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# A Comparative Analysis of South Korean and U.S. Firms: Ambidextrous Innovation, Supply Chain Resilience, and Market Performance

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## ABSTRACT

**This research explores the similarities and differences between Korean and U.S. firms developing both supply chain resilience and market performance through organizational culture and ambidextrous innovation. Firm-level data were collected from firms in South Korea and America. PLS-SEM software was used for the analysis with a multigroup analysis employed to test differences. Organizational culture is a key component for building supply chain resilience and market performance through ambidextrous innovation; however, exploration innovation was not used the same by Korean and U.S. firms. Korean firms were better able to exploit exploration innovation to establish both supply chain resilience and market performance. Cross-cultural comparative studies of supply chain management amid COVID-19 supply chain disruptions remain rare; thus, this study fills a key gap in the supply chain management and marketing literature in the U.S. and Korea. This paper further highlights ambidextrous innovation in the context of supply chain resilience and market performance.**

**Keywords:** *market performance, supply chain resilience, ambidextrous innovations, South Korea, United States*

## 1. INTRODUCTION

Recent international health concerns related to COVID-19 and the current geopolitical environment have presented a host of unforeseen challenges for the global business community. While innovative opportunities have become available to organizations in certain industries (e.g., pharmaceuticals, e-learning, e-services, etc.), most firms worldwide have suffered from logistical and supply chain issues contributing to delays in operations (Butt, 2021). These deficits have exposed firms to greater risks in their supply chains, as disruptions become common occurrences that have adversely influenced the success and longevity of organizations. Likewise, the resilience of supply chain ecosystems accompanying firms has waned (Clauss *et al*., 2021). Due to this criticality, literature focused on disruptive events (both natural and man-made) and supply chain resilience has gained considerable attention (Craighead *et al*., 2020). Scala and Lindsay (2021) found that an event with the impact and magnitude of the COVID-19 pandemic has required enterprises to transform their existing resources and capabilities to survive persistently amid continued disruption.

With reference to incidents such as the recent pandemic, new research in event systems theory (Morgeson *et al*., 2015) suggests that invasive events denude the vulnerability of supply chains amid durations characterized by complexity and volatility (Gomes *et al*., 2020). Consequently, organizations are persuaded to mitigate these disruptions through several avenues including the sensing or identification of technologies that could assist in developing plans to limit disruptions (Choi, 2020). Additionally, it may even be necessary to realign the organizational culture or structure (Scala and Lindsay, 2021) to invest in capabilities that are greatly suited to managing disruptions more effectively than traditional firm competencies (Wong *et al*., 2020). Relatedly, Hsu and Wang (2012) noted that in order to truly provide innovative responses to dynamism in a market, firms must renew and exploit their existing competencies, while also exploring processes to sustain the organization through the dynamic phase (Herzallah *et al*., 2017).

To contribute to supply chain literature, and address the issues conferred before, the current research builds a conceptual framework based on the dynamic capability theory (Teece *et al*., 1997; 2007; 2012). According to Katkalo *et al*. (2010), dynamic capabilities enable a firm to either create or capture market value through the modification of conventional capabilities to match the necessities of the environment (Teece, 2018). This procedure of creating value is particularly fortuitous when unexpected changes are experienced in a commercial setting. Thus, under the assumptions of dynamic capability theory, the creation of higher-order capabilities reveals an

organization's capacity to create and maintain its fit within the market ecosystem as deviations occur (Winter, 2003; Teece, 2012). The usefulness of a dynamic capability perspective is repeatedly on display in stages of the business environment that require an organization to manage environmental fluctuations. In these situations, performance is related to a firm's ability to adapt to change (Teece, 2012); using its organizational abilities to sustain its position in the market as managers formulate responses to dynamism (Teece, 2007). Consequently, this study extends the dynamic capability framework to include market performance as a dependent variable to measure the proposed model.

