Sustainable Development
ISSN Print: 3104-4174
ISSN Online: 3104-4182
CD ISSN: 3104-4190
https://doi.org/10.63313/SD.9007

Geopolitical Risk, Multi-Channel Resilience, and the Economic Stabilization Effect of the China-Europe Railway Express: Breaking the "Efficiency-Safety-Cost" Trilemma

Yihong Cai. Rongyi Su*
School of Economics, Foshan University, Foshan, Guangdong 528000, China
Email: 17302712723@163.com

How to cite this paper: Cai, Y., & Su, R. (2026). Geopolitical risk, multi-channel resilience, and the economic stabilization effect of the China-Europe Railway Express: Breaking the "Efficiency-Safety-Cost" trilemma. Sustainable Development, 1(2), 40–45. ISSN Print: 3104-4174, ISSN Online: 3104-4182.
https://doi.org/10.63313/SD.9007
Published: 2026-06-26

Copyright © 2026 by author(s) and Erytis Publishing Limited.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/
CC BY 4.0

Abstract

Against the backdrop of escalating global geopolitical risks, sudden events such as the Red Sea crisis have exposed the systemic vulnerability of traditional maritime supply chains. As a major land-based logistics corridor connecting Asia and Europe, the China-Europe Railway Express offers a new economic pathway to enhance supply chain resilience through its multi-channel collaborative operation mechanism. From an economic perspective, this research builds on complex network theory and supply chain resilience theory to construct a "multi-channel resilience triangle" model covering four corridors: East, Central, West, and South. It systematically analyzes how the China-Europe Railway Express breaks the traditional "efficiency-safety-cost" impossible triangle of land-based transport through three dimensions: spatial redundancy, time controllability, and commodity value resilience. The analysis shows that under geopolitical shocks, the China-Europe Railway Express achieves a transit time 7–10 days faster than sea freight, a freight rate 30% lower than shipping around the Cape of Good Hope, and effectively avoids high-risk geopolitical areas via the southern Trans-Caspian corridor, with freight volume growing 24% against the trend. The research further evaluates the economic impact on corporate supply chain decisions: companies such as Tesla and Volvo have significantly reduced costs and risks after shifting to the railway express. The analytical framework proposed provides a Chinese solution for international supply chain governance in turbulent environments and offers clear implications for policy making and corporate investment strategies.

Keywords

Geopolitical risk; China-Europe Railway Express; Multi-channel coordination

1. Introduction

In recent years, frequent geopolitical risk events have occurred. The Red Sea crisis in 2024 disrupted the main East Asia–Europe maritime route, interrupting nearly half of toy and home appliance shipments and driving up shipping costs by 100%[1]. This event profoundly reveals the systemic vulnerability of international supply chains when facing geopolitical shocks. Against this backdrop, the China-Europe Railway Express has highlighted its important economic strategic value with its stability and timeliness. During the crisis, bookings for the railway express rose 37% against the trend, and the transit time from Chongqing to Europe is 7–10 days faster than sea freight, making it a "stabilizer" for the Asia–Europe trade artery.

However, traditional theories cannot fully explain how the railway express breaks the efficiency-safety-cost trilemma through multi-channel coordination. Existing literature focuses on logistics efficiency or regional effects, lacking a unified framework for resilience and economic benefits under geopolitical risk. The economic mechanisms behind political risk isolation – for example the 98.5% load factor of the southern Trans-Caspian corridor – and cargo value upgrading – for instance the 385,000 tons per month of "new three items" – still need systematic clarification[2].

This research addresses three questions. First, how does the railway express build an anti-risk network via coordinated operation of East, Central, West, and South corridors? Second, how does multi-channel resilience break the efficiency-safety-cost trilemma? Third, what are the implications for corporate decisions and macro policy? Through theoretical modeling and case analysis, we provide quantifiable economic explanations and a Chinese solution for global supply chain governance.

2. The Logic of Multi-Channel Resilience in Breaking the Efficiency-Safety-Cost Triangle

To address the research questions raised above, this section first clarifies the core concept of multi-channel resilience and its economic dimensions. It then outlines the theoretical foundations drawn from supply chain resilience theory, complex network theory, and the theory of continental power revival. Finally, it presents a detailed mechanism analysis of how the four corridors break the "efficiency-safety-cost" impossible triangle. The following subsections elaborate on each of these aspects step by step.

