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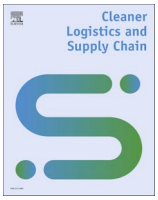

Crossing the chasm: investigating the relationship between sustainability and resilience in supply chain management

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ABSTRACT

In recent years, several studies have been conducted on the joint investigation of sustainability and supply chain resilience. However, they revealed the presence of divergent viewpoints in discussing the sustainability-resilience relationship. To fill this gap, this paper presents a Systematic Literature Network Analysis that combines the traditional systematic literature review with bibliometric techniques to analyse how the relationship between supply chain sustainability and supply chain resilience has been addressed by previous literature in the main research thematic areas of the field. The analysis revealed the presence of four perspectives for organizing the concepts of supply chain sustainability and supply chain resilience, sustainability and resilience are considered to be two different concepts that rely on separate and distinguishable goals, resilience is considered a component of sustainability, sustainability is considered a component of resilience, and they are considered as synonyms. The rationale for the presence of different perspectives can be identified in the level of detail with which sustainability and resilience objectives are considered. As a result, an original framework is developed to explain the different perspectives and link them with the emerging research streams of the literature. Research allows for providing conceptual clarity on definitions and the combination of resilience and sustainability to build a solid theoretical background for academics and to help effectively drive managerial decisions.

1. Introduction

In recent years, sustainability has gained importance as an ethical issue and as a managerial choice. Nowadays, companies are required to engage in the sustainability cause and integrate sustainability goals in their supply chains to be law-compliant, satisfy market needs, and follow new policy requirements (Wu et al., 2016). Sustainable Supply Chain Management (SSCM) has gained considerable interest to manage supply chains while integrating goals with regards to the triple bottom line (TBL) aspects, i.e., economic, environmental, and social (Seuring and Müller, 2008).

At the same time, recent disastrous events, such as the Covid-19 pandemic, have drawn attention to the importance of having supply chains prepared to react to abrupt disruptions (Paul et al., 2021). However, the latest research has highlighted that supply chains show difficulties in dealing with unpredictable events caused by the increasingly globalized and dynamic environment in which they operate (Chowdhury et al., 2020; Hosseini et al., 2019). It is recommended that supply chains increase their resilience, using the ability to "anticipate", "adapt" and "respond" to external disruptions to face disturbances, eventually switching to a better state (Ali et al., 2017; Christopher and Peck, 2004; Ponomarov and Holcomb, 2009). Thus, along with sustainability, supply chain resilience has become a new paradigm of supply chain management (SCM).

Supply chain sustainability and supply chain resilience have been investigated in recent decades, though the research on this subject is still incomplete (Fahimnia et al., 2019). In particular, viewpoints on the relationship between sustainability and resilience in supply chains are divergent and further studies are needed to provide conceptual clarity on the definitions and combinations of the two elements that can efficiently guide managerial decisions and communicate them to external stakeholders (Marchese et al., 2018; Negri et al., 2021). In fact, in some contexts, the distinction between sustainability and resilience is well defined and they appear to be two stand-alone concepts (Ivanov, 2018; Jabbarzadeh et al., 2018). Yet, in other cases, the boundaries between them are blurred and there is no univocal understanding of whether sustainability includes resilience attributes and vice versa (Ivanov, 2020; Zhu and Krikke, 2020). Ambiguity in the interpretation of

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similarities and differences in sustainability and resilience potentially leads to problems in their implementation (Marchese et al., 2018). Also, within private and public organizations, a common consensus on the conceptual relationship between supply chain sustainability and supply chain resilience is missing. Achieving resilience is presented as something enabled by the application of sustainable principles (the European Green Deal, SDGs) or the opposite (McKinsey Sustainability, 2020). In extreme cases, the words "sustainable" and "resilient" are even used as synonyms (The Coca Cola Company, 2020).

Although recent research endeavours have been made in the direction to systematize the literature on supply chain sustainability and supply chain resilience, related reviews published on the topic (e.g., Bui et al., 2021; Negri et al., 2021; López-Castro and Solano-Charris, 2021; Zavala-Alcívar et al., 2020a) have not addressed the research gap of the existence of ambiguity in the definitions and relationship between supply chain sustainability and resilience. In particular, the review of Bui et al. (2021) applies a data-driven approach based on content and bibliometric analyses to identify temporal trends and geographic distribution of the literature on sustainable supply chains, disruptions management and ambidexterity of organizations. Zavala-Alcívar et al. (2020a) conduct a systematic literature review to inform the management of resilience and the improvement of sustainability in the supply chain. However, these reviews adopt a perspective more focused on resilience than sustainability: the works are primarily oriented towards the analysis of resilience and risk management in supply chains where the role played by sustainability is functional (Bui et al., 2021) or integrative (Zavala-Alcívar et al., 2020a) to the ability to manage risks and disruptions.

Whereas the reviews of López-Castro and Solano-Charris (2021) and Negri et al. (2021) adopt a balanced approach in the analysis of the literature on supply chain sustainability and resilience. López-Castro and Solano-Charris (2021) propose a literature review on the integration of sustainability and resilience in the supply chain network design. As an interesting element, the authors consider multiple levels of decision-making (strategic, tactical, and operational) to combine resilience and sustainability when designing the supply chain network. The review assumes sustainable and resilience criteria as distinguishable and separated without further investigating their relationship on a more conceptual basis. Negri et al. (2021) review the existing body of knowledge through four dimensions of analysis: concepts and theory building, implementation (practices, pressures or drivers, decision-making, and barriers), performance and measurement, and future research agenda. In the discussion of the first dimension the authors highlight that "general confusion remains about the relationship between sustainability and resilience" (Negri et al., 2021, p. 9) and that "more research is needed to establish the theoretical building blocks of sustainable and resilient supply chains…to clarify the concepts and establish a common ground on which to build future research" (Negri et al., 2021, p. 15).

Our work attempts to answer the call for more research to establish a solid theoretical background to distinguish these concepts and shed light on how they are combined together.

Specifically, the paper aims at *clarifying the conceptual relationship between sustainability and resilience in the SCM field by analysing how previous contributions have addressed it.*

We conducted a SLNA (Systematic Literature Network Analysis) which combines the traditional literature review methodology with bibliometric analysis techniques. The methodology allowed us to highlight the main research topics and emerging trends in SCM while analysing how the relationship between supply chain sustainability and supply chain resilience has been developed in these research areas over time. The work provides insights for both academics and practitioners dealing with sustainability and resilience in the area of SCM.

The paper is organized as follows. Section 2 provides guidelines of the methodology used. In section 3 results of the literature review are reported. Section 4 is devoted to discussing the results, presenting a framework to interpret them and providing possible future research directions. In section 5 conclusions are drawn.

2. Methodology

The SLNA approach integrates the Systematic Literature Review (SLR) methodology with bibliographic networks techniques. The adopted methodology is divided into two phases, as shown in Fig. 1.

The first phase consists of conducting an SLR. A SLR is a "replicable, scientific and transparent approach" (Tranfield et al., 2003, p. 209) used to collect and summarize relevant information across a wide range of documents in a thorough way (Denyer and Tranfield, 2009). By following the approach proposed by Denyer and Tranfield (2009), we performed the main steps of the SLR: question formulation, locating studies, and study selection and evaluation. As a result, this first phase produced the set of selected documents. To collect the data, we relied on Scopus (https://www.scopus.com), which is a peer-reviewed literature database accounting for a wider collection of 80 million curated documents in the management and social science fields, including scientific journal articles, conference proceedings, books and book chapters (Shishodia et al., 2021). The use of other peer-reviewed article databases, i.e. Web of Science and Google Scholars, was explored as well. However, we found out that by launching the same research string on Scopus and other databases, the batch of papers retrieved using Scopus was bigger than the others and that the articles included in it were inclusive of those resulting from using other databases. In addition, Shishodia et al. (2021) also highlight that the Scopus database seems to be more accurate than Web of Science from an indexing error perspective. For this reason, we decided to rely only on Scopus.

In the second phase of the SLNA, we applied bibliometric network analysis techniques. At first, we performed the citation network analysis (CNA), which is a bibliometric established method to conduct a literature review based on the analysis of networks of papers where nodes in the network represent articles and links between them represent citations. The analysis involving such citation networks implies that emerging nodes in the network are those articles with the highest number of citations (Cai and Lo, 2020; Xu et al., 2022). But despite high-cited papers are often representative of influential and word-class works (Zhao and Strotmann, 2015), papers may receive a low number of citations regardless of the relevance of their content for several reasons (e.

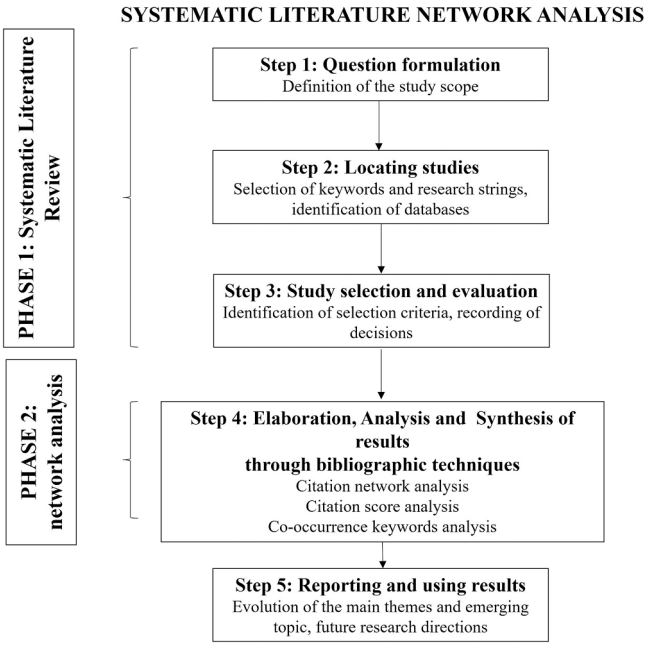


Fig. 1. Systematic literature network analysis methodology adapted from Denyer and Tranfield (2009), Ali et al. (2017), Colicchia et al. (2019).

g., they have only been recently published). Consequently, to overcome the limitations of the CNA and to also consider potential influential works that did not emerge within the CNA, we relied on other bibliometric analyses: the citation score analysis (CSA), and the papers' keywords analysis (Colicchia et al., 2019; Shishodia et al., 2021).

2.1. First phase of the systematic literature network analysis: Systematic literature review

The SLR represents the first phase of the SLNA. The three initial steps of the SLR have as an outcome the group of works to be examined in the state-of-the-art review (Denyer and Tranfield, 2009; Rousseau et al., 2008).

2.1.1. Question formulation

The first step is crucial to correctly and unambiguously define the scope of the research study by formulating an appropriate research question (Denyer and Tranfield, 2009). Our research objective is to study how previous literature has interpreted the relationship between sustainability and resilience within the SCM research areas.

2.1.2. Locating studies

After the definition of the research scope, the SLR proceeds with the selection of the search keywords with the aim of searching relevant contributions in databases to answer the research questions (Denyer and Tranfield, 2009). In line with other works in the field (Bui et al., 2021; Shishodia et al., 2021) we identified a list of synonyms for the area of sustainability, resilience, and supply chain. A list of 10 keywords was located for supply chain sustainability (sustainability, sustainable, sustainable development, environmental impact, circular economy, green management, green supply chain, climate change, social impact, green, eco-efficiency); a list of 6 keywords for supply chain resilience (resilience, resilient, risk management, risk assessment, disruption, risk mitigation); and a list of 4 keywords for supply chain (supply chain, supply chain management, supply chain design, supply network). The identified keywords were combined with Boolean operators to compose the final research string under the advice of a panel of experts composed of five academic professionals in the areas of supply chain sustainability and supply chain resilience (Table 1). The discussion with the panel of experts was organized in the form of a focus group where the three authors performed the role of moderators. The focus group lasted about one and a half hours and it ended only when a common consensus was reached on the research string to be applied. The selected string was ("sustainab*" OR "eco-efficien*" OR "green*") AND ("supply chain*" OR "supply network*") AND ("resilien*" OR "business continuity").

Table 1
Experts' profile.

Expert	Academic position	Area of expertise	Years of experience
#1	Ph.D., full professor in Supply Chain and Logistics	Supply chain sustainability, Sustainable logistics, Circular economy, Supply chain resilience	35
#2	Ph.D., associate professor in Supply Chain and Logistics	Supply chain sustainability, Circular Economy, Supply chain risk management, Supply chain resilience	15
#3	Ph.D., associate professor in Supply Chain and Logistics	Supply chain sustainability, Sustainable agri-food supply chains, Supply chain risk management, Supply chain resilience	15
#4	Ph.D., senior researcher in Logistics	Sustainable and resilient performance measurement in supply chains, Digital supply chains, Supply chain risk management, Supply chain resilience	15
#5	Ph.D., senior researcher in Logistics	Green logistics, Green supply chain management, Collaborative logistics, Supply chain risk management	10

2.1.3. Study selection and evaluation

To select and evaluate only those documents pertinent to the review questions, we used a list of inclusion/exclusion criteria that were recorded to maintain the transparency of the process (Denyer and Tranfield, 2009). Launching the research string in April 2021, we obtained 470 documents that were initially screened based on a first batch of inclusion criteria (Table 2).

By applying the first batch of selection criteria, the initial collection of papers was restricted to the 409 papers which could potentially be included as candidates for the literature review process. It is worth highlighting that in this phase we did not apply any restriction on publication years, thus we considered the widest possible time horizon of the articles going from 2004 to 2021. This choice is motivated by considering that one of the objectives of the study is to analyse how the relationship between supply chain sustainability and supply chain resilience has been developed in the research area over time. Specifically, the CNA allows for analysing the evolutionary path of knowledge in a particular field based on the flow of knowledge going from citing papers to cited ones (Colicchia and Strozzi, 2012). The completeness of the analysis improves if no restriction is applied to the years of publication, thus considering the years when the topic first emerged up to the present day.

