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GLOBAL SUPPLY CHAIN DISRUPTIONS AND SHIFTS IN EXPORT STRATEGIES OF LOGISTIC FIRMS

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ABSTRACT

The global supply chain landscape has undergone substantial disruptions due to a number of issues including but not limited to geopolitical tensions, climate change, technological advances, and post- pandemic restructuring. These dynamics have reshaped traditional supply chain models, compelling logistics firms to re-evaluate and adapt their export strategies. For instance, the integration of digital technologies such as artificial intelligence, block chain, and the Internet of Things (IoT) has enhanced real-time tracking, automation, and decision-making, improving supply chain efficiency in global trade. Consequently, geopolitical events, international conflicts, economic sanctions, political changes and even natural disasters have unprecedented consequences on global logistics systems, affecting the stability of supply and the efficiency of business operations. The increasing number of disasters caused by extreme weather events such as persistent drought, floods and hurricanes, not only affect the lives of societies, but also affect logistics and supply chains. Production centers in different parts of the world and the international logistics infrastructure, which ensures that the goods produced in these facilities reach the markets are adversely affected. The COVID-19 pandemic added to the growing list of causes of supply chain disruptors. The pandemic exposed deep vulnerabilities in global supply networks, revealing over-reliance on specific sourcing regions, limited buffer capacities, and a lack of visibility across cross-border operations. This shock accelerated a paradigm shift towards more resilient, agile, and regionalized supply chains. The pandemic accelerated the "flight to digital" for businesses and consumers, and this behavior is unlikely to be reversed in the future. These disruptions have had far-reaching consequences, from increased costs and delivery delays to complete disruption of production processes. Understanding how these disruptions affect our economies is key to managing risk and ensuring the stability of international logistics. This study examined the evolving nature of global supply chain dynamics and their direct and indirect effects on the export strategies of logistics firms

across different regions. Utilizing a qualitative research approach that includes case studies of leading logistics firms, analysis of industry reports, and expert interviews, the study identified key strategic responses such as formation of strategic alliances, sustainable shipment arrangement, operational adjustments and optimization of transportation networks. The research design employed in this study was descriptive. This study relied heavily on secondary data as is the case with most desktop research study. The study reviewed journal articles, unpublished papers and conference papers on global supply chain shifts and export strategies of logistic firms across the globe. Findings reveal that logistics firms are increasingly pivoting towards strategic alliances and operational adjustments together with flexible, data-driven, and environmentally sustainable export strategies tailored to navigate regulatory complexity, infrastructure constraints, and demand volatility. Diversifying transport routes and implementing business continuity planning are the most critical strategies that can be implemented by logistics firms in such crisis to enhance resilience. The paper contributes to the growing discourse on supply chain resilience and offers practical insights for logistics firms seeking to align their export strategies with the realities of a rapidly shifting global trade environment. This study recommends that there is need for agility, sustainability, and digital capabilities to more pronounced than ever in global logistics systems. Firms that proactively align with these shifts stand a better chance of maintaining competitiveness and resilience in a volatile global trade environment.

Key Words: *Supply Chain, Geopolitical Tensions, Climate Change, Technological Advances, Post- Pandemic Restructuring*

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BACKGROUND OF THE STUDY

Global supply chains are crucial for international trade and economic growth. However, in the recent years, supply chain disruptions have exposed vulnerabilities that has necessitated strategic adjustments. For exporting firms, understanding and adapting to these changes is essential to maintain competitiveness in the global market, (Riaz, Ullah, & Muhammad,2025; Andriantomanga, Bolhuis & Hakobyan, 2023). International trade has come under unprecedented stress as a result of Brexit, US-China trade tensions, the global financial and economic crisis, the Covid-19 pandemic, and geopolitical shocks including conflicts and political instability in the Middle East such as the war of Israel and Hamas, war in Yemen, tensions between Iran and Saudi Arabia and China and Taiwan trade tensions, (Alfaro &Chor,2023).Consequently, the United Kingdom's decision to leave the European Union, commonly referred to as Brexit, introduced uncertainty and complexity into supply chains operating between the UK and the EU, (Mishra *et al*,2024). The crisis in Syria, the Israeli-Palestine conflict, and Russia-Ukraine conflict poses global economic threats, potentially eroding interdependence and affecting globalization,(Wang, Du & Peng, 2024).Geopolitics and trade tensions around the world, have prompted many businesses to relocate parts of their supply chains. As more businesses consider how to derisk their supply chains, the race to rebalance is getting more and more competitive, (PWC, 2023).

Global supply chains, complex cross-border organizational structures and industry networks that are necessary to develop, produce, transport and deliver goods or services across the world, can be at high risk in the face of unexpected events and global pressures. With the war in Ukraine and in the Middle East, reinforcing the need for logistic firms and countries to rapidly build more resilient and diversified supply chains is inevitable, (UNCTAD, 2022). The Israel-Hamas conflict for instance, is a long-standing geopolitical issue characterized by periodic flare-ups of violence and tensions. Considering that its proximity to crucial trade routes and

energy resources, renders the region a strategic importance. Any escalation of the conflict can have ripple effects on the global logistics and supply chain industry, (Sidharth, 2023, November 13). For instance, on October 7th 2023, Hamas terrorists attacked Israel from Gaza. By 1 December,2023, around 1,332 Israelis had been killed including 395 IDF soldiers, 10 Shin Bet agents and 59 police officers, and at least 1,271 were been wounded, (Margolin, & Levitt, 2023.Nov, 2023). Hamas said its attack was in response to the continued Israeli occupation of the Palestinian territories, the blockade of the Gaza Strip, the expansion of illegal Israeli settlements, rising Israeli settler violence, and recent escalations. This war caused multifaceted risks to supply chains leading to either stopping/pausing of shipping activities or re-routing of shipping services, (Zanotti,2024). According to (*Notteboom, Haralambides & Cullinane,* 2024), the red Sea region is becoming increasingly important in global geopolitics. Given its importance for global trade and security, growing geo-economic projections, military rivalries and their risk of confrontation between key regional players and international actors are growing and could have far-reaching and disruptive repercussions. A study by (Mishra *et al*,2024) posits that, the renegotiation of trade agreements, changes in customs regulations, and the introduction of new border controls can disrupt the seamless movement of goods across borders. Delays in customs clearance procedures, increased transportation costs, and uncertainty regarding future trade relations can impact supply chain efficiency and profitability for logistic firms across the globe.

