachizawa & Wong, 2014; Vurro et al., 2009; Zander et al., 2016). In a narrower context around SC dyadic relationships, there are studies covering buyer-supplier governance models and the effects thereof on sustainable SC (Alexander, 2020; Ni & Sun, 2018). In general, there has been active engagement among OSCM scholars in governance mechanisms for sustainable SCs.

We notice that so far OSCM researchers utilize common concepts and certain aspects of sustainable supply chain management (SSCM) and “green” SC management practices when discussing governance. Examples of governance-related topics presented in different terms are supplier management (Huang et al., 2016; Kalkanci & Plambeck, 2020a; Lee et al., 2014; Seuring & Müller, 2008), standards and certifications (Christmann & Taylor, 2006; Corbett, 2006), and relationship and partnership for sustainability (Cheng & Sheu, 2012; Imparato, 2010). Among these streams of research, SSCG is referred to at a minimal level, mostly in a supporting role for other concepts regarding SSCM.

Many other OSCM papers have addressed the issue of SC governance, albeit implicitly. For instance, any paper on sustainable sourcing does so while addressing the management of supplier relationships (Kraft et al., 2020). Papers on green SCs identify a “social planner” who takes on the role of allocating and charging for emissions (Caro et al., 2013), and game-theoretical models will reflect on interactions between SC partners or between SC partners and social planners, or both. Such modeling efforts may serve the purpose of evaluating (environmental) regulations or particular incentive systems. A lot of discussion on governance is therefore prevalent without even mentioning the term. In this set of studies, the governance mechanisms or structures are presented as specific examples, for instance certain audit systems (Gualandris et al., 2015), carbon regulations (Caro et al., 2013; Theißen et al., 2014), SC information disclosure (Kalkanci et al., 2016; Kraft et al., 2018), and voluntary standards (Wijen & Chiroleu-Assouline, 2019). These studies may take a detail-oriented stance with respect to governance while not taking the concept itself to center stage.

We add to the literature an integrated overview of the underlying governance mechanisms as a means to an end. Examining the occurrences of SSCG in specific forms such as assessment and collaboration (Ni & Sun, 2018) holds the potential to greatly promote the development of SSCM field. Nevertheless, a thorough grasp of the underlying conceptual framework is crucial for a better understanding and application of critical matters. Scholars have thus called for further research around the topic to cover various governance structures and their dynamics (Ebers & Oerlemans, 2016; Ni & Sun, 2018; Vurro et al., 2009). In reply to these calls and to shed some light on the complex notion of SSCG featured in OSCM, we conduct a systematic literature review. We look to answer the following questions:

1. What is the state of research regarding SSCG?
2. How can we conceptually organize the SSCG literature?
3. What are the research opportunities for future studies?

While answering these questions, this paper contributes to the existing literature in several respects. We adopt a broad approach that encompasses various SC elements and relevant non-chain actors, rather than limiting ourselves solely to the dyadic buyer-supplier relationship or multi-tier supplier management. We conduct an inclusive search to encompass the diverse manifestations and terminologies associated with SSCG mechanisms, offering an extensive critical analysis of SSCG. Moreover, our study focuses on the most recent literature in the field to build upon previous reviews without excessively overlapping their results.

From the analysis of the extant literature, the notion of SC complexity emerges. We therefore conceptually investigate our observations of SSCG via the well-known yet disconnected lens of SC complexity, depicting a mutually dependent relationship between the two elements. We argue that complexity is an inherent characteristic of any SC, and thus indispensably has an impact on the selection, execution, and outcomes of SC activities. We then elaborate on how SC complexity influences and responds to various governance mechanisms in a sustainability-focused context. Such a discussion can subsequently serve as a guiding model for fellow scholars whose research interest coincides with ours for sustainable SC. We then propose areas that are currently understudied and draw out fruitful future research avenues based on the four key themes and the SC complexity lens.

The remainder of our work is structured as follows. Section 2 offers relevant concepts and definitions as a background for our audience to depart from. Section 3 reviews previous literature reviews of SSCM to capture preceding results and distinguish our review attempt. We proceed with the methodology in Section 4, detailing our systematic literature review approach and procedure. Key results follow in Section 5, along with our discussion of the SC complexity lens in Section 6. Our paper offers future research avenues in Section 7 and concludes in Section 8.

2 | BACKGROUND AND KEY CONCEPTS

We lay the groundwork for the subsequent review by defining several key terms.

In the existing literature, the concept of *sustainability* is often presented interchangeably with *sustainable development*, which is the development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development 1987, p. 8). However, it is important to recognize that these terms are interconnected yet distinct. Ongoing debates persist regarding the feasibility of achieving sustainable development due to the inherent tension between growth and long-term resource management (Hickel, 2019). Consequently, stakeholders may possess varying interpretations of sustainability, resulting in diverse governance approaches in practice.

In this paper, we acknowledge the ambiguity of sustainability concept, highlight distinctions among frequently used terms, and establish our operational definition of sustainability as the capacity

of a system to prosper and persist over an extended period, while safeguarding crucial elements. Notably, the widely adopted Triple Bottom Line framework, encompassing economic, environmental, and social dimensions, serves as a popular approach to sustainability on a global scale (Elkington, 2002; World Commission on Environment and Development, 1987). These three dimensions form the foundation of our sustainability-related keyword group, enabling a comprehensive exploration of the subject matter.

SC is commonly construed as “consist[ing] of all parties involved, directly or indirectly, in fulfilling a customer request” (Chopra & Meindl, 2013). In a SC, materials flow and transform from the upstream suppliers to the very downstream end users. In parallel yet closely related to the physical structure of a SC are the information, financial, and organizational structure, all of which play a key role in meeting customers and stakeholder requirements and achieving competitive advantages for the individual firms and the whole SC (Serdarasan, 2013; Seuring & Müller, 2008). The extent of the SC beyond single companies prompts us to include SC-related terms in our literature search.

From a transaction cost economics perspective, *governance* is the “means by which order is accomplished in a relation in which potential conflict threatens to undo or upset opportunities to realize mutual gains,” (Williamson, 1998), quoted by Tachizawa and Wong (2015). This theoretical background partially gives rise to the famous five types of global value chain governance (Gereffi et al., 2005), setting a common departure for later studies. The term SSCG is used to refer to practices, initiatives and processes used by firms to manage relationships with their suppliers and other stakeholders with the aim of improving their sustainability performance or to successfully implementing their corporate sustainability approach (Formentini & Taticchi, 2016).

The concept of governance can also be found in another set of literature whose scope expands beyond SCs (Tachizawa & Wong, 2015; Vurro et al., 2009). Raynolds (2004), and later Gimenez and Sierra (2013) defines governance as “the relations through which key actors create, maintain, and potentially transform network activities.” On the same school of thoughts, Alvarez et al. (2010) view network governance as the set of mechanisms that supports and sustains cooperation among participating organizations to enhance the likelihood of achieving network-level goals.

Comparing and combining those definitions, we identify three distinguishing aspects of SCG: (1) it is a framework that consists of rules, structures, and institutions; (2) it is meant to guide, supervise, and control relationships and interactions between organizations as well as actors within and out of chains; and (3) it serves the purpose of achieving a (set of) strategic goal(s).

SSCG, therefore, is constructed based on the notions of sustainable development and SCG. In this study, we operationally define SSCG as the set of institutional rules and structures to manage relationships within and beyond a SC with the aim of implementing and improving management practices for sustainability goals. When addressing SSCG at operational level, we refer thereto interchangeably as schemes, practices, initiatives, approaches, and mechanisms.

3 | CONTRIBUTIONS TO PREVIOUS LITERATURE REVIEWS

Sustainable SC has become the talk of the academic town in the last 2 decades. It is thus no surprise that there exist multiple literature reviews dealing with such a topic. In this section, we go through several seminal reviews concerning assorted aspects of sustainable SCs in a chronological order, recapitulate their contributions to the field, and eventually differentiate our review attempts from the established academic work. Table 1 summarizes the past literature reviews and our current work while highlighting our contributions to the field. We further discuss each review and describe our improvements thereto.

To begin with, the work of Seuring and Müller (2008) is the first major literature review paper witnessed in the field of SSCM. Building on 191 papers published in a 14-year period from 1994 to 2007, the authors summarize the upward publication trend with case studies as the prevailing method among SSCM researchers. A conceptual framework for SSCM featuring triggers of sustainable practices in SC, along with two strategies (supplier management for risks and performance and SCM for sustainable products) is developed. Besides, the limitation of contemporary research to green and environmental problems only is put forward, leading to a call for a more holistic and integrated research approach regarding all three bottom lines of sustainability.

Vurro et al. (2009), while acknowledging the research efforts so far of their fellow scholars on the topic of collaboration-based governance models for SSCM, notice that the characteristics of the network firms involved could be a determinant of the expansiveness and benefits of such governance mechanisms. In their article, four SSCG models, namely transactional, dictatorial, acquiescent, participative, are constructed upon two network dimensions, which are network density and centrality of the focal organizations. The results suggest that the more central a position that firms hold, the more they commit to sustainable goals, the more opportunities to facilitate collaborations for sustainability arise, and the broader their impact zone becomes. In addition, density level may shift network participants from a selfish and normative approach to a more relational and substantive one. This literature review contributes to the academic conversation of SSC by bringing up the notion of network to expand the long-established mindset limited to SC boundaries and offering network-based explanation for the success of certain SSCG models. The authors also draw attention to research opportunities on the dynamics of network and governance mechanisms, possibly with an empirical approach.

