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Geopolitical Tensions and Their Ripple Effects on Global Trade: Analyzing Supply Chain Disruptions

[1]Assistant Professor Anirudh Ramteke
[2]Assistant Professor Niharika Singh

Abstract

This paper systematically reviews the literature on the impact of geopolitical disruptions on supply chains to identify primary discourses, emergent themes and key gaps to set a future research agenda. The guiding research question is 'how do geopolitical disruptions affect the configuration, flow, and management of global supply chains?'. Through an in-depth literature analysis, this paper demarcates geopolitical disruptions and the resulting impact on supply chains as a new subfield of research. The results indicate that the impact of geopolitical disruptions on supply chains can be mitigated through: (1) supply chain re-design including regionalisation, back-shoring, and moving away from just-in-time delivery models as well as (2) the implementation of emerging technologies, such as blockchain, 3D printing and artificial intelligence, to improve supply chain transparency and the development of modularised manufacturing. This paper is one of the first to define the current state of research and thinking on the impact of geopolitical disruptions on supply chains, laying a firm foundation for future research by setting a detailed research agenda based on identified gaps.

Introduction

Since 2016, the Western world has witnessed a shift towards nationalism and protectionism that has led to tensions between nation states (Bieber 2018; Colantone and Stanig 2019; Noland 2019). On June 23rd, 2016, the UK voted to leave the European Union, setting in motion four long years of uncertainty for UK businesses, including labour shortages and stock-outs on store shelves. In the same year, Donald Trump was elected President of the United States with the slogan of 'Make America Great Again' and encouraging businesses to re-shore production to the US. Shortly after his election, President Trump instigated a trade war with China, imposing tariffs on key commodities (Hille 2020). These tariffs led to many companies moving production out of China, not to the US as President Trump hoped, but to nearby Vietnam, Malaysia and Singapore (Aeppel 2021). If the disruptions caused by these two events were not severe enough, COVID19 began its rapid spread across the world in late 2019, leading many nation states to lurch towards protectionism. Take, for example, the US Government's Defense Production Act that restricted the export of vaccines and Personal Protective Equipment (PPE), or India's restriction on the export of medicines that treat the symptoms of the virus (Williams and Stacey 2021). The pandemic undermined the 'global value chain' model – a production network paradigm which has characterised the world economy over the past 30 years (Barbieri et al. 2020), highlighting the vulnerability of interdependent economies and subsequent risks to supply chains (Mena, Karatzas, and Hansen 2022). More recently, the 2022 Russian invasion in the Ukraine has caused oil and gas prices to skyrocket while cutting off a major artery of trade. This led to a widespread energy crisis within Europe. In 2021, supplies from Russia covered approximately 40% of the EU27's natural gas consumption; with Germany – the EU's largest economy – receiving 65% of their gas supply from Russia (Halm 2022). The implementation of sanctions impacted the security of continuous operations and the competitiveness of Europe's most gas-reliant industries, such as chemicals, steel, cement, glass, refining and coking, and paper and printing production (Hollinger et al. 2022). In response to gas price hikes, European governments introduced price caps to protect private households. Some countries, such as Germany, went even further and extended price protection measures towards industry at a cost of e200bn

(Burchard 2022). A common theme between these events is that conflict between nation states has interfered with the smooth flow of global supply chains. Indeed, the compounding disruptions caused by these geopolitical disputes have prompted many firms to reconsider the design of their global supply chains entirely (Roscoe et al. 2022).

Strategies Among Supply Chain Disruptions

The challenge to employ the newest technological advances looms large in literature reviews on supply chain disruptions. In comparison, Etemadi et al. (2021) review highlights possible challenges related to blockchain, such as privacy and security from cyber threats. The need for further research on the use of blockchain technology in the supply chain is acknowledged in both reviews. Interestingly, none of the analysed reviews focuses on the concept of geopolitical disruptions or tries to establish common characteristics, risks, and mitigation strategies among this specific category of supply chain disruptions. This gap may partly stem from the novelty of this term – defined as conflicts or disputes between nation states that interfere in the smooth flow of goods and services in global supply chains. However, even before the term 'geopolitical disruption' was used in the supply chain literature (Alexander et al. 2022; Moradlou, Reefke, et al. 2021; Roscoe et al. 2020, 2022), the disruptions that could be classified as such have long been prevalent. The closest in-scope review is Charpin's (2022), that looks at nationalism as a trigger for supply chain disruptions. Charpin (2022) observes that nationalism can lead to supply chain disruptions for foreign MNEs, and that political risk factors should thus be integrated into supply chain management studies. However, in his review, he focuses more on nationalist sentiments, economic nationalism, and national animosity instead of relations between the nation states as a source of disruptions.

