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Geopolitical disruptions and Saudi Arabia's emergence as a global logistics stabilisation hub

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Background: Global supply chains remain highly exposed to geopolitical instability affecting critical maritime chokepoints across the Middle East, including the Strait of Hormuz, Bab el-Mandeb and the Suez Canal. Disruptions in these corridors can reverberate through logistics networks, increase supply chain risk exposure and weaken trade continuity.

Objectives: This study examines whether Saudi Arabia can function as a logistics stabilisation hub by connecting Red Sea gateways, Gulf ports, inland logistics corridors, energy logistics assets and digital logistics systems.

Method: A structured survey of 300 logistics professionals was analysed using structural equation modelling. The model tested the relationships between geopolitical instability, maritime logistics disruptions, supply chain risk exposure, logistics stabilisation hub capability and supply chain stability.

Results: Geopolitical instability increased maritime logistics disruptions, and maritime disruptions increased supply chain risk exposure. Supply chain risk exposure reduced global supply chain stability. Logistics stabilisation hub capability moderated the disruption–stability relationship and supported regional supply chain resilience.

Conclusion: National logistics systems can reduce the destabilising effects of maritime chokepoint disruption when they provide multimodal redundancy, energy-logistics continuity and digital cargo visibility.

Contribution: The study extends hub theory by framing logistics hubs as stabilisation infrastructure rather than only trade facilitation assets.

Keywords: Saudi Arabia; geopolitical risk; logistics hubs; supply chain resilience; maritime logistics disruptions; energy logistics; global trade corridors; logistics infrastructure.

Introduction

Global supply chains increasingly operate within a volatile geopolitical landscape. Political conflict, trade restrictions and maritime security incidents have increased uncertainty about the reliability of international logistics networks. Strategic sea routes linking Asia, Europe and Africa are especially susceptible to disruption. These routes concentrate a large proportion of the world's trade flows and thus are major nodes in terms of international supply chains (United Nations Conference on Trade and Development [UNCTAD] 2023).

Recent geopolitical tensions have drawn renewed attention to the vulnerability of maritime logistics networks in the Middle East. The Strait of Hormuz, the Bab el-Mandeb Strait and the Suez Canal are key chokepoints that serve as major conduits for global energy shipments and containerised trade. When these corridors are disrupted, the effects can quickly ripple through international logistics networks, increasing freight costs, extending cargo movement times and intensifying uncertainty in global supply chains (Notteboom, Pallis & Rodrigue 2021; Stopford 2009).

Saudi Arabia has a strategic geographic location linking the Gulf with the Red Sea and other global shipping lanes (Rodrigue 2020; UNCTAD 2023). It is situated between two of the most vital maritime systems in international shipping and thus is well-positioned to serve as a logistical bridge connecting Asia, Europe and Africa. Related infrastructure developments under Saudi Arabia's Vision 2030 logistics policy have also accelerated the modernisation of ports, logistics zones and multimodal transport corridors linking eastern and western maritime gateways (Ivanov 2022; Ivanov & Dolgui 2021).

Note: Additional supporting information may be found in the online version of this article as Online Appendix 1.

Although logistics infrastructure is increasingly important for trade continuity during major disruption events, few studies have examined how national logistics systems can operate as stabilisation mechanisms in global supply chains. Existing resilience research has mainly focused on firm-level preparedness, supply chain risk management and organisational recovery. Less attention has been given to large-scale logistics infrastructure systems and their role in buffering geopolitical disruption (Christopher & Peck 2004; Rodrigue 2020). This study addresses this gap by developing and testing a framework explaining how Saudi Arabia may act as a logistics stabilisation hub in global supply chains. Existing logistics and supply chain studies have examined port performance, supply chain resilience, disruption propagation and transport-network vulnerability (Christopher & Peck 2004; Dolgui, Ivanov & Sokolov 2018; Ivanov & Dolgui 2021; Notteboom et al. 2021). However, fewer studies explain how national logistics systems can function as stabilisation infrastructure when maritime chokepoints are exposed to geopolitical disruption.

This study does not argue that geopolitical instability directly creates logistics hub capability. Rather, it argues that when geopolitical instability produces maritime disruption, logistics stabilisation hub capability can buffer the effect of disruption on supply chain stability through multimodal redundancy, energy-logistics continuity and digital visibility.

The remainder of this article is organised as follows. The 'Literature review and conceptual framework' section reviews the literature and develops the hypotheses. The 'Research methods and design' section describes the research methods and empirical model. The 'Empirical results' section presents the empirical results. The 'Discussion' section discusses the findings, implications and limitations, and the 'Conclusion' section concludes the study.

Literature review and conceptual framework

Geopolitical risk and maritime chokepoint vulnerability

Global supply chains are increasingly exposed to geopolitical risk, trade-policy uncertainty, armed conflict, sanctions, maritime insecurity and strategic competition between states. Geopolitical risk is not only a political phenomenon; it has direct operational implications for transport reliability, cargo availability, inventory planning, freight-rate volatility and supply chain continuity. Caldara and Iacoviello (2022) conceptualise geopolitical risk as a measurable source of economic uncertainty that affects investment, trade and operational decision-making. In logistics and maritime transport, this uncertainty becomes operational when it disrupts shipping routes, reduces schedule reliability, increases insurance costs or forces carriers to reroute vessels through longer and more expensive corridors.

Maritime chokepoints are particularly vulnerable because they concentrate large volumes of trade and energy flows within narrow geographic passages. The Strait of Hormuz, Bab el-Mandeb and the Suez Canal are central to global energy, containerised trade and interregional connectivity. Their strategic importance creates a systemic vulnerability: disruption in one corridor can affect not only the immediate route but also freight markets, port calls, inland distribution, inventory cycles and production continuity across distant supply chains. Stopford (2009) and Rodrigue (2020) emphasise that maritime transport networks depend on route concentration, port hierarchy and corridor efficiency. These features generate strong economic advantages under normal conditions, but they can also intensify disruption when critical nodes or corridors are exposed to geopolitical tension.

Recent maritime disruptions have demonstrated that corridor vulnerability is not a marginal issue. When vessels are delayed, rerouted or exposed to security threats, the consequences extend across logistics networks through higher transport costs, longer transit times and reduced reliability. United Nations Conference on Trade and Development (2023, 2024) highlights that maritime transport remains essential to global trade but is increasingly affected by geopolitical fragmentation, climate-related disruption, congestion and security shocks. Notteboom et al. (2021) similarly show that disruptions in ports and shipping systems generate spatial and temporal effects across wider logistics networks. Therefore, geopolitical instability should be treated as a supply chain risk driver that becomes visible through maritime logistics disruption.

This study builds on this logic by focusing on how geopolitical instability affects maritime logistics disruptions in a region where several critical corridors intersect. The Middle East is not only a location of geopolitical tension; it is also a core logistics space connecting Asia, Europe and Africa. Therefore, the relationship between geopolitical instability and maritime logistics disruption is central to understanding supply chain vulnerability in this context.

Maritime chokepoints, disruption propagation and supply chain risk exposure

Supply chain disruption occurs when an unexpected event interrupts the normal flow of materials, information, services or financial resources across a supply network. Disruptions can originate from natural hazards, operational failures, cyber incidents, pandemics, geopolitical events or transport-system breakdowns. In logistics-intensive supply chains, disruption is rarely contained at the point of origin. Instead, it can spread through supplier dependencies, transport delays, inventory shortages, production rescheduling and customer-service failures.

