

## The Sharing Economy as an enabler of Sustainable and Resilient Supply Chains: a systematic literature review

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**Abstract:** Recent disastrous events and environmental risks have firmly recalled how resilience is an essential element for organizations to survive in today’s competitive scenario. However, increasing resilience through traditional approaches such as investing in extra capacity and resources is not always sustainable with respect to the declining availability of resources in the environment, also according to the Sustainable Development Goals, and in a general situation of erosion of the funding capacity of organizations. Accordingly, resilience and sustainability should be combined, but although the relationship between these two concepts in supply chains has been already explored, consensus on how to align their objectives is still missing. We posit that the sharing economy and its principles can represent a lever to combine resilience and sustainability through a better use of resources to be stretched and made adaptable in a sustainable way, laying the foundations of more resilient supply chains through better flexibility. In order to extend the current knowledge on this matter, we performed a Systematic Literature Review (SLR) combined with bibliometric network analysis techniques derived from the Systematic Literature Network Analysis (SLNA) methodology, investigating the intersection between resilience, sustainability and sharing economy in the field of supply chain management. A strong connection between resilience and sustainability and between sustainability and sharing economy is confirmed by our analysis. Whereas the relationship between resilience and sharing economy and the joint consideration of sustainable, resilient and sharing economy aspects are still unexplored by literature. The results of the review clarify the role of the sharing economy to empower more sustainable and resilient supply chains, providing useful insights for academics and practitioners and pave the way to future research in the field of sustainable and resilient supply chains.

**Keywords:** Supply chain; Sustainability; Resilience; Sharing economy

### 1. Introduction

Recent disastrous events have shown the essence of the so-called “VUCA (Volatile, Unpredictable, Complex, and Ambiguous)” world (Mack and Khare, 2016), where the majority of the supply chains (SCs) are unprepared to cope with the disruptions caused by the so-called “black swans”, i.e. risks with a low probability of occurrence but high impact. Effects of unpreparedness range from transport disruptions to “bullwhip” effects, with cases of overstock due to a sudden drop in the demand of some products, or stock-outs of commodities due to a sudden surge in demand (van Hoek, 2020). Black swans are rare events - generally they happen once per decade - but today not as rare as once believed (Zimmer, 2020). Even if it is impossible to predict when these events will occur, organizations can mitigate their consequences by being ready to react and execute plans prepared before the disruption takes place (Rice, 2020). Supply chains need to change their structure towards more resilience. A traditional way to increase resilience is to invest in extra capacity and resources to enable responsiveness and adaptability (Christopher, 2000). However, this comes at a cost and is not always sustainable, especially nowadays with the erosion of funding capacity and declining availability of resources in the environment, also according to the Sustainable Development Goals

(SDGs). In particular, SDG number 12 “Responsible consumption and production” aims at promoting a more efficient use of natural resources and energy doing “more and better with less” (“Transforming our world: the 2030 Agenda for Sustainable Development”, 2015). Consequently, sustainable development and in general sustainability are key to empower resilience (Fahimnia and Jabbarzadeh, 2016) through a better use of resources to be made adaptable in a sustainable way. The need to redesign supply chains according to the concepts of sustainability and resilience emerges, incorporating a set of reactive and proactive measures that do not conflict with sustainable development. Although previous literature has explored the relationship between resilience and sustainability, there is no common consensus on their similarities, differences and how their objectives can be aligned. Some studies consider sustainability and resilience strictly connected, or even the same concept; whereas others consider them distinct and unrelated (Marchese et al., 2018). At the same time, a way to stretch and adapt available resources to improve both resilience and sustainability within supply chain can be the sharing economy (Belk, 2014; Choi et al., 2020). Sharing economy can enable a more elastic supply chain (Choi, 2021), capable to react and adapt to changes without requiring additional resources. For example, crowd

