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Wildlife trafficking as a societal supply chain risk: Removing the parasite without damaging the host?

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Abstract

Humanity's intrusion into nature—with the objective of selling animals and plants as medicine, food, and tourist attractions—is detrimental not only to biodiversity and the health of ecosystems but also to local communities, global society, and human health. Often, traffickers exploit legal supply chains to secretly move endangered species and protected wildlife to end consumers. Serendipitous discoveries of wildlife trafficking attempts raise concerns that existing efforts to prevent wildlife trafficking and other criminal exploitation of legal supply chains brought about by international laws, regulations, and voluntary initiatives may often fail. Indeed, most supply chains are designed for economic purposes such as efficiency or responsiveness rather than security. Scholarship in supply chain management has thus far dedicated scarce attention to the overarching phenomenon of illegal exploitation of otherwise legal supply chains, referred to as “supply chain infiltration.” Because we were unable to speak with perpetrators directly, we obtained insights from expert stakeholders in order to study the delicate and covert topic of what makes supply chains vulnerable to wildlife trafficking, as well as how this vulnerability can be mitigated. Our data set comprises 37 semi-structured interviews with knowledgeable stakeholders concerning wildlife trafficking, specifically in maritime supply chains. This research develops a model that explains supply-chain-related vulnerabilities to wildlife trafficking and elaborates regarding how respective actors can contribute in addressing this understudied issue. We introduce the concept of “societal supply chain risk” to refer to hazards that emanate from or materialize within supply chains, which primarily affect actors in the supply chain context—and possibly even humanity in its entirety. Our research calls for more supply chain research, exploring situations in which individual firms may not be affected but can contribute to the solution.

KEYWORDS

biodiversity, criminal supply chain, regulation, social sustainability, supply chain infiltration, supply chain risk, sustainable supply chain management, wildlife trafficking

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INTRODUCTION

Supply chain management (SCM) research has addressed a plethora of sustainability issues in recent decades (Carter & Jennings, 2004; Tate et al., 2011), with environmental issues among the most commonly explored in the literature (Beske & Seuring, 2014; Carter & Easton, 2011; Quarshie et al., 2016). Whereas carbon emissions, as well as reductions in waste and pollution, have been frequently studied (Ashby et al., 2012; Ghadge et al., 2020), other environmental concerns—such as biodiversity reduction, deforestation, and land conversation—have received less attention in this research field to date (Quarshie et al., 2016, 2018; Schaltegger et al., 2022). This is surprising, as species extinction and biodiversity loss are likely to accelerate climate change and threaten local communities, food security, and human health (Panwar et al., 2022).

One of the main contributors to biodiversity loss is wildlife trafficking (WLT) (Secretariat of the Convention on Biological Diversity, 2020; United Nations Office on Drugs and Crime [UNODC], 2020), which is commonly understood as the illegal poaching and smuggling of endangered and protected wildlife species and plants, as well as products derived from them (South & Wyatt, 2011). WLT represents one of the five most lucrative crimes in the world (United for Wildlife [UFW], 2022) and generates up to 23 billion USD annually (World Bank, 2019). Over the past two decades, nearly 180,000 wildlife seizure incidents in 149 countries and territories were reported (UNODC, 2020), and more than 1000 rangers died in Africa alone over the last decade while protecting wildlife (UNODC, 2019). WLT threatens endangered species populations around the globe, with more than 8775 species now at risk of extinction (Scheffers et al., 2019). In addition to species extinction, WLT and intrusion into biodiversity increase the likelihood of zoonotic transmission to humans, thereby enhancing the risk of pandemics (Lawler et al., 2021; UNODC, 2020). However, to date, research on WLT has been neglected in SCM scholarship. Given its practical relevance, we seek to complement the discourse on sustainable SCM with insights into WLT in global supply chains.

The entire illegal WLT trade chain, from poacher to end consumer, typically includes poaching, further occasional processing into a product, trafficking, and selling. For example, most illegally trafficked ivory or rhino horn comes from illegally poached animals in South Africa and is then sold to traders, who typically engage intermediaries to forward the products to the African continent. Further downstream, internationally connected groups traffic these shipments to destination markets, such as

Asia, where the final products are sold to end consumers by wholesale and retail traders (UNODC, 2020).

Most of the aforementioned activities do not lie within the core scope of the SCM discipline and are of greater interest to criminologists and law enforcement agencies. However, the trafficking of wildlife (products) often includes the exploitation of otherwise legal supply chains—the same supply chains that SCM scholarship is by definition concerned with. To better capture this phenomenon, we adopt the notion of “supply chain infiltration” (SCI) as the illegal exploitation of otherwise legal supply chains (D’Amato & Papadimitriou, 2013, p. 988). SCI poses a problem to global supply chains, which are designed for efficiency or responsiveness (Fisher, 1997; Gunasekaran et al., 2004; New, 2010; Sahay, 2003) rather than security. For example, recently, Malaysian authorities seized a container of African elephant tusks, pangolin scales, and other animal skulls and bones hidden behind sawn timber with an estimated contraband worth of 18 million USD (The Independent, 2022). Because a large share of WLT via SCI occurs in maritime supply chains, where containerization helps to keep the contraband hidden (Fears, 2014; TRAFFIC, 2020), our research investigates WLT in a maritime context.

Whenever criminals infiltrate legal supply chains for WLT purposes, the respective supply chain members (i.e., suppliers, buyers, and final customers), as well as supporting supply chain entities (Carter et al., 2015) (i.e., monitoring agencies, carriers, and terminal operators), become affected stakeholders (Freeman, 1984). The perspectives of these various stakeholders surrounding WLT and the role SCM can play in tackling this issue have been widely neglected in the operations and SCM literature, although prior reports have frequently highlighted the importance of involving private actors in the mitigation of WLT (International Maritime Organization [IMO], 2022; Wannewetsch, 2020; Zavagli, 2021). To overcome the disconnect between a previously overlooked sustainability problem and existing SCM research, more detailed knowledge is required to better understand how legal supply chains are exploited, as well as how supply chain members can contribute to tackle this understudied issue (Quarshie et al., 2016).

Consequently, this research strives to generate insights regarding the intersection of SCM and WLT. Specifically, we explore the following two questions: *Why and how are legal supply chains vulnerable to WLT?* and *How can these vulnerabilities be mitigated?* We support the perspective that SCM scholarship can contribute a relevant share to the protection of biodiversity (Schaltegger et al., 2022) by scrutinizing WLT and SCI and laying the groundwork for effective countermeasures.

To answer the research questions, we apply an inductive theory-building approach (Corbin & Strauss, 2014), which relies on empirical evidence derived from 37 semi-structured interviews with knowledgeable stakeholders linked to maritime operations and supply chains, WLT, law enforcement authorities and criminologists, and non-governmental organizations (NGOs). The data analysis follows the Gioia method to inductively develop theory from the qualitative data (e.g., Corley & Gioia, 2004; Gioia et al., 2013).

The findings from this research contribute in a three-fold manner to extant scholarship in SCM. First, we provide a partial explanation of why WLT persists in legal supply chains despite long-lasting regulatory efforts to tackle this problem. Our WLT-specific findings reveal an inherent tension between the economic continuity perspective of supply chain members and societal urgency for intervention. Although the controversy over “traditional” supply chain priorities—specifically, efficiency—and sustainability issues has been widely discussed in the sustainable SCM literature, the unintended consequence of congruence among supply chain members and criminals adds a new perspective to this debate (Matos et al., 2020). Our findings illustrate that criminals and supply chain members are aligned in their continuity focus; that is, they share the intention to not disrupt the material flow in supply chains. Consequently, supply chain vulnerabilities have not been adequately mitigated to date. On the other hand, a societal urgency to intervene exists, given WLT’s detrimental repercussions, such as biodiversity loss, economic harm, and threats to global health.

Second, and linked to the above, we build on, challenge, and extend the supply chain risk management (SCRM) literature by advocating for a general opening up of scholarship in SCM to address societal-level risks. SCRM’s predominantly firm-centric orientation falls short in capturing our findings. This research indicates that past WLT infiltration incidents are not risky for supply chain members and their associated supply chains, but they have far-reaching implications for society. Although they are not directly involved in the economic activities of supply chains, all societal stakeholders can legitimately expect that their interests and concerns will be considered and adequately addressed by supply chain members. We therefore call for a more active contribution designed to address and take responsibility for issues in which the negative effects are not specifically and directly to the detriment of individual firms and their supply chains but may in fact contribute to the solution.

Third, we extend the SCI literature by empirically elaborating on WLT as an example of SCI. To date, the SCM literature has primarily investigated undesirable or

illegal activities in supply chains, but apart from some noteworthy exceptions (D’Amato et al., 2019; D’Amato & Papadimitriou, 2013), a systematic introduction of the topic is still lacking in the SCM discourse. Moreover, SCI has foremost been discussed in counterfeiting contexts (e.g., Ghamat et al., 2021; Yi et al., 2020) and has not yet been linked to WLT.

Moreover, this research provides practical relevance by clearly articulating recommendations for supply chain members to mitigate WLT. Additionally, the findings identify WLT-related countermeasures that contribute to the mitigation of WLT and allow for the continuity of material flows in global supply chains.

The next section provides the conceptual background for this research by elaborating on the WLT phenomenon. Thereafter, the methodology is summarized, including the choice of research design and descriptions of the data collection and applied coding procedures. Subsequently, we delineate our findings on WLT and the exploitation of legal supply chains before proceeding to a discussion of theoretical contributions and societal implications, as well as limitations and opportunities for future research. The paper concludes with a succinct summary.

WILDLIFE TRAFFICKING

WLT represents an environmental crime that entails “the illegal trade, smuggling, poaching, capture, or collection of endangered species, protected wildlife (including animals or plants that are subject to harvest quotas and regulated by permits), derivatives, or products thereof” (South & Wyatt, 2011, p. 546). The trafficking of animals typically involves poachers, runners or brokers, intermediaries, exporters, importers/wholesalers, and retail traders (Basu, 2014; Milliken & Shaw, 2012; UNODC, 2020). Each year, millions of caught wild animals and harvested plants are traded and sold as commodities, pets, food, medicine, and tourist attractions (van Uhm, 2018; WWF & Dalberg, 2012), generating between 7 and 23 billion USD annually, with high profit margins (World Bank, 2019). Although trade routes are generally product specific, seizure data indicate that criminals are primarily trafficking plants and animals from developing countries in the Global South, typically African and Asian countries, to supply countries mainly located in the Global North and Asia (Andersson et al., 2021; United Nations Environment Programme-World Conservation Monitoring Centre [UNEP-WCMC], 2021; van Uhm et al., 2019). Apart from being the final sales market, various destinations also serve as processing hubs, for example, the European Union (EU) by forwarding rosewood timber to Asian

countries (Arroyo-Quiroz & Wyatt, 2019; European Commission, 2022a; Halbwx, 2020).

There is a broad consensus that WLT is a widespread problem, with serious repercussions in several areas (European Commission, 2022b; U.S. Department of State, 2021). The most obvious negative impact of WLT refers to the extinction of species and the attendant biodiversity loss (Agu & Gore, 2020; Lavorgna, 2014; UNODC, 2020; Wyatt, 2016), which is illustrated, for example, by the significant reduction in elephant populations in Africa due to the global demand for ivory (Blanc et al., 2003). Whereas these phenomena generally have rather mediated, long-term effects on mankind, recently, more direct, short-term threats to societies and human health have become evident (Agu & Gore, 2020; Lavorgna, 2014; UNODC, 2020; Wyatt, 2016). Emerging infectious diseases are largely of zoonotic origin, and more than 70% of these emanate from wildlife. It is estimated that excessive intrusion into biodiversity creates two to four viruses every year, any of which could turn into a pandemic (Jones et al., 2008; United Nations Environment Programme [UNEP] & International Livestock Research Institute, 2020; Zavagli, 2021).

