

Analyzing Global Supply Chains in the Times of Disruption: A Literature Review on Structural Dynamics and Challenges

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Abstract

The global supply chains for different products, due to the increasing complexity, have nowadays exposed their vulnerability to countless disruptions, including natural disasters, pandemics, geopolitical tensions and trade wars. This review paper critically studies 17 scholarly publications focusing on global supply chains, especially around key products such as seafood, lithium, steel, energy, pharmaceuticals, agrifood, and others. The review identifies the major parties involved in the supply chains and significant business impacts, outlines obstacles and challenges, and explores the role of geopolitical tensions. The review finds geopolitical tensions have become the dominant challenge, along with technological and market forces which may restructure global logistics, trade dependencies, and risk strategies. It also finds some strategic initiatives taken by the practical world for these issues. It aims for a detailed exploration on recent geopolitical tensions as one of the most affecting supply chain disruptions under one umbrella rather than what is stated in the previous studies. Finally, some recommendations have been provided to cope with this disruption such as sourcing strategies, resiliency, visibility and digitization.

Keywords

Global Supply Chain, Traded Products, Geopolitical Tensions, Resilience, Disruption.

1. Introduction

Our world has reshaped itself over times in terms of international and global interactions. Global trade or business is one such form of global interaction without which, every operation may be stalled. However, recent human and

political disruptions such as COVID 19 and wars around the world have exposed vulnerabilities of global trade drastically. Today, business world is not concentrated on one specific area or location, it is geographically dispersed and connected through various crucial parties. Global supply chain is a very important aspect of international or global trade, which is in existence from the beginning of product request placement to the delivery to the customer at some other corner of the world. Global supply chains are that independent supply chain system that facilitate the international movements of goods and services across country boundaries. Over the past few decades, globalization, technological developments, and liberalized trade rules, regulations and policies have facilitated the proliferation of these networks (Freund et al. 2024). However, while performing the major operations in the global trade, the supply chains are heavily impacted by country borders and rules relevant to the borders, environmental, political and other constraints and challenges prevailing in all the involved countries. These complex networks are exposed to their inherent vulnerabilities due to the COVID-19 pandemic, increasing geopolitical tensions like the Russo-Ukrainian war, and escalating U.S.–China trade tensions, and rising protectionism. For example, supply chain configurations are altered significantly due to COVID 19 disaster, forcing firms and governments to reconsider their supply chain management strategies, i.e. sourcing strategies, supplier diversification, and the localization of production networks (Panwar et al. 2022). This signifies the critical importance of examining supply chains both from an efficiency standpoint and in terms of risk, resilience, and sustainability.

1.1 Research Gap and Objectives

Research Gaps

This literature review systematically analyzes key published contributions to the understanding of global supply chains.

1. While previous studies have focused on global supply chains from product point of view, in this paper it is presented in the review section from generic point of view. The business impacts arising from supply chain disruptions are also presented based on the global supply chains on general terms.
2. Some of the previous studies explored around few disrupting challenges and tensions of global supply chains. However, none of them focused on integrating all types of tensions under one umbrella. In this paper, the most significant tensions and challenges currently threatening global supply chain resilience are attempted to be presented altogether including the most recent ones, i.e. geopolitical tensions.

Objectives

This paper aims to fill in the research gaps found based on these themes.

1. This study aims to identify the most affecting supply chain disruption for global trades.
2. It aims for a detailed exploration on recent geopolitical tensions as one of the most affecting supply chain disruptions.
3. Another main purpose of this study is to provide some improvement strategies in order to better cope with the sudden and ongoing supply chain disruptions in global market.

For the purpose of satisfying the above themes, this study seeks to provide a coherent and deep understanding of contemporary global supply chains, emerging risks surrounded around these networks and suggest way for enhancing resilience in an increasingly uncertain global environment.

2. Literature Review

2.1 Parties Involved in Global Supply Chains

Global supply chains are composed of a diverse array of interconnected parties that span multiple sectors, industries, and geographical locations. The smooth functioning of the supply chain from raw material extraction to final product delivery is possible when each participant plays a critical role. Based on the reviewed literature, several key stakeholders emerge significantly.

