

Collaboration for the sustainable food supply chain: A bibliometric analysis

Abstract

There is increasing attention on the topic of collaboration for sustainable food supply chains (SFSCs), with increasingly contributing journals and publications every year. The urgency of this topic is even more highlighted due to the COVID-19 pandemic and the more recent energy and food crisis. Hence, the field needs to have a good portrait of the ongoing research in this area and to better understand future research directions to enable optimised future strategic plans and problem-solving capability of effective collaboration for SFSCs. This paper reviews, analyses and synthesises the current state of research into collaboration for SFSCs. We examine a sample of 528 articles identified from the Scopus and Web of Science databases using bibliometric analysis methodology. We identify four research clusters: collaboration and sustainable supply chain management, emerging markets and resilience, digital technologies, and perishable food products. This paper clarifies interrelated themes and identifies a range of topic areas that still demand further investigation.

Keywords: Bibliometric analysis; Collaboration; Food industry; Network analysis; Supply chain; Sustainability

1 Introduction

Recent disruptive events have provided compelling evidence that transforming food supply chains (FSCs) for sustainability is crucial for achieving sustainable development goals (SDGs) (Gómez and Lee, 2023). FSCs primarily include two main products: fresh foods (e.g. fresh fruits) and processed foods (e.g. ready-to-eat meals) (Zhu et al., 2018). Compared to other supply chains, FSCs have some unique characteristics, such as the perishability of food products, supply uncertainties due to climate change or ineffective food production practices, and variations in consumer demand (Krishnan *et al.*, 2022). Typically, FSCs focus on the economic performance of the whole chain (Li *et al.*, 2014). However, disruptive events (e.g. the COVID-19 pandemic, unpredictable weather patterns due to climate change and wars), have worsened the food waste situation and raised concerns about food shortages and have put a significant strain on the already stretched FSCs, making food products more expensive and less accessible (Sezer *et al.*, 2024). Consequently, recent studies have focused on approaches to make the FSCs more sustainable through innovations (Rogers and Dora, 2024) and changing

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farming practices (Gómez and Lee, 2023). Sustainable FSCs (SFSCs) are defined as the management of information, materials, activities and capital flows along FSCs while considering three dimensions of economic, environmental and social goals (Beske *et al.*, 2014). Previous studies commonly underlined that FSCs are dynamic and complex networks with high numbers of partners (e.g. farmers, producers and governments) and associated connections among these partners (Sezer *et al.*, 2024). These partners need to collaboratively take urgent actions to seriously stabilise food prices, ensure food security, and improve food sustainability (Santos *et al.*, 2023). Hence, collaboration, a key factor in this process, enables information, resources and knowledge sharing between partners within FSCs, making FSCs more sustainable (Camel *et al.*, 2024).

Generally, collaboration includes two facets: cooperation which refers to an alignment of interests and values among partners to reach a common goal, and coordination which refers to an alignment of parties' actions and tasks to identify a common goal (Roehrich *et al.*, 2024). The literature on collaboration for a sustainable food supply chain (SFSC) is broad but mostly focuses on two main streams in the literature. The first stream focuses on the effects of collaboration on the SFSC, e.g. enhancing food safety and quality (Zhao *et al.*, 2021), reducing food loss and waste (Nader *et al.*, 2022) and enhancing food security (Golgeci *et al.*, 2022). The second stream focuses on factors that influence collaborations. This stream defines trust, incentives (Kam and Lai, 2018), firm strategy (Zaridis *et al.*, 2021), collaborative behaviour (Dania *et al.*, 2018) and farmer willingness (Anastasiadis and Poole, 2015) as some of the factors affecting collaborations in FSCs. To benefit from collaborations, firms need to develop capabilities, change operational processes and even restructure for collaboration (Blome *et al.*, 2014). Small firms may be reluctant to collaborate for fear of becoming dependent on another firm (Matopoulos *et al.*, 2007). Regulation is another challenge for international collaboration, as firms have to meet different standards and certifications in different countries (Despoudi *et al.*, 2021). The diversity of the literature indicates a high level of interest in SFSCs (Oyedijo *et al.*, 2024).

However, the current business environment is changing faster than ever with unprecedented sustainability challenges. According to The Global Risk Report 2022, there are 37 types of global risks that can cause significant impacts on industries and countries (WEF, 2022). Once a disruption occurs, it can lead to regulations, policies, and behavioural changes that challenge the collaboration. Although supply chain collaboration is largely a well-developed domain, current circumstances are forcing us to rethink and refocus on collaboration

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as a potential way to address many of the challenges in the food industry (Aarikka-Stenroos *et al.*, 2022; Sahu *et al.*, 2023). A comprehensive review of collaboration for SFSC is therefore needed, given the diversity of the literature and the current highly complex business environment.

This paper is a timely response to the urgent calls to investigate sustainability in supply chains, particularly after the COVID-19 pandemic (Silva *et al.*, 2023), and the emerging need to study collaborations along FSCs (Dong *et al.*, 2023). Some prior works help to build research foundations and identify facets that need further investigation to address the compelling challenges currently faced by FSCs (Choudhary *et al.*, 2023). For example, Cloutier *et al.* (2020) investigated the role of collaboration in sustainability-oriented supply chain initiatives. Siems *et al.* (2021) focused on how to build SFSCs with a dynamic capabilities lens. Moreno-Miranda and Dries (2022) incorporated coordination mechanisms and analysed the assessment of FSC sustainability. These papers focused on a specific aspect of the topic and encouraged further reflection on FSC sustainability. For example, the social dimension of sustainability is still at an early stage and requires further consideration (Cloutier *et al.*, 2020). Therefore, a thorough review is needed to gain a comprehensive understanding of SFSCs and the role of collaboration in enhancing sustainability and to pave the way for future research on SFSCs. Particularly, we seek to answer three research questions:

RQ1. What are the foundations and theoretical themes of the field of collaboration for SFSCs, and how have theoretical themes in the field developed and evolved over time?

RQ2. What are the main research clusters associated with the field of collaboration for SFSCs?

RQ3. What are the future research directions in the field of collaboration for SFSCs?