For these reasons, WLT and countermeasures have been on the international community's agenda for quite some time. Beginning with the "Convention Relative to the Preservation of Fauna and Flora in their Natural State" (also known as the London Convention of 1933), several regulatory approaches have been launched to address WLT over the last several decades. Among these, the most important include the "Convention on International Trade in Endangered Species of Fauna and Flora" (CITES) in 1975, and regional initiatives such as the EU-promoted "Approach to Combat Wildlife Trafficking" (European Commission, 2017) and the UK's "London Declaration on Wildlife Trade" (2014). Furthermore, the 15th Sustainable Development Goal explicitly seeks to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (United Nations Economic and Social Council [UNESCO], 2017, p. 15). By signing up to CITES, 95% of all countries in the world agreed upon the illegality of trading 36,000 protected species and related products (Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection [BMUV], 2022; UNODC, 2020). However, country-specific legislation may still permit the legal consumption and trade of certain wildlife species or products. For example, bear bile can be obtained from legal farms for medical purposes in China (Oxford Martin School, 2020). In addition, recent reports have assailed sanctions, such as the leveling of fines and prison

sentences, which vary widely and do not always reflect the seriousness of WLT crimes (Alacs & Georges, 2008; Eurojust, 2014; European Commission, 2016; Maher & Sollund, 2016; Sollund & Maher, 2015).

Despite the aforementioned legal and collaborative efforts, recent reports of leopard hunts in Pakistan (Baloch, 2022), tortoise smuggling in Malaysia (BBC, 2019a), and the trafficking of rhino horn and ivory between east Asia and Europe (Tovey, 2022; Willsher & Carroll, 2021) question the effectiveness of measures in place to tackle WLT on a global scale. In view of the apparent societal consensus regarding the negative effects of WLT, this research seeks to better understand the reasons behind the persistence of WLT and the role SCM can play in its mitigation.

Complex sustainability issues—including modern slavery (Gold et al., 2015), conflict minerals (Hofmann et al., 2018), and deforestation (Lambin et al., 2018)—are often linked to supply chains and involve various stakeholders. Consequently, it is generally assumed that the mitigation of these issues requires holistic approaches and the inclusion of these stakeholders (Alexander et al., 2022; Bridoux & Stoelhorst, 2022). For example, in the case of child labor in gold mining, affected stakeholders such as mining companies, miner associations, miners, trade unions, NGOs, civil society organizations, academia, the media, communities, governments, parents, and children all work together to develop strategies to reduce child labor (International Labour Organization, 2022). However, most extant studies on criminal behavior including WLT have focused on criminological aspects, examining the problem primarily from a perpetrator's point of view (Cornish & Clarke, 2014). This perspective highlights that criminal actors seek to minimize risks and maximize profits, implying that they evaluate benefits and costs before acting illegally (Carson et al., 2020; Gul, 2009; Loughran et al., 2016; Thomas et al., 2020). Because profit margins are high and WLT takes a fairly low priority among law enforcement agencies when compared with other crimes, WLT tends to be a low-risk, high-profit business for perpetrators (Hall & Wyatt, 2017; Wyatt, 2013).

Although the narrow focus of prior WLT research is relatable, we argue that WLT, like the aforementioned sustainability issues, also often represents a complex phenomenon that is closely tied to supply chains, thereby warranting a multi-stakeholder approach. Differentiating first between legal and illegal trades and subsequently between the emergence of supply chains through which WLT occurs, we find that wildlife and its products can be shipped to end consumers in various ways (see Figure 1). WLT specifically refers to the illegal trade of living animals and plants and products made from them (South &

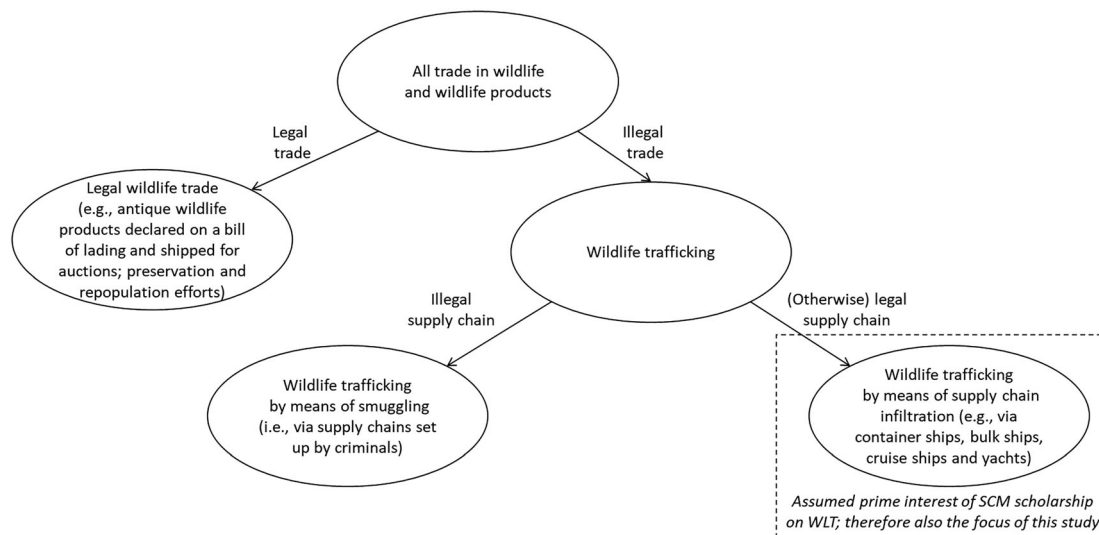


FIGURE 1 Categorization of wildlife product flows through supply chains. SCM, supply chain management; WLT, wildlife trafficking.

Wyatt, 2011). Legal products, such as legally collected artifacts or animals that are not endangered, are generally not included under the term WLT (therefore, only the right side in Figure 1 denotes WLT). To move illegally captured wildlife and wildlife products to consumer countries, perpetrators not only have been successful in establishing illegal smuggling supply chains but also have demonstrated their ability to exploit existing vulnerabilities and infiltrate legal supply chains and international trade routes (Outhwaite & Little, 2020; Shelley, 2018; UNODC, 2020). Such WLT by means of SCI is presumably of greatest interest to SCM scholarship and thus represents the focus of this research. Accordingly, respective supply chain members are regarded as important stakeholders whose perspectives are imperative in order to more effectively and holistically address WLT (Bridoux & Stoelhorst, 2022; Freeman, 1984).

In many cases, WLT is carried out via legal sea routes along maritime supply chains (Fears, 2014). Whereas non-maritime routes are also used for smuggling small-scale seizures or live animals, cargo shipments are primarily selected for large shipments of wildlife products (Fears, 2014; UNODC, 2020). For example, it is estimated that 72% of the international ivory trade is trafficked by sea in containerized cargo (TRAFFIC, 2020). Although the reasons for the rise in maritime transportation as a preferred trafficking mode are manifold (e.g., poorly guarded ports, understaffed authorities, and corruption), a significant reason for this increase is linked to containerization and the rise in capacity on container ships (Wyatt et al., 2018). Between 2000 and 2019, container port traffic increased by more than 254% in 20-foot equivalent units, at a compound annual growth rate of 6.9% (World Bank, 2020). As a result, immense cost reductions

and efficiency gains in world trade (Martin et al., 2015; Outhwaite & Little, 2020) often go hand in hand with more and better possibilities for illegal activities (Basu, 2013).

Previous research in the supply chain security literature has emphasized the challenges for customs in facilitating legitimate trade while deterring illicit trade (Basu, 2013, 2019) and has also highlighted structural and operational supply chain features that enable illicit trade (Basu, 2013, 2014; Shelley, 2018; Wyatt et al., 2018). To date, SCM research has investigated illegal activities in legal supply chains in the context of food supply chains (Smith & McElwee, 2021), conflict minerals (Hofmann et al., 2018), and modern slavery and human trafficking (Gold et al., 2015), and it has also linked illegal activities to supply chain vulnerability and resilience (Pettit et al., 2013; Wagner & Bode, 2006), supply chain security (Yang & Wei, 2013), and counterfeiting (D'Amato et al., 2019; Yi et al., 2020).

Yet, to the best of our knowledge, the operations and SCM literature has not yet scrutinized legitimate supply chain members' roles in WLT, as well as their efforts to mitigate this problem. This seems odd for at least two reasons: First, it can safely be assumed that supply chain members are knowledgeable about extant supply chain vulnerabilities vis-à-vis WLT. Second, it is well documented that focal firms in particular face increasing pressure to maintain due diligence over their supply chains (Schleper et al., 2022), as they are being held responsible for the actions of their suppliers (Hartmann et al., 2022; Hartmann & Moeller, 2014; Hofmann et al., 2014). For this reason, these firms should acknowledge WLT and the illegal exploitation of legal supply chains as serious concerns "in order to retain their license to operate"

(Quarshie et al., 2016, p. 33). In addition, various laws and regulations targeting sustainable SCM are being introduced with increasing frequency in the context of conflict minerals (e.g., Dodd-Frank Act of 2010; EU Conflict Minerals Regulation, 2021), modern slavery (e.g., UK Modern Slavery Act of 2015), and deforestation (e.g., U. K. Department for Environment, Food and Rural Affairs [Defra], 2022). If firms anticipate strengthened WLT legislation and greater regulatory scrutiny, they can initiate precautionary mitigation approaches and preempt the need for legislation (Schwartz & Carroll, 2003), resulting in a first-mover competitive advantage. Accordingly, first voluntary initiatives were launched in 2016, with 40 of the largest maritime business stakeholders signing the “Buckingham Declaration,” aimed at effectively disrupting WLT through a zero-tolerance policy (Vidal, 2016). Still, most of the container shipping industry tends to focus on other social and ecological problems rather than WLT (Tang & Gekara, 2020).

METHODOLOGY

Because of the absence of multi-stakeholder perspectives on WLT in prior SCM studies, our goal was to develop—rather than elaborate upon or test—theory. Thus, an inductive theory-building approach appeared appropriate (Bansal et al., 2018; Corbin & Strauss, 2014). Such a proceeding is particularly suitable to study unfamiliar and complex phenomena and to expose new theoretical directions (Bansal et al., 2018; Denk et al., 2012; Mohajan, 2018). This approach is also well established in SCM journals (Quarshie & Leuschner, 2020). Figure 2

depicts the chronological overview of our research process.

Our research interest initially directed our attention to the following questions: *Why and how are supply chains vulnerable to WLT?* and *How can these vulnerabilities be mitigated?* As is often the case in qualitative research, the focus of this investigation evolved throughout the course of the research, leading us not only to the answers to the initial WLT-related questions but also to findings and implications relevant to SCM scholarship in general.

Sampling and data collection

To understand legal supply chains’ vulnerabilities to WLT, we collected experiences from maritime supply chain members (e.g., shipping companies, terminal operators, other logistics operators, cruise ship operators, and forwarders) and other knowledgeable stakeholders (e.g., customs authorities, federal authorities, law enforcement authorities, NGOs, foundations, and academics) (Carter et al., 2015). Because maritime supply chains appear to be the main mode of transportation for large seizures of wildlife products (Fears, 2014; TRAFFIC, 2020), we deem this setting well suited to answer our research questions (Gioia et al., 2013).