The global financial and economic crisis and post-COVID-19 restructuring

The global financial and economic crisis which began in 2008-2009 with large investment banks based in the United States collapsing, resulted into unprecedented deterioration of the world economy and in the tightening of credit and a fall in demand for certain goods and services around the world. A decade later, in 2019, the coronavirus pandemic (COVID-19) further exacerbated the already complex global supply chains, with significant shifts in logistics and supply chain activities affecting the performance and profit margins of many businesses and industries worldwide, (Raj *et al,* 2022). Covid-19 caused 'systemic disruption in supply networks with distinctive characteristics such as long-term duration, unpredictable scaling and simultaneous disruptions in supply, demand, and logistics infrastructure, (Bednarski, 2023). According to (Ramani, Ghosh, & Sodhi 2022), COVID-19 joins the list of geopolitical events, because it led to protectionist measures by nation states including personal protection equipment (PPE) hoarding and vaccine nationalism, which subsequently led to trade tensions. Thepandemic-related lockdowns and border closings constrained the supply and deliveryof raw materials, critical products and other consumables,(Okafor *et al,* 2021). These pandemic-related implications, combined with a labour shortage (for example, in the manufacturing, transportation and warehouse sectors), resulted in manufacturing inefficiency or shutdowns; congestion on maritime, air and terrestrial routes; and a global shortage of key logistics components, such as shipping containers, (Musella, 2023). The effects of COVID-19 restrictions – massive delays and higher air and ocean freightprices – incited some companies to start looking for other ways to build more resilient supply chains and mitigate the risks of future shocks, (Li, 2023). A report by UNCTAD,(2022),posits that thecost of shipping a 40-foot container from Shanghai, China to New York, United States(Asia–North America East Coast route) rose fivefold from $2,325 in September 2019 to $11,778 in September 2021. On the route Shanghai-Durban (in South Africa), the cost of shipping a 440-foot container also rose, two-and-a-half-fold, from $2,521 to $6,450between December 2020 and December 2021. According to the (World Bank report, 2020; Ezeaku *et al*,2020), the underlying externalities on commodity prices are contingent on the type of commodity. Based on the narrative, at the onset of the COVID19 pandemic: (i) the monthly price of crude oil substantially dropped by almost 50% to a historic low as some benchmarks were trading at negative levels. (ii) Metal prices also fell, with the most significant drop in zinc and copper which were directly linked to the slowdown in global economic activity. (iii) Prices of agricultural commodities which are less linked to economic growth did not drop significantly, with the exception of rubber which is directly linked to transportation activities.

The Middle East Crisis

The Middle East crisis, marked by escalating tensions and disruptions in one of the world's most critical maritime trade routes, have sent shockwaves throughout the global logistics landscape. The marine chokepoint (Strait of Hormuz, Bab-el-Mandep Strait, the Strait of Malacca, the Danish Strait, the Turkish Strait, Cape of Good Hope, Strait of Gibraltar, Suez Canal and Panama Canal), denoted as a "critical juncture in the maritime supply chain", represents a pivotal area of investigation in the disruptions of global supply chains, (Wang, Du & Peng, 2024). The Red Sea route supports more than 20 percent of international container traffic with an estimated 12% of global trade, worth more than $1tn (£790bn) passing through it every year,(Khandare, 2024). The crisis has caused re-routing of ships through the Cape of Good Hope, compelling ships to add more days to their journeys, accompanied by increased costs, port congestions, increased maritime insurance, increased freight charges and transit time stretching from around 14 days to 48 days. This has heightened logistical uncertainties hampering timely delivery of goods and delays of consignments, causing jitters among supply chain members, jeopardizing valuable trade relationships and contracts,(Congressional Research Service,2024).

The ripple effects of the Red Sea diversions have expanded into the energy market and despite repeated attacks on Houthi rebels by the U.S. and allies, shipping experts say the crisis may linger for years and lead to a cargo container Supply Crunch. Fears are also growing over worsening perils for commercial shipping, maritime as insurance premiums edge upwards on increased risks on the Red Sea, (Chauhan *et al*,2022). Taking sides in the Israel-Hamas conflict could worsen trade relations and inflation, while rising global crude oil prices could impact industries, (yoganandham,2023). According to (Sidharth, 2023, November 13), the objective of the Gaza conflict reaction was to incite a retaliatory move that would affect Israel's standing internationally and chances for peace. Making the martyrs of Gaza's people a bigger cause is the strategy's main goal, which might have an impact on human lives, the balance of power in the region, and world peace. The prolonged Israel-Hamas conflict has caused oil prices to transcend the Brent standard and is predicted to average $90 per barrel internationally, prompting the World Bank to warn of a potential oil price disaster. The World Bank issued a warning about a possible 75% spike in oil prices as a result of rising tensions in the Gaza Strip and possible spillover effects from the Middle East conflict, (yoganandham, & kareem,2023).

Russia -Ukraine War

The Russian invasion of Ukraine that began on 24 February 2022 has led to the loss of lives, property, assets and infrastructure in Ukraine, resulting in a humanitarian disaster. It has disrupted agriculture (both countries are globally important producers of agricultural commodities), and this has impacted the food supply chain, particularly those nations dependent on sunflower oil, maize, and wheat, (Jagtap *et al*,2022). Ukraine accounts for 50 per cent of the global production of neon gas, a chemical element used to produce semiconductor chips. The destructive effect of the war on the manufacturing and transportation infrastructure in Ukraine upset operations, not only in that country, but also in other countries that trades with or relied on Ukraine for the supply and delivery of key materials and services. For instance, as a result of the threats posed by the war to the ability of Ukraine to supply this noble gas, supply chain constraints have been exacerbated in the global semiconductor and chip-making industries, (UNCTAD,2023; Simchi-Levi & Haren, 2022; Mamonov, 2022).