To answer these questions, this research follows an insightful bibliometric analysis approach (Chabowski *et al.*, 2022), a powerful method for identifying established and emerging topic areas (Khare and Jain, 2022). It adopts a quantitative approach for the mapping analysis and represents a transparent and systematic process (Mura *et al.*, 2018). Also, given the rapid growth of literature on this topic, many articles have been published in various journals. Thus, conducting a bibliometric analysis could systematically summarise different strands of literature, map main research themes and identify future research directions.

This paper is structured as follows. The second section presents the methodology that we adopted in this research. The paper then presents findings from the bibliometric analysis. This is followed by future research directions discussed in the fourth section. Finally, the fifth

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section offers conclusions, identifies important future research directions, and point out research limitations.

2 Methodology

Bibliometric analysis is a common method for systematically constructing a structural overview of a research topic (Khare and Jain, 2022). Numerous studies have employed bibliometric analysis in different disciplines to summarise the development of the literature, and recently it has been adopted in business and management (e.g. Chabowski *et al.*, 2022; Vogel *et al.*, 2022). This method allows us to investigate the evolution of a research field and shed light on future research areas (Donthu *et al.*, 2021).

Data were retrieved from Scopus and Web of Science (WoS), the most common bibliographic analysis databases (Mura *et al.*, 2018) in July 2022. To initiate this process, we examined and adopted four sets of keywords from recent review works on supply chain collaboration, sustainability, and the food industry (Beske *et al.*, 2014; Dania *et al.*, 2018). The first set of keywords relates to supply chain (e.g. “supply chain”, “supplier”, “value chain”, and “logistics”). The second set of keywords refers to collaboration (e.g. “collaboration”, “integration”, “cooperation”, “joint planning”, “joint product development”, and “coordination”). The third set relates to sustainability (e.g. “green”, “sustainable”, and “sustainability”). The final set refers to food (e.g. “food”, “agri”, and “agro”).

On Scopus, the search was carried on “Title-Abstract-Keywords”. The queries resulted in 3,027 documents. To ensure the consistency and quality of the sample publications, we only focused on 338 peer-reviewed journal articles published in English and in the “Business, Management and Accounting” area. On WoS, the search was carried on “Topic”, which resulted in 1,908 documents. We only selected 305 “Article”, “Review article”, and “Early access” journal articles published in English and in “Business Economics” and “Operations Research Management Science” research areas. In total 643 journal articles from Scopus and WoS were identified. After removing 115 duplicates, the final sample includes 528 journal articles.

Several software (e.g. BibExcel, CiteSpace) support bibliometric analysis. However, they do not assist researchers in a completed analysis. Thus, this research adopts *bibliometrix*, an R-package, that could perform comprehensive science mapping analyses (Aria and Cuccurullo, 2017). We follow the process of adopting *bibliometrix* outlined in Khare and Jain

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(2022). Bibliographic information of 528 articles was downloaded from Scopus and WoS and was imported to *bibliometrix*.

3 Results

The findings of this research reveal the breadth of the area, main research themes, and the research agenda on this topic area. First, we present results from citation analysis, such as the most cited documents and the publication trend. Second, we examine the research topics obtained through co-citation analysis and bibliographic coupling.

3.1 Descriptive analysis

The sample includes 528 articles published in the period 1997 – 2022, written by 1,557 authors. Forty articles were single-author articles, and 488 were multi-author articles. Around 24% of the sample are international co-authorship articles. Figure 1 presents the publication trends in the sample. The publication was scarce until 2013. Then, there is increasing attention in this field. This pattern in the food industry is relevant to the increasing attention to supply chain collaboration and sustainability in general (Marty and Ruel, 2024).

<< Insert Figure 1 about here >>

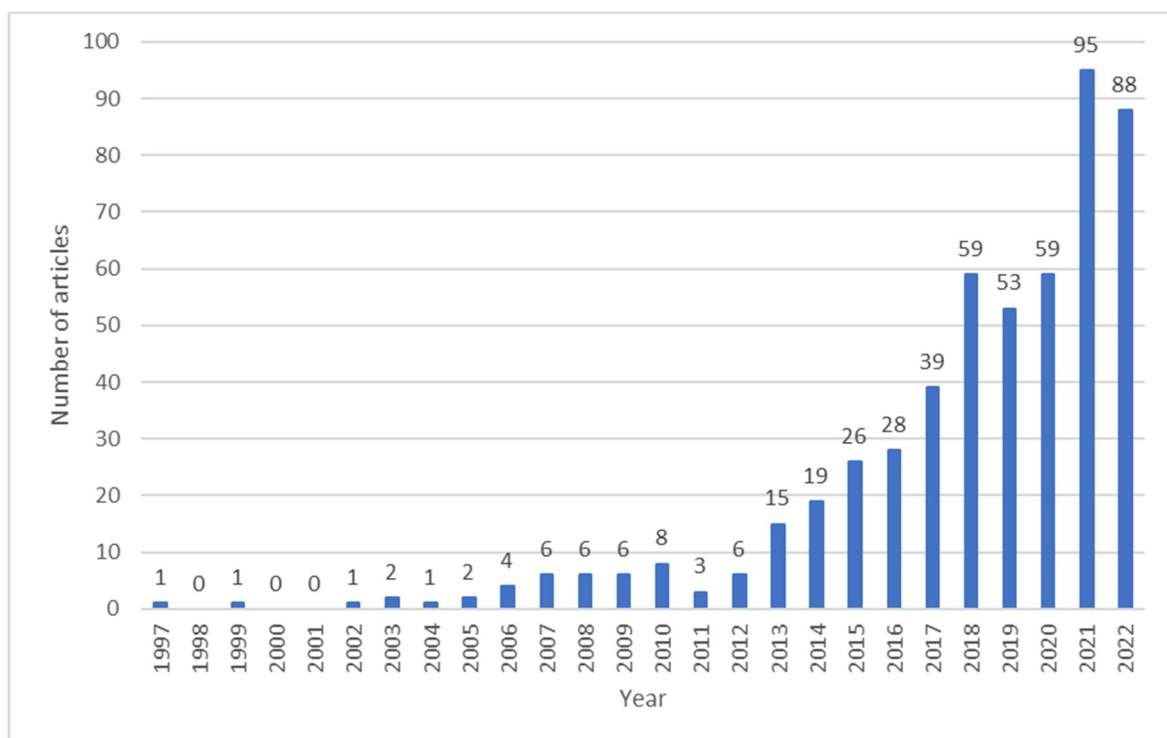


Figure 1: Total number of articles on collaboration for SFSCs published by year

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Articles in the sample were published in 186 journals. The top ten journals (Table 1) published 203 articles out of a total of 528 articles, representing approximately 28% of all articles. *Journal of Cleaner Production (JCP)* contributed the highest number of publications (95 articles), followed by *Supply Chain Management: An International Journal (SCMIJ)* (15 articles). The list also includes *Business Strategy and the Environment (BSE)*, *International Food and Agribusiness Management Review (IFAMR)*, *Production Planning and Control (PPC)*, and the *International Journal of Production Economics (IJPE)*.

