Frontiers in Economics and Management Volume 7 Issue 8, 2026
ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

Geopolitical Risk and Supply Cycle Disruption: A Case Study of the Strait of Hormuz

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Abstract

The Strait of Hormuz crisis in 2026 provides a classic case for studying how geopolitical risks disrupt the global supply chain cycle. The conventional view regards supply interruption as a binary event, that is, once the transportation channel is reopened, the operation will immediately return to normal. This article questions this hypothesis. We believe that the geopolitical shock has a lasting impact, which far exceeds the reopening of transportation routes. Using air freight rates, popular goods and data disclosed by enterprises, we have built an analytical framework containing three transmission paths: direct transportation delays, loss of production capacity and shipping network reorganization. We also introduced the concept of "asymmetric recovery" to describe the phenomenon that the time required for supply chain recovery far exceeds the duration of the initial shock. Case studies on aluminum, petrochemical products, helium and fertilizers show that the Strait of Hormuz is not only an energy channel, but also a multi-commodity industrial corridor. Among them, it will affect many industries such as agriculture, semiconductor manufacturing, automobiles and medical and health at the same time. These findings show that geopolitical risks cannot be simplified into a simple on or off state in the supply chain model. Enterprises must take measures such as diversifying supply sources, adjusting inventory strategies and strengthening organizational resilience to cope with long-term uncertainty.

Keywords

Geopolitical Risk; Supply Cycle; Strait of Hormuz; Supply Chain Resilience; Asymmetric Recovery.

1. Introduction

For decades, global supply chain optimization has been focused on geographical location and efficiency. However, the continuous incidents in recent years have continuously exposed the vulnerability of this system. For example, the COVID-19 pandemic has led to the large-scale closure of factories and logistics has fallen into bottlenecks; the Suez Canal was blocked in 2021, and the blockage of a single node is enough to paralyze global trade; the Russia-Ukraine conflict has directly disrupted the energy and food supply of all continents; the Red Sea crisis has further exacerbated the pressure on maritime transportation routes, etc.

The Strait of Hormuz crisis in 2026 provides a classic case for studying how geopolitical conflicts affect supply chain communication. The Strait of Hormuz is the most important energy channel in the world, and about 20% of global oil and 25% of offshore oil trade pass through it. But just looking at oil will ignore its broader importance. That is, the strait also transports liquefied natural gas, helium, petrochemical raw materials and fertilizers, which are the upstream raw materials of many industrial supply chains. As Lee et al. emphasize, the Strait's role extends far beyond energy, making it a critical node for multiple interdependent supply chains[1].

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

On February 28, 2026, the United States and Israel launched a military strike on Iran, and Iran responded by attacking merchant ships and restricting navigation. Until mid-March, no ship passed through the Strait of Hormuz for several days in a row. Although a temporary ceasefire was reached at the end of April, the supply situation did not return to the pre-conflict level. This leads to the core question of this article: How does geopolitical risk affect the supply cycle? Why is the recovery of the supply chain much slower than the end of the conflict?

"Supply cycle" refers to the whole time span from placing an order to receiving the goods. It is usually called "delivery period" in operation management. This indicator has a direct impact on inventory planning, production scheduling and customer responsiveness.

The contribution of this article is mainly in three aspects. First, the transmission mechanism is divided into direct transmission and indirect transmission. The results show that the impact of capacity loss and network restructuring is much more lasting than simple transportation delays. Second, the concept of "asymmetric recovery" is put forward to describe the phenomenon of continuous extension of the supply cycle after the conflict is subsided. Third, empirical evidence is provided through four case studies to verify the effectiveness of the analysis framework.

The order of this article is as follows: the second part reviews the relevant content of supply chain risks and geopolitical turmoil; the third part expounds the strategic position of the Strait of Hormuz and sorts out the evolution of the crisis in 2026; the fourth part constructs the analysis framework of this article; the fifth part conducts empirical research through cases such as aluminum, petrochemical products, helium and fertilizers; the sixth part discusses coping strategies; the seventh part summarizes the research findings and points out the limitations of the research.

