The hidden side of sustainable operations and supply chain management: unanticipated outcomes, trade-offs and tensions

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Abstract

Purpose – The research is based on a critically analyzed literature review focused on the unanticipated outcomes, trade-offs and tensions of sustainable operations and supply chain management (OSCM), including the articles selected for this special issue.

Design/methodology/approach – The authors introduce the key concepts, issues and theoretical foundations of this special issue on "The hidden side of sustainable operations and supply chain management (OSCM): Unanticipated outcomes, trade-offs and tensions". The authors explore these issues within this context, and how they may hinder the authors' transition to more sustainable practices.

Findings – The authors present an overview of unanticipated outcomes, trade-offs, tensions and influencing factors from the literature, and identify how such problems may emerge. The model addresses these problems by highlighting the crucial effect of the underlying state of knowledge on sustainable OSCM decision-making.

Research limitations/implications – The authors limited the literature review to journals that ranked 2 and above as defined by the Chartered Association of Business Schools Academic Journal Guide. The main implication for research is a call to focus attention on unanticipated outcomes as a starting point rather than only an afterthought. For practitioners, good intentions such as sustainability initiatives need careful consideration for potential unanticipated outcomes.

Originality/value – The study provides the first critical review of unanticipated outcomes, trade-offs and tensions in the sustainable OSCM discourse. While the literature review (including papers in this special issue) significantly contributes toward describing these issues, it is still unclear how such problems emerge. The model developed in this paper addresses this gap by highlighting the crucial effect of the underlying state of knowledge concerned with sustainable OSCM decision-making.

Keywords Sustainable supply chain management, Unanticipated outcomes, Trade-offs, Tensions, Literature review, Sustainability

Paper type Research paper

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Introduction

This paper explores the unanticipated outcomes, trade-offs and tensions in sustainable operations and supply chain management (OSCM), and how they may hinder our transition to more sustainable practices. With the world facing severe grand challenges such as climate change, deforestation, biodiversity loss, inequality, famine, labor exploitation, modern slavery and more recently global pandemics (George *et al.*, 2016; Scherer and Voegtlin, 2020), consumers and other stakeholders increasingly expect firms to take responsibility for their actions. As a result, concepts such as corporate sustainability, the triple bottom line and corporate social responsibility (CSR) have become increasingly imperative in today's corporate environments, including those in the OSCM field (Hartmann and Moeller, 2014; Mena and Schoenherr, 2020).

As we discuss below, trade-offs and tensions tend to focus on economic criteria, rather than sustainability concerns, whereas unanticipated consequences that relate to unforeseen negative social and environmental factors are often underestimated. Although scholars and practitioners are aware that attempts to improve specific supply chain parameters will impact others, much less attention has been focused on how this affects sustainable OSCM. An implicit assumption is that the good intentions of adopting sustainable practices may come at a financial cost, but otherwise will inevitably lead to societal benefits. In practice, such good intentions may be undermined by highly complex interactions among the myriad of sustainability parameters, and thus difficult to identify (Matos and Hall, 2007; Reiner *et al.*, 2015; Carter *et al.*, 2020, Wontner *et al.*, 2020; Ye *et al.*, 2020). They may also be shaped by variances in ignorance and self-interest (Nath *et al.*, 2020; Silvestre *et al.*, 2020; Glover, 2020). Our key message is that unanticipated outcomes, trade-offs and tensions are inevitable, and thus should be ingrained in OSCM.

Given that supply chains have become globally omnipresent and by definition include many different actors, their analysis is critical for understanding the problems that they create, as well as how they can improve social and environmental conditions. Yet, despite the strong academic and professional recognition that infusing OSCM practice with sustainability is crucial (Meinlschmidt *et al.*, 2018; Cousins *et al.*, 2019; Zarei *et al.*, 2019; Meqdadi *et al.*, 2020), some scholars have acknowledged that real-world progress toward sustainability in OSCM has been modest (e.g. Pagell and Shevchenko, 2014; Shevchenko *et al.*, 2016; Gold and Schleper, 2017). We address this lack of progress by suggesting that unanticipated outcomes, trade-offs and tensions in sustainable OSCM initiatives are often overlooked, yet necessary for advancing sustainable development.

In what follows, we present an overview of unanticipated outcomes, trade-offs, tensions and influencing factors, followed by a selected literature review on how they are treated within the sustainable OSCM discourse. We then discuss the various processes and contexts that underline OSCM decisions, followed by a summary of the papers presented in this special issue. Drawing on these studies, we then propose a model that explains the antecedents of unanticipated outcomes. We conclude with a brief outlook for future research.

Unanticipated outcomes, trade-offs and tensions in sustainable OSCM

Although reasons for the lack of sustainability progress in OSCM are multifaceted, one explanation within the literature is that there are inherent incompatibilities among sustainable development parameters, which are often ignored when they should instead be approached as a research starting point (Margolis and Walsh, 2003; Norman and MacDonald, 2004; Hahn *et al.*, 2015; Van der Byl and Slawinski, 2015; Haffar and Searcy, 2017). Similarly, the dogmatic idea that improved environmental or social dimensions can be easily correlated with improved financial performance (i.e. the so-called business case/win–win solutions) is often oversimplified. Such perspectives rely on an instrumental logic that has largely

hindered OSCM scholars in embracing economic tensions and trade-offs linked to sustainability, thus impeding substantial improvements and adoption (Pagell and Shevchenko, 2014; Gold and Schleper, 2017). This is somewhat surprising, given that seminal organization theories (e.g. Simon, 1962) and OSCM researchers have known for some time that efforts to improve specific parameters (in this case economic, environmental or social) will impact others (Matos and Hall, 2007; Hall *et al.*, 2012; Reiner *et al.*, 2015). Consequently, rather than an aberration or exception, trade-offs are normal and expected, and thus should be managed.

