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# Supply Chain Resilience and Energy Security under Strait of Hormuz Disruption

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**Abstract**
The Strait of Hormuz, a critical maritime chokepoint transporting approximately 20 million barrels of crude oil daily, remains vulnerable to geopolitical disruptions that threaten global energy security. The 2026 geopolitical crisis in the Middle East has exposed the Vulnerability of energy supply chains that rely on this strategic corridor. This study examines how geopolitical disruptions in strategic maritime corridors affect global energy supply chain vulnerability and assesses the role of supply chain resilience, energy-source diversification, collaboration, and responsiveness in mitigating these effects. Particular attention is given to the Strait of Hormuz and its implications for Iraq as a rentier oil-exporting economy. The study adopts a systematic literature review with an embedded case study design. The review follows PRISMA 2020 guidelines, covers the period January 2020 to July 2026, and synthesizes nine studies that met the inclusion criteria. The Iraqi case study relies on secondary data to trace the transmission of disruptions from maritime transportation to oil exports and broader economic outcomes, focusing on the Strait of Hormuz disruption of 28 February 2026. Geopolitical disruptions in strategic chokepoints substantially increase energy supply-chain vulnerability. Resilience capabilities—including flexibility, redundancy, collaboration, agility, route diversification, and rapid responsiveness—can mitigate disruption effects. The Iraqi case demonstrates that dependence on concentrated export infrastructure and limited alternative routes can transform a maritime disruption into broader fiscal vulnerability, with oil export reductions translating into significant revenue losses. Strengthening energy supply-chain resilience requires an integrated approach combining infrastructure diversification, strategic redundancy, stakeholder coordination, early-warning capabilities, and energy transition. The study connects the geopolitical vulnerability of the Strait of Hormuz with the structural characteristics of a rentier oil-exporting economy, providing a context-specific illustration of how maritime chokepoint disruptions propagate into national fiscal and economic vulnerabilities.

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**Keywords:** Supply Chain Resilience, Energy Security, Geopolitical Disruptions, Strait of Hormuz, Rentier Economy, Energy Source Diversification

## Introduction

In an increasingly interconnected global economy, supply chain resilience has emerged as a paramount strategic concern, concomitant with the relocation of manufacturing to lower-cost regions and the growing interdependence of global markets [1]. This imperative is particularly pronounced within the energy sector. The geopolitical crisis in the Middle East culminated in the effective Blockade of the Strait of Hormuz in early 2026. This disruption exposed the Vulnerability of the energy sector [2, 3]. As characterized by maritime and energy affairs analysts, the Strait serves as the "vital source of the worldwide petroleum trade," transporting approximately one-fifth of global oil consumption and a substantial proportion of liquefied natural gas (LNG) [4]. The crisis has laid bare the vulnerabilities inherent in just-in-time delivery systems and concentrated supply routes [5], thereby necessitating a fundamental reassessment of the trade-off between economic efficiency and systemic resilience [6, 7].

This study is grounded in the theoretical understanding that oil-exporting economies with rentier characteristics face distinct vulnerabilities to supply chain disruptions. Rentier states, defined by their heavy dependence on external resource rents [8, 9], exhibit structural features—including fiscal dependence on oil revenues, concentration of export infrastructure, and limited economic diversification—that amplify the transmission of external shocks into domestic economic instability [10, 11]. The concept of rentier-economy vulnerability is therefore central to understanding how a disruption in a maritime chokepoint, such

as the Strait of Hormuz, can propagate beyond immediate transportation constraints into broader fiscal and macroeconomic consequences.

The study addresses a gap in the literature by integrating the concepts of supply chain resilience and energy security within a unified analytical framework. It aims to explain how geopolitical disruptions at maritime chokepoints propagate through supply networks and affect international trade, thereby enriching both scholarly discourse and policy formulation. Through a focused case study of Iraq, the study provides an empirical foundation for the proposed theoretical relationships, elucidating how corridor-specific disruptions engender financial, economic, and strategic vulnerabilities that extend well beyond the purview of direct transportation. This study covers the period from January 2020 to July 2026, with the evidence cut-off date set at 31 July 2026. The analysis focuses on the disruption of the Strait of Hormuz that occurred on 28 February 2026. This paper aims to present a comprehensive analysis of the nexus between supply chain resilience and global energy security, employing a thematic synthesis literature review methodology in conjunction with a case study design centered on the Strait of Hormuz. In pursuit of these objectives, the study seeks to address the following pivotal research questions:

1. To what extent do geopolitical disruptions in strategic maritime corridors exacerbate the vulnerability of global energy supply chains?
2. To what extent does high supply chain resilience mitigate the adverse effects of maritime disruptions on international trade flows?
3. To what extent does the diversification of energy sources and suppliers enhance global energy security during periods of geopolitical disruption?

To what extent do supply chain resilience, source diversification, collaboration, and responsiveness enhance the ability of firms and states to respond to disruptions in the Strait of Hormuz?

## Literature Review

### Supply Chain Resilience

Supply Chain Resilience [12] is the capability of a supply chain to withstand disruptions, recover from them, and return to its original or an improved state quickly and cost-effectively. It also involves proactive preparedness for risks and unexpected events through planning for rapid response, anticipating potential risks and vulnerabilities, and mitigating their impacts, thereby ensuring the continuity of supply chain operations and minimizing the effects of operational or environmental disruptions [13]. Supply Chain Resilience (SCRES) refers to the integration of resilient practices across all stages of operations to ensure business continuity and enhance a company's long-term competitive advantage [14]. The key factors that contribute to supply chain resilience include agility, collaboration, resilience, supply chain reengineering, and a supply chain risk management culture.

