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Sustainability-driven co-opetition in supply chains as strategic capabilities: drivers, facilitators, and barriers

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ABSTRACT

Co-opetition is gaining increasing attention as a potentially useful form of inter-organisational collaboration model to improve firms' sustainable performance. However, limited previous studies have provided a clear substantive theory or offered empirical evidence for the process of sustainability-driven co-opetition. This paper explores how competing companies can collaborate in their supply chains (SCs) to achieve a higher level of sustainability performance by identifying drivers, facilitators and barriers of co-opetition. Based on two explorative case studies of co-opetition in the UK, the findings of this paper lead to a number of propositions and a theoretical framework for sustainability-driven co-opetition in SCs. This study contributes to the literature by providing a more in-depth understanding of co-opetition as a strategic capability for firms. This paper also proves the feasibility of a combined use of Resource-Based View and Network Theory perspectives in explaining a paradoxical inter-organisational relationship like co-opetition. A road map for sustainability-driven co-opetition in SCs is also provided as a heuristic decision model for practitioners.

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inter-organisational
collaboration; sustainability;
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1. Introduction


In the last two decades, there has been a shift in the focus of supply chain management (SCM) from a purely economic-based towards a triple-bottom-line (3BL) approach (Carter and Rogers 2008). This shift allows companies to sustain or improve their social or environmental performance, without undermining their economic performance (Mathiyazhagan et al. 2021; Bai et al. 2019; Gimenez, Sierra, and Rodon 2012). The fast-rising demand for sustainably produced and distributed products during the last decade (Beske, Land, and Seuring 2014) has made the integration of sustainability practices into SCM a strategic capability for many companies (Jraisat et al. 2021; Chen et al. 2017; Dubey et al. 2016).

There is a general consensus that inter-organisational collaboration (Dyer 2000) can help companies overcome sustainability challenges in their SC operations (Blome, Paulraj, and Schuetz 2014; Kiron et al. 2015). For example, engagement with external stakeholders is important for improving the social sustainability practices of logistics operations, by leading to reduced pollutions in local communities (Kumar and Anbanandam 2020), or by supporting the economic welfare of communities

through improving the presence of their companies in international markets (Kumar and Anbanandam 2019). Moreover, external engagement with logistics companies (e.g. in the form of coordinated logistics programmes and collaborative freight transportation partnerships) are important for improving the sustainability of SCs, by improving the environmental performance of SC operations (Centobelli, Cerchione, and Esposito 2017), for example through reduced CO₂ emissions from freight transportation (Allaoui, Guo, and Sarkis 2019).

One of the emerging inter-organisational collaboration models is *co-opetition*, which is referred to as 'cooperation among competitors', introduced by Brandenburger and Nalebuff (1996). Since then, different business and management fields have studied the advantages of co-opetition, including creating economic profit by sharing market knowledge between competitors (Botelho 2018), acquiring new knowledge by manufacturers (Li, Liu, and Liu 2011), and generating organisational learning from a network of competing firms (Bouncken and Fredrich 2016). Well-known examples of co-opetition include collaboration between Samsung Electronics and Sony Corporation, who created a joint venture called S-LCD aimed at developing and

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manufacturing flat screen LCD TV panels (Gnyawali and Park 2011); the collaboration between Unilever and Nestlé on improving the recycling of their packaging (Nestlé 2019); and the joint effort of Toyota, Peugeot and Citroen in designing and producing a new city car (Toyota 2020).

In developed countries, such as the UK, SCs are already vertically integrated to a high level; therefore, further improvement in efficiency in logistics and transportation practices is indicated by practitioners to be possible only through horizontal SC collaboration, and particularly through co-opetition. Despite being a paradoxical form of inter-organisational collaboration, due to the need for protecting key organisational knowledge from competitors (Gast et al. 2019), co-opetition in SCs is increasingly recognised as having the potential to help companies to obtain new capabilities and resources which are not achievable by them individually (Stadtler and Van Wassenhove 2016; Park, Srivastava, and Gnyawali 2014; Pathak, Wu, and Johnston 2014).

Generally, co-opetition research following a 3BL perspective, by considering its social and environmental advantages, is sparse (see also Table 1 and the next section for details of the existing literature on sustainability-driven co-opetition). The body of literature on co-opetition is limited in terms of depth and scope in exploring the sustainability aspects of co-opetition, and the demand for further explorative research on this area is highlighted (e.g. Christ, Burritt, and Varsei 2017; Stadtler and Van Wassenhove 2016). In particular, research on sustainability-driven co-opetition is limited in the area of SCM. Despite the increasing importance of sustainability in SC practices, the existing literature on co-opetition in SCs largely follows an economic perspective (e.g. Peng, Yen, and Bourne 2018; Kotzab and Teller 2003; Bakshi and Kleindorfer 2009; Wilhelm, 2011; Song, Cheon, and Pire 2015). The focus has been on studying motives of co-opetitive arrangements for reducing operational costs and market expansion (Seigfried 2012; Coyle et al. 2016; Shockley and Fetter 2015). Only a handful of studies have focused on environmental aspects of co-opetition in SCs (e.g. Christ, Burritt, and Varsei 2017; Limoubpratum, Shee, and Ahsan 2015), and with limited social perspectives in 3BL.

Furthermore, among the limited existing co-opetition studies, researchers have not provided an explanation of the mechanisms and processes of integrating sustainability targets into SC strategies and operations, to make engagement in co-opetition a strategic capability for companies. Given the paradoxical nature of co-opetition, which makes this type of relationship difficult to manage (Bengtsson and Raza-Ullah 2016; Le Roy and Fernandez 2015; Stadtler and Van Wassenhove 2016),

understanding the mechanisms, drivers and barriers of co-opetition for improving SC sustainability is urgently needed (Stadtler and Van Wassenhove 2016).

Methodologically, existing studies are either conceptual (e.g. Manzhynski and Figge 2020) or cross-sectional based on survey (e.g. Limoubpratum, Shee, and Ahsan 2015) or public secondary information (e.g. Christ, Burritt, and Varsei 2017), which are limited in providing in-depth understanding of the complex process of integrating 3BL objectives into SC co-opetition arrangements. They lack answers to the 'why' and 'how' questions of initiating and managing co-opetition, and hence they are limited in the development of substantive theory. Thus, there is a demand for inductive explorative case studies on co-opetition, to help gain understanding about the complexities associated with co-opetition (Christ, Burritt, and Varsei 2017).

Therefore, this paper aims to study co-opetition in SC practices driven by economic, social and environmental purposes, by identifying the barriers, drivers and facilitators of co-opetition, as well as important strategic capabilities of companies to pursue sustainable supply chain management (SSCM) via co-opetition. To achieve this, two complementary explorative case studies of co-opetition in the UK were conducted, including one long-term and one short-term initiative, in which competing companies collaborated on their SC operations for simultaneous creation of economic, environmental and social benefits. This paper provides novel theoretical contributions, leading to deeper understanding of sustainability-driven co-opetition in SCs from a combined theoretical perspective of Resource-Based View (RBV) (Barney 1991) and Network Theory (Koka, Madhavan, and Prescott 2006). Moreover, this paper will help practitioners to understand better the opportunities and challenges of sustainability-driven co-opetition in SCs, as well as the approaches to engage with co-opetition more effectively.

In the next section, a literature review is conducted to provide an overview of the existing research on co-opetition in SCs and a theoretical underpinning for this research. This is followed by the methodology section, in which case studies are presented. The discussion of findings is provided in the next section which leads to the development of research propositions and a theoretical framework of sustainability-driven co-opetition in SCs and a heuristic decision model for practitioners. Finally, implications, limitations and future research are discussed.

2. Literature review

To identify relevant publications for the literature review, we followed Tranfield, Denyer, and Smart's (2003)

guidelines. We started by searching key business and management knowledge databases including Google Scholar, Science Direct, Scopus, and EBSCO. The search included only publications in leading peer-reviewed journals (based on UK CABS journal ranking), which are more likely to be subject to stringent scrutiny. To ensure reliability of the selected literature, conference papers,

editorial notes, master's and doctoral theses, unpublished working papers and book chapters were excluded (see also Yadav and Desai 2016).

To identify suitable papers on 'inter-organisational collaboration for improving sustainability performance in supply chains', keyword search strings based on a combination of 'inter-organisational' (OR 'inter-firm' OR

Table 1. Review of publications on co-opetition for sustainability.

	Reference (from latest to oldest)	Method	Theoretical perspective	Industry/scope of sustainability (Environmental and/or social)	Scope and key highlights/ findings	Highlights of the gaps in the reference addressed by this paper
1	Jalali et al. (2021)	Modelling	Game Theory	Original Equipment Manufacturer (OEM) of Electronics/ Environmental	<ul style="list-style-type: none"> Studying co-opetition on recovering electronics via return of used items in a closed-loop supply chain, between an OEM (Dell) and a social collector (Goodwill agencies). Co-opetition is not always beneficial, and benefits from it exists for the OEM depending on the quality of returned item and markup costs. 	<ul style="list-style-type: none"> The research is based on modelling and by nature does not explain the process and mechanisms of co-opetition as qualitative case studies does. Focus is on return logistics and not forward logistics or SC operations.
2	Narayan and Tidström (2020)	Literature review	Implicitly followed the Transaction Cost Economics	Not specified/ Environmental	<ul style="list-style-type: none"> The paper proposes how using tokens in blockchain system can enable co-opetition as a way of transforming to circular economy. The paper proposes that shifting toward a decentralised network which enables access to identity of products and their history will enable opportunities for refurbishment, remanufacturing and recycling of products. 	<ul style="list-style-type: none"> The paper is conceptual, based on literature review, which cannot provide real insights based on implemented co-opetition. This is highlighted as a limitation of the study by its authors.
3	Trapp et al. (2020)	Mathematical modelling using data from two UK retailers	Game Theory	Container shipping in retail supply chains/ Environmental	<ul style="list-style-type: none"> The study shows limited economic advantages from co-opetition based on their model and data. Greatest benefits from co-opetition takes place when the price of fuels and social costs of CO₂ emissions (e.g. costs related to climate change) increase. 	<ul style="list-style-type: none"> Mathematical modelling based on calculating transport costs and emissions level is used, which due to its quantitative nature does not lead to explanations on the drivers, facilitators and process of co-opetition, and mainly provides quantified outcomes. This paper via explorative case studies addresses these areas.

(continued)

Table 1. Continued.

