

# Cost Consequences of a Port-Related Supply Chain Disruption



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## Abstract

Port functionality is a significant and important aspect of cargo transportation. Previous studies have identified a list of port-related supply chain disruption threats and developed a management model that seeks to address these threats. This paper adds value to these related studies by comparing four consequences of an example of these threats: (1) avoidance of disruption, (2) mitigation of disruption, (3) deviation of transportation plan and (4) delays and deviation of transportation plan. The impact of these consequences is simulated in a case study using data from a chemical manufacturer based in Singapore. This paper quantitatively measures the impact of a port-related threat on supply chains and thus highlights the importance of port-related supply chain disruption management.

**Key Words :** Port-related Supply Chain Disruption, Risk Management, Disruption Management, Port Resilience, Simulation

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## **I. Introduction**

Many studies have reported the importance of the port's functionality depicted through the detrimental effects resulting from operational failures of ports as nodes in supply chains. The West Coast port lockout in the US in 2002 caused port management to incur a loss of approximately US\$19.4 billion (Institute for Supply Management, 2002). Dock strikes at Kwai Tsing container terminal in Hong Kong in 2013 resulted in serious shipment delays and huge financial losses (TradeWinds, 2013). Defective or inadequate cargo handling equipment in Nigerian ports accounted for low productivity, inefficiency and damage or loss of cargo (Esq., 2001). These examples demonstrate the significant impact of man-made operational port threats on supply chains. This paper refers to this type of threat as port-related supply chain disruptions (PSCD) threats. A PSCD threat is an operational threat originating from the port and has a possible detrimental effect on supply chains. For instance, a PSCD threat can take the form of a port strike, congestion, power outage at port facilities, collisions, equipment breakdown and a shortage of facilities or equipment. Hence, natural disasters are not included in the discussion. The types of ports and supply chains affected by PSCD threats include those that transport containerized and non-containerized cargo. Previous studies have been conducted to develop a management model that addresses PSCD threats (Loh and Thai, 2014a, 2014b). This paper seeks to add to those works by providing a comparison of different scenarios of a PSCD threat's impact on supply chains using empirical data from a chemical manufacturer based in Singapore. This paper contributes to the existing literature by demonstrating the benefits of mitigating and avoiding a supply chain disruption caused by a PSCD threat. A more in-depth analysis of cost consequences would be meaningful, however, the purpose of this paper is to provide numerical evidence that the presence of effective management measures would help generate savings. The remainder of this paper is organized as follows. First, previous studies will be reviewed to establish the close relationship between ports and their communities in relation to the research background. Next, the supply chain network of the organization used in the case study and the descriptions of the case study methodology will be explained. The results will then be

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