Table 2
Inclusion criteria applied during the study selection and evaluation phase of the systematic literature review.

	Inclusion criterion	Motivation
First batch of inclusion criteria: application of the Scopus database filters	Papers in peer-reviewed journals	Peer-reviewed journals are considered to be of higher quality. This criterion was automatically applied since all the documents were retrieved from Scopus, which is a database of peer-reviewed documents.
	Papers published in the English language	English is the language used by researchers in the field
	Papers in Business, Management and Accounting and related subjects (Computer Sciences, Decision Sciences, Economics, Econometrics, Engineering, Environmental Science, Finance and Social Sciences)	Selection of papers pertinent to the research scope. i.e. supply chain management
	Papers with the keywords in the Title or Abstract	Selection of articles with high relevance
	Papers with no limits to the publication year	Widest possible time horizon to analyse the evolutionary path of the field
Second batch of inclusion criteria: reading of the title, abstract and full text	Papers dealing with the supply chain as the main research subject	Papers pertinent to the research scope that is supply chain management
	Papers addressing both sustainability and resilience	Presence of both sustainability and resilience topics to analyse their relationship
	Exclusion of non-refereed proceeding papers	Referred articles are considered to be of higher quality

Then, after having read the abstract and the full paper when necessary, a further 188 papers were excluded, as they were considered not pertinent to the research scope. This was done by applying a second batch of inclusion criteria (Table 2). In the end, 221 papers (Fig. 2) were deemed worthy of study.

2.2. Second phase of the systematic literature network analysis: Network analysis

In the second phase of the SLNA, we performed the bibliometric analyses, specifically the CNA, the CSA and the co-occurrence analysis of the papers' keywords. Table 3 summarises the key information of each analysis performed.

2.2.1. Citation network analysis (CNA)

The CNA assumes that in a research field, papers tend to cite each other to add knowledge to a particular topic (Colicchia and Strozzi, 2012). Thus, a paper that builds on the knowledge provided by other articles cites them and increases their number of citations. Starting from the assumption that the number of citations generally expresses the significance and the impact of a work in a research area, this mechanism creates networks of papers that are able to represent the evolutionary path of the knowledge in a research field. The CNA was performed using Pajek software, which is utilized to create and visualize networks. The software's algorithm allows for identifying a network of connected papers, where nodes represent papers and links between them are citations. Citations go from citing papers to cited ones and they describe the flow of knowledge. Within the 221 nodes of the selected papers, the software outlined some connected components, which are sets of nodes linked by citation links. In this case, the algorithm identified a biggest connected component made up of 107 papers, and several minor components of a few articles. The CNA yields the best results when considering components with a consistent number of papers, so we focused on analysing the largest connected component. The largest connected component of 107 items was analysed by applying the main path analysis and the clusterization of articles.

The main path contains 18 papers, published from 2008 to 2021. It is obtained by using a specific algorithm within the Pajek software. The algorithm allows for visualizing those nodes that are connected by stronger citation links; for this reason, they are able to represent the evolution of the knowledge and the main thematic areas developed in a research field. As the main path highlights those articles that build on previous articles but continue to be seminal works in a research area, the analysis makes it possible to identify the most relevant articles in different time periods that form the backbone of a research topic and to denote the dynamic behaviour of the research field under study (Colicchia and Strozzi, 2012). By splitting the main path along a time scale, it is possible to provide the papers' chronological development. Papers are divided according to three temporal segments: papers published up to 2013, papers published from 2013 up to 2018, and papers published from 2018 onwards. The choice of the three temporal segments is based on the identification of three publishing phases as explained in **Section 3.1.**: 2004–2013, 2013–2018 corresponding to the first publishing trend and 2018–2021 corresponding to the second publishing trend.

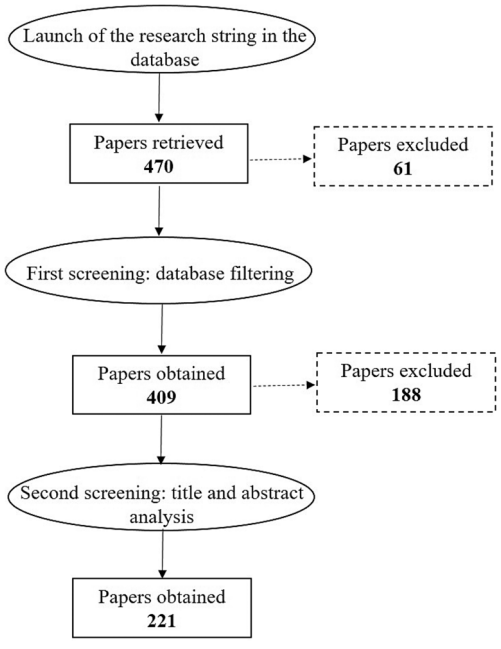


Fig. 2. Study selection and evaluation based on PRISMA framework (Moher et al., 2009).

Table 3
Bibliometric analysis developed in the second phase of the Systematic Literature Network Analysis.

Bibliometric technique	Software	Description	Main benefits
Citation Network Analysis: main path	Pajek software	Visualization and identification of nodes (i.e., articles) that are connected by stronger citation links	Representation of the evolution of knowledge in a particular research area by highlighting the most relevant articles in different time periods that form the backbone of a research topic and the main thematic areas developed
Citation Network Analysis: clusterization	Pajek software	Visualization of clusters of nodes (i.e., articles) connected by citation links	Identification of groups of articles focusing on specific research areas, with possibility to extract the underlying themes
Citation Score Analysis		Classification of articles according to the Citation Index	Identification of the seminal works (i.e., most cited articles) and of potential breakthrough articles (i.e., articles that obtained a large number of citations in a small time window)
Analysis of the papers' keywords	VoS viewer software	Visualization of clusters of nodes (i.e., keywords) connected by co-occurrence links (i.e., links due to the presence of the keywords in the same article)	Detection of the main research topics and trends within a specific research domain

The clusterization of articles methodology consists of identifying clusters of nodes within the group of connected papers by applying the Louvain community detection algorithm, which is available in the Pajek software. The Louvain algorithm, introduced by Blondel et al. (2008), is a hierarchical clustering algorithm for communities' detection that has become popular for its property to detect community partitions in a fast and memory-efficient manner (Lu et al., 2015). Since research works that cite each other tend to develop the same thematic area, the clusters of articles emerging from the CNA are useful to identify research trends and underlying themes within a specific research domain (Colicchia et al., 2019; Shishodia et al., 2021). Compared to other methodologies used to generate clusters of nodes within citation networks, the clusterization algorithm in the Pajek software allowed both to generate clusters and visualize them using a unique software rather than using multiple ones. An example is the study of Shishodia et al. (2021), which uses R for statistics software to perform the papers' clusterization based on citations and then VoS viewer to visualize them. As far as we know,

clustering with Pajek is the most effective way to generate and visualize clusters based on citations.

2.2.2. Citation score analysis (CSA)

The performed CNA does not take into account small connected components and isolated papers. As explained before, to overcome CNA limitations and include all relevant works in the analysis, we applied additional bibliometric techniques, that are, the CSA and the co-occurrence analysis of the papers' keywords, presented in the next paragraph.

In the CSA, the set of 221 papers retrieved was ranked according to a Citation Index (CI), which is evaluated by dividing the number of total citations collected by an article in the published literature until the last year of publication considered by the research (in this case 2021) by the number of years since its publication. The CI was assessed based on the methodology applied by Strozzi et al. (2017) and Colicchia et al. (2019). The CI is the average number of citations obtained by a paper in a year, which allows articles to be considered on an equal level regardless of their lifespan of publication. Recently published articles that have obtained a high number of citations in a short time may have a higher CI than less recently published articles with a higher number of total citations. Hence, classifying papers according to the CI makes it possible to take into account articles that have received significant consideration from the scientific community, as well as breakthrough works published recently that have a number of total citations lower than the oldest ones.

2.2.3. Keywords analysis of papers

The co-occurrence network analysis is effective in detecting the main research topics and trends within a particular research area (Colicchia and Strozzi, 2012).

The preliminary assumption behind the adoption of the co-occurrence analysis is that the content of a papers is adequately represented by its keywords (Colicchia et al., 2019). In the co-occurrence network, nodes represent keywords and links between them exist if they appear together in the same article. The number of times two keywords occur in the same article influences the link weight. Generally, many co-occurrences around the same group of words suggest common research patterns (Colicchia et al., 2019; Ding et al., 2001).

The co-occurrence analysis of the papers' keywords was executed with VoS viewer software (Van Eck and Waltman, 2014), which adopts the VOS (Visualization of Similarities) clusterization technique (Shishodia et al., 2021).

Before running the algorithm, the keywords were normalized through the elimination of final "s" (e.g., "supply chain, "supply chains") and the standardization of words with and without dashes (e.g., "multi-optimization", "multi optimization"). During the analysis, the minimum number of occurrences between keywords was set to five (which is the software default value). As result, we obtained 63 keywords and among them, we selected the 50 with the higher number of occurrences since they are the most representative.

3. Results

In the following section, we present the results of the descriptive analysis and the bibliometric network analyses. The descriptive analysis was obtained by elaborating on the main statistical data available for the list of the 221 selected papers. Instead, the bibliometric network analyses were obtained by performing the CNA, the CSA and the keywords analysis of the 221 selected papers that constitute the second step of the SLNA methodology.

3.1. Descriptive analysis

The list of the top journals the retrieved articles are published in (Table 4) shows that the first five journals account only for 26.6% of the total number of papers. This suggests that a single group of journals does not master the field and that the articles belong to several different sources.

Table 4
Number of papers in the top 5 journals.

Journal	No. of articles	(%)
"Journal of Cleaner Production"	21	9.5
"Sustainability Switzerland"	16	7.2
"International Journal of Production Research"	11	5.0
"Annals of Operation Research"	6	2.7
"IEEE Transactions On Engineering Management"	5	2.2

Analysing the time distribution of articles from 2004 to 2021 (Fig. 3), it appears that from 2018 to 2020 the number of publications has grown strongly: it has tripled, indicating that the research area is extremely topical. Moreover, by looking at trends in publishing highlighted in Fig. 3 it is possible to identify two years marking the beginning of increasing trends of publications in the field. The first trend goes from 2013 to 2018: in these years the number of publications significantly increased compared to previous ones. The second trend goes from 2018 to 2021: in these years, the number of articles further increased compared to that of the first trend. The average number of articles published per year from 2018 to 2020 is more than double the number published in the years before 2018.

3.2. Citation network analysis (CNA)

3.2.1. The main path

By analysing the articles in the first temporal batch (Fig. 4), it is possible to recognise that the research starts focusing on two streams: the creation of sustainability frameworks and the exploration of LARG (Lean, Agile, Resilient, Green) supply chains. In the first research stream, articles investigate the role of sustainability, presented as a new promising strategic direction that can create both business and environmental value, as well as increase network competitiveness (Moore and Manring, 2009; Park et al., 2010). Research efforts target sustainability, giving resilience only a marginal position and revealing ambiguous perspectives on the sustainability-resilience relationship.

In fact, resilience is interpreted either as the new state of equilibrium generated by the adoption of sustainable strategies (Moore and Manring, 2009), or it is described as a component of sustainability. The latter perspective is justified by considering that a resilient firm that easily adapts to environmental regulatory regimes and social pressures is also more sustainable (Park et al., 2010).

Whereas the second research stream introduces the topics of sustainability and resilience in LARG supply chains. The LARG paradigm is appointed as the foundation of competitive SCM. In high-risk and continuously changing scenarios, supply chains need to quickly respond to customer demand (be agile), to react effectively to unforeseen disturbances (be resilient), to be compliant with environmental responsibilities (be green), and eliminate non-value added processes (be lean). Sustainability and resilience are described as two separate entities, with independent conceptual existences, but both fundamental for the business. They need to be jointly implemented, along with the agility and the lean management paradigm, to enable a more competitive supply chain (Cabral et al., 2012; Carvalho et al., 2011).

By 2014, papers and thematic areas start to connect and converge on similar perspectives. Studies appearing in this temporal batch represent a major step forward in the joint study of sustainability and resilience in supply chains. These articles present a balanced view in dealing with the topics of sustainability and resilience since both are simultaneously and equally considered in managing supply chains.

The work of Azevedo et al. (2013), which introduces an "eco-resilient index" to tackle both sustainability and resilience in supply chain processes, denotes a decoupling point in the evolution of the literature. For the first time, sustainable and resilient performances are addressed

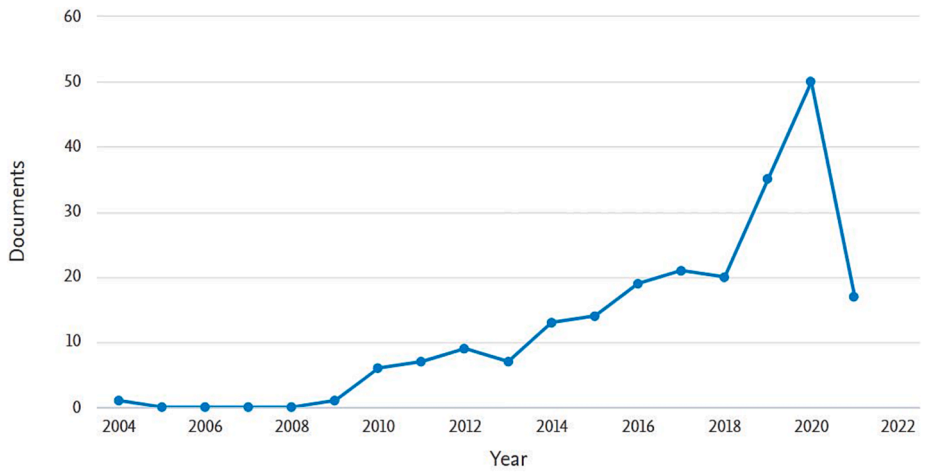


Fig. 3. Distribution of articles over time by year of publication from 2004 to 2021.