The ripple-effect literature explains how localised disruptions propagate across supply chain networks. Dolgui et al. (2018) argue that disruption effects travel through connected supply

chains because firms depend on interrelated suppliers, carriers, ports, warehouses and information systems. Ivanov (2022) further explains that supply chain viability depends on the ability of a network to maintain essential functions under severe external shocks. In maritime logistics, the ripple effect is especially important because a delay or rerouting decision at one chokepoint can affect vessel schedules, port congestion, inland transport capacity and downstream inventory availability.

Maritime chokepoints are critical because they combine high strategic value with limited routing flexibility. The Strait of Hormuz supports major energy flows from the Gulf region. Bab el-Mandeb connects the Red Sea with the Gulf of Aden and the Indian Ocean. The Suez Canal links Asia–Europe maritime trade and reduces the need for longer routes around the Cape of Good Hope. Disruption in these corridors can increase voyage distance, raise fuel and insurance costs, delay cargo arrivals and reduce schedule reliability. These operational effects subsequently increase supply chain risk exposure by affecting lead-time predictability, inventory availability, procurement continuity and service performance.

Supply chain resilience research provides the theoretical foundation for understanding how organisations and networks respond to such shocks. Christopher and Peck (2004) define resilience as the ability of a supply chain to return to its original or desired state after disruption. Sheffi (2005) emphasises redundancy, flexibility, collaboration and preparedness as core resilience mechanisms. Pettit, Fiksel and Croxton (2010) conceptualise resilience as the balance between vulnerabilities and capabilities, while Ponomarov and Holcomb (2009) highlight adaptive capability, recovery capacity and continuity. Wieland and Wallenburg (2013) add that resilience depends not only on flexibility and redundancy but also on relational competence across supply chain actors. Hosseini, Ivanov and Dolgui (2019) further show that supply chain resilience can be examined through multiple analytical lenses, including absorptive, adaptive and restorative capacity.

These studies suggest that resilience is not only a firm-level property. It is also shaped by logistics infrastructure, transport alternatives, institutional coordination and network design. A firm may have strong internal risk-management practices but remain vulnerable if it depends on a single maritime corridor or lacks credible alternative transport options. This is particularly relevant for supply chains that depend on energy flows, food imports, healthcare goods, manufacturing inputs and containerised trade. In such contexts, resilience requires more than inventory buffers or supplier diversification. It also requires transport-system redundancy, multimodal connectivity, digital visibility and corridor-level coordination.

Accordingly, this study treats supply chain risk exposure as the mechanism through which maritime logistics disruptions affect global supply chain stability. Maritime disruption increases uncertainty in lead times, cargo availability, freight cost and route reliability. This increases supply chain risk exposure, which can reduce stability across procurement, production, distribution and service continuity. The study therefore links geopolitical risk, maritime disruption and supply chain stability through a disruption-propagation logic grounded in supply chain resilience theory.

Hub theory, port regionalisation and logistics network stabilisation

Hub theory provides an important foundation for understanding how logistics systems create connectivity and coordination advantages. Early hub-location research explains how hubs concentrate flows, reduce network complexity and improve the efficiency of transport systems. O'Kelly (1986) conceptualises hubs as central nodes that consolidate and redistribute flows within spatial networks. Campbell (1994) develops the hub-location problem by showing how hub placement influences transport cost, routing efficiency and network structure.

Fleming and Hayuth (1994) further distinguish between centrality and intermediacy, arguing that transport hubs derive value not only from their local market but also from their position between major flows.

In maritime and port studies, hub theory has been extended through the concepts of port hierarchy, port regionalisation and hinterland integration. Notteboom and Rodrigue (2005) argue that ports increasingly develop beyond the seaport terminal through inland corridors, dry ports, logistics zones and intermodal systems. This regionalisation process shifts the role of ports from isolated maritime gateways to integrated logistics platforms. Rodrigue (2020) similarly emphasises that modern logistics hubs connect maritime, road, rail, warehousing and distribution functions across wider freight systems. Monios and Wilmsmeier (2012) show that inland terminals and intermodal corridors can reshape port competition and logistics integration. Ducruet and Notteboom (2012) also demonstrate that maritime networks are shaped by port centrality, connectivity and the interaction between global shipping routes and regional logistics systems.

Traditional hub theory focuses mainly on efficiency, consolidation, accessibility and trade facilitation. However, recent disruption conditions require a broader interpretation. Under geopolitical instability, a logistics hub is valuable not only because it reduces transport cost or improves cargo throughput, but also because it can stabilise flows when normal corridors are disrupted. This requires a shift from viewing hubs as efficiency infrastructure to viewing them as resilience infrastructure.

A logistics stabilisation hub can therefore be defined as a national or regional infrastructure system that maintains cargo, energy and information flows during disruption by combining alternative routing, multimodal transfer, cargo

visibility and institutional coordination. This stabilisation function depends on three interrelated capabilities. Firstly, logistics infrastructure quality provides the physical basis for rerouting and cargo absorption through ports, roads, rail links, dry ports, bonded zones and logistics parks. Secondly, energy logistics capacity supports continuity in energy-related flows through pipelines, industrial ports, export terminals and energy-distribution systems. Thirdly, digital logistics integration enables cargo visibility, data sharing, platform coordination and faster decision-making during disruption. These capabilities are consistent with resilience theory because they strengthen absorptive and adaptive capacity at the network level.

The concept of the logistics stabilisation hub therefore extends existing hub theory. It does not reject the traditional role of hubs in consolidation, intermediation and trade facilitation. Rather, it adds a disruption-oriented function.

Under geopolitical risk, the value of a hub lies in its ability to preserve system continuity, provide credible routing alternatives and reduce the destabilising effect of maritime disruption on supply chains.

Recent Saudi and Middle East and North Africa (MENA) logistics studies further support the relevance of digital, organisational and sustainability-oriented logistics capabilities. El-Nakib and Elzarka (2026a) show that green logistics performance in MENA requires integrated measurement of logistics efficiency and environmental performance. El-Nakib, Elzarka and Gouhar (2026) demonstrate that fossil-fuel-dependent logistics systems face interdependent human, technological and organisational constraints that affect sustainability transition. El-Nakib and Elzarka (2026b) further show that artificial intelligence (AI)-enabled and interoperable logistics architectures can strengthen coordination and resilience in Saudi supply chain systems. El-Nakib and Elzarka (2026c) additionally show that digital twin adoption readiness in Egypt's emerging logistics sector is strengthened by perceived operational benefits, workforce digital skills and managerial support, while investment uncertainty remains a significant barrier. These studies are not used as primary evidence for the present hypotheses, but they support the contextual argument that logistics capability in Saudi Arabia and MENA should be analysed as a multidimensional system involving infrastructure, digital integration and organisational readiness.

Saudi Arabia as a logistics stabilisation context

Saudi Arabia provides a strategically relevant context for studying logistics stabilisation under geopolitical disruption. The country is positioned between the Red Sea and the Gulf and connects maritime flows linking Asia, Europe and Africa. This position gives Saudi Arabia a distinctive logistics profile because it is not limited to one coastline or one maritime corridor. Its logistics system includes Red Sea gateways, Gulf ports, inland corridors, road and rail networks, logistics zones, energy logistics assets and digital logistics initiatives. This study uses the neutral term 'the Gulf' to avoid terminological controversy while preserving the study's focus on logistics corridors, ports and regional supply chain connectivity.