Narrowing down the scope of interest, Gimenez and Tachizawa (2012) review the literature on governance structured facilitating sustainability among upstream suppliers. Two notable hands-on governance approaches, supplier assessment and collaboration, are featured in 41 articles. The review concludes that positive outcomes of both governance mechanisms can be observed in the environmental and social performance of lead firms. Nevertheless, the separate application of supplier assessment is

TABLE 1 Summary of previous literature reviews.

Literature review	Review objective (s)	Sample size	Timespan	Database (s)
Seuring and Müller (2008)	Sustainable supply chain management (SSCM)	191	1994–2007	Elsevier, Wiley, Emerald, Scopus, Ebsco, Metapress, Subito
Vurro et al. (2009)	Sustainable value chains Supply chain governance models	Not specified	Not specified	Not specified
Gimenez and Tachizawa (2012)	Governance structures: supplier assessment and collaboration	41	1996–2011	MetaLib, including ABI/INFORM, EBSCO, Emerald, Cross Search, JSTOR, NBER
Tachizawa and Wong (2014)	Multi-tier supply chain	39	2000–2014	ABI Inform ProQuest and EBSCO Host
Boström et al. (2015)	Sustainable and responsible supply chain governance	16	2015	Journal of Cleaner Production
Koberg and Longoni (2019)	SSCM	66	2003–2018	Scopus, ScienceDirect, JSTOR Archival Journals, PLoS, ProQuest, Emerald Journals, Arts and Humanities Citation Index, Business Source Premier, Dialnet Plus, Science Citation Index, Social Sciences Citation Index

Supply chain scope	Sustainability scope	Key outcomes	Research agenda
Whole supply chain Exclude public purchasing, purchasing ethics, reverse logistics, and remanufacturing	Environmental and social Economic aspect assumed always applied	Theoretical models: triggers for SSCM Two SSCM strategies: Supplier management for risks and performance Supply chain management for sustainable products	Integrate perspectives on three sustainability dimensions Apply management-related theories Include methodology perspective
Supply chain network	Not specified	Four SSCG models based on SC density and centrality of focal organization	Multilevel perspective on the conditions that favor the adoption of integrated, collaborative approaches Incorporate other network attributes Empirical tests of the suggested model
Upstream supplier level	Environmental, social, CSR in general	Theoretical model: Internal and external enablers of SSCM at supplier level, two supplier governance mechanisms, and impact of different supply chain practices on performance	Research to apply the model to new contexts: SC and supplier networks
(Sub) suppliers supply chain network	Environmental, social, CSR in general	Conceptual framework of four approaches to manage the sustainability of multi-tier supply chains Contingency variables (e.g., power, dependency, distance, industry, knowledge resources)	Empirical tests of propositions, considering various contexts Develop methodologies for prioritizing the vast number of lower-tier suppliers Test extent to which approaches and contingencies differ for social and environmental sustainability
Global supply chains	Not specified	Six sustainability challenges and how to address them: geographical gaps, informational and knowledge gaps, communication gaps, compliance gaps, power gaps and legitimacy gaps	Stakeholder diversity and inclusion Sensitivity, familiarity, and recognition of context capability development via long-term, reflexive and committed learning
Global supply chains	Environmental, social, and economic	Theoretical framework depicting the relationships between two key elements of SSCM and sustainability outcomes: SSCM configurations: open, third-party, and closed SSCM governance mechanisms: direct and indirect	The roles and goals of non-traditional actors Implications of closed configurations on buyer and supplier sustainability outcomes Engagement of focal firms in multi-stakeholder initiatives Complementarity of direct and indirect SSCM governance mechanisms Configurational perspective

TABLE 1 (Continued)

Literature review	Review objective (s)	Sample size	Timespan	Database (s)
Cloutier et al. (2020)	Collaborative mechanisms for sustainability-oriented supply chain initiatives	404	1992–2018	Compendex, Elsevier Science Direct, Google Scholar, JSTOR, Sage Online, Springer Link, Web of Science, and Wiley Online
This review	Sustainable supply chain governance (wider terminological coverage)	126	2006–2021 (more updated)	Scopus Web of Science (more refined)

Abbreviations: CSR, corporate social responsibility; SSCG, sustainable supply chain governance.

proved to be insufficient based on inconsistent results from assorted studies. Therefore, firms are advised to develop collaborative mechanisms with their upstream partners as well. Another interesting observation put forward by the authors is the order of triple bottom line benefits, which states that under the concurrent implementation of both governance paradigms, environmental benefits come first, and only after enough time may economic benefits materialize. The authors wrap up their study with a list of internal and external enablers of SSCM along with some research paths for future studies within the scope of supplier sustainability strategies and practices.

From a similar yet more expansive viewpoint, Tachizawa and Wong (2014) investigate the literature on multi-tier SCs and sustainability management of sub-suppliers. Knowledge from 39 studies is consolidated to configure an SSCG framework in which lead firms ground on seven contingency variables to select the appropriate governance mode(s) among “Direct,” “Indirect,” “Work with third parties,” and “Don’t bother” to manage their relationships with their multi-tier suppliers.

The most relevant review to the SSCG concept is of Boström et al. (2015) who present challenges and opportunities for the governance of sustainable SCs and networks. Six governance metaphorical gaps fueled by SC complexity (geographical, informational and knowledge, communication, compliance, power, and legitimacy) are put forward as existing challenges to the implementation and effectiveness of current sustainability governance arrangements. In response to these hindrances, the authors report the involvement of multiple

stakeholders as well as the regards on context as the most popularly shared elements of effective governance mechanisms. The article concludes with two key takeaways for both academics and practitioners: first, enforcement tools should be accompanied by capacity building programs; second, reflexive learning along the temporal horizon is necessary to upgrade sustainability governance mechanisms.

Recently, Koberg and Longoni (2019) offer a review of SSCM in a global context. 66 articles across 15 years of research were analyzed to reveal SSCM configurations and SSCM governance mechanisms as the two new lenses to investigate the literature. The authors classify SSCG mechanisms into direct (supplier assessment and collaboration, codes of conducts, in-house standards, and multistakeholder initiatives) and indirect (third-party certifications), triangulate the two categories with the TBL dimensions, and summarize the respective outcomes thereof. Mix sustainability outcomes of SSCM configurations and governance mechanisms are depicted to support the authors' conclusion that there exists no one-size-fits-all configurations and governance arrangements for the heterogenous array of global SCs. Further research actions into the less studied areas of (1) SSCG and (2) combinations of SSCM approached are subsequently called for.

Cloutier et al. (2020), on a large pool of 404 articles, take a closer look at collaborative mechanisms for sustainability-oriented SC initiatives. They reached an agreement with other researchers that collaborative mechanism is useful in the SC sustainability progress. Subsequently, seven categories of SSCG mechanisms are synthesized. We notice that this classification features both

Supply chain scope	Sustainability scope	Key outcomes	Research agenda
Not specified	Environmental, social, and economic	Seven collaborative mechanisms and their roles in four phases of sustainable-oriented initiatives The impact of contextual complexities on collaborative mechanisms	Temporal dimension Impact of partners' sustainability performance Impact of inter-organizational collaboration structure of the selection of mechanisms Trade-off between the level of investment available and the complexity of the collaborative mechanisms The combinatory effect of multiple mechanisms Integration of social dimension
Supply chain, supply networks, and beyond (more inclusive)	Environmental, social, CSR in general	Four key themes (more inclusive) transactional/relational governance, the role of lead firms, the network perspective, and public/private governance SSCG via the supply chain complexity lens (new discussion of known theoretical perspective)	Further research orientations for each of the four themes (more detailed) Further research inquiries for supply chain complexity in the context of sustainable supply chains (new application of known theoretical perspective)

contractual-based and relational-based governance approaches, though under different nametags. Furthermore, the significance of two contextual complexity dimensions (SC reengineering and inter-organizational collaboration) on the necessity and intensity of collaborative mechanisms is exhibited, prompting further research to bridge SSCG mechanisms and SC complexity.

The relevant literature reviews drive us to several inferences. First, SSCG is popularly discussed by OSCM researchers, yet in various refined scopes. Second, the concept is rather manifested with specific examples or mechanisms than examined as a broad notion. Consequently, literature concerning SSCG appears to be fragmented. We, therefore, aim to refocus the scholarly conversation around SSCG through a systematic literature review. There are several aspects that set our study apart from previous review attempts. First, we allow a broad coverage of SC elements and relevant non-chain agents and thus do not restrict ourselves to the context of (multi-tier) supplier management. Second, we facilitate an inclusive search for SSCG mechanisms to account for their multiple forms and various names. Third, we set our specific time span to investigate the most recent literature in the field and to build up on the previous impactful reviews. In addition, we embrace a somewhat neglected yet influential concept of SC complexity as a guiding compass for our reorganization of the extant literature and furthermore highlight potential research directions for our academic fellows. Using the systematic literature review method, we bring the concept of SSCG into the spotlight by cover a wide range of pertinent studies about SSCG, consolidating research outputs in a more comprehensive and

consistent manner, and drawing potential research directions for our fellow intellectual.