In the Black Sea and in the Azov Sea, port infrastructure and ships have been hit by projectiles causing extensive damage. This has provided enormous obstacles for shipping since the start of the war. The operation of Ukrainian ports has been suspended and the activity in the Black Sea is also disrupted. There has been a significant decrease of port calls of deep-sea cargo vessels, explained first by a standstill of activity followed by a slight increase of activity due to the Black Sea Grain Initiative, (OECD, 2023). As of February 2023, total damage to transport infrastructure was estimated at USD 35.7 billion (17.8% of 2021 GDP). The Russian Federation's aggression had led to the destruction of 25,000 km of roads and 344 bridges and overpasses. The greatest share of the losses was in Donetsk (26%), Kherson (15%), Luhansk (15%) and Zaporizhzhia (14%)

regions. Those are the regions that were occupied by Russia or that experienced protracted positional fighting. The railway system was also affected, with 507 km of track and 126 stations damaged. The greatest destruction was witnessed in Donetsk (36% of total rail infrastructure damage) and Zaporizhzhia (23%) regions. As of February 2023, 19 civilian airports had been damaged, with the runway destroyed, (Kosse, 2023). The effects of the Russia -Ukraine war on the supply and price of crude oil, natural gas, metals and agricultural commodities contributed to further global supply chain disruptions. In an analysis on the effects of the war in Ukraine on maritime trade logistics, UNCTAD (2022) found that trade restrictions applied to the Russian Federation, the world's third-largest exporter of crude oil, resulted in higher energy costs (a 64 per cent fuel surcharge during the first quarter of 2022). This led to a spike in maritime shipping rates and caused significant inflationary pressures and an additional 1.6 per cent increase in consumer prices globally.

LITERATURE REVIEW

In today's globalized economy, the significance of effective supply chain and logistics management cannot be overstated. Businesses increasingly operate in complex environments where speed, efficiency, and responsiveness to customer demands are critical for competitive advantage, (Markad & Tonday, 2025;Panya &Marendi,2021). Globalization has expanded markets and supply chain networks, enabling businesses to access resources, labour, and markets worldwide. However, it also introduces complexities such as geopolitical risks, fluctuating exchange rates, and regulatory compliance challenges across different jurisdictions, (Abati *et al.,* 2024). A supply chain is an integrated system that starts from the procurement of raw materials or semi-finished products, proceeds through production, packaging, storage, and distribution, and finishes with the delivery of final products to end customers. The links of this chain are not limited to manufacturers and suppliers only, (Anaba., Kess-Momoh., & Ayodeji, 2024). A study by (Toygar & Yildirim,2023), indicates that there are many different parties in a supply chain, such as logistics service providers, retailers, insurance companies, customs brokerages, and customers. According to (Odimarha, Ayodeji, & Abaku, 2024; Panya, Ochiri, Achuora and Gakure,2021), supply chain management encompasses coordinating and integrating these activities across the supply chain, including procurement, production, distribution, and customer service. On the other hand, logistics management focuses on planning, implementing, and controlling the efficient movement and storage of goods and services and related information within the supply chain.

Whereas most of the supply chain disruptions occur presently due to pandemics and geopolitical wars such as Covid-19 pandemic, Israel-Palestine war, and Russia-Ukraine war, there are also several other causes such as production disruption, increased costs, trade policies change and government rules, transportation issues, political issues, and natural disasters, due to which the global supply chain has been disrupted significantly in the past, (Panya &Moronge 2023;Markad & Tonday, 2025). Trade policies for instance shape supply chain resilience strategies, prompting businesses to diversify suppliers, localize production, or explore alternative transportation routes to mitigate disruptions caused by trade disputes or geopolitical tensions (Anaba., et al, 2024). Increased costs are a challenge for all traders and supply chains, particularly smaller shippers who are less able to absorb the additional expense and disadvantaged when they are negotiating rates and booking space on ships.(UNCTAD,2022). For example, from the start of the pandemic to the beginning of 2022, the costs of shipping goods from Asia to the United States by air nearly doubled while the costs of long-distance trucking in the United States rose by almost 60 percent. These cost increases were accompanied by a large increase in lead times on production inputs, (Alessandria. Yar Khan, Khederlarian., Mix., & Ruhl.,2023). Geopolitical tensions and changing trade policies, including tariffs and trade agreements causes shifts in supply chain decisions such as sourcing strategies, manufacturing locations, and distribution channels, (Panya &Moronge, 2023; Ezeafulukwe, *et al.*, 2024).

Organizational logistics are conducted at strategic, operational, and tactical levels. At the strategic level, logistics is about decisions ensuring sufficient organizational capacity to cover the needs of the firm, adequate

organizational preparedness, and access to strategic resources from other firms within the industry. Strategic logistics determine which operations are possible to execute and the speed at which they may be executed, (Erbel & Kinsey, 2018). A trustworthy logistics strategy is an integral part of an organization's deterrence. Organizational logistics at the operational and tactical levels are a matter of both designing and establishing supply networks, and moving and sustaining resources in the area of operation, (Ekström, 2022). A study by (Markad & Tonday, 2025), *Israel- Palestine Conflict: A Supply Chain Disruption Growing after Russia-Ukraine War and Covid-19 Pandemic*, points out that, an interruption in the formal flow of products/goods, money, services, and/or information from supplier to end user via manufacturer is called a supply chain disruption. It goes further to explain that the possible consequences of disruptions such as delays, shortages, higher costs and supply chain inefficiencies may necessitate change in strategy by exporting firms. (Odimarha, Ayodeji, & Abaku, 2024), adds that efficient Supply chain and logistics management is therefore pivotal in ensuring the efficient flow of goods, services, and information from suppliers to customers. Efficient supply chain and logistics management would help firms reduce costs and enhance customer satisfaction by ensuring timely delivery of products and services.

Jarašunien & Gelžinis, (2025), researched on the Risk and Crisis Management Strategies in the Logistics Sector, and found that the COVID-19 pandemic, Russia-Ukraine war ,the middle East crisis and the USA-China trade tensions caused significant disruptions to supply chains including supply shortages, port congestion, and rising transportation costs. The study noted that these global events have underscored the vulnerability of global supply chains and logistics networks, emphasizing the urgent need for proactive risk mitigation. Similarly, climate-related disasters have affected essential infrastructure, prompting logistics firms to adopt more sustainable and resilient practices.