The main source of qualitative data for this research was interviews (Charmaz & Belgrave, 2012; Conlon et al., 2020). Our sample was not predetermined but, rather, developed over the course of the investigation (Corbin & Strauss, 2014). As a first sampling step, we created a comprehensive list of 90 relevant organizations

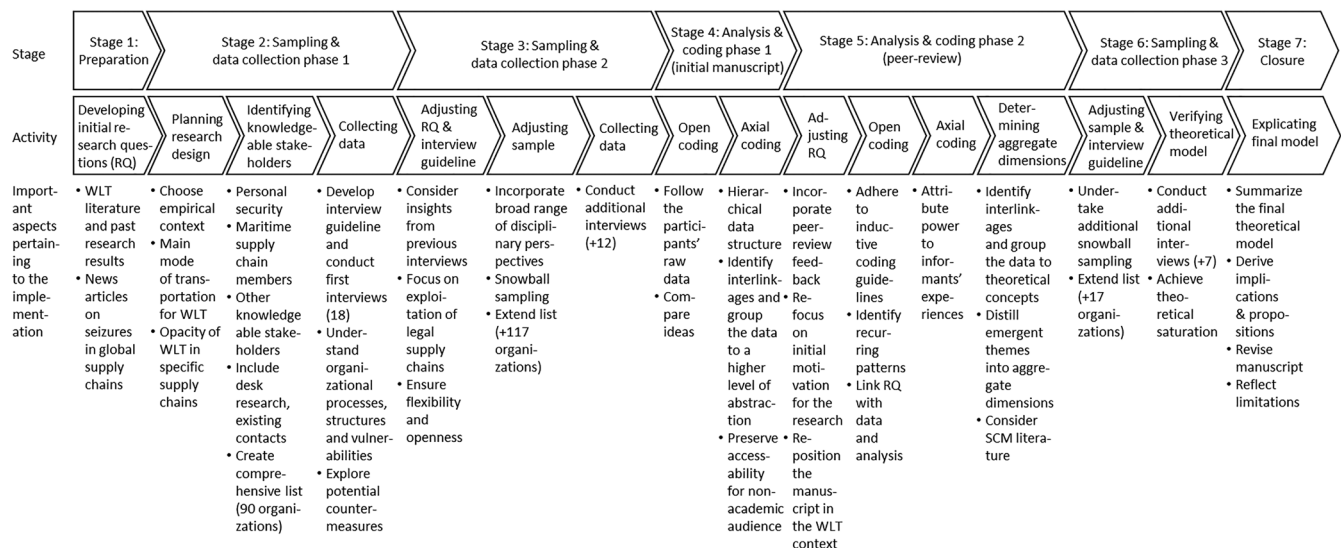


FIGURE 2 Chronological overview of the research process. SCM, supply chain management; WLT, wildlife trafficking.

TABLE 1 Database.

Type of organization	Job titles of interviewees	Interview duration ^a	Number of utilized codes
NGO	Training and capacity building coordinator ^b (E.1 ^c)	00:30:31	23
	Senior program officer (E.6)	00:51:44	29
Federal authority	Deputy head of department for legal matters and enforcement of species protection regulations (E.2)	01:05:25	42
NGO	Head of policy (E.3)	00:43:10	24
Cruise ship operator	Senior environmental manager (E.4)	00:57:40	40
Terminal operator	Energy, environmental, and sustainability management (E.5)	00:48:09	35
NGO	Marine program director (E.7)	00:30:17	18
Customs authority	Head of unit prohibitions and restrictions (E.8)	00:50:14	31
Shipping company	Head of sustainability, environmental officer (E.9)	00:38:38	22
Terminal operator	Head of corporate communications ^b (E.10)	00:13:52	13
IT solution provider	Program manager across digital devices, environment and compliance and consumer electronics ^b (E.11)	00:16:30	17
Foundation	Manager (wildlife program) ^b (E.12)	00:47:53	39
Shipping company	Member of the board and head of responsible procurement (E.13)	00:28:32	22
IT solution provider	Enterprise and distributed ledger technology consultant and strategy/business development manager (E.14)	00:28:03	10
Shipping company	Executive vice president (E.15)	00:30:15	28
Logistic operator	Global head ocean freight operations and development (E.16)	00:30:58	21
NGO	Senior advisor marine conservation (E.17)	n.a. ^d	8
	Representative of country X ^b (E.18)	00:32:17	30
NGO	Director of research and development (oceans program) ^b (E.19)	00:29:45	14
Shipping company	Head of department research shipping and expedition ^b (E.20)	00:12:59	7
Law enforcement authority	Law enforcement agency employee (E.21)	00:14:53	14
	Law enforcement agency employee (E.26)	00:15:44	14
Academia/law enforcement authority	Criminologist (law enforcement agency employee) (E.22)	00:39:32	18
Logistic operator	Public relation office/head of communication and marketing (E.23)	00:19:47	21
Academia	Sociologist/field of study wildlife crime (E.24)	00:21:50	8
Academia	Criminologist and sociologist (E.25)	00:22:24	18
Academia	Wildlife criminologist/field of study in criminal justice ^b (E.27)	00:37:44	17
Academia	Field of study in development policy and management (E.28)	00:27:30	17
Customs authority	Public relation for customs investigation (E.29)	00:31:34	21

(Continues)

TABLE 1 (Continued)

Type of organization	Job titles of interviewees	Interview duration ^a	Number of utilized codes
Academia	Field of study in criminal justice and crime and law enforcement (E.30)	00:28:10	20
Forwarder	Supply chain and operations lead (E.31)	00:25:05	18
Forwarder	Management board (E.32)	00:28:18	25
Shipping company	Logistics manager (E.33)	00:43:43	40
Forwarder	Operational logistic manager (E.34)	00:40:17	24
Forwarder	Head of purchasing department (E.35)	00:19:54	12
Forwarder	Head of outbound logistics (E.36)	00:42:15	21
Forwarder agent	Head of global quality, health, safety, and environment compliance (E.37)	00:38:48	39
		19:44:20	820

Abbreviation: NGO, non-governmental organization.

^aDepicted in hours:minutes:seconds.

^bSlightly modified for anonymization purpose.

^cInterview identifiers are assigned in chronological order, with E.1 being the first and E.37 the last expert interview that took place.

^dOne-page answer in writing obtained from the participant.

along maritime supply chains, based on desk research, existing contacts, and knowledge gleaned from other researchers. Suggestions from prior participants, their contacts to other organizations and researchers, and emerging theoretical concepts later allowed us to extend this list of potentially insightful contacts to 224 organizations and individuals (Conlon et al., 2020; Corbin & Strauss, 2014).

Because we did not find occasions where WLT was clearly allocated to specific departments, targeted respondents were preferably informants who have an exclusive position in the social context of decision-making processes that are impacted by or could potentially impact WLT (for individual positions, see Table 1). In particular, we included participants who could help us to understand organizational processes, structures, and vulnerabilities in maritime supply chains, or who are knowledgeable about potential countermeasures in this context. Our sampling initially targeted cargo shipping companies, terminal operators, cruise ship operators, federal authorities, NGOs, customs authorities, IT solution companies, and foundations as crucial stakeholders along maritime supply chains. During subsequent rounds of data collection, we extended our sample to include logistics operators, forwarders and forwarding agents, law enforcement authorities, and academics from outside the SCM field, either because prior informants had suggested these contacts or because the respective stakeholders were helpful in exploring concepts that had arisen during the course of the research (Gioia et al., 2013; see Table 1).

Overall, we deem this sampling approach suitable for two reasons: First, due to the opaque nature of illegal

activity, in which criminals strive to remain undetected, it is difficult and often impossible to directly investigate organized crime empirically by means of interviews with offenders (Naylor, 2004). Second, effective crime reduction measures in the context of biodiversity conservation require successful integration of expertise from a broad range of disciplinary perspectives (Borrion et al., 2020).

The final data set employed for our data analysis comprises interviews with 37 participants from 34 organizations (see Table 1). As all interviewees agreed to participate under conditions of confidentiality and anonymity, and given the sensitivity of the data provided, only non-identifiable information is shown.

The data collection process commenced in July 2018 and was completed in December 2021. It included three data collection periods in total. In response to the initial data collection period, our theoretical interest in the WLT phenomenon shifted somewhat, which is why we proceeded with a second data collection phase (see Figure 2). Interviews lasted 32 min on average. In total, 19 h and 45 min of verbal data were recorded, and 282 pages of data were transcribed. Two authors were responsible for collecting the data, and all of the interviews were conducted via either phone or Skype in English or German. Whenever the participants agreed, the data were recorded and subsequently transcribed. One respondent preferred to answer the questions solely via email (E.17), and another participant also answered the questions via email before being interviewed (E.25).

All interviews were based on a semi-structured interview guideline, with questions focusing on WLT and vulnerabilities to WLT in supply chains. We primarily

directed our attention to WLT via SCI in the ideal type of maritime supply chain. Using individual instances of WLT in very specific supply chains as the unit of analysis would have been impossible due to the opacity of WLT (which more often than not remains hidden), the aforementioned data collection challenges, and our need for personal security in conducting this investigation.

Because there is not yet an SCM-related theory surrounding our research question, we first approached the topic in a deliberately broad manner and discussed the following themes with our participants to ensure flexibility and openness to emerging topics: personal experiences with WLT, potential infiltration points and commodities, criminal behavior, infiltration impacts, transportation processes, supply chain information streams, and prevention strategies. The interview guideline and topics of discussion were adjusted over the course of the research according to insights from previous interviews (see Appendix A for the latest version), thereby steering questions in the direction of emerging theorizing (Gioia et al., 2013). For example, as informants raised concerns that supply chain members believe they are not accountable for commodities that are shipped along their legitimate cargo, we began to ask such actors about their security measures, their engagement in sustainability topics, and their potential role in mitigating WLT. After multiple rounds of additional data collection and re-analysis of our theoretical model, we were reasonably certain that we had achieved theoretical saturation (Conlon et al., 2020; Corbin & Strauss, 2014)—as indicated by the stability of our data structure and the concluding model.

Analysis and coding

We applied the Gioia method (e.g., Gioia et al., 2013) to develop theory from our data, similar to other recent studies in SCM (Quarshie & Leuschner, 2020; Sodero et al., 2019; Xiao et al., 2019). By adhering to a set of pre-determined guidelines, this method lays the groundwork for a rigorous analysis of qualitative data in the research process (Corley & Gioia, 2004). Interpretive approaches are generally appropriate for understanding informants' experiences of a phenomenon and deriving theories from these experiences (Gehman et al., 2018).

In line with the Gioia method, our procedure iterated between data collection phases, in which we searched for suitable new participants and collected insights from them, and data analysis phases, in which we identified and delineated emerging concepts based on interview statements (Gioia et al., 2013). In accordance with our

evolving research focus, the coding was adjusted multiple times. Our initial aim was to closely follow the participants' raw data and explore and compare ideas across all participants (Corley & Gioia, 2004).

To begin, we identified recurring patterns across our set of interview transcripts related to informants' experiences with WLT (Corbin & Strauss, 2014; Gioia et al., 2013). In particular, drawing on the interview guideline, we gathered extracts related to vulnerabilities and potential mitigation strategies. This approach allowed us to link our research question with the data and the analysis (Pratt, 2009). We identified a total of 820 extracts from the data, which helped to answer the research questions.

Consistent with the Gioia method, we identified inter-linkages among the extracts to group the data and to raise the analysis to a higher level of abstraction (Corbin & Strauss, 2014; Corley & Gioia, 2004). Therefore, we engaged in an axial coding process supported by the coding software MAXQDA. In other words, we sought to establish a hierarchical data structure—which has been well established in the literature (Gioia et al., 1994)—in working with the relevant data extracts. Beginning with the development of first-order concepts, we attributed power to informants' personal experiences with the phenomenon of WLT and illegal exploitation of legal supply chains (see Figure 3). For example, multiple informants referred to the vast amount of container shipments and the associated difficulties, making these topics self-evident in terms of itemization.

Subsequently, we developed theoretical second-order themes and aggregate dimensions (Gioia et al., 2013). Although the concepts and themes emerged from informants' experiences, we considered (sustainable) SCM literature as part of the theory-building process to refine our model in more abstract dimensions (Corbin & Strauss, 2014). For example, we determined that some of our concepts, such as “opacity of operations,” were linked to existing SCM discourse on security versus efficiency (Gunasekaran et al., 2004). Our data structure and the resulting model were revised and refined 11 times, until they explained the WLT phenomenon well, together with a tension that accompanies the explanation in view of the practitioners.

FINDINGS

Our final data structure employs urgency of intervention, continuity focus, and mitigation of WLT as top-level codes (see Figure 3). We integrated the aggregate dimensions in a grounded model (Gioia et al., 2013).