4 | METHODOLOGY

The aim of this paper is to systematically investigate the state of the art of SSCG, identify its key elements, conceptually organize the extant literature, and outline potential research opportunities. We accomplish these objectives by following the six-step paradigm for systematic literature review in SCM proposed by Durach et al. (2017) as illustrated in Figure 1 while taking into consideration the characteristics of systematic reviews in management (Tranfield et al., 2003). According to the paradigm, there are two major objectives that systematic literature reviews set out to achieve: solidifying research findings in a particular research area and identifying knowledge gaps that can orientate future research. A systematic literature review also facilitates a transparent, reliable, and replicable collection and analysis of a considerable amount of evidence. Durach et al. (2017) also propose the criticality of researchers' potential biases and respective counteractions such as collaboration with (expert) participants, which will be integrated into the process.

We executed our literature search on Scopus and Web of Science databases by applying multiple combinations of keywords and search strings (see Table 2) which were consolidated from personal reading experience and previous reviews (Gimenez & Tachizawa, 2012; Igarashi et al., 2013; Jia et al., 2018; Seuring & Müller, 2008; Sodhi

& Tang, 2018; Tachizawa & Wong, 2014; Zorzini et al., 2015). We choose these two databases based on their academic prestige, their extensive peer-reviewed research archives, as well as their applications in earlier reviews in the field sustainable SCs.

There are three groups of keywords in line with three parts of our key concept: Governance, Sustainability, and Supply Chain. For the first category, we decide to use the specific keyword of “governance” to avoid too many hits containing “management,” therefore keeping our study focused on SSCG. The decision to exclude the term “management” was made to concentrate specifically on the governance aspect of sustainable SCs, aiming for deeper insights into policies, frameworks, and mechanisms. To ensure comprehensive coverage, we perform manual screening of abstracts and titles. This approach aimed to encompass relevant papers that may not explicitly use the word “governance” but address sustainability governance. Although potential limitations exist, the multi-pronged approach enhances the review's precision and relevance to the chosen topic of SSCG. In addition, we excluded interdisciplinary terms like “mechanisms” and “regimes” to filter out engineering, political, and historical studies that may not significantly contribute to the results, ensuring thematic coherence and research relevance. These terms still appear in the results, yet strictly connected to governance.

The second category deals with sustainability and its environmental as well as social aspects. Acknowledging the inherent relevance and intertwinement of the economic aspect in the triple bottom lines for sustainability (Koberg & Longoni, 2019), we intentionally omit economic-related keywords for two reasons. Firstly, the inclusion of economics-related terms would likely result in an abundance of irrelevant articles, potentially diluting the essence and conciseness of our study. This deliberate omission ensures a more focused search, facilitating the identification of literature directly pertinent to our research objectives. Furthermore, this approach mitigates bias toward economic interests that may have dominated the existing literature (Gao & Bansal, 2013; Montabon et al., 2016), allocating more attention for the environmental and social facets. Regarding social-related keywords, concentrating on the keyword “social” facilitates a focused investigation into SSCG's social dimensions, avoiding overlap with broader and more general ethical concerns. However, to encompass ethical considerations, the search strategy integrated synonyms like “social” and “responsibility,” ensuring a comprehensive coverage of ethical aspects while maintaining a precise analysis of governance mechanisms tied specifically to social sustainability issues.

For the third category of SC-related terms, we derive our keywords from our definition in Section 2, which is supported by previous literature reviews. Those three types of keywords and search strings are simultaneously applied among study titles, abstracts, and keywords in the two databases during the last quarter of 2021 (see Appendix A).

Required characteristics of primary studies are agreed upon prior to the document collection and act as primary selection criteria. We limited our search to English language, peer-reviewed, published articles in the period of 2000–2021 so that we can produce an up-to-date review without significantly overlapping prior review results. This specific time span advances the seminal review of Seuring and Müller (2008) while complements other yet more recent reviews (Cloutier et al., 2020; Gimenez & Tachizawa, 2012; Koberg & Longoni, 2019; Tachizawa & Wong, 2014; Vurro et al., 2009) in terms of temporal coverage and topic specification. Primary built-in selection criteria on the two databased are applied, among which we opted for studies falling into the “Operations management” and “Management” category on Scopus as well as “Business, management and accounting” and “Decision Science” category on Web of Science. This results in 1957 initially collected articles. The elimination of duplicates left 1677 articles for the following screening rounds.

We then reviewed the titles (first round) and abstract (second round). To be qualified for selection, one article must deal with all three subjects of concern, namely governance, SC, and sustainability. We evaluated the relevance of each paper based on the appearance of the related keywords (see Table 2) in the titles and abstracts. The three dimensions are subsequently coded using our data extraction template (see Table 3). 350 articles passed our first round of screening, while 187 passed the second round.

Next, journal ranking was taken into account to select articles of high quality and high impact. For this criterion, we employed several credible journal indexing and ranking systems such as Journal Citation Report (first quartile of its field), and ABS Academic Journal Guide (rank 2 and above). Papers appearing in either or both two lists are included. After this round, we were left with 178 articles.

In order to cover impactful research that was not captured by the search, we added 34 highly cited papers from top researchers in the field of OSCM which cover our concept of interest. Backward snowballing from the shortlist (11 papers) is another method to cover relevant studies as well. Additional articles along with their respective source are kept track in separate Excel lists to ensure research transparency.

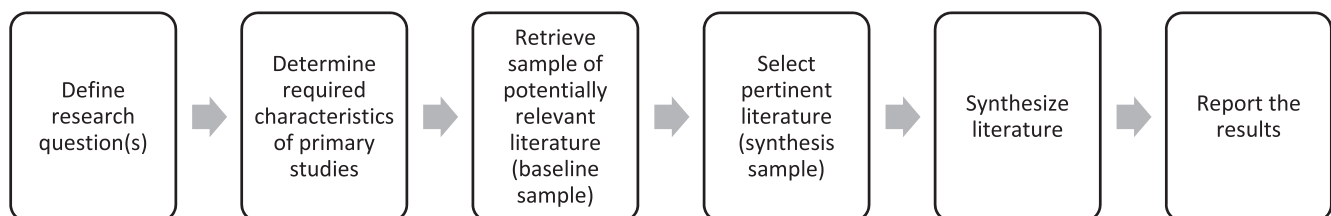


FIGURE 1 Systematic literature review process, adapted from Durach et al. (2017).

TABLE 2 Key words and search strings.

Subject	Related keywords	Search strings
Governance	Governance Mechanisms Regimes	"governance"
Sustainability	Sustainability Environment (Corporate) (social) responsibility Ethical	sustainab* OR green OR responsib* OR environmental OR eco OR social
Supply chain	Supply chains Sourcing Purchasing Procurement	suppl* OR chain OR sourc* OR purchas* OR procure*

TABLE 3 Data extraction template.

Category	Data	Explanation
Bibliographic information	Authors, the title of the article, the year of publication, the title of the journal, the volume, the issue, page start, page end, DOI, the abstract of the article	
Content	Governance-related	The aspect(s), forms, and mechanisms of governance dealt with in the article. Classification includes: + codes of conduct + certifications/standards + collaboration/collaborative/multistakeholder/partnership + contract(ing) + incentives + network/global (value) chain governance + public governance: laws, policies, lobbies, and regulations + public-private/hybrid governance + supplier selection + supplier assessment + supplier monitoring/management/compliance + trust/relational measures + other (with details)
	Sustainability-related	The aspect(s) of sustainability dealt with in the article. Classification includes: + economic + environmental + social + or sustainable/Triple Bottom Lines (in general, without a specific aspect)
	Supply chain-related	The aspect(s), segment, and participants of supply chain dealt with in the article. Classification includes: + buyer-supplier/dyadic relationship + chain and network properties + downstream/customer relations + external stakeholders + global value chain/production network + lead firm initiatives/supply chain leadership + multi-tier supply chain + supplier management + supply chain integration + whole supply chain + other (with details)
	Key ideas	Stated propositions. Supported hypotheses. Definitions and operationalization of key constructs Open-ended category: summarized from reading the article
	Industry	The industries covered in the study
Country	The country or countries covered in the study	
Methodology	The methodology or methodologies used in the study	

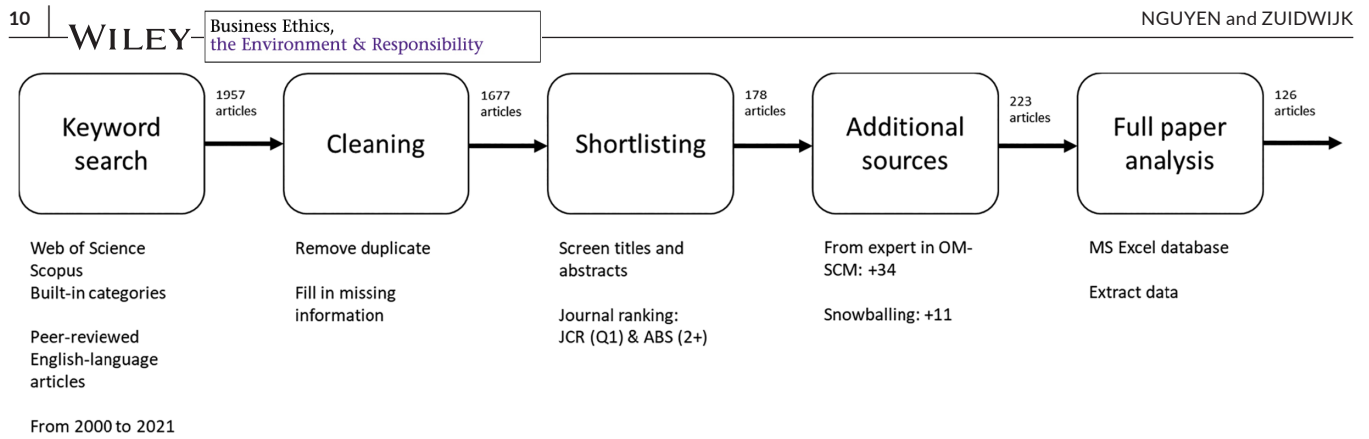


FIGURE 2 Selection process.