An angle that has drawn even less attention within the sustainable OSCM literature is that strategies and actions sometimes have both expected effects as well as unanticipated outcomes, that is, unintended, unplanned or unforeseen consequences. Interestingly, nonsustainability OSCM research seems to have a more visible focus on such outcomes than sustainable OSCM studies. Since at least the examination of the bullwhip effect (Lee *et al.*, 1997), OSCM scholars have found unintended consequences in various contexts, such as purchase price variance (Emiliani *et al.*, 2005), the modeling of equilibrium disclosure and pricing strategies (Guan and Chen, 2015), revenue sharing in the mobile value chain (Choi, 2018), price pressure on suppliers (Schleper *et al.*, 2017; Carnovale *et al.*, 2019) or the monitoring of agents through IT (Scott *et al.*, 2020). Moreover, Jonsson and Holmström (2016) investigate (un)intended consequences from a broader conceptual perspective in their supply chain planning study and emphasize the need to present both evidence of intended outcomes (when things work as designed) and unintended ones (when they do not).

Anticipated negative outcomes have been extensively addressed in the supply chain risk management literature, although attempts to incorporate sustainability-related supply chain risks have been sparse (Foerstl *et al.*, 2010; Hofmann *et al.*, 2014; Miemczyk and Luzzini, 2019; Hajmohammad and Shevchenko, 2020). One exception is presented by Giannakis and Papadopoulos (2016), who identified unwanted, yet anticipated consequences of sustainable management practices. This could include greenhouse gas emissions, accidents and environmental damages during logistics and transportation, boycotts against a company's products, financial damages caused by environmental accidents, legal noncompliance or unethical behavior such as child/ labor, animal testing, price fixing, bribery allegations and patent infringements during financial crisis (Giannakis and Papadopoulos, 2016).

Concerns over unanticipated outcomes build on seminal work by sociologists and economists. For example, Merton's (1936) seminal paper on unanticipated outcomes of social purposive action, emphasizes that recognition of unintended consequences is a necessary first step when developing sound scientific analysis, allowing for structured treatment of such unintended outcomes. Stigler's (1975) theory of economic regulation specifically focuses on who gains and who loses (often unintentionally) from regulatory policy, which stems from the failure of considering the political-economic interactions of its processes. Williamson (1993) notes that demand for control, i.e. obsessive calculativeness, can have both anticipated effects and unanticipated dysfunctional consequences, which can only be mitigated once the unintended consequences are taken into consideration when modeling calculations. Here, we use the term *(un)anticipated* to account for both positive and negative environmental and social consequences, since not all intended outcomes are positive nor are all unintended negative.

Actions taken in response to the current coronavirus disease 2019 (COVID-19) pandemic offer a variety of negative and positive examples of unanticipated consequences, thus calling for more research (Sarkis, 2020, forthcoming). One widely discussed example relates to the effect of the pandemic on CO_2 emissions. Increased CO_2 emission is an example of expected, thus anticipated, negative impacts that has historically been necessary for industrial expansion and economic growth. In contrast, the COVID-19 lockdown led to unexpected positive opportunities to experiment with reduced emissions from traffic and manufacturing that can now be used to develop future pollution mitigation strategies (Le *et al.*, 2020).

Interestingly, although one would intuitively expect increased home working to reduce individual CO_2 footprints, research indicates that this is only a seasonal benefit. For example, UK employees working from home the entire year produce on average about 80% more CO_2 than those working in an office, where reduced emissions from transport are offset by increased emissions from heating (WSP, 2020). This is consistent with Giannakis and Papadopoulos (2016), who found that reducing economic activity does not necessarily decrease supply chain-related carbon emissions. Finally, recent research also finds severe negative unanticipated outcomes related to the pandemic and CO_2 emissions on the macrolevel as many countries invest into the fossil fuel economy to avoid devastating recessions as a consequence of the pandemic (Harvey, 2020). Unfortunately, this effect might eventually even outweigh all other positive unanticipated outcomes.

Another example of positive and negative unanticipated outcomes relates to the poaching and smuggling of illegal wildlife. Whereas the number of killed rhinos in South Africa decreased by 53% during international travel restrictions and lockdowns (AFP, 2020), the decline of ecotourism and the following loss of income led to a sharp increase in the poaching of lions, giraffes and even a silverback gorilla in Uganda (Maron, 2020).

The limited attention given to unanticipated outcomes might also be caused by OSCM scholars' implicit assumptions that transitioning from mostly economic criteria in decision-making to include environmental and social aspects will automatically and unambiguously reduce environmental impacts and improve social conditions. This may have been the case in early sustainable supply chain efforts, where "low hanging fruits" were readily available (Schmidt *et al.*, 2017), although Newton and Harte (1997) have criticized the business literature for overemphasizing the "easy wins" early-on. However, within more complex environments it is necessary to recognize that well-intended practices and strategies aiming at sustainable development do not guarantee positive outcomes and typically exacerbate trade-offs. For example, the COVID-19 pandemic significantly tested the resilience and sustainability conflicts of current OSCM systems by highlighting on the one hand the flexibility of supply chain management, and on the other how focal companies in developed countries were buffered at the expense of weaker upstream supply chain stakeholders in developing regions (Trautrims *et al.*, 2020). Yet, only few supply chain studies have explored the additional complication of integrating resilience and sustainability factors (e.g. Fahimnia and Jabbarzadeh, 2016; Zahiri *et al.*, 2017; Fahimnia *et al.*, 2018; Jabbarzadeh *et al.*, 2018). Ivanov (2018), for example, found that sustainability measures such as single sourcing and reducing storage facilities negatively impact supply chain recovery after disruptions.