Wang,(2024) on his study, *Analyzing the Impact of the Russian-Ukrainian Conflict on the Supply Chain and Providing Solutions for Businesses,* posits that, Supply chain disruptions are a combination of unexpected occasions that causes disturbances to the movement of commodities and businesses severely. He categorized them in different ways. For example, internal disruptions include operational issues, such as faults with the machinery or quality assurance issues and cross-functional challenges, such as communication problems between departments; whilst external disruptions involve aspects beyond the company's control, for example, natural disasters or geopolitical conflicts. The study concluded by saying that the solutions to supply chain disruptions is only to focus on improving supply chain resilience, which he defined as the adaptive ability of the supply chains to prepare for unforeseen occurrences, cope with and recover from disturbances, by keeping the continuation of operation at the appropriate degree of connectivity while maintaining oversight over structure and function.

Studies by (Anderson *et al*., 2021;Barlow *et al.*, 2021; Wang *et al*., 2021; Verschuur *et al.*, 2021; Toygar & Yildirim, 2023), posits that although globalization has several advantages for multinational companies, wide-ranging issues affecting nations such as epidemics and wars can cause unforeseen disruption in supply chain links. For instance, these studies noted that, COVID-19 pandemic caused unprecedented disruptions in global trade, with sharp decreases in global trade volumes of agricultural commodities. As a result of the pressure of the pandemic on global trade, wheat prices rose to levels that have never been observed many years. Similarly, a study by (UNCTAD, 2022), concluded that, after 2 years with the COVID-19 pandemic, 60% of the global working population earned income less than that in the pre-pandemic period.

Despite the increasing body of literature on Supply chain shifts and its impacts on firms' strategies , several gaps remain that this research sought to fill. Much of the current literature focuses on the effects of supply disruptions from Russia-Ukraine war, Israel Hamas wars and other supply chain disruptions in other sectors but failed to focus on how these disruptions influence export strategies of logistic firms. While many studies focus on short-term operational decisions, such as offshoring and multiple sourcing, there is a need to understand how logistic firms can adapt their entire export strategies in response to ongoing persistent

disruptions to supply chain routes particularly in the context of global trade agreements and cross-border regulations. This study has critically examined the evolving nature of global supply chain dynamics and their direct and indirect effects on the export strategies of logistics firms across different regions. The paper has explored a number of export strategies that can help logistic firms mitigate the effect of frequent supply disruptions. This research therefore contributes to the growing discourse on supply chain resilience and offers practical insights for logistics firms seeking to align their export strategies with the realities of a rapidly shifting global trade environment.

METHODOLOGY

The research design employed in this study was descriptive. This study relied heavily on secondary data as is the case with most desktop research study. The study reviewed journal articles, unpublished papers and conference papers on the effects of global Supply Chain Shifts on export Strategies of logistic firms. The study employed a desktop approach to provide answers to the research objectives. Specifically, the paper used content analysis to gather information from peer reviewed publications such as, journal articles, organizations reports and online books.

DISCUSSIONS

Strategic Alliances and Global Supply Chain Shifts

A country's level of export competitiveness is crucial for its effective participation in international trade and eventual management of balance of trade distress. World over, countries are embracing and implementing international trade policies that are aimed at protecting and promoting local businesses to increase exports and to enable controlled importation of certain products, (Olyanga, 2021). In recent years, the global supply chains ecosystem has been disrupted by unprecedented trade turbulence, economic uncertainty, geopolitical events and natural disasters. In many parts of the world, these events have swayed networks of suppliers and buyers that were built over years – if not decades – thus revealing their vulnerability and exposure to unforeseen global shocks. With increasing uncertainty in the global atmosphere, companies have turned to strategic alliances to maintain their competitive advantages, (Philsoophian, 2021).

According to (Kindi, 2021), Strategic alliances are voluntary agreements between companies that include the exchange, sharing, or shared development of products, technologies, or services. These alliances can have different types and occur on vertical or horizontal lines. Businesses no longer act as independent entities due to their competitive nature; they compete by joining the supply chain alliance. Therefore, suppliers, producers, logistics companies, and retailers always form stronger horizontal or vertical alliances for competing in the supply chain, (Philsoophian, Akhavan, & Abbasi, (2021). Strategic alliance is defined as a strategic response, e.g., joint venture, to fast-paced shifts in the environment such as ever-increasing competition, accelerated technological progress, expansion of required investments, and globalization of markets, (Sohrabi, 2021). Strategic alliances are oftentimes suggested as an important tool for attaining and maintaining a competitive advantage. Furthermore, the concept of strategic alliances is becoming more popular for organizations, itself owing to the cost savings achieved through executive management of tasks, (Alex, 2024).

Inter-company cooperation is one of the keys to increasing the value of a company in its business strategy and building trust in its partners. But the problem that occurs is how to maintain the cooperation that exists so that the relationship remains of high quality, (Alhazami, 2023). Immunization of technologies and critical knowledge, expansion of entries and shares in the market, and spreading out of costs and risks are the three main advantages to creating alliances in supply chains. An alliance is a flexible tool for learning, a method to transfer knowledge effectively among partners and join resources, and a way to realize technological potentials and other complex capacities,(Philsoophian, 2021). Wang,(2024) in his study, *Analyzing the Impact of the Russian-Ukrainian Conflict on the Supply Chain and Providing Solutions for Businesses*, defines collaboration as a company's or supply chain's capacity to collaborate with partnerships and other

supply chain organisations productively and to react swiftly to supply chain interruptions. In addition, Wang, (2024) posits that the flexibility of a firm to collaborate with others would improve the speed and increase the number of possible alternations.

Sustainable Shipment Arrangement and Global Supply Chain Shifts

The intricate web of global supply chains is significantly influenced by shipping arrangements, which play a crucial role in the efficient movement of goods across borders, (Alfaro, 2023). Shipping is the backbone of global trade. Around 80% of world trade in goods is carried by the international shipping industry. The choice of transportation mode—whether by sea, air, rail, or road—has profound implications for global supply chains. Sea freight, accounting for over 80% of global trade by volume, is favored for its cost-effectiveness, especially for bulk goods. However, it is slower compared to air freight, which, though more expensive, is preferred for high-value and time-sensitive goods. Rail and road transport play critical roles in regional supply chains, offering flexibility and connectivity, (UNCTAD, 2024).