2. Literature Review

2.1. Supply Chain Risk and Geopolitical Risk

Supply chain risk management usually distinguishes between operational risks and disruption risks. Operational risks mainly include demand fluctuations and supplier reliability issues. The risk of interruption includes events such as natural disasters, geopolitical conflicts and terrorist attacks. Although the probability of these events is low, the impact after their occurrence is huge. The traditional coping strategy mainly relies on increasing resource reserves and capacity margins to deal with uncertainty.

Recent scholarship has shifted focus toward geopolitical risks. Lee et al. argue that the 2026 Hormuz crisis has forced a re-evaluation of traditional supply chain assumptions, particularly regarding the resilience of critical chokepoints[1]. Similarly, Kafoe and Foh examine how geopolitical escalation produces systemic business shocks that ripple through energy markets and global supply networks[2]. Ahn and Tan address supply chain diversification as a resilience strategy, providing a framework for understanding how firms and economies can reduce their exposure to chokepoint risks[3].

2.2. The Supply Cycle Concept

The traditional view regards supply interruption as a binary event, that is, once the transportation channel is reopened, the operation will immediately return to normal. However, the Strait of Hormuz crisis of 2026 shows that this may not be the case. That is to say, even if the strait reopens, the supply chain cycle will still be significantly extended. We call this phenomenon "asymmetric recovery". As Lee et al. observe, the crisis has exposed the limitations of models that treat disruptions as temporary and reversible[1].

The existing research is mainly lacking in two aspects. First, the degree of theorization of the transmission mechanism is not enough, and many studies still simply understand geopolitical risks as "delay caused by interruption". Second, there is too little attention to its recovery

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

process, and there are few studies on how the supply cycle changes after the conflict. This paper studies these two problems by constructing a multipath analysis framework and introducing the concept of "asymmetric recovery". The analysis framework of this article is shown in Figure 1.