logistics initiative allows firms to outsource logistics activities to the crowd with individuals that possess resources to be used to perform business logistics activities. Sharing allows better exploitation of logistics resources, thus promoting higher sustainable performance (Carbone et al., 2017; Castillo et al., 2018). At the same time, sharing allows benefiting from the diversification of options and from flexible capacity to be activated when needed with a consequent improvement of resilience against uncertainties (Heylighen, 2017). The sharing economy principles applied to supply chain management (SCM) indicate a potential answer to the adaptive needs of supply chains towards better sustainability and resilience. Even though there is general knowledge on the diffusion of sharing economy solutions and their importance, previous literature addresses these elements separately and the joint consideration of sustainability, resilience and sharing economy is missing. Indeed, studies have demonstrated the potential of sharing economy solutions to improve sustainability and resilience, but the benefits of sharing economy solutions in terms of sustainability and resilience are not investigated together. To address these gaps, the present paper aims to answer the following research question: *What are the main research themes within the topics of Supply chain resilience, Supply chain sustainability and Sharing economy taking into account their relationships and intersections?* Hence, our purpose is to provide an innovative view investigating how sharing economy can be used as lever for sustainable and resilient supply chains, also clarifying sustainability and resilience relationship in the field of supply chain management. To do this, we studied the intersection areas between the three research topics conducting a literature review that combines the systematic literature review (SRL) methodology with bibliometric network analyses derived from the Systematic Literature Network Analysis (SLNA). The analysis of the state-of-the-art of sharing economy solutions applied to sustainable and resilient supply chains could stimulate the academic debate on these matters and invite the industrial community to consider the sharing economy as an answer to the need of increased levels of sustainability and resilience. The rest of the paper is structured as follows. Section 2 illustrates the methodology; Section 3 and 4 present the results of the review where the three research topics are first analyzed separately and then jointly. In Section 5 future research directions are proposed; in Section 6 conclusions are drawn, implications, limitations of the study are provided.

## 2. Methodology

We adopted the Systematic Literature Review (SLR) approach combined with some analyses derived from the Systematic Literature Network Analysis (SLNA) methodology (Colicchia et al., 2019; Strozzi et al., 2017). We conducted the SLR following the approach proposed by Denyer and Tranfield, 2009. In the first step of SLR the research question and the scope of the literature review are defined. Our literature review aims to investigate the sharing economy in relation to supply chain sustainability and resilience. The scope of the analysis is to study supply chain sustainability, resilience

and sharing economy with a focus on common emerging research areas, analysing their joint implementation in SCM and highlighting the latest trajectories of development in the field. In line with the objective of the study, a number of keywords related to the research topics are identified. Considering synonyms, aggregating the keywords and combining them with Boolean operators, the following research strings were defined: “resilience” AND “supply chain\*” AND “supply chain resilience\*” for SC resilience; “sustainable development” AND (“sustainable supply chain\*” OR “supply chain sustainab\*”) for SC sustainability; “sharing econom\*” OR “collaborative consumption” OR “peer-to-peer economy\*” for sharing economy. The data were collected using the Scopus database that is one of the largest databases of peer-reviewed literature. Several exclusion criteria are applied to select only those documents that are pertinent to the review questions (Denyer and Tranfield, 2009). The analysis considered only papers in peer-reviewed scientific journals, written in English language, related to Logistics and Supply Chain Management, containing the keywords in the title or the abstract, with no restriction to the publication year. This led to obtain the following outcomes: 422 papers for supply chain resilience, 934 works for supply chain sustainability, 1660 for sharing economy. Given the resulting large amount of papers, we applied bibliometric analysis techniques derived from the SLNA to restrict the research field. SLNA techniques allow better studying the evolutionary aspects of contributions and detecting emerging topics (Colicchia et al., 2019; Strozzi et al., 2017). We first built a citation network for each research topic. Based on the bibliometric data retrieved from Scopus, the citation network was created with the VOSviewer software package, i.e. a tool for constructing and visualizing bibliometric networks ([www.vosviewer.com/](http://www.vosviewer.com/)). We set a threshold of 10 citations when creating the citation network, since we wanted to isolate the main connected components of the citation network only. As a result, a main connected component consisting of 128 papers was found for SC resilience, one made of 445 papers for SC sustainability and the last one made of 226 papers for sharing economy. We scrutinized the papers included in the main connected components, and we performed the co-occurrence analysis of the papers’ keywords. Also, the co-occurrence keywords analysis was executed with VOSviewer, setting a number of minimum occurrences equal to 5. To perform the co-occurrence analysis, the VOSviewer software utilizes the “Visualisation Of Similarities” algorithm that creates clusters of keywords minimizing the similarity measures between them (van Eck & Waltman, 2010). As a result, the analysis provided the papers’ keywords clusterization map in which keywords are represented by nodes and linkages between them express the strength of their interconnections. This analysis is instrumental to identify relevant research paths and trends of each research topic singularly, also looking for overlapping themes and shared research areas between them (Colicchia et al., 2019). Starting from the output of the bibliographic network analysis, the documents were analyzed and synthesized. Finally, by combining the related search strings, we studied the