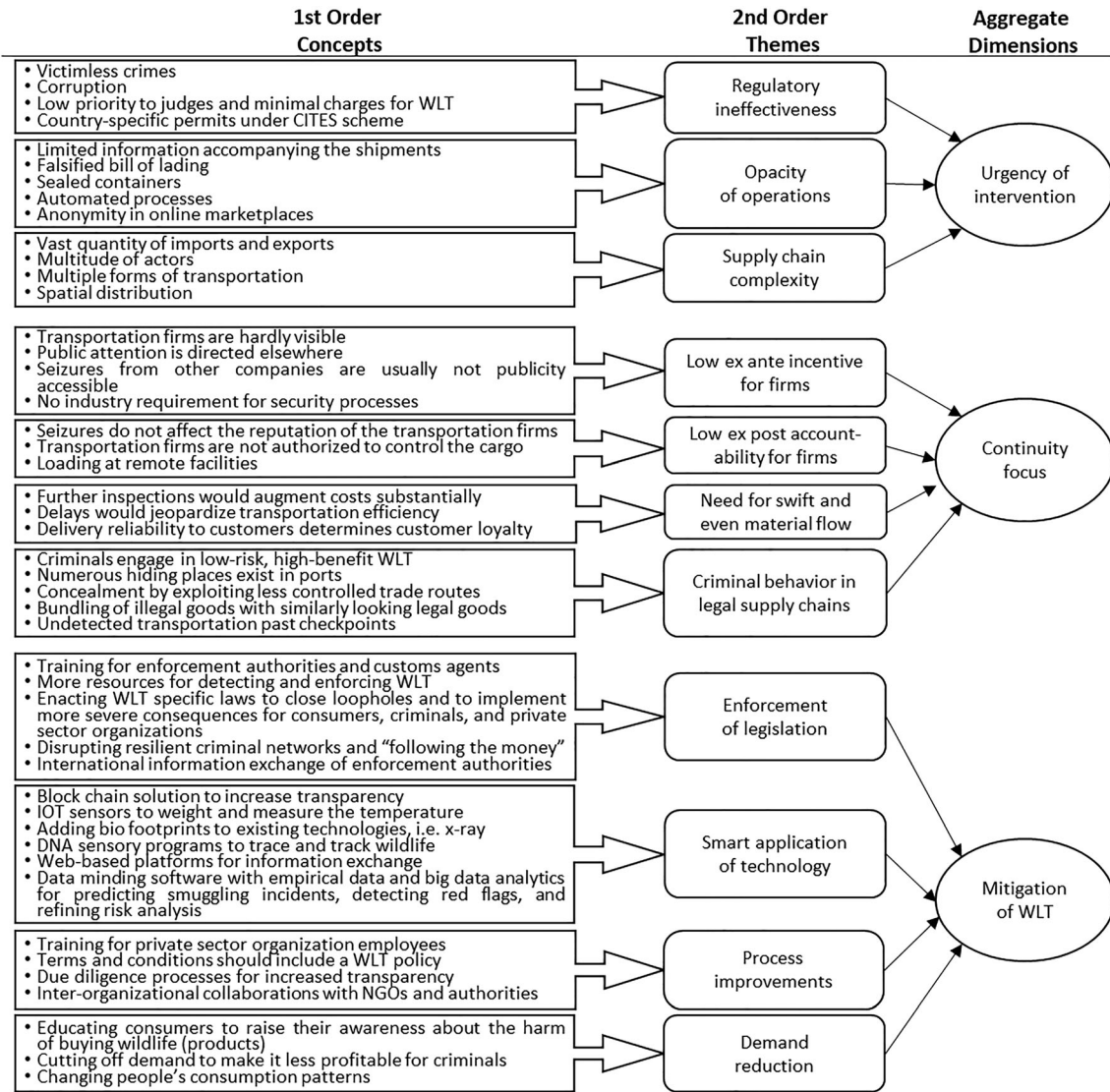


FIGURE 3 Data structure. NGOs, non-governmental organizations; WLT, wildlife trafficking.

Urgency of intervention

As depicted in Table 2, three second-order themes emerged from our empirical data, which refer to the societal level needed to interfere, namely, *regulatory ineffectiveness*, *opacity of operations*, and *supply chain complexity*. Based on our data, these three second-order themes reflect the vulnerabilities to WLT among global supply chains, as they allow for concealment of illicit activities and thus facilitate criminal operations in maritime supply chains. The resulting urgency of intervention manifests at the societal (i.e., macro) level via the severe repercussions of WLT on biodiversity and societies as a whole. In the following, we illustrate each of the second-order themes in greater detail.

Regulatory ineffectiveness

From our interviews with experts, it became clear that traffickers make use of regulatory ineffectiveness to infiltrate legal supply chains with illegal wildlife (products). The interviewees agreed that bribing takes place at different stages of the supply chain to facilitate WLT—for example, at permit-issuing authorities or checkpoints. Once corrupt actors have engaged in WLT, they have little to fear, as their (political) power allows them to suppress any potential allegations regarding their involvement. In addition, WLT has a rather low priority for law enforcement agencies compared with other crimes, which means that it is seen as a low-level instance of criminality leading to light sentences for

TABLE 2 Urgency of intervention.

Coding	Supportive quotes
<i>Regulatory ineffectiveness</i>	<p>“The effectiveness of predicted policing is [...] hardly debated [...], but the key element that always needs to be brought up with any sort of predicted poaching or trafficking model is what I call the silent victim problem. [...] Animals don’t call the cops. Therefore, the data you have about that problem is completely reliant on your efforts to find it. [...] It is all dependent on the efforts of a law enforcement agency, which (is) typically even more underfunded than national police.” [E.30]</p> <p>“The actors higher up, they just have enough power to suppress any claims of their involvements. So, for example in Uganda, there is a very strong involvement of political military elites in the smuggling of ivory or of illegal wildlife trade. But there never has been a conviction, particularly because their power allows them to engage in this trade. And also allows them to suppress any potential claim.” [E.28]</p> <p>“It’s [...] drugs or arms or human trafficking which are high priority (to) law enforcement elements. Wildlife trafficking is still seen as a fairly low-level instance. If people are caught there tends to be a slap on the wrist and maybe they’ll confiscate the materials. Quite often they get away with it. In some cases, people are arrested and there’s heavy prison sentences. It’s not as much as it should be.” [E.12]</p> <p>“On the one hand, there is corruption within authorities that issue permits. Permits are granted [for shipments] which do not meet the approval requirements [...]. On the other hand, certain port compliance officers are bribed in a way that they seem to carry out their control tasks to all appearance, but not in a way it should be. [...] Especially, if the employees’ payments, working conditions and working hours are quite poor. [...] In my mind, lack of assistance [...] to law enforcement agencies (is) not fined currently.” [E.2]</p> <p>“The way CITES is constructed means that the responsibility for [...] all the various processes that CITES demands, you know, the permitting process—so basically, (CITES) [...] is designed to regulate trade one way or the other in different wildlife products [...]—is fundamentally flawed. The responsibility for that rests with individual CITES parties’ governments and their CITES management authorities. There isn’t any central authority which polices that process [...] so you are relying on authorities in individual countries to manage the process and it’s still largely a paper process of issuing permits.” [E.3]</p>
<i>Opacity of operations</i>	<p>“With full container load in particular, it is common that the customer does [...] (the loading) himself. And theoretically, I can load everything in there. [...] After loading, I list the container number on the bill of lading and sent it off (to customs). [...] That’s when I realized for myself [...] that (it) was up to me at the end of the day, what I put in the container, how I stow it (the cargo) and what I list on the bill of lading.” [E.33]</p> <p>“The fish [...] was covered and stored in a parcel, but then it (the cover) opened up and then of course the package was completely soaked; that is where you realize that something is wrong [...]. Anyone can drop off a parcel in a post store and no one [...] verifies the content because, as I said, we’re not allowed to. That means, if someone wants to transport something illegally [...], the easiest way to do that is via post stores due to a lack of content control; [...] whether it’s wild animals or drugs or other prohibited things [...]. [...] As long as nothing unusual happens, it (the illegal commodity) flows undetected through the supply chain [...] and arrives at the customer on time.” [E.23]</p> <p>“At open and freely accessible marketplaces [...], there is the difficulty, that in most cases—and this is the main problem in the context (of WLT)—[...] that we cannot say at all whether it (the offer) is legal or illegal. At online marketplaces in particular, there is often no indication at all [...] whether official permits are given for an offer, or it (the offer) states randomly ‘papers are available’ without any further proof [...]. In our view, this is one of the worst issues, the lack of transparency, [...] what (offer) is legal and what is illegal.” [E.18]</p> <p>“If the shipper [...] loads something into the container and doesn’t state that, we’ll never find out. [...]. That’s a bit of a crux once you don’t have direct contact with the cargo [...]. (Or) [...] groupage freight containers, that is, people’s removals goods, [...] where there is simply an incredible amount of entries on the bill of lading. In these situations, it is easy to miss something and customs is not as accurate as in other situations. We had also refugees who tried to shelter in wind turbine tower parts and [...] (tried) to get to Europe [...] through transit in the goods themselves. So, you shelter goods in goods. Especially in the case of [...] large parts that are oversized and do not fit into the container and therefore are not x-rayed.” [E.37]</p>

(Continues)

TABLE 2 (Continued)

Coding	Supportive quotes
Supply chain complexity	<p>“In the case of our export processes, for example, we send (our cargo) [...] from Germany to France with DHL, then (DHL) [...] France works together with the post service of La Post [...]. And if it (the cargo) goes through different hubs again (afterwards) [...] it is not always monitored. For example, (in cases when) several service providers work together to set up their infrastructure, it can happen that unauthorized people [...] get access to the goods [...] without anyone noticing.” [E.34]</p> <p>“The biggest vulnerability is the high quantity of imports and exports. Basically, because of the sheer amount of goods traded globally and which also enters Germany on a variety of different transportation routes. We just cannot check up on everything and therefore contraband goods have been brought into the country despite custom checks as there is just such an incredible amount of trade. With globalization, it’s just increasing all the time. We have a lot of seizures in the maritime sector, why is that? Quite simply because of the possibility to supply a high amount of cargo.” [E.29]</p> <p>“Our customer request, for example, ‘from [...] our manufacturing facility, we would like you to provide an empty container for us to load goods [...] or we would like you to organize a pickup for a smaller scale of goods [...].’ In both cases, we execute the transport to the port authority. [...] Under revision of customs, we proceed with the loading of the vessel. [...] It’s the same process vis-à-vis the other side of the supply chain. We also have [...] customers with a smaller volume who say ‘we will deliver to [...] the port or to your warehouse ourselves for small scale cargos.’ So, they do the middle part (themselves). [...] There are different ways of how we work with [...] (customers). [...] The customer can also request a recruitment online and then we take care of everything else for the customer.” [E.16]</p> <p>“But because of the entry points [...] tackl(ing) WLT (is) much more complicated. Because the (maritime) supply chains are much more complex (than the aviation sector). [...] We have been actually thinking (of) the idea of convening another workshop [...] specific to maritime actors, so not only shipping companies but also trade forwarders, custom brokers, custom offices, port authorities that walk around and then work with them to understand better the supply chains, what are the potential entry points, what are the vulnerabilities [...]. But that is not that easy.” [E.6]</p>

Abbreviation: WLT, wildlife trafficking.

perpetrators, with little effort to enact new regulations: “Once you [...] get caught, a lot of the times, judges aren’t taking this seriously, because it is like a victimless crime, there is [...] nobody to defend their point on [...]. It is an animal. Or a country that is kind of getting their economy [...] affected by the removal of resources” [E.27]. Another frequently stated vulnerability is the individual administration of the permitting process by countries, which is often still paper based and results in a lack of centralized access to information for enforcement authorities.

Opacity of operations

Based on statements from our interviewees, we deem the global material flow in supply chains particularly vulnerable to WLT due to its opacity: “Container transportation, which is incredibly efficient for society, is somewhat vulnerable to a lack of knowledge of what is actually put in that container” [E.15]. One reason for this is related to the sealing of cargo as an expression of postal secrecy, rendering the detection of misdeclarations almost impossible for all supply chain members except customs due to the lack of direct contact with the cargo. Moreover,

illegal products are primarily bundled with legal products in containerized shipments or parcels, which hinders their detection—even by customs. Thus, unless something unusual happens (e.g., water leaks out of a package), the illegal cargo will pass through the respective firm without attracting attention. Finally, the lack of transparency regarding the existence of CITES permits allows criminals to offer illegal wildlife (products), especially in open-access online marketplaces under the guise of permission, as there is no requirement to submit the permits.