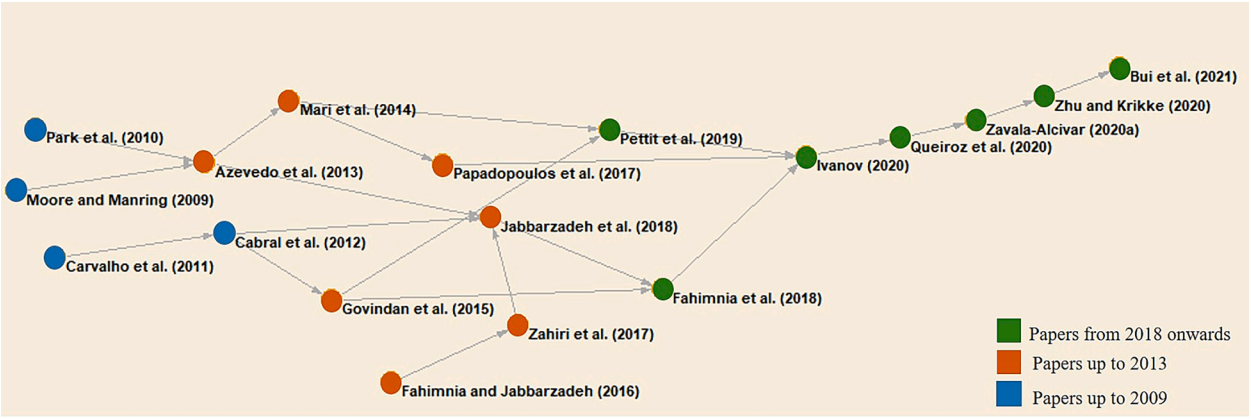


Fig. 4. Main path analysis of papers. The main path contains 18 papers published from 2008 to 2021 and divided by the authors into three temporal segments.

concurrently and exclusively. Indicators addressing green and resilient behaviours are identified separately and then they are combined together to build the composite index.

In the same years, the research stream of LARG supply chains continues growing with the work of Govindan et al. (2015), which no longer treats lean, agile, resilient and green principles as separate silos but identify inter-relationships among them and their effects on supply chain performances. The work demonstrates that resilient, sustainable and lean practices present both accordant and trade-off objectives (e.g, the use of just-in-time reduces inventory wastes but increases the risk of failure).

The topic of sustainability and resilience started to be addressed in the design of sustainable-resilient supply chain networks, as well (Fahimnia and Jabbarzadeh, 2016; Mari et al., 2014; Zahiri et al., 2017). The combination of supply chain sustainable and resilient objectives - pertaining to two separate but equally important attributes of the supply chain - is developed mainly through quantitative methodologies (e.g., multi-objective optimization models).

Recent research works published from 2018 onwards have disproved a balanced perspective between sustainably and resilience. A bunch of papers continue studying sustainable and resilient network design (Fahimnia et al., 2018; Jabbarzadeh et al., 2018), but at the same time, another group of papers more focused on resilience began to establish. The spread of the Covid-19 pandemic in 2020 emphasized the need to reconfigure supply chains to be prepared for uncertainties and to withstand future risks (Queiroz et al., 2020; Zhu and Krikke, 2020). This motivated the emergence of studies focused on analysing definitions, frameworks and strategies to enhance supply chain resilience by considering sustainability aspects (Ivanov, 2020). The primary aim of supply chains is "to maintain themselves and survive in a changing environment through a redesign of structures and re-planning of performance with long-term impacts" (Ivanov, 2020, p.1). Accordingly, sustainability is mainly interpreted as the ability to enhance supply chain survivability to external high-impact changes (i.e., social and environmental) and it contributes to building resilience (Ivanov, 2020; Queiroz et al., 2020). In extreme cases, sustainability is even presented as synonymous with resilience, when it is interpreted as the ability to survive external shocks (Pettit et al., 2019; Zhu and Krikke, 2020). To sum up, this branch of papers presents new frameworks and conceptual models to combine resilience and sustainability within supply chains, with resilience being the primary goal.

The last node of the path tries to align resilient and sustainable perspectives by introducing the organization ambidexterity: organizations need to develop ambidexterity by prioritizing sustainability objectives and by having at the same time sufficient redundancy to withstand disruptive events (Bui et al., 2021).

3.2.2. *The clusters*

The analysis returned seven clusters made respectively by 15, 12, 25, 19, 21, 3 and 12 nodes (Fig. 5). The Appendix provides a list of the articles contained in each cluster.

3.2.2.1. The first cluster: Supply chain sustainability frameworks. In this cluster, papers deal with the management of SSCM. A group of authors

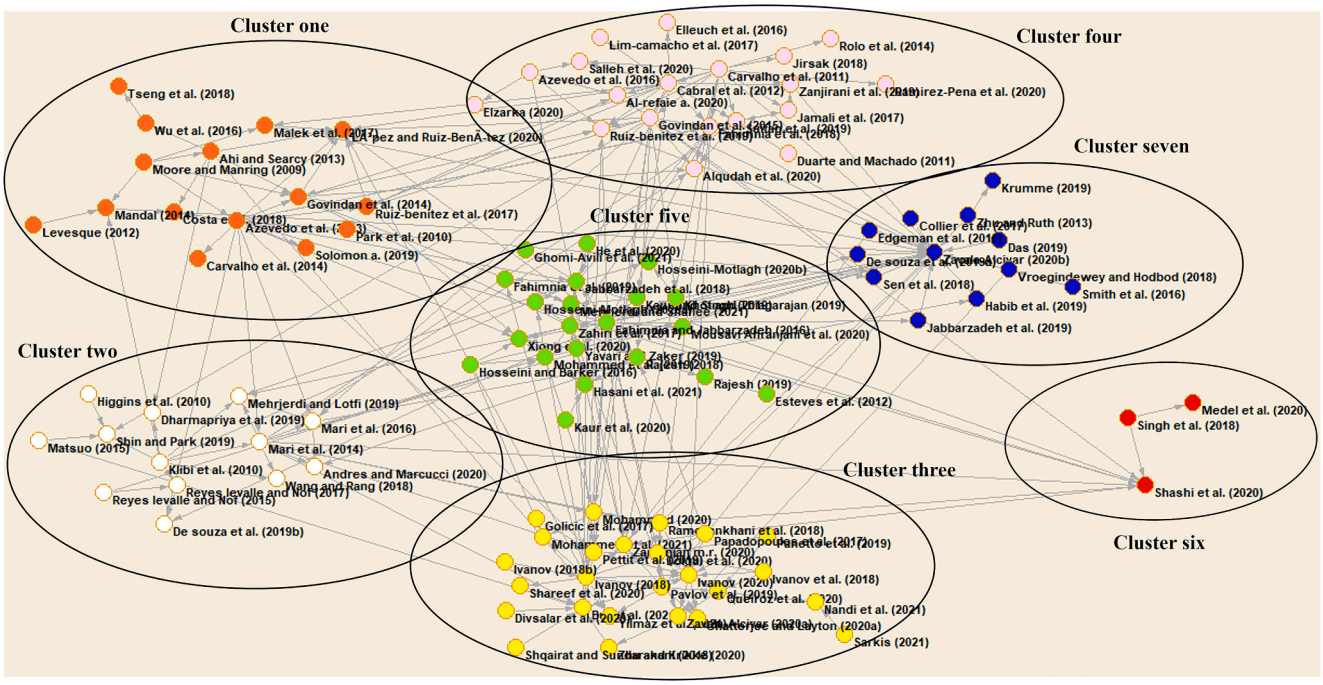


Fig. 5. Clusterization of papers by applying the Louvain community detection algorithm. The analysis returned seven clusters made respectively by 15, 12, 25, 19, 21, 3 and 12 nodes.

analyse SSCM strategies and introduce the concept of resilience as a characteristic or a dimension of sustainability. According to Park et al. (2010), who examine the implementation of sustainable business models in Chinese supply chains, the implementation of sustainable strategies is evaluated at different levels of analysis and includes four business dimensions: revenue, resiliency, legitimacy, and image. Wu et al. (2016) consider SSCM as a wider concept that cannot be covered entirely by the TBL, but has to be enlarged to the aspects of resilience. The same perspective is proposed by Govindan et al. (2014) and Ruiz-Benitez et al. (2017), who in the context of LARG supply chains demonstrate that supply chain risk management practises have an impact on SSCM performances.

Moore and Manring (2009) and Tseng et al. (2018) continue focusing on sustainability and, on the contrary, consider supply chain resilience to be a consequence of being sustainable in the long term. Indeed, according to Moore and Manring (2009), p. 276 "the implementation of sustainable strategies will become essential for addressing the systemic problems that underlie enterprise resilience", and according to Tseng et al. (2018) the improvement of resilience is one of the top weighted aspects of implementing sustainability practices.

3.2.2.2. The second cluster: Resilient supply chains for long-term survivability. The second cluster proposes frameworks to build supply chain resilience, showing a clear focus on resilience rather than on sustainability. The research focuses on models to improve supply chain resilience/robustness to ensure long-term survivability (Klibi et al., 2010). Supply chains need to improve supply chain resilience to increase supply chain sustainability (Shin and Park, 2019), where sustainability is presented as the ability to be stable and resilient to disruptive risks. Thus, it is the ability to be resilient in the long term (Andres and Marcucci, 2020; Wang and Ran, 2018). Sustainability loses its references to TBL to be identified primarily as having the ability to withstand disturbances and maintain a state of equilibrium: it is essentially interpreted as a synonym of resilience.

3.2.2.3. The third cluster: Frameworks for building resilience through sustainability. The third cluster presents papers that are not combined from a single perspective and that span different research areas. However, they show a common characteristic, which is the theorization of new frameworks to build resilience through sustainability. With respect to the previous cluster, in this one there is a greater effort - mainly born from the lesson learned from the Covid-19 pandemic (Queiroz et al., 2020; Sarkis, 2021) - to also consider and integrate sustainability aspects when managing resilience in supply chains.

In the cluster, a main research branch is made up of papers that attempt to propose frameworks and conceptual models to design supply chains that are able to withstand unpredictable events, where sustainability has an own conceptual existence. Sustainability and resilience are considered to be two separate but interconnected aspects that concur, building supply chains that are able to adapt in the face of disruptions (Mohammed et al., 2021; Nandi et al., 2021). At the same time, sustainability can also be considered a leverage to build a more resilient supply chain, that is, the supply chain's capacity to withstand disturbances embodied in the concepts of flexible supply chains (Ivanov et al., 2018), reconfigurable supply chains (Dolgui et al., 2020), and viable supply chains (Ivanov, 2020). Accordingly, sustainability enhances the ability "to survive global shocks that create societal and economic transformations" (Ivanov, 2020, p.1).

3.2.2.4. The fourth cluster: Lean, agile, resilient and green (LARG) supply chains. The papers of the fourth cluster analyse the application of green and resilient strategies in LARG supply chains. A crucial topic is how to increase competitiveness through the LARG paradigm and the effects of LARG criteria on the improvement of competitive performances in supply chains (Cabral et al., 2012; Jamali et al., 2017). Another branch of papers addresses how to combine LARG practises through the analysis of synergies and differences among lean, agile, resilient and green strategies (Carvalho et al., 2011; Ruiz-Benitez et al., 2019). Moreover, many works develop indexes to assess LARG performances and create benchmarks for firms (Azevedo et al., 2016; Elzarka, 2020). Within LARG supply chains, sustainability and resilience are treated as separate and equally important strategic pillars of the network with synergic or divergent objectives.

3.2.2.5. The fifth cluster: Sustainable and resilient supply chain network design. The papers of the fifth cluster show a clear research path: they propose models to design sustainable and resilient supply chain networks. Resilience and sustainability are considered to be two autonomous concepts with contrasting or accordant objectives and they are embedded in the problem of determining the optimal supply chain configuration also with respect to cost-efficiency performances. The optimal SC configuration is obtained by adopting quantitative methodologies based on simulation, multi-objective optimization (Hasani et al., 2021; Hosseini-Motlagh et al., 2020b) and trade-off analyses (Fahimnia and Jabbarzadeh, 2016). Within this research stream, studies present different scopes: some address the design of the entire supply chain, while others a specific supply chain process (e.g., the supplier selection (Hosseini and Barker, 2016), or the sourcing process (Jabbarzadeh et al., 2018). A further distinction is the focus on a specific pillar of sustainability with reference to the TBL. Most of the papers consider only the environmental pillar (Hasani et al., 2021; Hosseini and Barker, 2016); others consider the combination between the environmental and economic dimensions (Mohammed et al., 2019; Yavari and Zaker, 2019); some others take into account the economic and social dimensions (Hosseini-Motlagh et al., 2020a; b). At least, some papers investigate the three pillars at the same time (Fahimnia et al., 2019; Mehrjerdi and Shafiee, 2021; Zahiri et al., 2017).

3.2.2.6. The sixth cluster: High-impact events threatening supply chains. The papers of this cluster discuss how to build resilience to recover from natural disasters and, more in general, from huge impact events. In the long term, resilience produces sustainability, which is associated with the property of surviving against natural disturbances. The paper by Shashi et al. (2020) provides insights on how to improve resilience at the firm and supply chain level, whereas the other two papers (Medel et al., 2020; Singh et al., 2018) widen the focus to the extended supply chain, considering the societal level. Both analyse recovery from disasters and introduce the idea of humanitarian supply chains. At a higher organizational level, inter-governmental and non-governmental agencies, along with private firms, have a crucial role in building sustainable-resilient supply chains.

3.2.2.7. The seventh cluster: Sustainability and resilience in agri-food supply chains (AGFSCs). The central thematic area of the seventh cluster is the study of resilient and sustainable strategies, barriers, and enablers in food supply chains in response to high-risk events. Huge impact disruptions, such as natural disasters or epidemics, threaten agri-food and food value chains, producing negative effects on the social, ecological and economic environment. The work of Zavala-Alcívar et al. (2020b) represents the point of convergence of the branch of papers. It analyses resilience strategies put in place by agri-food supply chains (AFSCs) to face high-risks and the positive effect they have on the achievement of sustainability performances.