Contemporary scholarship has transcended the conceptualization of supply chain resilience as a mere recovery capability, reconceptualizing it instead as a multidimensional system of organizational capacities that is indispensable for adapting to an increasingly volatile global environment. The theoretical evolution of this construct traces a trajectory from reactive strategies toward proactive approaches that emphasize agility, adaptability, and forward-looking assessment, underpinned by such theoretical perspectives as the Resource-Based View (RBV), Dynamic Capabilities Theory, and Systems Theory [15]. This inherent complexity has precipitated the development of diverse integrative frameworks. For instance, an empirically grounded taxonomy delineates three interrelated dimensions of resilience—namely, adaptive capacity, structural flexibility, and transformative learning [16]—while systematic literature reviews have established a foundational framework comprising five core capabilities: anticipation, adaptation, response, recovery, and learning [17]. Empirical evidence indicates that firms using supply chain planning systems experienced fewer adverse financial repercussions and recovered faster from disruptions than their counterparts [18]. Resilience is not construed as an outcome of isolated interventions, but rather as an emergent property shaped by the interplay of multiple strategic choices over time—a sequential pattern of firm-level adjustments. This illustrates how critical it is for managing cost trade-offs and ensuring business continuity amidst persistent geopolitical uncertainty [19].

### Strategies for Building Supply Chain Resilience

An effective resilience strategy necessitates the alignment of sourcing, location, and technology decisions to manage cost trade-offs under conditions of persistent uncertainty—a finding corroborated by recent empirical studies that underscore the critical importance of both adaptive capacity and structural flexibility as fundamental enablers of supply chain resilience [20]. Strategies for building supply chain resilience have garnered considerable scholarly attention, being widely regarded as essential approaches for enhancing the capacity of supply chains to withstand disruptions and effectuate recovery. The extant literature identifies flexibility, redundancy creation, collaboration, and agility as the most widely recognized strategies, deemed most critical for achieving supply chain resilience [21]. Accordingly, these strategies can be delineated as follows:

1. **Flexibility:** This refers to the supply chain's ability to rapidly adapt to changes and disruptions by providing alternatives in resources and operational processes, thereby enhancing responsiveness and facilitating recovery. Supply chains can adapt to change through redesign or reconfiguration—what is termed *adaptive capacity* [22]. A proposed model of supply chain resilience comprises six constitutive elements: operational systems, logistics processes, supply network, organizational design, and information systems resilience. Notably, logistics process resilience pertains to the receipt and delivery of products amidst fluctuating supply sources and customer bases, whereas supply network resilience denotes the capacity to reconfigure the supply chain and adjust product sourcing in alignment with demand fluctuations [23, 24]. Resilience entails the development of internal capabilities that are adept at sensing and responding rapidly to emerging threats [25], which not only bolsters organizational resilience but also engenders a sustainable competitive advantage in the marketplace. which not only bolsters organizational resilience but also engenders a sustainable competitive advantage in the marketplace
2. **Creating Redundancy:** This strategy involves maintaining reserve capacity, safety inventories, and alternative suppliers to ensure business continuity and

minimize the adverse impact of disruptions when they materialize. Empirical evidence indicates that resource and relationship munificence significantly assist small enterprises in emerging markets in mitigating the effects of disruptions and Mitigating Customer Fluctuations [26]. Specifically, when a firm encounter one or multiple disruptions and lacks resource and relationship munificence, it experiences a 9.6% decline in sales. Conversely, firms characterized by high levels of such munificence are able to fully offset the negative repercussions of disruptions, registering sales growth that is 40.9 percentage points higher over a six-month period [27]. However, extant research [28] suggests that diversification strategies can reduce investments in inventory and production capacity, implying that redundancy in isolation may not constitute an optimal approach. The evidence collectively points to redundancy as a necessary condition, yet one that proves more efficacious when integrated with flexibility-oriented strategies [29].

3. **Supply Chain Collaboration:** This strategy concentrates on strengthening cooperation and the exchange of information and resources among supply chain partners, thereby facilitating effective coordination and augmenting the capacity to respond to and recover from disruptions. A structural equation modeling analysis conducted by [30] corroborated that supply chain integration exerts a direct influence on both early disruption warning systems and recovery capabilities. Furthermore, the collaborative engagement of labor, materials, and information resources has been demonstrated to be instrumental in fostering supply chain recovery [31].
4. **Supply Chain Agility:** This refers to the supply chain's capability to respond expeditiously to unanticipated changes through enhanced end-to-end visibility and accelerated adaptation and recovery processes. Internal integration—encompassing cross-functional and inter-departmental coordination—can engender a more cohesive and synchronized response to market fluctuations and disruptions. Moreover, the level of supply chain agility is contingent upon the availability of extant agility capabilities, particularly those that are externally oriented [32]. Supply chain agility is conceptualized as the firm's capacity to modulate its tactics and operations within its supply chain in response to environmental changes, opportunities, and threats [33]. Accordingly, these strategies can be defined in Figure (***1***)