Supply chain complexity

Our data indicate that the high level of complexity of maritime supply chains also facilitates WLT. Because multiple service providers work together, many points of interaction with the cargo occur, and as a result, an increased likelihood that unauthorized actors may gain access to it arises. “Especially in a market where [...] there is an undersupply, as it is with truckers, we have a vulnerability when sub- and sub-subcontractors are hired, and the shipping company may not even know about it” [E.33]. In

TABLE 3 Continuity focus.

Coding	Supportive quotes
<i>Low ex ante incentive for firms</i>	<p>“In Europe, there is no external pressure to ensure content security within the maritime supply chain. I can order a container, load it, seal it, and that’s it. But no one verifies whether the listed goods are inside, or whether someone has tampered with the container. These regulations do not exist here in Europe.” [E.36]</p> <p>“(WLT) seizures would have to be detected several times (in our area of responsibility) and these situations would have to lead to severe repercussions for us. If we would have to fear for example an [...] image loss because we were claimed to be responsible. Or that we might even get a fine [...]. [...] Then we would probably say, [...] we have to [...] change our forwarder, because he [...] doesn’t pay attention (to this security issue). Because at that point we have to ask ourselves ‘what can we do as a company to prevent this from happening.’ [...] Certainly, we [...] do not want to support [...] any criminal activities [...]. However, [...] if we [...] don’t notice anything about it (WLT) now, and [...] we have an effective supply chain, [...] it (WLT) would only have a secondary influence on my decision.” [E.34]</p> <p>“One does not hear anything of other companies that they have faced extremely high risks or that they have been affected (by WLT), nor did we hear that anyone (of our competitors) has been involved. So, [...] why should we proactively do something if it’s not even an issue (to us)? There are other priorities.” [E.32]</p> <p>“(Wildlife crime) is growing in attention and [...] media coverage. [...] But at the end of the day it is still such a low priority crime that a lot of times, the enforcement of it isn’t going to be that strong and also because of that, the link to business reputations hasn’t then (been) as big as, well, even drugs, right?” [E.30]</p>
<i>Low ex post accountability for firms</i>	<p>“There (are) no reputation issues (for us), because we are not responsible if a shipper hasn’t completed [...] the bill of lading decently; we can’t verify, because not every container is x-rayed and the container is sealed once we get involved in the supply process—we are just the means to an end.” [E.33]</p> <p>“Well, if people [...] want to smuggle wildlife via post stores, it is their own criminal energy. We don’t pack the parcels ourselves. They are delivered and they are paid for, so there is nothing we can do about it. [...] We can’t look inside the parcels.” [E.23]</p> <p>“I mean what is in the box has been a discussion for us in the sustainability team for a few years, but because the company will have very limited ways to verify [...], because of the technology, it also has limited responsibility in that sense.” [E.13]</p> <p>“In general [...], the shipper, [...] namely the person who fills the container with cargo, is responsible for the declaration. And you have to rely on that [...] in the supply chain. And (content) control, [...] is in the end a responsibility of public administration by customs.” [E.10]</p>
<i>Need for swift and even material flow</i>	<p>“If customs were to increase the frequency of content controls, it would probably slow down the supply chain. Because every inspection [...] where the container goes through an x-ray machine, costs an hour or two. Each inspection, where customs unpacks the container and repacks it, [...] costs [...] a day or two [...]. So, I think it will simply increase the transport and transit time.” [E.37]</p> <p>“Delivery reliability to customers is one of the most important criteria at all. This is the only way they get customer loyalty. [...] And unstable processes that lead to delivery delays are very negative for a business relationship.” [E.36]</p> <p>“Frequent content control [...] make [...] our pre- and on-carriage much more difficult, because the cargo stays longer in the warehouse; [...] simply because each container needs [...] more time [...] to be dispatched. As a result, we as a cargo shipping company would have significantly higher costs. At the moment, we can make for example two deliveries per day with one trucker, but in the future, (with a frequent content control), it will perhaps only be one and a half deliveries per day on an average, which of course reduces efficiency and increases costs.” [E.33]</p> <p>“We cannot carry out 100% control (of contents) [...]. If we were to control each cargo, people would have to start ordering their Christmas presents in February. Therefore, [...] we try [...] to reduce (content) control [...] to a certain minimum, because otherwise the material cannot flow.” [E.29]</p>

(Continues)

TABLE 3 (Continued)

Coding	Supportive quotes
<i>Criminal behavior in legal supply chains</i>	<p>“There is some pretty good indirect evidence that the presence [...] of legal trade [...] provides an opportunity to launder illegal products into trade. It compromises enforcement because it can be very difficult to distinguish what is an illegal and what isn’t an illegal product. This could potentially be [...] depending on circumstance so that can be quite tricky.” [E.3]</p> <p>“(Legal supply chains) [...] offer particular opportunities. [...] Because the cost–benefit analysis [...] shows that this hotspot offers opportunities which are not found elsewhere. For example, for the ivory trade, [...] many ivory [...] traders specifically start [...] trading through Uganda [...], because regionally, the cost of engaging in this trade have become fairly high. [...] Mombasa [...] port (in Kenia), [...] has been [...] a particular hotspot. But when some large-scale enforcement happened, this became less attractive. And Uganda became more attractive.” [E.28]</p> <p>“In general, a criminal’s strategy to move content to end consumers depends on the type of action, and here, it is called ‘smuggling’. Whether people, (other) animals, or inanimate contraband such as illegal drugs are smuggled, only determines the object-specific variations: sometimes the content can be transported airtight, sometimes it cannot. But the type of action, namely undetected transport across checkpoints, is the same for various smuggling operations, and therefore a criminal’s strategy is also basically the same (bribery, disabling custom technology, evading checkpoints, etc.)” [E.25]</p> <p>“(Criminals) are all faced by money and that is all they want. They don’t want to get actions destroying the plan or the whole system. [...] So is that then rational? I will say yes because they will plan according to profit and somehow they will also access the risk.” [E.24]</p>

Abbreviation: WLT, wildlife trafficking.

fact, numerous interfaces between different organizations represent the primary reason why our experts consider the maritime supply chain to be a major challenge in preventing WLT. Further, our interviewees stated that most maritime supply chains are designed to be efficient or responsive, yet not necessarily secure against infiltration. The sheer quantity of global shipments, which is still increasing due to globalization, results in a significant shortage of border and customs controls and thereby facilitates the import of illegal goods.

Continuity focus

At the same time, however, our data also support four second-order themes, which refer to actor-level (i.e., micro-level) needs for continuity in global supply chains: *low ex ante incentive for firms*, *low ex post accountability for firms*, *need for swift and even material flow*, and *criminal behavior in legal supply chains* (see Table 3). These categories reflect the unwillingness to change any of the aforementioned vulnerabilities, as expressed by low acceptance of intervention measures that disrupt or negatively impact the material flow or operational business activities in general. Importantly, perfectly legal and legitimate supply chain members and criminals share the same continuity focus. In the following, we will illustrate each of the four respective second-order themes in greater detail.

Low ex ante incentive for firms

A prevalent consensus among participants was that there is no external incentive for supply chain members to establish security processes or systems against WLT—at least in Europe. First, there is no legal framework that obliges organizations to ensure that no one tampers with the cargo and that all organizations in their respective supply chains act in a legal and sustainable manner. For example, “*it is not [...] a law for them (private sector organizations) that they need to have wildlife policies or programs like they might do for drugs*” [E.12]. Second, the informants have never heard of competing organizations facing any risks, leading to a lack of incentive to consider WLT countermeasures. One reason for this is that “*it’s very rare that [...] the press release(s) [...] seizure data (which includes the) [...] name (of) the company*” [E.12].

Low ex post accountability for firms

The second category derived from the collected data relates to supply chain members’ perception that they are not accountable for infiltration incidents related to WLT. Respondents are aware that they can defend themselves by pointing to the impossibility of verifying the content of containerized shipments, which in turn leads to a low level of commitment to WLT countermeasures: “*As bad as WLT [...] is, [...] I don’t believe that [...] service providers*

are willing [...] to install any security mechanisms. Because [...] we can't look inside anyway" [E.23]. This can be explained by the fact that shipments are usually packed and sealed at remote locations by the cargo owners, leading to intermediary supply chain members' inability to search inside for cargo verification. In addition, privacy regulations only allow customs to unseal containers, which means that all other firms have to trust the bills of lading.

Need for swift and even material flow

Throughout the interviews, it became clear that supply chain members strive for a swift and even material flow (Schmenner & Swink, 1998) that is not interrupted by any inspections from authorities. For example, interviewees agreed on *"more efforts in advance so that it is ensured that the individual shipments also pass straight through"* [E.36]. The main reason for our respondents' opposition to container inspections as a WLT countermeasure in legal supply chains is the nature of the inspection itself, as it slows down the material flow. Based on our data, this can be explained by the fact that a slowdown in the material supply chain interferes with delivery reliability, which is highly important to supply chain members in maintaining customer loyalty. In addition, respective supply chain members fear negative impacts on pre-carriage and on-carriage in terms of efficiency losses, as containers have longer dwell times in depots due to longer handling times.

Criminal behavior in legal supply chains

Finally, experts emphasized that perpetrators have a clear interest in the undetected and even transportation of illegal wildlife (products). Such criminal behavior is best realized in legal global supply chains with high volume, which require swift and even material flows of legal products, and which align with the perpetrators' continuity focus. Accordingly, criminals tend to insert similarly appearing products into legal trade, making it almost impossible for customs to differentiate between these two categories. For example, *"ivory [...] could be smuggled as part of organic food products [...] like dried fish or avocado [...]. In the past (it) also has been smuggled with timber and pangolin scales"* [E.6]. Further, the sheer amount of global trade, combined with limited resources among authorities, limits customs' ability to inspect every cargo, thereby fostering the constant material flow and offering criminals the lowest costs for concealment: *"You are talking about moving two thousand cages of ivory from East*

Africa to Asia. [...] There are only a few ways you can do that. [...] You could hire your own channel [...], but [...] it's gonna be such a cost that you wouldn't make it [...]. So, how you gonna move it and all the time you just gonna use existing transportation methods, it makes the most sense [...] (as it is) easier to hide in the thousands and millions of containers" [E.30].

Mitigation of WLT

From our interview database, we derived four second-order themes, all of which refer to WLT mitigation strategies: *enforcement of legislation, smart application of technology, process improvements, and demand reduction* (see Table 4). In the following, we will illustrate each of these categories in greater detail.

Enforcement of legislation

Most of the interviewees agreed that the removal of legal loopholes and ineffective enforcement are key countermeasures to WLT. As long as the aforementioned legal blind spots persist, the threshold to engage in WLT remains fairly low for potential criminals. When it comes to the detection of trafficking and smuggling activities, authorities dedicate less attention to WLT and frequently prioritize other goods, such as drugs: *"It's primarily (about) drug-related crime, and that's exactly what politics demands"* [E.26]. Multiple respondents requested increased accountability and more severe penalties for WLT among supply chain members, including buyers and suppliers, consumers, and supporting entities, such as carriers and forwarders: *"If people [...], (for example) in China [...] know they are going to suffer severe consequences for engaging in this illegal trade [...] we can make a difference in saving some of these species"* [E.15].

Smart application of technology

Various statements pointed toward the need for technological improvements along maritime supply chains to better combat WLT. Given that traditional scanning technologies significantly slow down the container handling process, an increase in their application would hamper global trade. Instead, for instance, adding bio footprints or DNA databases to scanning schemes and applying refined risk assessment technologies by using big data analytics and data mining software might help in identifying smuggling attempts: *"We talked to one of the X-ray manufacturers, so that they can add the bio footprint of*

TABLE 4 Mitigation of WLT.

