Keywords
Geopolitical Risk & Supply Shock, Strait of Hormuz Disruption, Multinational Enterprise Strategy, PESTLE-M Framework, Trade Network Diffusion.

Authors
Lu Lilan[1*]
Hasanuddin University, Makassar, Indonesia.
2592380495@qq.com

Muhammad Yunus Amar[2]
Hasanuddin University, Makassar, Indonesia

Abdul Razak Munir[3]
Hasanuddin University, Makassar, Indonesia

Received:17-06-2026
Revised:21-07-2026
Accepted:28-07-2026
Doi:10.1922/ejprd.v34i7s.1690

European Journal of Prosthodontics and Restorative Dentistry (2026) 34 (7s), 709–720

Toward a Multipolar Supply Chain Resilience Framework: Scenario-Based Evidence from the 2026 Iran–Israel–US Conflict

Abstract
Compounding geopolitical shocks — from COVID-19 to the Russia–Ukraine war and the 2026 Iran–Israel–US conflict (Operation Epic Fury, beginning 28 February 2026) — indicate that global supply chain vulnerability is shifting from isolated sectoral shocks toward simultaneous, cross-sector cascades under an emerging multipolar order. Existing supply chain resilience and geopolitical risk frameworks, however, largely conceptualize geopolitical shocks as isolated sectoral disruptions rather than cascading multi-sector systemic events, leaving unclear how energy and technology disruption channels interact structurally under conditions of multipolar military escalation. This study aims to explain how the 2026 Iran-Israel-US conflict propagates simultaneously across interconnected strategic sectors of the global supply chain and to develop a preliminary conceptual framework for managing this new category of risk. Using a qualitative embedded case study combined with formal scenario analysis of credible public secondary data — including the Caldara-Iacoviello Geopolitical Risk (GPR) Index, IEA Oil Market Reports, ACLED conflict-event data, and MSCI GeoSpatial Asset Intelligence — this research identifies six interlinked disruption channels: (1) energy market shock from the closure of the Strait of Hormuz; (2) disruption of high-technology supply chains centered on Israel's semiconductor and R&D cluster; (3) GCC commodity disruptions in aluminium, sulfur, fertilizers, and LNG; (4) collapse of aviation and logistics networks; (5) financial contagion; and (6) food and water security spillovers. Two scenarios — swift resolution (within eight weeks) and protracted conflict (over six months) — are used to test the scenario-robustness of strategic responses. This study extends supply chain resilience literature by introducing a multipolar resilience perspective that explains how simultaneous geopolitical shocks propagate across interconnected strategic sectors, and proposes the Multipolar Supply Chain Resilience (MSCR) framework as a dynamically calibrated architecture of six strategic pillars, each accompanied by testable research propositions. Beyond its theoretical contribution, the study offers multinational enterprises (MNEs) scenario-robust strategic anchors for navigating deep geopolitical uncertainty.

INTRODUCTION

A new wave of compound vulnerability is sweeping through the world's supply chains. It started with three severe and compounding shock events – Covid-19 (2020-2022), the Russia-Ukraine War (2022-present), and the Iran-Israel-US War (since February 2026) and have profoundly disrupted global supply chains. These shock events represent three different types of vulnerability. The vulnerability of just-in-time supply chains was exposed by COVID-19. The vulnerability of energy mono-cultures was highlighted by the Ukraine War.

The 2026 War, for the first time since 1973, threatened complete closure of the world's most important energy corridor – the Strait of Hormuz, which handles 20% of global crude oil and 83% of all traded liquefied natural gas (LNG) on a daily basis [1]. On February 28, 2026 the US and Israel launched operation Epic Fury - a synchronized military operation against Iran. Close to 900 airstrikes had been launched within 12 hours, leading to the assassination of Supreme Leader Ali Khamenei and targeting Iranian ballistic missile capabilities [2]. Iran fired hundreds of missiles and thousands of drones toward US military bases in the GCC, as well as toward oil facilities and along shipping lanes.

These actions shut down the flow of oil tankers and LNG carriers along the Strait of Hormuz, leading the International Energy Agency (2026) to dub the event the 'greatest global energy security challenge in history'. Previous studies on geopolitical risk and supply chain management present a consistent finding but a fragmented explanation. Building on the Caldara-Iacoviello GPR Index [3], scholars broadly agree that elevated geopolitical risk erodes supply chain efficiency, investment, and cross-border trade. Where they diverge is on the underlying transmission mechanism: Gereffi et al. [4] emphasize governance fragmentation within global value chains, Li and Cheng [5] foreground investment and financing uncertainty, Luo and Tung [6] and Zahoor et al. [7] frame the shift toward a multipolar order as reconfiguring where firms source and invest, while Kumar et al. [8] model geopolitical risk largely as a single-sector shock. None of these accounts explains how a single military escalation can generate simultaneous, cross-sector disruption — energy and technology cascading together — under an explicitly multipolar structural condition. This is the theoretical space the present study occupies.

Building on this synthesis, three specific gaps can be identified. First, existing frameworks conceptualize geopolitical shocks primarily as isolated sectoral disruptions rather than cascading multi-sector systemic events, and thus cannot explain how the 2026 conflict simultaneously disrupted one of the world's most important energy corridors (the Strait of Hormuz) and Israel's technology-R&D cluster within the same event window. Second, existing geopolitical-risk frameworks for supply chains have been developed largely from sub-state-level or single-actor shock contexts, so a direct state-versus-state military conflict of this scale falls outside their original scope. Third, the compounding effects documented across COVID-19 and the Russia-Ukraine war — which produce a multiplicative rather than additive vulnerability — are typically understated in single-event analyses that treat each shock in isolation.

Supply chain resilience literature has developed substantially since the COVID-19 pandemic, with scholars such as Spieske and Birkel, Hohenstein et al., and Ambulkar et al. building conceptual and empirical foundations. However, these frameworks primarily address natural disasters and sub-state disruptions, and do not account for multipolarity as a structural condition shaping which supply chain strategies are available to MNEs. Additionally, the literature on geopolitical risk and supply chains — while advancing rapidly — remains limited in explaining why some sectors experience tactical disruption while others face structural reconfiguration, and how firm-level dynamic capabilities condition exposure to geopolitical spillovers.

The specific novelty of this study is the concept of dual-channel simultaneity — the co-occurrence of an energy-corridor shock and a technology-cluster shock triggered by a single geopolitical event — which is used as the organizing lens for the six disruption channels and the resulting MSCR framework. Framed this way, this paper contributes in three ways. Theoretically, it introduces a multipolar resilience perspective that extends supply chain resilience and geopolitical risk literature beyond single-channel, sub-state disruption models. Methodologically, it demonstrates how an embedded case study can be combined with formal scenario analysis to study an unfolding, real-time geopolitical crisis using triangulated public secondary data. Managerially, it translates the six identified disruption channels into a scenario-robust set of strategic pillars that MNEs can act on without needing to forecast the conflict's duration.