	Reference (from latest to oldest)	Method	Theoretical perspective	Industry/scope of sustainability (Environmental and/or social)	Scope and key highlights/ findings	Highlights of the gaps in the reference addressed by this paper
4	Manzhynski and Figge (2020)	Conceptual	Resource-based View	Not specified/ environmental	<ul style="list-style-type: none"> • Linking organisational and societal outcomes of co-opetition by assuming two firms and scenarios for their type of relationship. • Identifying the trade-offs which can occur in co-opetition for sustainability by considering the three perspectives of firm, resource and societal. 	<ul style="list-style-type: none"> • Lack of empirical data with real practical insights/implications (research based on conceptual examples), which makes the study limited in providing sufficient explanations about the co-opetition process. • Lack of focus on mechanism and drivers, barriers and facilitators of co-opetition.
5	Christ, Burrirt, and Varsei (2017)	Case study based on publicly available information	Implicitly followed a combination of Resource-Based View and Game Theory	Wine industry (focusing on logistics aspects)/ environmental	<ul style="list-style-type: none"> • Identifying potential benefits and problems with sustainability-based co-opetition, based on an example of two competing Australian wine producers who agreed to collaborate on logistics. • Findings show increasing profitability and reduced emissions. • Change in the market, affecting competitiveness levels, leads to stopping co-opetition. • Co-opetition strategies need to be incorporated in standards and guidelines addressing environmental sustainability management. • Linking corporate co-opetition and corporate sustainability can help policy makers move industries toward sustainability. 	<ul style="list-style-type: none"> • Using publicly available information as data source, which limits the depth of exploration compared to using primary research data. • The study highlighted the need for research areas and scopes as necessary for the field, which are addressed in this paper: • Explorative case studies involving collaborative engagement of participants. • Research on long-term successful and unsuccessful (short-term) co-opetitive projects. • There is a demand for inductive case studies of environmental sustainability. • Exploring dynamics of sustainability-driven co-opetition.

(continued)

‘interfirm’) AND ‘collaboration’ (OR ‘cooperation’) AND ‘sustainability’ (OR ‘social’ OR ‘environmental’ OR ‘emission’) AND ‘supply chain’ (OR ‘logistics’ OR ‘transportation’ OR ‘operations’) were used. This resulted in 52 papers, which formed the basis of our literature review. To identify relevant papers on ‘co-opetition for improving sustainability in logistics, operations and SCM’, the

search strings were designed to include combinations of ‘co-opetition’ (OR ‘coopetition’ OR ‘cooperation and competition’ OR ‘collaborating with competitor’ OR ‘coopetitive’) AND ‘sustainability’ (OR ‘environment’ OR ‘social’ OR ‘emission’). This led to 115 journal papers in the business and management fields. Among these, 34 papers have a SCM perspective, and only 10 papers

Table 1. Continued.

	Reference (from latest to oldest)	Method	Theoretical perspective	Industry/scope of sustainability (Environmental and/or social)	Scope and key highlights/ findings	Highlights of the gaps in the reference addressed by this paper
6	Stadtler and Van Wassenhove (2016)	Multiple case studies	Implicitly followed a combination of Social Network Theory and Game Theory	Education system/social	<ul style="list-style-type: none"> Co-opetition between information and communication technology (ICT) companies, in collaboration with governments and civil-society actors used in the context of Jordanian and Egyptian educational systems. The paradoxical competitive and collaborative elements of co-opetition can lead to tensions between companies and governments (as intermediaries) have a role in managing the relationship between the companies. 	<ul style="list-style-type: none"> The focus is not on operations, logistics and SCM. The study highlights a demand for further empirical studies on design mechanisms for managing inter-organisational relationships in sustainability-driven competition – which is addressed in this paper.
7	Luo, Chen, and Wang (2016)	Modelling	Game theory	Manufacturing (not specified)/ environmental	<ul style="list-style-type: none"> Examining the role of co-opetition in achieving low carbon manufacturing. Co-opetition, compared to pure competition, leads to more profit and less total carbon emission, however it is subject to higher product prices and carbon emissions per produced item. 	<ul style="list-style-type: none"> The research is modelling and by nature does not explain the process and mechanisms of co-opetition through empirical studies. The scope of the paper is limited to only two companies in the manufacturing, and a study with a broader scope on the supply chain is highlighted as a necessary further research area.
8	Scandellius and Cohen (2016)	Multiple case studies	Implicitly followed a combination of Network theory, and Resource-based View	Food and drink value chains/ environmental	<ul style="list-style-type: none"> The study aims to provide solutions based on holistic and industry-wide collaborative ways to improve sustainability in value chains through collaboration. The focus is on communication between firms and stakeholders in value chains including suppliers, employees and industry colleagues. 	<ul style="list-style-type: none"> The study does not focus on mechanisms of co-opetition in supply chains. The paper highlights the need for studies on co-opetition which include perspectives of multiple companies, and a need for studies on sustainability-driven co-opetition in the context of industries other than food and drinks.

(continued)

Table 1. Continued.

	Reference (from latest to oldest)	Method	Theoretical perspective	Industry/scope of sustainability (Environmental and/or social)	Scope and key highlights/ findings	Highlights of the gaps in the reference addressed by this paper
9	Volschenk, Ungerer, and Smit (2016)	Case study	Stakeholder Theory	Recycling of wine glasses/ Environmental & Economic	<ul style="list-style-type: none"> The paper studied dynamics of value creation and appropriation in co-opetition considering the perspectives of producers and users of glasses and government in the context of South African wine industry. Environmental focus by improving recycling of wine bottles, which can lead to reducing the cost of production for wine producers. 	<ul style="list-style-type: none"> Limited focus on logistics and SCM. Focus on only one product.
10	Limoubratum, Shee, and Ahsan (2015)	Structural equations modelling, path analysis of survey data	Resource-based view	Newspaper supply chain partners/ Environmental	<ul style="list-style-type: none"> The paper studies if a co-opetition strategy would have any significant implications on logistics of newspapers in Thailand which lead to sustainability improvements. The study shows co-opetition can lead to sustainability improvements; however, relationship management is key in success of co-opetition. 	<ul style="list-style-type: none"> Due to its quantitative nature, the study does not provide explanations on the process of co-opetition. The study focuses mainly on benefits of co-opetition and not on barriers and challenges of it. The study highlights that further research in form of case study is needed to improve the understanding on the role of co-opetition in sustainability practices in SCs.

are focusing on sustainability-aspects of co-opetition, including either social or environmental or both aspects (a structured review of these 10 papers is presented in Table 1).

The keyword searches were completed by tracking citations and checking reference lists, personal enquiries with experienced researchers and online search, to ensure full inclusion of important works while appropriate analysis of content of each paper (see also Seuring and Gold, 2012).

2.1. Theoretical perspective of co-opetition for sustainability: the missing link

Traditionally, inter-organisational collaboration has followed a common array of theoretical perspectives, such as RBV (Barney 1991), Transaction Cost Economics (TCE) (Williamson, 1979), Research Depen-

dence Theory (RDT) (Salancik and Pfeffer 1978), Dynamic Capabilities View (DCV) (Teece, Pisano, and Shuen 1997) and Social Capital Theory (SCT) (Putnam 2001). These theories have been used to explain the collaborative relationship between non-competitive firms (i.e. firms not competing directly over products or services) (e.g. Dyer and Singh 1998).

The application or extension of those theories in understanding co-opetition is emerging but very limited. For example, Mention (2011) and Ritala and Sainio (2014) examined innovation made jointly by firms as a result of co-opetition from a RBV perspective. Ritala and Hurmelinna-Laukkanen (2009) studied value creation in collaborative projects between competing firms from a TCE perspective. DCV (Teece, Pisano, and Shuen 1997) is recognised as an important perspective to explain the capabilities of firms to engage with inter-organisational SC collaboration (Mandal 2017) but was rarely adopted

when studying co-opetition. An example of such can be found in M'Chirgui (2005) which followed DCV to examine co-opetition by studying the paradoxical relationships between producers of smart cards in the market.

The limited number of studies on co-opetition for sustainability (see Table 1) attempts to extend our understanding of the phenomenon from a game theory perspective (e.g. Jalali et al. 2021), RBV (e.g. Manzhynski and Figge 2020) and Stakeholder perspectives (Volschenk, Ungerer, and Smit 2016). However, most of those studies are vague or implicit in their theoretical perspectives, hence limited in the potential of their theoretical contributions. Overall, the existing attempts of theory development in co-opetition for sustainability are largely fragmented, especially in the SC field. Despite the potential of various theories to explain co-opetition, substantive theory development to explain sustainability-driven co-opetition in SCs is scarce. What has hindered the development of substantive theories in the field is that a single use of classical theories can be insufficient in explaining a paradoxical relationship such as co-opetition. Therefore, a combined theoretical perspective is needed (He et al. 2020).

In this paper, a combination of RBV (Barney 1991) and Network Theory (Koka, Madhavan, and Prescott 2006) is adopted to guide our empirical study. RBV suggests that competitive advantage lies in the possession of rare resources by firms. It identifies two preconditions for competitive advantage (Barney 1991): resource heterogeneity and imperfect mobility. Resource heterogeneity requires that not all firms possess the same amount and kinds of resources; imperfect mobility entails resources that are non-tradable or less valuable to users other than the firm that owns them (Peteraf 1993). It is due to these preconditions that researchers highlight the potential mutual benefits gained from collaborative inter-firm relationships, which allow the sharing of complementary resources between alliance partners while maintaining independent status (He et al. 2020). However, RBV has limited ability to explain why competitors would collaborate. Network theory (Koka, Madhavan, and Prescott 2006), on the other hand, does not preclude these types of relationships between firms and suggests that capitals and resources reside within networks of firms. This means that any participants, including competitors, can gain from networks of interacted relationships. Therefore, given that we want to explore the collaborative relationship between competitors in a SCM context, where dyads or networks of firms would appear, a combined use of both theories will provide a good basis for the development of the empirical study. The empirical evidence gained from this study will help to extend

the theoretical underpinnings of sustainability-driven co-opetition in SCs.

2.2. Inter-organisational collaboration for SC sustainability

Sustainability in the context of SCM is defined as 'the integration of environmental, social and economic aspects of business (i.e. triple-bottom-line) for achieving long-term economic viability' (Carter and Rogers 2008, 360). Traditionally companies have focused on economic aspects, aiming to maximise profit. In the last decade, however, in order to maintain or attain a global market, adopting sustainability into SC practices has become essential for companies (Yadav et al. 2020) and hence it has led to emerging trends in SCM research and practice, such as 'circular supply chain management' (Saroja, Garg, and Luthra 2021).