Besides ongoing pleas that trade-offs and tensions within sustainability are theoretically resolvable (at least in the mid- and long-term), sustainability management research has started to acknowledging conceptual trade-offs in recent years on a more fundamental level (Hahn *et al.*, 2015). According to this "paradox view" on organizations (Hahn and Knight, 2019) and organizationally driven contributions toward sustainability (Hall *et al.*, 2018), tensions are to be resolved, accommodated or at least accepted on various dimensions. This can be, among others, between (1) social, environmental and economic aspects; (2) long- vs short-term perspectives; (3) intra- and inter-generational interests and (4) meso and macro agendas. Acknowledging and managing tensions is crucial for not getting stuck with overly timid measures that claim to meet all sustainability performance aspects at once (Varsei *et al.*, 2014). It is thus even more remarkable, that a discipline such as OSCM that has a long and strong tradition of debating and investigating trade-offs between core performance dimensions such as flexibility, costs, quality, delivery time, dependability, etc. (cf. for example Ferdows and De Meyer, 1990; Hallgren *et al.*, 2011; Vanpoucke *et al.*, 2014; Wurzer and Reiner, 2018), tended to largely overlook these tensions and trade-offs when it comes to sustainable OSCM.

Other examples of the paradox view include Evenson and Gollin's (2003), Hall *et al.*'s (2008) and Pingali's (2012) examination of "Green Revolution" technologies in agriculture, originally

pioneered by Nobel Peace Prize winner Norman Borlaug. They show that innovations vastly increased productivity but inadvertently increased environmental degradation and widened interregional social disparities in developing countries where, for example, farmers migrated to urban areas with low employment opportunities. In agricultural biotechnology, advocacy pressures targeting large agricultural biotechnology firms such as Monsanto resulted in high regulatory barriers, creating monopolistic tendencies that favored the large multinationals at the expense of smaller firms and public institutes attempting to develop more sustainable crops (Hall *et al.*, 2018).

By investigating the supply chain position as an overlooked contextual variable in research on the link between sustainable OSCM and performance, Schmidt *et al.* (2017) find that companies that are closer to end consumers show higher levels of sustainable OSCM engagement. More surprisingly however, the performance gains for companies tend to decrease with higher proximity toward end consumers, a phenomenon they call the "supply chain position paradox" and which has – among other results – recently been confirmed by Mena and Schoenherr (2020).

Similarly, in healthcare operations, the implementation of patient care information systems increased medical errors rather than to reduce their likelihood (Ash *et al.*, 2004). In international and regional policy, unanticipated consequences of voluntary labeling included higher food prices, worsening the position of women and displaced local production (Oosterveer *et al.*, 2014).

While the above literature review outlines the importance, key issues, influencing factors and definitional constructs of (un)anticipated trade-offs and tensions from sustainability, the next section provides a more systematic review of how these issues are treated within the OSCM discourse.

Sustainability OSCM research addressing trade-offs, tensions and unanticipated outcomes

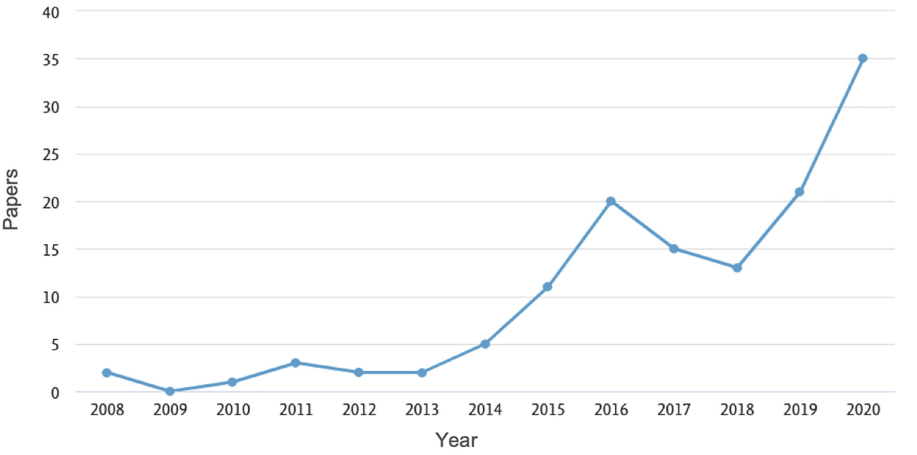
In order to better grasp the literature on unanticipated outcomes, trade-offs and tensions at the broader intersection of OSCM and sustainability/CSR, we conducted a literature review using Scopus, with the following search string on keywords, abstracts and titles of business and management publications published in English in peer-reviewed journals: ("supply chain*" OR "operations") AND ("sustainab*" OR "CSR" OR "responsibility" OR "green") AND ("tension" OR "trade-off*" OR "unintended" OR "unanticipated").

The initial search revealed a total of 274 papers. We then scanned through the abstracts and excluded all publications that were literature reviews or, and those that did not clearly focus on the abovementioned topics. We also excluded studies from journals ranked lower than "2" on the current Academic Journal Guide published by the Chartered Association of Business Schools, a comprehensive ranking scheme that includes 1,582 journals [1]. We did this mainly to increase the likelihood of more theoretical discussions of these concepts as usually required in higher ranked journals. This step left us with our final sample of 130 papers [2].

As can be seen in Figure 1, the first publications date back to 2008. After a period of six years, the publications started to increase significantly between 2014 and 2016, interrupted by a pullback in the years 2017 and 2018. Since then, publications on these topics re-emerged with 22 publications in 2019 and peaked with 35 in 2020 (to date).

Note that, prior to this special issue, very few publications have been published in top tier (ABS4 and 4*) OSCM journals, as well as adjacent fields, such as general management, strategic management, ethics/corporate governance and accounting (Table 1). The vast majority of papers have been published in *Journal of Cleaner Production* (50; ABS2), followed by *International Journal of Production Economics* (14; ABS3) and *International Journal of Operations and Production Management* (ABS4), four of which were published prior to this special issue.

However, after a more detailed analysis of the sample papers, it became clear that a wide range of papers mainly discuss the term "trade-off", but less so "tension" and very rarely "(un) anticipated outcomes" (Table 2).