Altogether, we had 223 papers entering the full paper review stage during which each paper is read and evaluated carefully. After this round, we concluded 126 articles in the final sample. The first author conducted all screening steps under the supervision and guidance of the second author, incorporating their valuable inputs throughout the process. The number of selected studies drops significantly due to the relevance of their content to SSCG. The full list is available in the electronic appendix. The whole selection process is presented in Figure 2.

We used a coding template on an Excel database to extract the data from the final sample. Table 3 illustrates our coding template and corresponding explanations. All bibliographic information is readily available upon retrieval while the content data were manually coded. We focus on the main ideas related to three subjects of our concern to derive patterns and trends among selected studies. Classification list in each category is built upon previous literature reviews as well as the authors' knowledge of the field. In the coding scheme, we allow room for details accompanying each classification, and we also record observations that do not fit in any particular category. We also coded for industrial and geographical contexts, along with methodologies of the reviewed studies.

After the first round of coding, we revisit the content-related information using a thematic lens to identify major themes covered in the sampled literature. In this step, rigorous searching, reviewing, and defining themes are executed, the results of which are reported in the following section.

5 | RESULTS

5.1 | Descriptive analysis

Our sample consists of 126 articles from 35 peer-reviewed high-ranking journal published between 2006 and 2021, which means it covers 15 years of research instead of 20 as planned. Figure 3 (and Appendix B) illustrates the number of relevant papers in each year. Overall, there has been a mounting interest in the topic of SSCG with most of the publication appearing from 2015 onwards.

The distribution of selected articles in top 10 outlet journals is presented in Figure 4 (with the full list in Appendix C). Four of the outlets (Journal of Cleaner Production, Journal of Business Ethics, Business Strategies and the Environment, and Supply Chain Management) account for half of the pooled publications. On further investigation, we recognized that this dominance is due to several special issues on the topic of SSCG published by the top three outlets. One reason for the proliferation of journal special issues on SSCG between 2015 and 2020 is the growing awareness of its significance. During this period, sustainability and responsible business practices gained substantial attention globally (Govindan et al., 2016). The concept of SSCG, which emphasizes integrating social and environmental considerations into SC management, emerged as a critical area for research and practices. As a result, scholars and practitioners recognized the need for more research addressing the governance gaps in the literature (Boström et al., 2015). Simultaneously, there was an increasing emphasis on multi-stakeholder collaboration to tackle complex sustainability challenges in the global economy and SCs (Josserand et al., 2018; Nelson et al., 2018). By bringing together diverse perspectives, theories, and empirical studies, these special issues aimed to fill the voids in understanding, generate new insights, and promote evidence-based practices.

Table 4 presents a summary of the methods employed in 126 reviewed papers on SSCG. Empirical research methods constitute the majority, accounting for three quarters of the reviewed research, with case studies being the most prevalent approach at 40.48%. The limited adoption of theoretical methods and literature reviews, comprising 19.84% and 4.76%, respectively, suggests a preference for practical and real-world insights. Surveys are the second most used empirical approach (18.25%), while mixed methods are applied in around a tenth of all papers. Secondary data usage is relatively minimal at 3.17%. The emphasis on primary data collection reflects the field's focus on practical applications and context-specific investigations for SSCG research.

Regarding the geographical distribution of the reviewed studies, Table 5 indicates a notable emphasis on the Asian context, with 39 out of 126 studies conducted in this region. Europe closely follows with 26 papers, encompassing a wide range of nations. In contrast, a

FIGURE 3 Distribution of reviewed articles based on the year of publication.

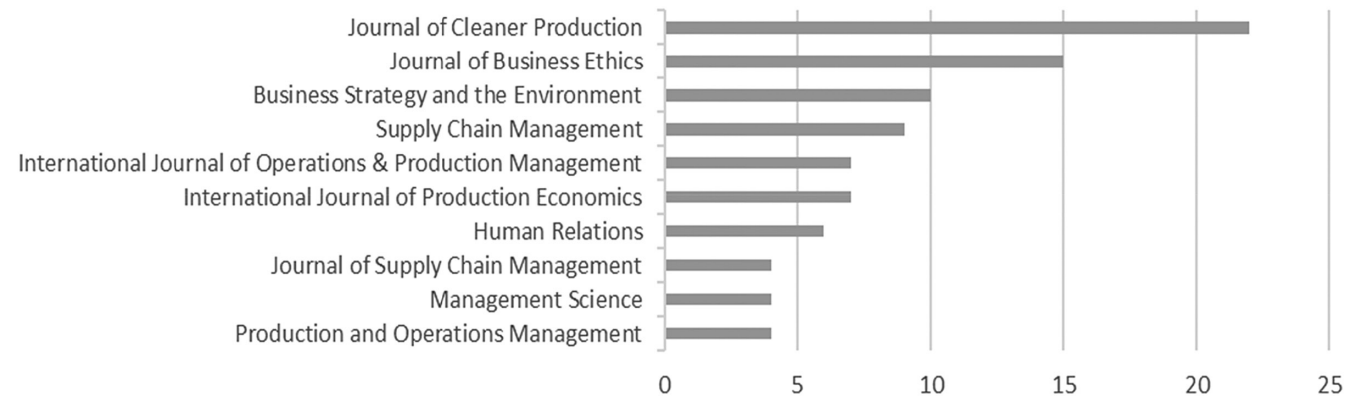
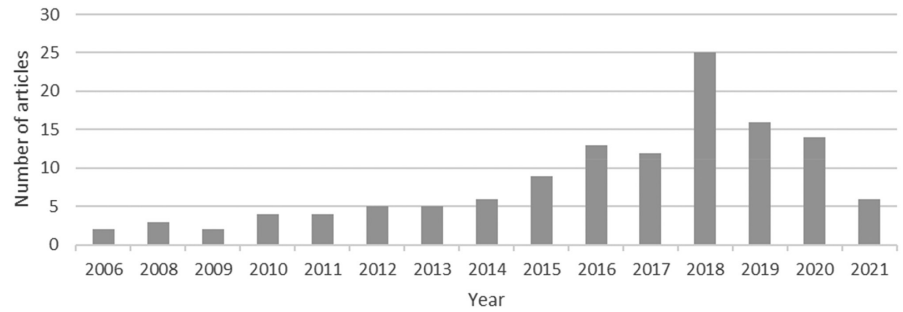


FIGURE 4 Distribution of articles based on the top outlet journals.

TABLE 4 Classification of reviewed papers (research methods).

Method(s)			No. of papers	% total papers
Theoretical	-	-	25	19.84
Literature review	-	-	6	4.76
Empirical	Primary data	Case study	51	40.48
		Survey	23	18.25
		Action research	1	0.79
		Ethnographic study	1	0.79
		Experiment	1	0.79
		Mixed method	14	11.11
		Secondary data	-	4
	Total		126	100.00

considerable disparity is evident for other continents, such as Africa, North/Central/South America, and Australia, where the number of research endeavors remains limited. This uneven distribution can be partially attributed to the empirical focus on certain unsustainable hotspots that have attracted significant public scrutiny due to their environmental and social incidents. For instance, countries like Bangladesh, which is prominent in the textile industry, China, renowned for its manufacturing sector, and Malaysia and Indonesia, major players in the agri-food sector, have received considerable research attention. Table 6 further illustrates the research effort allocated to specific industries, such as apparel/textile, manufacturing, and food/agri-food. These sectors likely contribute to the disparities in geographical distribution, as they represent critical areas of

concern for sustainability and have attracted substantial academic attention.