#### 4.1 SC Resilience and SC Sustainability

The intersection between supply chain resilience and sustainability is strong in the literature. Nowadays resilience and sustainability are considered two important characteristics of supply chains. On one side, the environment in which companies operate is more complex, vulnerable and uncertain, hence the need to have more resilient supply chains. On the other side, companies are receiving pressures from external stakeholders (e.g., society, governments, institutions) to engage in a more sustainable development (Marchese et al., 2018; Seuring and Müller, 2008; Wu and Wu, 2012). Yet the trade-offs or complementarity between them is still not clear. Both resilience and sustainability focus on the ability of a system to survive over time but there are potential conflicts due to their different temporal scales. Generally sustainability has a larger spatial and temporal scale, it considers medium-long term effects on global social and environmental systems; instead, resilience can also be achieved in the short term by a single organization at expense of another (Marchese et al., 2018). The relationship between resilience and sustainability can be explained by three frameworks: resilience as part of sustainability; sustainability as part of resilience; sustainability and resilience as separated concepts (Marchese et al., 2018).

According to some authors who perceive resilience being a part of sustainability, a sustainable supply chain should be flexible and resilient to cope with uncertainties. Firms may lose sustainability when trying to find solutions to face external disruptions if they are not resilient (Mari et al., 2014). To have an effective sustainable development, a sustainable system needs to be resilient to cope with possible vulnerabilities (Marchese et al., 2018, Lebel et al., 2006). Leveraging on supply chain risk management, a supply chain can understand and manage its economic, environmental and social risks, in this view corporations recognize risk management as part of their sustainability strategy (Carter and Rogers, 2008). On the opposite side, some authors treat sustainability as part of resilience. According to this view, increasing economic, social and environmental wellbeing reduces the possibility of the supply chain to be impacted by disturbances. A sustainable business has more chances to survive (Avery and Bergsteiner, 2011) since it can manage the so called sustainability-related risks. For a supply chain being resilient means also being sustainable considering that it can minimize environmental, social and economic risks (Giannakis and Papadopoulos, 2016). For instance, a company that will strictly follow environmental regulation to reduce pollution risks, will maximize employees' health and minimize the risk of unethical treatment. Sustainability and resilience can be considered two separated concepts with competitive or accordant objectives. This mainly happens in the short term when risk management and sustainability criteria sometimes lead to different decisions in the supply network. Resilience can be enhanced by redundancy (larger inventory, more facilities and machineries) which can lead to waste generation and resources dis-optimization (Ivanov, 2018). Moreover, according to sustainability criteria a local supply network is preferable to a global one since transportation routes are shorter and carbon