Shipment arrangements entail organizing, receiving, recording and sending shipments of goods, (0lyanga,2022). According to (Surucu-Balci, Iris, And Balci, 2024), shipping arrangements, encompassing the selection of transportation modes, route planning, and logistics management, are pivotal in determining the efficiency and reliability of these supply chains. Technological innovations are transforming shipping arrangements and global supply chains. The advent of digital platforms and the Internet of Things (IoT) enables real-time tracking and monitoring of shipments, enhancing transparency and efficiency. Blockchain technology offers secure and immutable transaction records, reducing the risk of fraud and errors in the shipping process, (E Surucu-Balci, 2024). Shipping needs global trade to exist and global trade cannot exist without an efficient shipping industry. A flourishing shipping industry is a very important contributor to and facilitator of international trade and the global economy, (ECSA, 2021).

Geopolitical factors, including trade policies, tariffs, and international relations, significantly impact shipping arrangements and, consequently, global supply chains, (Zahoor, 2023). Trade agreements and disputes can alter shipping routes and affect the cost and availability of shipping services. For instance, the U.S.-China trade war led to shifts in supply chains as companies sought to avoid tariffs by relocating production to other countries, Chukwuma, Ngoc, & Mativenga, (2024). Furthermore, geopolitical instability, such as conflicts or sanctions, can disrupt shipping lanes and port operations, forcing supply chains to adapt. The blockade of the Suez Canal in 2021 is a prime example of how a small mistake can have a ripple effect on global trade, causing delays and rerouting of shipping traffic. Barriers to shipping can hamper the efficient flow of goods and thus overall trade and economic growth, (Gast, 2021). Automation and the use of artificial intelligence (AI) in logistics planning optimize routes and improve cargo handling at ports, reducing transit times and costs. The development of autonomous ships and drones presents future possibilities for further streamlining shipping operations, potentially revolutionizing supply chains,(Tsolakis, 2022).

A study by (Huynh 2022), reveals that international shipments measure how easy it is to arrange shipments at competitive prices. Studies by (Eberhard-Ruiz and Calabrese, 2018; Olyanga, 2022), argue that extra cost of delay, bureaucratic influence, corruption and customs procedures can add up to 15% to the price of goods thereby undermining the export competitiveness of firms. They add that trade facilitation reforms help developing countries to integrate with global value chains, integration into the global logistics networks that will scale up productivity, increase employment opportunities and diversification of exports. According to a study by (Olutimehin, 2024), shipping arrangements are a critical determinant of global supply chain efficiency and resilience. The choice of transportation modes, logistics strategies, geopolitical dynamics, technological advancements, and environmental considerations all interplay to shape the movement of goods across the globe. As the world continues to evolve, so too will the shipping arrangements that underpin global supply chains, driving shifts that reflect the changing landscape of international trade. Understanding these

influences is essential for businesses and policymakers to navigate the complexities of global supply chains and ensure their robustness in an ever-changing world.

Operational Adjustments and Global Supply Chain Shifts

The dynamics of globalization and changing trade policies significantly influence supply chain strategies and operations on a global scale. (Sudarshan,2025). Global supply chain shifts necessitate significant operational adjustments for logistic firms. These firms must adapt to various changes to maintain efficiency, competitiveness, and customer satisfaction, (Krenková, Procházkap., & Túry, 2023). It is not uncommon for components to be manufactured in Asia, then assembled in Mexico, before the finished products are sold in the United States or Canada. As the Covid-19 pandemic and the war between Ukraine and Russia have shown, these global supply chains are sensitive to the slightest "grain of sand", and the world must learn to live with recurring shortages, (Paché, 2024). Since the onset of COVID-19, the reopening of the global economy has been hampered by large and unprecedented supply-chain disruptions that have substantially increased both the costs and time involved in moving goods within and across borders, (Alessandria. Yar Khan, Khederlarian., Mix., & Ruhl.,2023).

The COVID-19 pandemic for instance led to a sudden dip in international seaborne trade. But by late 2020 there had been a swift rebound mainly in container and dry bulk shipping. The asymmetric maritime trade recovery, mainly on East–West containerized trade lanes, increased pressure on supply chains, ports, shipping and trade. The surge in e-commerce, capacity constraints, equipment shortages and renewed virus infections in some parts of the world put supply chains under pressure in 2021,(UNCTAD,2022). The Russian-Ukrainian conflict was one of the fiercest geopolitical conflicts in the world and it is considered to have reshaped the global supply chain because Russia and Ukraine are exporters of many products which are the raw materials for various industries, such as crude oil, food and metals, leading to a shortage and hence a rise in the price level,(Wang, 2024). The impact of the 2022 Russian invasion on businesses in Ukraine has resulted in significant damage to the country's private sector. Eighteen percent of firms have reported experiencing damage. Additionally, limited access to finance and key export markets, along with insufficient demand and increased uncertainty, have hindered the growth of Ukrainian enterprises. Despite these challenges, Ukrainian firms that have continued to operate after the Russian invasion have shown resilience and adaptability by proactively adjusting their business strategies including seeking new customers, utilizing digital tools, and optimizing their supply chains, (Avdeenko, Castro, Criscuolo, *et al*, 2023).