This investigation strives to advance supply chain literature in three ways. First, this research progresses the literature through the introduction of dynamic capability theory to galvanize a framework that enhances the longevity of supply chain resilience and market performance. Second, the paper explores avenues for discrepancies in the framework through the introduction of cross-cultural differences in supply chain literature. While most supply chain studies examine a single measurement sample, the current research aims to include a comparison. Comparative research is valuable as it identifies differences in the execution of theory and the practice of business across borders; indeed, much can be learned from such studies. Consequently, two markets were assessed; namely, the United States and South Korea. Third, this study scrutinizes ambidexterity from two perspectives. The impact of ambidexterity on a firm's competitive advantage remains largely unexplored (Clauss *et al.*, 2021). Further, while some literature is found to support the impact of ambidextrous innovation on firm performance, contemporary research suggests that the construct should be dissected to measure the individual impacts of these capabilities on market success (Herzallah *et al*., 2017). Hence, the current research views the construct from both an exploitation and exploration perspective. The efficient exploitation and exploration of innovation provide an opportunity for both short-term success and long-term survival (Jurksiene and Pundziene, 2016). This study uniquely proposes that both are essential for a well-rounded response to dynamism afflicting companies today.

The paper will proceed accordingly. Following this section, the theoretical underpinnings, literature review, and hypotheses development are detailed. Next, the research methods, data collection, and additional study analysis are measured. Subsequent to the data analysis section, a discussion of the results is presented. Finally, contributions, limitations, and future studies regarding this research are noted.

# 2. LITERATURE REVIEW

## *2.1 Theoretical Underpinnings*

To build the conceptual model for this research, the dynamic capability view is employed. The dynamic capability view is regarded as an extension of the resource-based view (RBV) which proceeds to assume that the attainment of firm sustainable competitive advantages is a by-product of an organization's orientation of its resources and capabilities (Hitt *et al*., 2016). While the RBV remains an imperative antecedent for firm success, several authors have noted that the existing commercial environment has become too turbulent, and consequently requires an assessment of additional theories to support the RBV. Therefore, dynamic capabilities offer an opportunity to comprehend and manage rapid changes in the contemporary business environment (Teece, 2018).

Initially introduced as an attitude toward sustaining a competitive advantage in an organization (Teece and Pisano, 1994) during periods of change, the dynamic capability approach focuses on a firm's renewal of its organizational capabilities (Teece *et al*., 1997). According to the dynamic capability theory, organizations authorize internal procedures that enable the company to access its provisional capabilities when fluctuations occur in the commercial system (Teece, 2018). Teece *et al*. (2007) defined dynamic capabilities as a firm's capacity to manage variations in the environment through the reconfiguration, building, and integration of internal organizational capabilities (Teece, 2018). Dynamic capabilities, therefore, offer organizations an opportunity to adapt to environmental challenges through their ability to continuously modify organizational resources to fit the needs of the company.

Teece (2007) argues that dynamic capabilities are best understood when segregated into three interconnected capabilities, which comprise sensing, seizing, and the transformation (or reconfiguration) of firm activities when dealing with changes in the market. According to Teece *et al*. (2007), the aspect of sensing involves the process of exploring, searching for, and scanning market information. This course of action requires organizations to learn about customers, competitors, and the overall market throughout the external environment (Hitt *et al*., 2016). To contribute to the development of the conceptual framework for the current research (see **Figure 1**), supply chain disruption orientation is regarded as a firm sensing capability. An orientation toward understanding disruption grants an organization an opportunity to obtain market information with which to formulate the best course of action to limit the effect of the disruption (Liao and Widowati 2021; Sahi *et al*., 2020).