Increased urban institutional pressure is one of the drivers for improving the sustainability performance of supply networks (Rose et al. 2016). Therefore, integrating social and environmental thinking into SC processes is becoming increasingly important in the design and operation of SCs (Trapp et al. 2020; Raza 2018; Gimenez, Sierra, and Rodon 2012). As a result, companies are increasingly managing the environmental and social performance of their logistics and SC operations (Feng, Hu, and Orji 2021; Oyedijo et al. 2021; Mathiyazhagan et al. 2021; Yadav et al. 2020; Kumar and Anbanandam 2020; Centobelli, Cerchione, and Esposito 2017).

Nowadays, sustainability is increasingly seen as a joint SC effort rather than an individual organisational activity, and it is increasingly recognised that achieving the total benefits of socially responsible and environmentally friendly products and processes requires joint action by SC participants (Ferrell et al. 2020; Kiron et al. 2015). In general, inter-organisational collaboration is regarded as an important strategy used by companies to overcome social and environmental-related challenges in their SCs (Blome, Paulraj, and Schuetz 2014; Kiron et al. 2015).

A growing body of literature on sustainability has addressed collaborative paradigms to improve social and environmental SCM practices and has examined the relationship between inter-organisational collaborations and sustainability performance (Chen et al. 2017). Joint actions by SC participants are proven to be necessary for developing environmentally friendly products and processes (Saghiri and Mirzabeiki 2021; Kiron et al. 2015). Evidence suggests that collaborative activities, and communication and alignment between a buyer and its suppliers and customers can lead to the achievement of

sustained improvements in the environmental performance of companies and SCs (Busse et al. 2016). As an example, the collaboration between buyers and suppliers in the form of training and joint projects has resulted in reduced waste and improved recycling, as shown in the study by Gimenez and Sierra (2013). Therefore, SC relationships are essential in improving Corporate Social Responsibility (CSR) (Zhang et al. 2014; Lund-Thomsen and Lindgreen 2014).

A part of the literature studies the impacts of inter-organisational collaboration in improving sustainability in the logistics and transportation domain. Examples of such collaborative strategies include reducing emissions through joint transportation (Cruijssen, Cools, and Dullaert 2007), shipper consolidation (Ergun, Kuyzu, and Savelsbergh 2007) and joint programmes between buyers-suppliers leading to improved environmental or social practices (Saghiri and Mirzabeiki 2021).

Horizontal collaboration between logistics service providers, by sharing their logistics and transportation capacities, is also introduced as a strategy for improving both efficiency and environmental performance of logistics operations (Ferrell et al. 2020; Schmoltzi and Wallenburg 2011). A strand of the literature has emphasised the importance of collaboration mechanisms for achieving sustainability in SCs, by analyzing flows of materials, information, and approaches for interaction between companies, such as contractual agreements (Jraisat et al. 2021).

Developing decision support systems for collaborative logistics planning, considering both economic and environmental factors when designing product logistics networks, is also studied in the literature, as a way of designing information systems to support the reduction of emissions from transportation operations (Allaoui, Guo, and Sarkis 2019).

However, most of the literature's studies of collaborative models for SC sustainability are based on either vertical relationships or horizontal relationships between non-competing firms. There is a gap in the literature studying mechanisms and processes of co-opetition by systematic analysis of the elements affecting initiating, facilitating and achieving outcomes from co-opetition, as an emerging type of inter-organisational collaboration.

2.3. Co-opetition and its impact on SCM

There is a growing body of literature covering co-opetition in the management field, in areas such as product development (Gnyawali and Park 2011; Ho and Ganesan 2013; Ritala and Sainio 2014), marketing (Osarenkhoe 2010), manufacturing (Yilmaz, Rofcanin, and Gürbüz 2015), organisational learning (Bouncken

and Fredrich 2016; Peng, Yen, and Bourne 2018), knowledge acquisition (Li, Liu, and Liu 2011), inter-organisational knowledge sharing (Gast et al. 2019; Botelho 2018), innovation (Park, Srivastava, and Gnyawali 2014) and project management (Le Roy and Fernandez 2015). The common understanding is that co-opetitive relationships are complex and operationally challenging (Bengtsson and Raza-Ullah 2016; Gnyawali, He, and Madhavan 2016).

Despite being generic in nature, recent literature has started to achieve a better understanding of the associated management processes of co-opetition, by exploring the antecedents and supporting conditions, as well as tensions between competitors in such relationships (Gernsheimer, Kanbach, and Gast 2021; Fernandez, Le Roy, and Chiambaretto 2018; Granata et al. 2018; Pellegrin-Boucher, Le Roy, and Gurau 2018; Fernandez and Chiambaretto 2016). The process of co-opetition is concerned with three key aspects, namely dynamics, complexity, and managerial challenges (Bengtsson and Raza-Ullah 2016). 'Dynamics' relate to the configuration and reconfiguration of networks and the management of tensions potentially arising from concurrent cooperation and competition (Osarenkhoe 2010). 'Complexity' concerns the risk associated with managing conflicts between competitors, which entail demands for value creation and knowledge protection in information sharing practices between companies (Bouncken and Kraus 2013). 'Managerial challenges' include governance structures, contracts, legal checks and third-party mediation strategies (Bengtsson and Raza-Ullah 2016). Challenges and complexities are inherent to managing inter-organisational relationships. This is invariably the case where inter-organisational relationships are co-opetitive and when a fine balance between the competitive and cooperative dimensions needs to be maintained (Raza-Ullah, Bengtsson, and Kock 2014). Effective management processes enable collaborating and competing elements of inter-organisational relationships to co-exist (Bengtsson and Kock 2000; Osarenkhoe 2010).

The majority of the literature in the SCM field has focused on the incentives and outcomes of co-opetition from an economic perspective. Reasons companies enter into co-opetition in SCs include: improved procurement and supplier relationship management practices (Wilhelm 2011; Wilhelm and Sydow 2018), increased SC resilience (Shin and Park 2021), reaction to external market pressures due to high demand volatility (Seigfried 2012; Coyle et al. 2016; Shockley and Fetter 2015), price competition by reducing logistics costs (e.g. via using standardised packaging units) (Kotzab and Teller 2003), coping with changes in the logistics market (Song, Cheon, and Pire 2015) and political

initiatives to open up the market to foreign competition (Bengtsson and Kock 2000). Moreover, outcomes of co-opetition in SCs include expansion of logistics networks (Song, Cheon, and Pire 2015), reduction of collective operational expenses (Zhang and Frazier 2011), reduced inventory holding costs and decreased order-to-fulfilment response times (Shockley and Fetter 2015), higher levels of utilisation of assets within forward and reverse-logistics operations (Bengtsson and Kock 2000; Kotzab and Teller 2003), and higher levels of logistics customer service (Song and Lee 2012).

2.4. Co-opetition for sustainability

Current publications which directly study the implications of co-opetition for sustainability, although limited, are focusing on different areas including: efficiency improvements in the usage of organisational resources via co-opetition and potential environmental improvements (Manzhynski and Figge 2020); improving countries' national educational systems by collaboration of competing companies (e.g. IT firms), initiated and managed by government organisations (Stadler and Van Wassenhove 2016); joint initiatives for the recycling of used packaging based on the collaboration of a group of competing companies (Volschenk, Ungerer, and Smit 2016); co-opetition in food and drink value chains, focusing on the role of communication of sustainability values to stakeholders (Scandellius and Cohen 2016); and improving environmental performance in transport and logistics operations via collaborative logistics (Trapp et al. 2020; Christ, Burritt, and Varsei 2017; Limoubpratum, Shee, and Ahsan 2015). Only a handful of research studies focused on the implications of co-opetition for sustainability (having a 3BL perspective), considering improving economic and also environmental and/or social aspects of SC and logistics operations in different industries (Jalali et al. 2021; Narayan and Tidström 2020; Trapp et al. 2020).

Despite the focus of these papers on co-opetition for sustainability, none of these have provided explanations of the process of co-opetition by conducting a structured analysis of the drivers and facilitators of co-opetition and the mechanisms through which the desirable outcomes can be achieved from co-opetition. The reasons behind including the choice of methodologies, for example, using modelling approach focusing on building scenarios (e.g. Jalali et al. 2021; and Luo, Chen, and Wang 2016), and conceptual studies based on literature reviews (e.g. Narayan and Tidström 2020) or based on the publicly available information (e.g. Christ, Burritt, and Varsei 2017), which cannot provide real and in-depth practical explanations about co-opetition and its implications

for sustainability. Furthermore, in none of these studies is a combination of short-term and long-term co-opetition case studies included to enable high levels of generalisability of the findings and identification of the factors which can lead to sustaining co-opetition in different forms of relationships.

The reviewed literature on co-opetition for sustainability indicates the urgent need for explorative research based on primary data which can elaborate the process of initiating and managing co-opetition. Table 1 provides a list of the publications on sustainability-driven co-opetition and a comparison between them and the current study, highlighting the gaps in the literature which are filled by this paper.

2.5. Managing co-opetition in SCs

Previous literature has identified mechanisms through which successful collaborative relationships in SCs are enabled, such as resource sharing (e.g. warehouse and hardware) between operations of partners (Schmoltzi and Wallenburg 2011), shared IT infrastructure (Nucciarelli and Gastaldi 2009), knowledge exchange through interpersonal relationships (Wilding and Humphries 2006), effective cooperative governance structure (Agrell, Lundin, and Norrman 2017), collaborative planning and joint decision making and execution by SC partners (Ramanathan and Gunasekaran 2014).

However, co-opetitors are required to design unique processes that enable partnering companies to work effectively (Shockley and Fetter 2015; Song 2003). Successful co-opetition is dependent upon an array of more complex factors, due to the paradoxical nature of the co-opetitive relationships: Firstly, when implementing co-opetition in SCs, in which cooperation and competition co-exists, the importance of separating the collaborating and competing parts of the operation is a key factor for harmonised management of relationships to avoid conflicts (Bengtsson and Kock 2000). Logical separation of functions for cooperation between competing companies will allow better coordination and fairer sharing of costs and benefits.