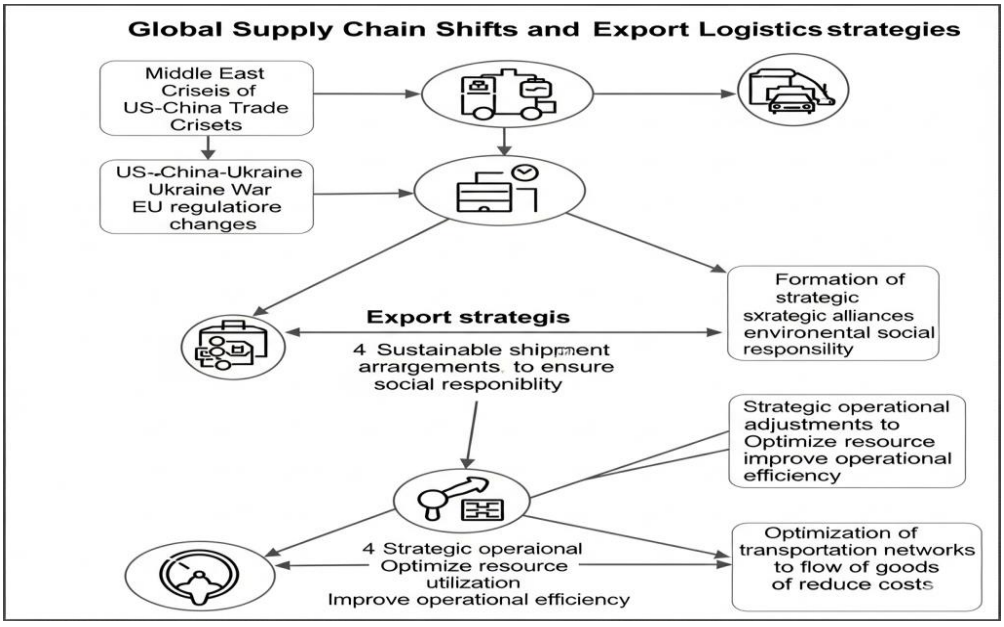

Figure 1: Research, 2025: Global Supply Chain Shifts and Export Strategies.

The Israel-Palestine conflict, marked by recent violence between Israel and Hamas, too has sent ripples through the shipping and maritime industry, leading international companies to issue cautionary advisories and adapt their operations in the region, (Kapoor & Dua Undated). Any geopolitical tension redraws a large part of the flow map, with a strong impact on the geography of the global economy. The direct proximity of both the Suez Canal and the Strait of Hormuz is a source of concern for global supply chain stakeholders, as these are bottlenecks that are highly sensitive to conflict and could rapidly slow down vital supplies in the event of paralysis. Paché, (2024). The Middle East crisis precipitated by the outbreak of war between Israel and Hamas has posed security risk to consignments transported through the port of Haifa. The transit of containers, especially hazardous materials, and the arrival of commercial vessels greatly emphasize the importance of security on this route. Such insecurity or potential terrorist attacks could lead to a shift in the routes used in the transportation of goods, Kapoor & Dua (Undated).

The war between Ukraine and Russia should led to huge disruptions in the supply chains worldwide, becoming one of the most serious geopolitical events, which was forecasted to lead to long-lasting changes in the global supply chains. The shortage of raw materials pushed up the cost of production, leading to inflation, particularly in Europe, where the price level grew faster than that due to the COVID-19 outbreak,(Wang, 2024). A study done by (UNCTAD,2022), *Maritime trade disrupted: The war in Ukraine and its effects on maritime trade logistics,* indicated that pressure caused by covid-19 lockdowns continued in 2022 exhibited by high port congestion and constrained logistics and transport networks. Median waiting time in ports for container ships increased by almost 20 per cent between pandemic times and the end of 2021. Freight rates surged, surcharges proliferated and service reliability declined while delays and dwell times went up. By the end of 2020, container rates were over five times higher than their 2019 levels; although declining, they remain elevated. New disruptions such as the closing of manufacturing activities and ports in China in the first half of 2022 due to new cases of COVID-19 infections further disrupted the system.

Krenková, Procházkap., & Túry, (2023), in their study, *enhancing supply chains agility – The development of logistics capabilities by automotive producers in Central and Eastern Europe following Russia's invasion of Ukraine*, indicate that due to supply difficulties caused by covid-19, most companies in Europe increased their inventory, and this practice has also been maintained in the post-COVID period. However, this practice has not become common, as it depends largely on the suppliers and the number and complexity of the products. Wang, (2024) posits that due sanctions imposed on Russia by USA, European Union and their allies, firstly, the European Governments turned to America who experienced a 9% increase in export volume for energy. In addition, the European Union (EU) also quickened the switch to renewable energy with the REPowerEU plan. To decrease the dependence on Russian crude oil by 2027 and to become carbon neutral by 2050, the EU carried out various policies, such as increasing the use of solar energy by the European Solar Rooftop Initiative, which raised the proportion of renewable energy in the EU's energy combination to 45% . Moreover, the European nations had a relatively resilient infrastructure to deal with the challenges. Despite the comprehensive transport system including motorways, railways, harbours and airports, the EU is also dedicated to erecting the trans-European transport network to enhance connectivity and resilience in the transport system. City logistics and technological advancements such as big data both improved resilience.

The war in Ukraine is stifling trade and logistics of Ukraine and the Black Sea region. The search for alternate trade routes goods has rapidly increased the demands on land and maritime transport infrastructure and services. For Ukraine's trading partners, many commodities now have to be sourced from further away. This has increased global vessel demand and the cost of shipping around the world, UNCTAD,2022). A study by (Avdeenko, Castro, Criscuolo, *et al,* 2023), *Ukraine: Firms through the War,* indicates that, approximately 43 percent of firms closed temporarily or permanently citing insufficient demand as their main reason for closure. Increased uncertainty linked to the invasion further dampened employment and investment. The study found that these *f*irms especially in the main active war zones in the Eastern and Southern regions who experienced

the most significant financial difficulties, affecting approximately 84 percent of firms, hampering sales, investment, and jobs damages, exhibited encouraging recovery signs by early 2023. The collapsed Ukrainian exports due to closure of the Russian market, and the disruptions in critical trade and logistics hubs are promising.

The disruptive Russian-Ukrainian war impacted European businesses mainly through sourcing. The first announced SC problems concerned a lack of spare parts. This was mainly driven by the lack of automotive electrical wire production, which was concentrated in Ukrainian factories. In extreme situations, agile reaction to new conditions helped companies respond quickly and efficiently to the new situation to fulfil their obligations. Skoda's suppliers for instance relocated their production from Ukraine to Czechia and increased capacities in other European and North African plants. As a result of the cooperation with the suppliers, Skoda provided the hall necessary for assembly, while the suppliers provided the equipment and knowledge. To secure the supply chain flow, solutions were developed jointly with suppliers, who were able to secure part of the orders through relocation to other facilities, adaptation of their production programmes, and by shifting plans according to the current situation in each area, (Skoda, 2022; Krenková, Procházkap., & Túry, 2023).