Vroegindewey and Hodbod (2018) and Smith et al. (2016) analyse how to align the concept of resilience and sustainability in AFSCs, having as a premise that non-resilient supply chains lose sustainable properties in the face of big disasters, whereas Habib et al. (2019) study how to manage supply chain waste in the event of a large-scale disaster considering the aspects of social, environmental and economic sustainability to increase system resilience in the long term.

3.3. Citation score analysis (CSA)

Table 5 presents the results of the CSA. The analysis identifies one additional paper (i.e., Ibn-Mohammed et al., 2021) that was previously excluded from the CNA analysis, whereas the other papers were already analysed above.

The CSA reveals that the theorization of new models to enable better resilience and sustainability received greater attention in the last year, driven by the analysis of the effects of the Covid-19 pandemic on supply chains. The research calls for new approaches to increase supply chain resilience that should consider supply chain sustainability as a way to maintain the ecosystem equilibrium and ensure long-term survivability. Moreover, supply chains need to tackle long-term objectives to face unexpected events, such as the pandemic, overcoming the traditional approach that is too focused on managing day-to-day business risks (Queiroz et al., 2020). A way for supply chains to survive in a continuously changing environment can be "viability" (Ivanov, 2020). Viable supply chains are agile, meaning that they react effectively to positive changes and are resilient and sustainable; in other words, they are able to recover from short-term and long-term shocks. In addition, the circular economy (CE) is presented as a possible lever to address the negative impacts of the pandemic by building a more resilient and environmentally sustainable world. CE can be the vehicle for creating sustainable systems which, in turn, will craft resilient economies thanks to more local and secure ecosystems that have better chances to adapt and survive to changes (Ibn-Mohammed et al., 2021; Sarkis, 2021). Sustainability through resilience thinking will enable robust and

Table 5
Citation score analysis. Articles are ranked according to the citation index obtained by dividing the citations received in 2021 by the number of years since publication.

Rank	Author	Title	Journal	Citation index	Included in the citation network analysis
1	Ahi and Searcy (2013)	"A comparative literature analysis of definitions for green and sustainable supply chain management"	*"Journal of Cleaner Production"*	73.8	X
2	Ivanov (2020)	"Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic"	*"Annals of Operations Research"*	70.5	X
3	Ibn-Mohammed et al. (2021)	"A critical review of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies"	*"Resources, Conservation and Recycling"*	63	
4	Queiroz et al. (2020)	"Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review"	*"Annals of Operations Research"*	62.5	X
5	Papadopoulos et al. (2017)	"The role of Big Data in explaining disaster resilience in supply chains for sustainability"	*"Journal of Cleaner Production"*	47.2	X
6	Klibi et al. (2010)	"The design of robust value-creating supply chain networks: A critical review"	*"European Journal of Operational Research"*	42.3	X
7	Sarkis (2021)	"Supply chain sustainability: learning from the COVID-19 pandemic"	*"International Journal of Operations and Production Management"*	36	X
8	Panetto et al. (2019)	"Challenges for the cyber-physical manufacturing enterprises of the future"	*"Annual Reviews in Control"*	35	X

*Citations 2021/years since publication.

survivable circular supply chains (Ibn-Mohammed et al., 2021).

3.4. Keywords analysis of papers

Analysing the papers' keywords for the 221 papers, four clusters came out (Fig. 6). The papers' keywords with their number of occurrences are reported In Table 6.

3.4.1. Cluster 1 (red): Sustainable and resilience supply chain network design

Cluster 1 is devoted to studying the relationship between sustainability and resilience at the "supply chain design" level, as shown by the related emerging keyword. The emergence of this topic confirms the results of the CNA.

In this cluster, sustainability and resilience are presented as two separate but equally essential attributes of supply chains. Studies in this research stream mainly adopt quantitative models, such as "multi-objective optimization" (as outlined by the presence of the corresponding keyword) based on weighted goal programming approach (Mari et al., 2014; Zahiri et al., 2017) and fuzzy goal programming (Fahimnia and Jabbarzadeh, 2016; Jabbarzadeh et al., 2018). Simulation-based studies are used as well (Ivanov, 2018). Sustainability is measured by considering the suppliers' environmental, social and economic performance (Jabbarzadeh et al., 2018, Hosseini and Barker, 2016), the level of carbon emissions in the network (Azevedo et al., 2013; Mari et al., 2014), the level of inventory, and the overall number of facilities.

3.4.2. Cluster 2 (green): Green supply chain management

The second cluster is focused on the paradigm of "green supply chain management" (GSCM) and "environmental management", as highlighted by the related keywords. GSCM is considered a part of SSCM and "has an emphasis on the characteristics of environmental, flow, and coordination" (Ahi and Searcy, 2013). Sometimes the concept of GSCM shows an overlap with that of SSCM and many authors address the design of sustainable and resilient supply chains explicitly focusing only on the environmental performances of sustainability (Ji et al., 2020). Within this cluster, the presence of the keywords "lean", "agile", green", and "resilient" reveals a second important stream of research, that being LARG (Lean, Agile, Resilient and Green) supply chains. Leveraging LARG capabilities, companies will be able to achieve competitive advantages, sustainability, continuity of the business and higher profitability (Fazendeiro et al., 2013). Even when dealing with the LARG paradigm, sustainable attributes are identified with those relating to the environmental pillar. In this cluster, sustainability and resilience are mainly presented as two separate concepts that together contribute to improving the competitiveness of the supply chain.

3.4.3. Cluster 3 (blue): Sustainability and resilience in agri-food supply chains (AFSCs)

The third cluster deals with risks threatening sustainable supply chains in the food and agriculture industry, as highlighted by the related keywords "food supply" and "agriculture". The presence of this topic is also in line with the results of the CNA. In this research stream, many studies present the development of frameworks to integrate sustainability objectives into the analysis, measurement and management of resilience in food supply chains. AFSCs are more vulnerable than other supply chains to natural risks, such as pandemics, floods, droughts, and hurricanes, which cause economic and social impacts on the entire population (Zavala-Alcívar et al., 2020b). Thus, these supply chains need to adopt resilient strategies to easily adapt to environmental challenges. At the same time, given the dependency of this industry on the use of natural resources, it is essential to integrate the concepts of "sustainable development" and risk mitigation to "vulnerabilities" (highlighted by the presence of the corresponding keywords) into one paradigm (Paloviita and Järvelä, 2019). Relying on more resilience enables the concept of "food security", interpreted as the capacity to safeguard the continuity and the quality of products in food supply chains against climate events and natural risks (Smith et al., 2016).

3.4.4. Cluster 4 (yellow): High-impact events threatening supply chains

In the fourth cluster of keywords, resilience is considered to be the capability to cope with huge impact events, such as "climate change", natural "disasters" and global health diseases, e.g., "Covid-19", as

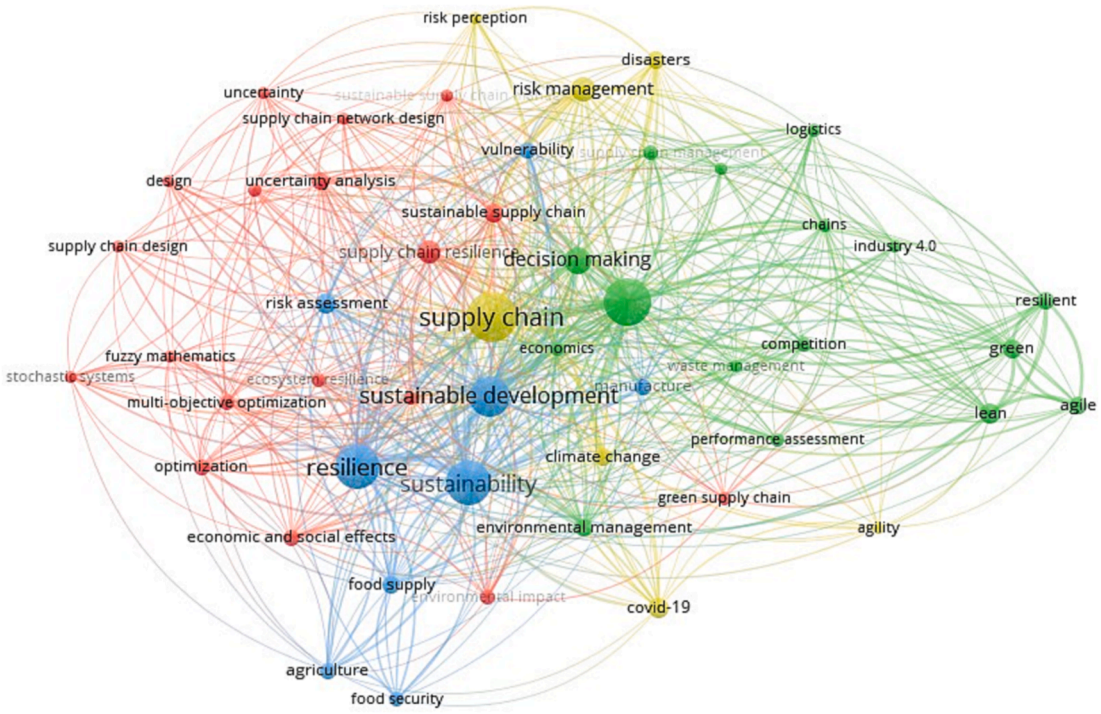


Fig. 6. Papers' keywords clusterization map.

Table 6
Number of occurrences of the papers' keywords.

Cluster	Keyword	No. of occurences
1	Supply chain resilience	19
	Sustainable supply chain	13
	Uncertainty analysis	12
	Economic and social effects	9
	Optimization	9
	Environmental impact	8
	Multi-objective optimization	8
	Ecosystem resilience	7
	Disruption	7
	Green supply chain	7
	Resilient supply chain	7
	Uncertainty	6
	Supply chain design	6
	Design	6
	Sustainable supply chain management	6
	Fuzzy mathematics	5
	Stochastic systems	5
	Supply chain network design	5
2	Supply chain management	79
	Decision making	25
	Lean	15
	Green	13
	Resilient	12
	Agile	11
	Environmental management	11
	Green supply chain management	8
	Competition	8
	Chains	7
	Logistics	7
	Performance assessment	7
	Economics	7
	Supply chain risk management	6
	Industry 4.0	6
	Waste management	5
3	Resilience	69
	Sustainability	68
	Sustainable development	57
	Risk assessment	15
	Food supply	12
	Vulnerability	10
	Agriculture	10
	Manufacture	9
	Food security	8
4	Supply chain	86
	Risk management	21
	Covid-19	14
	Disasters	12
	Climate change	12
	Risk perception	6
	Agility	5

demonstrated by the related keywords. The Covid-19 pandemic had strong impacts on supply chains, exposing businesses and societies to the shortfalls of normal activities. The pandemic outbreak has revealed how supply chains are unable to cope with unpredictable events, becoming the starting point of a research stream aimed at providing insights to make supply chains more resilient (Sarkis, 2021). The emergence of this research topic confirms previous analysis results. Moreover, the cluster reveals that a first research stream is focused on how to build more resilient supply chains without compromising sustainability, finding a balance between sustainable and resilient objectives (Nandi et al., 2021). A second group of works addresses the negative impacts that Covid-19 had on the achievement of SDGs (Adhikari et al., 2021) and a third one explores how the pandemic emphasized the need to be sustainable. According to the last one, Covid-19 made companies more aware of the magnitude of natural disasters, thus stimulating the need to become more sustainable in the face of climate and natural risks (Ibn-Mohammed et al., 2021).

4. Discussion

4.1. Main research topics

The SLNA allowed for providing insights into the main research themes and trajectories in the literature and how the relationship between supply chain sustainability and supply chain resilience has been addressed in the different research areas. The review highlighted the presence of four main thematic areas emerging from the joint consideration of the CNA, CSA and co-occurrence analysis of the papers' keywords (Table 7). Our analysis showed that in the literature the attempt to combine sustainability and resilience in supply chains has been made in a multi-dimensional way.

The strong consensus among the CNA and the co-occurrence analysis of the paper's keywords is on the presence of research trends focusing on models to design supply chains that are able to match sustainable and resilient objectives by using mathematical optimization and simulations studies (*Design of sustainable and resilient supply chains*) and the combination of green, resilient, lean, and agile paradigms into supply chains (*LARG supply chain frameworks*). Along with them, other two research streams emerging as fundamental are the application of sustainability and resilience in the area of agricultural and food supply chains (*AFSCs*) and the study of high-impact events threatening the supply chain such as the impacts of the epidemic outbreak (*Epidemic outbreak*) and high-risk events like those of natural origin (e.g., climate change, hurricanes, floods) (*Natural disasters and climate change*). The CNA, both the main path and clusterization analysis, detects the presence of research areas of a more conceptual nature that are the creation of frameworks to build supply chain sustainability and supply chain resilience, with a predominant focus on one of these two subjects (*Supply chain sustainability frameworks* and *Supply chain resilience frameworks*). Whereas, not surprisingly, the CSA highlights that the articles that are recently receiving attention in the research field are those dealing with the effects of the Covid-19 pandemic on supply chains (*Epidemic outbreak*).

4.2. Conceptual framework

Contributions in the literature show strong disagreements in addressing the relationship between supply chain sustainability and supply chain resilience. In particular, it is possible to highlight the presence of multiple frameworks to explain how this relationship has been approached. The SLNA allowed for identifying four dominating perspectives for organizing sustainability and resilience: sustainability and resilience as two separate concepts, resilience as part of sustainability, sustainability as part of resilience, and sustainability and resilience as synonyms. Marchese et al. (2018) theorized the presence of three frameworks to explain the relationship sustainability-resilience ("sustainability and resilience as two separate concepts", "resilience as a component of sustainability", "sustainability as a component of resilience").