Secondly, for successful co-opetition in SCs to happen, effective coordination of firms in the co-opetitive relationship is needed. This is because, co-opetition may involve a network of companies (e.g. producers, retailers, wholesalers, logistics service providers, shipping companies). For example, Brandenburger and Nalebuff (1996) show that co-opetition for sustainability was achieved in the case of collaboration of a large number of Dutch tulip growers when they decided to jointly plant flowers indoors. Such effort led to cost savings of their operations

and also a significant reduction of greenhouse gas emissions, however, the required coordination effort has been massive.

Thirdly, despite the need for effective coordination – usually enabled by information sharing – it is necessary to create mechanisms with adequate control over sensitive information and to plan to avoid unintended information spillovers (Shockley and Fetter 2015). However, ‘over-controlled’ data sharing can be a barrier when implementing co-opetition (Cruijssen, Cools, and Dul-laert 2007; Shockley and Fetter 2015).

Fourthly, apart from overcoming the traditional rivalry mindset, firms also need to overcome regulative restrictions (such as, anti-trust laws) present in many countries, to implement co-opetition legally. For example, Song (2003) emphasises that when conducting co-opetition, companies should ensure that the initiative does not breach any form of anti-competition regulations (e.g. price fixing). Therefore, careful design of the relationship is needed. This is also the reason why more co-opetition takes place in the upstream of SCs, such as logistics operations and transportation, which are not close to customers (Bengtsson and Raza-Ullah 2016).

Overall, the literature suggests that the research into co-opetition with a sustainability focus, especially in the domain of SCM, is still in its infant stage. This calls for exploratory research that discloses the entire process of implementing co-opetition in SC operations, by studying the drivers, barriers, facilitators and mechanisms which can affect outcomes from collaboration with competing firms. In-depth explanations are needed in order to understand how co-opetition can create strategic capabilities for firms. To shed light on the complexities associated with processes of co-opetition for SC sustainability, this paper conducts an explorative study following the multiple case studies approach.

3. Research methods

Case study is capable of providing a strong base for theory-building in emerging fields, leading to in-depth comprehension about complex phenomena by providing answers to the ‘why’ and ‘how’ questions (Eisenhardt and Graebner 2007; Yin 2014; Eisenhardt 1989; Ellram 1996). Studying multiple case studies rather than a single case leads to outcomes with higher levels of reliability and generalisability (Stake 2013). In this paper, an explorative multiple case studies approach was followed. We focus on a smaller number of cases to allow for a deep contextualised understanding of cases (Stake 1995), suitable for an explorative study such as this.

This study is conducted following four main stages, to ensure a robust understanding of the phenomenon (see

Figure 1 for a flow chart). Stage one: a comprehensive literature review was conducted to pave the way for field-based studies. Stage two: before selecting cases, multiple in-depth interviews were carried out with field experts, practitioners, logistics managers and consultants in the UK to acquire initial knowledge on co-opetition and its relationship with sustainability (the list of interviews is shown in Appendix A, supplementary material). Stage three: a focus group (Flick 2018) with 18 managers from UK companies from different sectors was conducted to gain a better understanding of the current practices of co-opetition in the industry, practical characteristics of co-opetition and implications for sustainability performance. The list of participants in the focus group is provided in Appendix C (see supplementary material). Stage three also led to designing the case study protocol and selection criteria for appropriate cases. Stage four: studying the selected cases by using different sources of data (more detail in section 3.2).

3.1. Case selection

In this study, the unit of analysis is co-opetitive relationships. The selection criteria for cases are as follows: (1) *Competitive* – the sale of one firm’s product or service is to the detriment of the other firm’s sales; (2) *Deliberate* – companies must enter into the co-opetition consciously and willfully, actively and intentionally, even if an intermediary is used to actually affect the action; (3) *Committed* – commitment to the relationship must be demonstrated by all parties for at least 12 months; (4) *Common interest* – collaborators must share a common problem or opportunity; (5) *Theme relevance* – the case should be relevant by presenting an initiative based on co-opetition leading to sustainability, including both environmental and social aspects.

Gaining access to companies which conduct co-opetition with a sustainability scope (i.e. for environmental and social purposes, besides economic reasons) in SCs was not easy because such a phenomenon is relatively rare. However, we identified two complementary cases meeting our selection criteria:

- Case 1: A long-term case of co-operation between Nestlé and Pladis, as two leading rival global food manufacturers who do joint transportation of their finished goods from factories to their distribution centres in order to reduce their emissions from logistics and to achieve economic efficiencies by reducing their logistics costs.
- Case 2: A fixed-term (short-term compared to Case 1) collaboration on logistics of products from Northern Ireland to the UK and EU mainland by a group of

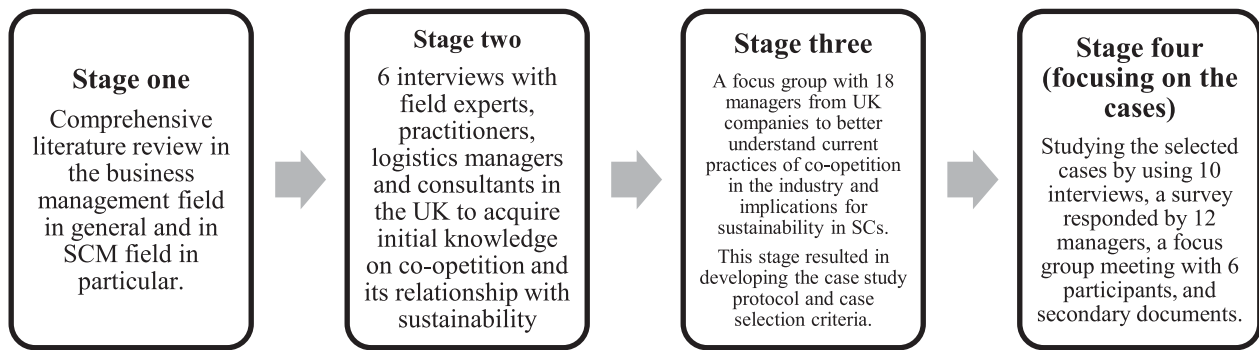


Figure 1. Main stages of this research.

competing Northern Irish manufacturers and logistics service providers, with the aim of making their products more competitive in the destination markets.

These two cases are complementary in three aspects. Firstly, in terms of scope of sustainability, Case 1's scope is on environmental and economic aspects of co-opetition, and Case 2's is primarily on social and economic aspects of sustainability (with secondary environmental implications). Therefore, the two cases in combination cover all three elements of the 3BL sustainability in the context of co-opetition in SCs. Secondly, in terms of the structure of the co-opetition relationship, while Case 1 represents a 'dyadic co-opetition' between two companies, in Case 2 co-opetition is occurring between multiple companies, thus representing a 'network-based co-opetition'. Thirdly, in terms of duration of the co-opetition, the two cases provide a combination of a long-term (Case 1) and a fixed-term/short-term (Case 2) co-opetition. Studying both long-term and short-term co-opetition projects is highlighted as a necessary research approach when studying co-opetition for sustainability (Christ, Burritt, and Varsei 2017).

3.2. Collecting data for case studies

Multiple sources of primary and secondary data were used to gain balanced understanding of both case studies (see Table 2). For Case 1 these include in-depth interviews, a questionnaire survey, a focus group and documentations of companies. For Case 2 the data sources include in-depth interviews and documentations of companies. The data collection from these sources is further explained next.

3.2.1. Interviews

Given that co-opetition for environmental and social objectives is largely unexplored in the field, in-depth interviews enable insight into the process and mechanism

of managing such an innovative inter-organisational relationship (Ozcan 2018). In-depth interviews also enable researchers to capture the richness of perceptions needed to gain insight into the subtleties and cultural depth of issues behind the phenomenon.

After making initial contact with the companies involved in the co-opetitive relationships in Case 1 and Case 2, the key people who were involved in the relationship from the beginning were introduced to the researchers as the most knowledgeable individuals about the co-opetitive relationship. These people have been involved in both the strategic decision-making stage prior to the relationship being built and, in the designing, and execution of the co-opetitive operations. This made them the most suitable interview respondents. For Case 1, the respondents are logistics and SC managers from Nestlé and Pladis who have been involved in the co-opetitive project between the companies. In Case 2 we conducted one interview with the company which orchestrated the relationship and three other interviews with one of the leading logistics service providers involved in the relationship. In total, ten in-depth interviews were conducted for both cases (six in Case 1 and four in Case 2, see Table 3) based on interview questions listed in Appendix B (see supplementary material).

Before each interview respondents were briefed on the definition of co-opetition, sustainability (3BL) and the purpose of the study. During the interviews, the interviewers kept the focus of the discussions on the sustainability aspects of co-opetition. All interviews lasted between 1 and 2 hours and were recorded where permitted, transcribed and coded following the guidelines of Yin (2014).

3.2.2. Survey

Case 1 interviews were also supplemented by a structured questionnaire with 12 nominated managers from both companies involved in the co-opetition (8 from Nestlé and 4 from Pladis). The purpose is threefold.

Table 2. Primary and secondary data collected on the cases.

Cases (co-opetitive networks)	Length of co-opetition	Sustainability aspect	Type of network	Companies involved in each case	Data	
					Primary data sources	Secondary data sources
Case 1 – Two leading food manufacturers	Long-term and ongoing	Environmental and economic	Dyad	<ul style="list-style-type: none"> • Nestlé • Pladis 	<ul style="list-style-type: none"> • 6 in-depth interviews with managers from both companies (2 before and 4 after the survey). • A semi-structured survey completed by 12 respondents from both companies (8 from Nestlé and 4 from Pladis). • A focus group with 6 participants including lead project managers from both companies. 	<ul style="list-style-type: none"> • Official websites of Nestlé, Pladis and the facilitator of the relationship. • Press releases including 19 articles (more than 130 pages). • Other online documentation and archival records (more than 250 pages).
Case 2 – A national network of manufacturers and logistics service providers	Short-term	Primarily social and economic; Secondly environmental, (leading to reducing the emissions)	Network	<ul style="list-style-type: none"> • The consulting company who orchestrated the relationship (Company C) • Logistics service provider (Company D) 	<ul style="list-style-type: none"> • 4 in-depth interviews with the representatives of two companies, i.e. the consulting company who orchestrated and managed the relationship as a third-party, and a leading logistics service provider. 	<ul style="list-style-type: none"> • Official websites of the companies and facilitators of their relationships. Press releases including 16 articles (more than 90 pages) • Online documentation and archival records (more than 170 pages).