The Red Sea side includes major gateways such as Jeddah Islamic Port, King Abdullah Port and Yanbu Port, which connect Saudi Arabia to Asia, Europe and Africa. The Gulf side includes ports such as King Abdulaziz Port in Dammam and Jubail Industrial Port, which support regional trade, industrial logistics and energy-related flows. Inland logistics corridors and dry-port functions around Riyadh connect these maritime systems and support cargo movement between eastern and western gateways. This dual-coast geography is important because it creates the possibility of rerouting cargo and energy-related flows when a maritime chokepoint becomes unreliable.

Saudi Arabia's logistics transformation is also embedded in national policy. Vision 2030 and the National Transport and Logistics Strategy position logistics as a central pillar of economic diversification, trade integration and regional connectivity (Kingdom of Saudi Arabia 2016; Ministry of Transport and Logistic Services 2021). These strategies emphasise transport-mode integration, logistics-zone development, port capacity, aviation and maritime connectivity, infrastructure governance and digital services. The National Industrial Development and Logistics Programme also reinforces the role of logistics in linking industrial growth, energy systems, mining, trade and supply chain development (National Industrial Development and Logistics Program 2021).

In this context, Saudi Arabia's logistics corridors can be interpreted as strategic stabilisation infrastructure. Inland connections between Gulf ports, Riyadh logistics facilities and Red Sea gateways can provide alternative pathways when maritime routes face instability, congestion or security concerns. These corridors combine road, rail, port, dry-port, pipeline and logistics-zone assets to support cargo redistribution across national and regional trade routes. From a resilience perspective, such multimodal integration can reduce dependence on a single chokepoint and increase the number of feasible routing options available to logistics operators during disruption.

Cross-border logistics corridors further extend this stabilisation role. Land-based freight routes connecting Saudi Arabia with neighbouring Gulf, Levant and Red Sea markets can complement maritime flows and support regional supply chain continuity. These corridors are particularly relevant when maritime transport is delayed, congested or exposed to security threats. By integrating maritime gateways, inland logistics nodes and cross-border transport routes, Saudi Arabia can contribute to a multilayered logistics system that supports both national trade connectivity and regional supply chain resilience.

For this study, the Saudi context matters for theoretical as well as practical reasons. Theoretically, Saudi Arabia provides a case where hub capability can be examined as a system-level stabilisation construct rather than as a single-port performance measure. Practically, the country's location near major maritime chokepoints makes the stabilisation role of logistics infrastructure especially relevant. If geopolitical instability affects the Strait of Hormuz, Bab el-Mandeb or the Suez Canal, logistics actors require credible alternatives that combine ports, inland corridors, energy logistics and digital visibility.

However, it is important not to overstate the argument. This study does not claim that geopolitical instability automatically strengthens Saudi logistics hub capability. Rather, it argues that geopolitical instability can increase maritime disruption, and that logistics stabilisation hub capability can reduce the negative consequences of such disruption when the required infrastructure, energy-logistics and digital capabilities are present. This distinction is important because hub capability is not a direct outcome of instability; it is a preparedness and response capability that becomes strategically valuable under disruption.

Research gap

The existing literature has generated important insights into geopolitical risk, maritime chokepoints, supply chain disruption, resilience and logistics hub development. However, these streams remain insufficiently integrated. Geopolitical risk studies often focus on macroeconomic uncertainty, trade volatility or energy-market consequences. Maritime transport studies examine port performance, route concentration, chokepoint vulnerability and network connectivity. Supply chain resilience studies explain disruption propagation, adaptive capability and recovery. Hub theory and port regionalisation research focus mainly on efficiency, connectivity and hinterland integration.

Despite these contributions, limited attention has been given to how national logistics systems can act as stabilisation hubs during geopolitical disruption. In particular, the literature has not sufficiently explained how inland corridors, multimodal infrastructure, energy logistics and digital logistics integration can reduce the destabilising effect of maritime disruption on supply chains. This gap is especially important in regions where geopolitical instability intersects with highly concentrated maritime corridors.

Saudi Arabia offers a strong context for addressing this gap because its logistics system combines dual-coast maritime access, inland corridor development, energy logistics assets, logistics-zone expansion and national policy support for logistics transformation. This context enables the study to move beyond conventional port-efficiency analysis and examine logistics hub capability as a resilience-oriented stabilisation mechanism.

Accordingly, this study contributes to the literature in three ways. Firstly, it links geopolitical instability to maritime logistics disruption and supply chain risk exposure through a disruption-propagation logic. Secondly, it extends hub theory by conceptualising logistics stabilisation hub capability as a network-level resilience capability rather than only an efficiency or connectivity construct. Thirdly, it situates Saudi Arabia's logistics transformation within a broader theoretical discussion of regional supply chain resilience under geopolitical uncertainty.

Hypotheses development

The first relationship concerns the effect of geopolitical instability on maritime logistics disruptions. Geopolitical instability can increase the probability of route disruption, vessel delay, port-security restrictions, insurance-cost escalation and rerouting. Maritime corridors that carry high volumes of energy and containerised trade are particularly sensitive to political and security shocks because alternative routes may involve longer distances, higher costs and weaker schedule reliability. Therefore, geopolitical instability is expected to increase maritime logistics disruptions:

> **H1:** Geopolitical instability positively influences maritime logistics disruptions.

The second relationship links maritime logistics disruptions to supply chain risk exposure. When maritime routes are disrupted, firms face uncertainty in cargo arrival, lead times, freight costs, inventory availability and customer-service reliability. These conditions increase exposure to operational, financial and service risks. In line with ripple-effect theory, disruption in the maritime transport layer can propagate into procurement, production and distribution decisions:

> **H2:** Maritime logistics disruptions increase supply chain risk exposure.

The third relationship links supply chain risk exposure to global supply chain stability. Higher risk exposure reduces the ability of supply chains to maintain predictable flows, service continuity and operational reliability. When firms face uncertain delivery times, unstable costs and weaker cargo visibility, global supply chain stability declines. This relationship is consistent with resilience theory, which argues that vulnerability increases when exposure is high and adaptive capability is insufficient:

> **H3:** Supply chain risk exposure negatively affects global supply chain stability.

The fourth hypothesis concerns the moderating role of logistics stabilisation hub capability. Strong hub capability can weaken the negative effect of maritime disruption on supply chain stability by offering alternative routing, multimodal coordination, cargo visibility and energy-logistics continuity. This means that maritime disruption should have a less damaging effect on supply chain stability when logistics stabilisation hub capability is high:

> **H4:** Logistics stabilisation hub capability moderates the relationship between maritime logistics disruptions and global

supply chain stability, such that the negative effect of maritime logistics disruptions on global supply chain stability is weaker when logistics stabilisation hub capability is higher.

To test H4, an interaction term between maritime logistics disruptions and logistics stabilisation hub capability was created after mean-centring the relevant construct scores. The interaction term was then entered into the structural model to assess whether logistics stabilisation hub capability weakened the negative disruption–stability relationship.

The fifth hypothesis concerns the direct contribution of logistics stabilisation hub capability to regional supply chain resilience. A hub that connects ports, inland corridors, energy assets and digital logistics systems can support the continuity of regional flows during disruption. Such capability strengthens the ability of supply chains to absorb shocks, adapt routing decisions and sustain critical flows:

H5: Logistics stabilisation hub capability positively influences regional supply chain resilience.

