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Supply chain resilience, firm performance, and management policies in the liner shipping industry

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ABSTRACT

This study empirically examines a model that describes the relationship between supply chain resilience (SCR) and firm performance by using survey data collected from the Taiwanese liner shipping industry. In the model, the theoretical constructs of SCR consist of a risk management culture, agility, integration, and supply chain (re-)engineering. The results from testing the model show that the positive direct effects of a risk management culture on agility, integration, and supply chain (re-)engineering are significant and that risk management performance contributes to firm performance. The findings also suggest that risk management performance plays a crucial role in the positive effects of the three types of SCR (i.e., agility, integration, and supply chain (re-)engineering) on firm performance. Managers are advised to focus on the role of risk management performance to realize the performance value of SCR.

1. Introduction

Businesses compete no longer on an individual basis but as a member of a supply chain (SC) (Christopher, 2000). A well-managed SC is thus one of the enduring resources to enhance a firm's competitive strength. Determining how to lower inventory levels, reduce lead times, increase SC efficiency, and enhance profit is a formidable challenge confronting many managers. Further, specialization in industry and the globalization of materials and markets encourage manufacturers to outsource their productive activities to nations with lower wages to reduce costs. On the other hand, manufacturers market their products to emerging countries with strong purchasing power such as the BRICS (Brazil, Russia, India, China, and South Africa) to increase their potential revenue. It is natural for SC members to transform themselves from local to regional or global operations. As an SC expands to include members from different cultures, locations, and time zones, SC management (SCM) becomes a complicated and challenging task.

The liner shipping industry is the cornerstone of the semi-manufactured and manufactured goods market with the objective of increasing the goods' availability and generating higher profits. To achieve this objective, shipping lines need to constantly increase their number of container ships in order to provide broader geographical coverage for their shipping service. Many liner shipping companies began their operations by providing shipping service for a single nation and subsequently

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expanded to cover a cluster of nations in a region and many nations globally. The expansion of shipping service coverage and service routes renders liner shipping companies' operations complicated and fragile. Indeed, widespread political instability, climate change, communicable diseases, and terrorist attacks frequently increase the likelihood of SC disruptions. For instance, the 9/11 terrorist attack, damage from Hurricane Katrina, the Tohoku earthquake in Japan in 2011, the Debt Crisis in the EU, and the 2011 flooding in Thailand have all significantly hindered SCM (Pettit et al., 2013).

Further, the liner shipping industry needs to tackle operational challenges related to unstable economic cycles, empty container repositioning, seafarer shortages, escalating bunker prices, cargo space oversupply, fluctuating ship prices, and port closures (e.g., port closures due to an explosion at the Tianjin Port, the industrial strike at the port of Long Beach and Los Angeles, the earthquake and tsunami in Japan, and the Hanjin Shipping bankruptcy in Korea). Damages to ships due to collisions, fire, explosions, warfare, terrorist attacks, piracy, and so forth have also weakened organizations' ability regarding SC resilience (SCR). To be proactive, port authorities and liner operators have to change their business mindset. They must now consider not only whether a disruption will occur but also when the disruption will occur and how long the effects will last before they can operate as usual. In addition to SC costs and efficiency, they have to improve the resilience of their SC (i.e., SCR) to ensure the continued operations of the whole SC and eventually ensure the long-lasting competitiveness of their SC (Christopher and Peck, 2004; Zsidisin and Wagner, 2010).

SCR is key to the success of enterprises and SCs (Ambulkar et al., 2015; Hohenstein et al., 2015; Pereira et al., 2014; Soni et al., 2014; Wieland and Wallenburg, 2013): it is useful for enterprises to quickly assess the impacts of risks on the SC and the possible levels of recovery during disruptions, which improves collaboration between SC partners (Soni et al., 2014). SCR can be defined as an enterprise's ability to identify bottlenecks and potential risks in managing an SC, which allows it to adopt effective measures before an SC is disconnected (Brandon-Jones et al., 2014).

SCR is one of the most important aspects of SCM, and its enablers have been extensively studied, such as SC risk management (e.g., Ivanov et al., 2014; Pettit et al., 2013; Ratick et al., 2008; Soni et al., 2014; Spiegler et al., 2012; Vugrin et al., 2011), social capital (Johnson et al., 2013), relational competencies (Wieland and Wallenburg, 2013), procurement (Pereira et al., 2014), resource reconfiguration (Ambulkar et al., 2015) and firm innovativeness (Gölgeci and Ponomarov, 2015). According to a study conducted by Alcantara (2014), 81% of the respondents report that they encountered at least one SC disruption in 2013, and almost one-quarter of the respondents (23.6%) report annual cumulative losses of at least €1 million due to SC disruptions. The profitability and economic sustainability of many firms are greatly threatened because of their inability to manage uncertainty and the risks they encounter. For instance, based on a survey of 800 American companies that have experienced an SC disruption at least once, Hendricks and Singhal (2005) find that SC disruptions decrease a company's operating income and sales by 107% and 7%, respectively, and unfortunately, increase its costs by 11%. Further, when risk events occurred, these two negative impacts continued for at least another two years, and the companies' stock prices experienced a rapid drop. Thus, the performance value of SCR cannot be neglected.

There are three motivations for this study. First, although SCR has been identified as one of the most important issues in contemporary SCM (Brandon-Jones et al., 2014; Ivanov et al., 2014; Spiegler et al., 2012; Urciuoli et al., 2014), the theoretical basis for understanding SCR is fragmented and lacks systematic integration. Extant studies on SCR are mostly qualitative (e.g., Azevedo et al., 2013; Jüttner and Maklan, 2011; Johnson et al., 2013; Leat and Revoredo-Giha, 2013; Scholten et al., 2014; Urciuoli et al., 2014; Wedawatta et al., 2010), and quantitative studies based on large-scale surveys on SCR are scant (e.g., Ambulkar et al., 2015; Brandon-Jones et al., 2014). To narrow the gap between practice and theory, this study uses a rigorous quantitative research technique to examine the relationship between firms' SCR capability and their performance. Second, most SCR studies have focused on surveying the manufacturing industry (e.g., Azevedo et al., 2013; Carvalho et al., 2012; Colicchia et al., 2010; Jüttner and Maklan, 2011; Pettit et al., 2010; Wieland and Wallenburg, 2013), but to the authors' knowledge, there is a very limited number of SCR conceptualization studies dedicated to the liner shipping industry (e.g., Bhaskar et al., 2014), which is characterized by a competitive and unstable operating environment. Third, there are no commonly accepted sub-constructs for SCR (Hohenstein et al., 2015), and there is little empirical evidence on how different theoretical constructs/measurements of SCR simultaneously influence firm performance. While some previous studies have simply treated SCR as a dependent variable in examining how factors influence it and how the relationship between SCR and certain independent variables is moderated by other variables (e.g., Brandon-Jones et al., 2014; Jüttner and Maklan, 2011), other studies have merely focused on the influence of various SCR constructs on an SC's customer values (Wieland and Wallenburg, 2013). In short, very few of the above-mentioned studies have discussed the relationships between the different SCR sub-constructs/measurements and firm performance or the mediating effect of risk management performance on the relationship between SCR and firm performance. Considering these research voids, this study aims to examine these relationships by using data collected from one of the most important service industries, the liner shipping industry, to empirically examine the impact of SCR on firm performance from the resource-based view (RBV). The questions answered by this study are as follows:

- What are the theoretical constructs/measurements of SCR and their interrelationships with firm performance in the liner shipping industry?
- How do the different types of SCR affect firm performance in the liner shipping industry?

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