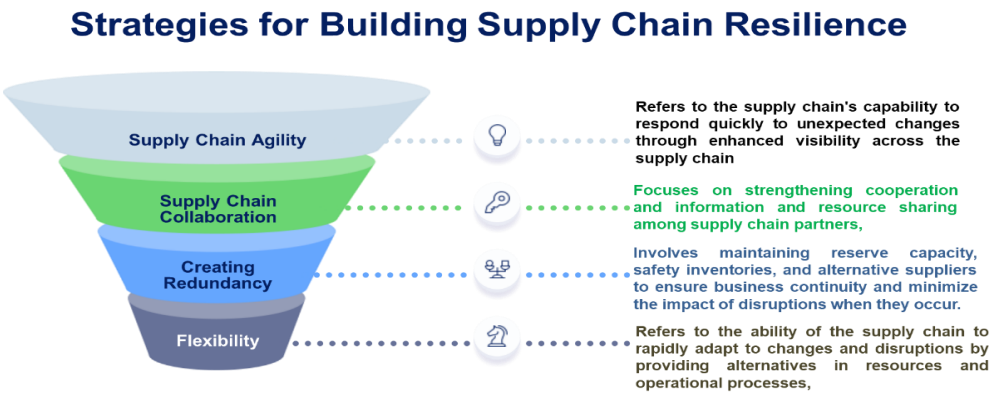



**Fig 1:** Strategies for Building Supply Chain Resilience

**Global Energy Security**

The concept of energy security has evolved significantly throughout the twentieth century [21]. In its early stages, it was closely intertwined with national security, particularly during the First and Second World Wars, when securing oil supplies was deemed essential for sustaining the military capabilities of nations. During the 1950s and 1960s, rapid global economic expansion precipitated a substantial surge in energy demand, accompanied by considerable growth in international oil trade, which was largely dominated by major Western oil companies. However, mounting dissatisfaction among oil-producing countries regarding the distribution of oil revenues ultimately culminated in the establishment of the Organization of the Petroleum Exporting Countries (OPEC) in 1960. Energy security is conceptualized as a broad and multidimensional construct, the definition of which diverges substantively between energy-exporting and energy-importing countries. Exporting nations emphasize demand security by ensuring access to external markets, whereas importing nations prioritize the reliability and continuity of energy supplies at affordable prices [34].

Energy security is further delineated as a multidimensional concept that centers on ensuring the continuous and reliable availability of energy supplies at affordable prices to meet the needs of individuals and various economic sectors [35]. This concept encompasses physical dimensions pertaining to the continuity and reliability of energy supply, economic dimensions associated with affordability and price stability, social dimensions emphasizing access to essential energy services for individuals and businesses, and environmental dimensions concerning the acceptability of energy sources and the mitigation of their ecological impacts. It also incorporates a temporal dimension, which considers the realization of energy security in both the short and long term. Energy demand constitutes a fundamental component of energy security, as its rapid growth—particularly in Africa and Asia—exerts significant influence on global energy markets, international trade flows, and strategic alliances [36]. Furthermore, energy efficiency and demand-side management policies contribute to reducing competition for energy resources and enhancing the resilience of energy systems.

Contemporary scholarship has witnessed a notable evolution in the conceptualization of global energy security, transcending its traditional focus on the continuous physical availability of fossil fuel supplies at affordable prices [37].

Decades of research have yielded greater conceptual convergence, with energy security now widely understood to encompass not only energy security and economic stability, but also environmental sustainability, system resilience, technological adaptability, and the resilience of energy infrastructure against physical and cyber threats [38].

The contemporary energy security landscape is rendered increasingly complex by the emergence of three distinct yet interrelated categories of risk: commodity flow risks, manifesting as disruptions to maritime chokepoints; material and technology stock risks, associated with export restrictions on critical minerals; and operational flow risks within digital energy systems [39]. This can be illustrated in Figure (***2***).

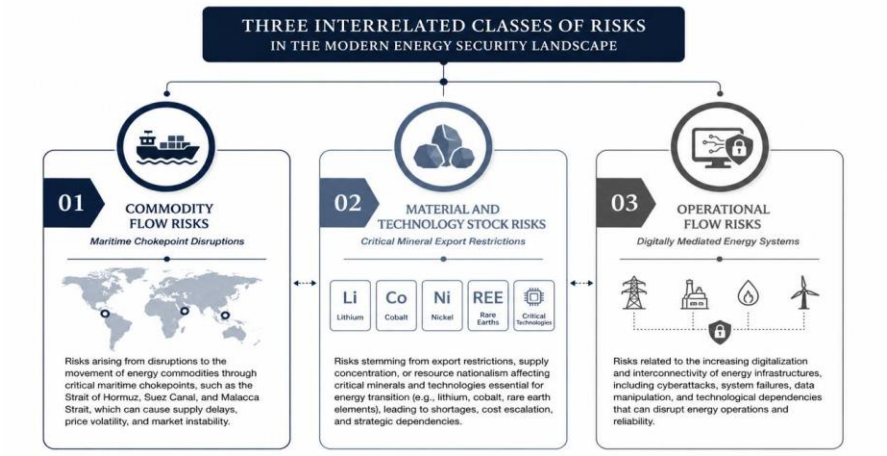



**Fig 2:** three interrelated classes of risks

Moreover, geopolitical conflict has accelerated the recalibration of energy transition policies, such that these are no longer perceived merely as climate-oriented exercises, but rather as matters of sovereignty, macroeconomic stability, and national security. This paradigm shift is evidenced by Japan's reactivation of nuclear power, Germany's redesign of backup systems, and India's expansion of renewable energy deployment while simultaneously maintaining coal capacity to ensure reliability [40]. Furthermore, clean energy supply chains themselves confront risks of excessive concentration, as photovoltaic solar and lithium-ion battery supply chains remain vulnerable to geopolitical and trade constraints, having witnessed nearly 200 trade-restrictive measures since 2020. This underscores the sobering reality that efforts to reduce one form of dependency may simply substitute it with another [41]. Beyond direct energy trade, a growing corpus of research foregrounds the critical significance of embodied energy transfers across global supply chains, revealing latent dependencies and structural vulnerabilities wherein energy-related risks propagate indirectly through international trade networks—often through spatial sourcing tiers that conventional bilateral energy flow analysis fails to capture [42].