Producers and Manufacturers

Producers and manufacturers are those parties who convert raw materials into finished goods. For example, producers of the seafood supply chains faced immense challenges related to labor shortages during COVID 19 pandemic (Lara Veylit et al. 2025). Similarly, manufacturers in lithium and steel production faced difficulties due to limited access to essential inputs and transportations (Jin et al. 2023).

Suppliers and Sub-Suppliers

Suppliers are the backbone of a supply network, initiating the main production process by providing necessary inputs to manufacturers, adding to the complexity with the involvement of sub-tier suppliers. As Wang, Tan, and Liu (2023) note, sub-tier suppliers often present the "hidden" vulnerabilities within the chains (Wang et al. 2025).

Logistics and Transportation Providers

Shipping companies, freight carriers, and logistics firms are very essential for moving goods and products across international borders. A significant disturbances like port congestions, increased shipping costs, and prolonged delivery times due to the pandemic and geopolitical issues (Jomthanachai et al. 2022).

Distributors and Retailers

Distribution centers and retailers form the critical link between supply chains and end users. Any sort of disruptions at the storages at production or transport stages heavily impact inventory levels, pricing, and consumer satisfaction. As observed during the pandemic, agrifood and pharmaceutical supplies shortages affected the distributors and retailers worldwide (Pava and Tucker 2023, Zhang et al. 2024).

Regulatory Bodies and Governments

Governments and international regulatory agencies are vital players in global supply chain dynamics as they involve in the trade through policy interventions, trade agreements and tax/tariffs. Geopolitical tensions such as the U.S.–China trade war and the Russo-Ukrainian conflict are good examples of how state actions can abruptly reshape supply routes and affect access to critical commodities (Freund et al. 2024, Cui et al. 2023).

Financial Institutions and Insurance Providers

Financial institutions are yet another crucial party of the global supply chains. Banks and investment firms are required for funding activities to help stabilize cash flows for the suppliers. On the other hand, insurance companies are required for dealing with financial risks by providing security against political risks, natural disasters, and transportation losses (Charpin and Cousineau 2024).

Non-Governmental Organizations (NGOs) and Advocacy Groups

NGOs increasingly influence supply chain practices by involving in ethical sourcing, sustainability, and labor rights. For instance, environmental and human rights organizations have heightened pressure on companies to ensure responsible sourcing of conflict minerals and sustainable seafood harvesting practices (Panwar et al. 2022).

Technology Providers

Finally, technology provider with tools like blockchain, IoT-based tracking, AI-driven analytics, 3D printing are increasingly being pivotal party in the global supply chains. Their role seems to be prominent, especially in enhancing visibility, traceability, and real-time risk assessment (Rejeb et al. 2022).

2.2 Impacts of Global Supply Chain Disruptions

The literature reveals that the impacts of the disruptions to global supply vary depending on the industry, geographical exposure, and supply chain structure. The impacts can be seen on business operations, financial performance, and strategic planning across industries.

Increased Operational Costs

One of the most immediate impacts of supply chain disruptions is a significant increase in operational costs. Rising transportation expenses, surging raw material prices, and additional compliance requirements have collectively increased supply chain costs. According to one scholar, inefficiencies induced by COVID-19 led to operational cost increases of up to 20–30% in certain manufacturing sectors (Jomthanachai et al. 2022).

Supply Chain Reconfiguration

Many firms are now reassessing their sourcing strategies due after being hit by disruptions. They are now focusing more on nearshoring strategies and geographic concentrations (Panwar et al., 2022). For instance, pharmaceutical companies, heavily dependent on Chinese and Indian suppliers for active pharmaceutical ingredients (APIs), are now seeking alternative sources to build resilience (Pava and Tucker 2023).

Financial Volatility

Supply disruptions create falling effects on revenue streams and cash flows. For example, in energy supply chains, the Russo-Ukrainian conflict caused severe price volatility, drastically affecting cash flows of both suppliers and buyers (Cui et al. 2023).