Based on these three knowledge gaps, this paper will focus on three research questions, which are: (1) How do the geopolitical spillover effects of the Iran-Israel-US conflict impact the global supply chains; (2) How do the disruption channels vary under the circumstances of rapid vs. Protracted conflicts; (3) What scenario-robust strategic options can be derived for MNEs from the observed disruption channels.

The rest of the paper is organized as follows: Section 2 reviews the relevant literature; Section 3 develops the research gap; Section 4 presents the methodology; Section 5 presents findings, scenario analysis, and the MSCR framework; and Section 6 concludes.

2. LITERATURE REVIEW

2.1 Supply Chain Resilience: Evolution, Dynamic Capability, and Adaptive Capacity

Supply chain resilience (SCR) research has evolved from an early focus on risk mitigation and redundancy toward a capability-based view of how firms sense, respond to, and recover from disruption. Ambulkar et al. [23] conceptualize firm resilience as an organizational capacity built on resource reconfiguration, while Hohenstein et al. [22] show, through a systematic review, that the field has progressively shifted from reactive risk management toward proactive, capability-driven resilience strategies. Spieske and Birkel [21] further link resilience to Industry 4.0 digital capabilities, arguing that visibility and real-time data materially shorten recovery time. Underlying much of this literature is Teece's dynamic capabilities framework [13], which distinguishes sensing (detecting emerging threats), seizing (mobilizing a response), and reconfiguring (adapting resources and structures) as the mechanisms through which firms convert exposure into adaptive capacity. This study adopts dynamic capability as its firm-level theoretical anchor, but departs from prior applications by treating multipolarity — rather than a single natural-disaster or pandemic shock — as the structural condition that determines which sensing, seizing, and reconfiguring capabilities are available to MNEs.

2.2 Geopolitical Risk and Economic Security

Geopolitical risk (GPR) research has been substantially advanced by the Caldara-Iacoviello GPR Index [3], which decomposes geopolitical risk into realized geopolitical acts (GPAs) and anticipated geopolitical threats (GPTs) and demonstrates that both dimensions independently affect investment, trade, and asset prices. Political-uncertainty scholarship building on this index links elevated GPR to reduced foreign direct investment, contract renegotiation, and supply base concentration. Parallel to this, the economic-security literature reframes supply chain dependency — particularly for critical minerals, semiconductors, and energy — as a matter of national security rather than pure cost efficiency, a reframing accelerated by geo-economic fragmentation between competing blocs. This study draws on the GPA/GPT distinction as the macro-level analytical foundation for classifying the 2026 conflict's spillovers, while extending the economic-security literature by treating energy and technology dependency as jointly, rather than separately, exposed to geopolitical shock.

2.3 Multipolarity in International Relations Theory: Realism, Complex Interdependence, and Geoeconomics

Because the 2026 conflict is fundamentally a state-level military event, this study situates its structural premise within international relations (IR) theory rather than treating multipolarity as a purely economic descriptor. Classical realism [24] explains the shift from a unipolar to a multipolar order as a redistribution of relative power among competing states, in which no single hegemon can guarantee the security of global trade routes — a condition directly visible in the contested status of the Strait of Hormuz. Complex interdependence theory [25] complicates this picture by showing that even rival states remain economically entangled through multiple channels, meaning that military escalation does not sever trade so much as reroute and fragment it. Geoeconomics [26] bridges these two traditions by treating economic instruments — chokepoints, sanctions, export controls, and supply concentration — as extensions of state power. Read together, these three traditions justify treating multipolarity not merely as “more countries trading” but as a structural condition under which supply chains are simultaneously economic infrastructure and geopolitical terrain — the premise on which the MSCR framework in Section 5.3 is built.

2.4 Cascading and Systemic Risk in Supply Chains

The six-channel spillover pattern documented in this study is conceptually a cascading risk phenomenon: a shock originating in one node (Hormuz closure) propagates through interconnected sectors (energy, technology, commodities, logistics, finance, food/water) rather than remaining contained. Choi, Dooley, and Rungtusanatham [30] frame supply networks as complex adaptive systems in which local disruptions can produce emergent, system-wide effects that are not reducible to any single node, while Pettit, Fiksel, and Croxton [31] argue that resilience depends on the balance between a firm's vulnerability exposure and its capability profile across the wider network, not just its own operations. This cascading-risk lens is essential to the present study because the MSCR framework's central claim — dual-channel simultaneity — is itself a cascading-risk mechanism: energy and technology shocks do not simply co-occur, they reinforce one another through shared logistics, financing, and insurance infrastructure.

2.5 Scenario Planning as a Method for Studying Deep Uncertainty

Because the conflict examined here was still unfolding at the time of writing, this study also draws on the scenario-planning tradition as a method for reasoning under deep uncertainty. Wack [27], writing from experience at Royal Dutch Shell, argued that scenarios are valuable precisely when single-point forecasting is unreliable, because they force decision-makers to prepare for structurally different futures rather than one predicted path. Schoemaker [10] formalized this into the Cone of Plausibility approach used in Section 4.6 of this study, while van der Heijden [29] emphasizes scenarios as a vehicle for strategic conversation within organizations rather than a purely technical forecasting exercise. Wilkinson and Kupers [28] extend this tradition to systemic, cross-sectoral risks, arguing that scenario logic is most useful precisely where cascading, multi-actor dynamics make conventional risk models unreliable — the same condition this study identifies in the 2026 conflict.

3. METHODOLOGY

3.1 Research Design

This study employed an interpretivist-qualitative-secondary research design that combined structured case study analysis with formal scenario analysis. The unit of analysis is the 2026 Iran-Israel-US conflict (Operation Epic Fury, began 28 February 2026) and the reported impact on global supply chains during Feb-April 2026. This design conforms with the requirements of explanatory case studies on current real world phenomena, where control over behavior is beyond researcher's reach, and where phenomenon-context boundaries are not sharp [9].

An embedded single-case design was chosen over three plausible alternatives. A multiple-case design was not adopted because the 2026 conflict is, at the time of writing, a singular, still-unfolding event with no comparable contemporaneous case that would permit valid cross-case replication logic. Process tracing was considered but set aside because its primary strength —

establishing a fine-grained causal chain between a small number of variables — is less suited to mapping six parallel, simultaneously activated disruption channels than an embedded design that treats each channel as a distinct sub-unit while retaining the single conflict as the bounding case. Qualitative content analysis alone was also considered insufficient, since it would code textual data without the structural benefit of scenario-based projection needed to assess strategic robustness under alternative conflict trajectories (Section 4.6). The embedded case design was therefore selected because it allows the six disruption channels to be analyzed both independently and as expressions of one bounded, real-time geopolitical event.