Discerning three main themes within the discourse helped to provide insights into the main research question: How do geopolitical disruptions affect the configuration, flow, and management of global supply chains? The concept map (see Figure 1) was created to highlight the concepts distilled from the literature review and see how they cut across the identified themes. The value of a concept map lies in identifying key ideas to understand the theory, concepts and relationships between them (Rowley 2012). During the analysis, the researcher uses three processes: subsumption, progressive differentiation and integrative reconciliation. In subsumption, lower-order concepts are subsumed under higher-order concepts, while in progressive differentiation, concepts are broken down into finer components. Progressive differentiation is similar to the process of analysis, while integrative reconciliation occurs when the analyst attempts to reconcile and link concepts on the left side of the map with those on the right. This corresponds to the process of synthesis (Daley and Torre 2010).

Figure 1 shows the result of mapping geopolitical impacts on the supply chains based on the structured literature review. Geopolitical events in Figure 1, lead to an impact on the supply chains. On one hand, this impact leads to technological innovation through disruption and on the other hand to the efforts to re-design the existing supply chains. On the side of technological innovation, two categories of new technologies emerge. One category includes sensors that collect data across different stages of supply chains, Internet of Things networks that communicate and exchange information from sensors, and Big Data analytics tools that can harness the large volume of data points to produce useful insights for decision-makers. The second category is based on the modularisation of the production process. This relies on smart additive manufacturing and 3D printing that allows the cost-effective manufacturing of customised goods closer to major centres of demand (i.e. edge manufacturing). The concept of edge manufacturing directly borrows from the computer sciences where 'edge computing' is ubiquitously used and represents the architecture where computing capacities are situated at the edge of the network, namely close to the consumers and their devices to provide a higher level of responsiveness (Satyanarayanan 2017).

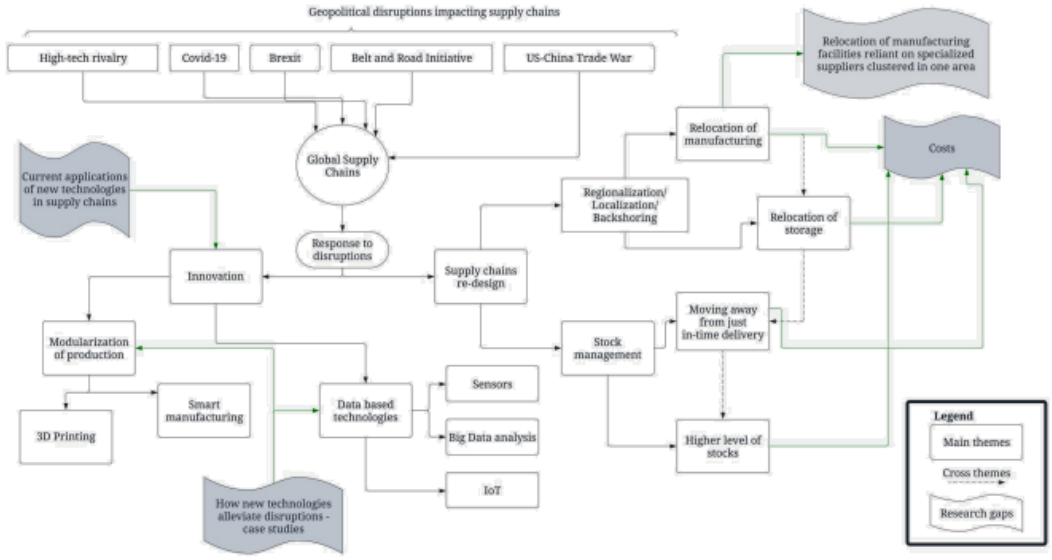

Figure 1

As the arrow in Figure 1 shows, the modularisation of production, identified within Theme 3 'technology', supports the trend of supply chain regionalisation identified within Theme 2 'supply chain design'. Similarly, the data-based category of technology supports the novel approaches to stock management highlighted in Theme 2, with the potential to provide higher transparency to the stock levels across the supply chains in real-time. Supply chain re-design efforts, as a consequence of geopolitical disruptions, narrow down Figure 1. Concept mapping framework. PRODUCTION PLANNING & CONTROL 5 to regionalisation of supply chains strategies and aforementioned stock management techniques. Regionalisation of supply chains can be broken down into relocation/construction of manufacturing and storage facilities in new geographical areas, ideally with a view of establishing an independent, self-sufficient supply chain, free from geopolitical disturbances. Considering the complexity of today's supply chains, e.g. in the automotive or portable electronics industry, such ideas are very difficult if not impossible to implement. Particularly the complexity from the perspective of the supply base (Ates¸ and Memis¸ 2021), plays a role here. The structured literature review identified the gaps in our understanding of the viability and costs of supply chain decoupling. Green lines in Figure 1 point out other identified research gaps which are further discussed in the following section.

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