emissions are reduced, provided the transport mode for global sourcing is the same as for local sourcing. However, to be resilient many supply chains rely on geographical differentiated suppliers' network with both local and global suppliers and a consequent dis-optimization of CO<sub>2</sub> emissions. In the literature, several studies propose optimization models for the implementation of resilience and sustainable supply chain networks, considered two separated but both fundamental aspects of supply chain. Many contributions focus on developing quantitative models, such as multiple objectives optimizations, simulation-based studies, stochastic optimization models. These models are developed considering sourcing strategies (Fahimnia and Jabbarzadeh, 2016; Ivanov, 2018), the reduction of carbon emissions in the network (Mari et al., 2014) and the review of the inventory level at different stages (Ivanov, 2018). The focus is on the environmental part of sustainability since most of the supply chain design decisions directly influence the number and length of transportation paths and so carbon emissions (Azevedo et al., 2013; Ivanov, 2018; Mari et al., 2014). Contributions in this research area are still incomplete since it is difficult to provide a complete and exhaustive view on sustainable and resilience interactions within the entire supply chain.

#### 4.2 SC Sustainability and Sharing economy

In the literature the relationship between sharing economy and sustainability is strong. Sharing economy solutions contribute to enhancing sustainability through a better matching between demand and supply, this leads to reduce the waste of resources (Heylighen, 2017). Therefore, resources sharing can prevent excessive production and consumption promoting the achievement of a more sustainable society (Heylighen, 2017; Ryu et al., 2019). In the literature particular attention is given to the practice of crowd logistics. Crowd logistics involves “*initiatives that tap into the logistical resources of the crowd to perform logistics services*” (Carbone et al., 2017). It refers to the outsourcing of logistics activities by firms or individuals to the crowd. The idea is that individuals possess logistics resources (vehicles, storage spaces etc.) that others can use to perform their business logistics activities using digital platforms to exchange information. In this case, sharing allows making better use of distributed, idle logistics resources and capabilities; as well as freeing resources to utilize in alternative innovative projects. Moreover, crowd logistics has a relevant impact on reducing CO<sub>2</sub> emissions and the necessity of new investments in logistics infrastructure (Carbone et al., 2017; Castillo et al., 2018). Also infrastructure sharing positively contributes to the sustainable growth by increasing the utilization of machines and infrastructures, and reducing idle capacity waste (Fan and Fang, 2020; Helman et al., 2021). In general, sharing economy is linked to the idea of a more sustainable use of resources (Geissinger et al., 2019). Indeed, sharing practices leveraging on the utilization of available resources have transformed the old consumption paradigm based on traditional market exchanges in a more sustainable one (Curtis and Lehner, 2019; Pouri and Hilty, 2018). Moreover, sharing economy

can support the development of circular economy in industrial contexts by enhancing firms' collaboration, incentivizing the share of productive resources with the aim to reduce wastes and improve the resources utilization (Choi et al., 2020).

#### 4.3 SC Resilience and Sharing economy

Studies on the relationship between sharing economy and supply chain resilience are scarce. A network based on resources sharing can benefit from the diversity of components considering that a problem affecting some resources has a low probability of affecting others (Heylighen, 2017). Thus, acting on diversification of options a system can enhance its resilience. At the same time, sharing is based on flexible capacity to be activated when needed with the consequent creation of an extra buffer capacity against scarcity. Relying on flexible production or logistics capacity allows the supply chain to adjust its configuration in order to anticipate and to cope better with disruptions (Ivanov et al., 2017). Both flexibility and redundancy are considered aspects of resilience (Shekarian and Mellat Parast, 2020). By increasing redundancy of resources, the system can respond to unpredictable changes in demand and guarantee its continuity in case of operational disruptions (Heylighen, 2017). On-demand solutions also have the potential to enable a better monitoring of flows because of the use of platforms and high traceable market exchanges (Ryu et al., 2019). Basically, sharing networks and platforms can contribute to enhancing resilience introducing a variety of options and promoting a more flexible and elastic use of resources (Choi, 2021; Heylighen, 2017; Ryu et al., 2019). According to a recent review of the literature conducted by Ryu et al. (2019) the research field is still immature and the literature has no empirical evidence supporting the impact of sharing on resilience.