The direct impact on energy prices is only the first layer of a more complex cascade. The disruption *was associated with* compounded shipping costs. Freight rates for oil tankers surged by over 90%, bunker fuel prices nearly doubled, and war risk insurance premiums escalated sharply, with some insurers withdrawing coverage for vessels operating in the Persian Gulf [43]. A network-cascade framework further demonstrates that such disruptions can become systemic, causing supply chain failures and "ripple effects" that propagate through global production networks [44]. The research indicates that terminal production losses reach 50% at a 32% blockade intensity, underscoring how localized disruptions can trigger widespread economic damage [45]. Figure (***3***) illustrates global impacts.

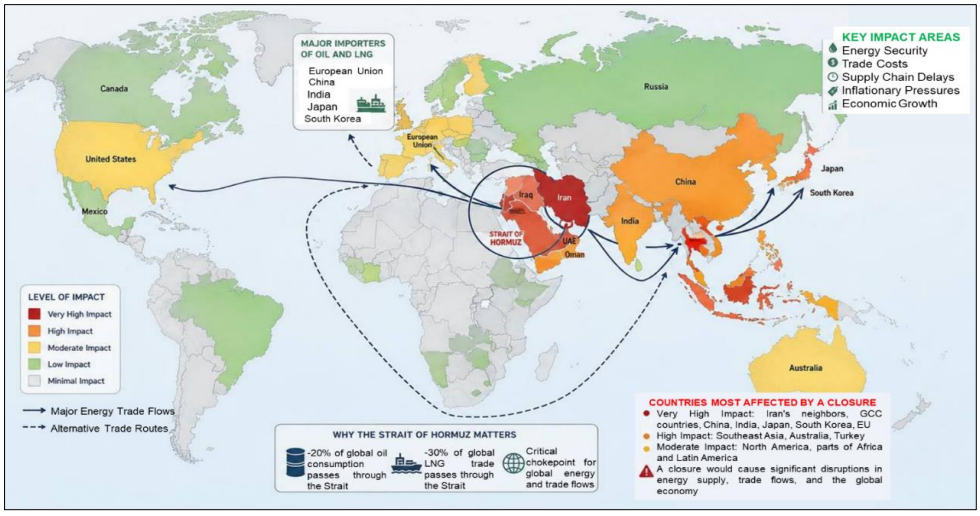



**Fig 3:** Global Geographic and Sectoral Impact of a Potential Strait of Hormuz Disruption.

## Method

This study employed a mixed-methods approach that integrates a systematic literature review with a case study design, aiming to achieve complementarity between theoretical depth and practical application in analyzing the impact of geopolitical disruptions on energy supply chains. This methodological design was selected for its capacity to facilitate the extrapolation of general patterns on the one hand, while enabling an in-depth understanding of the contextual specificities of affected countries on the other—particularly given the complexity of the variables under investigation and the intricate interrelationships among geopolitical, economic, and logistical dimensions.

A systematic literature review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [46]. The data sources for this study comprise three distinct categories: (a) peer-reviewed academic literature retrieved from Scopus, (b) institutional reports from the World Bank and the International Energy Agency (IEA), and (c) secondary data from Iraqi government sources, including the Central Bank of Iraq and the Ministry of Oil. These three source categories serve complementary purposes: the academic literature provides the theoretical and empirical foundation for understanding supply chain resilience and energy security; institutional reports offer macroeconomic and sectoral data on Iraq's oil-dependent economy; and government sources supply specific data on oil export volumes, government revenues, and alternative route utilization. The systematic literature review focused on Scopus as the primary academic database. The search timeframe was delineated from 2020 to 2026 to ensure comprehensive coverage of theoretical and empirical developments in the fields of supply chain resilience and energy security. Specific keywords were employed, including "Supply Chain Resilience," "Energy Security," "Geopolitical Disruptions," "Strait of Hormuz," and "Maritime Chokepoints." Rigorous selection criteria were applied, encompassing: (a) studies published in peer-reviewed journals or reputable institutional reports; (b) studies explicitly addressing the nexus between geopolitical factors and supply chains; and (c) studies offering a theoretically or empirically analyzable framework. The procedure flow across the different stages of this SLR study is illustrated in the PRISMA flowchart (Fig. 4) generated by the PRISMA flowchart tool [47].