Our work advances the work of Marchese et al. (2018) in several ways: by analysing this relationship in the SCM context, by introducing a fourth perspective and by linking these perspectives to the main research themes in the literature on supply chain sustainability and supply chain resilience that emerged from the SLNA. Table 8 combines the four thematic areas identified through the SLNA with the four emerging perspectives on the sustainability-resilience relationship. The Appendix contains further details on how Table 8 has been constructed.

Moreover, our findings suggest that the rationale behind the presence of the different frameworks can essentially be identified in the level of detail with which sustainability and resilience objectives are considered, whether according to a high-level of detail or a low-level of detail. Specifically, when sustainability and resilience objectives are viewed at a high-level of detail, they result to be specific and focused, while when they are interpreted at a lower level of detail, they appear to be broad and wide-spanning. A focus on the achievement of high-detailed

Table 7
Four thematic areas of supply chain sustainability and supply chain resilience emerging by performing the citation network analysis, the citation score analysis and the co-occurrence analysis of the papers' keywords.

No.	Thematic areas	Sub-thematic areas	Citation network analysis	Citation score analysis	Analysis of papers' keywords
1	Supply chain conceptualization	Supply chain sustainability frameworks	Main path: Moore and Manring (2009), Park et al. (2010) Cluster 1	Ahi and Searcy (2013)	
		Supply chain resilience frameworks	Main path: Pettit et al. (2019); Zhu and Krikke (2020); Queiroz et al. (2020); Ivanov (2020); Zavala-Alcívar et al. (2020a); Bui et al. (2021) Cluster 2 Cluster 3		
		LARG supply chain frameworks	Main path: Cabral et al. (2012); Carvalho et al. (2011); Govindan et al. (2015) Cluster 4		Cluster 2: lean, green, agile, resilient
2	Supply chain modelling	Design of sustainable and resilient supply chains	Main path: Azevedo et al. (2013); Fahimnia et al. (2018); Fahimnia and Jabbarzadeh (2016); Jabbarzadeh et al. (2018); Mari et al. (2014); Zahiri et al. (2017) Cluster 5		Cluster 1: supply chain design; multi-objective optimization; fuzzy mathematics; stochastic systems; optimization
3	Types of risks	Natural disasters and climate change	Main path: Papadopoulos et al. (2017) Cluster 6	Papadopoulos et al. (2017)	Cluster 4: disasters, climate change
		Epidemic outbreak	Main path: Zhu and Krikke (2020); Queiroz et al. (2020); Ivanov (2020) Cluster 3	Ivanov (2020); Queiroz et al. (2020); Ibn-Mohammed et al., (2021); Sarkis, (2021)	Cluster 4: covid-19
4	Application areas	AFSCs	Cluster 7		Cluster 3: food supply; food security; agriculture; vulnerability

Table 8
Combining the sustainability-resilience according to the different thematic areas from the citation network analysis.

No.	Thematic areas	Sub-thematic areas	Resilience and sustainability are separate concepts	Resilience is a component of sustainability	Sustainability is a component of resilience	Resilience and sustainability are synonyms
1	Supply chain conceptualization	Supply chain sustainability frameworks		X	X	
		Supply chain resilience frameworks			X	X
		LARG supply chain frameworks	X	X		
2	Supply chain modelling	Design of sustainable and resilient supply chains	X	X		
3	Types of risks	Natural disasters and climate change		X	X	X
		Epidemic outbreak	X		X	X
4	Application areas	AFSCs		X		

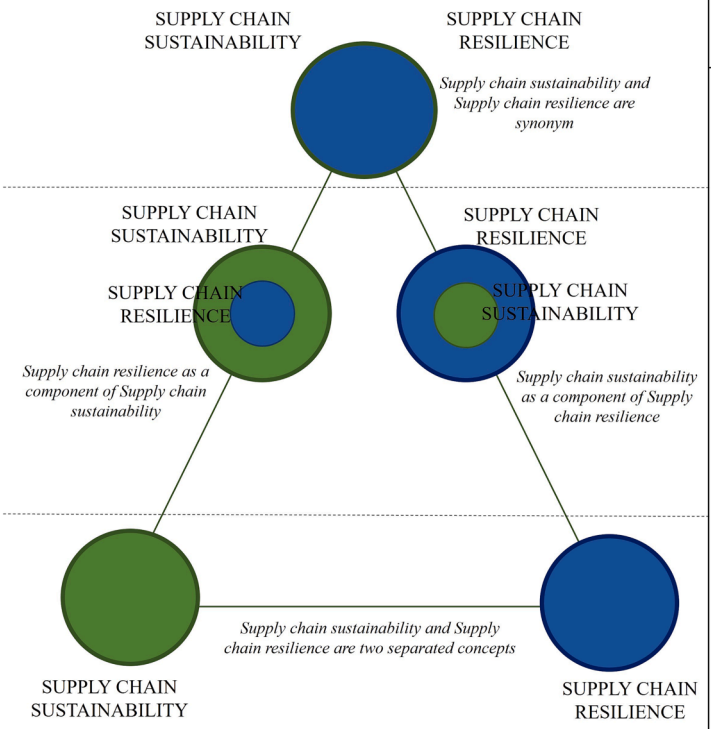
objectives generally leads to considering sustainability and resilience as two separate concepts of the supply chain, each with its own goals and specific strategies to adopt to pursue them. For example, the reduction of carbon emissions to increase supply chain sustainability, the increase of the level of inventory or the introduction of multiple suppliers to enhance supply chain resilience. When considering supply chain sustainability and resilience by focusing on high-detailed and specific objectives these concepts appear distinguishable and separate since each one can be achieved by adopting stand-alone strategies. When sustainable and resilient goals start being broader and less-specific, sustainability and resilience may be considered strongly affiliated concepts, where one can be a constitutive part of the other. For example, the management of potential risks to increase supply chain sustainability. In this case, the objective of increasing supply chain sustainability is interpreted by focusing on the long-term and generic objective of establishing a solid supply chain able to improve economic, social, and environmental performances while preserving itself. Indeed, supply chains need also to include resilience management aspects to preserve their sustainability against possible damaging events (Mari et al., 2014). In the same fashion but at the opposite, when resilience objectives are set not by focusing on specific and detailed goals but rather considering the generic goal of anticipating, adapting and responding to all types of damaging events, also social, environmental and economic risks are included. Thus, resilient supply chains need to include sustainable management aspects to minimize all types of supply chain risks (Giannakis and Papadopoulos, 2016). At least, concerning the ultimate and broadest objective, which is the supply chain survivability over time, sustainability and resilience are interpreted as a single concept with a common goal of creating "resilient organizations through integrated economic, social and environmental systems" (Bansal, 2010, p.1).

Fig. 7 systematizes the four perspectives, their definitions and linkages with the type of sustainable-resilience objectives, into a single framework.

- Sustainability and resilience as separate concepts.

The idea behind considering sustainability and resilience as two separate concepts is that resilience does not contribute to building sustainability and sustainability does not contribute to building resilience. They are addressed as two separate entities with different and distinguishable objectives and strategies. However, the distinction between their objectives does not imply that supply chain sustainability and supply chain resilience are unrelated. Indeed, resilient objectives can be complementary or compelling to sustainable ones.

The stream of literature dealing with *LARG supply chains* prevalently adopts this perspective. In the implementation of LARG supply chains,



Supply chain sustainability - Supply chain resilience relationship	Definition	Objectives
Supply chain sustainability and Supply chain resilience are synonym	Resilient and sustainable supply chains are supply chains able to survive over time.	Creation of resilient organizations through integrated economic, social and environmental systems (Bansal, 2010).
Supply chain resilience as a component of Supply chain sustainability	Sustainable supply chains need to include resilience management aspects to preserve sustainability against possible damaging events.	Creation of sustainable supply chains that, incorporating resilience, do not lose sustainability in the event of possible disruptions (Mari et al., 2014).
Supply chain sustainability as a component of Supply chain resilience	Resilient supply chains need to include sustainable management aspects to minimize environmental, social and economic risks.	Creation of resilient supply chains that are socially, environmentally and economically compliant to resist all types of damaging events (Giannakis and Papadopoulos, 2016).
Supply chain sustainability and Supply chain resilience are two separate concepts	Supply chains need to pursue both sustainability and resilience to improve their economic, social and environmental performances, but also their capacity to anticipate, adapt and respond to unpredictable events.	Creation of supply chains able to combine sustainable and resilient objectives. They are distinguishable and might be unrelated, positively or negatively related (Fahimnia and Jabbarzadeh, 2016; Govidan et al., 2015).

Fig. 7. Supply chain sustainability and supply chain resilience relationship framework.

sustainability and resilience are treated as two separate pillars that contribute to enhancing supply chain competitiveness, along with lean and agile paradigms (Cabral et al., 2012; Govindan et al., 2015). Works in this research area focus on analysing green, lean, agile and resilient strategies as autonomous outstanding concepts looking at their synergic or divergent goals (Carvalho et al., 2014; Ruiz-Benitez et al., 2017). For example, the increase of information frequency and information level represent objectives in accordance with the green and resilient paradigms, while increasing the inventory level and creating surplus capacity increases resilience at the expense of sustainability (Carvalho et al., 2011; Govindan et al., 2015).

In the same fashion, articles in the research stream of the *Design of sustainable and resilient supply chains* assume supply chain sustainability and supply chain resilience to be independent attributes relying on different levers, entailing different strategies and presenting synergic or divergent objectives. The combination of sustainable and resilient criteria when making supply chain network configuration decisions concerns the evaluation of high-detailed objectives that are achievable by pursuing specific strategies. Sustainable or resilience-oriented decision variables may include the arrangement of nodes (factories, warehouses), the length of transport routes, the level of inventory in the network (Ghomi-Avili et al., 2021; Ivanov, 2018), and the selection of suppliers (Hosseini and Barker, 2016; Jabbarzadeh et al., 2018). In this case, setting variables (e.g., number of nodes, stock levels, distance of suppliers) to take network configuration decisions produces different effects on sustainability and resilience performances. Because of the introduction of sustainability and resilience quantifiable objectives, the methodology often used is based on quantitative mathematical models, such as multi-objective optimization (Fahimnia and Jabbarzadeh, 2016; Hasani et al., 2021).

- Resilience as a component of sustainability: does resilience build sustainability?

According to this perspective, resilience contributes to building sustainability. "Increasing the resilience of a system makes it more sustainable but increasing the sustainability of the system does not make it more resilient" (Marchese et al., 2018, p.1276). Resilience can be interpreted as an aspect of sustainability because a system loses its sustainability if it is not resilient in the event of possible disruptions. A sustainable system has to be resilient to cope with unexpected disruptions and thus preserve its sustainability. The main streams of literature addressing resilience as a key part of building sustainable supply chains are those focused on *Supply chain sustainability frameworks* and *AFSCs*.

In contributions to developing SSCM frameworks, resilience is considered to be an aspect to be studied in an analysis of sustainability. Indeed, addressing supply chain sustainability leveraging on the TBL approach is not sufficient to ensure system survivability over time. The TBL approach needs to be integrated with risk management features (Ahi and Searcy, 2013; Wu et al., 2016). In a broader sense, business sustainability means pursuing environmental, social and economic goals while ensuring the organization's adaptability to internal and external shocks thanks to the incorporation of resilient attributes (Ahi and Searcy, 2013; Park et al., 2010).

In AFSCs, resilience is fundamentally perceived as the success factor for ensuring the sustainability of the chain against natural shocks and disasters (Smith et al., 2016; Vroegindewey and Hodbod, 2018). Huge impact events affecting AFSCs have negative effects on the social, ecological and economic environment. Therefore, implementing resilience in AFSCs has a positive effect on increasing their sustainability (Zavala-Alcívar et al., 2020b).

Albeit in a minority, this viewpoint is developed by studies addressing *LARG supply chain frameworks*, and the *Design of sustainable and resilient supply chains*.

In LARG supply chains literature, a group of works study the impact of resilient, lean and green practices on supply chain sustainability. Supply chain resilient practices, such as risk management (Govindan et al., 2014; Ruiz-Benitez et al., 2017), collaboration and proactivity are fundamental ingredients to pursue sustainability at the supply chain level since they allow for managing potential risks, including environmental accidents, thus making the supply chain more sustainable in the long-term (López and Ruiz-Benítez, 2020). According to this view,

supply chain risk management has a positive impact on the achievement of sustainable performances.

Mari et al. (2014; 2016) and Yılmaz et al. (2021) advance the theory that combining sustainability and resilience in the network design is necessary to ensure that the achievement of sustainable objectives is not compromised by adverse events threatening the supply chain. Thus, to be effectively sustainable, a system also needs to be resilient.

Even if not emerging among the thematic areas highlighted by the SLNA, another research topic that is worth mentioning in the discussion of resilience as a component of sustainability perspective is the *Criticality assessment within the Life Cycle Sustainability Assessment (LCSA)*. The LCSA extends the LCA (Life Cycle Assessment) measurement of the environmental impacts of a product system to economic and social impacts (Cimprich et al., 2017; Helbig et al., 2016). To better address the resource sustainability challenges, another effort has been made to develop a comprehensive and holistic LCSA framework by also considering resource aspects related to the risks of raw materials (Helbig et al., 2016). This research endeavour has been formalized into the integration of supply chain sustainability and resilience by including the supply criticality assessment into LCSA (Bach et al., 2016; Berr et al., 2022; Cimprich et al., 2017; Gemechu et al., 2016; Helbig et al., 2016). Indeed, according to the perspective that the "creation of a resilient supply chain… should provide opportunities for increased sustainability and disruption management" (Berr et al., 2022, p.1), the LCSA framework should integrate disruption impacts with environmental impacts to offer a comprehensive perspective able to balance the burdens of different supply chain processes considering both resilience and sustainability (Berr et al., 2022).