<< Insert Table 1 about here >>

Table 1: Top journals most frequently published

Journal	No. of articles
Journal of Cleaner Production	96
Supply Chain Management: An International Journal	15
Production Planning and Control	14
Business Strategy and the Environment	14
International Journal of Production Economics	12
British Food Journal	11
World Development	10
Journal of Agribusiness in Developing and Emerging Economies	10
International Journal on Food System Dynamics	9
International Journal of Logistics Management	7
International Journal of Logistics Research and Applications	7
Annals of Operations Research	7
Food Policy	7
International Food and Agribusiness Management Review	7

A high number of studies were conducted by authors based in the UK (106 occurrences), the USA (86 occurrences), China (55 occurrences), India (50 occurrences) and Italy (48 occurrences). Not many authors are based in Asian countries (apart from China and India) and African countries, which might be explained by the underdeveloped infrastructures for SFSC, and, hence, limited research in those countries. However, since African and Asian countries are vulnerable to climate change, more research should focus on these regions to support the achievement of sustainable development goals.

3.2 Citation analysis

Citation analysis assumes that researchers cite publications based on the publication's importance and relevance (Donthu *et al.*, 2021). Highly cited authors and articles influence and

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shape the research area. Table 2 presents the ten most cited articles within the sample. The local citation is the number of citations by other articles within the 528 sample articles. The global citation is the total citations in the whole WoS and Scopus databases. The difference between local and global citations indicates the attention paid to an article from other disciplines. The sample's top-cited articles are review works that provide critical analysis of SFSCs and offer insights for building SFSCs (e.g. Beske *et al.*, 2014; Govindan, 2018).

<< Insert Table 2 about here >>

Table 2: Top articles based on local and global citations

Articles	Local citation	Global citation in WoS	Global citation in Scopus
Beske <i>et al.</i> (2014)	30	414	536
Govindan (2018)	21	183	242
Mangla <i>et al.</i> (2018)	18	138	175
Touboulic and Walker (2015a)	17	116	133
Gold <i>et al.</i> (2013)	11	146	168
Walker and Jones (2012)	10	261	340
Genovese <i>et al.</i> (2017)	9	507	649
Kittipanya-ngam and Tan (2020)	7	65	101
Touboulic <i>et al.</i> (2014)	7	157	192
Dania <i>et al.</i> (2018)	6	107	129

3.3 Co-citation analysis

Co-citation analysis measures the frequency of any two articles being cited in a third article (Marty and Ruel, 2024). This analysis is used to identify the foundations of a research field. The assumption is that researchers cite works based on their relevance and similarity (Donthu *et al.*, 2021). The more frequently the two articles are cited by other articles, the more likely they belong to the same cluster. We conducted a document-based co-citation analysis by using the *biblioNetwork* function in *bibliometrix*. Figure 2 presents three research foundations identified from co-citation analysis.

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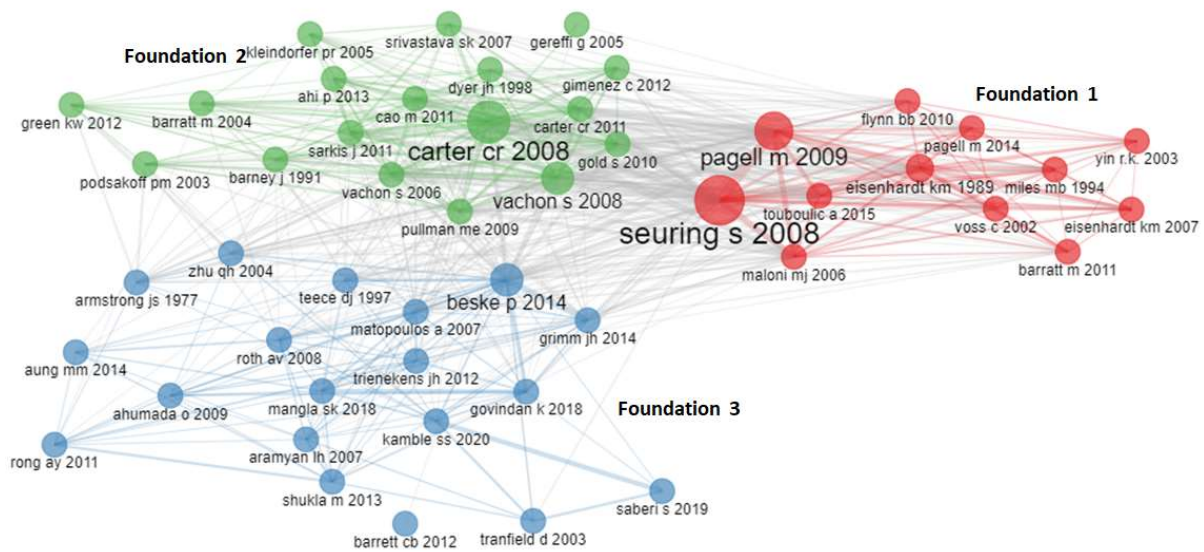


Figure 2: Co-citation network of articles

3.3.1 Foundation 1: Sustainable supply chain management

Foundation 1 represents sustainable supply chain management (SSCM). The most commonly adopted methodology in this foundation are case study (Yin, 2009) and theory development (Eisenhardt and Graebner, 2007). The most frequently cited article in this cluster is Seuring and Müller (2008), which offers a comprehensive literature review and a conceptual framework for SSCM. While sustainability receives much attention, theory-building studies for SSCM remain scarce (Touboulic and Walker, 2015b). Additionally, sustainability studies primarily consider the economic aspects of sustainability. The social aspect of sustainability is still rare, which deserves more focus by future research to better understand the trade-offs to develop more comprehensive sustainable supply chains (Sudusinghe and Seuring, 2022).