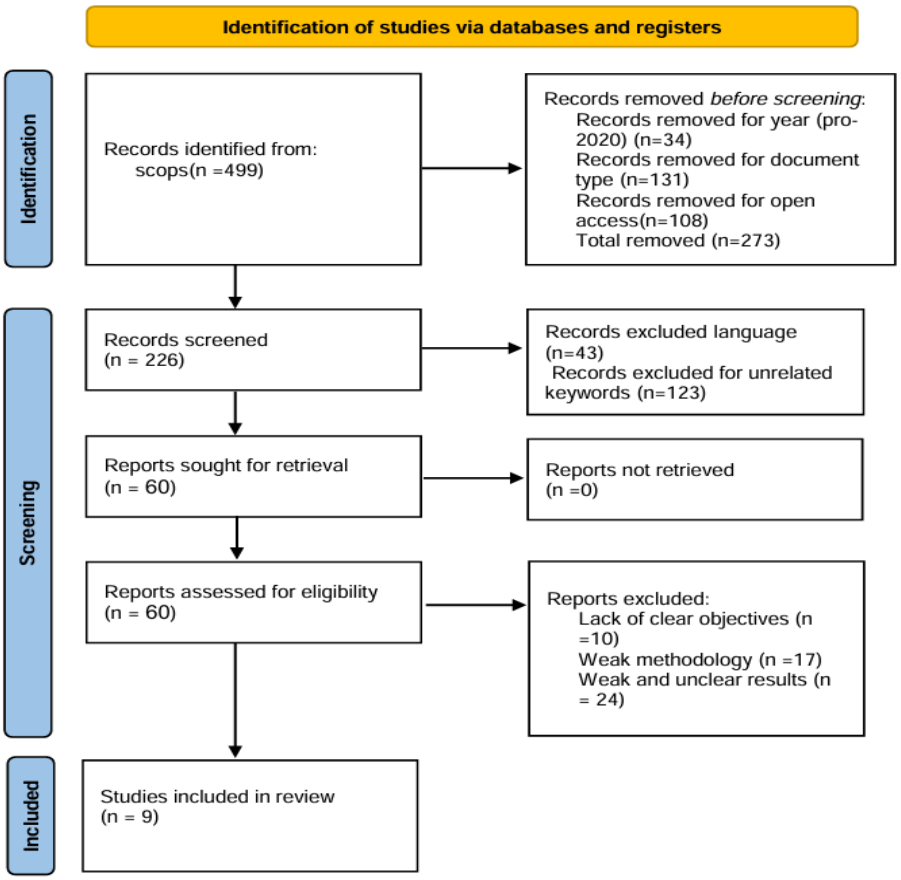



**Fig 4:** PRISMA flowchart of the systematic literature process

A minimum composite score of 2.5 out of 3 was established as the inclusion threshold. This threshold was selected to ensure that included studies demonstrated: (1) clearly defined objectives; (2) well-explained methodology; and (3) unambiguous research findings. Studies scoring below 2.5 exhibited significant methodological vulnerability—particularly in the clarity of their findings or the transparency of their methodology—that would have compromised the credibility of the synthesis. The threshold was determined a priori, before the screening process commenced, to minimize selection bias. A sensitivity analysis conducted at a threshold of 2.0 yielded no substantive differences in the thematic synthesis, confirming the resilience of the selected threshold. Table (1) criteria for scoring the eligibility and quality assessment.

**Table 1.** Criteria for scoring the eligibility and quality assessment

| Criteria | Score | Description |
|---|---|---|
| Well-defined objectives? | 1 | Yes, the paper clearly outlines its objectives and goals. |
| | 0.5 | The paper outlines its objectives, though the goals are not explicitly defined. |
| | 0 | No, the paper does not have well-defined objectives. |
| Well-explained methodology? | 1 | Yes, the paper showcases a comprehensive and well-documented methodology. |
| | 0.5 | Partially documented methodology that needs more details. |
| | 0 | No, the paper fails to provide a well-explained methodology. |
| Clear research findings? | 1 | Indeed, the study provides clear findings with appropriate visualizations |
| | 0.5 | The study does present its findings, but not in clear statements or visualizations. |
| | 0 | The study's research findings are unclear and lacking elaboration. |

A case study design was adopted, with a concentrated focus on Iraq as a rentier oil-exporting state characterized by heavy dependence on a single export corridor. Iraq was selected for several substantive reasons, most notably: (i) its status as one of the largest oil exporters traversing the Strait of Hormuz; (ii) its rentier economic structure, which renders it an intensive case for testing the proposed theoretical relationships. The case study relied on secondary data analysis derived from reports of the World Bank, the Organization of the Petroleum Exporting Countries (OPEC), and the Iraqi Ministry of Oil, in addition to media reports and academic studies addressing the repercussions of the Strait crisis on Iraq.

## Results

### Answers to the Research Questions

Based on a study of Scopus data with a focus on studies related to the research subject, we have created a table summarizing the top nine papers. Table (2) shows each study's setting, methodology, primary variables/outcomes, main findings, and the research issues it addresses.