Reputational Risks

Reputational damage is something which is very difficult to recover, specially when they fail to meet delivery commitments or when they practice unethical activities. According to Rejeb et al. (2023), consumers demand transparency regarding company’s sourcing practices and other environmental, social, and governance (ESG) expectations (Rejeb et al. 2022). Gray-market trading, particularly in pharmaceuticals and technology products during disruptions, also can be a risk for brand integrity (Li et al. 2021).

Innovation and Strategic Shifts

Conversely, disruptions have been a boom for innovation. Some firms are adopting technologies such as AI-based supply chain visibility tools, blockchain and digital twins (Rejeb et al. 2022). Furthermore, resilient supply chain building is a high priority for many companies now as a core competency (Moradlou et al. 2025). Interestingly firms rapidly adapt to these shifts to mainly gain competitive advantages in the post-disruption environment, rather than only to recover from damages (Gopinath et al. 2025).

3. Methods

A systematic literature review was done to identify the relevant papers.

3.1 Literature Search Strategy

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), a widely accepted and applied technique for conducting and reporting systematic reviews, has been used for the literature review (Davis et al. 2014; Moher et al. 2009).

Keywords: A combination of specific keywords were used: global supply chain, traded products, electronics, textiles, pharmaceuticals, challenges, geopolitical tensions, resilience, disruption (Table 1).

The combined keywords which were finally used in literature lookup are listed below in Table 1:

Table 1. Combination of Keywords

Global supply chains AND most traded products	Global supply chains AND challenges
Resilience of global supply chains AND electronics/textiles/pharmaceuticals	Global supply chains AND geopolitical tensions
Resilience of global supply chains AND textiles	Global supply chains AND trade disruption
Resilience of global supply chains AND pharmaceuticals	Global supply chains AND recent trends
Global trade flows AND product supply chains	Global supply chains AND wars
Top traded products AND global supply chain management	

Data Source: Articles were explored on Web of Science and Science Direct.

3.2 Inclusion/Exclusion Criterion

Articles with publication date between year 2020-2025 have been chosen for exploration. Research paper and conference paper have been chosen as the type of publications for inclusion for review. Specifically, articles focusing on global supply chain structure, dimension and challenges have been focused on for further study.

Among around 10000+ publications, 17 articles were retained for the purpose of this study.

3.3 Screening Process

The literature review was conducted systematically in 3 steps. Figure 1 shows the PRISMA methodology step by step.

Identification: In the first step of identification, around 10323 articles were found based on the keywords and their combinations. In this step, whichever articles had the combination of keywords present in their titles, irrespective of any relevant relationships, have been selected for further screening.

Eligibility: In the second step of eligibility screening, only 130 articles were retained after applying the inclusion exclusion criterion mentioned above and considering the relationship between the keywords. Publications which did not state any relationship among the keywords stated from the title, were excluded from this step. Also, duplicate publications like same topic as journal and conference and duplicates from the different data sources have been removed.

Inclusion: In the final step, the abstract review resulted in finally 17 publications for literature review.

4. Results and Discussion

4.1 Complications and Challenges in Global Supply Chains

Global supply chains are increasingly being subject to a complex web of risks and operational challenges that expose their fragility. Drawing from the reviewed literature, several major types of complications consistently emerge across industries (Figure 1).

Supply Chain Visibility and Traceability

One of the most persistent challenges is the lack of end-to-end visibility across the networks. Many firms, involved with multi-tier suppliers, often lack in-depth knowledge beyond their immediate partners (Wang et al. 2025). This lacking makes it difficult to anticipate sudden disruptions and implement timely risk mitigation measures. The seafood and lithium industries, were cited as examples in several studies where limited traceability and visibility intensified the damages and vulnerabilities during COVID-19 disruptions (Lara Veylit et al. 2025, Jin et al. 2023).