#### 4.4 SC Resilience, SC Sustainability, Sharing economy

Even if this stream of literature is still immature, studies on sharing practices as enabler of better sustainable and resilient networks are growing. On one side, the optimized matching between offers and demands on the market can help in preventing excessive production and in reducing wastes. The more efficient use of resources enabled by sharing practices promotes sustainability. On the other side, sharing offers redundancy and diversification of components that are able to provide quick remedies to uncertainties and to enhance the resilience of a system (Heylighen, 2017). Moreover, by making higher use of servitization rather than owning resources, sharing is able to increase the flexibility of a system (Belk, 2014). The flexibility, considered one of the key capabilities of resilience (Shekarian and Mellat Parast, 2020), offered by sharing economy is achieved leveraging on sharing and not on redundancy of resources without compromising sustainability performances. Sharing economy supporting a more elastic use of resources allows the company's capabilities to be expanded or reduced to face changing demands in the supply chain (Choi, 2021). Thus, a flexible and efficient use of resources enabled by sharing economy solutions can be the way to achieve both sustainable and resilient

performances in supply chains. Although at the moment there is not a consistent and extensive body of research focused on sustainable and resilient performances of supply chain according to the principles of the sharing economy, recent papers started taking into account how sharing practices help ensure sustainability and create resilient supply chains. This is considered a promising and important research path for the future (Breidbach and Brodie, 2017; Heylighen, 2017; Ryu et al., 2019).

#### 5. Research agenda

Analysing systematically the literature and combining the outputs of bibliometric analyses, we were able to depict a landscape of the current state-of-the-art and draw a research agenda on the investigated fields.

##### SC Resilience and SC Sustainability

Cluster two and four in the resilience co-occurrence analysis outlined that in the literature the joint study of sustainability and resilience in the field of SCM is well developed. However, the main gap concerning these studies is the lack of conceptual clarity. The analysis confirmed that the main reason for the misalignment in sustainability and resilient concept definitions is the reference to different temporal scales, as suggested by Marchese et al. (2018). Future research might want to explore the extent to which key determinants of sustainability also determine the resilience of a supply chain, and or otherwise. Or whether such determinants remain having the same effects over time across different supply chain configurations.

The analysis of clusters two and four in the resilience co-occurrence analysis revealed a prevalence of studies focusing on the environmental pillar of sustainability when combined with resilience elements. The predominance of the environmental dimension can be detected both in research works addressing the reduction of climate change risks for more sustainable and resilient networks in the long term (Giannakis and Papadopoulos, 2016), and in those proposing the matching between supply chain sustainability and resilience in the short term where the sustainability aspects rely mainly on carbon emissions reduction (Azevedo et al., 2013; Hosseini and Barker, 2016; Ivanov, 2018; Mari et al., 2014). Our suggestion is that further research should pay more attention to also integrating social and economic pillars of sustainability in designing a more sustainable-resilient supply chain both theoretically and empirically.

##### SC Sustainability and Sharing economy

Cluster one of the sharing economy co-occurrence analysis showed that in the literature arguments have been advanced to support sustainability benefits stemming from the adoption of sharing economy solutions. They include a better matching of the demand and supply on the market and the optimization in the use of available resources (Geissinger et al., 2019), the reduction of carbon emissions (Carbone et al., 2017; Castillo et al., 2018), which are prevalently environmental sustainability benefits. For future research, we recommend paying more attention to studying the drivers and benefits of sharing economy solutions not only with respect to environmental performance, but also for social and economic sustainability.