3.3.2 Foundation 2: Collaboration for sustainability

Foundation 2 represents collaboration for sustainable supply chains. For firms attempting to move to sustainability, they must extend their management efforts across their supply chains (Vachon and Klassen, 2008). Collaboration across the supply chain increases transparency, improves economic sustainability, and reduces the consequences of high resource dependence (Carter and Rogers, 2008). Collaboration helps firms leverage knowledge and resources and improve performance (Cao and Zhang, 2011). Foundation 2 mainly examines the environmental collaboration activities, which generate valuable inter-organisational resources and sustained inter-firm competitive advantages (Gold *et al.*, 2010).

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3.3.3 Foundation 3: Sustainable food supply chains

Foundation 3 discusses SFSCs. Beske *et al.* (2014), the most influential work in this cluster, offers insights about sustainability practices in the FSC to address increasing concerns about food security and safety. Mangla *et al.* (2018) identified ten important enablers for SFSCs from a rigorous literature review and suggested information inaccuracy, lack of transparency and inadequacy of management as significant issues in SFSCs. Emerging technologies, such as big data analytics, blockchain, and IoT, have the potential for facilitating SFSCs (Kamble *et al.*, 2020). Additionally, foundation 3 highlights the importance of supply chain collaboration in the context of FSCs, which focus more on maximising revenue and customer satisfaction but focus less on food waste reduction (Shukla and Jharkharia, 2013). Matopoulos *et al.* (2007) revealed that the structure of the food industry and the nature of food products impinged the intensity of collaboration.

3.4 Conceptual structure

Conceptual structure analyses the co-occurrence of words or terms extracted from titles, abstracts, or keywords. It helps identify the important themes within a research area and the evolution of these themes over time (Khare and Jain, 2022). Our review analyses the conceptual structure based on the co-occurrence of keywords within 528 articles. The themes identified from the conceptual structure were plotted into the composite thematic map consisting of centrality and density. Centrality measures a theme's importance, whilst density measures themes' level of development (Callon *et al.*, 1991). The details of these themes are presented in Figure 3. The bubble size represents the number of words occurring. For each bubble, we include the top three keywords with the highest occurrence value. Each theme can be interpreted based on its position on the map.

“Sustainability”, “sustainable development” and “food industry” are **basic themes**, which are highly relevant but less developed in the research field. Topics under basic themes include “innovation”, “circular economy”, “sustainable supply chain”, “supply chain” and “agriculture”. The basic themes indicate that these topics are underdeveloped in the field. Thus, they have the potential for future research.

“Food supply chain” is a **motor theme**, which is a developed and essential theme. This theme includes topics such as “blockchain” and “literature review”. Blockchain and other digital technologies have offered many potentials in the transition to SFSC, especially in facing the significant disruption caused by the COVID-19 pandemic.

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“Consumer behaviour”, “performance”, “value chain” and “food” are **niche themes** which are high density but less centrality. It means they are developed themes and marginally important for this research field. These themes include topics such as “global value chain”, “quality”, “experiential marketing”, “global food supply” and “governance”.

“Relationships”, “supply chain integration” and “supply chain collaboration” are topics under **emerging or declining themes** that are low in both centrality and density. As they are mainly low in centrality and less developed, they are possibly emerging themes. Although these topics seem to be well-studied, they have only received much attention since 2013 (as mentioned in the Descriptive analysis section).

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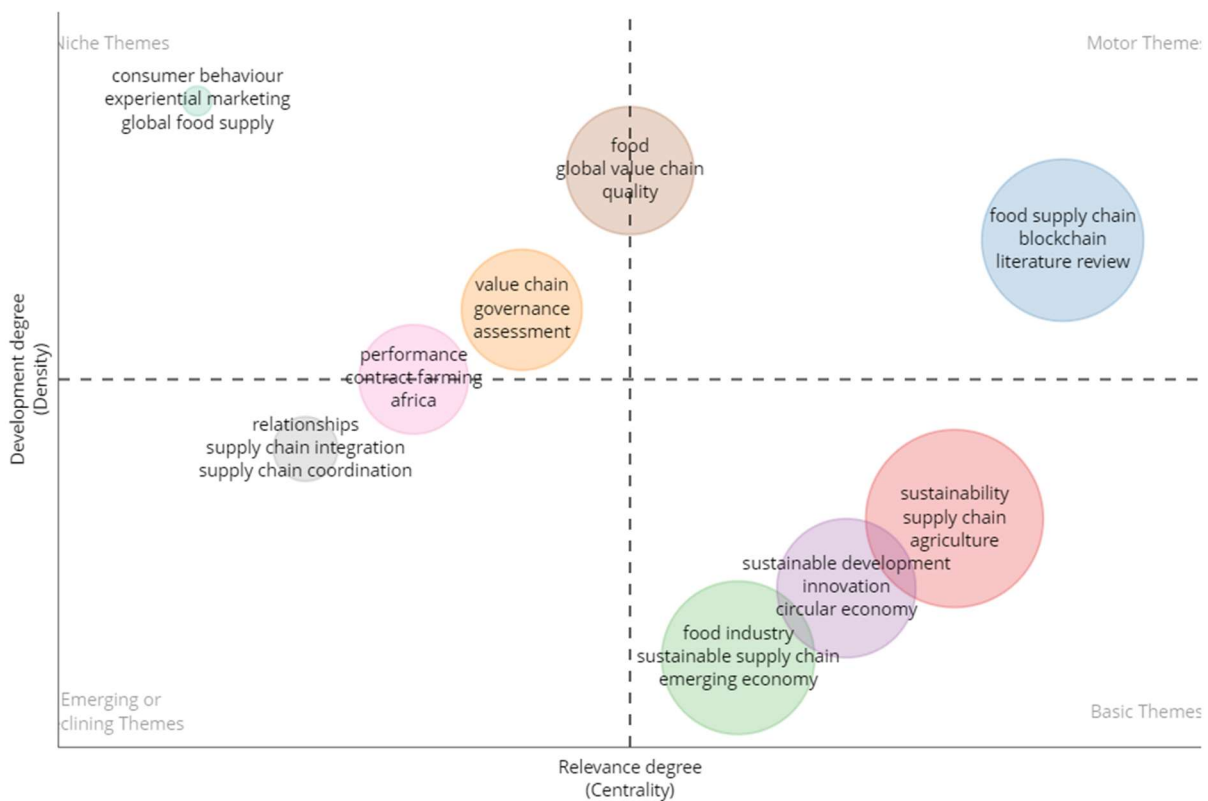


