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Empirical Relationships of Perceived Environmental Uncertainty, Supply Chain Collaboration and Operational Performance: Analyses of Direct, Indirect and Total Effects*

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ABSTRACT

There are two aims of this study: one is to analyze the relationship among perceived environmental uncertainty, supply chain integration and operational performance and the other is to test direct, indirect and total effects among the variables. To achieve the aims of this study, various research methods were used. The population is Korean firms in China. Questionnaires were sent to the sample firms, and 208 data were used in the analysis. Validity and reliability of measuring items were verified by a confirmatory factor analysis, and the causal links among the variables were verified by a structural equation modeling analysis. The results are as follows. First, the relationship between perceived environmental uncertainty and supply chain integration is the causal link. Environmental uncertainty is an antecedent of supply chain integration and this is explained by information processing theory. Second, supply chain integration has a positive effect on operational performance. To improve performance, managers have need of interaction with suppliers and customers as well as inter-departments. Third, there is no direct effect between environment and performance but there are direct, indirect and total effects among the variables. The negative effect of perceived environmental uncertainty on performance (direct effect) is changed with positive effect (indirect and total effects). This is explained by fit as mediation by Venkatraman (1989).

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1. Introduction

Many firms have performed direct investment to China because the country is the world's factory. In addition, many Korean firms have also

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invested in China. The cause of foreign direct investment (FDI) to China is keen competition in the market and the competition is followed by firms' needs which would achieve cost advantage. This is the cause of investment to China which has cheap and quality labor. An increase of the firms which invest in China is caused by variance of the Chinese market and this is the background to the growth of the Chinese market. However, research which analyzes environment on the Chinese market is not active. From the viewpoint, research concerned with perceived environmental uncertainty of the Chinese market is required.

Firms which have performed FDI in China grasp customer needs, share the needs with other departments, and achieve the needs through sharing the information with suppliers to minimize the negative effect of perceived environmental uncertainty on performance. From this viewpoint, supply chain integration is an important strategy of firms which perform FDI in China and this is explained by information processing theory. Firms acquire information from external environment because of perceived environmental uncertainty. The external information is learnt by managers and applied to internal processes. Superior internal processes structured through absorption of the information are also the basis of integration with suppliers and customers and this is connected with high performance (Bae and Lee, 2015).

Research concerned with the relationship between environment, integration and performance has been performed by many researchers. For example, the moderating effect of environment on the relationship between integration and performance is verified by many researchers (Fynes et al., 2004; Kim and Chai, 2016; O'Leary-Kelly and Flores, 2002; Richey et al., 2009; Sundram et al., 2016; Wong et al., 2011). In addition, previous studies have investigated that perceived environmental uncertainty has a direct effect on supply chain integration (Paulraj and Chen, 2007; Ragatz et al., 2002). The relationship between the variables can be explained by information processing theory. Environment exists in exterior of firms and has an effect on firms. To overcome the negative effect of perceived environmental uncertainty on performance, managers acquire information from external environment, and the information is the basis of improving internal processes of firms. In addition, firms which structure the efficient internal processes make better integration possible with suppliers and customers. From this viewpoint, managers mediate the relationship between environment and firms. In this regard, managers' recognition of environment is the basis of firms' strategic behavior. Their recognition on supply chain integration is the basis of performance improvement. In addition, the mediating effect of supply chain integration on the relationship between perceived environmental uncertainty and performance can be explained by fit as mediation by Venkatraman (1989). However, there are the research papers which have not verified the relationship. For instance, environmental uncertainty has no moderating effect on the relationship between customer integration and service performance (Wong et al., 2011). Technological uncertainty has no effect on the relationship between supply chain relationship quality and supply chain performance (Fynes et al., 2004). Pagell and Krause (2004) did not prove the relationship between perceived environmental uncertainty, manufacturing flexibility and performance. Liao and Tu (2008) have verified that manufacturing system integration has no effect on manufacturing performance in high environmental uncertainty. Tarifa-Fernandez and De Burgos-Jimenez (2017) did not find the moderating effect of uncertainty between supply chain integration and performance. On the other hand, prior research has analyzed that environmental uncertainty has negative effect on a manufacturer's satisfaction with the perceived supplier performance (Ryu et al., 2008) and service

performance (Wood, 2008). This is connected with the limitations of the research as follows.

First, research concerned with the direct effect of perceived environmental uncertainty on supply chain integration is not active. In addition, prior research has verified the negative relationship between environment and performance (Ryu et al., 2008; Wood, 2008) but research to consider perceived environmental uncertainty as an antecedent of supply chain integration is insufficient. This means that research concerned with precedent variables to affect supply chain integration is needed.

Second, prior research has not verified a causal link between perceived environmental uncertainty and supply chain integration (Pagell and Krause, 2004). According to strategic choice theory, environment is existed in exterior of firms and it is an important factor to influence on firms. In this regard, firms choose proper strategy to fit the variance of environment, followed by high performance. Supply chain integration as a strategy of firms is affected by perceived environmental uncertainty and this is the basis of gaps in performance among firms. Therefore, this study needs to investigate the effect of perceived environmental uncertainty as an antecedent of supply chain integration.

Third, research which has analyzed the moderating effect of environmental uncertainty on the relationship between supply chain integration and performance is active (Fynes et al., 2004; O'Leary-Kelly and Flores, 2002; Richey et al., 2009; Wong et al., 2011) but research concerned with the mediating effect of supply chain integration on the relationship is not active. Sundram et al. (2016) found that supply chain integration mediates the relationship between supply chain management practices and supply chain performance. According to information processing theory, if managers recognize environmental uncertainty, they acquire information in the market to minimize the negative effect of environmental uncertainty on performance, and the information is the basis of improving internal processes. In addition, they achieve supply chain integration through sharing the information with suppliers and this is connected with high performance. Hence, the negative effect of environmental uncertainty on performance (Ryu et al., 2008; Wood, 2008) is changed as the positive effect by way of supply chain integration. Moreover, this study needs to verify the mediating effect of supply chain integration on the relationship between perceived environmental uncertainty and performance. The confirmation of the direct, indirect and total effects among perceived environmental uncertainty, supply chain integration and operational performance can make it possible better understanding to the relationship between the variables. Therefore, there are two objectives of this study. One is to prove the mediation effect of integration on the relationship between environment and performance and the other is to verify direct, indirect and total effects among the variables.

2. Literature Review

2.1. Perceived environmental uncertainty and supply chain integration

Environment is investigated as a moderator between integration and performance by prior research (Richey et al., 2009; Wong et al., 2011). However, the direct effect of environment on integration is not investigated in the research. From the viewpoint of contingency theory, environment is the factor which has a direct influence on strategy and performance (Lawence and Lorsch, 1967; Thompson, 1967). Moreover, supply chain integration is one of strategies which firms can choose.

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