5.2 | Main themes

Based on the coded content in the previous step, we identify within our sample several governance-related themes covering both within chain and beyond chain dynamics and developments. We examine the codes from all three categories, reduce them into keywords, and synthesize the outcomes to arrive at (1) the prevalence of transactional/contractual and relational governance mechanisms, (2) the role of lead firms, (3) the network standpoint,

Continent	Countries	No. of studies
Asia	Cambodia, China, Bangladesh, Hong Kong, India, Indonesia, Israel, Japan, Malaysia, South Korea, Taiwan, Thailand, Vietnam	39
Europe	Belgium, Denmark, Finland, Germany, Italy, Norway, Romania, Spain, Sweden, Switzerland, the Czech Republic, the Netherlands, the UK, Turkey	26
North America	Canada, Mexico, The US	9
Africa	Ethiopia, Kenya, South Africa, Tanzania, West Africa	8
South America	Brazil, Colombia	7
Australia	Australia, New Zealand	5
Central America	Costa Rica, Guatemala, Honduras, Nicaragua	2

^aNot all studies specify their geographical contexts.

TABLE 5 Classification of reviewed papers (geographical distribution).^a

Type of industry	Research design	
	Single industry	Multiple industries
Apparel/Textile	21	14
Food/agri-food/agricultural produces	16	15
Civil society	6	0
Services	6	0
Forestry/wood	4	0
Retail	3	0
Electronics	2	15
Public sector	2	0
Oil/gas/biofuel	1	2
Construction materials	0	3
Machinery/mechanical equipment	0	11
Automotive	0	5
Chemical	0	10
Pharmaceutical/biotech	0	6
Metal	0	8
Non-metal mineral products	0	3
Utilities	0	1
Computer equipment	0	5
Packaging	0	4
Furniture	0	6
Not mentioned/not applicable	36	

TABLE 6 Classification of reviewed papers (industrial context).

and (4) the dynamics within and between public and private governance. Table 7 summarizes the major themes along with their exemplary studies.

5.2.1 | Types of governance mechanisms

Firstly, the reviewed literature seems to concur that *transactional* (or *contractual*) and *relational* forms of governance are the most universal

categorization (Roehrich et al., 2020). Definitions and exemplary studies of these two governance forms are provided in Table 6.

On the one hand, the literature features the prevalence of transactional/contractual governance mechanisms not only among the public sector but also the private one. These mechanisms could take on diverse forms and names, for example, sustainability standards and certifications, codes of conduct, supplier contracts, laws, and public regulations. These mechanisms converge in their logic of controlling and monitoring compliance among which they are

TABLE 7 Four main themes in SSCG literature.

Theme	Description	References
Types of governance mechanisms	<i>Transactional/contractual governance</i> are inter-organizational mechanisms that are manifested in jointly stipulated contractual and legally enforceable clauses, arrangements, and bilateral transaction-specific investments	(Jajja et al., 2019; Keating et al., 2008; Liu et al., 2009; Mueller et al., 2009; Poppo & Zhou, 2014; Roehrich et al., 2020; Sancha et al., 2016)
	<i>Relational governance</i> are inter-organizational mechanisms that are manifested in social-based arrangements; they focus on the roles of social interactions and socially embedded relationships in economic activities	(Alvarez et al., 2010; Benstead et al., 2018; Cheng & Sheu, 2012; Paulraj et al., 2014; Rupley et al., 2012; Sancha et al., 2016; Tepic et al., 2011)
The role of lead firms	Lead firms (or focal firms) are the firms that usually: (i) rule or govern the supply chain, (ii) provide direct contact with the customer, and (iii) design the product or service offered	(Alvarez et al., 2010; Gimenez & Sierra, 2013; Li et al., 2014; Perez-Aleman & Sandilands, 2008; Poppo & Zhou, 2014; Seuring & Müller, 2008)
The network standpoint	Supply chain network involves not only traditional chain participants such as suppliers, manufacturers, transporters, retailers, and customers but also relevant non-chain stakeholders such as other businesses, governmental bodies, and civil societies	(Alamgir & Banerjee, 2019; Alexander, 2020; Alinaghian et al., 2021; Bush et al., 2015; MacCarthy & Jayarathne, 2012; Tachizawa & Wong, 2014; Tepic et al., 2011; Vellema & Van Wijk, 2015; Vurro et al., 2009; Zander et al., 2016)
Public and private governance	Public governance are organizational mechanisms inaugurated, facilitated, and monitored by governmental bodies	(Hueskes et al., 2017; Larsen et al., 2018; Niu et al., 2017; Rahim, 2017)
	Private governance are organizational mechanisms inaugurated, facilitated, and monitored by nongovernmental actors such as for-profit companies, industry-wide organizations, and civil societies	(Alvarez et al., 2010; Fransen & Burgoon, 2014; Huq et al., 2014; Perez-Aleman & Sandilands, 2008; Von Geibler, 2013)

Abbreviation: SSCG, sustainable supply chain governance.

enforced upon (Auld et al., 2015; Locke et al., 2013). In the public sector, governments may launch legally enforceable laws and regulations to realign economic behaviors of private entities (Wijaya & Glasbergen, 2016), employ their inherent regulating power to influence purchasing process of firms via punishment and incentives (Niu et al., 2017), or foster sustainability via public procurement (Walker & Preuss, 2008). Private bodies, similarly, select and carry out sustainability-oriented contractual arrangements with their SC partners, mostly their upstream suppliers, to ensure desirable operational practices within the SC (Lun et al., 2015; Poppo & Zhou, 2014).

On the other hand, relational mechanisms are reported to increase its popularity, from within chains (supplier engagement, collaboration, and development) to across chains (multi-stakeholder collaboration, industry-wide and international roundtables, etc.). Based on social links, norms, and customs, relational mechanisms partly operationalize the logic of empowerment (Auld et al., 2015) via building long-term relationships with SC partners for the sake of mutual development. Trust between SC partners (a supplier and a buyer for instance) appears to be the most common concept depicting relational governance mechanisms among the reviewed

literature (Cheng & Sheu, 2012; Tepic et al., 2011). Based on trust, other forms of relational mechanisms such as intra- and inter-firm communications (Paulraj et al., 2014), long-term relationship adaptation (Paulraj et al., 2014; Zhu & Morgan, 2018), business partner involvement (Lo et al., 2018; Lun et al., 2015), and knowledge sharing (Benstead et al., 2018; Yadlapalli et al., 2019) emerge, enriching the informal sustainability toolkit for SC actors.

A common thread in the review literature is the advocacy for the coalescence of both transactional and relational governance mechanisms (Locke et al., 2013; Paulraj & Blome, 2017). Many scholars have voiced criticisms about the suboptimal performance of either governance forms (Gimenez & Sierra, 2013; Loconto, 2015; Perez-Aleman & Sandilands, 2008) and called for a joint design or ambidextrous governance model (Zhang, Pan, & Feng, 2020). Most of them start with the performance evaluation of transactional governance mechanisms such as codes of conduct, supplier assessment, and audit (Plambeck & Taylor, 2016), then point out that the relational counterparts, supplier collaboration, and development for instance, can ameliorate the shortcomings of contract-based tools (Lun et al., 2015).

5.2.2 | The role of lead firms

Secondly, *the role of lead firms* in igniting, facilitating, and spreading sustainability practices to the upstream is greatly emphasized (Alinaghian et al., 2021; Gereffi & Lee, 2016; Jia et al., 2019). The positioning of focal companies generally allows them to exert power on dependent SC actors to respond to stakeholder pressure (Tachizawa & Wong, 2015). Their role, therefore, is widely and diversely manifested in the upstream part of the SCs, and fundamentally involves suppliers. Supplier selection, development, assessment, and collaboration are among the most studied sustainable practices among lead firms. Furthermore, SC leadership assumed by focal firms, either transactional or transformational in nature (Mokhtar et al., 2019), plays a key part in disseminating SC sustainability to suppliers of multiple tiers. On the other end of the SC, customer relations are another avenue that firms can walk to improve their economic and environmental performance (Q. Zhu et al., 2017); nevertheless, this direction is scarcely featured in the reviewed literature. This scarcity might be a consequence of our search terms which lean more toward the upstream part of SCs. Therefore, we acknowledge this shortcoming and refrain from commenting elaboratively on the downstream research direction.

Not only within their SC, the function of focal firms is also exhibited via their interaction with external stakeholders. Kalkanci and Plambeck (2020b) explore this facet by bringing in external investors whose evaluation of the firm is contingent upon the disclosed and observed behaviors of the firm regarding their suppliers' sustainability administration. In a more complex setup, lead firms face various pressure from both governments (Esfahbodi et al., 2017; Ge & Zhao, 2017) and civil societies (Boersma, 2018). This embeddedness gives rise to our next theme of network.

5.2.3 | The network standpoint

Thirdly, a *network standpoint* rather than a dyadic or single-chain lens has become increasingly prevalent among sustainable SC literature. Network characteristics such as centrality, density, and complexity are taken into account by in-chain actors (Alinaghian et al., 2021), especially lead firms to expand CSR (corporate social responsibility) practices beyond the traditional limits of vertical and horizontal collaborations (Bush et al., 2015; Tachizawa & Wong, 2014; Vurro et al., 2009).