Figure 3: The composite thematic map of the research field

3.5 Bibliographic coupling

This section provides findings from bibliographic coupling, which measures the similarity between two articles based on the share of common references in two articles. If one article appears in the reference list of two other articles, these two articles are bibliographically

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coupled (Aria and Cuccurullo, 2017). The greater the number of shared references between the two articles, the more significant the overlap. The 528 sample articles cite 31,563 references. We started by screening and cleaning all the references to ensure they have a consistent format (e.g. consistent publication years, author names and journal names). Then, the *bibliometrix* package was adopted for bibliographic coupling (Aria and Cuccurullo, 2017). Results from the *bibliometrix* package reveal four clusters — predominant research themes related to the topic (Figure 4).

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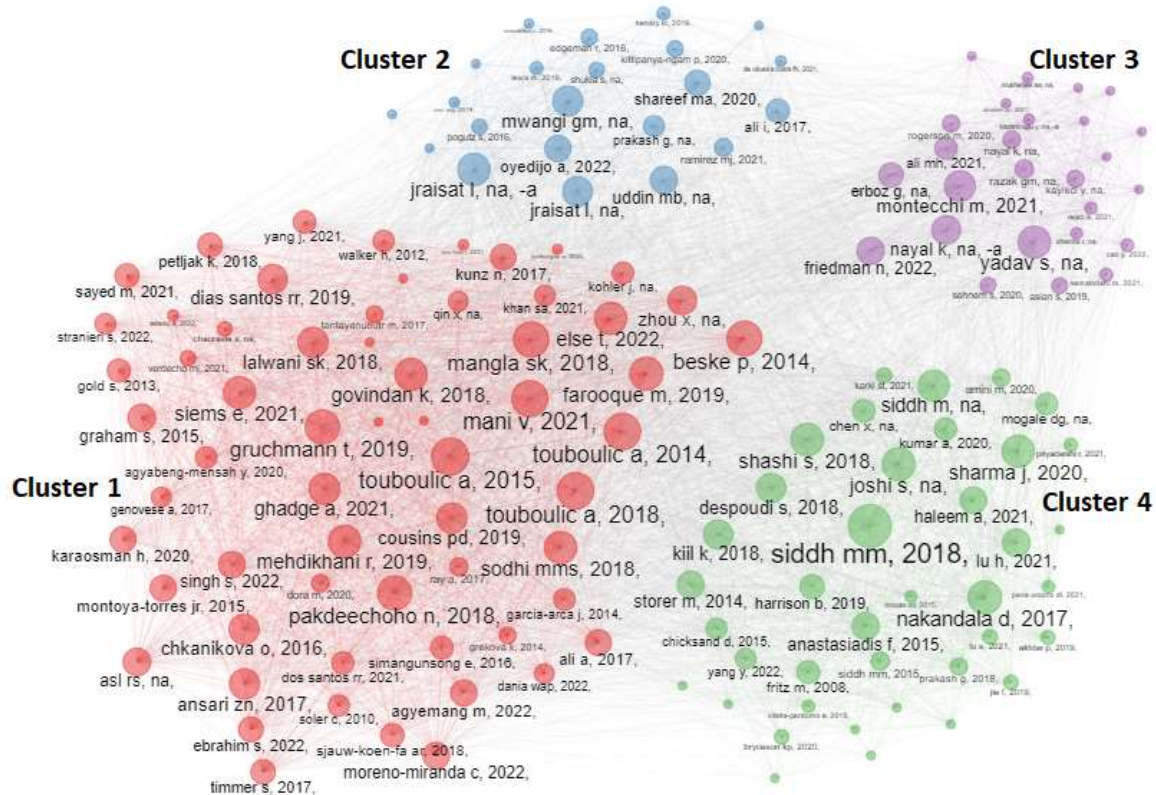


Figure 4: Bibliographic coupling among articles

3.5.1 Cluster 1. Collaboration and SSCM

Cluster 1 (62 articles), the largest cluster, provides insights into the role of collaboration in SSCM. Articles in this cluster are mainly empirical adopting case study, survey and interview-based methodology. The most influential article in this cluster is Touboulic *et al.* (2014), who used the resource-dependence theory and analysed the effects of the relationship between buyers and suppliers on the implementation of sustainable practices in the food industry. Mehdiikhani and Valmohammadi (2019) found that cooperation positively impacted the implementation of sustainable practices and had a positive impact on SFSCs. Grekova *et al.*

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(2016) claimed that coordination with suppliers could improve environmental performance of suppliers. Interestingly, Pakdeechoho and Sukhotu (2018) argued that supply chain collaboration does not improve environmental performance in developing countries; probably, it is because environmental performance still receives little attention in developing countries.

Additionally, social sustainability has received attention since it positively relates to a firm's reputation and performance. Sodhi and Tang (2018) highlighted that collaboration could enhance buyers' and suppliers' social performance. Particularly, collaboration for sustainability enhances ethical performance for suppliers and reputation of focal firms (Mani and Gunasekaran, 2021). However, for food firms, managing sustainability tensions is significantly difficult due to firms' limited resources (Somlai, 2022). Also, a higher number of firms within an FSC causes challenges in assessing and managing social sustainability performance in an FSC (Mangla *et al.*, 2018).