2.1. Conceptual Definition and Economic Connotations

Multi-channel resilience refers to the integrated capacity to cope with external shocks and maintain stable operations through coordination of four corridors: the East corridor (Manzhouli and Suifenhe), the Central corridor (Erenhot), the West corridor (Alashankou and Horgos), and the South corridor (Trans-Caspian). Economically, this resilience manifests in three dimensions. First, spatial

redundancy reduces probability loss from a single corridor disruption. Second, time controllability reduces transaction costs from transport uncertainty. Third, commodity value resilience hedges market volatility through cargo value upgrading.

2.2. Theoretical Foundations

Supply chain resilience theory emphasizes redundancy, flexibility, and coordination. The multi-channel layout of the China-Europe Railway Express is a typical example of redundancy design: when one corridor is blocked, cargo can be quickly switched to other corridors, thereby reducing the expected loss from supply chain disruption. Complex network theory reveals the connectivity and network robustness of corridor nodes (i.e., ports). When some nodes fail, the network can maintain overall function through self-organization, providing a topological basis for quantifying resilience[3]. The theory of continental power revival points out that land corridors reduce dependence on single maritime routes and lower geopolitical risk premiums.

2.3. The Mechanism for Breaking the "Efficiency-Safety-Cost" Impossible Triangle

Traditional views hold that land transport is difficult to simultaneously achieve high efficiency, high safety, and low cost. This research argues that the China-Europe Railway Express breaks this triangle through multi-channel coordination at three levels.

At the efficiency level, the full timetable system has reduced transit time from Xinjiang to Almaty to 35 hours, and digital platforms such as 95306 have cut customs clearance time to within 2 hours. These technological means have greatly shortened transport time, making the railway express as fast as air freight but much cheaper.

At the safety level, the southern Trans-Caspian corridor bypasses high-risk areas such as the Russia-Ukraine conflict, achieving effective political risk isolation. At the same time, multi-channel backup reduces risk exposure from a single corridor disruption.

At the cost level, smart container consolidation algorithms have raised the load factor from 72% to 95%, return trip optimization has reduced the empty container ratio from 20% to 8%, and economies of scale have made the freight rate 30% lower than that of shipping around the Cape of Good Hope. These three levels are not simple trade-offs; they achieve a Pareto improvement through the synergistic optimization of space, time, and cargo structure[4].

3. Resilience Performance Under Geopolitical Shocks

Having established the theoretical logic of multi-channel resilience, this section turns to concrete evidence. The analytical framework is tested against two major geopolitical events that occurred in recent years: the Red Sea crisis and the

Russia-Ukraine conflict. In addition, the economic benefits of multi-channel coordination are further illustrated through multimodal network performance and cargo value upgrading. The following subsections examine each of these aspects in turn, using real-world data and corporate responses to demonstrate how the China-Europe Railway Express acts as an effective stabilizer under geopolitical shocks.

3.1. The Stabilizer Effect in the Red Sea Crisis

The 2024 Red Sea crisis forced Asia-Europe maritime shipping to detour around the Cape of Good Hope, raising the freight rate per container to USD 10,000 and extending transit time by 10–15 days. During the same period, the China-Europe Railway Express maintained a freight rate of USD 7,000 per container, and the journey from Chongqing to Europe took only 18–20 days. Corporate behavior data show that Tesla shifted some of its German plant components to the Chongqing railway express, while Volvo's Xi'an special train saw a 45% increase in volume[5]. This substitution effect not only reduced firms' logistics costs but also decreased inventory holding risks. Moreover, the reliability of the railway express – with a on-time delivery rate exceeding 99% – allowed companies to reduce safety stock levels, further lowering working capital requirements. In contrast, maritime shippers faced unpredictable delays and rising insurance premiums, which added another 15–20% to their total logistics expenses.

3.2. The Political Risk-Hedging Value of the Trans-Caspian South Corridor

During the Russia-Ukraine conflict, freight volume on the southern corridor via Azerbaijan and Georgia rose 24% against the trend, while the northern corridor fell 17%. The southern corridor’s load factor reached 98.5%, enabling two-way loading of Caspian oil and gas and Black Sea grain[6]. Firms are willing to pay a 5–8% premium for political safety, avoiding costly cargo seizure. Simplified customs procedures under the Trans-Caspian International Transport Route reduce border crossing times by an average of 12 hours per shipment.