Source(s): Scopus

Figure 1.
Published papers per year

Journal	# of publications	ABS journal ranking 2018
Academy of Management Journal	1	ABS 4*
Journal of Operations Management	1	ABS 4*
Int. Journal of Operations and Production Management	10[†]	ABS 4
Production and Operations Management	3	ABS 4
Int. Journal of Production Economics	14	ABS 3
Int. Journal of Production Research	7	ABS 3
Business Strategy and the Environment	6	ABS 3
Production Planning and Control	6	ABS 3
Transportation Research Part E	4	ABS 3
Journal of Supply Chain Management	4	ABS 3
Journal of Business Ethics	3	ABS 3
Supply Chain Management	2	ABS 3
Omega	2	ABS 3
Accounting, Auditing and Accountability	1	ABS 3
California Management Review	1	ABS 3
Corporate Governance	1	ABS 3
Decision Support Systems	1	ABS 3
Organization	1	ABS 3
Journal of Cleaner Production	50	ABS 2
Int. Journal of Phys. Distr. & Logistics Management	4	ABS 2
Journal of Business Logistics	2	ABS 2
Sustainability Accounting, Management and Policy	2	ABS 2
Journal of Service Management	1	ABS 2
Journal of Social Entrepreneurship	1	ABS 2
Journal of Strategic Marketing	1	ABS 2
Organization and Environment	1	ABS 2

Note(s): [†] The number includes the six papers published in this special issue

Table 1.
Published papers per ranked journal

Sustainability trade-offs

In general, trade-offs can be defined as situations in which one or more sustainability element(s) is/are chosen over one or more other sustainability elements at their expense (Fracarolli Nunes *et al.*, 2020). Trade-off and win–win studies often follow an instrumental

logic with the aim of stricter alignment between different dimensions or goals (Tuni *et al.*, 2020). Consequently, many studies typically investigate trade-offs within a single sustainability dimension, such as the trade-off between land use and CO_2 emissions (Niu *et al.*, 2020); between two different sustainability dimensions, such as financial vs environmental objectives (e.g. Darvish *et al.*, 2019; Eskandarpour *et al.*, 2019; Saunders *et al.*, 2020) or social and environmental aspects (Galeazzo and Klassen, 2015); between other key OSCM concepts such as supply chain resilience and supply chain sustainability (e.g. Ivanov, 2018; Fahimnia *et al.*, 2018), lean and green supply chains (Baumer-Cardoso *et al.*, 2020) or quality and environmental concerns (Li, 2013); or among all conflicting economic, environmental and social objectives altogether (e.g. Rabbani *et al.*, 2018; Martins *et al.*, 2019).

While these research streams have merit for the OSCM field, we rarely found the trade-off concept being further conceptualized or sources for these trade-offs to be examined within these publications, with notable exemptions (e.g. Dabhilkar *et al.*, 2016; Rodríguez *et al.*, 2016; Brennan and Tennant, 2018; Koster *et al.*, 2019; Longoni *et al.*, 2019). In this light, the aim of this special issue is to foster research that more actively engages with the challenges of unanticipated outcomes, tensions and trade-offs from a conceptual stance.

Sustainability tensions

Tensions may be conceived as the relationship between the two poles of a paradox, which appear incompatible and/or illogical when taken together (Wannags and Gold, 2020). Research under the term "tension" is usually quite heterogenous, and the concept is sometimes used as an umbrella for win–win, trade-off, integrative and paradox sustainability research (Van der Byl and Slawinski, 2015). This seems to be the reason why we have found the tension discourses more conceptually coined and explorative than the mere focus on trade-offs.

Examples of sustainability tensions research include Ndubisi *et al.* (2020), who studies conflicting stakeholder demands and various management mechanisms as sources for tensions in the context of closed-loop technology and blood metals. Focusing on multistakeholder initiatives, Boersma (2018) identifies tensions between the normative-ethical and political-strategic dimensions within these entities as well as tensions regarding the effectiveness of supply chain auditing, broadening labor rights to remediate child labor and the role of standards. Meqdadi *et al.* (2020) examine the potential tensions between social and commercial logics in social enterprises, finding that mitigation can be achieved through monitoring and development of individual relationships and through the structure of the network (e.g. NGOs and direct suppliers). In their study on CSR integration within a construction company's business strategy, Siltaloppi *et al.* (2020) find three types of tensions: (1) those between past understandings and future visions; (2) between competing decision-making rationales and (3) the tension of inconsistent behaviors.

Xiao *et al.* (2019) apply a paradox perspective on tensions in sustainable supply chain management within an emerging market context. They highlight that tensions are not problematic *per se*, but may become so depending on buyers' and suppliers' responses to them, where sustainability manager's contextualizing can alleviate such tensions (Xiao *et al.*, 2019). Consistent with previous research (Busse *et al.*, 2016), Golicic *et al.* (2020) underline the complexity and ambiguity of social sustainability and call for a common global and

Keyword	# Of publications
Trade-off	103
Tension	21
Unintended	10
Unanticipated	2

Table 2. Appearance of keywords among 130 papers

contextual definition of this concept. From a procurement perspective, Fayezi *et al.* (2018) illustrate procurement sustainability tensions on the company and supply chain level and provide an analysis of the manifestation of these tensions. More specifically, they identify different legitimacy contexts (temporal and spatial) surrounding the procurement function, and analyze the impact of institutional distance between these contexts of procurement and their salient stakeholders as sources for these tensions.

Unanticipated outcomes in the quest for sustainability

The vast majority of unanticipated outcomes identified in the literature relate to social and environmental issues. For example, Tencati *et al.* (2008) were among the first to shed light on unanticipated outcomes from CSR in their study on Vietnamese suppliers in global supply chains. They emphasize that bluntly imposing CSR on suppliers might have the adverse effect of triggering protectionism. CSR by Western companies should therefore be pursued through innovative partnerships and a demand-driven educational agenda. Arya and Mittendorf (2015) examine the wider consequences for supply chains when CSR subsidies are offered. They found that while encouraging socially beneficial CSR behavior, subsidies can also harm consumers in primary markets by inflating prices. Ugarte *et al.* (2016) found that while some lean logistics practices improve operational performance, they may unintentionally increase environmental impacts. The study by Tan *et al.* (2017) in China found that enforcing environmental regulations often exacerbated opportunistic behavior at the expense of other stakeholders. The study by Naumov *et al.* (2020) on automated vehicles found that carpooling initiatives could actually unintentionally result in making traffic congestion worse. Zarei *et al.* (2019) found that even humanitarian supply chains have unintended consequences, where for example detrimental environmental outcomes are often neglected.