3.2 Case Selection and Unit of Analysis

The primary unit of analysis is the 2026 Iran-Israel-US conflict (Operation Epic Fury, initiated 28 February 2026) and its reported impacts on global supply chains during February-April 2026. To provide analytical manageability and theoretical clarity, this study adopts an embedded case study structure [9] in which the primary case contains six embedded sub-units:

Sub-unit 1 : Energy corridor disruption (Strait of Hormuz)
Sub-unit 2 : High-technology supply chain disruption (Israel semiconductor and R&D ecosystem)
Sub-unit 3 : GCC commodity and industrial supply chain disruption
Sub-unit 4 : Aviation and logistics network collapse
Sub-unit 5 : Financial contagion and insurance market disruption
Sub-unit 6 : Food and water security transmission

This embedded structure transforms the six disruption channels from a descriptive list into theoretically grounded sub-units of analysis, each traceable to specific empirical evidence and each linked to a corresponding pillar in the MSCR Framework.

The 2026 Iran-Israel-US conflict was purposively selected as a critical case [9] rather than a typical or convenience case. Unlike the Russia-Ukraine war, which is predominantly a single-channel energy and agricultural-commodity shock, or the Red Sea shipping crisis, which is predominantly a logistics-rerouting event, the 2026 conflict is the only contemporaneous case in which a state-level military escalation simultaneously threatened a top-tier energy chokepoint and a globally systemic technology-R&D cluster. A comparable Taiwan Strait contingency, while conceptually similar in its technology-sector exposure, had not materialized as an actual military event at the time of data collection and therefore could not serve as an empirical case. The 2026 conflict thus represents an extreme case of dual-channel simultaneity: if the proposed MSCR framework can organize the strategic response to this case, it is likely to generalize to less extreme, single-channel geopolitical disruptions.

3.3 Data Sources and Inclusion Criteria

The study relied exclusively on publicly available secondary data sources. The specific secondary data sources utilized include: (i) the Caldara-Iacoviello GPR Index (Federal Reserve Board; policyuncertainty.com), offering monthly geopolitical risk indices up to April 2026, (ii) the March 2026 IEA Oil Market Report detailing disruption volumes through Hormuz, production cutbacks, and price levels, (iii) ACLED Middle East Special Issue (March 2026) covering event data of the conflict, (iv) MSCI GeoSpatial Asset Intelligence reports (March 2026) on equity portfolio supply chain exposures, (v) March 2026 industry analyses on firm-level supply chain disruptions from Resilinc and Z2Data, (vi) a March 2026 Dallas Fed working paper [12] on the US inflationary impact of the conflict, and (vii) the March 2026 Congressional Research Service briefing on the US-Iran conflict. Data are cross-validated among multiple sources to reduce single-source bias, and value ranges reported for estimated data. Triangulation was performed by comparing findings across government reports, industry databases, conflict-event datasets, and academic literature. Disruption channels were retained only when supported by at least two independent sources.

Table 3.1 Data Collection Source

Source	Institution	Time Coverage	Purpose in This Study
Caldara-Iacoviello GPR Index	Federal Reserve Board	Monthly, through April 2026	Macro-level classification of geopolitical acts (GPA) vs. threats (GPT)
Oil Market Report	International Energy Agency (IEA)	March 2026	Hormuz disruption volumes, production cutbacks, price levels
Middle East Special Issue	ACLED	March 2026	Conflict-event data; verification of ceasefire/escalation triggers
GeoSpatial Asset Intelligence	MSCI	March 2026	Firm-level equity and supply chain exposure mapping
Industry disruption analyses	Resilinc; Z2Data	March 2026	Firm-level supply chain disruption and force-majeure tracking
Working paper on US inflation impact	Federal Reserve Bank of Dallas	March 2026	Macroeconomic (inflation) transmission channel
Conflict briefing	US Congressional Research Service	March 2026	Independent verification of conflict timeline and scope

3.3.1 Data Collection and Source Selection Protocol

To ensure academic rigor, transparency, and replicability, secondary data sources were gathered and filtered through a structured selection protocol based on four strict eligibility criteria.:

1.Time Horizon

Sources were selected based on relevance to supply chain disruption, publication date between February and April 2026, institutional credibility, and direct evidence of disruption magnitude. Sources were excluded when they provided only opinion-based commentary without traceable data.

2. Inclusion and Exclusion Criteria

Inclusion sources were included only if they provided empirical, quantifiable evidence regarding specific supply chain disruption channels (e.g., energy supply shocks, technology supply fragility, aviation/logistics collapse) within the Middle East/GCC region.

Exclusion sources were general opinion pieces, speculative news editorials, and sources lacking granular data points or verifiable event tracking were strictly excluded. Furthermore, as a strict rule of validation, any identified disruption channel was excluded unless it was independently supported and verified by at least two unrelated sources.

3. Source Credibility Criteria

To eliminate institutional bias, data collection was restricted to highly credible, internationally recognized bodies across four distinct domains:

a.Government & Central Banking Authorities (e.g., Federal Reserve Board, Dallas Fed, Congressional Research Service).

b.Intergovernmental Organizations (e.g., International Energy Agency/IEA, United Nations).

c.Specialized Global Industry Databases & Research Firms (e.g., MSCI GeoSpatial, Resilinc, Z2Data).

d.Peer-Reviewed/Established Conflict Datasets (e.g., ACLED).

4. Rationale for Selection

These specific sources were selected because they collectively allow for robust data triangulation. By cross-validating macroeconomic variables (like the Caldara-Iacoviello GPR Index) against granular, firm-level supply chain exposures (MSCI, Z2Data) and real-time conflict event data (ACLED), the study effectively minimizes single-source bias and establishes verified causal links between geopolitical shocks and structural disruption channels.

For the identification of the six disruption channels, this research used thematic coding analysis of the empirical data colle cted. Initially, the process of coding involved the categorization of raw data in the form of PESTLE-M framework. After that, the axial coding approach was used to find the cause and effect relationship between the framework and supply chain vulnerability. These PESTLE-M framework components were then crystallized into six disruption channels through triangulation with secondary sources.