The sixth hypothesis concerns logistics infrastructure quality as an antecedent of logistics stabilisation hub capability. Ports, roads, rail links, inland logistics zones and dry ports provide the physical foundation for routing alternatives and cargo redistribution. Without strong infrastructure quality, a logistics hub cannot credibly perform a stabilisation role:

H6: Logistics infrastructure quality strengthens logistics stabilisation hub capability.

The seventh hypothesis concerns energy logistics capacity. In the Saudi and wider Middle Eastern context, energy logistics is central to regional and global supply chain continuity. Pipelines, industrial ports, export terminals and related energy-logistics systems can support continuity when maritime energy routes are exposed to disruption. Energy logistics capacity is therefore expected to contribute positively to logistics stabilisation hub capability:

H7: Energy logistics capacity positively contributes to logistics stabilisation hub capability.

The eighth hypothesis concerns digital logistics integration. Digital platforms, cargo tracking, data sharing, customs integration and real-time visibility improve coordination during disruption. These capabilities reduce information uncertainty and support faster rerouting and decision-making. Therefore, digital logistics integration is expected to strengthen logistics stabilisation hub capability:

H8: Digital logistics integration improves logistics stabilisation hub capability.

Together, these hypotheses develop a disruption-to-stabilisation model. Geopolitical instability is expected to increase maritime logistics disruptions; maritime disruptions are expected to increase supply chain risk exposure; and risk exposure is expected to reduce global supply chain stability. Logistics stabilisation hub capability is expected to buffer the disruption–stability relationship and support regional supply chain resilience. Its stabilisation role is enabled by logistics infrastructure quality, energy logistics capacity and digital logistics integration.

Theoretical synthesis and Saudi logistics components

Table 1 synthesises the main literature streams supporting the conceptual framework. The study draws on geopolitical risk, maritime chokepoint vulnerability, ripple-effect theory, supply chain resilience, hub theory, port regionalisation and digital logistics integration. This theoretical synthesis is important because geopolitical maritime disruption is a multidimensional phenomenon involving political risk, transport-system vulnerability, supply chain exposure and infrastructure-based resilience.

The table shows that the proposed model draws on multiple literature streams rather than relying on a single theoretical lens. This is important because geopolitical maritime disruption is a multidimensional phenomenon involving political risk, transport-system vulnerability, supply chain exposure and infrastructure-based resilience.

Table 2 summarises the Saudi logistics components that support the stabilisation-hub argument. These components show that Saudi Arabia's relevance is not based only on geographic location, but on the interaction between maritime access, inland corridors, energy logistics assets and digital logistics integration.

This table clarifies why Saudi Arabia is a theoretically relevant setting for examining logistics stabilisation hub

TABLE 1: Literature streams supporting the conceptual framework.

Literature stream	Main contribution	Relevance to this study
Geopolitical risk	Explains how political tension, conflict, sanctions and strategic competition generate uncertainty in trade and investment	Supports the link between geopolitical instability and maritime logistics disruptions
Maritime chokepoint vulnerability	Explains how concentrated maritime corridors create systemic exposure for trade and energy flows	Supports the study's focus on Hormuz, Bab el-Mandeb and Suez as critical disruption points
Ripple-effect theory	Explains how localised disruptions propagate across supply chain networks	Supports the link between maritime disruption and supply chain risk exposure
Supply chain resilience	Explains absorptive, adaptive and restorative capabilities under disruption	Supports the resilience logic behind logistics stabilisation hub capability
Hub theory and port regionalisation	Explains the role of hubs, inland corridors and multimodal integration in logistics networks	Supports the extension from efficiency-oriented hubs to stabilisation-oriented hubs
Digital logistics integration	Explains how visibility, data sharing and platform coordination improve decision-making	Supports digital logistics integration as an antecedent of hub stabilisation capability

TABLE 2: Saudi logistics components supporting stabilisation capability.

Component	Examples	Stabilisation role
Red Sea gateways	Jeddah Islamic Port, King Abdullah Port, Yanbu Port	Support access to Asia–Europe–Africa trade routes and provide western maritime connectivity
Gulf gateways	King Abdulaziz Port, Jubail Industrial Port	Support Gulf trade, industrial logistics and energy-related flows
Inland logistics corridors	Riyadh-linked road, rail and dry-port functions	Enable cargo transfer between eastern and western gateways
Energy logistics assets	Pipelines, industrial ports, export terminals and storage systems	Support continuity of energy-related flows during maritime disruption
Cross-border corridors	Gulf, Levant and Red Sea-linked land routes	Extend regional freight redistribution and reduce dependence on single maritime routes
Digital logistics systems	Cargo visibility, data sharing, customs integration and logistics platforms	Improve coordination, rerouting decisions and disruption response

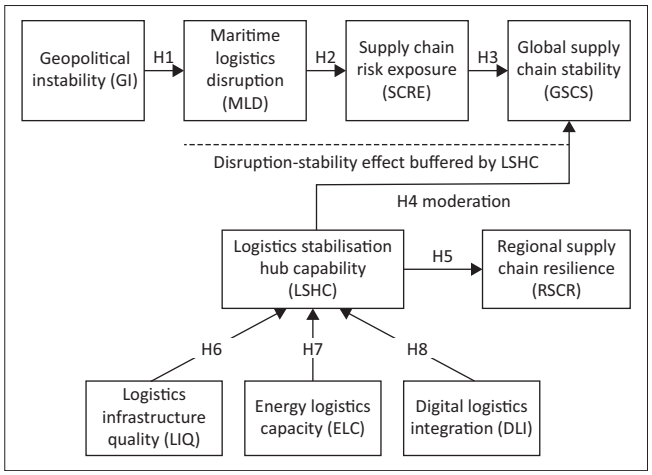


FIGURE 1: Conceptual framework of geopolitical maritime disruption and logistics stabilisation hub capability.

capability. The country's significance is not based only on geography, but on the interaction between maritime access, inland corridors, energy logistics and digital logistics integration.

Figure 1 presents the conceptual framework visually after the hypotheses. The figure shows geopolitical instability influencing maritime logistics disruptions, maritime logistics disruptions increasing supply chain risk exposure, and supply chain risk exposure reducing global supply chain stability. Logistics stabilisation hub capability appears as a moderator between maritime logistics disruptions and global supply chain stability. Logistics infrastructure quality, energy logistics capacity and digital logistics integration appear as antecedents of logistics stabilisation hub capability. Finally, logistics stabilisation hub capability directly influences regional supply chain resilience.

The figure visually summarises the proposed disruption-to-stabilisation model. It positions logistics stabilisation hub capability as both a direct resilience-enhancing capability and a buffering mechanism that reduces the negative effect of maritime disruption on supply chain stability.

Research methods and design

Target population and data collection

The target population comprised logistics professionals with experience in maritime transport, port operations, freight forwarding, energy logistics, transport planning, logistics infrastructure, supply chain risk management or logistics policy. Respondents were eligible if they had at least 5 years of relevant professional experience and were familiar with logistics operations connected to Middle Eastern trade corridors. Participants were recruited through professional networks, logistics associations, company contacts, LinkedIn and direct email invitations.