Table 3. Interviews conducted for both case studies.

Case	Interview #	Position	Type of organisation	Duration	Type (face-to-face/telephone)
Case 1	1	Head of Logistics	Nestlé	2 hours	Face-to-face
	2	Head of Distribution	Pladis	2 hours	Face-to-face
	3	Head of Distribution	Nestlé	1 hour	Telephone
	4	Head of Supply Chain	Nestlé	1 hour	Telephone
	5	Transport Operations Manager	Pladis	1 hour	Telephone
Case 2	6	National Transport Controller	Pladis	1 hour	Telephone
	7	Consultant/broker of transportation pooling	Company C	1.5 hours	Telephone
	8	Logistics Manager	Company D	1 hours	Telephone
	9	Distribution Manager	Company D	1.5 hours	Telephone
	10	Project Manager	Company D	1 hours	Telephone

First, the survey will help to measure the managers' perceptions of the co-opetitive relationship from both sides simultaneously. Second, using survey data in addition to the interviews will enhance data triangulation, hence improving validity of the findings (Wilding and Humphries 2006). Third, the survey was used as an instrument to confirm the quality of the ongoing co-opetitive relationship based on the established framework of 'Innovation', 'Investment', 'Communication', 'Operations' and 'Value' in the inter-organisational relationship literature (see also Mena et al., 2009; Wilding and Humphries 2006). The survey supplements the findings of interviews by identifying the managers' perceptions of the range and strength, as well as the success and failure factors of the co-opetition.

38 structured questions based on five-point Likert-type scales were derived from the literature (see Appendix D, supplementary material). The survey was only conducted in Case 1, because Case 2 was a fixed-term (short-term compared to Case 1) co-opetition which had ended before the current study. The length of the co-opetition in Case 2 does not justify the survey to measure the quality of the ongoing co-opetition.

3.2.3. Focus group

For Case 1, a half-day focus group was also conducted with 6 participants including managers from Nestlé and Pladis and the research team, to complement the interview and to confirm the survey results (Flick 2018; Wilkinson 1998). During the focus group, the results of

the interview and survey on Case 1 were presented to top SC managers of Nestlé and Pladis who had been the main decision-makers for the co-opetition, to allow for feedbacks and insights. The results of the focus group and statements of the participants regarding different dimensions of the relationship are shown in Appendix E (see supplementary material).

3.2.4. Documents

For both case studies, documentation in different forms (Eisenhardt 1989; Yin 2014), including data publicly available on company websites, YouTube videos, press releases and articles, company reports, blogs and trade magazine articles were reviewed to comprehend the co-opetitions. While evaluating details of all the documents, the focus was on identifying successes, failure factors and enablers of co-opetition, benefits of co-opetition economically, socially and environmentally, as well as concerns over cultural and regulatory issues and speculation over knowledge spill-over. A combination of primary and secondary data sources (Stake 2013) led to the deepened understanding of co-opetition in both cases, as well as improved reliability and validity of findings through data triangulation (Woodside and Wilson 2003).

3.3. Data analysis

Content analysis facilitated by NVivo 10 was used to analyze the qualitative data, including the interview transcripts, documents and quotes from the focus group. The keywords used for coding the qualitative data included: 'sustainability-related drivers', 'environmental outcomes', 'social outcomes', 'economic outcomes', 'facilitators', 'barriers/challenges', 'process and mechanisms of managing relationship' and 'gained organisational capabilities'. To ensure intercoder reliability of case study analysis (O'Connor and Joffe 2020), two researchers first agreed on the keywords. They independently reviewed and coded the qualitative data. They then met and compared their coding and achieved consensus on their results.

After data coding, following Miles and Huberman (2013), matrix spreadsheets were used with codes on one dimension and their relevant quotes on the other dimension to display the qualitative data. The themes emerged in the data as a result of the analysis include: 'the role of a strong business case in the success of sustainability-driven co-opetition', 'synergies in operations of companies as an important factor in sustainability-driven co-opetition', 'the role of a neutral third party in initiating and managing co-opetition', 'the role of management support in the success of sustainability-driven

co-opetition', 'the importance of not breaching anti-trust regulations', 'creation of a strategic competitive capability for companies by being able to engage in co-opetition' and 'mechanism and process of managing co-opetition, including sub-themes as setting clear boundaries and protecting confidential information'.

The survey data was analyzed separately and the results of performance of the companies in a sustainability-driven co-opetition in Case 1 was used as an indicator of the outcome of co-opetition.

The data analysis led to creating the initial propositions of the study, which was finalised after 5 brainstorming sessions between two researchers and a follow-up interview with participating managers of the focus group.

3.4. Research quality

Following Yin (2014), the quality of the case study was checked and ensured at different stages of the study. To ensure *construct validity* during data collection, multiple sources of evidence were used, leading to data triangulation. Moreover, draft case study reports were sent to key informants involved in the studies for review and approval. To ensure *internal validity*, research propositions and the theoretical framework were established based on a comprehensive analysis of cases which was cross-checked by key informants and against the literature. To ensuring *external validity*, a robust replication logic based on well-defined case selection criteria was used (as explained in the beginning of Section 3). Moreover, pattern matching through identifying the within-case and cross-case patterns allowed generalisation of results. To ensure *reliability*, a case study protocol was developed and followed throughout the fieldwork process to allow replicability. In addition, Zhang and Shaw's (2012) guidelines were followed, to ensure the high level of completeness, clarity and credibility of the research method and results (see Table 4). These processes maximise the quality of the research methods and findings.

4. Case analysis, findings, and propositions

4.1. Overview of case studies

4.1.1. Case study 1

Nestlé is the world's biggest food manufacturer. It makes a wide variety of products including pet food, baby food, hot and cold beverages, confectionery and snacks. Pladis is the largest biscuit and snack food manufacturer in the UK. It owns many well-known brands in the grocery sector and is a direct competitor to Nestlé. During

Table 4. Completeness, clarity, and credibility of method and results.

	Method	Results
Completeness	The ways of obtaining data for this research, including the list of participants in different stages of the study are explained in detail (a summary of the stages of the study and data collection procedures in each is provided in Figure 1).	Unit of analysis of case studies is introduced. Size of samples of respondents for each stage of the study and data collection are provided.
Clarity	Details are provided on the measures used in the study, e.g. interview questions, and instrument used for collecting data using survey and focus group. The keywords used for coding the qualitative data, selected according to the research questions are provided.	The research questions of the study are clearly answered in the findings. The propositions explain drivers, facilitators and barriers of co-opetition, and the capabilities which are needed by companies to pursue sustainability of their SCs via co-opetition.
Credibility	The sampling procedure and selection criteria for cases, and respondents of interviews and surveys are detailed.	Direct quotes from the interviewees and participants in the focus group are provided; draft case study sent to key informants for review and approval to ensure correctness of interpretation.

a chance conversation at a ‘Speed Dating for Business’ session organised by the Institute of Grocery Distributors (IGD) in 2007, two logistics managers from the two companies realised that they had similar problems with empty heavy goods vehicles returning from deliveries. Both were failing to meet their sustainability targets. During previous sessions, Pladis and Nestlé had identified partners to work with, but these were always retailers and non-competing manufacturers with whom they had little in-common. The two companies had always discounted working together because they were competitors. With the support of senior sponsors on each side and considerable determination and initiative, the two logistics managers broke down the cultural barriers that had traditionally stopped the rival companies working together. They implemented a co-opetitive arrangement whereby they shared transport resources on particular routes. This arrangement is still operating successfully today. Their motto is: ‘We compete on the shelf, not in the back of a lorry’. The first year of their joint operation eliminated 28,000 km of empty trailer journeys, saved 95,000 litres of fuel, reduced CO₂ emissions by 250 tons and reduced costs by £300,000 per year. Both firms are now looking to expand the co-opetition to exploit new opportunities. Nestlé and Pladis have overcome a number of difficulties in order to make co-opetition work in practice.

4.1.2. Case study 2

In 2000, the Confederation of British Industry (CBI) and Invest Northern Ireland (INI) initiated a project based on increasing the competitiveness of Northern Irish industries by promoting and facilitating collaboration among a large number of manufacturers and logistics service providers. The driving force behind this initiative was the high transportation costs which made Northern Irish consumer products expensive in the UK and EU markets. The project was aiming to facilitate joint transportation of companies by larger companies filling the empty spaces on their trucks with pallets from smaller companies for a low price per pallet, subject to having a matching destination and direction. As another important facilitator, having the same customers could make companies perfect collaborators for joint transportation. Therefore, the project was not only an innovative inter-organisational initiative aiming for economic development for the country, but it was also indirectly leading to improved sustainability of Northern Irish SCs through improving the filling rate of vehicles and reducing the carbon footprint of their transported goods (environmental) and making NI products more competitive in the UK market (social). A consulting company was in charge of the project. Some parts of the collaboration among a number of the companies are still running at the time of writing this paper.

Issues which companies have been coping with include competition over which company has the first delivery and imbalance between directions of shipment as companies could not get an equally good rate for their transport in both directions (i.e. to and from Northern Ireland). The co-opetition enabled the participants to control the routes and volumes and to offer better market rates. It enabled members of the network to compete in the market despite collaborating in transportation. The participants found that by adopting a pragmatic, simple approach to the collaboration from the beginning, they overcame resistance and encouraged trusting behaviours. In particular, the role of the neutral third-party who initiated the project was crucial in its development. To avoid the issues related to EU anti-trust legislation, individual companies arranged their own commercial relationships with the third-party company.

To summarise, the key co-opetitive aspects of each case and a cross-case synthesis are shown in Table 5. Cross-case analysis reveals a number of emergent, salient topics which are discussed below in light of the literature and allow the research propositions to be derived.

4.2. Drivers of co-opetition

Case analysis results in a few important areas as per sustainability enabled by co-opetition in SCs. In both cases,

Table 5. Dimensions of the co-opetitive relationship.