Schenker,(2023), in his study, Unveiling the "Forecasting Fortune Teller" found that deploying AI-driven demand forecasting tools to analyze shipping history and weather data, can improve load factor by 15% and reducing last-minute capacity shortages. Similarly, a study by Maersk. & Moller,(2022), indicate that Maersk and IBM's TradeLens platform offered customs agencies near real-time access to shipping documentation, cutting border processing times by up to 40% during the COVID-19 disruptions . A study by DHL, DHL Smartification, (2022), indicate that DHL's predictive maintenance using IoT sensors decreased unplanned vehicle downtime by 20%, improving fleet availability during peak periods .And Kuehne and Nagel has used their vehicle telematics devices to rerouted cargo using weather-integrated GPS data to avoid delays caused by Central European floods. Siemens on the other hand in its study Siemens Holistic Digital Twin simulation, 2022, Siemens Logistics used digital twins of warehouse operations to simulate labour shortage recovery scenarios, reducing process reconfiguration time by 25%, (Jarašunien & Gelžinis, (2025).

A study by (Omoush, 2022), *The impact of the practices of logistic management on operational performance: A field study of road transport companies,* concluded by saying that logistics management companies can design and implement approaches that generate a sustainable competitive advantage amidst these disruptions. Jarašunien & Gelžinis, (2025), posits that, the evolving risk landscape in supply chain across the globe necessitates a shift from reactive crisis management to proactive risk mitigation. Firms must embrace modern strategies that integrate predictive analytics, artificial intelligence (AI), and digital modelling to anticipate and mitigate risks and modern decision-making frameworks such as the Analytic Hierarchy Process (AHP) that provides structured methodologies for assessing risk factors and optimizing resource allocation, rather than the traditional approaches that focus only on short-term responses to disruptions.

According to a study by (Wang, 2024), *Analyzing the Impact of the Russian-Ukrainian Conflict on the Supply Chain and Providing Solutions for Businesses*, firms may lower the risks associated with ongoing geopolitical tensions around the globe by lessening their dependency on foreign suppliers and investing in domestic manufacturing and sourcing. The study also indicated that for instance, China has enhanced the storage of its energy sources to reduce reliance on foreign supply. In addition, the Chinese government also implemented policies to develop green energy vehicles by offering subsidies to the company's manufacturing electric cars and it also has the goal to reach carbon neutrality by 2060. China has also built a series of transportation infrastructures to improve resilience, although its logistical network has proved to be underdeveloped as compared to rich nations in Europe and the west.

Optimization of Transportation Networks and Global Supply Chain Shifts

The logistics sector plays a critical role in global trade but faces significant risks due to geopolitical instability, economic downturns, and environmental disruptions, (Jarašunien & Gelžinis, 2025). Globalization

has changed the way business operate and how they are expanding their commercial transactions. This expansion has transformed the transport and logistics market and increased the value of logistics, (Omoush, 2022). According (Panya &Marendi,2021), logistic firms face considerable challenges in managing large-scale, complex issues while endeavoring to balance cost-efficiency with service quality. This intricate relationships within logistics networks heighten risks, as supply chains depend on multiple stakeholders, infrastructure elements, and external factors such as regulatory changes and weather conditions. Any disruptions in one segment can have a cascading effect on the entire system, making crisis management a priority. The growing emphasis on sustainability has reshaped supply chain management practices, prompting a shift towards green logistics and environmentally friendly operations. Modern consumers are increasingly eco-conscious, demanding products and services that align with sustainable practices. As a result, businesses are integrating sustainability into their supply chain strategies to reduce carbon footprints, minimize waste, and promote ethical sourcing practices (Adegbola, Adegbola, Amajuoyi, Benjamin, & Adeusi, 2024).

Green logistics initiatives such as optimization of transportation routes to reduce fuel consumption, adopting eco-friendly packaging materials, and implementing reverse logistics programs for product recycling and reuse has immense benefits, including enhanced brand reputation, attracting environmentally conscious consumers, and mitigating risks associated with regulatory compliance and climate change impacts, (Adanma & Ogunbiyi, 2024). Key Strategies for Optimization Efficient supply chain management involves adopting strategies that streamline operations, enhance responsiveness, and minimize costs. Anaba., Kess-Momoh., & Ayodeji (2024). Beyond strategies, modern logistics increasingly relies on advanced technologies to reduce risk and manage disruptions. Innovations such as artificial intelligence (AI), blockchain, predictive analytics, and digital twins are vital in enhancing visibility, efficiency, and resilience. Jarašunien & Gelžinis, (2025).

A study by (UNCTAD,2022), indicates that disrupted regional logistics, the halting of port operations in Ukraine, the destruction of important infrastructure, trade restrictions, increased insurance costs, and higher fuel prices, have contributed to the logistical hurdles including a more costly and unpredictable global trading and shipping environment. As a mitigation strategy, many countries have had to look further afield for suppliers of oil, gas and grain. Consequently, shipping distances increased, along with transit times and costs. According to (OECD,2023), global supply chains were already stressed by the COVID-19 pandemic, causing inflationary pressure, supply shortages and manufacturing delays across the world. The Russian - Ukrainian war made things worse, with the closure of airspaces, international sanctions and intense conflict in the Black Sea further disrupting the international flow of goods.