The criticality assessment of supply risks encompasses social, environmental, and economic risks related to raw materials along with their potential consequences on the supply chain (Achzet and Helbig, 2013; Gemechu et al., 2015). Within supply risks, many authors have focused on assessing socioeconomic and geopolitical risks (Cimprich et al., 2017; Gemechu et al., 2015; Helbig et al., 2016). The research highlights that the consideration of socioeconomic and geopolitical aspects of natural resources' risks is relevant for current and future sustainability challenges and hence needs to be an essential part of the LCSA framework (Gemechu et al., 2015). To conclude, the integration of supply disruption impacts within LCSA allows having a comprehensive approach that ensures the creation of integrated sustainable supply processes, which means that along with social, environmental and economic sustainability aspects of raw materials, also criticalities are evaluated and eventually resilience strategies to better anticipate supply risks are adopted (Berr et al., 2022; Gemechu et al., 2015).

- Sustainability as a component of resilience: does sustainability build resilience?

According to this perspective, sustainability contributes to building resilience. "Increasing the sustainability of the system makes it more resilient but increasing its resilience does not make it more sustainable" (Marchese et al., 2018, p.1276). Implementing sustainability leads to having a socially, economically and environmentally compliant supply chain that will most likely withstand damaging events. This view considers sustainability-related risks (i.e., social, environmental, economic risks): being sustainable allows for improving the economic, social and environmental well-being, ultimately allowing for risk reduction and making the supply chain more robust.

The stream of literature dealing with huge impact events threatening the supply chain, both *Natural disasters and climate change* and *Epidemic outbreak*, adopts this framework extensively. Indeed, resilience has the objective to enable supply chains "to provide an effective response to risks and remove vulnerabilities" (Khot and Thiagarajan, 2019). According to this view, supply chain resilience is eventually defined as the ability to withstand small-scale (e.g., demand fluctuations, product-production risks) and big-scale uncertainties (e.g., natural disasters, climate change, political and financial crises) (Kaur and Singh, 2019; Khot and Thiagarajan, 2019). In the face of natural disasters and climate change, social and environmental risk management aims at building resilient supply chains that are able to face social and environmental risks and gain their "sustainable competitive advantage" (Rajesh, 2019). In particular, enabling more environmentally sustainable supply chains through the reduction of carbon emissions allows for becoming more resilient against climate change risks (Kaur and Singh, 2019). Habib et al. (2019) suggest that to effectively increase resilience against future disasters, supply chains need to work on long-term planning and set goals for social and economic sustainability. Ensuring a successful reduction of environmental and social risks could represent a better chance to survive. This mechanism allows for overcoming the limits of normal disaster policies that attempt to bring the community back to the normal routine leveraging on short-term planning objectives.

Also, when dealing with Covid-19 effects on SCM, many works report this type of approach in combining resilience and sustainability. Accordingly, to effectively withstand disruptions such as the pandemic, supply chain risk and resilience management need to overcome the limitations of a traditional focus on the short-term and need to adopt a broader approach (Paul et al., 2021). Sustainability can enable- more resilient supply chains, able to survive through an adaptive re-planning of long-term objectives (Ivanov, 2020; Queiroz et al., 2020). Sustainability practises can contribute to enhancing resilience, for example by ensuring ecosystem services or promoting the sustainable local purchasing of goods (Sarkis, 2021). According to Ibn-Mohammed et al. (2021), the CE model can be a way to promote sustainability and resilience after the Covid-19 pandemic. Indeed, resilience in the context of CE will embrace long-term objectives (i.e., products easier to handle and transform, optimized cycles).

Contributions focusing on the creation of *Supply chain resilience frameworks* consider sustainability to be a component of resilience. Sustainability is interpreted as the driver to enable supply chain reconfigurability (Dolgui et al., 2020) or SC flexibility (Ivanov et al., 2018), which is defined as the ability of a system to change dynamically in response to perturbations in the environment. Even if these works present sustainability separated from resilience (both are actually drivers of supply chain reconfigurability and supply chain flexibility), it is possible to infer that the definitions of reconfigurability and flexibility are closely similar to those of resilience, so we can conclude that sustainability is interpreted as being one of the components of resilience.

Lastly, few works in the *Supply chain sustainability frameworks* stream interpret sustainability as part of resilience: sustainability can enhance resilience by setting an equilibrium state through the creation of social, environmental and economic long-term value (Moore and Manring, 2009; Tseng et al., 2018).

- Sustainability and resilience are synonyms

This perspective prevails when sustainability is presented with a meaning that is extremely close to that of resilience. Supply chain sustainability, interpreted as "the ability to survive and be successful over the long-term" (Golicic et al., 2017, p.74), "will enable the whole supply chain proactively and resiliently" to respond to uncertainties and maintain the continuity of operations (Wang and Ran, 2018, p.1). Supply chain sustainability is a concept that can be affiliated with the resistance/survival to disruptions aspect of resilience (Gligor et al., 2019; Ponomarov and Holcomb, 2009).

The stream of literature focused on the creation of *Supply chain resilience frameworks* adopts this perspective. Sustainability is prevalently associated with the ability to resist over time and references to the TBL approach are overlooked (He et al., 2021; Pettit et al., 2019). In this context, resilience allows for withstanding adverse events and thus promoting more sustainable development (Elleuch et al., 2016; Klibi et al., 2010). It is possible to conclude that resilience and sustainability have the same objective to ensure system survivability.

In the face of *Natural disasters and climate change*, developing high resilience against environmental risks means being sustainable – also here interpreted as survivability over time (Shareef et al., 2020; Singh et al., 2018). The concepts of sustainability and resilience are used as synonyms, since both have the objective to enable the supply chain to subsist against natural risks.

4.3. Future research directions

Our research paves the way to two main research directions.

Future research studies should analyse how the application of theoretical lenses can explain the presence of different frameworks that explain the sustainability-resilience relationship. Marchese et al. (2018) suggest that interpreting resilience as a component of sustainability can find a well-founded explanation in the institutional theory when resilience is placed within the institutional boundaries of sustainability, whereas considering sustainability and resilience as two separate concepts are informed by goal-oriented efforts, where sustainability and resilience objectives can compete in the short term. Indeed, according to the goal-oriented theory, the basis of an effective and successful SCM is the identification of the different SCM objectives, with their performance measures and possible outcomes (Otto and Kotzab, 2003). Separately assessing the impact of sustainable and resilient performances within a supply chain could lead to better analyse and find successful strategies to improve overall SCM performances (Govindan et al., 2015). Instead, the complexity theory applied to SSCM (Dubey et al., 2017) provides the theoretical foundations to interpret supply chain sustainability as part of supply chain resilience by considering that "implementing sustainability is necessary for the firm to be sensitive and responsive to the external environment with interdependencies in adapting to the system" (Sarkis et al., 2011, p. 4). A sustainable supply chain needs to be resilient enough to survive and thrive in a continuously changing environment by constantly adapting to external changes (Gligor et al., 2019; Paul et al., 2019). Taking into account that several theories have been applied to the field of SCM, and in particular, to those of SSCM and Supply chain resilience, it could be valuable to study which theory best fits the three presented perspectives.

The CE represents a possibility to overcome the misalignment of perspectives. Assuming the perspective where sustainability and resilience are seen as separate concepts, the CE represents a new approach to combine them and consider them as autonomous concepts with independent objectives. Indeed, CE might be a tool for mitigating climate change and developing a more resilient economy (Fahimnia et al., 2019; Ibn-Mohammed et al., 2021). It is well-known that CE in supply chains leads to sustainable benefits, but, concurrently, the literature has begun to speculate on resilience benefits as well. As concerns sustainable benefits, CE is a new business model born to react to the resources scarcity problems and aims at reducing waste generation, achieving a sustainable economy and society (Batista et al., 2021; Khan et al., 2021). In the circular SCM approach, materials and resources are kept as much as possible in the business cycles to exploit their full value (Govindan and Hasanagic, 2018; Mangla et al., 2018). Concurrently, research has been started theorizing that technological instruments (e.g., blockchain, Internet of Things) that play a central role in CE implementation improve visibility (Nandi et al., 2021; Ponomarov and Holcomb, 2009), which, in turn, build more resilience and robustness (Paul et al., 2021; Sarkis, 2021). Circular supply chains can recover more rapidly from shocks because they are simpler and local. The use of circular practices such as industrial symbiosis, local by-products, local suppliers, and waste exchange might enable a more resilient supply chain by improving supply chain localization (Sarkis, 2021; Smart et al., 2017).

The implementation of CE could also be the answer to dealing with sustainability and resilience when sustainability objectives are interpreted as converging with resilience objectives. According to the perspective that sustainability is a component of resilience, the impact on the ecosystem of circular supply chains could minimize the probability of risks, such as those of the environmental kind, which may have originated from the use of unsustainable practices (Creazza et al., 2020). In other words, more sustainable supply chains thanks to the circular business model would have more chances to survive.

The literature presents a double-perspective approach towards CE as an enabling factor for better sustainability and resilience. However, if sustainability benefits stemming from the adoption of CE are well-established, resilience benefits have not been empirically studied. Future research should develop and also test resilience benefits enabled by CE. The investigation could be conducted assuming the first perspective, where resilience performances and benefits are studied more independently than those of sustainability, and the second perspective, where resilience benefits are studied as the result of having more sustainable supply chains.

5. Conclusions

Our work extends current literature by developing a framework to explain the different perspectives for organizing the concepts of supply chain sustainability and supply chain resilience and by linking them with the main research streams in the field.

Theoretically, our work advances the existing literature by detecting the main thematic areas and their evolution in the field of supply chain sustainability and supply chain resilience. The analysis of the literature through bibliometric techniques allows the emergence of different perspectives to interpret the relationship between sustainability and resilience clearly and compellingly. Starting from the work of Marchese et al. (2018), we propose an innovative view to categorize contributions according to different relational perspectives and the rationale behind their existence, attributable to the level of detail according to which sustainability and resilience objectives are interpreted. Specifically, when sustainability and resilience are considered by focusing on high-detailed and specific objectives, these concepts appear to be distinguishable and separate since each is achievable by pursuing specific and stand-alone strategies. Whereas, when the objective of achieving a sustainable supply chain is considered as the long-term and generic objective of establishing a solid supply chain able to improve economic, social, and environmental performances while preserving itself, also resilience aspects are considered. To be sustainable, supply chains need also to safeguard their status against possible damaging events while addressing economic, social, and environmental aspects. On the opposite, when the resilient objective is interpreted as the broad goal of anticipating, adapting and responding to all types of risks, sustainability can contribute to building resilience by limiting social, environmental and economic risks. Concerning the generic and ultimate objective of the supply chain survivability over time, the concepts of sustainability and resilience are considered synonyms.

The categorization provides clarity in understanding how the concepts of sustainability and resilience have been addressed in the literature, thus contributing to the ongoing debate regarding the relationship between supply chain resilience and sustainability. Concerning related reviews published on the topic, our manuscript advances previous knowledge by specifically addressing and studying the presence of divergent viewpoints on how supply chain sustainability and supply chain resilience are related and interpreted. We adopt a balanced perspective, overcoming the limitations of works that are prevalently focused on analysing resilience and risk management aspects in supply chains rather than sustainable ones (Bui et al., 2021; Zavala-Alcívar et al., 2020a). Whereas compared to those research works focused on both sustainability and resilience (López-Castro and Solano-Charris, 2021; Negri et al., 2021), our study further investigates supply chain sustainability and resilience on a more theoretical basis by attempting to clarify how the literature has conceptually interpreted their relationship.

From the practical point of view, the analysis provides the industrial community with a clearer idea about the concepts of supply chain

sustainability and supply chain resilience according to their relationship.

Practitioners driving profit and non-profit organizations, as well as policy-makers, can be enlightened about the co-existence of different viewpoints to interpret sustainability and resilience to choose the perspective that best suits their purposes and establish a consistent strategic framework with it. This can help them drive decisions unambiguously and more effectively by coherently setting definitions, goals, and strategies. Moreover, the establishment of a coherent perspective about how sustainability and resilience are interpreted and managed by the organization is crucial not only to define suitable and unambiguous plans but also to properly communicate them with internal and external stakeholders. Overall, this research work could raise awareness among managers and policy-makers about the existence of different points of view for interpreting sustainability and resilience to help them avoid misconceptions and develop viable sustainable and resilience strategic plans.

The work presents some limitations due to the methodology that has been applied. The citation network analysis and citation score analysis used in the systematic literature network analysis assumes that the contribution of an article to the literature is expressed by its citations. However, citations cannot fully account for a paper's unique contributions to existing research (Colicchia et al., 2019; Strozzi et al., 2017). Another issue concerning citations is the "Matthew effect", whereby the most cited papers continue to receive an increasing number of citations due to the high consideration and popularity they have (Colicchia et al., 2019). In addition, the articles analysed were retrieved from the Scopus database which, whilst including a large and comprehensive number of papers, is not able to take into account all existing contributions in a specific field. Finally, although the authors strived to be as objective as possible, the analysis and categorization of the literature are not free from the subjective lens of the authors. Nevertheless, these criticisms do not represent a limitation to the truthfulness and validity of the work.

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CRediT authorship contribution statement

Maria Concetta Carissimi: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – review & editing. **Alessandro Creazza:** Conceptualization, Investigation, Methodology, Supervision, Writing – review & editing. **Claudia Colicchia:** Conceptualization, Investigation, Methodology, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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References

Achzet, B., Helbig, C., 2013. How to evaluate raw material supply risks—An overview. Resour. Policy 38, 435–447.

Adhikari, J., Timsina, J., Khadka, S.R., Ghale, Y., Ojha, H., 2021. COVID-19 impacts on agriculture and food systems in Nepal: Implications for SDGs. Agricultural Systems 186, 102990. https://doi.org/10.1016/j.agsy.2020.102990.

Ahi, P., Searcy, C., 2013. A comparative literature analysis of definitions for green and sustainable supply chain management. J. Clean. Prod. 52, 329–341. https://doi.org/10.1016/j.jclepro.2013.02.018.

Ali, A., Mahfouz, A., Arisha, A., 2017. Analysing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. Supply Chain Manag. 22, 16–39. https://doi.org/10.1108/SCM-06-2016-0197.