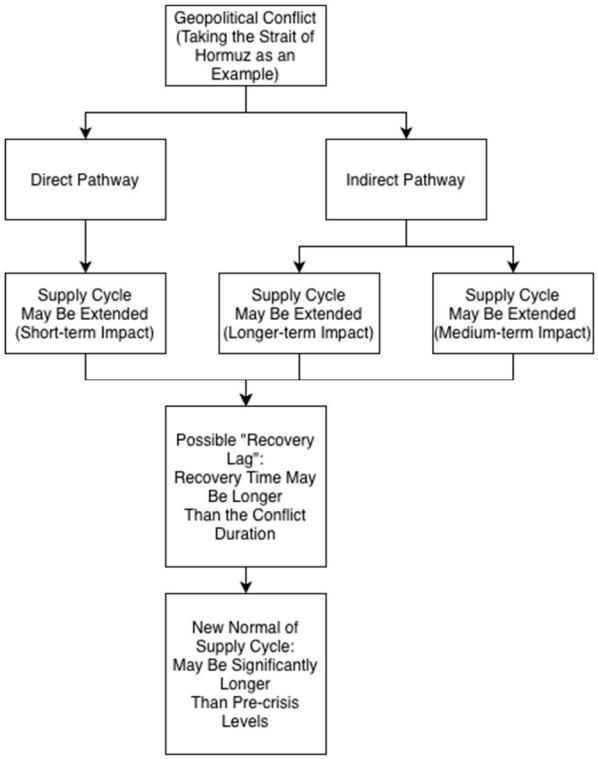

Figure 1. Analytical Framework

3. The Strait of Hormuz: Strategic Importance and the 2026 Crisis

3.1. A Multi-Commodity Industrial Corridor

The Strait of Hormuz is the only outlet of the Persian Gulf and an important channel connecting the oil-producing areas of the Middle East with the Asian, European and African markets. It borders Iran in the north and Oman in the south. Its strategic importance is reflected in many key aspects. Before the 2026 conflict, the strait transported about 20 million barrels of oil every day, accounting for 20% of global oil consumption and 25% of offshore oil trade. About 20% of the world's liquified natural gas (LNG) trade passes through this strait, and most of it comes from Qatar. About 93% of Qatar and 96% of UAE's liquified natural gas exports need to go through this route. About 29% of the global liquified petroleum gas (LPG) trade and 13% of the trade in related chemicals are also transported through this strait. Since nearly half of China's crude oil imports need to go through this key transportation channel, it is highly dependent on the Strait of Hormuz. The entire Gulf region has about 60% of the world's oil reserves and 40% of the world's natural gas reserves.

Lee et al. emphasize that the Strait's importance extends well beyond oil. It is equally critical for helium, fertilizers, and petrochemical feedstocks[1]. About 33% of the world's helium supply comes from the Raslafan complex in Qatar, which is critical to semiconductor manufacturing, nuclear magnetic resonance imaging and aerospace. 35% to 40% of the world's fertiliser supply comes from the Gulf region. Natural gas is the main raw material for ammonia production, and ammonia is the basis of most nitrogen fertilisers. Naphta and related hydrocarbons are essential raw materials for the production of plastics, synthetic fibres and packaging materials. It can be seen that the transportation of these key materials is highly

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

dependent on the channel of the Strait of Hormuz. Once the passage of the Strait is blocked, the interruption effect will spread rapidly along these supply chains, having a chain impact on many industries. Hinz et al. further highlight that such bottlenecks not only raise energy prices but also threaten global food security through fertilizer supply disruptions[4].

3.2. Crisis Timeline

The crisis of interruption in the Strait of Hormuz in 2026 can be divided into four stages. The first phase lasted from February 28 to mid-March. After the United States and Israel launched a strike, Iran responded by attacking merchant ships and imposing navigation restrictions. By March 14, there were no ships in the strait for several consecutive days. The price of Brent crude oil once exceeded 119 dollars per barrel, and the daily crude oil production in the Gulf region decreased by about 12 million barrels. As Kabil Hamed documents, the strategic management of energy markets becomes critical when such supply disruptions occur, as the volatility transmits rapidly across global energy systems[5].

The second phase lasts from mid-March to early April. Traffic restrictions in the Strait of Hormuz continue to tighten, and shipping companies are forced to detour other routes for a long time, extending a single voyage by about 10 to 14 days. At the same time, the security situation in the Red Sea has deteriorated, and the war risk rate has risen sharply, from 0.2%-0.3% to 1%-3%, and some high-risk routes have even reached 3% to 7.5%. The dual-chokepoint pressure created a logistical bottleneck that, according to Lee, Kim, and Yun, exposed the fragility of global shipping networks[1].

The third stage began in mid-April, and the negotiations between the United States and Iran broke down. The Strait Was Briefly Opened On April 17, But It Was Blocked Again The Next Day. During this period, a total of 13 ships returned, including 4 container ships that had passed through the strait. The uncertainty during this phase, as documented in the OECD analysis, caused significant disruptions across multiple industrial supply chains beyond just energy markets[6].

In the fourth stage, after late April, the temporary ceasefire agreement was extended. The resumption of shipping still faces major obstacles. It will take months or even years for the damaged oil and gas fields to resume production, the insurance market is still in chaos, and the trust of enterprises in the strait has not been restored.

3.3. Distinctive Features of This Crisis

There are three significant differences between this crisis and previous supply chain disruptions. First of all, the Strait of Hormuz and the Red Sea-Suez Canal Corridor are under pressure at the same time, and the Cape of Good Hope becomes the only alternative route, greatly extending the voyage. The impact of this simultaneous blocking of dual key channels far exceeds the impact of the closure of a single channel. As noted by Shell, the disruption to global LNG trade had lasting effects, with supply patterns not expected to return to pre-crisis levels in the short term[7].

