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Supply chain agility: Securing performance for Chinese manufacturers

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ABSTRACT

This study develops and empirically tests a conceptual framework to investigate the antecedents of manufacturers' supply chain agility and the connection of their agility with performance in an emerging economy. Drawing upon the information theory, this study argues that technical (IT capability) and relational factors (information sharing and trust, and operational collaboration) are the antecedents of a manufacturer's supply chain agility. This study also posits that cost efficiency mediates the relationship between agility and performance based on transaction cost economics. Employing path analysis, this study shows that strong associations exist between a manufacturing firm's IT capability and operational collaboration with suppliers and its supply chain agility. The results also indicate the significant mediating effect of cost efficiency between the manufacturer's supply chain agility and performance. Implications are discussed and future research directions are also suggested.

1. Introduction

It has been increasingly recognized that an individual business no longer competes as a stand-alone entity, but rather as member of a supply chain (Christopher, 2000). Companies compete and win based on the capabilities they can assemble across their supply networks (Rice and Hoppe, 2001). A considerable number of studies on supply chain management in the past have focused attention on different ways of improving supply chain performance. However, within unpredictable and turbulent business environment, supply chains are vulnerable to business disruptions such as the occurrence of undesirable events, natural disasters, loss of partnership relationships, and new customization demands from customers. Supply chain disruption risks have been described as the occurrence of these unpredictable and undesirable events (Braunscheidel and Suresh, 2009; Tang and Tomlin, 2008). Supply chain disruptions are risks related to the collaboration and uncertainty of supply chain and the impact of natural disasters, terrorism and labor strikes (Kleindorfer and Saad, 2005). This study focuses on operational collaboration and information asymmetry in buyer–supplier relationships in a transition economy, which are related to supply chain disruptions. Extant studies have been conducted in western cultures, there is a dearth of understanding of buyer–supplier relationships in transition economies (e.g., China). As China is transforming into market-based competition from the centrally planned economy, it experiences complex changes in socio-cultural environment in which interorganizational relations serve as a foundation for economic exchanges (Park and Luo, 2001). As a primary location for international outsourcing and its role of global manufacturing center, China serves a sound ground for assessing the effectiveness of channel cooperation.

While showing their interest in improving supply chain performance, scholars are increasingly focusing on supply chain agility. Christopher (2000) for example, stated that agility is the effective and flexible accommodation of unique customer demands. Business practitioners and scholars have embraced notion of agility in the supply chain. An agile supply chain enables exchange partners in the supply chain to sense, respond quickly to, and exploit anticipated or unexpected changes in market demand and in the business environment (Sharifi and Zhang, 2001). Improving supply chain agility is a potential strategy for mitigating supply chain disruption risks discussed above (Tang and Tomlin, 2008). It becomes important for a firm to improve its supply chain agility. However, there is a scarce of current research investigating the determinants and consequences of supply chain agility in transition economies from both technical and relational perspective. This study aims to fill several research gaps in the literature and contributes to the existing literature by answering the following two research questions: (1) how technical and relational factors serve as antecedents of supply chain agility and (2) how cost efficiency mediates the relationship between a firm's supply chain agility and performance in the context of Chinese manufacturers. In addition, this study supplements the research that focuses on organizational practices as antecedents of supply chain agility (i.e., Braunscheidel and Suresh, 2009) and is case-based (i.e., Mondragon et al., 2004). Empirically, findings of this study will help us better understand how technical and relational factors contribute to the agility of supply chain operations and the

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important role of cost efficiency in improving manufacturers' performance in the context of an emerging economy.

In the rest of the paper, a review of relevant literature is followed by theoretical background and hypotheses development, and research methods and data analysis are discussed. After presenting the results of the analysis, we also discuss theoretical contributions and managerial implications. Future research and limitations of this study are also addressed.