Andres, B., Marcucci, G., 2020. A strategies alignment approach to manage disruptive events in collaborative networks. Sustainability. 12, 2641. https://doi.org/10.3390/su12072641.

Azevedo, S.G., Govindan, K., Carvalho, H., Cruz-Machado, V., 2013. Ecosilient Index to assess the greenness and resilience of the upstream automotive supply chain. J. Clean. Prod. 56, 131–146. https://doi.org/10.1016/j.jclepro.2012.04.011.

Azevedo, S.G., Carvalho, H., Cruz-Machado, V., 2016. LARG index: a benchmarking tool for improving the leanness, agility, resilience and greenness of the automotive supply chain. Benchmarking 23, 1472–1499. https://doi.org/10.1108/BIJ-07-2014-0072.

Bach, V., Berger, M., Henßler, M., Kirchner, M., Leiser, S., Mohr, L., Rother, E., Ruhland, K., Schneider, L., Tikana, L., 2016. Integrated method to assess resource efficiency–ESSENZ. J. Clean. Prod. 137, 118–130. https://doi.org/10.1016/j.jclepro.2016.07.077.

Bansal, T., 2010. Network for Business Sustainability. https://www.nbs.net/articles/primer-business-sustainability (accessed 20 October 2021).

Batista, L., Dora, M., Garza-Reyes, J.A., Kumar, V., 2021. Improving the sustainability of food supply chains through circular economy practices–a qualitative mapping approach. Management of Environmental Quality. An International Journal 32 (4), 752–767. https://doi.org/10.1108/MEQ-09-2020-0211.

Berr, M., Beloin-Saint-Pierre, D., Hischier, R., Hool, A., Wäger, P., 2022. SPOTTER: assessing supply disruption impacts along the supply chain within life cycle sustainability assessment. Clean. Logist. Supply Chain 4, 100063. https://doi.org/10.1016/j.clscn.2022.100063.

Blondel, V.D., Guillaume, J.-L., Lambiotte, R., Lefebvre, E., 2008. Fast unfolding of communities in large networks. J. Stat. Mech. Theory Exp. 10008 https://doi.org/10.1088/1742-5468/2008/10/P1000.

Bui, T.-D., Tsai, F.M., Tseng, M.-L., Tan, R.R., Yu, K.D.S., Lim, M.K., 2021. Sustainable supply chain management towards disruption and organizational ambidexterity: a data driven analysis. Sustain. Prod. Consum. 26, 373–410. https://doi.org/10.1016/j.spc.2020.09.017.

Cabral, I., Grilo, A., Cruz-Machado, V., 2012. A decision-making model for Lean, Agile, Resilient and Green supply chain management. Int. J. Prod. Res. 50, 4830–4845. https://doi.org/10.1080/00207543.2012.657970.

Cai, Y.J., Lo, C.K., 2020. Omni-channel management in the new retailing era: a systematic review and future research agenda. Int. J. Prod. Econon. 229, 107729 https://doi.org/10.1016/j.ijpe.2020.107729.

Carvalho, H., Duarte, S., Machado, V.C., 2011. Lean, agile, resilient and green: divergencies and synergies. Int. J. Lean Six Sigma 2, 151–179. https://doi.org/10.1108/20401461111135037.

Carvalho, H., Azevedo, S., Cruz-Machado, V., 2014. Trade-offs among lean, agile, resilient and green paradigms in supply chain management: A case study approach. Proceedings of the Seventh International Conference on Management Science and Engineering Management. Lecture Notes in Electrical Engineering 242, 953–968. 10.1007/978-3-642-40081-0_81.

Chowdhury, Md.T., Sarkar, A., Paul, S., Moktadir, M., 2020. A case study on strategies to deal with the impacts of COVID-19 pandemic in the food and beverage industry. Oper. Manage. Res.. 10.1007/s12063-020-00166-9.

Christopher, M., Peck, H., 2004. Building the resilient supply chain. Int. J. Logist. Manag. 15, 1–29. https://doi.org/10.1108/09574090410700275.

Cimprich, A., Young, S.B., Helbig, C., Gemechu, E.D., Thorenz, A., Tuma, A., Sonnemann, G., 2017. Extension of geopolitical supply risk methodology: characterization model applied to conventional and electric vehicles. J. Clean. Prod. 162, 754–763. https://doi.org/10.1016/j.jclepro.2017.06.063.

Colicchia, C., Creazza, A., Noè, C., Strozzi, F., 2019. Information sharing in supply chains: a review of risks and opportunities using the systematic literature network analysis (SLNA). Supply Chain Manag. 24, 5–21. https://doi.org/10.1108/SCM-01-2018-0003.

Colicchia, C., Strozzi, F., 2012. Supply chain risk management: a new methodology for a systematic literature review. Supply Chain Manag. 17, 401–418. https://doi.org/10.1108/13598541211246558.

Creazza, A., Pizzurno, E., Urbinati, A., 2020. Economia Circolare e Management: un nuovo approccio industriale per la gestione d'impresa. Guerini Next srl, Milano.

Denyer, D., Tranfield, D., 2009. Producing a systematic review. In: Buchanan, A.D., Bryman, A. (Eds.), The Sage Handbook of Organizational Research Methods. Sage Publications, London, pp. 671–689.

Ding, Y., Chowdhury, G.G., Foo, S., 2001. Bibliometric cartography of information retrieval research by using co-word analysis. Inf. Process. Manag. 37, 817–842. https://doi.org/10.1016/S0306-4573(00)00051-0.

Dolgui, A., Ivanov, D., Sokolov, B., 2020. Reconfigurable supply chain: the X-network. Int. J. Prod. Res. 58, 4138–4163. https://doi.org/10.1080/00207543.2020.1774679.

Dubey, R., Gunasekaran, A., Papadopoulos, T., 2017. Green supply chain management: theoretical framework and further research directions. BIJ 24, 184–218. https://doi.org/10.1108/BIJ-01-2016-0011.
Elleuch, H., Dafaoui, E., Elmhamedi, A., Chabchoub, H., 2016. Resilience and vulnerability in supply chain: literature review. IFAC-PapersOnLinee. 49, 1448–1453. https://doi.org/10.1016/j.ifacol.2016.07.775.
Elzarka, S., 2020. A study on using lean, agile, resilient and green index to assess the sustainability of Egyptian FMCGs supply chains. Int. J. Logist. Syst. Manag. 37, 173–224. https://doi.org/10.1504/IJLSM.2020.110580.
Fahimnia, B., Jabbarzadeh, A., 2016. Marrying supply chain sustainability and resilience: a match made in heaven. Transport. Res. E. Logist. Transport. Rev. 91, 306–324. https://doi.org/10.1016/j.tre.2016.02.007.
Fahimnia, B., Jabbarzadeh, A., Sarkis, J., 2018. Greening versus resilience: a supply chain design perspective. Transport. Res. E. Logist. Transport. Rev. 119, 129–148. https://doi.org/10.1016/j.tre.2018.09.005.
Fahimnia, B., Sarkis, J., Talluri, S., 2019. Editorial design and management of sustainable and resilient supply chains. IEEE Trans. Eng. Manag. 66, 2–7. https://doi.org/10.1109/TEM.2018.2870924.
Fazendeiro, P., Azevedo, S.G., Cruz-Machado, V., 2013. A Framework Proposal to Assess the LARG Index of a Supply Chain in a Fuzzy Context. In Cruz-Cunha, M., Moreira, F., Varajão, J. (Eds.), Handbook of Research on Enterprise 2.0: Technological, Social, and Organizational Dimensions. IGI Global, pp. 550-571.
Gemechu, E.D., Helbig, C., Sonnemann, G., Thorenz, A., Tuma, A., 2016. Import-based indicator for the geopolitical supply risk of raw materials in life cycle sustainability assessments: import-based indicator for geopolitical supply risk of raw materials. J. Ind. Ecol. 20, 154–165. https://doi.org/10.1111/jiec.12279.
Ghomi-Avili, M., Tavakkoli-Moghaddam, R., Jalali Naeini, S.G., Jabbarzadeh, A., 2021. Competitive green supply chain network design model considering inventory decisions under uncertainty: a real case of a filter company. Int. J. Prod. Res. 59, 4248–4267. https://doi.org/10.1080/00207543.2020.1760391.
Giannakis, M., Papadopoulos, T., 2016. Supply chain sustainability: A risk management approach. Int. J. Prod. Econ. 171, 455–470. https://doi.org/10.1016/j.ijpe.2015.06.032.
Gligor, D., Gligor, N., Holcomb, M., Bozkurt, S., 2019. Distinguishing between the concepts of supply chain agility and resilience: a multidisciplinary literature review. Int. J. Logist. Manag. 30, 467–487. https://doi.org/10.1108/IJLM-10-2017-0259.
Golicic, S.L., Flint, D.J., Signori, P., 2017. Building business sustainability through resilience in the wine industry. Int. J. Wine Bus. Res. 29, 74–97.
Govindan, K., Azevedo, S.G., Carvalho, H., Cruz-Machado, V., 2014. Impact of supply chain management practices on sustainability. J. Clean. Prod. 85, 212–225. https://doi.org/10.1016/j.jclepro.2014.05.068.
Govindan, K., Azevedo, S.G., Carvalho, H., Cruz-Machado, V., 2015. Lean, green and resilient practices influence on supply chain performance: interpretive structural modeling approach. Int. J. Environ. Sci. Technol. 12, 15–34. https://doi.org/10.1007/s13762-013-0409-7.
Govindan, K., Hasanagic, M., 2018. A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective. Int. J. Prod. Res. 56, 278–311. https://doi.org/10.1080/00207543.2017.1402141.
Habib, M.S., Sarkar, B., Tayyab, M., Saleem, M.W., Hussain, A., Ullah, M., Omair, M., Iqbal, M.W., 2019. Large-scale disaster waste management under uncertain environment. J. Clean. Prod. 212, 200–222. https://doi.org/10.1016/j.jclepro.2018.11.154.
Hasani, A., Mokhtari, H., Fattahi, M., 2021. A multi-objective optimization approach for green and resilient supply chain network design: a real-life case study. J. Clean. Prod. 278 https://doi.org/10.1016/j.jclepro.2020.123199.
He, L., Wu, Z., Xiang, W., Goh, M., Xu, Z., Song, W., Ming, X., Wu, X., 2021. A novel Kano-QFD-DEMATEL approach to optimise the risk resilience solution for sustainable supply chain. Int. J. Prod. Res. 59, 1714–1735. https://doi.org/10.1080/00207543.2020.1724343.
Helbig, C., Gemechu, E.D., Pillain, B., Young, S.B., Thorenz, A., Tuma, A., Sonnemann, G., 2016. Extending the geopolitical supply risk indicator: application of life cycle sustainability assessment to the petrochemical supply chain of polyacrylonitrile-based carbon fibers. J. Clean. Prod. 137, 1170–1178. https://doi.org/10.1016/j.jclepro.2016.07.214.
Hosseini, S., Barker, K., 2016. A Bayesian network model for resilience-based supplier selection. Int. J. Prod. Econ. 180, 68–87. https://doi.org/10.1016/j.ijpe.2016.07.007.
Hosseini, S., Ivanov, D., Dolgui, A., 2019. Review of quantitative methods for supply chain resilience analysis. Transport. Res. E Logist. Transport. Rev. 125, 285–307. https://doi.org/10.1016/j.tre.2019.03.001.
Hosseini-Motlagh, S.-M., Samani, M.R.G., Saadi, F.A., 2020a. A novel hybrid approach for synchronized development of sustainability and resiliency in the wheat network. Comput. Electron. Agric. 168 https://doi.org/10.1016/j.compag.2019.105095.
Hosseini-Motlagh, S.-M., Samani, M.R.G., Shahbazbegian, V., 2020b. Innovative strategy to design a mixed resilient-sustainable electricity supply chain network under uncertainty. Appl. Energ. 280 https://doi.org/10.1016/j.apenergy.2020.115921.
Ibn-Mohammed, T., Mustapha, K.B., Godsell, J., Adamu, Z., Babatunde, K.A., Akintade, D.D., Acquaye, A., Fujii, H., Ndiaye, M.M., Yamoah, F.A., Koh, S.C.L., 2021. A critical review of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies. Resour. Conserv. Recy. 164 https://doi.org/10.1016/j.resconrec.2020.105169.
Ivanov, D., 2018. Revealing interfaces of supply chain resilience and sustainability: a simulation study. Int. J. Prod. Res. 56, 3507–3523. https://doi.org/10.1080/00207543.2017.1343507.
Ivanov, D., 2020. Viable supply chain model: integrating agility, resilience and sustainability perspectives—lessons from and thinking beyond the COVID-19 pandemic. Ann. Operat. Res. https://doi.org/10.1007/s10479-020-03640-6.
Ivanov, D., Das, A., Choi, T.-M., 2018. New flexibility drivers for manufacturing, supply chain and service operations. Int. J. Prod. Res. 56, 3359–3368. https://doi.org/10.1080/00207543.2018.1457813.
Jabbarzadeh, A., Fahimnia, B., Sabouhi, F., 2018. Resilient and sustainable supply chain design: sustainability analysis under disruption risks. Int. J. Prod. Res. 56, 5945–5968. https://doi.org/10.1080/00207543.2018.1461950.
Jamali, G., Asl, E.K., Zolfani, S.H., Šaparauskas, J., 2017. Analysing LARG supply chain management competitive strategies in Iranian cement industries. Ekonomie a Management 20, 70–83. https://doi.org/10.15240/tul/001/2017-3-005.
Ji, L., Yuan, C., Feng, T., Wang, C., 2020. Achieving the environmental profits of green supplier integration: the roles of supply chain resilience and knowledge combination. Sustain. Dev. 28, 978–989. https://doi.org/10.1002/sd.2050.
Kaur, H., Singh, S.P., 2019. Sustainable procurement and logistics for disaster resilient supply chain. Ann. Operat. Res. 283, 309–354. https://doi.org/10.1007/s10479-016-2374-2.
Khan, S.A.R., Zia-ul-haq, H.M., Umar, M., Yu, Z., 2021. Digital technology and circular economy practices: An strategy to improve organizational performance. Business Strategy & Development 4 (4), 482–490. https://doi.org/10.1002/bsd2.176.
Khot, S.B., Thiagarajan, S., 2019. Resilience and sustainability of supply chain management in the Indian automobile industry. Int. J. Data Net. Sci. 3, 339–348. https://doi.org/10.5267/j.ijdns.2019.4.002.
Klibi, W., Martel, A., Guitouni, A., 2010. The design of robust value-creating supply chain networks: a critical review. Eur. J. Oper. Res. 203, 283–293. https://doi.org/10.1016/j.ejor.2009.06.011.
López, C., Ruiz-Benítez, R., 2020. Multilayer analysis of supply chain strategies' impact on sustainability. J. Purch. Supply Manag. 26 https://doi.org/10.1016/j.pursup.2019.04.003.
López-Castro, L.F., Solano-Charris, E.L., 2021. Integrating resilience and sustainability criteria in the supply chain network design. A systematic literature review. Sustainability 13, 10925. https://doi.org/10.3390/su131910925.
Lu, H., Halappanavar, M., Kalyanaraman, A., 2015. Parallel heuristics for scalable community detection. Parallel Comput. 47, 19–37. https://doi.org/10.1016/j.parco.2015.03.003.
Mangla, S.K., Luthra, S., Mishra, N., Singh, A., Rana, N.P., Dora, M., Dwivedi, Y., 2018. Barriers to effective circular supply chain management in a developing country context. Prod. Plan. Control 29, 551–569. https://doi.org/10.1080/09537287.2018.1449265.
Marchese, D., Reynolds, E., Bates, M.E., Morgan, H., Clark, S.S., Linkov, I., 2018. Resilience and sustainability: similarities and differences in environmental management applications. Sci. Tot. Environ. 613–614, 1275–1283. https://doi.org/10.1016/j.scitotenv.2017.09.086.
Mari, S.I., Lee, Y.H., Memon, M.S., 2014. Sustainable and resilient supply chain network design under disruption risks. Sustainability 6, 6666–6686. https://doi.org/10.3390/su6106666.
Mari, S.I., Lee, Y.H., Memon, M.S., 2016. Sustainable and resilient garment supply chain network design with fuzzy multi-objectives under uncertainty. Sustainability 8. https://doi.org/10.3390/su8101038.
McKinsey Sustainability, 2020. Addressing climate change in a post-pandemic world. https://www.elsevier.com/journals/journal-of-cleaner-production/0959-6526/guide-for-authors (accessed 09 February 2022).
Medel, K., Kousar, R., Masood, T., 2020. A collaboration–resilience framework for disaster management supply networks: a case study of the Philippines. J. Humanit. Logist. Supply Chain Manag. 10, 509–553. https://doi.org/10.1108/JHLSCM-09-2019-0066.
Mehrjerdi, Y.Z., Shafiee, M., 2021. A resilient and sustainable closed-loop supply chain using multiple sourcing and information sharing strategies. J. Clean. Prod. 289 https://doi.org/10.1016/j.jclepro.2020.125141.
Mohammed, A., Harris, I., Soroka, A., et al., 2021. Gresilient supplier assessment and order allocation planning. Ann Oper Res 296, 335–362. doi:10.1007/s10479-020-03611-x.
Mohammed, A., Harris, I., Soroka, A., Nujoom, R., 2019. A hybrid MCDM-fuzzy multi-objective programming approach for a G-resilient supply chain network design. Comput. Ind. Eng. 127, 297–312. https://doi.org/10.1016/j.cie.2018.09.052.
Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., Altman, D., Antes, G., Atkins, D., Barbour, V., Barrowman, N., Berlin, J.A., 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J. Chin. Integr. Med. 7, 889–896.
Moore, S.B., Manring, S.L., 2009. Strategy development in small and medium sized enterprises for sustainability and increased value creation. J. Clean. Prod. 17, 276–282. https://doi.org/10.1016/j.jclepro.2008.06.004.
Nandi, S., Sarkis, J., Hervani, A.A., Helms, M.M., 2021. Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences. Sustain. Prod. Consum. 27, 10–22. https://doi.org/10.1016/j.spc.2020.10.019.
Negri, M., Cagno, E., Colicchia, C., Sarkis, J., 2021. Integrating sustainability and resilience in the supply chain: a systematic literature review and a research agenda. Bus. Strateg. Environ. https://doi.org/10.1002/bse.2776.
Otto, A., Kotzab, H., 2003. Does supply chain management really pay? Six perspectives to measure the performance of managing a supply chain. Eur. J. Oper. Res. 144, 306–320. https://doi.org/10.1016/S0377-2217(02)00396-X.
Paloviita, A., Järvelä, M., 2019. Multilevel governance for climate change adaptation in food supply chains. In: Sarkar, A., Sensarma, S., vanLoon, G. (Eds.), Sustainable Solutions for Food Security. Springer, Cham, pp. 479–496.