Data were collected between March and May 2026. A total of 342 responses were received. After removing 42 incomplete responses, straight-line responses and responses that failed the screening criteria, 300 usable responses were retained for analysis. Participation was voluntary and anonymous.

Based on the conceptual framework developed in the 'Literature review and conceptual framework' section, the empirical model tested eight hypotheses linking geopolitical instability, maritime logistics disruptions, supply chain risk exposure, logistics stabilisation hub capability, global supply chain stability and regional supply chain resilience. The model also tested logistics infrastructure quality, energy logistics capacity and digital logistics integration as antecedents of logistics stabilisation hub capability.

Measurement of constructs

The measurement model was operationalised using reflective survey indicators adapted from prior literature and adjusted to the context of maritime disruption, logistics corridors and regional supply chain resilience. All items were measured using a five-point Likert scale, ranging from strong disagreement to strong agreement. Table 3 summarises the main constructs, abbreviations and survey-style measurement indicators used in the empirical model.

Table 3 converts the measurement indicators into perception-based survey items rather than objective infrastructure statistics. This revision is important because the empirical analysis is based on respondent perceptions collected through a structured survey rather than direct measurement of port throughput, pipeline capacity or real-time tracking-system data.

Data analysis and structural equation modelling procedure

The final sample of 300 usable responses satisfies recommended thresholds for partial least squares structural

TABLE 3: Operationalisation of constructs used in the empirical model.

Construct	Code	Survey-style measurement indicators	Supporting literature
Geopolitical instability	GI	Geopolitical tensions affect logistics operations in regional trade corridors. Political conflict, sanctions or security risks increase uncertainty in maritime transport decisions. Strategic competition between states affects logistics planning.	Caldara and Iacoviello (2022); Rodrigue (2020)
Maritime logistics disruptions	MLD	Maritime routes used by supply chains are exposed to disruption. Shipping delays and rerouting increase operational uncertainty. Chokepoint disruption affects freight cost and schedule reliability.	Stopford (2009); Notteboom et al. (2021)
Supply chain risk exposure	SCRE	Transport disruptions increase exposure to inventory shortages, procurement delays and service unreliability. Maritime uncertainty increases operational and financial supply chain risks.	Ivanov and Dolgui (2021); Ivanov (2022)
Global supply chain stability	GSCS	Supply chains maintain predictable flows despite external shocks. Logistics operations continue with acceptable reliability during disruption. Cargo availability and delivery continuity remain stable.	Christopher and Peck (2004); Sheffi (2005)
Regional supply chain resilience	RSCR	Regional supply chains can absorb disruption and maintain critical flows. Logistics actors can adapt routing and recovery decisions during disruption. Regional logistics systems recover effectively after shocks.	Ponomarov and Holcomb (2009); Pettit et al. (2010)
Logistics stabilisation hub capability	LSHC	The logistics system provides alternative routing options during disruption. The hub supports cargo redistribution across maritime and inland corridors. The hub maintains connectivity when strategic corridors are disrupted.	Notteboom and Rodrigue (2005); Rodrigue (2020)
Logistics infrastructure quality	LIQ	Ports, roads and rail systems provide sufficient capacity for rerouting. Logistics zones and inland corridors support alternative cargo flows. Infrastructure integration strengthens disruption response.	Rodrigue (2020); Notteboom et al. (2021)
Energy logistics capacity	ELC	Energy logistics infrastructure supports continuity during maritime disruption. Pipeline, terminal and industrial logistics assets strengthen regional logistics resilience. Energy-related flows can be maintained through alternative logistics assets.	Stopford (2009); UNCTAD (2023)
Digital logistics integration	DLI	Digital logistics platforms improve cargo visibility during disruption. Real-time data sharing supports faster coordination and rerouting decisions. Digital systems improve integration among logistics actors.	Christopher and Peck (2004); Ivanov (2022)

Note: Please see the full reference list of the article, El-Nakib, I., Osailan, S., Balfaqih, H., Gohar, N.M. & Elzarka, S., 2026, 'Geopolitical disruptions and Saudi Arabia's emergence as a global logistics stabilisation hub', *Journal of Transport and Supply Chain Management* 20(0), a1436. https://doi.org/10.4102/jtscm.v20i0.1436, for more information.

equation modelling (PLS-SEM) analysis (Hair et al. 2019). The empirical analysis was conducted using SmartPLS 4 to evaluate the direct and moderating relationships within the proposed model.

The analysis followed the PLS SEM procedure because the study examined prediction-oriented relationships among multiple latent constructs and included an interaction effect. The measurement model was assessed using indicator loadings, Cronbach's alpha, composite reliability and average variance extracted. Discriminant validity was evaluated using the heterotrait-monotrait ratio. The structural model was assessed using path coefficients, bootstrapped significance levels, variance inflation factors, coefficient of determination values, effect sizes and the interaction effect for the moderation hypothesis. A bootstrapping procedure with 5000 resamples was used to assess statistical significance.

Empirical model specification

To test the proposed conceptual relationships, this study specifies a structural model linking geopolitical instability, maritime logistics disruptions, supply chain risk exposure, logistics stabilisation hub capability, global supply chain stability and regional supply chain resilience. The structural relationships can be expressed as follows, in Equation 1, Equation 2, Equation 3, Equation 4 and Equation 5:

$$MLD = \beta_1 GI + \varepsilon_1 \quad [Eqn\ 1]$$

$$SCRE = \beta_2 MLD + \varepsilon_2 \quad [Eqn\ 2]$$

$$LSHC = \beta_3 LIQ + \beta_4 ELC + \beta_5 DLI + \varepsilon_3 \quad [Eqn\ 3]$$

$$GSCS = \beta_6 SCRE + \beta_7 MLD + \beta_8 LSHC + \beta_9 (MLD \times LSHC) + \varepsilon_4 \quad [Eqn\ 4]$$

$$RSCR = \beta_{10} LSHC + \varepsilon_5 \quad [Eqn\ 5]$$

where GI represents geopolitical instability, MLD represents maritime logistics disruptions, SCRE represents supply chain risk exposure, LSHC represents logistics stabilisation hub capability, GSCS represents global supply chain stability, RSCR represents regional supply chain resilience, LIQ represents logistics infrastructure quality, ELC represents energy logistics capacity, and DLI represents digital logistics integration. The interaction term MLD × LSHC captures the moderating role of logistics stabilisation hub capability in weakening the negative effect of maritime logistics disruptions on global supply chain stability.

Common method bias assessment

Because the study relied on single-source survey data, common method bias was assessed before interpreting the structural model. Firstly, Harman's single-factor test was conducted to examine whether one factor accounted for most of the variance. The first unrotated factor explained 31.74% of the total variance, which was below the recommended 50% threshold. Secondly, full collinearity was assessed using variance inflation factors. The VIF values ranged from 1.24 to 2.89, remaining below the conservative threshold of 3.3. These results suggest that common method bias is unlikely to be a serious threat to the interpretation of the findings.

Ethical considerations

The study was conducted in accordance with institutional research ethics principles. Formal ethical approval was not required, and a waiver to conduct this study was obtained from the Effat University Ethics Committee because the research used an anonymous, voluntary survey of professional respondents, did not collect personally identifiable information, and reported only aggregated results.

Empirical results

Descriptive statistics and correlation analysis

The empirical analysis begins with descriptive statistics and correlation analysis for the variables included in the conceptual model. These statistics provide an overview of construct distribution and allow an initial assessment of the relationships among the main variables before structural model estimation.