Crop certification schemes have been regarded as a mechanism to ensure supply chain sustainability through for example increased small farmer technology adoption and improved market knowledge, resulting in higher and more reliable income for those able to comply (Scarlat and Dallemand, 2011). However, certification has also been known to cause a number of adverse unexpected effects including local food security issues, loss of land ownership and gender inequality (Oosterveer *et al.*, 2014; Schleifer and Sun, 2020).

By investigating tensions on individual, organizational and supply chain levels, Gruchmann *et al.* (2020) were able to explain why automation and ergonomic practices in warehouse logistics are not adequately implemented, despite health, safety and operational performance benefits. They found that tensions are primarily caused by increased cognitive requirements for these workplace innovations versus supply chain customer pressures based on price and flexibility. From an accounting perspective on supply chains, Gold and Heikkurinen (2018) argue that stakeholder calls for greater supply chain transparency do not lead to increased corporate responsibility and accountability, since they tend to spur corporate narratives of self-praise rather than increase supply chain sustainability. Such action would need to acknowledge and embrace the existence of organizational opaqueness and deal with the complexity, distance and resistance within international supply chains.

Within an emerging economy context, Esfahbodi *et al.* (2016) found a time dependence regarding the trade-off between the adoption of SSCM practices and improved cost performance. They explain that such tension can be minimized if firms take a long-term view on profit gains. Although the influence of poverty common within developing countries are often the focus of studies in crop certification, a recent review of the literature concluded that there is limited evidence linking certification and social-economic outcomes, and as a result they remain insufficiently understood (Schleifer and Sun, 2020). A key reason is attributed to the high dependence of local data on certification impact.

The next section outlines the papers included in this special issue, and specifically how they address some of the deficiencies outlined in this section.

Overview of papers in this special issue

This special issue brought together research on the underlying processes by which unanticipated outcomes, either positive or negative, may result from attempts at developing more sustainable OSCM. The selected papers illuminate how good intentions result in unanticipated outcomes, which may emerge through unexpected or hidden connections between stakeholders and issues at stake.

Drawing on an ethnographic study, Glover (2020) discusses supply chain relationship dynamics between supermarkets and farmers and illustrate that sustainability initiatives often favor one partner at the expense of another. SSCM may thus lead to negative unintended consequences, such as impacts on farmers' well-being and increased stress levels in the working environment. In contrast, supermarkets benefit from such initiatives as they help to consolidate their power over suppliers while improving environmental performance. The intriguing point here is whether such a negative outcome was in fact "unintended". As discussed above, decisions may be performed without awareness, and it is not always possible to presume that decisions involve a clear-cut purpose, or whether the actor refused to consider additional aspects to favor a particular interest or value. The study by Glover (2020) thus opens interesting venues for ethnographic research in SCM, the mechanisms involved in the decision to adopt sustainable SCM, and the integration of communities in which the supply chains operate.

The study developed by Ye *et al.* (2020) challenges the traditional assumption that certification processes assures better operations management performance. They examine whether good intentions, such as the adoption of ISO 14001, an international environmental management accreditation, help firms gain a win–win paradigm regarding environmental process improvement and a competitive advantage in the market. The results indicate that although ISO 14001 leads to lower financial risk, it may hinder sales growth, an unanticipated outcome. The latter is caused by the lock-in effect that ISO standards may exert on firms' practices, leading to a risk-aversive mind-set and by the high costs of accreditation processes, hindering deployable resources for market expansion. This unanticipated trade-off worsens over time, becoming particularly more severe among firms that adopt ISO 14001 early and operate in less-polluting industries. They thus suggest these mixed aspects of certification highlight the influence of timing and industrial contexts and recommend the wise use of such standard instruments.

Based on interviews with managers and owners of apparel subsuppliers and with institutional actors in Bangladesh, Nath *et al.* (2020) examine how developing country subsuppliers decouple the implementation of sustainable supply management practices through hybrid approaches involving both consensual and concealment strategies. Following a consensual strategy, subsuppliers communicate openly about their realities with institutional actors (e.g. buyers and first-tier suppliers) whom they trust; they agree mutually to not (fully) implement the sustainability standards. In contrast, concealment strategy means that subsuppliers hide noncompliant and/or unethical supply chain practices from institutional actors. The study finds that different conflicting institutional logics (i.e. instrumental logic, legitimacy logic complexity and gaps in normative logic) allow subsuppliers to decouple the implementation of sustainable practices. Nath *et al.* (2020) respond to the call for more empirical research on subsuppliers in a challenging developing country context, and refine our theoretical insights into subsuppliers' decoupling strategies as well as the underlying institutional frictions that facilitate these strategies.

Drawing on the institutional theory, business corruption and the sustainability standards literature, Silvestre *et al.* (2020) propose a typology of supply chain corruption practices. They suggest that if sustainable SCM practices are adopted symbolically and not substantively, unanticipated outcomes such as supply chain corruption may occur. They highlight that current economic/financial sustainability standards may lead to "social isomorphism for

corruption", enabled by low normative pressures (e.g. "nothing will happen if I do it"), high mimetic pressures (e.g. "everyone does it") and high coercive pressures (e.g. "if I don't do it, I will be excluded"). They conclude that corruption practices can be prevented if focal companies promote substantive, as opposed to symbolic, adoption of sustainability standards across their supply chains.

Carter *et al.* (2020) develop a typology of the unintended consequences of sustainable SCM initiatives and propose a conceptual model of the antecedents of these unintended consequences. The authors draw on paradox theory to identify multiple levels of stakeholders, performance dimensions, time horizons and the interplay with social construction as key antecedents of unintended consequences of sustainable SCM. They found that such antecedents demonstrate the need to focus research on interactions within and between social and environmental performance. In doing so, they contribute to the theorization, i.e. the why and the how, of unintended consequences within sustainable SCM. They also highlight that the resultant unintended consequences can provide an initial invaluable roadmap for managers to continue, discontinue or further consider a SSCM initiative.