Studies by Ke, Wang, & Peng, (2025) indicated that, the alteration in trade relations instigated by the Russia–Ukraine conflict modified global LNG flows, resulting in a fragmented overall network structure and diminished transportation efficiency. The Israel-Hamas conflict has also raised concerns about the stability of the International North-South Transport Corridor (INSTC) corridor's stability. The INSTC is a vital trade route for several locations – a multimodal network of shipping, rail, and road routes that connects India, the Middle East, and Europe, Sidharth, R. (2023, November 13). Findings of a study by Jarašunien & Gelžinis, (2025), indicate that diversifying transport routes and implementing business continuity planning are the most critical strategies that can be implemented by logistics firms in such crisis to enhance resilience. Jarašunien & Gelžinis, (2025),on the other hand suggest that, collaboration among logistics companies, suppliers, and policymakers is essential for effective crisis management. According to,(UNCTAD,2022), the war in Ukraine is one of several major issues currently affecting international maritime transport, compounding other challenges such as the COVID-19 pandemic, port congestion and the need to switch to low carbon fuels. The Russia–Ukraine conflict altered the structure of the Liquefied Natural Gas (LNG) transportation network and diminished its robustness. Ke, Wang, & Peng, (2025)

The aviation industry plays a pivotal role in domestic and international transportation systems. Despite the ongoing recovery of global air travel from the impacts of the pandemic, the sector remains highly susceptible

to external disruptions such as financial crises, regional conflicts, and fluctuations in fuel prices Xue, Du , Yifan, Zhang and Sun, (2025). Supply Chain disruptions can have far-reaching operational and financial impacts on airlines, airports, and passengers. (Maneejuk et al., 2024). During covid-19, air freight processes become more complex. In three out of five countries, air freight is undergoing lengthy bureaucratic customs certification processes and delays. Only a few air cargo companies were operating in some of the key countries producing HIV medicines. This resulted in a threefold increase in the cost of air cargo. Cargo movement through passenger planes contributed to a large proportion of overall air freight capacity. The cancellation of passenger flights placed added pressure on available cargo space,(Chu et al., 2024). The increase in jet fuel prices and the loss of cargo capacity on international flights negatively impacted the profitability of airlines which were still recovering from the demand drop caused by the COVID-19 pandemic, (Sopamena, 2022); Sun et al., 2021). In 2022, the United States, United Kingdom, European Union (EU), and Canada prohibited Russian carriers from entering their airspace. In a reciprocal action, Russia likewise imposed the same sanctions on these countries. Airspace closure results in more flight time and fuel consumption. Subsequently, ticket prices increase significantly, hindering the revival of flight demand. In addition, Russia has blocked energy delivery to other countries, causing an obvious spike in jet fuel prices (Mardones, 2023).

According to Alfaro & Chor, (2023), due to the US-China trade tensions, direct US sourcing from China has decreased, with low-wage locations (principally: Vietnam) and nearshoring/friendshoring alternatives (notably: Mexico) gaining in import share. The production line positioning of the US' imports has also become more upstream, which is indicative of some reshoring of production stages. A study by Uchechukwu. & Arinze, (2024), *Optimizing Supply Chain Networks: Strategies for Minimising Transportation Costs and Mitigating Currency Risks,* indicates that, the primary focus of this optimization endeavor is to reduce transportation expenses and manage currency risks since these factors have a direct influence on the company's profitability and overall efficiency of the supply chain. An efficiently optimized supply chain network allows organisations to minimize the time it takes to deliver items, decrease the expenses associated with keeping inventory, and enhance overall efficiency in transporting products from suppliers to end consumers. The study found that, to achieve cost-effective transportation logistics, meticulous planning, coordination, and optimization are necessary across the whole supply chain network. Furthermore, the ever-changing nature of transportation markets, along with increasing customer preferences and geopolitical risks, increased the difficulty of minimising transportation costs while ensuring timely deliveries and satisfying service level agreements. The research also emphasized the need of using sophisticated data analysis, technology-driven solutions, and cooperative alliances to optimize efficiency, decrease expenses, and strengthen adaptability in the midst of unpredictability.

A study by Chadalawada, (2022). *Optimizing public transit networks an exploration of how multi-modal transportation systems can be integrated in smart cities,* investigated the strategies for optimizing public transit networks within the framework of smart cities, emphasizing the crucial need for seamless integration across multiple modes of transportation. The study looked at the use mathematical modeling and optimization algorithms to streamline transit schedules and routes, ultimately reducing travel time and operational costs. The study showed that real-time data from IoT sensors and GPS tracking can support dynamic route optimization, adjusting transit schedules based on demand fluctuations and traffic conditions, thereby enhancing the overall efficiency of public transportation. The study underscores the importance of a balanced approach in developing multi-modal networks that prioritize sustainability, accessibility, and effective governance, providing valuable insights for future urban transit optimization.

Lele., & Shah. (2023).in their study, *Optimizing Transportation and Logistics Networks for Seamless Resource Flow: People, Materials, and Beyond,* analysed the transportation ecosystem encompassing roadways, public transit systems, and emerging mobility solutions that intricately link the Washington DC and

its proximate regions and highlighted how the absence of network optimization affects the day-to-day commute for different transportation networks and people. The study delves into the multifaceted realm of transportation and logistics, exploring its profound influence on economies, supply chains, and overall societal connectivity. The study found that using optimization techniques and strategies helps identify the best possible solution in dealing with transportation issues.

CONCLUSION

In today's digitalized economy, supply chain networks, enables businesses to access resources, labour, and markets worldwide. A slight interruption to the global order due to complexities such as geopolitics, fluctuating exchange rates, and regulatory compliance challenges across different jurisdictions can acerbate an already fragile global supply chain. Most recent supply chain disruptions have occurred due to pandemics such as the Covid-19 pandemic, Ebola virus and geopolitical wars including the Israel-Palestine war, the Russia-Ukraine war, the USA -China tensions, and several other causes such as production disruption, increased costs, trade policies change and government rules, transportation issues, political issues, and natural disasters, among others. These have caused great shifts in the logistics strategies across the globe. Logistics companies must focus on improving its ability to prepare for unforeseen occurrences, cope with and recover from disturbances. With increasing uncertainty in the global atmosphere, logistics firms must form strategic alliances to maintain their competitive advantages. Suppliers, producers, logistics companies, and retailers must also form stronger horizontal or vertical alliances for competing in the supply chain, Inter-company cooperation is one of the keys to increasing the value of a company in its business strategy and building trust in its partners. Lastly, logistics firms must embrace technology like the use of telematics and real-time data from IoT sensors and GPS tracking to support dynamic route optimization, adjusting transit schedules based on demand fluctuations and traffic conditions, thereby enhancing the overall efficiency of public transportation. The study recommends that there is need for agility, sustainability, and digital capabilities to more pronounced than ever in global logistics systems. Firms that proactively align with these shifts stand a better chance of maintaining competitiveness and resilience in a volatile global trade environment.

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