Table 4 reports the mean values, standard deviations and correlation coefficients for the main variables included in the study. The correlation matrix provides preliminary support for the proposed theoretical logic by showing a positive association between geopolitical instability and maritime logistics disruptions, a positive association between maritime logistics disruptions and supply chain risk exposure and a negative association between supply chain risk exposure and global supply chain stability.

The correlation matrix also shows that geopolitical instability has a weak negative correlation with logistics stabilisation hub capability ($r = -0.12$). This indicates that respondents did not perceive hub capability as a direct outcome of geopolitical instability. Instead, they appeared to treat geopolitical instability as an external corridor-risk condition and logistics stabilisation hub capability as an internal infrastructure and coordination capability.

This supports the study's moderation logic: Hub capability buffers the effects of disruption, but it is not automatically created by geopolitical instability.

The results indicate moderate variation across the constructs. Geopolitical instability is positively associated with maritime logistics disruptions, while maritime logistics disruptions are positively associated with supply chain risk exposure. Logistics stabilisation hub capability shows a positive association with global supply chain stability and regional supply chain resilience. This pattern suggests that respondents perceive hub capability as a distinct stabilising capability associated with lower disruption exposure and stronger resilience outcomes. None of the correlation coefficients exceeds commonly accepted multicollinearity thresholds, indicating that the variables can be safely included in the structural model.

Measurement model assessment

Prior to testing the structural relationships, the reliability and validity of the measurement constructs were evaluated. The analysis assessed internal consistency reliability and convergent validity following established PLS-SEM procedures (Hair et al. 2019). Cronbach's alpha values above 0.70 indicate acceptable internal consistency, composite reliability values above 0.70 indicate satisfactory construct reliability, and average variance extracted values above 0.50 indicate convergent validity.

As shown in Table 5, the reliability and convergent validity results indicate that all constructs meet the recommended thresholds. Cronbach's alpha values range from 0.84 to 0.91, composite reliability values range from 0.88 to 0.93 and AVE values range from 0.59 to 0.67. These results indicate that the measurement indicators adequately capture their respective latent constructs and provide a reliable basis for structural model assessment.

Discriminant validity

Discriminant validity was assessed using the heterotrait-monotrait ratio of correlations. The heterotrait-monotrait ratio (HTMT) values ranged from 0.397 to 0.741 and remained below the conservative threshold of 0.85 and the more liberal threshold of 0.90, supporting discriminant validity. Full HTMT ratios are provided as Online Appendix 1.

Structural model assessment

After establishing measurement reliability, convergent validity and discriminant validity, the structural model was assessed using SmartPLS 4. The assessment considered approximate model fit, collinearity diagnostics, explanatory power, path significance and the moderating effect of logistics stabilisation hub capability. The model demonstrated

TABLE 5: Measurement model reliability and convergent validity.

Construct	Cronbach's alpha	Composite reliability	AVE	Interpretation
GI	0.88	0.91	0.63	Acceptable
MLD	0.86	0.90	0.61	Acceptable
SCRE	0.89	0.92	0.65	Acceptable
LSHC	0.91	0.93	0.67	Acceptable
GSCS	0.87	0.90	0.62	Acceptable
RSCR	0.88	0.91	0.64	Acceptable
LIQ	0.85	0.89	0.60	Acceptable
ELC	0.84	0.88	0.59	Acceptable
DLI	0.87	0.90	0.62	Acceptable

AVE, average variance extracted; GI, geopolitical instability; MLD, maritime logistics disruptions; SCRE, supply chain risk exposure; LSHC, logistics stabilisation hub capability; GSCS, global supply chain stability; RSCR, regional supply chain resilience; LIQ, logistics infrastructure quality; ELC, energy logistics capacity; DLI, digital logistics integration.

TABLE 4: Descriptive statistics and correlation matrix.

Variable	Mean	s.d.	GI	MLD	SCRE	LSHC	GSCS	RSCR
Geopolitical instability	3.84	0.76	1	-	-	-	-	-
Maritime logistics disruptions	3.61	0.82	0.58	1	-	-	-	-
Supply chain risk exposure	3.73	0.79	0.44	0.62	1	-	-	-
Logistics stabilisation hub capability	3.95	0.71	-0.12	-0.18	-0.31	1	-	-
Global supply chain stability	3.52	0.84	-0.37	-0.42	-0.55	0.48	1	-
Regional supply chain resilience	3.68	0.77	-0.20	-0.26	-0.36	0.57	0.51	1

GI, geopolitical instability; MLD, maritime logistics disruptions; SCRE, supply chain risk exposure; LSHC, logistics stabilisation hub capability; GSCS, global supply chain stability; RSCR, regional supply chain resilience; s.d., standard deviation.

TABLE 6: Structural model and hypothesis testing results.

Hypothesis	Relationship	Path coefficient	*t*-value	*p*-value	Result
H1	GI to MLD	0.53	9.84	< 0.001	Supported
H2	MLD to SCRE	0.49	8.76	< 0.001	Supported
H3	SCRE to GSCS	-0.46	7.94	< 0.001	Supported
H4	MLD–LSHC interaction to GSCS	0.28	3.12	0.002	Supported
H5	LSHC to RSCR	0.35	6.21	< 0.001	Supported
H6	LIQ to LSHC	0.41	7.33	< 0.001	Supported
H7	ELC to LSHC	0.37	6.85	< 0.001	Supported
H8	DLI to LSHC	0.39	7.02	< 0.001	Supported

GI, geopolitical instability; MLD, maritime logistics disruptions; SCRE, supply chain risk exposure; LSHC, logistics stabilisation hub capability; GSCS, global supply chain stability; RSCR, regional supply chain resilience; LIQ, logistics infrastructure quality; ELC, energy logistics capacity; DLI, digital logistics integration.

acceptable fit (standardised root mean square residual [SRMR] = 0.061; normed fit index [NFI] = 0.912), no severe collinearity (variance Inflation Factor [VIF] range = 1.24–2.89), moderate to substantial explained variance and predictive relevance. Full HTMT ratios, model-fit diagnostics, effect-size statistics, predictive relevance values and the complete survey instrument are provided as Online Appendix 1.

Table 6 shows that all hypothesised relationships are supported. The strongest coefficient is observed for the relationship between geopolitical instability and maritime logistics disruptions, confirming that geopolitical conditions are an important driver of disruption in strategic maritime corridors. The moderating effect is positive and significant, indicating that logistics stabilisation hub capability weakens the negative disruption effect on global supply chain stability.

Implications for logistics stabilisation hubs

The empirical results highlight the strategic importance of logistics infrastructure systems capable of supporting cargo rerouting during disruption events. Countries positioned along critical trade corridors can enhance supply chain stability by investing in multimodal logistics infrastructure linking maritime gateways with inland transport corridors, energy logistics assets and digital coordination platforms.

Saudi Arabia's logistics infrastructure development, including port modernisation, logistics zones, inland transport corridors and digital logistics initiatives, illustrates how national logistics systems can function as stabilisation hubs within global supply networks. By connecting ports on the Gulf with Red Sea maritime gateways, these infrastructure systems provide alternative trade routes capable of maintaining cargo flows during geopolitical disruptions.