The study by Wontner *et al.* (2020) explores the challenges of implementing a sustainable public procurement policy in the form of community benefits to ensure that public expenditures result in positive social and economic outcomes for the local community. Drawing on resource dependence theory, they found that while implementing community benefit policies improve economic and social outcomes, differing views between buyers and suppliers often creates tensions, while unintended consequences may result when one form of community benefits (CB) is promoted over another. They advance resource dependency theory by developing four constructs: powerful stakeholders; intra- and interorganizational issues; challenges and enablers, to better understand power and resource flows for more sustainable public procurement.

Table 3 provides an exemplary summary of sustainable OSCM literature on trade-offs, tensions and unanticipated outcomes. In the next section, we draw on these studies, as well as the sociology and behavioral science literatures to propose a model that paves the way of possible antecedents of (un)anticipated consequences in OSCM.

A model of the antecedents of (un)anticipated consequences in sustainable OSCM

A key issue related to the anticipation of consequence, is the state of knowledge in which actions are taken and analyses are made. In this section, we develop a model that explains four possible mechanisms through which different states of knowledge may lead to (un) anticipated outcomes (Figure 2).

Merton (1936) suggests that unanticipated outcomes may emerge due to ignorance, error or immediacy of interest, i.e. when the actor's preoccupation with the foreseen short-term consequences hinders consideration of long-term ones (Quadrant-I). Ignorance has been a common factor for explaining unanticipated outcomes and relates to limitations in foreseeing events related to novel and complex situations. Such situations could arise with the emergence of new technologies for which the impacts, particularly long-term ones, are largely unknown. Studies on artificial intelligence (AI) technologies in medical applications for example found that while some outcomes such as the loss of social rituals between patient and doctor could be anticipated, others such as how women and racial minorities were treated were missed (Hashimoto *et al.*, 2018; Verghese *et al.*, 2018). In the supply chain field, limited available information on relevant suppliers required regulatory frameworks or consumer acceptance, hindering the development of accurate consequence analysis (Matos and Hall, 2007).

Thematic category	Example(s)
Trade-offs between	
Land use vs CO_2 emissions reduction	Niu *et al.* (2020)
Financial vs environmental objectives	Darvish *et al.* (2019); Eskandarpour *et al.* (2019), Saunders *et al.* (2020)
Social vs environmental objectives	Galeazzo and Klassen (2015)
Supply chain resilience vs sustainability	Ivanov (2018), Fahimnia *et al.* (2018)
Lean vs green supply chain	Baumer-Cardoso *et al.* (2020)
Economic vs environmental vs social objectives altogether	Rabbani *et al.* (2018), Martins *et al.* (2019)
Product quality vs environmental concerns	Li (2013)
Tensions between	
Stakeholder demands and various management mechanisms	Ndubisi *et al.* (2020)
Normative-ethical and political-strategic dimensions Supply chain auditing effectiveness and labor rights	Boersma (2018)
Social and commercial logics in social enterprises	Meqdadi *et al.* (2020)
Past understandings and future visions	Siltaloppi *et al.* (2020)
Competing decision-making rationales Inconsistent behaviors in strategy	
Procurement sustainability tensions	Fayezi *et al.* (2018), Wontner *et al.* (2020)
Buyers' and suppliers' responses to tensions	Xiao *et al.* (2019)
Innovations' cognitive requirements and price and flexibility pressures	Gruchmann *et al.* (2020)
Unanticipated outcomes in the quest for sustainability	
Supply chain protectionism	Tencati *et al.* (2008)
Price inflation	Arya and Mittendorf (2015)
Unintentional environmental impacts	Ugarte *et al.* (2016), Zarei *et al.* (2019), Naumov *et al.* (2020)
Opportunistic behavior	Tan *et al.* (2017), Wontner *et al.* (2020)
Food security issues, loss of land ownership and gender inequality	Oosterveer *et al.* (2014), Schleifer and Sun (2020)
Corporate narratives of self-praise and/or exculpation	Gold and Heikkurinen (2018)
Coercion and corruption	Silvestre *et al.* (2020)
Environmental standards adoption hindering sales growth	Ye *et al.* (2020)
Impact of social well-being of suppliers	Glover (2020)

Table 3.
Examples of trade-offs, tensions and unanticipated outcomes from the literature

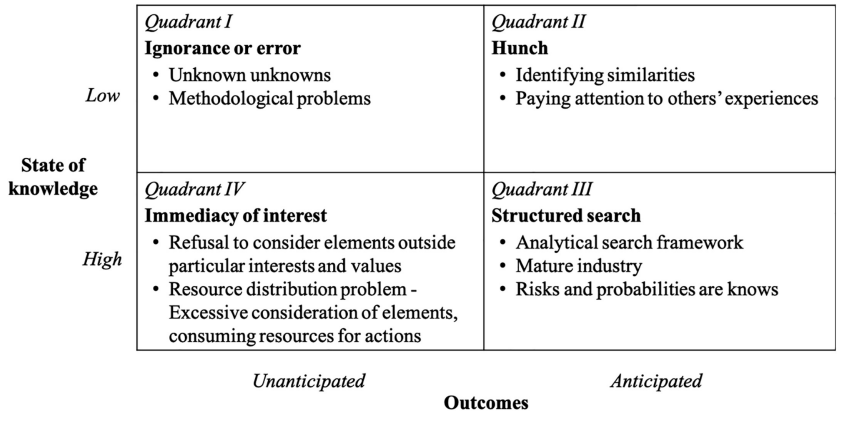


Figure 2.
State of knowledge and (un)anticipated consequences

Another major factor leading to unintended consequences is error, which Merton (1936) suggests arise from inappropriate assessment of the current situation, which in turn compromises appropriate selection and execution of action. Weak assessment of sustainability issues may be due to poor methodological approaches in identifying, collecting and analyzing relevant data, a problem that has been discussed in the OSCM literature (e.g. Lambert and Enz, 2017; Towers *et al.*, 2020). Criminal practices around supply chain management, such as modern slavery (Gold *et al.*, 2015; Benstead *et al.*, 2018), corruption (Silvestre *et al.*, 2020, this issue) or conflict minerals (Hofmann *et al.*, 2018) also pose strong challenges to the reliability and validity of data.