Secondly, the crisis has caused substantial damage to the supply side. The conflict between the United States and Iran not only blocked shipping, but also directly destroyed production facilities. Heavy oil fields in Kuwait and Iraq are expected to take four to five months to recover. The attack on Qatar's Laffan facility interrupted about 20% of the world's liquified natural gas supply.

Third, this crisis has triggered a global synchronous impact. The energy, chemical, automotive and semiconductor industries are affected at the same time. The impact is transmitted along the chain from energy to logistics, to raw materials, and finally to manufacturing, forming a global chain reaction. Balicevac et al. emphasize that such systemic shocks require firms to develop adaptive resilience strategies, particularly as geopolitical tensions continue to reshape

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

global supply chain configurations[8]. Sarwar and Rye similarly documented, in the context of the Russia-Ukraine war, how geopolitical conflicts can cascade through global supply networks, with effects that persist long after the initial shock[9].

4. How Geopolitical Risk Affects Supply Cycles: An Analytical Framework

4.1. Direct Pathway: Transport Time Extension

The direct path is reflected in the extension of transportation time. After the ship was routed to the Cape of Good Hope, the range increased by about 3,500 to 4,000 nautical miles, and the single voyage was extended by 10 to 14 days. The capacity of alternative ports in the United Arab Emirates and Oman is limited, which is rapidly saturated, exacerbating port congestion and further lengthening the overall transportation time. Customs and security inspection have also extended the customs clearance cycle. Take the typical container transportation from Jebe Ali Port to Shanghai as an example. It takes 18 to 20 days under normal circumstances, but more than 45 days during the crisis. These transport delays are consistent with the cascading logistics effects described by Lee et al. in their analysis of supply chain reconfiguration[1].

4.2. Indirect Pathway I: Production Capacity Loss

The first indirect path is the direct loss of production capacity. About 20% of the world's liquified natural gas supply was interrupted after the attack on the Raslafan LNG facility in Qatar. A smelter of Emirates Global Aluminium (EGA) in the United Arab Emirates was attacked by a missile, and then it was announced that it would stop production due to force majeure. Bahrain Aluminum was forced to close three major production lines and reduce production by about 19% due to the double pressure of blocked exports and shortage of raw materials. As Kabil Hamed argues, strategic management capabilities-including resilience, diversification, and risk management-determine how effectively organizations and economies can absorb such production shocks[5].

The recovery process is not overnight, but has obvious path dependence. Under safe conditions, about 50% of oil and gas fields can resume production within two weeks, 30% will take six weeks, and the remaining 20% face serious challenges, which may take months or even longer. Aluminum smelting is particularly inflexible. Once production is discontinued, restarting involves high costs, and it usually takes months or even years to restore.

4.3. Indirect Pathway II: Shipping Network Reconfiguration

The second indirect conduction path is the restructuring of the shipping network. In early March, the war risk insurance underwriting of the Hormuz transit route was cancelled, coupled with Iran's physical blockade, forming a "soft blockade". The cost of freight has risen sharply. Law's data shows an increase of 11 to 12 times, and the comprehensive cost of a single container on multiple routes has exceeded 10,000 US dollars. When the conflict subsides, the shipping network will not be restored immediately. Shipping companies need to redealocate their capacity, ports need to empty the backlog of goods, and the insurance market must also re-price. Kafoe and Foh characterize this as a systemic business shock, where the reconfiguration costs and delays become embedded in the operating costs of firms across multiple sectors[2].

4.4. Asymmetric Recovery

The above analysis reveals a key finding: the extension of the supply cycle shows the characteristic of "asymmetric recovery", that is, the recovery time required far exceeds the duration of the shock. Hardware repair itself is slow. Once oil refineries, liquefaction plants and smelters are damaged, the recovery cycle is often in months or even years. Rystad Energy's

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

analysis shows that even if a prolonged ceasefire is reached immediately and the strait is reopened, it will be difficult for the market to return to normal within six months.