Panetto, H., Iung, B., Ivanov, D., Weichhart, G., Wang, X., 2019. Challenges for the cyber-physical manufacturing enterprises of the future. Annu. Rev. Control 47, 200–213. https://doi.org/10.1016/j.arcontrol.2019.02.002.

Papadopoulos, T., Gunasekaran, A., Dubey, R., Altay, N., Childe, S.J., Fosso-Wamba, S., 2017. The role of Big Data in explaining disaster resilience in supply chains for sustainability. J. Clean. Prod. 142, 1108–1118. https://doi.org/10.1016/j.jclepro.2016.03.059.

Park, J., Sarkis, J., Wu, Z., 2010. Creating integrated business and environmental value within the context of China's circular economy and ecological modernization. J. Clean. Prod. 18, 1494–1501. https://doi.org/10.1016/j.jclepro.2010.06.001.

Paul, S.K., Moktadir, M.A., Ahsan, K., 2021. Key supply chain strategies for the post-COVID-19 era: implications for resilience and sustainability. Int. J. Logist. Manag. https://doi.org/10.1108/IJLM-04-2021-0238.

Pettit, T.J., Croxton, K.L., Fiksel, J., 2019. The evolution of resilience in supply chain management: a retrospective on ensuring supply chain resilience. J. Bus. Logist. 40, 56–65. https://doi.org/10.1111/jbl.12202.

Ponomarov, S.Y., Holcomb, M.C., 2009. Understanding the concept of supply chain resilience. Int. J. Logist. Manag. 20, 124–143. https://doi.org/10.1108/09574090910954873.

Queiroz, M.M., Ivanov, D., Dolgui, A., Fosso Wamba, S., 2020. Impacts of epidemic outbreaks on supply chains: mapping a research agenda amid the COVID-19 pandemic through a structured literature review. Ann. Operat. Res. https://doi.org/10.1007/s10479-020-03685-7.

Rajesh, R., 2019. Social and environmental risk management in resilient supply chains: a periodical study by the Grey-Verhulst model. Int. J. Prod. Res. 57, 3748–3765. https://doi.org/10.1080/00207543.2019.1566656.

Rousseau, D.M., Manning, J., Denyer, D., 2008. Evidence in management and organizational science: assembling the field's full weight of scientific knowledge through syntheses. Acad. Manag. Ann. 2, 475–515. https://doi.org/10.5465/19416520802211651.

Ruiz-Benitez, R., López, C., Real, J.C., 2017. Environmental benefits of lean, green and resilient supply chain management: the case of the aerospace sector. J. Clean. Prod. 167, 850–862. https://doi.org/10.1016/j.jclepro.2017.07.201.

Ruiz-Benitez, R., López, C., Real, J.C., 2019. Achieving sustainability through the lean and resilient management of the supply chain abstract. Int. J. Phys. Distr. Log. 49, 122–155. https://doi.org/10.1108/IJPDLM-10-2017-0320.

Sarkis, J., 2021. Supply chain sustainability: learning from the COVID-19 pandemic. Int. J. Oper. Prod. Manag. 41, 63–73. https://doi.org/10.1108/IJOPM-08-2020-0568.

Sarkis, J., Zhu, Q., Lai, K., 2011. An organizational theoretic review of green supply chain management literature. Int. J. Logist. Manag. 130, 1–15. https://doi.org/10.1016/j.ijpe.2010.11.010.

Seuring, S., Müller, M., 2008. From a literature review to a conceptual framework for sustainable supply chain management. J. Clean. Prod. 16, 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020.

Shareef, M.A., Dwivedi, Y.K., Kumar, V., Hughes, D.L., Raman, R., 2020. Sustainable supply chain for disaster management: structural dynamics and disruptive risks. Ann. Operat. Res. https://doi.org/10.1007/s10479-020-03708-3.

Shashi, Centobelli, P., Cerchione, R., Ertz, M., 2020. Managing supply chain resilience to pursue business and environmental strategies. Bus. Strateg. Environ. 29, 1215–1246. https://doi.org/10.1002/bse.2428.

Shin, N., Park, S., 2019. Evidence-based resilience management for supply chain sustainability: an interpretive structural modelling approach. Sustainability 11. https://doi.org/10.3390/su11020484.

Shishodia, A., Sharma, R., Rajesh, R., Munim, Z.H., 2021. Supply chain resilience: a review, conceptual framework and future research. Int. J. Logist. Manag. https://doi.org/10.1108/IJLM-03-2021-0169.

Singh, R.K., Gupta, A., Gunasekaran, A., 2018. Analysing the interaction of factors for resilient humanitarian supply chain. Int. J. Prod. Res. 56, 6809–6827. https://doi.org/10.1080/00207543.2018.1424373.

Smart, P., Hemel, S., Lettice, F., Adams, R., Evans, S., 2017. Pre-paradigmatic status of industrial sustainability: a systematic review. Int. J. Logist. Manag. 37, 1425–1450.

Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M., 2016. The resilience of long and short food chains: a case study of flooding in Queensland, Australia. Agric. Hum. Values 33, 45–60. https://doi.org/10.1007/s10460-015-9603-1.

Strozzi, F., Colicchia, C., Creazza, A., Noè, C., 2017. Literature review on the 'Smart Factory' concept using bibliometric tools. Int. J. Prod. Res. 55, 6572–6591. https://doi.org/10.1080/00207543.2017.1326643.

The Coca Cola Company, 2020. 2020 Business & Environmental, Social and Governance Report. accessed 09 February 2022. https://www.coca-colacompany.com/content/dam/journey/us/en/reports/coca-cola-business-environmental-social-governance-report-2020.pdf.

Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Brit. J. Manage. 14, 207–222. https://doi.org/10.1111/1467-8551.00375.

Tseng, M.-L., Lim, M., Wu, K.-J., Zhou, L., Bui, D.T.D., 2018. A novel approach for enhancing green supply chain management using converged interval-valued triangular fuzzy numbers-grey relation analysis. Resour. Conserv. Recy. 128, 122–133. https://doi.org/10.1016/j.resconrec.2017.01.007.

van Eck, N.J., Waltman, L., 2014. Visualizing Bibliometric Networks. In: Ding, Y., Rousseau, R., Wolfram, D. (Eds.), Measuring Scholarly Impact: Methods and Practice. Springer International Publishing, Cham, pp. 285–320.

Vroegindewey, R., Hodbod, J., 2018. Resilience of agricultural value chains in developing country contexts: a framework and assessment approach. Sustainability 10. https://doi.org/10.3390/su10040916.

Wang, J., Ran, B., 2018. Sustainable Collaborative Governance in supply chain. Sustainability 10. https://doi.org/10.3390/su10010171.

Wu, K.-J., Liao, C.-J., Tseng, M., Chiu, K.-K.-S., 2016. Multi-attribute approach to sustainable supply chain management under uncertainty. Ind. Manag. Data Syst. 116, 777–800. https://doi.org/10.1108/IMDS-08-2015-0327.

Xu, X., Chung, S.-H., Lo, C.K.Y., Yeung, A.C.L., 2022. Sustainable supply chain management with NGOs, NPOs, and charity organizations: a systematic review and research agenda. Transp. Res. E Logist. Transp. Rev. 164 https://doi.org/10.1016/j.tre.2022.102822.

Yavari, M., Zaker, H., 2019. An integrated two-layer network model for designing a resilient green-closed loop supply chain of perishable products under disruption. J. Clean. Prod. 230, 198–218. https://doi.org/10.1016/j.jclepro.2019.04.130.

Yılmaz, Ö.F., Özçelik, G., Yeni, F.B., 2021. Ensuring sustainability in the reverse supply chain in case of the ripple effect: a two-stage stochastic optimization model. J. Clean. Prod. 282 https://doi.org/10.1016/j.jclepro.2020.124548.

Zahiri, B., Zhuang, J., Mohammadi, M., 2017. Toward an integrated sustainable-resilient supply chain: a pharmaceutical case study. Transport. Res. E Logist. Transport. Rev. 103, 109–142. https://doi.org/10.1016/j.tre.2017.04.009.

Zavala-Alcívar, A., Verdecho, M.-J., Alfaro-Saiz, J.-J., 2020a. A conceptual framework to manage resilience and increase sustainability in the supply chain. Sustainability 12. https://doi.org/10.3390/SU12166300.

Zavala-Alcívar, A., Verdecho, M.-J., Alfaro-Saiz, J.-J., 2020b. Resilient strategies and sustainability in agri-food supply chains in the face of high-risk events. IFIP Adv. Inf. Commun. Technol. 598, 560–570. https://doi.org/10.1007/978-3-030-62412-5_46.

Zhao, D., Strotmann, A., 2015. Analysis and visualization of citation networks. Synthesis lectures on information concepts, retrieval, and services 7, 1–207. 10.2200/S00624ED1V01Y201501ICR039.

Zhu, Q., Krikke, H.R., 2020. Managing a sustainable and resilient perishable food supply chain (PFSC) after an outbreak. Sustainability 12, 5004. https://doi.org/10.3390/su12125004.