Social networks and ties influence behaviors of actors and subsequently their sustainability performance, signaling a movement from "in chains" through "of chains" to "through chains" form of sustainability governance (Bush et al., 2015). In the most closed form, governing sustainability "in chains" refers to the socially and environmentally improving activities of private firms as chain participants with a business standpoint. Monitoring systems designed for the internal regulation of sustainability issues fall into this sustainability governance category. Moving to governing sustainability "of chains," the role of lead firms in coordinating their suppliers' social and environmental performance reemerges. Vertical integration fosters trust and interdependence between chain actors, paving the way for sustainability upgrading in several ways (Bush et al., 2015). The broadest level of sustainability governance featured in this study is governing "through chains." In this model, SCs are used as a medium to purposefully transform the nature of production and consumption. This setup is neither a firm-level system nor an inter-firm coordination; it entails the chain and all its participants in an intertwined network relationship. Strong and expansive collaborative networks are, therefore, beneficial to the progress of our sustainability agenda (MacCarthy & Jayarathne, 2012).

Beyond the boundaries of SCs, non-chain agents utilize their intermediary positions to mediate conflicts, monitor sustainable operations, and share essential knowledge to other less fortunate chain participants (Kaine & Josserand, 2018; Soundararajan et al., 2018; Underhill et al., 2018). Alinaghian et al. (2021) consolidate such functions in the term "bridge actors," emphasizing the key roles of sub-network groups in diffusing, enabling, and monitoring sustainability initiatives at more remote levels of the SC. NGOs, auditors, civil and trade associations are examples thereof. At a more regional level, grass-root brokering organizations may be in a crucial position to narrow the gap between the common top-down governance and local implementation (Kaine & Josserand, 2018). Similarly, boundary work performed by sourcing agents can informally compensate for the influence of the MNCs' inherent liability of foreignness on working conditions in suppliers' homeland (Soundararajan et al., 2018). Various roles of such non-chain organizations are depicted, ranging from periodic information dissemination to active engagements in resolving conflicts. Nevertheless, the coverage and operational scale of those agents remain limited and incoherent due to lack of professional support and systematic planning at different tiers (Hannibal & Kauppi, 2019), leaving the success of these actors open for questions (Kaine & Josserand, 2018).

5.2.4 | Public and private governance

Finally, the *dynamics within and between public and private governance* are also featured in the sampled literature. The indispensable collaboration and mutual support of public and private actors have gained tremendous popularity among interested scholars who have named such incidence ambidextrous/hybrid governance (Hueskes et al., 2017; Imparato, 2010; Locke et al., 2013; Zhang, Pan, Jiang, & Feng, 2020). In the early 2010s, discussions around public and private governance mostly orbited around the question of whether they complement or substitute each other (Locke et al., 2013). Locke et al. (2013), in their study of labor standards in global SCs, conclude that private codes may act as either a complement or a substitute depending on the stringency of existing governmental regulations. Later, public–private partnerships (PPP) have increasingly attracted academic attention (Hueskes et al., 2017; Loconto, 2015; McCarter & Fudge Kamal, 2013). Those partnerships could materialize in diverse forms and purposes, ranging from promoting transformational exchange among impoverished gold miners via a coordination of private banks and state-owned entities (Imparato, 2010) to facilitate social services in tea-cultivating areas via arrangements between the local government and voluntary standards network (Loconto, 2015). Among those partnerships, supporting as well as competing efforts are simultaneously observed (Gereffi & Lee, 2016; McCarter & Fudge Kamal, 2013), yet a mindset of collaboration is strongly endorsed among relevant studies.

Within each sector, we observe a shift in roles and approaches toward a sustainable SC. On one hand, governments return to a more decentralized and supporting role rather than their traditional authoritarian stand. The states, in a global context moving toward a more sustainable future, are “far from sidelined” (Guéneau, 2018). While multiple research efforts have shown that sustainability-targeted private regulatory arrangements initiated by the global North are meant to assist and could undertake unfulfilled governance functions of the global South, governmental agents of producer countries do not appear to solely accept such an external enforcement. Examples of Southern governments' activities for the sake of sustainable development in their territories are popular. Zhu et al. (2011) investigate the effectiveness of Chinese government-induced ecological regulations and policies on the adoption of green SCM practices among Chinese manufacturers. Rahim (2017) analyzes the new governance approach via laws in Bangladesh garment industry, dissecting how the government implements inclusive, decentralized, and protective policies to incentivize cooperative socially responsible behaviors among global suppliers.

Another noticeable example of this governmental change is in the palm oil industry in Southeast Asia. Wijaya and Glasbergen (2016) present a case study of Indonesia in which public actors from such a producer country formulate several responses to the heightened activities of the Roundtable on Sustainable Palm Oil and eventually initiate their own alternative sustainability standards and certifications. Despite national efforts to reclaim power over their staple agricultural product, Indonesian government faces severe criticisms

recently. Nevertheless, those public-led campaigns illustrate progressing involvement of the states in the walk toward sustainability.

On the other hand, the reviewed literature also bears witness to the evolution of the sustainability markets of the private sector. Take the standards and certifications world for example: it has moved from niche market which provides competitive advantages to the minority to mainstream standardization without which businesses are considered “laggards,” and eventually toward proprietary supplier engagement and empowerment initiatives (Thorlakson, 2018). The role of SC structures, standard stringency, and media coverage in standard adoption and dispersion has been featured in various studies (Castka & Corbett, 2016; Corbett, 2006; Lee et al., 2014), while a SC strategy framework reveals that though widely employed, certain certification programs are not as effective as expected (Forrer & Mo, 2013). NGOs and other civil society organizations, therefore, encounter a forced transition from a service provider (Hannibal & Kauppi, 2019) and adoption ignitor (Fransen & Burgoon, 2014) toward a more collaborative and steward-like function (Fransen et al., 2019). Fairtrade International, for example, has witnessed the need to expand their business beyond certification and auditing services to further engage in partnership with rising privately owned sustainability initiatives.

6 | A SUPPLY CHAIN COMPLEXITY LENS

In contemporary SC management, the recognition of SC complexity as a critical factor has garnered significant attention from both scholars and practitioners. Our review reveals four key themes: transactional/relational governance, the role of lead firms, the network standpoint, and public/private governance. These themes collectively underscore the intricacies inherent in global SC networks and the challenges they pose. To provide a more profound conceptual analysis, this study adopts the SC complexity lens, which proves particularly relevant for examining SSCG in the context of the identified themes. Table 8 summarizes how the notion of SC complexity emerges from the four themes in our analysis.

Firstly, SC complexity acknowledges the intricate web of relationships and interactions among various stakeholders within and beyond the SC. The themes of transactional/relational governance and the network standpoint highlight the significance of fostering collaborative and trust-based relationships between suppliers, manufacturers, and distributors. The SC complexity lens can elucidate the interdependencies and communication channels necessary to ensure effective governance and decision-making in such relationships.

Secondly, the role of lead firms holds immense significance in orchestrating and molding the intricate dynamics of SCs. This influence stems from their ability to exert control over critical aspects such as supplier selection, distribution strategies, and the adoption of sustainable practices. As lead firms take the lead to coordinate a sustainable SC, complexity arises both structurally and dynamically (Bode & Wagner, 2015). The SC complexity lens can aid in the

understanding the multifaceted interactions and power dynamics between lead firms and their network partners, enabling a more comprehensive evaluation of their impact on sustainable governance initiatives.

What is more, adopting a SC complexity lens enables a holistic examination of how sustainable practices and governance mechanisms can be integrated and harmonized across the entire SC network. By understanding the complex relationships, dependencies, and feedback loops among stakeholders, researchers and practitioners can identify potential leverage points to enhance sustainability and resilience within global SCs.

In addition, public/private governance brings into focus the regulations, policies, and partnerships that play a pivotal role in shaping sustainable practices across SCs. The complexity lens can help unravel the diverse and often conflicting interests of public and private entities, allowing for an in-depth analysis of how governance structures evolve and adapt in the face of intricate challenges.

We, therefore, reexamine our pooled literature through the lens of SC complexity inspired by Adhikary et al. (2020), Boström et al. (2015), and Tachizawa and Wong (2015) and subsequently conclude that there exists a mutually dependent relationship between SSCG and SC complexity in a broader sense (Figure 5).

SC complexity is defined as “the level of detail complexity and dynamic complexity exhibited by the products, processes and relationships that make up a SC” (Bozarth et al., 2009). While detail, or structural, complexity refers to the distinct components, parts, and participants that structure a SC, dynamic complexity “represents the uncertainty in the SC and involves the aspects of time and randomness” (Serdarasan, 2013). Structural complexity of a SC, therefore, arises from diverse components involved along the chain such as suppliers, materials, processes, products, customers, and so forth, as well as from the relationship between them. Dynamic complexity in a SC distincts itself from its structural counterpart via changes in SC elements or the interactions between these along the time dimension (Fernández Campos et al., 2019).

SC is a complex system, and the various complexities stemming from such a system need addressing as part of SC management (Serdarasan, 2013). Such complexities may also impede

sustainability efforts by firms (Najjar & Yasin, 2021). Framing the concept of SC complexity into sustainable SCs, we specify our conceptualization of SC complexity to (1) the structural characteristics defining a SC and supply network, and (2) the relationships and interdependence between relevant actors within and beyond the system. In our discussion, we take into consideration not only the structural but also the dynamic complexity of SC. Although we follow Bode and Wagner (2015) definitions to build our working constructs, we narrow down SC structural complexity to the number, variety, and structure of actors involving and influencing the SC, including but not limited to producers, suppliers of multiple tiers, NGOs, and governments; hence, SC dynamic complexity refers to the (changing) interactions between the aforementioned agents. This specification of concepts will support our following discussion of SSCG.

