Assessing the Vulnerability of Global Supply Chains to Cargo Theft: A Multi-Regional Input-Output Approach

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This paper presents a new framework for assessing the impact of cargo theft on the global supply chain. Extensive research has been conducted in economic modeling, particularly through the Inoperability Input-Output Model (IIM) and the Computable General Equilibrium (CGE) Model, to estimate the economic consequences of disasters. However, most previous studies have focused on low-probability, high-impact risks such as earthquakes, floods, and terrorism. In contrast, there has been limited research on high-probability, lower-impact risks, such as cargo theft.

Cargo theft continues to pose significant challenges to global supply chains, leading to financial losses, injuries, fatalities, disruptions, and increased costs due to heightened security measures. The economic impact extends beyond direct losses, affecting insurance premiums, supply chain reliability, and consumer trust in global trade networks. Despite growing awareness of resilience strategies and advancements in security technologies, such as real-time monitoring systems, cargo theft incidents are on the rise. In 2023, 156,000 incidents were reported in the Europe, Middle East, and Africa (EMEA) region, resulting in total losses of $585 million (TAPA, 2023). In Asia, 343 incidents led to losses of $200 million (TAPA, 2023). That same year, the United States and Canada experienced a record-high number of cargo thefts, with 2,852 reported incidents and total losses amounting to $331 million (CargoNet, 2025).

The structure of global supply chains is evolving due to the increasing fragmentation of production and the growing awareness of network concentration risks, particularly following shocks such as COVID-19. The target goods of cargo theft are also influenced by global dynamics. Thieves tend to focus on high-value, easily resellable goods, with general inflation and product shortages further contributing to the rise in theft incidents. Frequently targeted commodities include food and beverages, pharmaceuticals, metals, and fuels. During the COVID-19 pandemic, medical supplies such as masks and medicines became particularly vulnerable to theft.

To mitigate the impact of cargo theft on supply chain disruptions and economic losses, stakeholders must understand the evolving risks associated with global trade. In our analysis, we assess the vulnerability of product supply chains to cargo theft over time using the Inter-Country Input-Output Tables published by the OECD and cargo incident data from the Transported Asset Protection Association Incident Information Service (TAPA IIS) database. Given that cargo theft increases transportation costs through heightened security expenditures and rising cargo insurance premiums, we develop a model to examine how the cost pressures are propagated through global supply chains, aiming to identify important stakeholders who are indirectly affected. Specifically, we focus on global supply chains passing through hot spot countries and products that have experienced a rapid increase in cargo theft incidents. Since previous studies have largely focused on localized cargo theft risksâ€”analyzing incidents at the national or city levelâ€”our research provides a more comprehensive perspective for global supply chain managers. Furthermore, our analytical framework can help quantify the benefits of mitigation measures aimed at reducing cargo theft. This framework provides valuable insights into improving supply chain resilience while minimizing the financial risks associated with cargo theft.