The findings also indicate that stabilisation capability is not generated by geography alone. Rather, it depends on the combined effect of physical infrastructure, energy logistics capacity and digital logistics integration. This means that logistics hub strategies should move beyond throughput expansion and incorporate resilience-oriented planning, multimodal coordination, real-time visibility and cross-border cargo redistribution capability.

Discussion

Interpretation of findings

The findings should be interpreted in relation to three established streams of research. Firstly, supply chain resilience studies show that disruption exposure is not limited to single firms but propagates through interdependent logistics, inventory and information systems. Secondly, maritime transport research shows that ports, corridors and shipping networks are spatially interdependent, so disruption in one chokepoint can create wider network effects. Thirdly, hub theory explains how transport hubs generate value through connectivity, consolidation and coordination. The present study extends this logic by arguing that, under geopolitical disruption, logistics hubs can also perform a stabilisation function when they combine multimodal redundancy, cargo visibility and energy-logistics continuity.

The results provide empirical support for the theoretical relations positioned within the conceptual model. The results validate that the level of geopolitical instability in a region meaningfully increases the chance of maritime logistics disruptions, which in turn cause higher supply chain risk exposure and lower global supply chain stability. These findings align with recent research on supply chain disruptions showing the propagation of geopolitical shocks through interdependent logistic networks via key transport corridors impacting global trade performance (Ivanov 2022; Ivanov & Dolgui 2021). The positive relationship between geopolitical instability and maritime logistics disruptions confirms that political and security risks become operationally significant when they affect strategic maritime chokepoints. In corridors such as the Strait of Hormuz, Bab el-Mandeb and the Suez Canal, even limited disruption can affect shipping reliability, transport costs and cargo availability across wider logistics systems (Notteboom et al. 2021; Stopford 2009).

The findings also support the ripple-effect mechanism discussed in supply chain disruption literature. Maritime transport disruptions increase supply chain risk exposure, which subsequently reduces global supply chain stability. This cascading process shows how disruption at strategic logistics nodes or corridors can move through connected supply networks, affecting production systems, inventory flows and distribution processes. A major finding of the study is that logistics stabilisation hub capability moderates this disruption effect. Logistics systems with strong multimodal infrastructure, energy logistics capacity and digital integration are better positioned to sustain cargo flows during disruption events. These results support the argument that investment in logistics infrastructure can

enhance supply chain resilience and reduce the exposure of global trade systems to geopolitical shocks.

One unexpected result is the weak negative correlation between geopolitical instability and logistics stabilisation hub capability. This suggests that respondents did not perceive Saudi logistics hub capability as a simple direct response to geopolitical instability. Instead, they appeared to treat geopolitical instability and hub capability as analytically distinct constructs: Geopolitical instability reflects external corridor risk, while logistics stabilisation hub capability reflects internal infrastructure, multimodal redundancy, energy-logistics capacity and digital visibility. This weak correlation is important because it limits any claim that geopolitical instability automatically produces stronger hub capability. Rather, the results support a more conditional interpretation. Hub capability becomes relevant when maritime disruption affects supply chain stability, but it is not merely a direct by-product of geopolitical instability.

Saudi Arabia's expanding logistics infrastructure provides an illustrative case of this stabilising mechanism. Ports like Jeddah Islamic Port, King Abdullah Port and King Abdulaziz Port connect with inland logistics corridors and multimodal transport systems to provide alternative routes for cargo between the Gulf and Red Sea. These logistics corridors help cargo be redirected during or after maritime disruptions and make regional trading networks more resilient.

Thus, the results underscore the strategic importance of integrated logistics infrastructure in stabilising supply chains during geopolitical disruptions. Countries positioned along key global trade corridors have an opportunity to strengthen supply chain resilience by investing in multimodal logistics systems capable of supporting cargo rerouting and sustaining trade connectivity under disruption scenarios.

Theoretical contributions

This study makes three theoretical contributions. Firstly, it extends the ripple-effect perspective by positioning geopolitical instability as an upstream driver of maritime logistics disruption. While prior studies have examined operational disruptions, demand shocks and pandemic-related interruptions, fewer empirical studies have examined how geopolitical instability affects maritime logistics networks and supply chain stability. Secondly, the study develops the concept of logistics stabilisation hub capability as a network-level resilience construct. This extends hub theory beyond efficiency, consolidation and trade facilitation by showing how hubs can also perform a stabilising role during disruption. Thirdly, the study identifies logistics infrastructure quality, energy logistics capacity and digital logistics integration as antecedents of stabilisation capability. This clarifies how physical, energy-related and digital capabilities jointly support logistics resilience under geopolitical uncertainty.

Managerial and policy implications

This study has important implications for logistics managers and public policy makers responsible for managing supply chain disruptions. For logistics managers, the findings underscore the need to devise supply chain strategies that account for alternative transport corridors and multimodal logistics infrastructure. Companies operating in global supply chains should assess their logistics networks not just on how cost-effective they are, but also how robust they will be against geopolitical upheavals. Supply chain stability during disruptive events can be greatly improved through diversification of transport routes and reinforcement of logistics visibility using digital platforms. For policymakers, the findings highlight the need to strengthen integrated logistics infrastructure that can continue functioning during geopolitical disruptions. The development of multimodal corridors linking ports, logistics hubs and inland transport networks must prioritise national logistics strategies. These infrastructure investments will serve to enhance not only individual but also global economic resilience and mobility. Saudi Arabia centres its Vision 2030 strategy around logistics development, with several large-scale infrastructure projects turning the country into a regional trade hub. Inland logistics corridors connecting the Gulf to Red Sea maritime gateways provide additional cargo routes that lessen reliance on vulnerable maritime chokepoints. These infrastructure initiatives are an example of how logistics systems can serve as stabilisation mechanisms in global supply chains.

Limitations and future research

This study has several limitations. Firstly, the empirical analysis is based on perceptions of logistics professionals from available survey data rather than actual operational logistics performance data. Future research may leverage network-level shipping traffic data or large-scale automatic identification system (AIS) vessel movement datasets to investigate the propagation of disruptions through maritime corridors. Secondly, the study focuses on Saudi Arabia, although broader regional logistics networks may also influence supply chain resilience. Future research could examine logistics stabilisation mechanisms across multiple regional logistics hubs in the Middle East.

A further limitation concerns the dual role of logistics hubs under geopolitical tension. While highly capable hubs can buffer maritime disruption by providing alternative routing and coordination capacity, they may also become strategically visible assets and therefore potential targets of geopolitical pressure, cyber disruption, sanctions exposure or security threats. Future research should therefore examine not only how logistics hubs stabilise supply chains, but also how hub centrality may create new vulnerabilities.

Conclusion

This study examined the relationship between geopolitical instability, maritime logistics disruptions, supply chain risk

exposure and logistics stabilisation hub capability in global trade networks. The findings show that geopolitical instability increases maritime logistics disruptions, which in turn increase supply chain risk exposure and reduce global supply chain stability. The results also show that logistics stabilisation hub capability can buffer the destabilising effect of maritime disruption when logistics systems combine infrastructure connectivity, energy logistics capacity and digital logistics integration.

The investigation combines theoretical perspectives on supply chain disruption with empirical analysis of the capabilities provided by logistics infrastructure to propose the concept of logistics stabilisation hubs as a model for understanding how national logistics systems may underpin global supply chain stability. The results underscore the strategic role of multimodal logistics infrastructure connecting maritime gateways to inland transport corridors. Countries at the heart of global trade channels could improve supply chain resilience by investing in their logistics infrastructure to sustain cargo diversion in times of geopolitical stress.