The recovery of trust is also slow. After experiencing a serious shipping interruption, the corporate risk perception will change. This will lead enterprises to tend to maintain more conservative inventory strategies and more diverse supplier structures. This "behavioural inertia" continues to prolong the supply cycle after the end of the conflict. More importantly, some structural changes may be irreversible. That is, if some enterprises have found alternative suppliers and channels during the crisis, even if the original channels are restored, they may not be willing to switch back.

Lee et al. found that such behavioral inertia is a key factor in the asymmetric recovery pattern, as firms' risk perceptions change permanently after experiencing a severe disruption[1]. As Kafoe and Foh argue, the crisis has fundamentally altered how firms perceive and manage geopolitical risk, leading to lasting changes in supply chain strategy[2]. Ahn and Tan further suggest that supply chain diversification, while essential for resilience, requires careful calibration to balance efficiency and redundancy[3]. Hinz et al. emphasize that the duration of such disruptions is critical, as prolonged bottlenecks can trigger cascading effects across food and energy systems[4].

5. Case Studies: Supply Cycle Changes in Key Commodities

5.1. Aluminium

Aluminum is a typical case that reflects the transmission path of the entire supply chain. The Gulf region accounts for about 8% of the global aluminum supply. After the blockade of the Strait, aluminum exports in the Middle East almost stagnated, and Alba (Aluminium Bahrain) was forced to reduce production. A smelter of Emirates Global Aluminium (EGA) in the United Arab Emirates was attacked by a missile, and then announced that it would stop production due to force majeure. The situation has evolved from "logistics interruption" to "loss of production capacity". As Kabil Hamed notes, such supply chain disruptions in the Strait of Hormuz significantly increase energy price volatility and negatively affect global economic stability[5].

Since the outbreak of the conflict, aluminum prices have risen by more than 13%, with an increase of about 19% during the year. Electric vehicles use a lot of aluminum alloy to reduce the weight of the car, and the cost pressure has increased significantly. Before the crisis, the typical supply cycle of aluminum procurement from the Middle East was 6 to 8 weeks. During the crisis, new orders cannot be fulfilled, and existing contracts also face indefinite postponement.

5.2. Petrochemicals

Petrochemical products are extremely sensitive to the supply of raw materials. The export of naphtha in the Gulf region decreased sharply, and the price rose by more than 50%. The price of plastic raw materials has also risen by 30% to 50% accordingly. In Japan, 6 out of 12 ethylene factories have reduced their production capacity, and the output of some factories has dropped to 60% of the normal level. The production efficiency of the four major oil refineries in South Korea has also declined significantly. Home appliance enterprises are forced to rise the supply price by 2% to 20%. The production capacity of European chemical industry has also been impacted. BASF has increased the price of some product lines by up to 30%. The supply cycle of petrochemical products has been extended from 4 to 6 weeks to more than 10 weeks. The OECD analysis emphasizes that such disruptions affect a broad range of supply chains, from cars to copper mining, and from medical equipment to food production[6].

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

5.3. Helium and Fertilizers

The supply of helium is facing a serious interruption. About 33% of the world's helium comes from Qatar, and the interruption of production in Ras Laffan directly leads to market shortages. Alternative sources of helium are very limited, Russian supply is restricted by sanctions, and U.S. reserves continue to be consumed. As a result, the spot price soared by 40% to 50%, and the delivery cycle was extended from 4 weeks to more than 12 weeks. Lee et al. highlight that the Strait's importance as a multi-commodity corridor means that disruptions affect not just energy but also critical materials for high-tech industries[1].

The interruption of fertiliser supply will affect food security. The Gulf region supplies 35% to 40% of the world's fertilisers. Natural gas is the main raw material of ammonia, and ammonia is the basis of most nitrogen fertilisers. As Hinz et al. demonstrate, the closure of the Strait of Hormuz creates energy bottlenecks that directly threaten global food security, with developing countries being disproportionately affected[4]. The conduction chain described by BRG is shown in Figure 2.