Coding	Supportive quotes
<i>Enforcement of legislation</i>	<p>“I think really critically for all this enforcement (is to have) better trained border customs agents (so) that they can actually prioritize wildlife, [...] that (they can) [...] actually find wildlife.” [E.22]</p> <p>“In criminology, [...] they call that (the) rational choice perspective [...]. But the interpretation of risk is very different (from the perspective of criminals) [...], depending on the actor and the likelihood that they are going to be caught [...]. (But) the certainty of punishment (with respect to) wildlife crimes is so low, that punishment systems don't get sort of to risk calculations as much as [...] getting run over by an elephant or attacked by another animal or bit by a snake.” [E.30]</p> <p>“It is of course our goal to increase the threshold [for illegal wildlife trade] as much as possible. [...] For ivory, for example, we advise to completely ban the product. Yet, there are still many exceptions for ivory trade, such as the trade of antiques. [...] However, this facilitates abuse, as younger ivory may be smuggled and sold as antique ivory. This happens quite often and has been proven through samples. (Another) [...] major problem [...] pose animals which are protected in their country of origin, but not internationally. [...] When those animals are smuggled out of their country, and find their way to the international market, they can be legally sold. To put a stop to this, you would need a law [...]. [...] This is a legal loophole which urgently needs to be closed. And surely, traffickers take advantage of that loophole. But according to current legislation, this is not illegal.” [E.18]</p> <p>“The real keys to this are just like in the rest of our business driven by supply and demand. So, on the demand side governments intervene to make the consequences so severe that people will not want to be buyers and on the supply side governments show the sort of ethical integrity that's required and apply the most severe consequences (for private sector organizations) [...]” [E.15]</p>
<i>Smart application of technology</i>	<p>“There is a promising technology, using intelligence that makes inferences with certain vessel behavior patterns that are correlated with illegal human trafficking. For example, if the satellites picked up a vessel, a fishing vessel, from Thailand let's say, and then it makes a stop in Myanmar and then it goes out in the Pacific Ocean and then it stops and then it meets another vessel [...]—that is highly associated with illegal trafficking.” [E.19]</p> <p>“We have incorporated into our screening processes intelligence which is provided to us by third parties that might possess it and NGOs can be helpful in this sense. And so based upon that sort of intelligence, we can adapt our risk assessment of our cargo manifests. And identify for the authorities which cargos we think might want further attention from them because it has [...] potentially [...] something unlawful there, including potentially illegal wildlife trade.” [E.15]</p> <p>“There is sort of big data analytics [...] that can be used to sort of profile offenders and sort of give percentage probabilities that a poaching instant for example is going to happen at this time. Or that, you know, that you can use historic data to say 'ok we know that between this month and this month [...] is turtle poaching season so there is going to be a higher incidence [...] of smuggling these animals so let's have the right law enforcement measures in place'.” [E.11]</p> <p>“There are DNA programs [...] for instance [...] ivory across Africa. So, when ivory is seized at the ports [...] you can then take samples which can help you to trace the likely source of that ivory at least for a specific region. So, there are technologies, I know South Africa has been trying to put some in place, a sort of DNA barcode in technology to try and help trace and track [...] lion bone products that are coming out of South Africa. [...] One of the things we have been trying to highlight is the need to a robust, [...] system of recording and monitoring wildlife trade and transactions and ensuring the legality. Because it is very difficult to tell if something is legal or not. It completely compromises your enforcement processes.” [E.3]</p>
<i>Process improvements</i>	<p>“You have (to) focus on [...] due diligence and the know(ledge) of your customer [...]. You need to be more aware of whom you are doing business with. [...] Once it's in a container and it's shut, the likelihood that it's going to be searched is low anyway, so you need to be focusing on the early part. In the grand scheme [...] the animal is (already) dead [...]. The shipping company [...] needs to have better resources to be able to know whom they are doing business with.” [E.12]</p> <p>“We gain knowledge of smuggling attempts through direct information from customs. In addition, colleagues from other (European) states, for example, the UK, may inform us about suspicious cargo [...]. In the past, this approach has led to a detection of several cases where animals have been illegally traded with forged documents. Hence, we were able to save the animals and punish the perpetrators.” [E.2]</p>

(Continues)

TABLE 4 (Continued)

Coding	Supportive quotes
	<p>“And a company like ours which, you know, has banned the carriage of wildlife trophies, has banned the carriage of shark fins, has banned the carriage of legal/illegal wildlife, you know, that only goes so far because at the end of the day, what we are moving is the box and we may not really know what’s inside the box.” [E.15]</p> <p>“So, what we are doing, among other things, is also providing capacity, building and trainings where we talk about the [...] patterns of wildlife trafficking and the routes and the scale and the smuggling techniques and what are the vulnerabilities of the transportations sector, what are the risks, and we are looking at red flags or indicators that the sector can sort of keep in mind and look out for in terms of potential risks or suspiciousness of wildlife smuggling.” [E.6]</p>
<i>Demand reduction</i>	<p>“But you also have to rely on educating the people. [...] People [...] still believe it is good to consume these products that they have always consumed. [...] You have to (have) tough enforcement [...] but at the same time you need to really educate the people in the society to stop buying these products.” [E.24]</p> <p>“So they catch the fish, they take the swim bladder out and it is a giant fish, so it is a giant swim bladder and that is very, very valuable in China. A display of wealth and status, less medical and more something you put on your wall to show how well off you are. And to impress your friends and to give it as gifts. It is a very tragic situation and to my knowledge, nothing has really worked to stop that flow and except maybe domestic campaign within China to reduce the demand.” [E.19]</p> <p>“It is also important to inform consumers in demand countries like China, Southeast Asia, or Germany about the risks and issues of illegal wildlife trade, especially in regards to protected species. To focus the entire value chain.” [E.18]</p> <p>“What we can do here (in Germany) above all is [...] demand reduction. We are a destination country for consumption [...]. We have customers who are interested in reptiles, birds, amphibians [...]. Ultimately, the only way to mitigate WLT is to influence demand, reduce demand or control demand [...]. Because [...], if no money can be made [...], the smuggler is not interested in the trade.” [E.2]</p>

Abbreviations: NGOs, non-governmental organizations; WLT, wildlife trafficking.

ivory, or rhino horn. [...] While they are scanning for drugs and arms, they can also pick up rhino horn (or) pangolin scales as an automatic response” [E.12]. Accordingly, innovative equipment with a focus on non-intrusive technologies could enable a higher control rate and the improved identification of WLT incidents while ensuring smooth material flows in global trade.

Process improvements

As a third category of countermeasures to WLT, we found broad agreement among the interviewed experts that inter- and intra-organizational process improvements should be more frequently applied. Interviewees referred to the general requirement for better trained employees who become knowledgeable in the WLT domain: “Of course, employees have to be trained again and again to pay attention to unnormal situations. [...] It’s really about being vigilant and simply looking at what might not be [...] normal here” [E.23]. In particular, we derived the need for an improved inter-organizational WLT information flow between supply chain members and other stakeholders, such as regulators, NGOs, and foundations. For example, trends in WLT routes and

smuggling techniques, as well as vulnerabilities in global supply chains, can be reintegrated in risk analysis or scanning processes to more precisely discover or even predict WLT attempts. In addition, cross-sector collaboration can contribute to identifying transnational criminal network structures, for example, by screening perpetrators’ financial records. Process improvements can also be achieved by establishing wildlife-banning policies and due-diligence processes in supply chain members.

Demand reduction

Whereas the categories mentioned above primarily refer to supply-side interventions, efforts to lower WLT trade through the reduction of consumer demand emerged as the fourth and final category of countermeasures. There was broad consensus regarding the necessity to decrease WLT demand by raising awareness on the consumer side. An expert claimed that “only 8% of Chinese people were aware of the ban on ivory” [E.12]. If such awareness-raising measures were successful, the WLT market could be drained: “Our mission is to end illegal wildlife trade. We do that from two angles. First, [...] demand reduction, focused on countries where the highest wildlife product

demand is—China, Thailand, Vietnam, Hong Kong, etc.; (second), encourage the education of the public [...] in source countries and in consumer countries [...] to make it harder for smugglers to do what they do” [E.7]. Thus, informing consumers and other stakeholders could in turn decrease criminals’ profitability stemming from these illegal activities. Specific activities in this category can vary from social marketing over educational approaches to campaigns targeting individual behavioral change.

DISCUSSION

Based on the interplay of the three aggregate dimensions depicted in the Findings section, namely, *urgency of intervention*, *continuity focus*, and *mitigation of WLT*, we develop a concluding model that is illustrated in Figure 4.

Whereas supply chain members and criminals are aligned in their focus on the continuity of material flows, several supply chain vulnerabilities legitimate and necessitate interventions along global supply chains to prevent WLT. These two contrary perspectives, which are derived from an actor level (i.e., micro level) and a societal level (i.e., macro level), account for a tension that necessitates resolution.

Against this background, on the one hand, this research suggests a mitigation approach that recognizes various stakeholder perspectives on WLT and their roles in tackling this issue, but on the other hand, this research also acknowledges the importance of continued global

trade. For example, by implementing non-intrusive technologies, such as refined risk assessment technologies for cargo inspections (e.g., using big data analytics and data mining software), both the urgency of intervention to prevent WLT and the continuity focus are *partially fulfilled*. Although the societally driven (i.e., macro level) call for intervention would prefer the inspection of all containers to ensure that undesirable WLT attempts do not occur in the first place, such a comprehensive approach would massively hamper global trade and compromise the continuity focus (i.e., micro level).

We argue that such a mitigation approach is suitable to bridge the empirically observed tension by partially fulfilling the micro- and macro-level needs. For example, by using X-ray technologies only for those shipments that have been assessed as high risk, a reliable detection of WLT attempts without an excessive disturbance of trade flows that partially fulfills both requirements becomes feasible, thereby advancing biodiversity conservation and global health without (overly) disrupting the flow of materials.

Scholarly implications

The findings from this research contribute in a threefold manner to scholarship in sustainable SCM and SCRM. (1) As depicted in Figure 4, the findings highlight a tension between the economic continuity perspective of supply chain members and the societal urgency for intervention. (2) Interestingly, however, the infiltration of global supply chains for the purposes of WLT is not

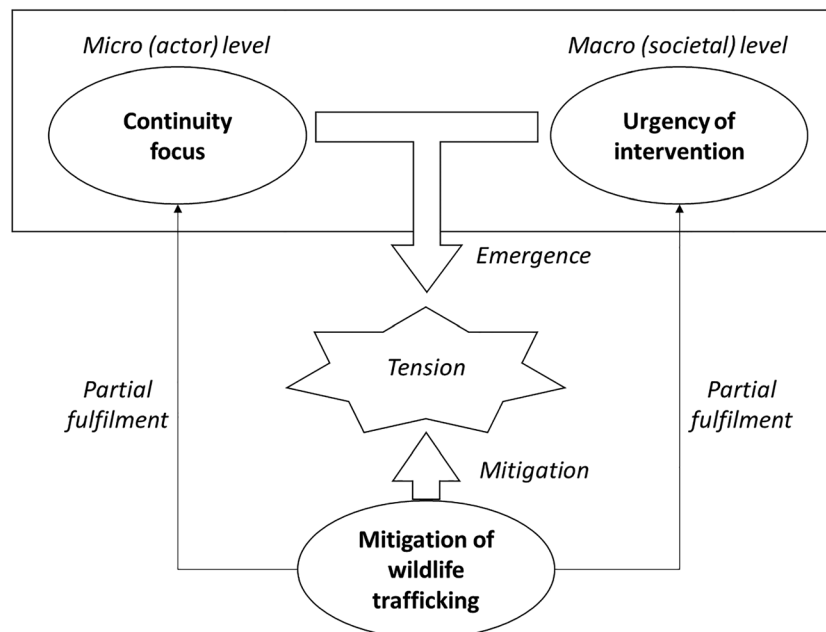


FIGURE 4 Theoretical Model.

risky for supply chain members, causing us to attribute this phenomenon to the new category of societal supply chain risks, which has not received adequate attention in the SCRM discourse to date. This research challenges and extends existing SCRM literature and advocates for a general opening up of scholarship to address these novel risks. (3) The investigation extends prior SCI literature on undesirable or illegal infiltration activities in supply chains. It elaborates on WLT as an example of SCI, thereby facilitating a broader discussion and a more systematic introduction of SCI as a supply chain risk and of WLT as a specific form of SCI. Below, we elaborate on each of the scholarly contributions.