Two complementary analytic techniques from Yin's case-study methodology [9] were applied on top of this coding process. Pattern matching was used to compare the empirically observed disruption sequence (Hormuz closure → tanker/LNG halt → price spike) against the theoretically predicted pattern of a classical exogenous oil-supply shock [14], confirming that the energy channel followed an established causal pattern rather than an idiosyncratic one. Explanation building was then used iteratively across the remaining five channels: an initial explanation of how a disruption channel operates was drafted from the first data source, then revised against each additional source until a stable, cross-source-consistent explanation remained — this iterative revision is what allows the study to state, for each channel, how exactly it emerged rather than simply that it occurred.

Table 3.2 PESTLE-M to Disruption Channel Mapping

Dimension	Empirical Evidence	Disruption Channel	Primary Sources
Political/Military	Iranian missile and drone strikes; Hormuz tanker halt	Energy supply shock	IEA, Britannica
Technological	Iranian cyber attacks; Israeli R&D or semiconductor disruption	Technology supply fragility	MSCI, Z2Data
Economic	GCC aluminum/sulfur/LNG cut-off; fertilizer price spike	GCC commodity disruption	Z2Data, IEA
Economic/Military	Airspace closures; 4,000+ daily flights cancelled	Aviation/logistics collapse	Resilinc, ACLED
Legal/Financial	Force majeure claims; war-risk insurance spike; USD volatility	Financial contagion	MSCI, Dallas Fed
Environmental/Social	Desalination plant attacks; GCC food import disruption	Food/water security	UN Arab States Report

3.4 Analytical Procedure

The analytical framework for this study combines three interconnected theories. The macro level uses the Caldara-Iacoviello GPR analysis as the analytical foundation for classifying and quantifying geopolitical risk. The meso level employs the Global Value Chain framework (GVC) [4] as the guiding theory to trace shock transmission within value chain structures. Finally, the firm level uses the dynamic capabilities framework to [13] articulate the specific sensing, seizing and reconfiguring capabilities which distinguish a resilient supply chain architecture from a vulnerable one.

3.4.1 Reliability and Trustworthiness

Given the interpretive nature of this design, reliability was addressed through four complementary mechanisms rather than statistical reliability tests. First, triangulation was enforced systematically: as noted in Section 4.3, a disruption channel was retained only when corroborated by at least two independent source types (e.g., a government report and an industry database). Second, an audit trail was maintained by logging, for every empirical claim in Section 5.1, the specific source and publication date from which it was drawn, allowing the coding-to-finding chain to be traced and re-examined. Third, source verification was applied by cross-checking event-level claims (e.g., ceasefire timing, tanker resumption) against ACLED's real-time conflict-event data, which serves as an independent verification layer distinct from the economic and industry sources. Fourth, a written analytic protocol — specifying the PESTLE-M coding scheme, the axial-coding rules linking codes to disruption channels, and the two-source retention threshold — was fixed prior to full-scale coding and applied consistently across all six sub-units, so that the procedure could in principle be replicated by an independent coder.

3.4.2 Scenario Construction and Validation

The scenario analysis technique was employed as a supplement to case study analysis; it was used to trace supply chain impacts under alternative conflict outcomes according to the Cone of Plausibility (CoP) approach formally laid out by Schoemaker [10], and applied to geopolitical disruption research by Recorded Future (2026).

Consistent with the standard scenario-planning sequence [10,27–29], scenario construction proceeded in five explicit steps. (1) Driving forces were first identified from the PESTLE-M coding in Section 4.4 — principally conflict duration, Hormuz operability, and Israeli tech-sector recovery speed. (2) Critical uncertainties were then isolated by assessing which driving forces were both high-impact and genuinely unresolved as of April 2026; conflict duration and Hormuz operability emerged as the two dominant uncertainties, while other forces (e.g., that some disruption would occur) were treated as predetermined. (3) These two critical uncertainties were combined into a scenario matrix, from which two internally consistent, sufficiently divergent scenarios were retained: swift resolution and protracted conflict. (4) Each scenario was then developed into a narrative calibrated to the six PESTLE-M dimensions and benchmarked against the ARC Advisory Group scenario benchmarks [11]. (5) Finally, the strategic implications of each narrative were derived and cross-compared to identify which strategic responses remain valuable regardless of which scenario materializes

Table 3.3 Scenario Parameter Matrix

Parameter	Scenario A Swift Resolution	Scenario B Protracted Conflict
Conflict duration	≤8 weeks from onset	>6 months through Q3 2026
Hormuz status	Partial reopening mid-April; full resumption late April-May 2026	Closed or severely constrained through Q3 2026
Brent crude price	Stabilizes at US$85-95/barrel	Sustained >US$120 or high volatility
Aviation/logistics	Normalization within 4-6 weeks	Structural rerouting via Cape of Good Hope
Israeli tech sector	Re-normalization within 4-6 weeks	Sustained R&D disruption; semiconductor shortages
SCM implication	Tactical resilience (inventory, sourcing, freight)	Structural reconfiguration (nearshoring, multi-bloc sourcing)
Trigger indicators	Ceasefire announcement; tanker movement resumption	No diplomatic progress; GCC military escalation; >US$110 Brent

In order to monitor the accuracy of the trigger indicators in Table 2.2, the following operationally specific definitions of the triggers have been made: (1) "Ceasefire" will be defined as a complete halt of all offensive military operations for 72 hours, confirmed by ACLED conflict monitoring data; (2) "Tanker movement resumption" will be monitored using maritime AIS data as an increase in daily transits through the Strait of Hormuz up to 70% of the average daily number of tankers before the escalation; and (3) the US$110 level of Brent crude oil price is based on market volatility analysis using findings by Kilian et al. (2026) and is seen as a historically proven tipping point, triggering shocks to logistics costs around the world. Verification of prices will be done in real time with Bloomberg/Reuters terminals.

4. Result and Discussion

4.1 Multi-Channel Disruption Analysis

The 2026 Iran-Israel-US War transmits itself through global supply chains via six cascading channels, each via a separate but interconnected and mutually reinforcing transmission mechanism. Unlike previous supply chain disruptions documented in SCM literature – most of which had only one channel – the 2026 war created a complex interplay between simultaneously activating energy, technology, commodity, logistics, financial, and food security supply chain disruption channels, producing a confluence of resilience deficits with which single-channel analyses are ill-equipped to cope.

Channel one is the energy supply shock via the Strait of Hormuz. The Iranian response to the Israeli assassination campaign successfully halted tanker flows through the Strait of Hormuz-the world's most important maritime energy chokepoint-from about 20 million barrels per day (mb/d) to near-zero. Brent crude spiked from \$72.48/barrel on 27 February to almost \$120/barrel, a 66 percent gain in just over two weeks; March 2026 posted only the eighth highest month-over-month Brent oil price increase in history at 51 percent. GCC energy suppliers were forced to cut output by at least 10mb/d, as their reserves filled up and their export supply chain logistics collapsed; this event represented the largest geopolitical oil supply disruption in history, according to Killian et al. [14], 2 to 3 times larger than that caused by the 1973 Arab Oil Embargo or the 1990 Gulf War supply disruption. Price movements for oil were driven by a classical exogenous geopolitical oil supply shock [12] made possible by the reliance of the global manufacturing sector on oil inputs from the Middle East.