Case	Partners and focus of collaboration	Strategic capability and social/ environmental benefits	Drivers	Key resources to utilise and share	Improved capabilities of companies as an outcome of co-opetition
Case 1	Two British food manufacturers in the UK, Nestlé and Pladis, are sharing trucks when transporting finished goods from factories to distribution centres.	<ul style="list-style-type: none"> • Environmental sustainability • Cost reduction • New capability utilisation 	<ul style="list-style-type: none"> • Route and vehicle optimisation • Reduce carbon footprint • Increase CSR • Encouragement and facilitation by a third-party 	<ul style="list-style-type: none"> • Cheaper service • Simplicity of service and management • Management systems discipline to segregate the information on transport from retail • Operational synergy 	<ul style="list-style-type: none"> • Consolidated deliveries • Reduced geographical supply and demand imbalances • Exploiting operational synergies
Case 2	Manufacturers and transport service providers working together to reduce costs and improve competitive position.	<ul style="list-style-type: none"> • Market share improvement for Northern Irish products in the UK market • Reducing logistics cost • Reducing delays and complexities • Profitability improvement • Conformance to anti-trust legislation • Relationship building <ul style="list-style-type: none"> ◦ encouraging trust ◦ overcoming resistance • Improving the filling rate of vehicles and reducing carbon footprints of transported goods 	<ul style="list-style-type: none"> • Consolidating the supply base • Balancing the product flows • Better utilisation of vehicle space • Making NI products more competitive in the UK market (as a result of reducing logistics cost through this co-opetition) 	<ul style="list-style-type: none"> • Shared knowledge of small 'top up' transportation spaces • External manager/facilitator key to mobilising support and cooperation • Shared customers and routes 	<ul style="list-style-type: none"> • 'Level the playing field' for manufacturing customers • Control branding • Control of routes and volumes • Power to control market rates • Achieving full loads in both directions • Opportunity to reduce costs and increase earnings
Cross-case synthesis	Competing companies collaborate on logistics operations to improve economic, environmental, and social performance of their supply chains.	<ul style="list-style-type: none"> • Environmental improvements and social contribution besides considerable improvements in logistics efficiency in economic terms, e.g. fill rate of trucks and reduction in total transportation. • Building strategic capabilities for organisations for being flexible in terms of inter-organisational collaboration, even with competing companies. 	<ul style="list-style-type: none"> • In both cases environmental sustainability (reducing emissions and total ton-kilometers of transport) is a key driver. In Case 2 social sustainability, i.e. making the Northern Irish products generally more competitive in the UK market, is also a sustainability-related driver. Therefore case 1 is on economic and environmental aspects. However, Case 2 covers all 3BL aspects – economic, environmental and social sides of sustainability – improved via co-opetition. 	<ul style="list-style-type: none"> • Sharing transportation resources, e.g. spaces on trucks, and also customers and supply chain knowledge. 	<ul style="list-style-type: none"> • Reducing total cost of logistics and supply chain management. • Improving branding via being known as socially responsible companies. • Improving profitability. • Gaining competitive capability of being able to engage in co-opetition, by having the experience of how to get engaged in this relationship and knowing about the measures and mechanisms to follow for successful engagement in co-opetition. They include setting clear boundaries, protecting sensitive information and working within anti-trust regulations.

it was clearly shown that the existence of strong business drivers – clear economic benefits from cooperation among competitors – is essential in the development of co-opetitive sustainability-based relationships. In case 1 (where environmental objectives were one of the main drivers of the relationship) and in case 2 (where the economic development of a region was the main reason for initiating the relationship) economic feasibility of co-opetition has been essential in motivating companies to join and to continue with the initiatives. For example, a respondent in Case 1 suggests that their aim was to achieve both sustainability and cost avoidance benefits:

Quote 1: There was common understanding between us and we could work together. The ultimate measure of efficiency is zero empty running.

This emphasises the necessity of having an economic driver besides sustainability objectives in SC operations, because companies involved in such initiatives will eventually need to see a clear economic benefit (Luo, Chen, and Wang 2016; Jalali et al. 2021). For example, in the case of logistics, such benefit can be improving the resource utilisation through increased fill rate of vehicles, reducing the price paid by companies for logistics, or reducing the number of transported vehicles. The competing companies will have support from their senior managers only in the presence of such a 3BL incentive.

Quote 2: We only do it because it makes good business sense... We gradually built the business case and the momentum. This overcame resistance.

In Case 1 despite the public focus on increased sustainability and carbon footprint reduction, it is only addressed when there is a simultaneous economic advantage from the co-opetition. In Case 2 transportation costs are inflated by the need to cross the Irish Sea, which led to a strong case for collaboration of several competitors. Other economic objectives also mentioned by respondents in both cases include cost reduction, better utilisation of resources, market consolidation, growth and improved customer service. The above observations led to proposition 1.

Proposition 1: Sustainability-driven co-opetition in supply chains can receive support from top management in companies if it leads to business advantages, in addition to environmental or social advantages.

4.3. Facilitators of co-opetition in supply chain for sustainability

Through the case studies, we have identified a number of facilitators of co-opetition for sustainability – the environmental conditions or characteristics of SCs and the operations of companies which make co-opetition take

place more easily or faster. These facilitators are discussed below.

4.3.1. Potential for coordination among operations of companies in their SCs

To create a strong business case which justifies co-opetition for sustainability, the degree of potential for coordination in SC operations of companies is key. For example, in Case 2 the haulers' customers are able to utilise the full capacity of their vehicles by load sharing. In Case 1 the similarities of resources (e.g. load units and trucks), operations and geographical areas of two companies facilitated the co-opetition. However, their system of equitable benefits distribution was described as a means of complying with anti-trust legislation rather than an operational capability. In Case 1 both companies faced the same market imperatives of congested road networks, inefficient utilisation of vehicles and sustainability challenges.

Quote 3: We operated with the same type of equipment and we operated in the same way in that we operate our own warehouses but have our own core fleet of vehicles and hire haulers. We have pallets of the same sort of dimensions. There were lots and lots of similarities between the two businesses, but clearly we were competitors.

The two companies in Case 1 had close geographical areas of logistics networks, comparable commercial approaches, the same load units and logistics equipment and had to comply with the same food regulations and standards. These similarities enabled the establishment of co-opetition arrangements. Therefore,

Proposition 2: Potential for synergetic supply chain operations of competing companies is a key facilitator for sustainability-driven co-opetition in supply chains.

4.3.2. The role of the third-party in initiating and facilitating co-opetition for sustainability

In both cases, the role of the third party was highlighted by the companies as a key facilitator for co-opetition. Catalyst organisations, such as government, not-for-profit organisations and trade associations, can create the environment for co-opetition to take place (see also Stadler and Van Wassenhove 2016). For example, in Case 1 a third-party facilitator mobilises support and cooperation by developing a common bond amongst the haulers through realisation that they share customers and routes. In Case 1 the first talks between the companies occurred at a business 'speed-dating' event organised by IGD, a respected UK trade association (IGD 2009a, 2009b). In Case 2, the project was sponsored and initiated by the CBI, a non-profit UK business organisation (CBI 2021)

and INI, the Economic Development Agency for Northern Ireland (INI 2019).

It became clear that there were concerns about barriers prohibiting many of the potential co-opetitions, such as incompatible products, volume flows or types of handling equipment.

Quote 4: We had a chat in one of the breaks and it soon became clear that those barriers didn't necessarily exist to the same degree between Nestlé and Pladis.

However, meetings facilitated by the third-party bridged the gap in understanding and reduced the perceived barriers of co-opetition. In Case 2, having access to a large pool of companies made available via the facilitating non-profit organisations (CBI and INI) could make larger the 'pie' to be shared between companies.

The not-for-profit orientations of third-party organisations bridged the gaps between competitors, neutralised the relationships and extended the agenda of competing companies beyond immediate economic benefits to social and environmental objectives (see Stadtler and Van Wassenhove 2016).

Proposition 3: Neutral third-party organisations, such as not-for-profit trustees or government bodies with no financial interests, can play a key role in facilitating sustainability-driven co-opetition in supply chains.

4.3.3. Attitudinal effects of collaboration with competitors

There is evidence that co-opetitive relationships in SCs are difficult both to initiate and sustain due to the cultural aversion of working with competitors. In Case 1, there was deep suspicion from both organisations initially, because of the 'psychological difficulties to overcome' among staff towards working with competitors. A commercial manager was overheard saying:

Quote 5: Why is our competitor's truck in our yard, is it lost?

but, Nestlé's senior manager stated:

Quote 6: Pladis' trailers are branded up with Jaffa Cakes and McVitie's, and they are brands of theirs, and yet they're collecting Kit Kat, which is one of their biggest competitors. But what we realised was actually, once the vehicle had actually gone off the site, nobody knew what was in it. It made no difference to anybody outside of our site how the vehicle was branded.

Powerful sponsors and much-determined promotion were necessary to overcome these attitudes.

Quote 7: In the early days our team understood what we were trying to do and took ownership of the relationship.

In both cases studies, these attitude barriers were overcome. What we found is that the role of senior managers with innovative mindsets is essential in providing the vision and drive to overcome traditional cultural resistance in selling the concept, in initiating co-opetition and in developing and sustaining the relationship in the long term. In both cases, this encouraged mutual trust and commitment.

Proposition 4: In order to overcome traditional cultural attitudes to competitors, sustainability-driven co-opetition in supply chains can be enabled by determined and innovative senior managers.

4.4. Building strategic capabilities through co-opetition

Besides the operational outcomes, engagement with co-opetition generates important strategic capability for companies – enabling them to achieve results they could not have achieved without cooperating with their competitors.

4.4.1. Coping with anti-trust regulations

Companies in both cases developed strong capabilities to work successfully within anti-trust regulations. For example, in Case 2, haulers arrange their own commercial relationships with third parties. In Case 1 two competing companies use market rates to avoid accusations of undercutting third party suppliers. Both companies maintain separate commercial arrangements with third-party logistics providers (3PLs) to demonstrate that there is no collusion. If the exchange can be interpreted by the competition authorities as collusion, then they will take immediate action.

Quote 8: There are no legal barriers to shared transport, especially as it reduces the carbon footprint. There would be if we were getting together to fix prices.

Proposition 5: Effectively engaging with sustainability-driven co-opetition in supply chains within anti-trust regulations can be an important capability for competing companies.

4.4.2. Capability of building a relationship with a competitor

This study identifies the new capability created for companies through sustainability-driven co-opetition, as an innovative form of inter-organisational collaboration. Competing companies obtain new capabilities which are made available only through cooperating with competitors (Dyer and Singh 1998). The long-term relationship based upon a slow build-up, strong cooperating model,

with simple but common objectives and mutual trust, enabled competing companies to develop capabilities for sustaining and enhancing co-opetition. Such capabilities are regarded as a source of competitive advantages by the companies. On an annual basis, the collaborative relationships make a significant reduction in environmental impact as well as financial savings for the companies by reducing empty trailer movements, fuel consumption and CO₂ emissions.