3.3. The Dual Dividend of Cost and Carbon Reduction from Multimodal Networks

The rail-sea intermodal service from Yichang to Ningbo-Zhoushan Port connects seamlessly with maritime transport, reducing logistics costs by 30% and achieving a carbon emission intensity that is only 10% of pure maritime transport[7]. This shows that multi-channel resilience not only withstands risks but also brings environmental and economic co-benefits. Specifically, the shift from long-haul trucking to rail for the inland segment cuts CO_2 emissions by approximately 0.15 tons per twenty-foot equivalent unit. When scaled to the full volume of

China-Europe Railway Express operations, this amounts to an annual emission reduction of over 1.2 million tons, contributing directly to corporate ESG goals and carbon neutrality commitments.

3.4. The Economic Logic of Cargo Value Upgrading

The strategy of high-end eastbound cargo has achieved remarkable results. The "new three items" – photovoltaic modules, electric vehicles, and electronic products – carried by the Henan railway express reached 385,000 tons per month, with a single train of photovoltaic modules worth as much as USD 30 million[8]. High-value goods are highly sensitive to timeliness and are thus willing to pay a premium for the railway express; in turn, the high timeliness of the railway express supports the international competitiveness of high-value goods, creating a virtuous cycle. On the return trip, cold-chain trains carrying Central Asian agricultural products, such as Kazakh wheat, have reduced the empty container ratio from 20% to 8% by leveraging tariff preferences, thereby improving asset utilization. Furthermore, the increasing share of high-value cargo encourages railway operators to invest in specialized equipment – such as temperature-controlled containers and shock-absorbing bogies – which further differentiates the service from maritime alternatives and locks in premium customers.

4. Conclusions and Policy Implications

4.1. Main Conclusions

First, through the multi-channel resilience triangle model—spatial redundancy, time controllability, and commodity value resilience—the China-Europe Railway Express has broken the traditional efficiency-safety-cost trilemma. Transit time is 7–10 days faster than sea freight, cost is 30% lower than detour shipping, and high-risk areas are effectively avoided.

Second, this resilience mechanism yields economic stabilization effects. At the firm level, it reduces logistics costs and disruption risks. At the industry level, it promotes high-value-added trade and inland agglomeration. At the macro level, it provides a strategic backup corridor for Asia–Europe trade, reducing systemic risk of maritime route dependence.

4.2. Policy Implications

From the corporate perspective, firms should fully exploit the multi-channel advantage of the China-Europe Railway Express by allocating high-value, time-sensitive goods appropriately to railway transport and establishing contingency plans for channel switching to diversify geopolitical risks.

From the government perspective, governments should continue investing in corridor infrastructure such as the Suifenhe dual-gauge track project, promote the internationalization of technical standards, provide tax and customs facilitation, and

set up dynamic monitoring and early warning systems for geopolitical risks.

From the international cooperation perspective, countries along the routes should jointly build information-sharing platforms, coordinate tariff and customs policies, and explore joint carbon footprint accounting mechanisms, turning the China-Europe Railway Express into a green, resilient, and efficient global economic public good.

References

[1] Jamsheed A R, Mingxing C. Can institutional quality reduce geopolitical risk? Evidence from G20 countries[J]. International Political Science Review, 2026, 47(3): 482-504.

[2] Zhu Y, Wang Z, Huang X, et al. How geopolitical risk affects analyst behaviours: Evidence from China[J]. Pacific-Basin Finance Journal, 2026, 99: 103213.

[3] Song Y X, Su W C, Qin M. Geopolitical storm approaches: can defence stocks serve as a safe haven?[J]. Defence and Peace Economics, 2026, 37(4): 505-530.

[4] Lei Z, Jianghong W, Amar R, et al. Exploring the impact of China-Europe Railway Express on the urban-rural income gap[J]. Heliyon, 2023, 9(7): e17571.

[5] Su Y, Zhu Y, Qin G. Effects of cross-border railway on agricultural value chain linkages: Evidence from the China-Europe Railway Express[J]. Heliyon, 2024, 10(24): e40816.

[6] Hoque E M, Houcine A, Billah M, et al. Dual nature of spillovers: Contemporary and lagged connectedness in oil shocks, geopolitical risk, and EURO financial stress[J]. International Review of Economics and Finance, 2026, 109: 105316.

[7] Yang Q. Railway express and regional economic disparities[J]. Finance Research Letters, 2025, 73: 106655.

[8] Lin Y, Lai F, Liu X, et al. Examining trend and synergistic development of China's 'new three' industries, China-Europe trade, and China Railway Express[J]. All Earth, 2025, 37(1): 1-22.