Theoretically, this channel is a textbook exogenous supply shock in Kilian's [14] sense, but its significance for supply chain resilience theory lies in its scale and speed: a near-total, near-instantaneous chokepoint closure leaves firms' sensing capability [13] with almost no lead time, making the pillar-3 chokepoint-resilience response (Section 5.3) a pre-committed, not reactive, capability requirement.

Channel two, dual-channel simultaneity, is a conceptually new channel: an instantaneous disruption of Israel's high-technology supply chain ecosystem. As Israel is home to major R&D operations of Intel, Nvidia, and Hightower Semiconductor and a leading global exporter of potassium (potash)-a key agricultural input [15]-an Iranian missile campaign targeting central Israel with continuing Iranian cyber warfare created a significant and immediate risk for the multinational technology companies dependent on its R&D capabilities. As reported by MSCI [16], markets with a strong technology component such as Korea and Taiwan experienced declines of 8-10 percent within the week after the war began; this dual-channel simultaneous risk is of a new type to SCM, because energy and technology supply chain disruption mitigation strategies are entirely disparate. This channel is the empirical anchor of the study's central novelty claim: because energy and technology exposures normally sit in separate risk silos with separate mitigation playbooks, their simultaneous activation is precisely the cascading, complex-adaptive-system dynamic described by Choi et al. [30] — a local shock (Israel strikes) producing an emergent, system-wide effect (global tech-supply repricing) that neither an energy-risk nor a technology-risk model alone would predict.

Channel three is disruption to GCC commodity and industrial supply chains beyond crude oil. Due to the GCC accounting for 8 percent of global aluminum production, Qatar and Bahrain cut off all deliveries of aluminum to global customers; US manufacturers alone, who source 20 percent of their aluminum supply from the Middle East, were immediately impacted and scrambled to find replacement suppliers in Asia and Australia [15]. With GCC countries responsible for 45 percent of the global sulfur market, supply disruptions caused fertilizer prices to rise by 40 percent between late February and 20 March 2026, risking global food supply chains; helium supply was similarly interrupted. This channel illustrates geo-economic fragmentation [26] operating below the level of crude oil: firms with no direct GCC energy exposure were nonetheless affected through shared upstream commodity dependence, reinforcing the case for treating supplier concentration — not just chokepoint exposure — as a distinct resilience-capability requirement.

Channel four is collapse of aviation and logistics networks. The widespread shutdown of airspace across the region, including airspace in Iraq, Syria, Kuwait, Bahrain, Iran, the UAE, and Israel-over 4,000 flights cancelled per day-grounded three of the world's largest cargo carriers: Emirates, Etihad, and Qatar Airways. Their grounded cargo operations along with flights from Lufthansa, British Airways, Cathay Pacific, Air India, and Virgin Atlantic significantly disrupted global supply chain logistics; Resilinc [17] documented the unprecedented speed with which many companies resorted to force majeure clauses covering both conflict-zone businesses and Asian firms reliant on Middle Eastern cargo hubs, underscoring the cascading effects of supply chain disruption. The speed with which firms invoked force majeure here signals a capability gap rather than a legal one: firms possessed the contractual mechanism but lacked pre-calibrated criteria for a state-military trigger, a gap the MFCH pillar (Section 5.3, Pillar 5) is designed to close.

Fifthly, financial contagion and insurance markets are linked. The depreciation of the US Dollar due to expected geopolitical risks led the 10-year treasury note yield to increase to 4.46% on March 27, which is the highest since July 2025. The rising cost of insuring against war risk on commercial shipping vessels, driven by the Hormuz closure, forced up insurance premiums significantly. The failure of standard geographic market classifications to account for supply chain exposure is evident in MSCI data indicating 3,000 facilities operated by US firms in the GCC and significant supply chain reliance on the GCC by Indian firms [16]. This channel demonstrates that financial exposure is not a downstream consequence of physical disruption but a parallel transmission path in its own right, consistent with the network-resilience view that vulnerability propagates through financial as well as physical linkages [31].

Channel six is Food and water security transmission. The Iranian retaliatory campaign targeted Kuwait and Qatar desalination plants, disrupting their sole sources of drinking water (99 percent). Additionally, 70 percent of GCC food imports-overwhelmingly reliant on Hormuz supply chains-were disrupted by mid-March 2026, causing retail price spikes of 40-120 percent across the Gulf region (Economic Impact, 2026). A projected 120-

194 billion GDP decline in the Arab nations could reshapes global supply chain strategy for years [18]. This final channel closes the causal loop back to Channel one: because desalination and food-import infrastructure are themselves energy-dependent, the food/water channel is best understood not as an independent seventh vulnerability but as a second-order cascade of the initial energy shock — the clearest single illustration in this case of cross-sector cascading risk [30].

4.2 Scenario Analysis: Swift Resolution vs. Prolonged Conflict

A scenario analysis is undertaken to assess how the six disruption channels outlined above might unfold across two different conflict paths. The two scenarios-Quick Resolution (Scenario A, 8 weeks) and Protracted Conflict (Scenario B, > 6 months)-are calibrated to likely indicators as at April 2026. As at the date of submission, elements of Scenario A are actually unfolding: A ceasefire was announced on 7 April 2026 and the Strait temporarily re-opened before collapsing and resuming strikes in subsequent days. As such, there is enormous uncertainty as to the likely path of conflict, warranting a scenario-based approach rather than single-path forecasting [10].

Scenario A entails a cease-fire being brokered within 8 weeks via either Omani or Chinese mediation. Partial opening of the Hormuz follows from mid April with full tanker resumption by late April-May 2026. Strategic release of IEA stocks provides a bridging buffer. Brent crude stabilises around $85-95 per barrel. Israel's tech industry re-normalises over 4-6 weeks; there are no material long-term implications for semiconductor supply chain production. The dominant SCM lesson in this scenario are the need for tactical resilience: The companies that succeed in weathering the disruption employ a pre-approved contingent sourcing network, deplete safety stock levels, re-negotiate freight and insurance rates and utilize an AI-driven risk monitoring system with a Tier 2 and Tier 3 supplier-level map [19]. Notably, Resilinc observed that, "inventory can give you a false sense of security - if you can't move it, it doesn't matter how much you have": the presence of inventory alone can't compensate for a vulnerable logistics network.