### SC Resilience and Sharing economy

Research paths investigating SC resilience and sharing economy are missing and contributions in this area can only be found by analysing together the three research topics. This clearly shows that the joint consideration of SC resilience and the sharing economy is very weak (Breidbach and Brodie, 2017; Ryu et al., 2019). In this sense, future research should focus on analysing the resilient benefits stemming from the adoption of sharing solutions, such as diversification of options enhancing flexibility (Heylighen, 2017, Ivanov et al., 2017; Choi, 2021; Ryu et al., 2019), redundancy of resources (Heylighen, 2017) and higher visibility on transactions (Ryu et al., 2019).

### SC Resilience, SC Sustainability, Sharing economy

In the literature, research works addressing at the same time sustainability, resilience and sharing economy are scarce. This suggests that the research area is still in its infancy and future research should be developed (Breidbach and Brodie, 2017; Ryu et al., 2019). Future contributions in this area should address the drivers and mechanisms of empirical cases of resilient and sustainable strategies stemming from sharing solutions. In particular, there are calls for more real world implementations or pilot studies of SC sharing solutions such as crowd logistics (Carbone et al., 2017; Castillo et al., 2018) and infrastructure sharing (Fan and Fang, 2020; Helman et al., 2021). Future research could also investigate the recourse to servitization in logistics and operational processes, as part of the transition “from owning to using strategies” (Kumar et al., 2017), as the key to empower both sustainability and resilience through sharing solutions.

### 6. Conclusions

With the purpose to investigate supply chain resilience, supply chain sustainability and sharing economy taking into account their relationship and intersections, we conducted an SLR combined with bibliometric network analysis derived from the SLNA methodology. Our findings suggest that the intersection between supply chain resilience and sustainability, supply chain sustainability and sharing economy is strong in literature. On the contrary, contributions on the relationship between supply chain resilience and sharing economy and the joint consideration of the three research topics are scarce. From the theoretical point of view, our study contributes to the current literature, by enlarging the knowledge on the role of sharing economy in promoting more resilient and sustainable supply chains. These topics have been investigated with an original and innovative perspective that is the application of the SLNA techniques to the classical systematic literature review. This paper has highlighted the main thematic areas for each topic, has discovered the overlapping research themes and has clarified the relationships among supply chain resilience, sustainability and sharing economy. Our research provides meaningful insights into the ongoing debate regarding the relationship between supply chain resilience and sustainability and their potential intersections. At the same time, our work sheds light on the intersection between sharing economy and

sustainability, discovering the benefits in terms of sustainable goals achieved by implementing sharing practices. Finally, this paper contributes to the existing literature analysing the implementation of sharing practices in the supply chain to enhance resilient and sustainable characteristics. From the practical viewpoint, our work informs companies on the emergent sharing practices and their benefits on sustainable and resilient performance to drive strategic and managerial decisions more effectively. The business community can realise that there is a new lens in combining sustainable and resilience objectives, that of sharing economy. Nevertheless, the methodology applied in the paper present some limitations. The first criticism relates to the inability of citations to take into account the full contribution of an article to the academic research (Colicchia et al., 2019; Strozzi et al., 2017). At the same time, citations are retrieved from the Scopus database. Although it comprehends a wide and exhaustive collection of papers, it cannot include all the scientific publications produced. Finally, citations are affected by the “Matthew effect”, according to which most cited papers tend to receive additional further citations by scholars because of their popularity and acknowledgment (Colicchia et al., 2019). Nevertheless, the paper provides an interesting application of the SLNA methodology and SLR in a research field that calls for further investigation.

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The full list of references is available in the Appendix, available at: [https://liuc-my.sharepoint.com/:w/g/personal/mcarissimi\\_liuc\\_it/EScJTe8oRYRGsrN0zdPiyMBeFBzX50ofyW5NSEdDPskMw?e=HKAEAF](https://liuc-my.sharepoint.com/:w/g/personal/mcarissimi_liuc_it/EScJTe8oRYRGsrN0zdPiyMBeFBzX50ofyW5NSEdDPskMw?e=HKAEAF)