Scientific
Research

Sea-Port Operational Efficiency: An Evaluation of Five Asian Ports Using Stochastic Frontier Production Function Model

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ABSTRACT

Sea-port operational efficiency is critical factor for handling of goods in the international supply chains, and is viewed to impact transportation and logistics which play an important role in trade exchange with other countries. It is important to evaluate operational efficiency of sea-ports to reflect their status and reveal their position in this competitive environment. Moreover, knowing impacts of efficiency of sea-ports on the supply chain is vital for business survival. This study uses stochastic frontier and inefficiency models to analyze sea-port operational efficiency and Delphi technique to seek expert respondents' opinion on its characteristics. The research also uses structural equation modeling to build a model of sea-port operational efficiency as a further step to examine the significance of the characteristics. The results of this study emphasize the need to improve sea-port operational efficiency, and indicate which characteristics should be given more attention.

1. Introduction

Sea-ports have been considered to be important parts of international supply chains [1]. They hold a very important role and are the most critical nodes in the supply chain [2]. It is widely believed that sea-ports form a vital link in the overall trading chain [3]. Sea-ports are a component of freight distribution as they offer a maritime to land interface for cross-border businesses. Therefore, efficiency of sea-port operation is vital for supply chains.

A lot of research has been done in the area of sea-port operational efficiency. Many of such research dwell on tactical means of bolstering sea-port operational efficiency [3-6]. Some researchers regard sea-port as Third Party Logistics (3PL) provider that intervenes in a series of different companies and supply chains [7]. Three different channels: trade channel, logistics channel and supply chain channel were identified by [7] as a new framework of measuring performance of sea-ports. However, there still exists a gap in assessing the sea-port operational efficiency. The question: "What characteristics are key to improving sea-port operational and to what extent they can bolster efficiency?" has not been adequately

addressed in literature. Some research dwell on one or two aspects at a time leaving out other aspects.

This research seeks to address this concern by examining sea-port operational efficiency, establishing determinants of such efficiency for its evaluation and building its model. Since various aspects of efficiency do not lend themselves to precise analytical techniques but can benefit from subjective judgments on collective basis [8], Delphi technique was chosen as a feasible method for identifying key factors that are significant to sea-port operational efficiency.

The paper will be comprised of five main sections. Following the introductory section, the paper will present reviews on related literature concerning sea-port operational efficiency and logistics flexibility. The section will be devoted to defining it and outlining its theoretical precepts. Next section will present the selected research methodology followed by results of the research as well as their analyses and related discussions. The paper will further present implications of research findings and discussions of limitations of the current study as well as recommendations for further research. Finally, there will