3.5.2 Cluster 2: Emerging markets and resilience

Cluster 2 (22 articles), the smallest cluster, focuses on emerging markets and resilience. Although supply chain collaboration has received much attention, there are still shortcomings in the literature that investigate supply chain collaboration, specifically cooperation, in emerging markets and enhance sustainable competitive advantages (Oyedijo *et al.*, 2022). Emerging markets have a strong potential for economic growth, though, they have common issues, such as inefficient technology infrastructure, political instability, risks in food security and safety, and a lack of regulations that might restrict the adoption of knowledge gained from developed countries and the implementation of supply chain collaboration (Takahashi *et al.*, 2020). In addition, the transition towards SFSCs in emerging markets is problematic and requires government intervention (Shareef *et al.*, 2020). Extending the current literature to the emerging market can expand the knowledge in cross-country settings and generate country-related practical implications. For example, Jraisat *et al.* (2022) emphasised that food firms in emerging markets should collaborate and adopt good information-sharing practices to improve sustainability across the FSC. Hence, we call for further studies to investigate the collaboration and information-sharing mechanisms for FSCs in emerging markets.

The increasing number of disruptions and uncertainties make food firms vulnerable and affect the transition towards sustainability, which requires firms to adopt resilience strategies (e.g. collaboration) to increase their resilience (Ali *et al.*, 2023). These strategies require more investment and can affect the ability of firms, especially in emerging markets, to maintain

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profitability. Accordingly, Mwangi *et al.* (2022) found that although food firms engage in resilience and sustainability practices, not many resilience practices are implemented. Therefore, Shareef *et al.* (2020) called to develop mechanisms for enhancing cooperation among stakeholders in FSCs.

3.5.3 Cluster 3: Digital technologies

Cluster 3 (26 articles) discusses the role of digital technologies in the collaboration for SFSCs. For example, using Blockchain technology, Walmart collaborates with its suppliers and successfully develops a scope 3 emission evaluation framework (Asif *et al.*, 2022). The development of digital technologies, such as blockchain, IoT, and big data analytics, enhances the collaboration within FSCs for information sharing, strategic alignment, and joint decision-making (Yadav *et al.*, 2023). Ali *et al.* (2021) highlighted several examples of benefits of digital technologies on the collaboration for SFSCS. These benefits include information sharing for enhancing innovation capability and achieving food quality and safety requirements (Nayal *et al.*, 2023), reducing the amount of food loss, enhancing product traceability (Montecchi *et al.*, 2021), and driving sustainability (Friedman and Ormiston, 2022).

Existing literature on this cluster highlighted that digital technologies help firms share information, and this requires adequate digital devices available at all firms in the FSC for data entry (Kamble *et al.*, 2020). This requirement makes food firms reluctant to adopt digital technologies as they, especially small and medium enterprises (SMEs), commonly have limited resources (e.g. knowledge and finance). Thus, food firms are cautious about investment and only make investment decisions after observing success stories from the adoption (Ali *et al.*, 2021). Here, we call for studies to investigate factors affecting the adoption of digital technologies (e.g. a firm's readiness to take risks of information sharing), which foster collaboration and support the transitions towards SFSCs.

3.5.4 Cluster 4: Perishable food products

Cluster 4 (39 articles) focuses on how collaboration helps perishable food supply chains (PFSCs) to be more sustainable. Food products are perishable by nature and due to uncertainties from both the supply and demand sides, ensuring sustainability for perishable FSCs generates challenges. For example, a misunderstanding about the collection time between farmers and collectors can leave harvested products on the field without proper protection, which decreases the quality of harvested products and increases the amount of food loss and waste (Cattaneo *et*

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al., 2021). Other factors (e.g. temperature, environmental conditions and storage conditions) can affect the quality of PFPs and make the perishable FSCs unsustainable. Thus, it is required to have consistent and systematic approaches to address complexities and challenges in PFSCs (Siddh *et al.*, 2018). For this reason, collaboration is considered an important factor for sustainability in PFSCs (Kumar *et al.*, 2020). For example, Yang *et al.* (2021) demonstrated that the cooperation between farmers and other stakeholders is crucial to maintaining vegetable quality. Despoudi *et al.* (2018) suggested that collaboration between farmers and cooperatives could reduce food loss.

4 Discussion and implications for future research

Our review examines the networks of leading articles, research foundations, and research themes in the area of collaboration for SFSCs. The integration of findings from co-citation analysis, bibliographic coupling, and conceptual structure helps to identify research foundations, research clusters, and the evolution of research themes. This section reflects research findings and informs future research directions.

4.1 Sustainability transition

The thematic map shows “sustainability” as a basic and urgent theme, given the growing pressure to achieve net-zero emissions in global food systems by 2050 (Costa *et al.*, 2022). There are many opportunities to accelerate the sustainability transition in the food industry, particularly in the era post-COVID-19 pandemic, such as opportunities to promote local supply chains (Sarkis, 2021). Cluster 1 highlights that achieving sustainability is a dynamic and innovative process (Beske *et al.*, 2014). Existing literature primarily pays attention to the economic and environmental aspects rather than to the social aspect of sustainability. As the FSC faces many social issues (e.g. farmer welfare and forced labour), improving social sustainability is one of the main concerns of FSC stakeholders (Agyemang *et al.*, 2022). Research in Cluster 1 (e.g. Agyemang *et al.*, 2022) demonstrated that food firms enhanced the implementation of social sustainability practices through collaboration. However, these practices are mostly focused on their first-tier suppliers (Kalkanci *et al.*, 2019). Thus, future research should include multiple stakeholders in the FSC to ensure the success of these social sustainability practices. Moreover, future studies could investigate how the collaboration could help food firms manage the tensions between the social aspect and the other two aspects of

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sustainability (i.e. environmental and economic) and transform their business model (Somlai, 2022).

However, the transition towards sustainability is lengthy and involves many stakeholders who usually have conflicting objectives (Chauhan *et al.*, 2022). Therefore, finding ways to get all stakeholders involved to collaborate and work towards sustainability issues remains a challenge (Sodhi and Tang, 2018). Interestingly, while collaboration includes both cooperation and coordination, we found that food firms mostly focus on coordination practices in the transitions towards sustainability. The lack of cooperation within FSCs could be because of differences in regulations, culture and technologies between food firms. This finding is supported by Marty and Ruel (2024), who suggest that the main barriers to global supply chain collaboration are regulatory, contextual and technological. Given that strong consensus on interests and values among stakeholders is critical for achieving a common goal (sustainability in this case) (Govindan, 2018), future studies should focus on mechanisms to enhance cooperation in FSCs. Also, future research should investigate the multiple perspectives of different stakeholders or the role of communication among stakeholders in the sustainability transition. Such understanding could enhance trusted relationship between food firms, leading to better embedding of sustainability practices in FSCs (Faruquee *et al.*, 2021).