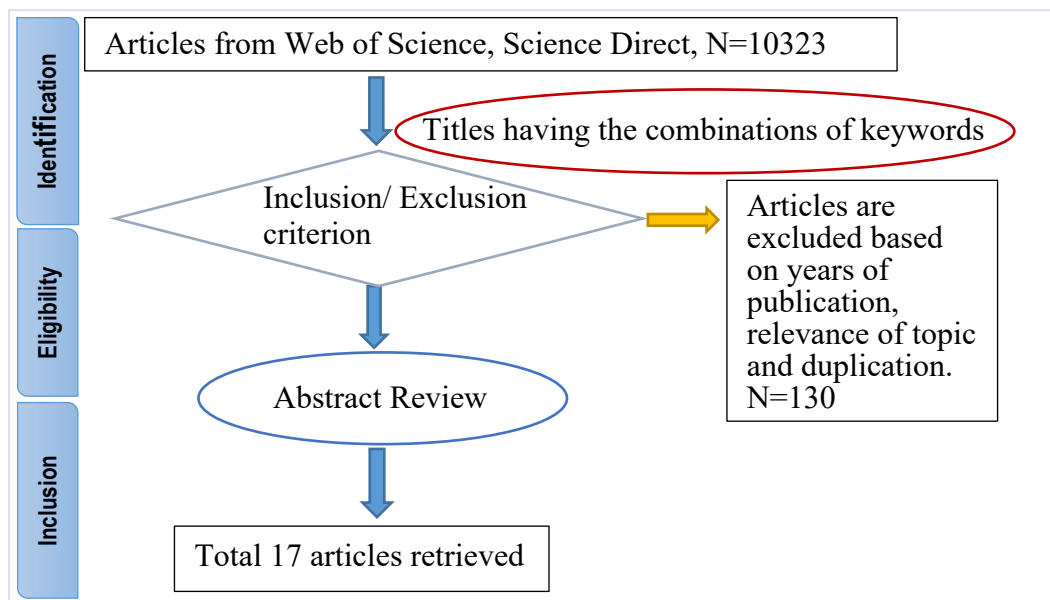


Figure 1. PRISMA Methodology

Complexity and Interdependence

Supply chains are like a huge spider web with highly interconnected systems, making them vulnerable to arising failures. As demonstrated by Hao et al. (2022) in the global steel product chain, disruptions in China's production facilities quickly propagate through multiple layers, worsening impacts downstream (Hao et al. 2024). The concept of structural ambidexterity — having an effective balance between efficiency and resilience, becomes critically challenging to achieve (Moradlou et al. 2025).

Regulatory and Trade Barriers

Global supply chains are affected by some external complications by a huge extent. Always changing trade policies, tariffs, and sanctions represent major such issues. Freund et al. (2020) highlight the effect the U.S. trade policies had on global manufacturing hubs, leading to costly reconfigurations (Freund et al. 2024). Similarly, some policies can change the way or routes the products get transferred generally. For example, bilateral trade frictions, such as between

the U.S. and China, as well as the EU's energy policies in response to the Russo-Ukrainian conflict, disturbed the established supply routes (Góes and Bekkers 2022).

Labor Shortages and Workforce Instability

Labor shortage and labor instability is one such problem without fixing which no operation can be done. During the COVID-19 pandemic, labor shortages across seafood processing facilities, agrifood networks, and transportation sectors tremendously hampered supply chain performance (Lara Veylit et al. 2025, (ava and Tucker 2023). Automation could be a long-term solution, but emerging economies are yet to accept its implementation on large scale (Rejeb et al. 2022).

Cybersecurity and Digital Risks

With technology, there comes some unavoidable issues. As supply chains become more digitized and IT centered, they become more vulnerable to cyberattacks and cyberthreats. Supply chain cyberattacks, such as ransomware attacks, can create new systemic which can lead to disruptive situation (Rejeb et al. 2022). Additionally, too much digital dependencies can be a source of vulnerability, specially in case of system failure.

Natural Disasters and Climate Change

Physical damages from natural disasters and extreme weather events present ongoing threats to global supply chains. Earthquakes, hurricanes, and floods regularly disrupt production centers and transportation networks in multiple countries and locations. In industries such as agrifood and energy, climate related unpredictability can hamper the supply chain activities and performance significantly (Panwar et al. 2022).