Continuity–intervention tension

The first scholarly contribution refers to the inherent tension between the economic continuity perspective of supply chain members and a societal urgency for intervention. To articulate this contribution, we employ propositions. Although doing so aligns more strongly with a positivistic than with an interpretive research tradition, the advantage is that readers can rather easily detect the essence of a contribution. Propositions 1 and 2 relate to the emergence of (i) an urgency of intervention at the societal (i.e., macro) level and (ii) an actor-level (i.e., micro-level) continuity focus on material flows in supply chains, whereas Proposition 3 refers to the tension that arises between these two goals across the different levels of analysis.

The results indicate that vulnerabilities vis-à-vis supply chains facilitate criminal operations. For example, opacity in supply chain operations renders the detection of misdeclarations or illegally bundled products almost impossible due to the lack of direct contact with the cargo. We thus argue that these vulnerabilities, presented in the form of *regulatory ineffectiveness*, *global supply chain complexity*, and *opacity of operations*, account for the negative consequences that are associated with WLT, leading to the need for intervention measures to protect biodiversity. Accordingly, we posit the following:

Proposition 1. *Regulatory ineffectiveness, supply chain complexity, and opacity of operations augment negative WLT consequences and lead to an urgency of intervention at the societal (i.e., macro) level.*

Although the interviewees agreed that criminals exploit supply chain members, including buyers, forwarders, and carriers, the affected organizations might not want to mitigate the above-claimed vulnerabilities.

Moreover, their interest is apparently aligned with the interests of perpetrators. Supply chain members have no ex ante incentive or ex post accountability to proactively engage in intervention measures, although they are affected stakeholders. For example, in cases in which WLT is detected, the reputational risk for legally and unconsciously involved supply chain members, such as cargo shipping companies, terminal operators, and logistic operators, is negligibly low. Moreover, for economic reasons, these supply chain members strive for a swift and even material flow that circumvents operational disruptions or slowdowns. Because of this continuity focus, global supply chains can also facilitate the undesirable flow of illegal products. Perpetrators engaging in WLT actively search for such vulnerabilities and infiltrate the continuous material flow in global supply chains by hiding their contraband among legal products. Thus, we maintain the following:

Proposition 2. *Faced with the WLT problem, firms' low ex ante incentive and low ex post accountability, their need for swift and even material flows, and criminal behavior in legal supply chains lead to an actor-level (i.e., micro-level) continuity focus on material flows in supply chains.*

Although the aforementioned perspectives embodied in Propositions 1 and 2 relate to different levels of analysis, a contradiction is apparent. Thus, we posit the following:

Proposition 3. *The urgency of intervention to tackle WLT from a societal (i.e., macro) level and the continuity focus from an actor (i.e., micro) level within global supply chains account for a tension that necessitates a resolution.*

Although tensions between “traditional” supply chain priorities and sustainability have been acknowledged and investigated before, the findings augment the discourse surrounding the unintended consequences in sustainable SCM (Ketchen et al., 2021; Matos et al., 2020; Wieland, 2021; Xiao et al., 2019) by illustrating a congruence among supply chain members and criminals in their interests for continuity. This alignment helps the SCM community to obtain a better understanding of why and how supply chains are exploited (Quarshie et al., 2016). In that vein, we draw scholarly attention to WLT as an important antecedent to biodiversity loss, an environmental issue that has generally been neglected in (sustainable) SCM to date (Schaltegger et al., 2022; Sodhi &

Tang, 2021). This research explains, at least to a certain extent, the current focus of supply chain members on other sustainability issues (Tang & Gekara, 2020). Based on the findings, it could be assumed that these organizations fear that WLT mitigation measures will significantly hamper the swift and even material flow in global supply chains, resulting in a generally low commitment to engage in WLT mitigation and biodiversity management (Panwar et al., 2022).

One of the key problems in mitigating WLT is the need to address illegal activities without disrupting the legal supply chain or, metaphorically speaking, *to remove the parasite without damaging the host*. Our interviewees instinctively sought a compromise that allows for continuity and still mitigates WLT, even though various vulnerabilities would legitimate an inspection of all shipments. By acknowledging distinct stakeholder perspectives within our data, including those of traditional supply chain members (e.g., buying firms, carriers, and forwarders) and supporting entities (e.g., various authorities, NGOs, and academics), this research provides WLT countermeasures that allow for a continuous material flow without (excessive) disruption. Accordingly, stringent enforcement of legislation, smart application of technology, better utilization of process improvements, and demand reduction are suitable in mitigating WLT. This is because these mitigation measures are suitable in reducing the empirically observed continuity-intervention tension. Thus, we present our fourth and fifth propositions as follows:

Proposition 4. *Stringent enforcement of legislation, smart application of technology, better utilization of process improvements, and demand reduction are effective means for WLT mitigation.*

Proposition 5. *Effective WLT mitigation measures, such as stringent enforcement of legislation, smart application of technology, better utilization of process improvements, and demand reduction, reduce the tension between the urgency of intervention and the continuity focus.*

Prior literature individually acknowledges some of these countermeasures, such as the need for more and better regulation (Basu, 2013; Wyatt, 2016; Wyatt et al., 2018), the widespread cooperation among various private and public sector entities (Wyatt, 2016), an intensified demand reduction (Lavorgna, 2014; van Uhm, 2020), the use of technology systems (Shelley, 2018), and a strict security compliance program

(Basu, 2013). However, the WLT literature still lacks a holistic approach to countermeasures, especially from an SCM perspective. This lack is surprising, given that prior reports emphasized the importance of involving private actors (IMO, 2022; Wannenwetsch, 2020). In addition, SCM scholarship has previously highlighted that a proactive stance toward discourse pertaining to public policy can enhance private actors' competitive advantage (Cantor et al., 2022). Given that there is a broad consensus that WLT is a widespread problem on the international policy agenda (European Commission, 2022b; U.S. Department of State, 2021), firms' engagement in WLT mitigation might pose a promising endeavor to achieve competitive advantage.

By considering the perspectives of multiple private and public stakeholders surrounding WLT mitigation measures, this research complements the SCM discourse about establishing supply chain resilience by pointing to collaboration between governments and private actors, as well as among numerous upstream and downstream actors, including competitors, NGOs, and governments (Azadegan & Dooley, 2021; Quarshie & Leuschner, 2020). Finally, the mitigation of WLT contributes to biodiversity conversations and also lowers humanities' contact with wildlife and potential zoonotic transmissions to humans.

Societal risks in global supply chains

Elaborating on our second scholarly contribution, our research builds on, challenges, and extends the dominant orientation of SCRM. Supply chain risk has been defined as the negative deviation from an expected value, with negative impacts for the focal firm (Wagner & Bode, 2006). When they manifest, supply chain risks often lead to disruptions, which can result in ripple effects on different global supply chains (Krausmann, 2004; Regmi, 2001; Yamano et al., 2007). The specific causes for disruptions are manifold, and broad categorizations of these risks commonly range from operational contingencies, natural hazards, including earthquakes, hurricanes, and storms, to issues surrounding political instability and terrorism (Ho et al., 2015; Kleindorfer & Saad, 2005). Consequently, previous discussions of SCRM are centered on the reduction of supply chain vulnerabilities, which can lead to disruptions, with negative performance repercussions for the focal firm (Jüttner, 2005; Manhart et al., 2020; Wieland & Wallenburg, 2012).

Only recently, a new conceptualization of supply chain risks has found its way into the extant literature. Given the increased public and stakeholder attention

accorded to firms' and supply chains' social and environmental repercussions, the still nascent field of sustainability-related SCRM has gained the attention of scholars and managers (Busse et al., 2016; Foerstl et al., 2010; Hajmohammad & Vachon, 2016; Hofmann et al., 2014). Based on the rise in related real-world incidents, scholars have begun to posit that focal firms may also be negatively affected in the absence of disruptions, namely, when stakeholders delegitimize buying firms due to unsustainability in their upstream supply chain (Busse et al., 2016; Hofmann et al., 2014). Such delegitimization in the form of bad press subsequently triggers a loss in market value for the affected firms (Kim et al., 2019; Mateska et al., 2017). By broadening the scope of incidents that firms need to scrutinize (i.e., negative stakeholder reactions), firms are thus inclined to manage their supply chains to avoid the worst sustainability conditions therein. Further, by acknowledging the expectations of stakeholders, who are traditionally seen as outside the supply chain, sustainability-related SCRM "*reconceptualize(s) who is in the supply chain*" (Pagell & Wu, 2009, p. 52).

Despite these advancements in the SCRM literature, scholarly and managerial attention remains predominantly firm centric and focused on the focal firm (Fan & Stevenson, 2018), which disregards a more holistic view surrounding risk. According to well-established definitions, SCRM entails "*the identification, assessment, treatment, and monitoring of supply chain risks [...] to reduce vulnerability and ensure continuity coupled with profitability, leading to competitive advantage*" (Fan & Stevenson, 2018, p. 7). This perspective incorporates two important aspects, namely, (i) a continuity focus and (ii) a profit and competitive advantage perspective. However, WLT challenges this SCRM perspective to the extent that it turns it upside down.

(i) When it comes to the continuity perspective, perpetrators engaging in WLT are naturally interested in a hidden, smooth, and continuous flow of their products along supply chains. The trafficking of wildlife products does not necessarily interfere with the flow of goods through otherwise legal supply chains, for example, through containerized shipping. As this research has shown, continuity is precisely what these criminals, who represent the source of the problem, seek.

(ii) The same argument holds true regarding the profit and competitive advantage focus. Given that undetected WLT does not disrupt supply chains via this form of SCI, the profitability of firms operating along these supply chains is almost never at stake. Furthermore, in cases in which WLT is detected (e.g., through raids, seizures, or proactive prevention), legal supply chain members who are unconsciously involved in these

activities do not appear to experience any accountability. Media reports about WLT primarily focus on the crime aspect as such and hardly scrutinize legal supply chain members' accountability in preventing SCI through WLT (BBC, 2019b; Guardian, 2020; New York Times, 2019). Consequently, material flow disruptions, issues surrounding profitability, and negative stakeholder reactions as reputational threats fall short of capturing WLT as a genuine supply chain risk.

In their conceptual essay, Sodhi and Tang (2021) acknowledge the shortcomings of previous research in SCRM in providing adequate responses to extreme conditions, such as climate change. Against this background, they suggest that the conceptualization of supply chain risks may require a general overhaul, moving away from the perspective of single incidents affecting a limited number of companies for a certain amount of time (Sodhi & Tang, 2021). Interestingly, however, they stop after calling for a reconceptualization of a better SCM for extreme conditions. This empirical research goes beyond their call and, based on its findings, argues that even more is needed: a better SCM to *prevent* extreme conditions from occurring.

Accordingly, we follow the call to incorporate the wider systemic environment in contemporary research (Bansal et al., 2021; Wieland, 2021) and provide a more holistic view of SCRM by introducing the concept of "societal risks" to the SCRM discourse. Societal risks in global supply chains describe hazards that emanate from or materialize within supply chains, and which primarily affect actors in the supply chain context—and possibly even humanity in its entirety. To exemplify this concept within our research context: WLT is a societal supply chain risk whose risk sources are, for example, the poaching of animals or the harvesting of plants that originate from outside the classical supply chain and emerge in the wider supply chain context. Yet, WLT risks manifest within the material flow of supply chains in the form of SCI, that is, smuggling illegal wildlife within supply chains. However, the effects of WLT do not (primarily) affect the material flow within the supply chain and are thus not immediately linked to focal firms or other supply chain actors. To the contrary, WLT has first and foremost a negative societal effect, such as biodiversity loss or, through certain mediating steps, pandemics. Hence, these findings amend the sustainability-related business strategy discourse by highlighting insights regarding barriers for corporate biodiversity management (Schaltegger et al., 2022).

In contrast to sustainability-related supply chain risks, incidents of WLT through SCI pose neither operational nor reputational (sustainability) risks for supply chain members. Yet, WLT is closely linked to biodiversity

loss and increases the likelihood of zoonotic transmission to humans and, in turn, the probability of further pandemics (Lawler et al., 2021; UNODC, 2020). This research highlights that societal supply chain risks arise from or materialize within interconnected, highly complex, globally dispersed supply chains, far outside the realm of current corporate control. However, neither focal firms nor other supply chain members account for these risks.