**Table 2.** Included studies summary

| Study | Context | Method | Main Variable/ Outcome | Key Finding | RQ Supported |
|---|---|---|---|---|---|
| [4] | Geopolitical turbulence in the Middle East; military confrontation involving the US, Israel, and Iran; impact on global energy markets via the Strait of Hormuz | Commentary / Policy Analysis | Geopolitical risk, energy security, supply chain securitization, shipping costs, price volatility | Short-term disruptions reduce logistical efficiency, raise shipping/insurance costs, delay deliveries, heighten price volatility. Long-term: accelerates securitization of supply chains, deepens geopolitical stratification of energy trade, shifts energy governance toward alliance-based coordination. | RQ1, RQ4 |
| [7] | Strait of Hormuz blockade scenario; energy supply resilience and industrial continuity under disruption | Multi-regional input–output (MRIO) stress test (OECD ICIO 2025) | Energy supply disruption, inventory damping, first-round vs. later-round burden, cost pass-through | With 30% inventory absorption, upstream energy shock needed for downstream manufacturing to reach 10% added-cost threshold rises from 73.6% to 85.3%. Energy-intensive materials, aviation, chemicals, minerals, metals, electronics, and machinery face the highest downstream costs. Supports targeted reserve release, coordinated rerouting, and port-logistics priority. | RQ1, RQ2, RQ4 |
| [48] | Strait of Hormuz as critical energy chokepoint; escalating geopolitical tensions amplifying global supply chain vulnerabilities. | Conceptual Framework / Commentary (Triple-A Supply Chain extension) | Logistical agility, Anticipatory-Adaptive-Reconfigurable (AAR) framework, route diversification, digital risk intelligence, public–private coordination | Advances logistical agility as a dynamic capability. Identifies three operational pillars: Route and infrastructure diversification, Digital risk intelligence and monitoring, and Public–private coordination. Highlights limits of reactive approaches and proposes future research on multi-chokepoint disruption scenarios. | RQ2, RQ3, RQ4 |
| [6] | Effective closure of the Strait of Hormuz (Feb 2026); disruption of ~20 million bbl/day crude oil transit; Arctic route (NSR) as partial mitigation | Scenario analysis (3 × 3 matrix); SSCR, TBL, SDG framework | Economic losses, NSR mitigation potential, SDG trade-offs, sustainable supply chain resilience | Global GDP losses range from USD 330 billion to USD 2.2 trillion. NSR mitigates only 1.1–3.6% of total losses—functions as marginal insurance, not a substitute. South Korea and Japan are disproportionately affected. NSR offsets energy-security losses (SDGs 7, 9) but worsens climate/marine outcomes (SDGs 13, 14). Energy transition remains the most effective long-term response. | RQ1, RQ2, RQ3, RQ4 |

| Study | Context | Method | Main Variable/ Outcome | Key Finding | RQ Supported |
|---|---|---|---|---|---|
| [42] | Embodied energy transfers in global supply chains; energy security reshaped by cross-border flows embedded in traded goods/services | Multi-regional input–output (MRIO) model (GTAP 11 + IEA data) | Embodied energy dependency, embodied energy diversification, energy-risk mask method, spatial sourcing tiers | Global embodied energy dependency declined slightly since 2000. Highly globalized economies (Singapore, Luxembourg) remain extremely reliant on external energy. Norway and China exhibit concentrated embodied energy import sources. Over 50% of global medium/high-risk embodied energy is transmitted through long-distance trade. Conventional metrics fail to capture hidden dependencies. | RQ1, RQ3 |
| [49] | Material constraints influence renewable energy system performance and resilience during low-carbon transitions. | Bottom-up energy system model (2026–2050); composite energy security index | Material requirements, technology deployment, carbon pricing, import dependence, composite energy security index | Carbon pricing accelerates renewable/storage deployment but significantly increases material demand and supply-chain exposure. Emission constraint policies moderate storage expansion and material use, reducing import dependence and improving overall energy security despite lower renewable penetration. Highlights the importance of material-aware planning. | RQ3, RQ4 |
| [50] | Energy system resilience as an all-hazards system-of-systems property under climate and security challenges. | Review / Synthesis (engineering, ecological, adaptive perspectives) | Resilience vs. reliability, event-centric recovery trajectories, interdependencies across electricity, gas, water, telecom, transport, supply chains | Resilience is event-centric, consequence-sensitive, defined by degradation and recovery trajectories. Interdependencies convert localized failures into systemic disruptions. Proposes resilience-by-design framing: robustness, rapid restoration, graceful degradation, learning, reconfiguration. Prioritizes multi-hazard stress testing, coupled infrastructure modeling, cyber resilience, materials/supply-chain vulnerability attention. | RQ1, RQ2, RQ4 |
| [51] | Post-2022 disruption of Russian pipeline gas; European shift toward LNG at different speeds; role of storage adequacy | Balanced panel data (8 major European gas importers, 2015–2024; 80 obs); panel regression | LNG share in total gas imports, storage fill levels, post-2022 structural break, renewable penetration | Interaction between post-2022 structural break and storage fill levels is negative and significant ($\beta = -0.006$, $p = 0.019$). Countries with lower storage reserves increased LNG dependence more strongly. Renewable energy penetration emerges as a significant positive predictor. The storage–LNG relationship was absent before the shock and emerged only after disruption. | RQ2, RQ3 |
| [52] | Natural gas supply chain resilience; disruptions and shutdowns of plant nodes; disparity between demand and supply | Review / Synthesis | Energy supply chain resilience, optimization, disruption, uncertainty, natural gas, COVID-19 | Optimization is a useful tool to continuously achieve resilience in supply chain production, storage, and transportation activities. Existing studies favor fewer system-based strategies for optimizing resilience. Highlights the need for a broader understanding of potential disruptions caused by uncertainties (e.g., the COVID-19 pandemic). | RQ2, RQ4 |

**Research Question 1:** To what extent do geopolitical disruptions in strategic maritime corridors exacerbate the vulnerability of global energy supply chains? The literature reviewed in this study indicates that geopolitical disruptions in strategic maritime corridors precipitate a significant escalation in the vulnerability of global energy supply chains, particularly when such disruptions occur in strategically vital chokepoints such as the Strait of Hormuz. Empirical evidence substantiates this relationship.