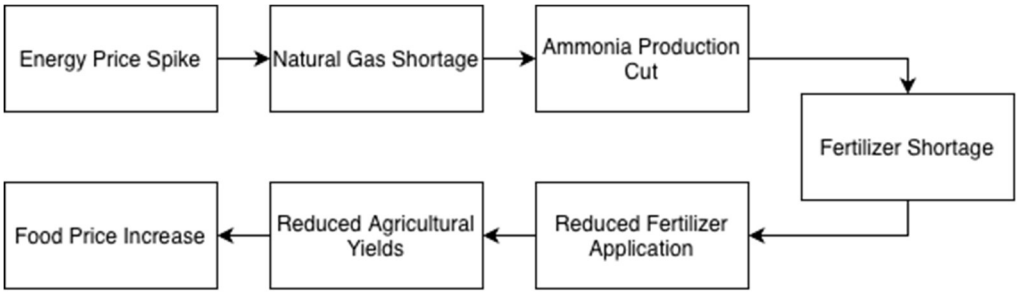

Figure 2. Transmission chain from energy shock to food security crisis

The soaring energy prices directly lead to the shortage of natural gas. Natural gas is the main raw material for the production of ammonia, so ammonia production will decline, which will lead to insufficient fertiliser supply. After farmers reduced the amount of fertiliser, agricultural output was affected, which eventually led to an increase in food prices. However, there is a significant time lag in the agricultural cycle, and fertiliser procurement is usually completed a few months before sowing. Therefore, the economic impact of this transmission process may not appear in the food market until two or three quarters later.As Sarwar and Rye documented in their systematic review of the Russia-Ukraine war's supply chain impacts, geopolitical conflicts tend to produce cascading effects that propagate through multiple sectors over extended periods[9]. The Holmuz crisis also shows a similar transmission pattern, and its impact is likely to go far beyond the duration of the conflict itself.

5.4. Summary of Case Findings

These three cases have a common feature, that is, the extension of the supply cycle not only means slower transportation, but more importantly, the upstream capacity is damaged and the supply capacity is weakened. Once the production capacity is lost, the recovery of the supply chain will lag far behind the reopening of the transportation channel. As reviewed in the literature review section of this article, the Strait of Hormuz crisis provides a key case for understanding how geopolitical risks can fundamentally change the supply chain of multiple industries.

6. Mitigation Strategies and Supply Chain Resilience

Several strategies can be distilled from the above analysis. The first is the diversification of supply sources, which can reduce dependence on a single transportation channel. For Chinese

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

enterprises, it is particularly important to accelerate the diversified layout of imports to Russia, Central Asia, Africa and South America. In supplier management, suppliers can be divided into three levels: core, backup and emergency to ensure that any supplier has alternative options in case of problems. In addition, through long-term capacity reservation agreements, resources can also be locked in advance and priority supply rights can be obtained. Ahn and Tan provide a framework for understanding how supply chain diversification can enhance resilience, though they caution that diversification itself requires significant investment and coordination[3].

Secondly, the inventory strategy must be adjusted. For key materials with long delivery cycles and limited substitutes, the safety inventory level should be appropriately improved. Some semiconductor companies have increased their helium safety inventory from 4 weeks to 12 weeks. Integrating geopolitical risk indicators into the dynamic management system of inventory decision-making can trigger automatic replenishment when the risk threshold is broken, thus enhancing the ability to cope with uncertainty.

Third, the redundancy of transportation routes is crucial. The multi-route strategy can reduce the dependence on a single important channel. Optional alternatives include bypassing the Cape of Good Hope, China-Europe train, and seasonal Arctic routes. With the help of digital supply chain visualisation technology, enterprises can track the location of goods and the expected arrival time in real time, so as to respond quickly to abnormal situations. Lee et al. argue that Arctic route diversification, while offering a potential alternative, involves significant economic trade-offs that must be carefully evaluated[1]. Shell has demonstrated that major energy companies are already adjusting their supply strategies in response to the crisis, including reassessing their exposure to chokepoint risks[7].