Resource Scarcity

Competition over critical resources such as lithium, rare earth minerals, and oil has intensified complications. Global lithium supply chains are vulnerable due to geographic boundaries and dependence, making resource scarcity a major challenge (Jin et al. 2023).

4.2 Geopolitical Tensions and Global Supply Chains

One of the most significant external shocks to global supply chains is geopolitical tensions, which are generally complex, multilayered and often unpredictable.

Impacts of Geopolitical Tension on Global Supply Chain:

Reconfiguration and Fragmentation of Supply Chains

The reconfiguration of global trade relationships are often the end results of geopolitical complications. For example, the U.S.–China trade war made many firms to move some of their manufacturing factories from China to other regions of Southeast Asia and other location (Freund et al. 2024). These efforts reduce dependency from politically affected countries, but it fragments the supply chain making it less efficient and difficult to coordinate. Also, the Russia–Ukraine war triggered widespread energy insecurity in Europe, leading to major sudden changes in import strategies and renewed investments in alternative energy supply chains (Cui et al. 2023).

Strategic Resource Nationalism

As vital resources become increasingly politically affected, countries are adopting protectionist measures. The global lithium supply chain is a prime example, where control over extraction and refinement capacity is concentrated in a few regions (Jin et al. 2023).

China is dominant over rare earth minerals and battery-grade lithium which has forced Western countries to seek alternative strategies for achieving competitive advantage and diversity (Li et al. 2021).

Trade Policies and Regulatory Changes

Formal trade sanctions, embargoes, policies, or non-tariff barriers disturb the existing supply routes. The Russo-Ukrainian conflict led to swift impositions of sanctions by the U.S., EU, and other allies, directly impacting energy, fertilizer, and grain supply chains. These actions have long-term effects on global trade, for which companies are now adopting dual supply systems — one for the Western bloc, another for sanctioned or non-aligned states (Gopinath et al. 2025).

Security Concerns of Trade and Critical Infrastructure

Beyond economic measures, strategic transport hubs such as ports, pipelines, and data routes have become security concerns. Enhances surveillance and military presence in trade-critical zones are prevailing. Charpin and Cousineau (2023) state that firms must keep buffer against sudden access denial caused by conflict escalation or maritime disputes (Charpin and Cousineau 2024).

Strategic Decoupling and Dual-Sourcing

Geopolitical tensions have also caused the trend of decoupling by reducing economic interdependence for national security reasons. The semiconductor industry in USA is an example here: U.S. export has directly affected China's tech ecosystem, prompting strategic investments in self-sufficiency. Dual-sourcing and multi-regional manufacturing are becoming popular as single sourcing from politically sensitive regions can hamper drastically in times of disruptions (Panwar et al. 2022).

Rise of Geopolitical Risk as a Core Business Metric

Goes and Bekkers (2022) emphasize that global firms now conduct scenario planning based on potential and emerging geopolitical issue as they consider it as a core business metric, such as Middle East tensions (Góes and Bekkers 2022).

Most Affecting Geopolitical Issue: U.S.–China Rivalry

Among the various geopolitical tensions reviewed from the multiple studies, the U.S.–China strategic rivalry is consistently identified as the most disruptive issue for global supply chains. This rivalry's impact is broad and systemic as it spans through trade, policy, transport, tariff etc.

The long-term consequences include structural modifications of global supply systems, technological dependency, and persistent uncertainty. Given China's central role in manufacturing and the U.S.'s role in global policy and innovation ecosystems, disruptions here ripple across all industries — from pharmaceuticals and semiconductors to agrifood and energy (Freund et al. 2024).

Global Strategies to Mitigate the Impacts of the Challenges:

During the multiple geopolitical tensions around the world, many companies had to take some drastic strategic supply chain decisions. Those strategies helped them to fight the tensions. Some are stated below:

Diversification of Supply Chains: The diversification of the supply chains enables global businesses to mitigate risks by decentralizing their assets and operational activities into multiple places. It reduces the dependency on a single supplier. (Maishera Grace Ifraimu et al. 2024, pp. 31–34). Some strategies taken are multi-sourcing and supplier redundancy, nearshoring or reshoring critical operations and multiple supplies consolidation.