Quote 9: We respect each other as being innovative businesses. There are few players out there who collaborate with their competitors.

A Nestlé transport manager said:

Quote 10: We gradually built confidence in working together. We have realised that building relationships is an important capability for our young managers. We are encouraging them to become the operational conduits for conversations on new opportunities, in what we are currently doing and what we can do differently.

In Case 1, recent joint team building events have focused on looking for new opportunities.

Quote 11: The industry is now more open to collaboration. It is the right time to build. We are working with the retailers to align the booking of delivery times and are discussing a second initiative that could increase the value of our relationship.

The competing firms are very proud of their successful co-opetition.

Quote 12: [Nestlé-Pladis] won industry awards and allowed us to eliminate empty running and achieve our sustainability aims. ... We are very proud of our innovative cultures. Openness with our partner is a great help.

Individually, competitors deploy the capability to exploit opportunities with new partners in other areas, such as warehousing and scheduling.

Quote 13: Overall, this is worth circa £22 million per annum. ... We recently sold a division and have set up a similar collaborative relationship with them on transport as we have with Nestlé.

Generally, the empirical evidence supports the importance of co-opetition as a capability beyond immediate operational requirements, which enables competing firms to extend their operations and to achieve performance levels which could not be attained elsewhere. Therefore, the following proposition is developed.

Proposition 6: The ability to build, manage and sustain sustainability-driven co-opetition in supply chains represents a strategic capability that confers a competitive advantage for participating firms.

4.5. Barriers of co-opetition in supply chains for sustainability

There are a number of areas which prevent fast and successful implementation of co-opetition in SCs for sustainability, identified through our case studies.

4.5.1. No clear boundaries between collaboration and competition and lack of control for information sharing

In both cases, the interaction between companies is limited to a simple, transparent set of business processes and relationship rules, including a formulaic approach to benefit sharing that maintains the boundaries between competing and collaborating parts of the business. Moreover, in both cases boundaries of processes and information sharing are strictly maintained.

As stated by a respondent:

Quote 14: Should information about product pricing, launches and promotions at the retail level 'leak', then senior managers will certainly terminate the relationship.

Another example is that the trucks are loaded without the drivers being aware of the contents; they do not even have sight of the paperwork or access to the locked container.

Quote 15: We put various safeguards in place to make sure that if we are launching a new product that is in competition with Pladis, they would have no prior knowledge because the driver isn't involved in loading the vehicle. The vehicle is sealed when it leaves here and the driver isn't involved in unloading it, so there's no way for them to know that we're launching a new product or anything like that.

Without logical and clear boundaries drawn on what is to be shared and what is not, co-opetition can be a chaotic situation. Moreover, the prevention of unnecessary information leakage is called for by competitors, given the intense competition at the consumer end.

A Nestlé transport scheduler commented:

Quote 16: Our conversations at the operational level are constrained because we are competitors... We've addressed communications recently because it isn't where it should be. Perhaps we haven't kept up the effort and maybe we should do more.

The above observation led to the following propositions.

Proposition 7a: Clear and logical boundaries of cooperative and competitive parts of the supply chain operations are needed for successful co-opetition for sustainability.

Proposition 7b: Strategy and mechanisms should be in place to protect the confidential information of competing companies involved in co-opetition.

Figure 2 illustrates the theoretical framework of sustainability-driven co-opetition in SCs, linked with research propositions and four main elements of co-opetition development discussed in this paper, i.e. drivers of co-opetition, facilitators of co-opetition, capabilities created as a result of co-opetition and barriers of co-opetition.

5. Discussion

Based on the case study findings, successful co-opetition in SCs has the potential to enhance sustainable performance (economic, environmental and social) of competing firms. The findings provide much detailed information about the way co-opetition in SCs can lead to improved economic, environmental and social performance of competing firms simultaneously: for Case 1, reduced logistics cost and carbon footprint and for Case 2, reduced logistics cost, more competitive regional economy and lower emissions. This fills the gap in the recent literature concerning co-opetition, which evidences only single aspects of 3BL (e.g. Jalali et al. 2021; Trapp et al. 2020; Christ, Burritt, and Varsei 2017; Limoubpratum, Shee, and Ahsan 2015).

Economically, the improved efficiency of logistics operations shown in both case studies is in line with a number of previous research studies on co-opetition, which identified opportunities for more efficient use of logistics resources between competitors, such as the creation of load unit pooling systems (Kotzab and Teller 2003), cost reductions through more efficient inventory management (Bengtsson and Kock 2000; Zhang and Frazier 2011) and logistics market growth through reaching out to networks of partners (Song, Cheon, and Pire 2015; Shockley and Fetter 2015). Our study further emphasises the importance of a balance between economic and environmental and social advantages of co-opetition in SC operations which echoes a few recent studies (e.g. Christ, Burritt, and Varsei 2017; Trapp et al. 2020). Such a balance will not only maximise the gains from co-opetition but also justify the relationship to company managers, various stakeholders and regulators.

As stated in Proposition 1, we identified the importance of a strong business case (see also Quote 2) besides environmental or social advantages (Quote 1) as an incentive for companies to become involved in sustainability-driven co-opetition. This is in line with the literature which suggests that achieving economy of scale is regarded as an important reason why companies engage in co-opetition in SC operations (Kotzab and Teller 2003; Song, Cheon, and Pire 2015).

Proposition 2 emphasises the facilitators of sustainability-driven co-opetition in SCs including the potential

of synergetic SC operations, for example, by operating in the same geographical areas and using similar logistics equipment and vehicles (as stated in Quote 3). Such synergies of operations are important factors leading to decreasing empty hauling and better usage of storage spaces (Crujssen, Cools, and Dullaert 2007). This is in line with the extant co-opetition literature which highlights using standardised load units as an important enabler (Kotzab and Teller 2003), and the lack of common technology as a barrier against initiating and sustaining co-opetition between a group of companies (Cetindamar, Gatay, B., and Basmaci 2005).

Proposition 3 highlights the important role of neutral third-party organisations, such as government agencies and not-for-profit organisations in initiating and facilitating co-opetition in SCs. As stated in Quote 4, a business speed-dating event organised by the IGD had been the initial point of contact of the two managers from Nestlé and Pladis. Although the literature on co-opetition highlights the role of a mediator to facilitate the relationship, for example, a buyer of two suppliers, in creating co-opetition between them (Wilhelm, 2011), this paper further highlights the role of a neutral third-party (e.g. IGD in Case 1 and the Company C in Case 2). Thus, this paper supports the important role government agencies can play in initiating successful co-opetition and in leading to the improved sustainable performance of SCs on a large scale and even contributing to the development of the national economy by improving the overall logistics capacity, regional competitiveness, as well as social and environmental performance.

Although previous literature highlighted the importance of soft facilitating factors, such as interfirm trust (Peng, Yen, and Bourne 2018) and degree of friendliness versus hostility between competitors in co-opetition (Nasr, Kilgour, and Noori 2015), the role of senior managers and their attitude in creating and supporting co-opetition (as discussed in Case 1) has been largely omitted in the previous co-opetition literature. Our findings fill this gap, as Proposition 4 emphasises the role of senior managers in shaping and importing organisational culture, for example, openness toward collaboration especially with competitors (as shown in Quote 5 and Quote 6).

Proactive engagement with anti-trust regulations, as highlighted in Proposition 5, is very important to consider (see also Quote 8). Awareness of management about legal considerations when working with competitors is important as is advocated in the logistics literature (e.g. Song 2003). Co-opetition may go too far when cost reduction will lead to price fixing. Therefore, a clear mindset is needed on the boundary of co-opetition by collaborating at the right stage of the

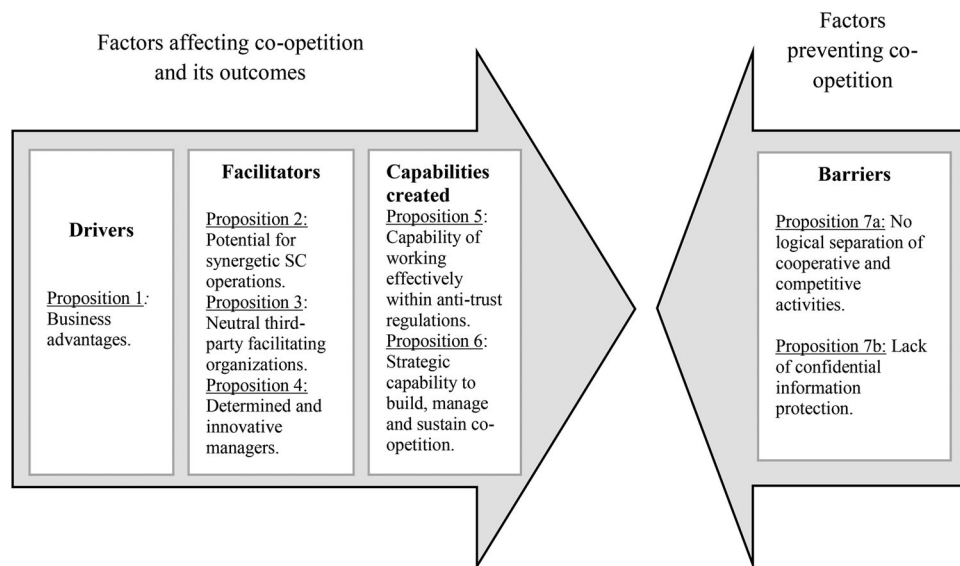


Figure 2. Theoretical framework of sustainability-driven co-opetition in supply chains.

value chain (see also Case 1 and Quote 14 and 16). Moreover, the active involvement of a neutral third party, especially government agencies, will be needed to avoid any potential breaches of anti-trust regulations in advance.

Proposition 6 emphasises the ability of companies to engage in co-opetition as a strategic capability, which can serve as a competitive advantage of participating companies (as highlighted in Quote 9). We found that the industry is getting increasingly open to collaboration at the logistic end (see Quote 11). Such openness has led to significant economic benefits for companies and they have improved their reputation as inclusive and environment-friendly companies (as shown in Case 1) – making them winners of industry awards (See Quote 12 and Quote 13). Our findings further evidence how companies could build such a capability, for example, by making their young managers ready for collaboration with competitors (Quote 10). Previous literature suggests that developing effective interfirm relationships is seen as a valuable capability (Dyer, Kale, and Singh 2001; Dyer and Singh 1998). Likewise, the capability of engaging in co-opetition not only enables firms to meet sustainability challenges, but also leads to competitive advantage for companies (c.f. Bouncken et al. 2015; Yilmaz, Rofcanin, and Gürbüz 2015). This paper thus provides evidence that successful co-opetition can turn out to be an important strategic capability, echoing previous studies of co-opetition which emphasised the potential for strategies capability but which lacked in-depth empirical study (e.g. Liu 2013; Bouncken et al. 2015; Peng, Yen, and Bourne 2018; Song and Lee 2012).