In our reviewed articles, SC complexity is implicitly embedded in SSCG discussion. SC complexity is manifested in all three well-known structural dimensions, namely vertical, horizontal, and spatial (Bode & Wagner, 2015), the depth of which also surpasses the mere counts of entities, tiers, and geographical dispersion of SCs. Examples of SC complexity in SSCG literature includes the multi-tier chain/network structure, same- and cross-tier relationships of SC actors, the diversity of governance roles among those actors, the multiplicity of governance mechanisms stemming from these relationships, and so forth.

Referring back to the four key themes, we can observe how SC structural and dynamic complexity are featured in the SSCG literature. First, transactional and relational governance mechanisms are built upon the buyer–supplier structure of a SC, which is inherently prone to structural complexity. Multi-tier SC configuration obscures the conduct of production from focal companies (Gold et al., 2015), impacts how downstream environmental requirements pass to upstream suppliers (Lee et al., 2014), and complexifies auditing practices (Plambeck & Taylor, 2016). The role of lead firm, consequently, stems from their physical and relational position along the chain. How these focal companies exert power and resources to facilitate sustainability initiatives depends on their hierarchical stand and relationships with regard to other SC participants (Gosling et al., 2017; Wohlgezogen et al., 2021). Next, the network standpoint emphasizes

TABLE 8 Emergence of supply chain complexity from the literature themes.

Theme	Elements	Supply chain complexity dimension
Transactional/dynamic governance mechanisms	Enforcement, control, and monitoring of compliance	Dynamic complexity
	Relationship management between supply chain partners	Dynamic complexity
The role of lead firms	Critical position in the supply chain	Structural complexity
	Stakeholder management	Dynamic complexity
The network standpoint	Network centrality, density, and complexity	Structural complexity
	Social networks and ties	Dynamic complexity
	Non-chain actors' involvement	Structural and dynamic complexity
Public/private governance	Public–private collaboration	Dynamic complexity
	Changes over time of roles and approaches	Dynamic complexity

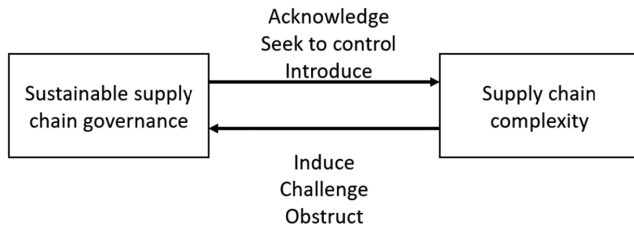


FIGURE 5 SSCG and supply chain complexity. SSCG, sustainable supply chain governance.

on the intertwined structural and dynamic complexity of interconnected SCs, illustrating how physical and social ties dictate the success or failure of sustainability schemes (Alinaghian et al., 2021). The network view not only covers chain-exclusive relations such as multi-tier supply network but also takes into account actors from a larger institutional context (governments and civil societies for instance), the dynamics of which may set off different approaches toward sustainable goals (Alamgir & Banerjee, 2019; Buliga & Nichiforel, 2019; Jia et al., 2019). Last but not least, dynamic complexity plays a key role in the evolving relationships between and within public and private governance. Changes in the roles and assumed responsibilities of different public and private agents engender new forms of SSCG, challenge current governance practices, and stimulate competitions thereof.

The two-way relationship between SSCG and SC complexity (see Figure 5) is built upon our particularized concept of SC complexity. Generally, SSCG mechanisms are selected based on perceived SC complexities in order to acknowledge, control and mitigate the negative consequences of complexities to an organization's sustainability performance. This intuitive course is featured in both contractual and relational modes of governance: The more powerful and legitimate actors (usually the lead firms) acknowledge unsustainable issues in their SC and therefore implement a (combination of) governance tool(s) to address those issues. Sourcing policy is one transactional mechanism via which buyers can induce alteration in their suppliers' unsustainable processes in case sourcing options are restricted (Agrawal & Lee, 2019), while supplier development based on relationship quality is proven to improve upstream green SC integration (Lo et al., 2018).

Interestingly enough, SSCG mechanisms themselves may become an unintended source of SC complexity. The study of voluntary certifications by Fransen et al. (2019) nicely illustrates this point: the multiplicity of standards and certifications as a SSCG tool can trigger "a race to the bottom," thus increasing both structural (number of competing standard-setting organizations) and dynamic complexity (competition between standards for company adoptions) for the chains.

On the other hand, existing complexities may induce a set of certain SSCG mechanism(s), challenge or even obstruct the effectiveness of certain SSCG mechanism. Take Corbett (2006) for example: various SC structural complexity dimensions promote the diffusion of ISO quality management system standards. Spatial complexity in form of geographical partition between early and late adopters,

vertical complexity emerging from stakeholder pressures, and horizontal complexity among firms in late-adopting countries together trigger the spread of industry standards as a governance mechanism.

In a case of Westpac, Keating et al. (2008) study how a focal corporate sustain its supplier relationships to develop a sustainable SC. The authors find out that monitoring small suppliers chisels away the company's resources, thus restrain it from effectively managing larger suppliers. Both structural and dynamic complexity in form of their many and diverse suppliers with different evaluation needs seems to introduce challenges to the lead firm, forcing it to design and adopt a more flexible toolkit customized to several supplier groups.

Next, we compare the two articles of Kalkanci and Plambeck (2020b) and Alvarez et al. (2010) to illustrate how the SC complexity lens brings out a coherent narrative from seemingly disparate lines of research. Although the two studies differ significantly with regard to scope of research, objects of interest, and methodological approaches, they share an underlying story of how SC complexity and SSCG reciprocally influence each other.

In the former study, mathematical modeling is the selected method to investigate how external investors' valuations of a firm and a disclosure mandate influence a firm's decision to learn about, to mitigate, and to disclose the social and environmental impact of their suppliers. Using the SC complexity lens, the results can be summarized as such: a complexity aspect (expectations from network stakeholders) induces several governance mechanisms (supplier impact learning and disclosure), which in turn introduce another complexity aspect (the extent and conditions in which SSCG mechanisms are executed).

In the later study, a longitudinal case study into Nestlé's Nespresso AAA sustainable quality program features the establishment and evolution of a company-based sustainable initiative. The authors describe the five-year development of such a program, from initial conversations between a few key convenors to a full-scale implementation with a large portfolio of suppliers. Applying the SC complexity lens once more, we can see that a complexity aspect (informal, limited inter-, and intra-organizational relationships) gradually shapes SSCG mechanisms (farmer training, assessment, and product tracking), which subsequently give rise to the need for a shift in complexity scales (toward a more formal and structured relationship with a wider range of stakeholders).

This back-and-forth tension is described but barely termed in the reviewed literature. The majority of the selected articles feature only one aspect of this tug-of-war, while the two-way relationship has not been under rigorous investigation. Understanding this obscure affair may help scholars rationalize practical choices of SSCG mechanisms as well as their potential of success and possible detrimental impacts on sustainability outcomes of certain circumstances.

The relationship between SSCG and SC complexities enhances literature synthesis by providing a comprehensive understanding of interdependencies among stakeholders, practices, and contexts. It allows for context-specific analysis of contemporary sustainable practices, incorporating a feedback-loop perspective which links

TABLE 9 Research gaps and agenda.