Cluster 2 and the thematic map highlight the lack of research in emerging markets, which face more difficulties in the sustainability transition process due to the limited infrastructure, finance, and high-skilled labour (Shareef *et al.*, 2020). For example, emerging markets may rely on low-cost labour but pay little attention to labour rights. Moreover, emerging markets, having high pressure in improving economic performance, face more challenges in raising awareness of social and environmental performance and adopting sustainable practices (Mangla *et al.*, 2018). Therefore, collaboration along the FSC is needed for the sustainability transition in emerging markets. Collaboration mechanisms (e.g. goal congruence, resource sharing and information sharing) have been evidenced to enhance sustainable performance in developed countries (Despoudi *et al.*, 2018). Here, future research should explore the unique contextual factors in emerging markets that affect the adoption of collaboration mechanisms and sustainability transitions.

Furthermore, the thematic map shows that circular economy (CE) — one of main approaches to achieving sustainability (Dossa *et al.*, 2022) — remains an underdeveloped theme in this topic. CE encourages reuse and improves resource recovery within a supply chain (Genovese *et al.*, 2017), leading to reduction on environmental impacts (e.g. reducing food loss

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and waste) and improvement of financial performance (Dossa *et al.*, 2022). These benefits can only be achieved if firms collaborate with their stakeholders to implement CE (Farooque *et al.*, 2019). Zucchella and Previtali (2019) showed that collaboration is a key factor in building circular business models, which requires a complex mix of governance mechanisms and resources. The literature mostly discussed coordination in the CE implementation for FSCs (Moreno-Miranda and Dries, 2022). Hence, there is a need for food firms to cooperate and adjust mutual goals for the CE implementation (Castilla-Polo and Sánchez-Hernández, 2022). Furthermore, there is also a lack of studies on CE practices in the context of emerging markets (Sehnm *et al.*, 2020) and SMEs (Colley *et al.*, 2020). This would be an opportunity for future studies to conduct exploratory studies in these contexts and provide insights into the role of CE practices and how food firms work together to implement CE practices in these contexts.

4.2 Digital technologies

Our findings suggest that digital technologies is an underdeveloped theme. This finding is supported by Sarkis (2021) who considers digital technologies an approach to address the challenges of the transition towards sustainability. FSCs require timely and accurate information, which leads to the adoption of technologies such as big data analytics, blockchain and IoT (Annosi *et al.*, 2021). Such technologies enable firms to manage and share data to foster collaboration across the FSCs and improve sustainability performance (Nayal *et al.*, 2023). To successfully implement digital technologies, food firms need to collaborate together and with other stakeholders such as public organisations, communities and social organisations (Kalkanci *et al.*, 2019).

More specifically, successful adoption of digital technologies requires a multi-stakeholder and multi-disciplinary approach (Broekhuizen *et al.*, 2021). This approach is crucial as FSC becomes more interconnected and involves stakeholders in different geographies with diverse cultures and objectives (McKinsey, 2022). Although there are calls for multi-stakeholder and multi-disciplinary approaches (Vallet-Bellmunt *et al.*, 2011), our findings show that most existing studies focus on only one aspect of sustainability (e.g. food loss) without considering other related aspects, such as management or marketing. Multi-disciplinary approaches could promote the involvement of various stakeholders, providing robust knowledge and solutions for the transition towards sustainable food supply chains (Dora *et al.*, 2021). Future work could focus on the multi-stakeholder and multi-disciplinary approach to better understand how stakeholders collaborate to adopt digital technologies in FSCs (Das

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et al., 2023). Topics such as how the government can increase awareness of contemporary issues (e.g. SFSC and food safety) or how the government can support food firms to develop skills and knowledge are vital to the adoption of digital technologies.

Moreover, farmers and SMEs have been less involved in digital transformation due to limited financial resources and required skills (Lioutas *et al.*, 2021). Consequently, the data shared in the FSC is incomplete or inaccurate. For example, while data plays a vital role in digital transformation, small farmers are normally located in rural areas where collecting data is difficult due to weak mobile and internet networks or small farmers' inability to afford expensive data-collecting technologies (e.g. field sensors). As a result, the data collected for digital transformation is of poor quality. This could negatively affect the outcomes of digital transformation in FSCs and the performance of stakeholders involved in the digital transformation process, and finally the collaboration between firms in FSCs (Li *et al.*, 2023). Therefore, large stakeholders (e.g. multinational companies or governments) need to find appropriate approaches to support farmers and SMEs in adopting digital technologies for the transition towards sustainable business models (Kazancoglu *et al.*, 2024). Multinational companies normally work on the objective of selling more agricultural inputs (e.g. financial services and machinery) to small farmers and integrating small farmers into the company's network (GRAIN, 2021). Small farmers, on the other hand, might be concerned that multinational companies will control farming practices and, hence, hesitate to work with multinational companies (Sezer *et al.*, 2024). Here, our findings highlight the critical role of information transparency in developing coordination between farmers, especially small farmers and multinational companies. Future research could explore how leading companies design collaboration strategies to engage and encourage farmers adopt new technologies and improve supply chain performance (Reardon *et al.*, 2019). Examples of initiatives in which big companies work with farmers in specific countries (e.g. Microsoft developed FarmBeats projects to analyse the condition of water, soils, and crops and Amazon provided precision agriculture technology in India (GRAIN, 2021)) could be expanded to other countries. Future research could investigate these initiatives to get deeper understanding of these initiatives and to develop collaborative strategies for other settings (e.g. different countries and different engagement schemes).

Finally, public-private collaboration is considered a tool to drive innovation and address sustainability targets (George *et al.*, 2024). For example, public organisations can work with tech companies to invest in internet networks and stimulate the sharing of knowledge and

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information to encourage innovation. Public sector plays a key role in developing policies for (small) farmers to access advanced technologies and achieve sustainability targets (Adenle *et al.*, 2019). Sustainability for FSCs is an ambitious target with the involvement of private (e.g. farmers and food manufacturers) and public (e.g. local authorities and national institutions) stakeholders. Here, clear descriptions of expectations, roles and obligations of any organisation involved in the collaboration are critical for the achievement of sustainability targets (Roehrich *et al.*, 2024). However, such coordination practices remain limited in FSCs (Biswas *et al.*, 2023). Thus, future studies should pay more attention to public-private collaboration for SFSCs. For instance, future studies could investigate how public organisations support food firms at different stages of the procurement cycle to achieve sustainability and what are the most effective forms of support to create public value.