A number of recent studies explore co-opetition management through studying antecedents and supporting conditions (Pathak, Wu, and Johnston 2014), management mechanisms (Fernandez, Le Roy, and Chiambaretto 2018; Granata et al. 2018; Pellegrin-Boucher, Le Roy, and Gurau 2018) and conflict management (Fernandez and Chiambaretto 2016). However, in most of these studies, co-opetition is initiated for the purpose of economic benefits rather than 3BL. Instead, our study provides evidence from a 3BL perspective. Proposition 7a highlights those competitors willing to participate in co-opetition firstly need to define a clear boundary between areas of competition and collaboration to avoid potential conflicts and breach of anti-trust regulations (see Quote 16). This is in line with Peng and Bourne (2009) who suggest that compatible but different networks in terms of structures and resources have a higher potential for successful co-opetition. Moreover, as highlighted in proposition 7b, we found that not only logical and clear boundaries of cooperation and competition, but also effective strategy and mechanisms of information sharing should be in place to ensure successful sustainability-driven co-opetition in SCs. Lack of clear understanding of the relationship dynamics (Bengtsson et al., 2010) can result in a high risk of conflict of interests between companies (Bengtsson and Kock 2000, 2014). For this reason, an effective co-opetition coordination mechanism should be supported by clearly documented guidance (c.f., Pomponi, Fratocchi and, and Rossi Tafuri 2015). Moreover, an information protection mechanism is emphasised (as stated in Quote 14 and Quote 15) to avoid unnecessary knowledge spillovers

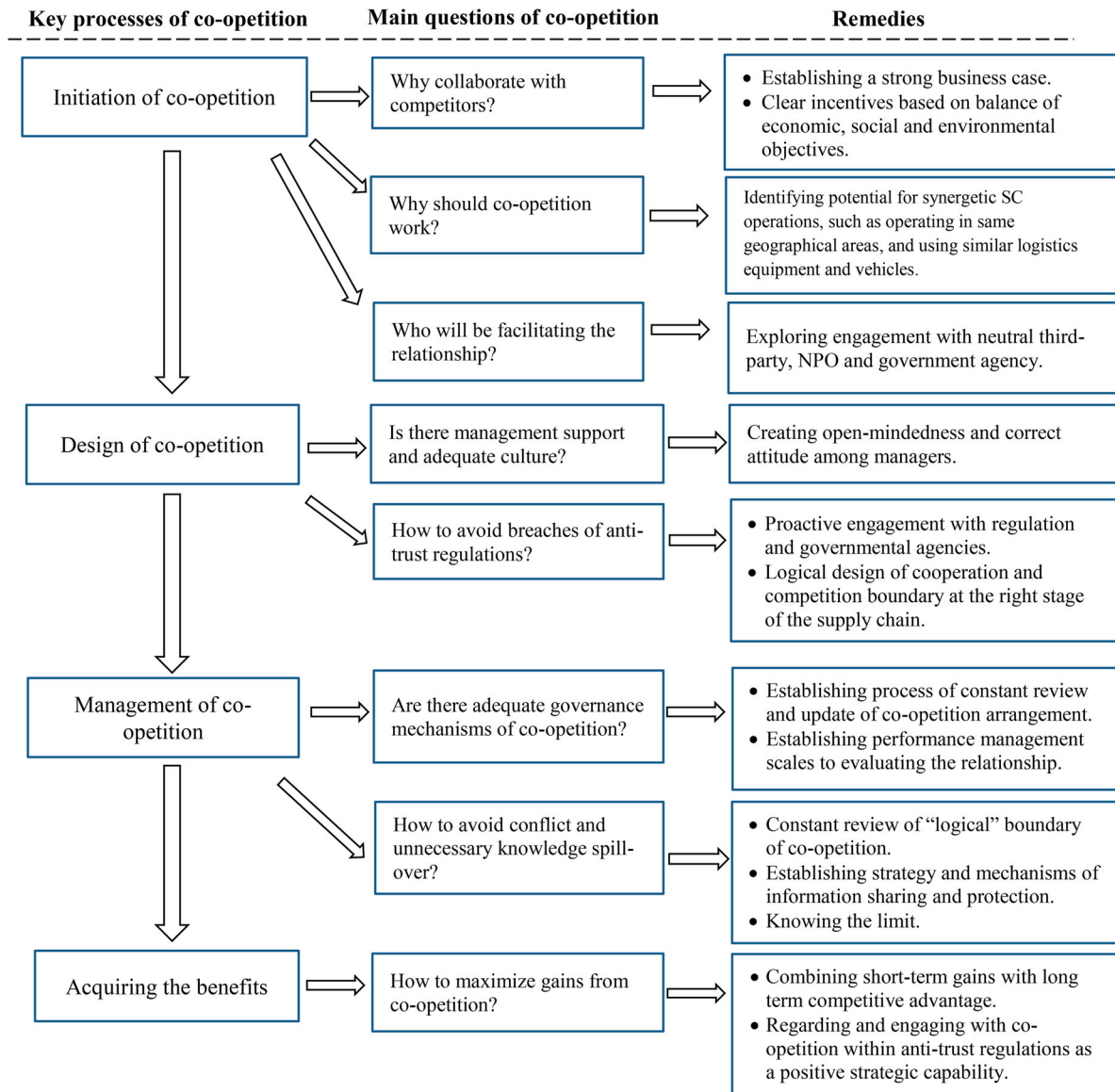


Figure 3. Management roadmap of sustainability-driven co-opetition in supply chains.

(c.f., Bouncken and Kraus 2013; Shockley and Fetter 2015).

Based on the empirical evidence and the above discussion of propositions, a road map for successful SC sustainability-driven co-opetition for practitioners is generated (see Figure 3). This road map depicts the key processes of co-opetition, major issues, and remedies and can serve as a heuristic decision model for practitioners who are willing to engage with sustainability-driven co-opetition in their companies' SCs.

6. Conclusion

This paper followed an exploratory multiple case studies approach to propose a theoretical framework depicting

sustainability-driven co-opetition in SCs. Empirically, this paper provides important evidence of companies engaging with co-opetition as an innovative type of inter-organisational relationship to meet 3BL objectives and to gain competitive advantage from it. This paper sheds light on the process of managing co-opetitive relationships and the way that co-opetition with both economic and social-environmental benefits can be initiated and managed around the SC operations of firms.

Theoretically, we acknowledge that previous research into co-opetition lacked clear underpinnings because of the infant nature of the field. We advocate that use of a single theory might not be able to explain the paradoxical relationship of co-opetition. Instead, a combined use of RBV and Network Theory is feasible and can provide

better explanations. In this vein, we have gained evidence on how sustainability-driven co-opetition in SCs can enable participating firms to develop rare capabilities to generate competitive advantage, and how important capital can lie in much wider networks of firms including competitors. In this way, co-opetition, which appears to be a paradoxical relationship, can turn out to be a competitive advantage for all parties involved.

Practically, we have developed a heuristic decision model to help practitioners to successfully engage with co-opetition. This model suggests that (1) the area of cooperation and competition should be logically separated, such that cooperative and competitive features of the relationship are balanced; (2) information sharing should be controlled and sensitive data should be protected by competing firms; (3) there should be mechanisms in place for such arrangements; (4) companies should proactively work with anti-trust regulations to avoid potential breaches.

The predominant finding also highlights important pre-conditions covering key processes of sustainability-driven co-opetition in SCs: (1) the presence of economic advantages resulting from sustainability initiatives; (2) the potential synergy of SC operations of competitors; (3) the positive facilitating role of neutral third-party organisations; (4) overcoming cultural and attitudinal barriers associated with working with competitors; (5) having the ability to work effectively within boundaries of anti-trust regulations; (6) establishing performance management scales and performing constant evaluation of the relationship; (7) having the ability to balance short-term and long-term gains and turn co-opetition into a strategic capability.

Due to the lack of previous substantive theory of sustainability-driven co-opetition in SCs, this study is exploratory in nature. It has limitations to be addressed by future studies. Firstly, this paper offered the opportunity for a combined use of RBV and Network Theory perspectives, which focuses on the competitive advantage and resources originating from co-opetitive relationships. However, this paper did not cover potential opportunistic behaviours during co-opetition. Future research could explore the existence of such behaviours by integrating game theory (von Neumann and Morgenstern 1994), which may shed light on the sources and nature of potential opportunistic behaviours in co-opetition, hence helping to understand the optimum strategic decisions to maximise gains through creating win-win situations.

Secondly, neither RBV nor Network theory are able to explain the dynamic process of competing firms forming strategic capabilities through co-opetition. Hence, DCV (Teece, Pisano, and Shuen 1997), which is rarely used in the co-opetition literature, can be used to

explore the process of firms engaging with sustainability-driven co-opetition in SCs in response to highly turbulent business environments and gaining essential capabilities.

Thirdly, the theoretical framework of this paper is rather simplified, as it aims to provide an initial guideline for sustainability-driven co-opetition in SCs. Future research can extend from our theoretical framework by integrating more sophisticated relational factors, such as goal congruence, information exchange norms and relationship harmony between competing firms (Jap and Anderson 2007), which will further enrich the understanding of the phenomenon.

Fourthly, due to the emerging nature of the phenomenon (i.e. sustainability-driven co-opetition) and the limited relevant cases in practice, this paper investigated two complementary cases of UK industry. Despite using a variety of data sources including interview, survey, focus group and documentation, which allowed for deep contextualised understanding of cases (Skake, 1995), a larger scale study in the future will be preferred. To achieve higher levels of generalisability, a cross-sectional study would be desirable to verify the theoretical framework and related propositions. Moreover, exploring more cases from a wider international context beyond the UK is also suggested for future studies. A comparative study of different countries can generate more comprehensive understanding of sustainability-driven co-opetition considering various economic and regulative conditions.

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Data availability statement

The dataset of this paper can be obtained by contacting the corresponding author Prof. Qile He.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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