**Research Question 2:** To what extent does high supply chain resilience mitigate the adverse effects of maritime disruptions on international trade flows? The study demonstrates that supply chain resilience constitutes a pivotal mitigating mechanism for addressing the repercussions of maritime disruptions.

**Research Question 3:** To what extent does the diversification of energy sources and suppliers enhance global energy security during periods of geopolitical disruption? The study furnishes robust theoretical support for this relationship, indicating that energy security is significantly contingent upon the diversification of energy sources, suppliers, and transportation modes, as well as the mitigation of political risks. Multiple sources corroborate a positive relationship.

**Research Question 4:** To what extent do supply chain resilience, source diversification, collaboration, and responsiveness enhance the ability of firms and states to respond to disruptions in the Strait of Hormuz? The study directly supports this relationship, positing that supply chain resilience fundamentally determines the capacity of firms and states to absorb disruptions, respond to them, adapt to evolving conditions, and recover from their deleterious effects.

**Case Study: The Impact of Strait of Hormuz Disruption on Iraq's Oil Exports and Rentier Economy**

The Strait of Hormuz represents a critical maritime chokepoint for Iraq, whose oil-export system is highly concentrated in the southern terminals of Basra, making the country particularly vulnerable to geopolitical disruptions affecting the Strait.

The quantitative impact of the Strait disruption on Iraq's oil exports is substantial. In 2025, Iraq's average crude oil exports through the southern terminals of Basra amounted to

approximately 3.4 million barrels per day (mbpd), accounting for over 85% of total crude exports [53]. The disruption in February 2026 reduced southern export capacity by an estimated 60-70%, forcing a reduction in total export volumes to approximately 1.2-1.5 mbpd—a decline of more than 50% from pre-disruption levels.

The disruption forced Iraq to rely more heavily on alternative export routes, particularly the Iraq–Türkiye pipeline leading to the Mediterranean port of Ceyhan. During the crisis, crude exports through Ceyhan provided an alternative channel for Iraqi oil, but at volumes substantially below the normal capacity of the southern maritime export system. Subsequent arrangements between Iraq and Türkiye sought to increase flows through the Ceyhan route [54]. The Iraq-Türkiye pipeline through Ceyhan has a maximum throughput capacity of approximately 1.0 mbpd—substantially below the 3.4 mbpd capacity of the southern maritime export system. During the crisis, actual flows through Ceyhan averaged only 0.6-0.8 mbpd, resulting in an export shortfall of 1.5-2.0 mbpd.

The fiscal impact of this export shortfall is severe. At an average oil price of approximately USD 75 per barrel [55], the 1.5-2.0 mbpd reduction translates to monthly revenue losses of USD 3.4-4.5 billion, or USD 10-13 billion over a three-month disruption period—representing approximately 15-20% of Iraq's annual government revenues. For a country where 88% of government revenues and 91% of merchandise exports are derived from oil [53], such revenue losses create immediate fiscal pressures, constraining the government's ability to meet public sector wage obligations, fund social services, and sustain public investment programs. Accordingly, the impact of the Strait disruption can be understood through a sequential transmission mechanism that traces how a maritime disruption propagates through Iraq's economy, as illustrated in Figure (5).

The export shortfall generated severe fiscal pressure, with monthly revenue losses of USD 3.4-4.5 billion—equivalent to USD 10-13 billion over a three-month period, representing 15-20% of Iraq's annual government revenues. This fiscal pressure exposed the underlying rentier-economy vulnerability of Iraq, where 53% of GDP, 88% of government revenues, and 91% of merchandise exports are derived from oil [53]. The case thus illustrates how a disruption at a single maritime chokepoint can propagate beyond immediate transportation constraints into broader fiscal and macroeconomic consequences.