Future research can build on this framework by incorporating integrated network-based logistics data and simulation models to examine disruption propagation across global supply chain networks. Further research could also investigate the role of digital logistics technologies and real-time data systems in enhancing supply chain resilience under geopolitical crises.

In general, results show that interconnected logistics infrastructure networks act as stabilisation mechanisms within coupled global supply chains facing geopolitical risk. Saudi Arabia's expanding logistics network, connecting maritime gateways with inland corridors and multimodal transport systems, provides a relevant case for examining how national logistics infrastructure may support regional and global supply chain resilience under geopolitical disruption.

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CRediT authorship contribution

Islam El-Nakib: Conceptualisation, Formal analysis, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. Sarah Osailan: Data curation, Investigation, Resources, Writing – review & editing. Hassan Balfaqih: Data curation, Investigation, Visualisation, Writing – review & editing. Nermin M. Gohar: Formal analysis, Methodology, Validation, Writing – review & editing. Sara Elzarka: Project administration, Supervision, Validation, Writing – review & editing. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication, and take responsibility for the integrity of its findings.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain survey responses from logistics professionals and are subject to confidentiality and participant privacy considerations.

Disclaimer

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References

Caldara, D. & Iacoviello, M., 2022, 'Measuring geopolitical risk', *American Economic Review* 112(4), 1194–1225. https://doi.org/10.1257/aer.20191823

Campbell, J.F., 1994, 'Integer programming formulations of discrete hub location problems', *European Journal of Operational Research* 72(2), 387–405. https://doi.org/10.1016/0377-2217(94)90318-2

Christopher, M. & Peck, H., 2004, 'Building the resilient supply chain', *The International Journal of Logistics Management* 15(2), 1–14. https://doi.org/10.1108/09574090410700275

Dolgui, A., Ivanov, D. & Sokolov, B., 2018, 'Ripple effect in the supply chain: An analysis and recent literature', *International Journal of Production Research* 56(1–2), 414–430. https://doi.org/10.1080/00207543.2017.1387680

Ducruet, C. & Notteboom, T., 2012, 'The worldwide maritime network of container shipping: Spatial structure and regional dynamics', *Global Networks* 12(3), 395–423. https://doi.org/10.1111/j.1471-0374.2011.00355.x

El-Nakib, I. & Elzarka, S., 2026a, 'An enhanced composite green logistics performance index for MENA: Methodology, drivers and hybrid forecasting to 2030', *Logistics* 10(3), 56. https://doi.org/10.3390/logistics10030056

El-Nakib, I. & Elzarka, S., 2026b, 'Artificial intelligence enabled physical internet readiness improves sustainable healthcare supply chain performance', *Discover Sustainability*. https://doi.org/10.1007/s43621-026-03695-8

El-Nakib, I. & Elzarka, S., 2026c, 'Determinants of digital twin adoption readiness in logistics: Evidence from Egypt's emerging logistics sector', *Journal of Transport and Supply Chain Management* 20(0), a1379. https://doi.org/10.4102/jtscm.v20i0.1379

El-Nakib, I., Elzarka, S. & Gouhar, N., 2026, 'Human-centered barriers to green supply chain management in fossil fuel-dependent logistics systems: An ISM-based analysis', *Frontiers in Sustainability* 7, 1806432. https://doi.org/10.3389/frsus.2026.1806432

Fleming, D.K. & Hayuth, Y., 1994, 'Spatial characteristics of transportation hubs: Centrality and intermediacy', *Journal of Transport Geography* 2(1), 3–18. https://doi.org/10.1016/0966-6923(94)90030-2

Hair, J.F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M., 2019, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 2nd edn., Sage, Thousand Oaks, CA.

Hosseini, S., Ivanov, D. & Dolgui, A., 2019, 'Review of quantitative methods for supply chain resilience analysis', *Transportation Research Part E: Logistics and Transportation Review* 125, 285–307. https://doi.org/10.1016/j.tre.2019.03.001

Ivanov, D., 2022, 'Viable supply chain model: Integrating agility, resilience and sustainability perspectives – Lessons from and thinking beyond the COVID-19 pandemic', *Annals of Operations Research* 319, 1411–1431. https://doi.org/10.1007/s10479-020-03640-6

Ivanov, D. & Dolgui, A., 2021, 'A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0', *Production Planning & Control* 32(9), 775–788. https://doi.org/10.1080/09537287.2020.1768450

Kingdom of Saudi Arabia, 2016, *Saudi vision 2030*, Government of Saudi Arabia, Riyadh.

Ministry of Transport and Logistic Services, 2021, *National transport and logistics strategy*, Ministry of Transport and Logistic Services, Riyadh, viewed n.d., from https://mot.gov.sa/en/ntls.

Monios, J. & Wilmsmeier, G., 2012, 'Giving a direction to port regionalisation', *Transportation Research Part A: Policy and Practice* 46(10), 1551–1561. https://doi.org/10.1016/j.tra.2012.07.008

National Industrial Development and Logistics Program, 2021, *National industrial development and logistics program delivery plan 2021–2025*, Vision 2030, Riyadh, viewed n.d., from https://www.vision2030.gov.sa/media/bsan2azp/2021-2025-national-industrial-development-and-logistics-program-delivery-plan-en.pdf.

Notteboom, T., Pallis, A. & Rodrigue, J.-P., 2021, 'Disruptions and resilience in global container shipping and ports: The COVID-19 pandemic versus the 2008–2009 financial crisis', *Maritime Economics & Logistics* 23(2), 179–210. https://doi.org/10.1057/s41278-020-00180-5

Notteboom, T.E. & Rodrigue, J.-P., 2005, 'Port regionalization: Towards a new phase in port development', *Maritime Policy & Management* 32(3), 297–313. https://doi.org/10.1080/03088830500139885

O'Kelly, M.E., 1986, 'The location of interacting hub facilities', *Transportation Science* 20(2), 92–106. https://doi.org/10.1287/trsc.20.2.92

Pettit, T.J., Fiksel, J. & Croxton, K.L., 2010, 'Ensuring supply chain resilience: Development of a conceptual framework', *Journal of Business Logistics* 31(1), 1–21. https://doi.org/10.1002/j.2158-1592.2010.tb00125.x

Ponomarov, S.Y. & Holcomb, M.C., 2009, 'Understanding the concept of supply chain resilience', *The International Journal of Logistics Management* 20(1), 124–143. https://doi.org/10.1108/09574090910954873

Rodrigue, J.P., 2020, *The geography of transport systems*, 5th edn., Routledge, London.

Sheffi, Y., 2005, *The resilient enterprise: Overcoming vulnerability for competitive advantage*, MIT Press, Cambridge, MA.

Stopford, M., 2009, *Maritime economics*, 3rd edn., Routledge, London.

UNCTAD, 2023, *Review of maritime transport 2023: Towards a green and just transition*, United Nations Conference on Trade and Development, Geneva.

UNCTAD, 2024, *Review of maritime transport 2024: Navigating maritime chokepoints*, United Nations Conference on Trade and Development, Geneva.

Wieland, A. & Wallenburg, C.M., 2013, 'The influence of relational competencies on supply chain resilience: A relational view', *International Journal of Physical Distribution & Logistics Management* 43(4), 300–320. https://doi.org/10.1108/IJPDLM-08-2012-0243