Scenario B relies on sustained Iranian strength (access to its considerable drone production capacity allowing it to drain U.S. And Israeli munitions stocks), lack of diplomatic progress and the possible entrance of GCC ground troops into the conflict or Russian proxies acting as surrogates. The Hormuz will remain shut or severely constrained through Q3 2026 forcing tankers to make the longer Cape of Good Hope routing, increasing transit times to Europe-Asia by an estimated 10-14 days, and raising freight costs by between 40-60 percent on this corridor [11]. The SCM implications here are transformative, not tactical: Permanent escalation in energy and materials costs, compounded by rising freight costs in shipping, translates into structural price increases for energy-intensive industries such as steelmaking, aluminum production and chemical synthesis [20]. The very notion of the GCC as an economic hub comes under strain. Between $120-194 billion in GCC GDP will be lost, creating an operating environment that MNEs can't compensate for through any level of firm-level resilience. Investment in nearshoring initiatives and region processing centers, and formal, long-term contracting away from single sources outside the theater of conflict, is the name of the game.

A crucial lesson from comparing the scenarios is that certain strategies are robust under both scenarios-dominant strategy regardless of conflict length. Such actions include immediately leveraging force-majeure contract clauses, mapping Tier 2 and Tier 3 suppliers in GPR-sensitive areas, diversification of supply base across different geopolitical blocks, and leveraging an AI-powered risk monitoring tool. This concept of robustness under uncertainty is vital for decision-makers: a firm does not need to forecast the actual length of the conflict in order to reap benefits from valuable resilience-enabling investments-the same foundational investments pay off under either outcome, at different magnitudes.

Table 3.4 Strategic Implication by Scenario

Strategy	Scenario A Value	Scenario B Value	Scenario Robust?
Force majeure activation	Immediate legal protection	Legal protection + cost recovery	Yes
Tier 2/3 supplier mapping	Identifies substitutes quickly	Enables structural redesign	Yes
Geopolitical bloc diversification	Reduces concentration risk	Enables structural multi-bloc sourcing	Yes
AI-driven risk monitoring	Early warning; faster response	Continuous scenario simulation	Yes
Bypass route pre-commitment	Reduces spot-market premium	Avoids route unavailability entirely	Yes
Nearshoring/regional centers	Operational by Scenario B onset	Core structural requirement	Partial

4.3 The Multipolar Supply Chain Resilience (MSCR) Framework

The Six-Pillar Multipolar Supply Chain Resilience (MSCR) Framework outlined here merges the evidence of disruption from Section 3.1 and the scenario insights from

Section 3.2 into a practical strategic architecture for MNEs operating in a multipolar geopolitical environment. Rather than describing only what firms should do, each pillar below is framed to clarify why the risk exists (its structural driver), how firms are expected to respond (the operational mechanism), and when the response is triggered (its calibration signal). The framework is built upon four core design principles: multipolarity (recognizes three or more competing geopolitical blocs rather than a US-centered or bipolar system); dual-channel awareness (integrates both energy and technology supply chain resilience into a single framework); dynamic calibration (each pillar is linked to observable, publicly available data sources, allowing for continuous monitoring); and actionability (provides both immediate tactical responses and long-term structural changes over predefined time horizons).

Pillar 1 – Geopolitical Risk Intelligence (GRI). Why: firms cannot manage exposure they cannot see; realized acts (GPAs) and anticipated threats (GPTs) require different responses [3]. **How:** by linking GPR scores, ACLED conflict-event data, insurance-market signals, and supplier communications into a single monitoring layer. **When:** continuously, with escalation thresholds tied to GPA surges. This capability is what allowed AI-powered platforms like Resilinc and MSCI GeoSpatial Asset Intelligence to outperform traditional monitoring methods during the 2026 conflict.

Pillar 2 – Multi-Polar Supplier Network (MSN). Why: single-region supplier dependency was the principal structural vulnerability revealed by the 2026 conflict. **How**: by quantifying HHI on supplier spend broken down by commodity and geopolitical bloc, with no bloc exceeding 40% of spend for a strategically critical commodity across three blocs (Western Alliance, BRICS+, Non-Aligned States). **When**: as a standing structural target, re-assessed whenever HHI concentration crosses the 40% threshold. The three-bloc system reflects the multipolar world described by Luo and Tung [6], who highlight friend-shoring, nearshoring, and re-globalisation as preferred responses to multipolar fragmentation.

Pillar 3 – Strategic Chokepoint Resilience (SCR). Why: chokepoint closure leaves almost no sensing lead time (Section 5.1). **How:** firms systematically assess logistics dependence on the five major maritime chokepoints (Hormuz, Suez, Malacca, Bosphorus, Panama) and pre-negotiate bypass routing with guaranteed capacity reservations. **When:** bypass capacity must be secured before a crisis, not during one — firms that had already secured capacity on the Cape of Good Hope route suffered materially less financial loss than those dependent on spot-market access. This pillar targets the logistics network, a dimension of resilience often neglected relative to inventory-focused approaches [21].

Pillar 4 - Dynamic Inventory and Buffer Strategy (DIBS) moves beyond the simplistic lean vs. resilience debate that dominated post-COVID SCM. Instead of indiscriminately increasing safety stocks across all commodity categories, DIBS focuses on adaptive buffers tailored to GPR volatility: when GPR scores exceed preset thresholds-specifically when the GPA components surge, indicating realized disruption rather than potential risk-automatically replenished safety stocks for GPR-sensitive commodities, financed through pre-arranged inventory credit facilities. This approach mitigates the over-investment risks of constantly elevated safety stocks as well as the under-investment risks of the "pure lean" model, aligning with the concept of dynamic capabilities [13].

Pillar 5 - Multipolar Financial and Contractual Hedging (MFCH) addresses how geopolitical risk spreads through financial and contractual means in addition to physical flows. The 2026 conflict triggered numerous force majeure claims, revealing how poorly standard commercial contract force majeure clauses, originally designed for natural disasters, fit state-actor military events. MFCH calls for GPR-calibrated clause libraries specifically addressing sanctions, maritime closures, state warfare, and airspace denial as trigger conditions-a critical integration of law and SCM currently lacking in academic research and practice.

Pillar 6 - Digital Resilience and AI Monitoring (DRAM) acknowledges the pivotal role of technology-enhanced visibility in managing geopolitical risk. AI-powered platforms (Resilinc, Z2Data, GEP SMART, MSCI GeoSpatial Asset Intelligence), offering real-time, multi-tier supplier visibility and scenario simulation capabilities, gave firms that used them a crucial resilience advantage during the 2026 conflict over those reliant on manual monitoring. DRAM demands investment in platforms providing Tier 2 and Tier 3 supplier visibility, digital twin simulation of scenarios, and real-time integration with GPR data feeds. The DRAM pillar is particularly important for pharmaceuticals and life sciences, as the regulatory-SCM interface requires AI-driven pre-qualification of alternative sourcing options, re-routing and materials substitutions for emergency situations.