Building Strategic Alliances and Partnerships: A strategic partnership with some significant and critical suppliers can mitigate the risk of sudden geopolitical disruptions (Maishera Grace Ifraimu et al. 2024, pp. 31–34).

Adoption of Technology and Automation: Global supply chains are hugely benefitted by the application of technologies like artificial intelligence (AI), machine learning (ML), blockchain, and the Internet of Things (IoT) by getting real-time data, future predictions, and improved visibility. (Celestin and Sujatha 2024).

Avoiding Conflict Zones: Sometimes simply avoiding the conflict zones works for many companies in times of geopolitical tensions. For example, in January 2024, container freight rates increased sharply due to US and UK airstrikes in Yemen. The strikes aimed at attaching Red Sea shipping which forced many container ships to avoid the Suez Canal which significantly increased transportation time and costs. But it saved major loss of losing all shipments due to the attacks (Rashyvalov et al. 2024).

Building Supply Chain Resiliency: Some strategies taken by the supply chain to build resiliency in supply chains are maintaining safety stocks of crucial components, developing backup and restoration plans to maintain operations, regularly updating the plans as required to maintain effectiveness (Oladele 2024).

4.3 Proposed Improvements: Recommendations for Firms and Policymakers

Given these realities, firms and policymakers should prioritize:

- Multi-sourcing and nearshoring strategies: Choosing multiple suppliers for sourcing of a material can give advantage in times of disruption. If there is a long route to bring supplies from a party, then nearshoring can prevent the hassle of geopolitical situations.
- Enhanced supply chain transparency and digitalization: Improved visibility is always a good option to track whether any supplier will default in times of global issues or not.
- Having scenario analysis into enterprise risk management frameworks.
- Investment in supply chain resilience: Building a responsive supply chain from beforehand can warrant against any types of disruption, not only against geopolitical tensions.
- Stronger collaboration with governments and international organizations.

Firms that build flexible, redundant, and geopolitically informed supply chains will have a significant competitive edge in this new global environment.

4.4 Future Research Direction

Future research studies can be aimed to explore further for any specific global product and its supply chain, i.e. what global disruptions it faces and how it is tackled in one specific country. Further studies can be undertaken to identify firm level actions and reactive measures as part of resiliency and measures taken for proactive protection.

5. Conclusion

From the review of multiple studies, it is clear that global supply chains are entering a new era characterized by increased fragility, vulnerability, complexity, and geopolitical complexities. A global supply chain may have majorly 8 parties involved in the operations. These parties are impacted hugely in terms of financial aspect, reputations, reconfiguration and strategic shifts during and after any supply chain disruption. The reviewed literature highlights that along with the traditional challenges and risks of the supply chains, such as natural disasters or operational inefficiencies, geopolitical factors are one emerging disrupting forces. 8 major complications were identified affecting the global supply chain performance unfavourably. The most affecting challenge was geopolitical tensions, such as U.S.–China Strategic Rivalry and most recently before the development of this paper is Iran-Israel war. Policy makers are recommended some actions, if followed, can relieve much of the global pressures and challenges arising from disruptions like geopolitical issues. Future researchers are suggested to take further with a specific global product from a specific country perspective or a specific firm from resiliency perspective.

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Biography

Shahanaj Sultana is the first author of this paper. She completed her MASc degree successfully in Industrial Systems Engineering from the University of Regina in Saskatchewan on 2024. Before coming to Canada, she used to work in a bank in Bangladesh with her educational background in Management Information Systems (MIS). During her masters program, she was in the thesis-based program. Her thesis topic was based on 3D printing and construction supply chain. The thesis focused on the advantages 3D printing offers due to its unique automatic construction features and how these benefits can be leveraged to solve the numerous challenges traditional construction supply chain faces. The aim of her thesis was to suggest a framework to link those benefits and challenges by developing some challenge mitigations strategies. Currently, she is pursuing a PhD program in the same field from the University of Regina in thesis-route. Her thesis is ongoing and is mainly focused on geopolitical disruptions on global supply chains.