2. Literature review

There exist two streams of research that examine supply chain agility. The first stream focuses on the importance of speed and responsiveness to volatile markets in a flexible way (e.g., Van Hoek et al., 2001; Sambamurthy et al., 2003; Swafford et al., 2008). In particular, Swafford et al. (2008) distinguished flexibility and agility of the supply chain and presented a research framework for their connections. In their study, supply chain flexibility is identified as ability embedded in a firm's internal supply chain functions and agility as an externally facing capability. They observed that supply chain flexibility represents operational abilities while agility reflects the speed of the adaptation to the evolving markets. Yusuf et al. (2004) advanced a reach and range analysis of agile supply chains. In their two-dimensional framework, reach is on the vertical axis and range is on the horizontal axis. They stated that an agile supply chain should extend to the highest levels on both dimensions of reach and range. Christopher (2000) suggested that supply chain agility is an ability of a firm for handling the changes of volume and variety in customer demand. Agility was tightly associated with the effectiveness of strategic supply chain management (Li et al., 2008) in the competition among supply chains, rather than entities (Christopher and Towill, 2001). Van Hoek et al. (2001) considered agility as an attribute for responding to changes, handling customer requests, and mastering market turbulence. Li et al. (2009) suggested that supply chain agility has two dimensions, alertness to change and response capability, at three levels including strategic, operational, and episodic. Based on five firm supply chain agility dimensions including alertness, accessibility, decisiveness, swiftness, and flexibility, Gligor and Holcomb (2012, 2013) defined a firm's supply chain agility as "a firm's ability to quickly adjust tactics and operations within its supply chain to respond or adapt to changes, opportunities, or threats in its environment" (p. 95). Costantino et al. (2012) defined supply chain agility as a network of different companies integrated with streamlined material, information, and financial flow, and focused on flexibility and performance. Using data from 121 supply chain management professionals, Blome et al. (2013) showed that supply chain agility mediates the relationship between supply- and demand-side competencies and operational performance building upon the dynamic capabilities perspective. Through regression analysis of a sample of 151 managers, Gligor and Holcomb (2012) suggested that behavioral/relational elements including coordination and communication are positively associated with supply chain agility, which in turn results in superior operational and relational performance. In an investigation of 144 US manufacturers, Chiang et al. (2012) found that strategic sourcing and a firm's strategic flexibility are key drivers of the firm's supply chain agility and there exists partial mediation of strategic flexibility on the link between strategic sourcing and the firm's supply chain agility. Supply chain agility consists of demand response, joint planning, customer responsiveness, and visibility (Braunscheidel and Suresh, 2009).

The second line of research into supply chain agility highlights the importance of information-driven relationships in offering awareness to changes (e.g., Dove, 2005; Holsapple and Jones, 2005; L et al., 2006). For example, information sharing has been found to enhance the firms' agility while improving the relational stability and performance in buyer and supplier relationships (Li et al., 2006). Agarwal et al. (2007) have presented an agile supply chain model, which consists of information-driven virtual integration, process integration and performance management, centralized and collaborative planning, and market sensitivity and responsiveness. Collaboration intelligence sharing through the use of IT promotes organizational decentralization and a flexible technology focus (Heim and Peng, 2010).

Prior studies assert that flexibility is a driver for agility (Chiang et al., 2012); flexibility is an internal and operational ability and agility is an external ability (Swafford et al., 2008); and agility represents both internal and external ability (Braunscheidel and Suresh, 2009). Taking the tenets from both streams, we define *a firm's supply chain agility* as an operational and relational capability in quick response to uncertain and turbulent markets. In such partnerships, both the buyer and supplier stress the relationship outcome through information sharing and joint relationships effort to achieve superior relationship outcomes (Nyaga et al., 2010). Thus, technical and relational factors facilitating continuous information sharing between the manufacturers and their suppliers are conducive to enhancing the agility of a firm's operations.

Prior studies have advanced our understanding of how information process capabilities enable the sharing of information in a seamless chain (e.g., Bala and Venkatesh, 2007). To date, however, the studies in this field mainly focused on Western cultures with a developed market and stable institutional environment. Yet, little is known about how the technical and relational factors are related to a manufacturer's supply chain agility in emerging economies such as China, where a large variety of products are produced and exported to other countries worldwide. Manufacturing has become the most important sector in China and is the major source of its growth. Manufacturers operating in transition economies characterized by a dearth of well-established institutional frameworks can reap the harvest in economic exchanges by acquiring strategic resources through effective information sharing and cooperation among manufacturers. While several researchers have examined the roles of IT and non-IT attributes in improving agility (i.e., Mondragon et al., 2004; Ayyappan and Jayadev, 2010) and the buyer–supplier relationship in the Chinese context (Millington et al., 2006; Pressey and Xin, 2007), these studies are either case-based (former) or focused on companies in general rather than manufacturing (latter), the most important sector as Chinese practices transition their economy from central planning to greater market competition. As a larger proportion of products distributed to advanced economies are produced in emerging economies (i.e., China), an investigation of the agility of operations of the manufacturers in China's transition economy is of significant importance to better understand the mechanisms of improving agility and manufacturers' performance.

Second, few studies have assessed the effect of manufacturers' supply chain agility on performance in a buyer–supplier relationship. Moreover, the connection between supply chain agility and performance could be contingent on the Chinese context. A growing number of Chinese executives feel under pressure from the institutionalization of China's legal infrastructure to adapt themselves to the "crooked" ways of guanxi practices (Guthrie, 1998). In comparing doing business in China and western countries, Luo and Chen (1996, p298) stated that,

> "*The Chinese build the relationship and, if they are successful, transactions and profits will follow, whereas Westerners believe that one should build transactions and, if they are successful, a relationship will follow. One should not feel strange when he heard that McDonald was evicted from a central Beijing building*