Fourth, the construction of organisational resilience is indispensable. Setting up a special geopolitical risk monitoring team or cooperating with professional intelligence agencies is conducive to early warning rather than passive response. Regularly carry out emergency drills to cover all kinds of scenarios from minor delays to complete shutdowns. At the same time, maintaining a certain amount of cash reserves or financial buffer measures such as a committed credit limit can also provide enterprises with the necessary flexibility to cope with cost shocks. Balicevac et al. emphasize that small and medium-sized enterprises face particular challenges in building such resilience, often lacking the resources of larger firms, and require tailored support mechanisms[8].

Finally, as Hinz et al. suggest, policymakers need to develop risk management frameworks that account for the cascading nature of chokepoint disruptions, particularly their effects on food security and developing economies[4]. The crisis has underscored that traditional efficiency-focused supply chain models must be rebalanced with resilience considerations, a lesson that resonates with the findings of Sarwar on the broader impacts of geopolitical conflicts on global supply networks[9].

7. Conclusion

7.1. Main Findings

Taking the Strait of Hormuz crisis in 2026 as a case, this paper systematically analyses the transmission mechanism of geopolitical risks affecting the supply cycle. The study drew the following four main conclusions.

First of all, geopolitical risks extend the supply cycle through direct and indirect paths. The direct path is manifested by transportation delays, including route changes, port congestion and extended customs clearance time. Indirect paths include behavioural inertia caused by loss of capacity, restructuring of shipping networks and changes in enterprise risk perception.

ISSN: 2692-7608 DOI: 10.6981/FEM.202608_7(8).0015

Secondly, the extension of the supply cycle shows the characteristics of asymmetric recovery, that is, the recovery time significantly exceeds the duration of the shock. This asymmetry stems from the physical limitations of hardware repair, irreversible changes in market structure and persistent changes in corporate risk perception. As Lee et al. argue, this asymmetry is a defining feature of geopolitical supply chain disruptions.

Thirdly, the impact of the Hormuz crisis goes far beyond the energy market. The strait is a multi-commodity industrial corridor. It is transmitted to many industries such as global agriculture, semiconductor manufacturing, automobile production and health care through key materials such as fertilisers, helium and petrochemical products. The OECD has particularly emphasized this broad sectoral impact, noting that the Gulf supplies 35 percent of global helium exports and over half of global sulphur exports. Hinz et al. further underscore the food security implications, particularly for developing countries.

Fourthly, geopolitical risks cannot simply be regarded as a binary state of "on" or "off" in the supply chain model. Even if the conflict is calmed down and the channel is reopened, the supply cycle may remain in a new normal longer than before the crisis. In other words, geopolitical risks are not one-time shocks, but structural factors that may change the long-term operation of the supply chain. Ahn and Tan reinforce this conclusion by highlighting the persistent nature of supply chain vulnerabilities and the need for long-term diversification strategies.

7.2. Limitations and Future Research

There are three limitations of this article. First, as a single case study, the conclusion still needs more cases to be verified. Second, due to the lack of micro-data at the enterprise level, this article fails to accurately quantify the extension of the supply cycle. Third, the formation mechanism of the asymmetric recovery mechanism still needs to be further deepened.

Future research can be promoted from the following directions: developing quantitative models to estimate the relationship between geopolitical risk intensity and the extension of the supply cycle; obtaining more accurate recovery delay parameters through enterprise surveys or simulations; comparing the differences in the impact of different types of geopolitical shocks on the supply cycle; and assessing the long-term economic cost of the supply chain from efficiency-oriented to safety-oriented. As Balicevac et al. suggest, future research should also explore how different types of firms-particularly small and medium-sized enterprises-can build resilience against geopolitical shocks with limited resources. Sarwar similarly call for more systematic research on the cascading effects of geopolitical conflicts through global supply networks.

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