Table 4.5 From Disruption Findings to MSCR Framework Pillars

Disruption Finding	Core Risk	Strategic Response	MSCR Pillar
Hormuz closure; logistics rerouting	Chokepoint dependency	Bypass routing; pre-committed capacity	Strategic Chokepoint Resilience (SCR)
Israeli R&D/semiconductor disruption	R&D concentration risk	Innovation redundancy; multi-site sourcing	Multi-Polar Supplier Network (MSN)
Force majeure invocations; insurance spikes	Legal and contractual ambiguity	GPR-calibrated contract clauses	Multipolar Financial & Contractual Hedging (MFCH)
GCC single-region supplier failure	Geopolitical concentration risk	Supplier diversification across blocs	Multi-Polar Supplier Network (MSN)
Inventory without logistics = false security	Inventory-logistics mismatch	Adaptive buffers tied to GPR triggers	Dynamic Inventory & Buffer Strategy (DIBS)
Firms using AI-based platforms reported fewer disruption delays in industry surveys	Visibility gap	Tier 2/3 visibility; digital twin simulation	Digital Resilience & AI Monitoring (DRAM)
GPR spikes precede disruption	Risk monitoring gap	GPR/GPA/GPT real-time monitoring	Geopolitical Risk Intelligence (GRI)

Table Error! No text of specified style in document.**3 MSCR Framework Summary**

s	Definition	Key Indicator	Data Source	Dynamic Capability
GRI	Real-time geopolitical risk monitoring (GPAs vs GPTs)	GPR monitoring frequency; insurance signals	GPR Index, ACLED, insurance markets	Sensing
MSN	Supplier diversification across geopolitical blocs	HHI by commodity and geopolitical bloc	Internal procurement data; trade databases	Sensing and Seizing
SCR	Bypass routing for major maritime chokepoints	Percentage of shipment exposure per chokepoint	Logistics databases, port data	Seizing
DIBS	GPR-triggered adaptive inventory buffers	Buffer days for GPR-sensitive commodities	GPR Index, internal inventory data	Seizing and Reconfiguring
MFCH	GPR-calibrated contractual and financial hedging	Percentage of contracts with geopolitical force majeure	Contract management systems	Reconfiguring
DRAM	AI-powered multi-tier supply chain visibility	Tier 2/3 digital visibility coverage	Resilinc, Z2Data, MSCI, GEP SMART	Sensing and Seizing

5. DISCUSSION

The findings speak directly to three established theoretical traditions rather than merely restating the results. First, in relation to dynamic capability theory [13], the case shows that sensing, seizing, and reconfiguring capabilities are not uniformly available across disruption channels: firms could sense the energy shock almost immediately through price signals, but sensing the technology-channel shock required GPA/GPT-level geopolitical monitoring that most firms lacked — extending dynamic capability theory by showing that capability adequacy is channel-specific, not firm-generic, under multipolar conditions. Second, in relation to network and supply chain resilience theory [21–23,31], the findings support the view that resilience depends on network-wide capability-vulnerability balance rather than firm-level buffers alone: the observation that "inventory alone cannot compensate for a vulnerable logistics network" (Section 5.2) is a direct empirical instance of Pettit et al.'s [31] capability-vulnerability balance, while extending it to a case where the vulnerability driver is geopolitical rather than operational or natural. Third, in relation to complex adaptive systems (CAS) theory [30], the six-channel cascade — particularly the second-order transmission from the energy channel into the food/water channel

(Section 5.1) — demonstrates emergent, system-wide effects that no single-channel model would predict, supporting Choi et al.'s [30] characterization of supply networks as complex adaptive systems and extending it to a case driven by military rather than market shocks.

Taken together, these findings neither simply confirm nor reject prior theory: they extend dynamic capability and network-resilience theory into a multipolar, state-conflict setting that these theories were not originally built to explain, and in doing so justify treating multipolarity — as argued in Section 2.3 — as a distinct structural condition for supply chain resilience research, not a variant of existing sub-state disruption models.

6. CONCLUSION

This paper has considered the multi-channel propagation of geopolitical spillovers from the 2026 Iran-Israel-US conflict through global supply chains; assessed potential impacts across two conflict scenarios; and presented the six-pillar Multipolar Supply Chain Resilience (MSCR) Framework as an architecture of strategic responses that managers can use to cope with a multipolar order.

6.1 Theoretical Implications

The 2026 conflict marks a new qualitative category of geopolitical supply chain disruption: dual-channel simultaneity — the simultaneous threat to energy (Strait of Hormuz) and technology (Israel's semiconductor/R&D clusters) supply ecosystems — that no existing single-channel framework adequately addresses. The MSCR framework contributes to supply chain resilience and international business literature in three ways: it is the first conceptual framework directly calibrated to great-power conflict within a multipolar order, extending prior resilience frameworks [21–23] beyond sub-state disruptions; it integrates geopolitical risk measures (a macro construct) with operational supply chain design (a firm-level construct) into one cohesive structure, bridging the translation gap noted by Gereffi et al. [4]; and it is associated with a scenario-robust blend of tactical and structural responses, grounded in observable secondary data and expressed as testable propositions (Section 5.3).

6.2 Managerial Implications

Scenario analysis has revealed strategic responses that work across both immediate crisis and extended conflict – active use of the force majeure clause, mapped Tier 2/3 supply networks, geopolitical bloc diversification, and AI-driven risk monitoring. These serve as managerial anchors in conditions of deep uncertainty and suggest that investment in resilient supply chains does not depend on accurately forecasting the duration of the conflict, because these high-value strategies are largely scenario-independent. The MSCR Framework uses openly available public data, allowing managers to continuously measure and benchmark their own resilience posture against the six pillars.

6.3 Policy Implications

For policymakers, the projected $120–194 billion GCC GDP decline [18] and the demonstrated fragility of standard force majeure and insurance instruments under state-actor conflict (Section 5.1) suggest a need for coordinated chokepoint-contingency planning (e.g., strategic petroleum reserve release protocols) and for regulatory clarification of force majeure applicability to state-level military escalation, so that firms and insurers are not left to interpret contractual ambiguity during an active crisis.

6.4 Limitations

This research has several limitations. First, given that the study is conducted during an active conflict, a final assessment of the total extent and duration of disruptions remains impossible. Second, relying exclusively on public secondary data prevents quantitative firm-level validation. Third, the MSCR Framework is mainly designed for MNEs that operate within Western Alliance and BRICS-adjacent markets; its applicability to state-owned enterprises, subject to different governance logics, warrants further exploration. Fourth, the dimension of cybersecurity for digital supply chains, especially given the documented cyber warfare capabilities of Iran, deserves a separate study.