Of particular concern here is the difficulty in dealing with the complications of sustainability in supply chains. Given that sustainability involves a large number of social, environmental and economic factors (Varsei *et al.*, 2014), one problem is how many variables need to be taken into consideration to allow for the development of a robust study. This involves the difficult choice and justification of defining the study's scope, which for example could attempt to include all social, environmental and economic issues versus focusing on only some, determining the number of tiers within the supply chain that will be considered, and identifying which stakeholders are relevant. For example, some studies have focused supply chain analysis toward vertical multi-tier supply chain management (e.g. Tachizawa and Wong, 2014; Carter *et al.*, 2015; Meinlschmidt *et al.*, 2018; Villena, 2019), thereby neglecting potentially vast horizontal complexities that may arise on single supply chain tiers through the practice of (unauthorized) subcontracting (Caro *et al.*, 2020; Gold *et al.*, 2020). The study in this issue by Nath *et al.* (2020) shows an example of how unanticipated consequences can be identified by horizontally examining subsupplier relations.

In addition to the challenges in defining the right scope of analysis, a second and related difficulty is to ensure that the consequences are being attributed to the right actions, i.e. avoiding casual imputation (Saleh, 2009). Sustainability issues, with systemically intertwined social-economic and technical factors (cf. Kull *et al.*, 2013), thus call for holistic methodological approaches that include both inductive and deductive methods that complement each other (Eisenhardt *et al.*, 2016) as well as complementary modeling and simulation techniques. For example, while deductive approaches (often based on regression-based econometrics) can effectively identify what unanticipated outcomes are, inductive methods (often based on qualitative methods) can uncover the reasons why such consequences emerged, enabling actors to discern and perhaps take control of a relevant issue. The paper by Glover (2020) for example, used ethnographic observations to reveal why the implementation of sustainable SCM in the dairy industry may have negative effects. Modeling and simulation techniques based on empirical data, such as system dynamics or agent-based modeling, may help complementing findings from qualitative and quantitative empirical research through a distinct systems perspective that acknowledges for example a wide range of actors, temporal dynamics or nonlinear relationships between variables. Modeling techniques may thus facilitate refuting, corroborating, or refining findings or theory from empirical research through methodological triangulation (Gold *et al.*, 2020).

Simon (1962) defined limitations in knowledge that are imposed by complexity as bounded rationality, and as a result, decisions are often made, according to Knight (1921), on the bases of opinion and estimate instead of scientific knowledge (Quadrant-II). Thus, under limited access to information that restricts calculations or other possible ways of deduction, decisions may be made on the bases of "hunches" Merton (1936). This can involve, for example, analogical reasoning where in the absence of better data and adequate analytical tools, managers transfer previous knowledge from similar industry or other relevant characteristics to guide their decisions in the novel situation (Gavetti *et al.*, 2005). Such a "hunch" will then depend on managers' personal experiences or capability of identifying

similarities from paying attention to the experience of others. For example, the delays and controversy during the implementation of transgenic technology over the last 20 years, have provided clear evidence of the importance of considering consumer acceptance and supply chain integration issues during early stages of technology development in the agro-biotech industry (Hall *et al.*, 2014). Modeling techniques may help managers and other decision-makers to find a satisficing strategy right from the beginning, as it allows sensitivity analysis and "trial and error" within the model and thus prevents (time-consuming and costly) "trial and error" in the real world.

A contrasting and more favorable scenario, is the careful consideration for all pitfalls and challenges discussed above by adopting a "structured search approach" (Quadrant-III), which features known scopes of data collection and analysis, leading to high knowledge levels and thus a satisfactory anticipation of consequences. Previous studies have applied the complex adaptive systems paradigm to OSCM that considers complexity between agents, environments and emergent system properties spanning both micro- and macro levels (e.g. Koh *et al.*, 2017; Nair and Reed-Tsochas, 2019). Others have applied Simon's (1962) concept of complexity theory in supply chains (e.g. Choi *et al.*, 2001) and sustainability management (e.g. Matos and Hall, 2007). The latter study proposes an analytical framework to help practitioners to identify both obvious and not-so-obvious interactions, where parameters and uncertainties are identified and assessed by searching for interdependences, essentially turning uncertainties into probabilistic risks. Once this is achieved, satisfactory solutions can be identified. In this special issue, Ye *et al.* (2020) show that a proper analysis can reveal negative outcomes of practices usually assumed to bring positive sustainability outcomes, such as an organization's certification with ISO 14001. Also in this special issue, Wontner *et al.* (2020) suggest that ensuring supplier–buyer communication at early contract stages increases coordination, which avoids unanticipated consequences of sustainable public procurement policies.

Another possible scenario of high state of knowledge leading to anticipated outcomes may include gambling, where risks and probabilities are known, as well as mature industry sectors such as oil and gas, with well-established science, supply chain infrastructure and knowledge about its environmental impact. The recent example of COVID-19 has shown that these states of high knowledge regarding scope of data search and analysis are still islands in a sea of uncertainty that can be quickly flooded by unforeseen events that require adaptations toward a not (yet) known new state of "normal".