4.3 Theoretical development

The development of the supply chain management field has relied significantly on theories from other fields (e.g. general management, organisational behaviour and economics) (Carter *et al.*, 2019). The dynamic capability view (DCV) is the most common theory in the field (Teece *et al.*, 2016). DCV becomes more relevant in turbulent contexts (Govindan, 2018). For example, building on DCV, Gruchmann *et al.* (2019) identified core practices that can support the online business of local food producers and distributors and help them achieve higher sustainability performance. However, our results show that the use of theoretical perspectives remains scarce on the topic of collaboration for SFSCs.

Although stakeholders play a key role in the transition to sustainability, when and how to involve them in the transition process is still unclear. Stakeholders influence the firm's collaboration strategy and sustainable practices. They can lead the transition process and be involved in the implementation stage (e.g. monitoring the sustainability performance). This is evident when comparing articles discussing environmental assessment under clusters 1 and 2 of the bibliographic coupling. Cluster 1 highlights that firms pay attention to environmental certification to prompt better collaboration with stakeholders and enhance sustainability (Acquaye *et al.*, 2015). Cluster 2, focusing on emerging markets, emphasises the role of stakeholders in driving environmental practices and assessment (Lu *et al.*, 2021). Future research could employ stakeholder theory (Parmar *et al.*, 2010) to investigate how firm collaborate with different stakeholders during the transition towards sustainability. Also, as cluster 2 focuses on emerging markets which normally have limited resources, future studies

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could adopt resources orchestration theory (Sirmon *et al.*, 2011) or resource-based view (Barney, 2018) to investigate further the transition towards sustainability in emerging markets.

Soosay and Hyland (2015) reviewed the twelve organisational theories that have been employed to investigate supply chain collaboration. However, Wieland (2021) argued that most theories take a static view of the supply chain. In contrast, a supply chain cannot be isolated from the rest of the world and is vulnerable to any disruption (e.g. the supply chain crisis during COVID-19 is a perfect example of the vulnerability of the global supply chain). Thus, new research paradigms are needed to understand the complexity of a supply chain (Wieland *et al.*, 2023). For example, resource constraint is a concern of food firms in facilitating SFSC, hence resource-based view (Barney, 2018) could explain the collaboration for SFSCs. We join Khan *et al.* (2023) in their call for research to investigate variables that intervene in the adoption of various resources in the transition towards sustainability, such as the role of managerial commitment in the relationship between supply chain information sharing and sustainable practices.

Future research could also adopt the resource orchestration theory (ROT) (Sirmon *et al.*, 2011), which explains the manager roles in transforming resources into capabilities. For instance, grounded on the ROT, Ardekani *et al.* (2023) assessed the impact of the relationship management on the sustainable performance of FSCs, under the impact of the COVID-19 pandemic. The ROT is suitable for understanding how firms mobilise and orchestrate their resources to achieve sustainable performance. However, Skipworth *et al.* (2023) noted the scarcity of empirical studies that investigating how firms collaboratively orchestrate their resources to swiftly respond to urgent agendas (e.g. sustainability). Thus, it is a prominent research avenue on this topic area (i.e., collaboration for SFSCs).

Additionally, there is evidence from Cluster 3 that food firms have paid much attention to digital technologies to support collaboration and their transitions towards sustainability. The adoption of digital technologies is a form of innovation that involves many stages and processes (Cole *et al.*, 2019; Verhoef *et al.*, 2021). In this perspective, the diffusion of innovation theory (e.g. Chen *et al.*, 2017) can provide a better understanding of collaboration at different stages of the digitalisation for SFSCs.

5 Conclusion

This research reviews the literature on the topic of collaboration for SFSCs. Using the bibliometric analysis of 528 articles, we make several contributions to the field of collaboration

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for SFSCs. First, in response to RQ1 (*What are the foundations and theoretical themes of the field of collaboration for SFSCs, and how have theoretical themes in the field developed and evolved over time?*), we highlight that SSCM, collaboration for sustainability, and SFSCs are the three research foundations of the topic area. The conceptual structure analysis helps us identify theoretical themes and their evolution overtime, which is useful for answering RQ3. The results highlight the consensus on the need for collaboration for SFSCs due to the complexity of the food industry and the nature of the food products. However, we also found that the field have paid less attention to social sustainability which could be a challenge for achieving overall sustainability targets.

In response to our RQ2 (*What are the main research clusters associated with the field of collaboration for SFSCs*), through bibliographic coupling, we reveal collaboration and SSCM, emerging markets and resilience, digital technologies and perishable food products are four main research clusters in the field. The discussion of the gaps within each cluster provides answers to RQ3 (*What are the future research directions in the field of collaboration for SFSCs*). We divide the future research directions into three groups: sustainability transition, digital technologies and theoretical development. The sustainability transition group calls for studies to explore ways to engage stakeholders in the sustainability transition, with a stronger focus on social sustainability, and in the emerging economies context. Moreover, we argue that a complex mix of governance mechanisms and resources is required to implement CE, because there is a lack of research on the CE implementation in SMEs and in the emerging markets context.

Digital technologies group highlights the importance of adopting digital technologies to share information in a timely and accurate manner along the FSC. However, the lack of successful cases and the limited resources of food firms are key challenges for the adoption of digital technologies. Finally, the theoretical development group shows a lack of the use of theoretical perspectives in the area of collaboration for SFSCs. We call for the more diverse use of research paradigms to understand the dynamics and complexity of SFSCs.

It is worth noting that the findings of this research are subject to several limitations. First, the selected keywords and search engines could limit the results of this research. While Scopus and WoS are the most commonly used databases, other databases could provide a larger sample for the literature review. Second, we only include journal articles published in English and in the field of business and management. For this reason, we acknowledge that certain insights could be gained from journals in other fields, such as agriculture and engineering,

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practitioner journals, or journals published in languages of emerging markets. Future research could extend our literature review following the approach adopted in this paper.

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