6.5 Future Research

Future research can test the MSCR Framework's propositions (Section 5.3) empirically through survey-based primary data from SCM managers during the 2026 disruptions; quantify dual-channel simultaneity as a novel component of the GPR Index; study the role of non-aligned geopolitical balancers (India, Turkey, Indonesia, Saudi Arabia) in multipolar supply chains; and examine the regulatory-SCM intersection of pharmaceutical supply chains during geopolitical emergencies. Although this study has laid the conceptual and scenario-based groundwork for the MSCR framework, empirical verification of its propositions — especially the effectiveness of the six pillars in practice — is needed via primary data gathered from supply chain practitioners.

The 2026 conflict between Iran, Israel and the US is a harsh real-world lesson on the vulnerability of efficient supply chains and the costs of geopolitical ignorance. This paper contributes a durable approach towards navigating this unprecedented and irreversible multipolar transition in global economics.

REFERENCES

1. Amid regional conflict, the Strait of Hormuz remains critical oil chokepoint - U.S. Energy Information Administration (EIA), https://www.eia.gov/todayinenergy/detail.php?id=65504, last accessed 2026/05/08.
2. 2026 Iran war | Explained, United States, Israel, Strait of Hormuz, Map, & Conflict | Britannica, https://www.britannica.com/event/2026-Iran-war, last accessed 2026/05/08.
3. Caldara, D., Iacoviell, M.: Measuring Geopolitical Risk. American Economic Review. 112, 1194–1225 (2022). https://doi.org/10.1257/AER.20191823.
4. Gereffi, G., Humphrey, J., Sturgeon, T.: The governance of global value chains. Rev. Int. Polit. Econ. 12, 78–104 (2005). https://doi.org/10.1080/09692290500049805.

5. Chang, X., Song, Z., Zhou, T.: Geopolitical risk and global supply chain resilience. Financ. Res. Lett. 86, (2025). https://doi.org/10.1016/j.frl.2025.108551.

6. Luo, Y., Tung, R.L.: A multipolar geo-strategy for international business. J. Int. Bus. Stud. 56, 821–829 (2025). https://doi.org/10.1057/S41267-025-00777-Z/FIGURES/1.

7. Zahoor, N., Wu, J., Khan, H., Khan, Z.: De-globalization, International Trade Protectionism, and the Reconfigurations of Global Value Chains. Management International Review 2023 63:5. 63, 823–859 (2023). https://doi.org/10.1007/S11575-023-00522-4.

8. Kumar Yadav, A., Singh, P., Padhi, A., Verma, N., Shrivastava, A., Yadav, K.: LEX LOCALIS-JOURNAL OF LOCAL SELF-GOVERNMENT GEO-POLITICAL RISKS AND GLOBAL SUPPLY CHAINS: A STRATEGIC RESILIENCE MODEL. (2013).

9. Yin, R.: Case Study and Applications: Design and Methods (6th ed.). Theory and Methods of Metallurgical Process Integration. 11, 179–272 (2016).

10. Schoemaker, P.J.H.: Scenario Planning: A Tool for Strategic Thinking. MIT Sloan Manag. Rev. (1995).

11. Supply Chain Scenario Analysis: Short vs. Prolonged U.S.–Iran Conflict - Logistics Viewpoints, https://logisticsviewpoints-com.translate.goog/2026/03/04/supply-chain-scenario-analysis-global-manufacturing-impacts-of-a-short-vs-prolonged-u-s-iran-conflict/?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=tc, last accessed 2026/05/09.

12. Kilian, L., Plante, M.D., Richter, A.W., Zhou, X.: The Impact of the 2026 Iran War on U.S. Inflation: A Scenario Analysis The Impact of the 2026 Iran War on U.S. Inflation: A Scenario Analysis *. (2026). https://doi.org/10.24149/wp2609.

13. Teece, D.J.: The Evolution of the Dynamic Capabilities Framework. In: FGF Studies in Small Business and Entrepreneurship. pp. 113–129. Springer Science and Business Media Deutschland GmbH (2023). https://doi.org/10.1007/978-3-031-11371-0_6.

14. Kilian, L.: Exogenous Oil Supply Shocks: How Big Are They and How Much Do They Matter for the U.S. Economy? Rev. Econ. Stat. 90, 216–240 (2008). https://doi.org/10.1162/REST.90.2.216.

15. How the Iran Conflict Is Rippling Across Global Supply Chains - Z2Data, https://www.z2data.com/insights/how-the-iran-conflict-is-rippling-across-global-supply-chains, last accessed 2026/05/09.

16. Uncovering Supply-Chain Risks in the Iran War | MSCI, https://www.msci.com/research-and-insights/blog-post/uncovering-supply-chain-risks-in-the-iran-war, last accessed 2026/05/09.

17. Middle East Special Issue: March 2026 | ACLED, https://acleddata.com/update/middle-east-special-issue-march-2026, last accessed 2026/05/08.

18. Regional Bureau for Arab States ECONOMIC AND SOCIAL IMPLICATIONS FOR THE ARAB STATES REGION MILITARY ESCALATION IN THE MIDDLE EAST: Preliminary Assessment 2 Regional Bureau for Arab States.

19. Middle East Conflict and Global Supply Chain Impact, https://resilinc.ai/learning-center/webinars/on-demand-webinar-navigating-middle-east-conflict-global-supply-chain-impact/, last accessed 2026/05/09.

20. Iran War: supply chain risks and outlook for mining industry - Mining Technology, https://www.mining-technology.com/analyst-comment/iran-war-supply-chain-risks-outlook-mining-industry/, last accessed 2026/05/09.

21. Spieske, A., Birkel, H.: Improving supply chain resilience through industry 4.0: A systematic literature review under the impressions of the COVID-19 pandemic. Comput. Ind. Eng. 158, 107452 (2021). https://doi.org/10.1016/J.CIE.2021.107452.

22. Hohenstein, N.O., Feise, E., Hartmann, E., Giunipero, L.: Research on the phenomenon of supply chain resilienceA systematic review and paths for further investigation. International Journal of Physical Distribution & Logistics Management. 45, 90–117 (2015). https://doi.org/10.1108/IJPDLM-05-2013-0128.

23. Ambulkar, S., Blackhurst, J., Grawe, S.: Firm's resilience to supply chain disruptions: Scale development and empirical examination. Journal of Operations Management. 33–34, 111–122 (2015). https://doi.org/10.1016/J.JOM.2014.11.002.