Review of the SSCG literature		Research gaps	Sample research questions
Themes	Transaccional/relational governance mechanisms	Contracts and contingent contractual designs Optimal/unfavorable conditions for contractual mechanisms Pre-contractual arrangements	<ol style="list-style-type: none"> 1. How do specific contingent contractual designs address environmental and social responsibilities across supply chain tiers? 2. Which contractual designs are suitable for centralized versus decentralized supply chain? 3. What are the key factors and conditions that lead to successful implementation of transactional governance? And what are the potential challenges? 4. In which settings may transactional mechanisms backfire? How can these risks be mitigated? 5. What types of pre-contractual arrangements are most conducive to achieving sustainability goals? How can they be integrated into supply chain processes?
	The network standpoint	Transaction governance in a network context The role of non-chain stakeholders	<ol style="list-style-type: none"> 1. How do different network structures and dynamics impact the effectiveness of transactional mechanisms? How can organizations navigate these complexities to achieve sustainable goals? 2. How has the adoption of third-party standards for sustainable outcomes developed? What are the implications for businesses and relevant stakeholders? 3. How have de-standardization and standard divestment evolved? What are the impacts of these trends on the effectiveness of transactional governance mechanisms? 4. What are the roles of non-chain stakeholders (local governments, intermediaries, and investors) in the selection and implementation of sustainable governance schemes? How can their involvement be optimized to achieve favorable outcomes?
	The role of lead firms	Interdisciplinary: Supply chain management and behavioral research Relational conflicts (Mis)trust Fairness	<ol style="list-style-type: none"> 1. What are the different types of relational conflict that arise in sustainable supply chain governance (SSCG)? How do they impact the dynamics between lead firms and other supply chain actors? How can these conflicts be effectively addressed and resolved to enhance SSCG? 2. Which strategies can lead firms employ to build and maintain trust among supply chain actors? How does this trust influence the overall sustainability outcomes in the supply chain? 3. What role does (the perception of) justice and fairness play in shaping dyadic relationships within the supply chain? How can lead firms utilize these factors to foster more collaborative and sustainable supply chain relationships? 4. What are the key characteristics and behaviors of effective supply chain leadership? How do they influence the sustainability performance of the entire supply chain ecosystem?
	Public/private governance	The embeddedness of global supply chains initiatives in local communities	<ol style="list-style-type: none"> 1. How do local actors in different communities respond to and engage with global sustainability requirements imposed by supply chains? What are the key factors that influence their level of participation and commitment? How can supply chain management practices be tailored to better align with local sustainability priorities? 2. How do legal, institutional, and cultural contexts of sourcing origins influence the progress and effectiveness of sustainability initiatives in global supply chains? What are the challenges and opportunities associated with aligning global sourcing practices with local regulations and norms? How can supply chain managers navigate these complexities to achieve sustainable progress? 3. What are the sustainability impacts of local embeddedness of global supply chains? How can supply chain governance strategies be designed to promote the benefits thereof? 4. What are the unique contributions that supply chain management can bring to this area of research? How can interdisciplinary approaches be leveraged to enhance sustainable outcomes for both supply chains and local communities?

TABLE 9 (Continued)

Review of the SSCG literature	Research gaps	Sample research questions
Conceptual model The supply chain complexity lens	Supply chain complexity as an underlying factor for the success of SSCG mechanisms	<ol style="list-style-type: none"> How can we extend the definition of supply chain complexity in the context of sustainable developments? How do they differ from traditional supply chain complexity? What are the relevant supply chain complexity dimensions in SSCM? How can these dimensions be identified, categorized, and measured to provide a comprehensive understanding of the complex interactions and relationships within sustainable supply chains? How do specific SSCG mechanisms complement or substitute each other? How can their interactions be optimized for better sustainability outcomes? Which criteria can be used to select multiple SSCG mechanisms in a given context? How can supply chain managers make informed decisions about the most appropriate combination of mechanisms to achieve sustainable goals while considering the unique complexities of their specific supply chain environment?

seemingly loose research streams together. Therefore, our framework connecting SSCG and SC complexity contributes to the SSCM literature on a conceptual level.

7 | RESEARCH AGENDA

From our thematic and conceptual review of the literature, we notice several knowledge gaps which may inspire future research. Table 9 summarizes the four themes emerging from our review work, the conceptual model of SC complexity and SSCG, the corresponding research gaps, and several research questions for further inquiries. We explain each orientation in the following passages.

First, our review reveals that despite the extensive research in the transactional mechanisms for sustainable outcomes, several in-depth issues call for further investigation. Contracts and (contingent) contractual designs seem to be a universal tool for focal firm management teams to deal with their upstream partners (Letizia & Hendrikse, 2016; Lun et al., 2015; Poppo & Zhou, 2014); nevertheless, the optimal conditions to deploy such a tool as well as unfavorable settings in which contractual mechanisms may backfire is merely studied by instance. In addition, pre-contractual arrangements have caught researchers' attention recently (Bird & Soundararajan, 2020). A more coherent narrative for contract-related is therefore called upon, for which theoretical modeling would be methodologically suitable.

Second, our results suggest that transactional governance in a network context is a promising yet underdeveloped research avenue. Recent shift in standards and certification implementation as a transactional tool, for instance, is an appealing research orientation (Thorlakson, 2018). External standard adoption evolution from symbolic to substantive and the de-standardization as well as standard divestment trends are examples of open questions in SSCG. In addition, the roles of non-chain stakeholders such as domestic governments (Imparato, 2010; Niu et al., 2017), brokers and intermediaries (Kaine & Josserand, 2018), and investors (Kalkanci & Plambeck, 2020a) have become increasingly significant. Understanding their impacts on the selection, execution, and evaluation of sustainable governance mechanisms in SCs would help increase the chances of favorable outcomes.

Third, the role of lead firms along with their dynamics with other SC actors is where SC management and behavioral research collide. Issues stemming from a relational governance approach such as principal–agency problem, (mis)trust, and fairness hold enormous potential for SCM scholars. Possible directions are relational conflict typology (Cheng & Sheu, 2012; Egels-Zandén & Hyllman, 2011), justice and fairness as antecedents of SC dyadic relationships (Poppo & Zhou, 2014), and SC leadership as an emerging relational approach toward SSCG (Gosling et al., 2017; Mokhtar et al., 2019).

Fourth, the embeddedness of global SCs initiatives in local communities is gaining traction as a promising research avenue (Lund-Thomsen & Nadvi, 2010; Vellema & Van Wijk, 2015). While local embeddedness and community development are commonly known as the concern of Society and Development researchers, SCM, with its expanding reach worldwide, must take on the responsibility too. Future research could

explore how local actors respond to global sustainability requirements (Huq et al., 2014), how environmental and social externalities are integrated into communities (Hajjar et al., 2019), and how legal, institutional, and cultural context of sourcing origins impact sustainable progress of global SCs (Abreu et al., 2012; Zhu & Morgan, 2018).

On a conceptual level, our review of the SSCG literature signals that more research efforts should be spent on the underlying SC complexity as an explanatory factor for the success of SSCG mechanisms. Bridging the two parallel streams (sustainability and complexity) in the OSCM dialog holds enormous potential for fellow researchers to consolidate relevant yet disconnected areas. With that direction in mind, a more comprehensive description of complexities should be set up to cover understudied areas such as chain of custody and intermediary roles of non-chain actors. We could start by extending the definition of SC complexity in the context of sustainable development, identifying relevant complexity dimensions, and measuring their impacts on SC sustainability performance. Example research questions could be “How can we extend the definition of SC complexity in the context of sustainable developments?”, “What are the relevant supply chain complexity dimensions in SSCM?”, and “What are the impacts of supply chain complexity on supply chain sustainability performance?”

Based on an adapted SC complexity lens, studies into the selection of SSCG mechanisms as a collective toolkit to address various facets of complexity would be a promising path to take (Koberg & Longoni, 2019). Several questions to consider are “How do specific SSCG mechanisms complement or substitute each other?” and “Which criteria can be used to select multiple SSCG mechanisms in a given context?”

8 | LIMITATIONS AND CONCLUSIONS

This study recognizes and acknowledges the methodological limitations inherent in literature reviews. Specifically, we acknowledge the potential shortcomings related to the sampling procedure, as highlighted in the works of Durach et al. (2017) and Tranfield et al. (2003). Our reliance on scientific databases such as Web of Science and Scopus, along with our subjective selection process performed by a single researcher, may have inadvertently excluded relevant papers, introducing a potential issue of generalizability to our findings. Additionally, our literature review only considers published works rather than unpublished or professional literature, leading to potential publication bias.

Furthermore, the scope of our interest and the timeframe within which we conducted the review may also impose limitations on our findings. By focusing on a specific area of research and setting a particular timeframe, we may have overlooked important studies published outside our defined boundaries. Consequently, this could impact the breadth and depth of our analysis. Lastly, we recognize the inherent challenges associated with replicating or validating the subjective nature of the review process, even when employing recommended review frameworks.

To conclude, this review offers an analysis of SSCG literature, presenting its variety in forms, dynamics, and developments. We consolidate our findings in a two-way relationship between SC complexity and SSCG mechanisms. Further research directions are suggested accordingly based on our observations of under-discussed topics and our conceptualization of current empirical discoveries.

Our study also offers several contributions with regard to SSCM. We first present to our audience an overview of common SSCG mechanisms, followed by an explanation of how various aspects of a SC such as network and a firm's position within their SC may influence the implementation and outcomes of firms' efforts. We then introduce the SC complexity lens as a conceptual framework to recognize and evaluate different SSCG mechanisms in their context of application. The framework, on the one hand, may help our audience identify the complexities a certain SSCG scheme expects to control as well as the ones it may trigger. Identifying the structural and dynamic complexities of a given SC, on the other hand, may explain and evaluate existing SSCG practices while predicting suitable ones for future adoption.

Further research avenues are subsequently presented based on our findings. We not only draw the audience attention to the role of transactional governance mechanisms, especially in a network context, but also call for further interdisciplinary investigations regarding relational governance modes and local embeddedness of the global SC. At a broader scope, our analysis of the literature on SSCG (SSCG) suggests the need for further studies on the role of SC complexity in explaining the effectiveness of SSCG mechanisms. The convergence of sustainability and complexity within the operations and SC management (OSCM) field presents an opportunity to bridge disconnected areas. A comprehensive understanding of these complexities will enhance our knowledge of SSCG and its implications for SSCM.

AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Linh Thuy Nguyen. The first draft of the manuscript was written by Linh Thuy Nguyen and was critically revised by Rob Zuidwijk. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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No conflicts of interest.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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