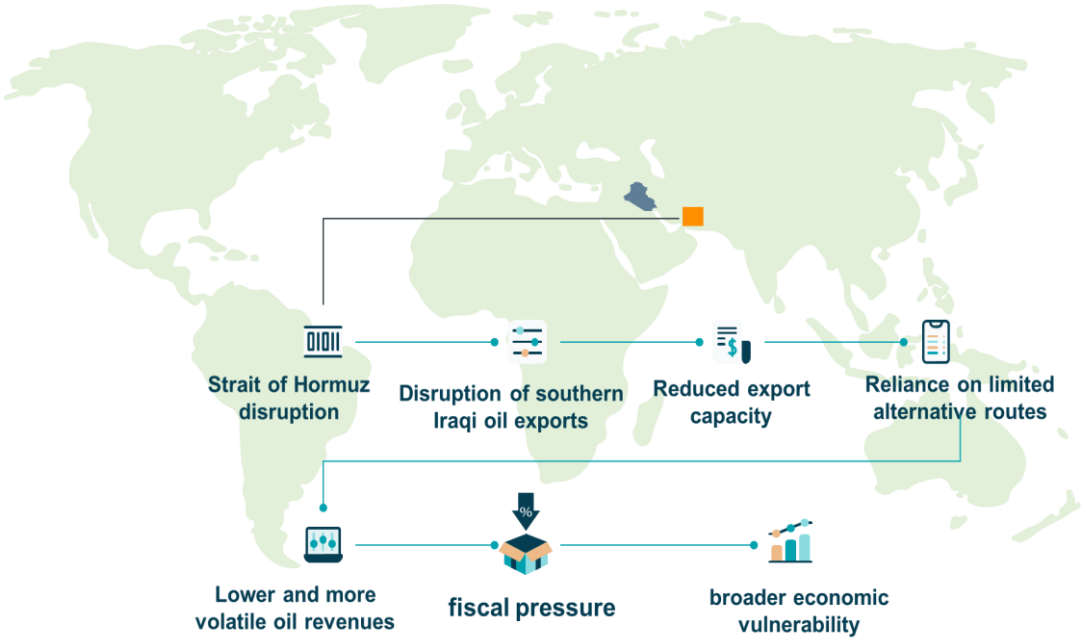



**Fig 5:** shows the effect of the Strait Disruption through a sequential transport mechanism.

The Iraqi case highlights the difference between resource abundance and economic resilience: Iraq possesses substantial oil reserves and production capacity, but the evidence suggests that these resources cannot generate their full economic value without reliable and diversified transportation corridors. The concentration of export capacity in the south creates a structural dependency in which disruption at a single maritime chokepoint can rapidly become a national economic risk.

The Iraqi case supports the central theoretical argument of this study: geopolitical disruptions in strategic maritime corridors can generate effects that extend beyond transportation and energy flows into the fiscal and economic structures of highly oil-dependent countries. The case demonstrates that strengthening supply chain resilience requires diversifying export routes, increasing alternative transportation capacity, strengthening logistical redundancy, and gradually reducing excessive dependence on oil revenues.

It is important to emphasize that the transmission mechanism presented in this study is a conceptual framework empirically illustrated through a single case study, rather than a statistically demonstrated causal model. The mechanism should therefore be interpreted as a plausible explanatory pathway that warrants further empirical testing through comparative, multi-country, or longitudinal research designs.

## Discussion

This study makes a significant theoretical and practical contribution to understanding the dialectical relationship between operational efficiency and strategic resilience within the context of global energy supply chains. The discussion

proceeds from the premise that traditional models predicated on just-in-time (JIT) procurement and minimum marginal cost have demonstrated their inadequacy in the face of sudden geopolitical shocks, thereby necessitating a fundamental paradigm shift toward models that foster adaptability, diversification, and proactive responsiveness. The findings reveal that resilience is not merely a recovery capability. Still, rather a multidimensional system encompassing anticipation, adaptation, and transformative learning. This conceptualization aligns coherently with Dynamic Capabilities Theory, which emphasizes the organization's capacity to reconfigure its resources in environments characterized by uncertainty. The study underscores that the diversification of energy sources, suppliers, and alternative routes constitutes a critical determinant of energy security enhancement. However, the empirical evidence base remains circumscribed with respect to quantitative effect sizes, thereby opening avenues for future research aimed at developing precise standardized metrics. Furthermore, the results indicate that collaboration in maritime security and intelligence information sharing between the public and private sectors constitutes foundational pillars for enhancing operational resilience, a finding consistent with the extant literature on collaborative risk management. With respect to the case study, the Iraqi experience epitomizes the "resource curse" phenomenon within the context of vital maritime chokepoints, wherein the geographical concentration of export energy infrastructure translates into a strategic vulnerability. Iraq's dependence on oil for 91% of its commodity exports, the majority of which are channeled through a single maritime corridor, has rendered it susceptible to cascading effects extending from physical flow disruptions to a full-fledged fiscal and financial crisis. This underscores the urgent imperative for the re-engineering of economic policies away from oil rentierism. Nevertheless, it must be acknowledged that the generalizability of this study's findings warrants caution, given the idiosyncrasies of each country in terms of geographical location, economic structure, and degree of integration into global markets.

## Conclusion

The synthesized evidence indicates that geopolitical disruptions in strategic maritime corridors substantially exacerbate the vulnerability of global energy supply chains. The nine reviewed studies consistently report that chokepoint disruptions elevate shipping costs, freight rates, and insurance premiums, while reducing the reliability of energy flows. However, the magnitude of these effects varies across contexts and depends on the degree of import dependence, the availability of alternative routes, and the level of strategic reserves. The evidence suggests that supply chain resilience capabilities—including flexibility, redundancy, collaboration, and agility—are associated with attenuated adverse effects and expedited recovery. However, the evidence base remains limited with respect to precise quantitative effect sizes, and the findings should be interpreted as indicative rather than definitive. The reviewed literature provides robust theoretical and empirical support for a positive association between diversification (of energy sources, suppliers, and transportation routes) and enhanced energy security. Multiple studies corroborate this relationship, although the strength of the association appears to be contingent on contextual factors such as the pace of energy transition and the availability of alternative infrastructure. The evidence supports the proposition that these capabilities collectively enhance the capacity of firms and states to absorb, respond to, adapt to, and recover from disruptions. The Iraqi case study provides a context-specific illustration of how the absence of these capabilities—particularly route diversification and redundancy—can amplify vulnerability. However, given the single-case design, these findings should be interpreted as illustrative rather than generalizable. The Strait of Hormuz crisis illustrates that the importance of energy security in the twenty-first century is no longer solely contingent upon resource availability, but rather upon the capacity to manage risks and diversify options in a world characterized by intertwined interests and escalating uncertainties. The study recommends the adoption of a long-term strategic approach that recalibrates the equilibrium between economic efficiency and systemic resilience, with a particular emphasis on investing in alternative export routes, advancing renewable energy technologies, and strengthening regional and international cooperation in maritime risk management. It further calls for future research endeavors focused on quantitatively measuring the impact of resilience and on developing dynamic simulation models that account for the complex interplay among geopolitical, economic, and technological variables.

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