As we know from other hazards that arise from or materialize within supply chains, corporate practices can pose serious threats to societies. For example, apparently ordinary production and distribution processes of prescription drugs have exacerbated negative consequences for societies in the form of opioid epidemics. This occurs when some supply chain members (e.g., manufacturers, distributors, and pharmacies) strategically decide to supply beyond safe levels of a market, as it has recently been the case in the United States (Skilton & Bernardes, 2022). We may safely assume that there are further phenomena that represent societal supply chain risks, which do pose serious threats not only to societies but also to ecosystems or the Earth's climate.

To summarize, societal supply chain risks denote a broader accountability for unintended consequences that emanate from or materialize within supply chains (MacDonald, 2011; Matos et al., 2020; Matten & Moon, 2008) and thereby transcend existing SCRM concepts. Although they are not directly involved in the economic activities of supply chains, all societal actors can legitimately expect that their interests and concerns are considered and that societal supply chain risks are addressed by supply chain members (Gold & Schleper, 2017; Pagell & Shevchenko, 2014).

WLT as an example of SCI

By empirically elaborating on WLT, this research extends the literature on SCI and SCM. Prior research defines SCI as situations in which an “*unauthorized actor succeeds in inserting (illegal) products into a legitimate supply chain*” (D’Amato & Papadimitriou, 2013, p. 988). According to this perspective, research on illegal activities in otherwise legal supply chains—such as in the context of food supply chains (Smith & McElwee, 2021), conflict minerals (Hofmann et al., 2018; Schleper et al., 2022), and modern slavery and human trafficking (Gold et al., 2015)—could be subsumed under the SCI concept. However, apart from rather indirect links to concepts such as supply chain vulnerability (Wagner & Bode, 2006), supply chain security (Yang & Wei, 2013), supply chain resilience (Wieland & Durach, 2021), and counterfeiting (D’Amato & Papadimitriou, 2013; Yi et al., 2020), SCI has

not been systematically studied within our field, and WLT had not been categorized and investigated as an SCI phenomenon. This research demonstrates how criminals’ preference to exploit otherwise legal supply chains renders WLT an important SCI phenomenon.

Practical implications

Although prior reports have highlighted the importance of supply chain members in mitigating WLT (Wannenwetsch, 2020; Zavagli, 2021), to date, their perspectives have been widely neglected in the operations and SCM literature (Quarshie et al., 2016).

Given how global trade is organized, and considering the difficulties in effectively combatting corruption in supply chains (Silvestre et al., 2020), the influence supply chain members exert over mitigating WLT seems limited, but it does exist. Based on our interviews, the most impactful mitigation measures that firms can directly implement refer to process improvements (particularly customer due diligence, cross-sectoral cooperation, utilization of awareness-raising materials for employees, and wildlife-banning policies) and smart application of technology (especially content-screening intelligence). These practical countermeasures preserve supply chain members’ focus on continuity but still partially fulfill society’s call for intervention. For example, our interviewees frequently stated that supply chain members, such as shipping companies, logistic operators, or forwarding agents, can conduct customer due diligence as part of their risk management to ensure that their customers are engaging in legitimate trade.

In addition, specific knowledge of WLT in terms of high-risk trade routes or smuggling techniques (e.g., common misdeclarations on documents or similarly appearing products to conceal ivory shipments) can be implemented in content-screening systems, primarily by supply chain members who work with cargo documents, to discover WLT shipments. In that vein, cross-sectoral cooperation with NGOs, foundations, and other WLT-focused initiatives are helpful in obtaining valuable information on WLT and specific smuggling techniques. These information streams can also be used to train employees and subcontracted firms and to raise awareness about latest WLT trends, enabling employees to focus their attention on suspicious cargo.

Finally, supply chain members, such as shipping companies, logistics operators, forwarding agents, and downstream actors, including online marketplace providers, can issue and implement a wildlife ban within their company policies. For example, logistics service providers can explicitly exclude the transport of wildlife and

products derived therefrom, or online marketplace providers can identify and block offers that lack clear certification. A strong example is provided by an initiative in which some of the world's largest shipping companies have banned shark fin shipments (WWF, 2017).

Societal implications

This research lays the groundwork for governments and regulatory bodies to implement laws and regulations that secure the accountability of supply chain members when it comes to WLT and SCI. Insufficient voluntary action on behalf of firms may push authorities to decide that, after all, *the removal of the parasite* is more important than the *continued health of individual hosts*. The last decade has already seen an increasing number of laws and regulations aimed at sustainable SCM and at holding firms accountable for misconduct in their supply chains—for example, in the context of conflict minerals (e.g., Dodd-Frank Act, 2010; EU Conflict Minerals Regulation, 2021), modern slavery (e.g., UK Modern Slavery Act, 2015), and, presumably very soon, deforestation (European Commission, 2021).

This research underscores the need for international and cross-sectoral collaboration to grow capabilities, knowledge, and expertise in order to effectively counter WLT and to ensure that interventions are successful. For example, WLT experts working for NGOs, public authorities such as the German Federal Agency for Nature Conservation, and academics make valuable contributions by transferring specific WLT knowledge to legislative authorities at an international level. Such cross-sectoral collaboration resulted in the EU Action Plan against WLT, which devised new measures for demand reduction and for enforcing extant regulations (EU, 2016). Expanding regulatory frameworks for higher supply chain security against WLT by inter-agency, cross-sectoral, and international collaboration has also recently been called for by the IMO (2022). Given policymakers' awareness and interest, legal loopholes can be eliminated, and local enforcement authorities can prioritize WLT in their detection of smuggling attempts. Furthermore, international collaboration fosters the identification of and combat against transnational criminal network structures (see Table 4).

Other countermeasures in our multi-stakeholder approach, for example, improving equipment for detecting wildlife with smart technology applications and raising awareness, can be supported by governments. As an example, the United States Agency for International Development (USAID, 2022) leveraged 4.3 million USD to launch the campaign “beautiful without ivory” to raise

awareness for negative WLT consequences linked to the consumer side in China and to reduce the demand for wildlife products. In addition, the EU committed itself to prevent WLT by financing and supporting anti-WLT campaigns that specifically target consumer-demand reduction (EU, 2016).

Limitations, boundary conditions, and future research

Our research involves some limitations, which should be considered when interpreting the results, and which motivate future research in various ways. Although our research design and questions strongly favored qualitative research to investigate WLT, inductive theory building is subject to limitations, as is every method. In particular, our findings are limited with respect to the final sample and interviewees' opinions therein. We carefully and purposefully selected the interviewed experts to gather a holistic perspective of WLT, and we ensured theoretical saturation (Corbin & Strauss, 2014), but the biggest limitation within our data relates to the fact that they do not comprise direct knowledge from criminals. A few studies in the context of WLT have successfully gained access to perpetrators. However, we deemed such an approach as too dangerous and forlorn due to a lack of contacts in this field. As a consequence, this research does not include detailed information of how exactly criminals make SCI decisions (e.g., in terms of their heuristics and biases). Greater insights into how perpetrators filter and assimilate information would represent a crucial gain for the development of SCI as a distinct research stream. In this respect, future research should strive to investigate WLT and SCI through different methodological angles by obtaining direct insights from criminals, through either primary or secondary data collection (e.g., through police or court protocols). Moreover, the proposed countermeasures should be assessed against their effectiveness in changing criminals' behavior.

With respect to boundary conditions, we acknowledge that the generalizability of our results may be limited and that several research opportunities exist to validate and extend this research's results in different WLT contexts and also through large-scale data analysis. Even though our research provides in-depth perspectives on WLT in maritime supply chains, we empirically investigated the emergence of SCI only in this particular area. Based on insights obtained from the interviews, we assume that important differences may exist between airborne, sea-borne, and land-based supply chains. It appears that maritime supply chains are particularly suitable for large trafficking volumes, for keeping contraband hidden

among other goods, and for wildlife products rather than live animals (Fears, 2014; TRAFFIC, 2020). Similarly, the trafficking of wildlife (products) may differ in important ways from the smuggling of weapons, drugs, or even humans, a topic that requires in-depth investigation. More importantly, we believe that a broader investigation of other SCI phenomena, such as gray markets, copycatting, or third shifts in counterfeiting, may prove fruitful. Specifically, future research should investigate the emergence, manifestation, and impact of other SCI cases to provide a more fine-grained overview of the concept.

Finally, we strongly advocate that the concept of societal supply chain risk should receive additional empirical and conceptual attention. Thus far, SCRM research has primarily focused on the prediction, prevention, and mitigation of focal firm risks. In contrast, this research has clearly indicated a research gap for situations in which supply chains are an integral part of a wider problem but are not the primary locus of negative effects. Societal supply chain risks can severely impact societies and a broad set of stakeholders, but because they do not primarily affect focal firms and their supply chains (through disruptions or reputational impact), they have been largely ignored in our domain to date. In our view, SCRM and sustainable SCM are incomplete unless these externalities are accounted for. Consequently, responsible SCM (research) must be able to narrow this accountability gap by leaving solely (focal) firm-centric arguments behind (Gold & Schleper, 2017; Pagell & Shevchenko, 2014).

CONCLUSION

This research empirically explored the under-researched topic of WLT in maritime supply chains through an inductive theory-building approach based on interviews with a diverse set of stakeholders. We elaborated on the reasons for the persistence of WLT in legal supply chains by identifying a tension between supply-chain-related vulnerabilities to WLT that legitimate an urgency of intervention on the one hand and supply chain members' and criminals' aligned interests in continuity of the flow of goods on the other hand. Thus, we identified countermeasures within the data that reduce this tension as they mitigate the WLT phenomenon while ensuring a continuity of material flow in maritime supply chains. Our data support the assumption that a major share of illegal wildlife trade occurs through legal supply chains. In that vein, we were able to subsume WLT under the wider concept of SCI. Prior research has indicated that the illegal poaching and trade of wildlife (products) results in a significant biodiversity loss and augments humanities'

contact to wildlife, thus increasing potential zoonotic transmissions to humans. Given these negative repercussions, which have gone largely unnoticed by traditional and contemporary SCRM approaches, we advocate for a comprehensive consideration of a new type of risk, denoted as "societal supply chain risk." This new risk category primarily effects society as a whole, rather than individual firms and their supply chains. Consequently, this research presents a nascent step toward a more holistic, more responsible, less firm-centric, and profitability-focused SCM.

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APPENDIX A: INTERVIEW GUIDELINE

This research deals with wildlife trafficking in maritime supply chains and possible entry points to address and mitigate this problem. The Carl von Ossietzky University of Oldenburg (Authors A and C) and the University of Sussex (Author B) are collaborating on this research. The aim of this interview is to develop a better understanding of the development of available countermeasures. The results are anonymized so that no conclusions can be drawn about your company or person. To facilitate the analysis of the content, I would like to record our conversation if you agree.

1. How do you personally encounter the issue of wildlife trafficking in maritime supply chains?
2. In your opinion, what goods can you think of being smuggled through the different supply chains?

3. Can you think of some tricks or strategies how criminals could smuggle illegal goods?
4. How do you find out about incidents of smuggling?
5. Do you see any related weaknesses regarding the general transport process that may facilitate the access for criminals?
6. How is it possible to prevent the criminal access?
7. To what extent does corruption facilitate wildlife trafficking in your opinion?
8. What do you know about criminal behavior?
9. Are you aware of any high security processes to mitigate smuggling of any kind?
10. How do you assess the financial, legal, and reputational implications for companies involved in smuggling (albeit unintentionally)?
11. Which sustainability-related projects currently have the highest priority for you? Where do you see the most need for action and why?
12. How do you personally assess the need to reduce the wildlife trade?
13. Can you compare the issue of illegal wildlife trafficking with the smuggling of other goods or any illegal activities in otherwise legal supply chains? What similarities or differences are there? What predominates (similarities or differences)?
14. Is there anything else that might be relevant for us to understand?
15. Do you have any questions or comments regarding the interview?

We have reached the end of the interview. Thank you very much for your information and the time you have invested!