High knowledge can also lead to unanticipated consequences when, for example, an actor purposively refuses to consider certain elements but instead focuses on a particular interest or value, i.e. Merton's immediacy of interest (Quadrant-IV). These are cases of "stakeholder ambiguity", a term coined by Hall and Vredenburg (2003), where it is difficult to identify the elements at stake and/or why stakeholders may oppose them. As a result, decision-making heuristics based on scientific evidence thus might not work. For example, in this special issue, Silvestre *et al.* (2020) show that some sustainable SCM practices may have a hidden and symbolic rather than an explicit and sustainability improvement intent. Anticipated outcomes, however, may seem positive and desirable to certain actors, although they may seem negative to others. According to Merton (1936), such controversy is true even in situations where the intended result is "the lesser of two evils" (p. 895). For example, one may argue that in the case of sustainable SCM, improving at least one of the environmental or the social dimensions of sustainability is better than if neither were attempted. Lastly, a high state of knowledge may also result in unanticipated outcomes when too much effort and resources are devoted to collect information, increasing the level of complexity to such high levels that little time and energy is left to reach a conclusion. This may be due to a preoccupation with implementing an activity (i.e. "ticking all the right boxes"), rather than focusing on the actual benefits that the initiative may bring.

As per their nature, trade-offs have to remain below optimal solutions, leaving a wide spectrum for tensions and unanticipated/unintended consequences and effects of managerial decision-making and policy implementation. More specifically, it means that both theory and practice should acknowledge that the *a priori* postulated link between addressing sustainable OSCM concerns and an overall positive societal and environmental (let alone economic) contribution might be decoupled, or at least severely delayed. Furthermore, even when the decision of implementing sustainable OSCM is based on the best intentions, ultimately the consequences of such decision will depend on the interplay of a number of different variables and players, or as referred by Knight (1921), the conditions of action under uncertainty. Consequently, much more attention in OSCM research needs to focus on the unintended consequences of good intentions toward sustainable OSCM.

While this special issue attempted to address some of the concerns outlined in this paper, there are still a number of areas of investigation that warrant attention, as summarized in Table 4. This includes some suggestions on how methodological approaches can be

Research category	Specific areas for future research
Methodological issues	(1) Need to consider greater complexity, especially with not-so-obvious interactions among actor groups, and/or among economic, environmental and social parameters
	(2) Need for better triangulation/data verification, control over social desirability bias and attention to causal imputation
	(3) For relatively short-term trade-offs and tensions, there are established methods (e.g. inductive research, system dynamics, agent-based modeling, etc.), which can be applied within a sustainability context
	(4) For longer term unanticipated outcomes, there are relatively less established methods within OSCM literature, calling for the development of novel methods that build on longitudinal and/or ethnographic studies, sustainability transitions approaches, etc.
Contextual factors	(1) Emerging vs developed countries
	(2) Varying sustainability capabilities among organizations
	(3) Horizontal complexity on each supply chain stage
	(4) Supply chain position
	(5) Conflicting stakeholder demands (ambiguity)
	(6) Regulatory factors, governance structures and institutional environments
	(7) Organizational and decision processes
	(8) Individual behavior
Contemporary examples that may trigger unanticipated outcomes	(1) Pandemics and other global disasters that challenge the resilience of highly efficient but perhaps vulnerable lean supply chains, power balances and national and regional economic stability
	(2) The impact of climate change and sustainability risks, and how they may impact logistics, international supply chains, fair trade, social inclusion, etc.
	(3) Geo-political shifts that may foster or hinder globalization and trade (e.g. Trumpism vs Bidenism, US–Chinese trade war, Brexit, etc.)
	(4) The impact of emerging technologies and OSCM concepts, such as reverse logistics, resilience, sustainability decision processes, Industry 4.0, digitalization, artificial intelligence, blockchain and other distributed ledger technologies, smart contracting, 3D printing, etc.

Table 4.
Future research directions

improved, as well as contextual factors that shape (or are shaped) by some contemporary examples that may trigger unanticipated outcomes. For example, research is needed on OSCM issues related to unanticipated outcomes and potential ripple effects of technological innovation. Another underexplored issue is the displacement of harmful activities from one organization only to be adopted by another, which may have lower sustainability capabilities or operate under governance structures with weaker institutions. In addition, the recent COVID-19 pandemic has raised significant supply chain issues that need to be examined. For example, what issues have been exposed by the pandemic on the (un)sustainable side effects of popular OSCM concepts, such as reverse logistics, just-in-time and lean manufacturing? Did sustainable OSCM initiatives get thrown out to make room for other priorities?

On a more positive note, we also need to consider approaches that improve various sustainability goals, perhaps in other sectors, industrial applications and/or markets that exceed what was originally intended. This also includes findings on intangible by-products, such as knowledge accumulation from learning, resilience and self-organizing experiences that can have a positive impact toward sustainable OSCM.

Conclusion

The purpose of this paper and special issue was to explore the (un)anticipated outcomes, trade-offs and tensions in sustainable OSCM in an attempt to improve our capabilities to transition toward more sustainable practices and societies. In general, the literature suggests that trade-offs and tensions tend to focus on economic criteria, rather than sustainability concerns, whereas the much less researched area of unanticipated consequences often relate to unforeseen negative social and environmental factors. Thus, although scholars have known for some time that attempts to improve specific supply chain parameters will impact others, much less attention has been focused on how this affects sustainable OSCM. Rather than treating (un)anticipated outcomes, trade-offs and tensions as aberrations or exceptions, they should be seen as inevitable, and thus managed.

Although coming from different directions, the empirical and theoretical work of the selected papers for this special issue point out that unintended outcomes may arise when relevant interactions are disregarded. Overall, these studies indicate the reasons why they may vary between ignorance and self-interest (Nath *et al.*, 2020; Silvestre *et al.*, 2020; Glover, 2020) or, due to complexity, these interactions may be difficult to identify (Carter *et al.*, 2020; Wontner *et al.*, 2020; Ye *et al.*, 2020). While these studies significantly contribute to describing the phenomena of trade-offs and unintended issues, it is still not clear how such problems emerge. The model developed in this paper aimed at paving the way to address this gap by highlighting the crucial effect of the underlying state of knowledge on sustainable OSCM decision-making.

Notes

1. https://charteredabs.org/academic-journal-guide-2018/
2. A full list of these papers is available from the authors upon request.

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