While the technique of sensing involves the acquisition of new intelligence, seizing requires an organization to appraise prevailing and emerging capabilities to create above-average returns for the organization (Gölgeci and Kuivalainen, 2020). Seizing is advanced when firms make greater investments in tangible and intangible resources (Teece, 2018). Both sensing and seizing are thought of as strategic processes which assist in the development of further strategies (Teece, 2018). The current research offers the introduction of ambidextrous innovations to demonstrate a seizing capability in an organization. It has been recognized that innovation is a consequence of dynamic capabilities (Teece, 2018). Organizations are capable of ascertaining market information and realizing the needs of the market participants through the utilization of dynamic capabilities. An important feature of the dynamic capability view is that it is regarded as a strategic process based on the exploitation of innovations emanating from the attainment of current market knowledge. Thus, the theory contends that knowledge remains an essential resource that organizations can mobilize when building sustainable competitive advantages. Exploration and exploitation innovation could help a firm to advance its operations and adapt to disruptive events and uncertain circumstances more rapidly by

integrating the related resources, leading to competitive advantage (Duncan, 1976; Wang *et al*., 2021). The continuous exploration and exploitation of operational activities are reinforced by the strategic process designed around the dynamic capability's framework. Consequently, the dynamic capability theory advances a context for conjecturing the intermediating role of ambidexterity in the exchange between supply chain dynamism orientation, supply chain resilience, and market performance.

Finally, when organizations commit to the reconfiguration of their operations, they increase the probability of aligning themselves closely with the environment (Hitt *et al*., 2016). This could be achieved through an orientation focused on mobilizing processes to change the base of resources in the organization. This approach can contribute to the competitive advantage of the firm (Wilden *et al*., 2016). According to the resource-based theory (Katkalo *et al*., 2010; Teece, 2012), organizations are comprised of bundles of resources and capabilities that they utilize to create value. Under the approach of dynamic capabilities, organizations recombine these resources and capabilities according to changes in the market. This reconfiguration approach encompasses the final step of dynamic capabilities and attempts to enhance the abilities of the organization both internally and externally by integrating resources in a novel way (Teece, 2012; 2018). This process of augmenting the abilities of the firm is related to resilience (Gölgeci and Kuivalainen, 2020). Subsequently, supply chain resilience builds the eventual capability of the research model displayed in **Figure 1**. Teece (2018) suggested that sensing, seizing, and transforming are specific characteristics that firms possess that support them to progress along with changes in the business environment. Accordingly, the inclusion of dynamic capabilities to the research model is recognized as a relevant approach to further contributing to supply chain literature.

## *2.2 Supply Chain Disruption Orientation*

Recent unexpected occurrences such as the COVID-19 pandemic have interrupted global supply chains. Moreover, these disruptions have been inexplicably severe due to their consequential ripple effect experienced in supply chains, and the impacts of these troubling episodes on the durability of global infrastructures (Choi, 2020). Supply chain disruptions are described as unforeseen events that upset the traditional processes or activities of an organization (Ivanov, 2020). Within the scenario of a supply chain, pauses are characterized by an interruption in the flow of goods or materials in the supply chain process that exposes organizations to financial or operational risks (Swafford *et al*., 2006). The climate of the recent business environment has been once characterized by an increased frequency in disturbances that have created major issues throughout the supply chains of companies (Munir *et al*., 2020). Within the present global market, turbulence related to particular outlier events (e.g., COVID-19) requires a greater organizational, process, and functional analysis to ensure the longevity of the organization (Gölgeci and Kuivalainen, 2020). Therefore, the systems and operations required for mitigating supply chain disruptions have become important for both practitioners and academics (Azadegan *et al*., 2020; Pettit *et al*., 2019).

An approach toward disruption orientation under the impact of COVID-19 had been evidenced by several authors. Sharma *et al*. (2020) for instance concluded that the coordination and exploration of inventory practices during the pandemic allowed firms to mitigate the negative impacts of COVID-19. The authors make mention of exploration innovation and suggested that companies could, for example, reduce inventory levels during disruptive periods as a way of utilizing agile production when supply networks are inefficient. While the approach of reducing inventory levels to moderate interruptions sounds counterproductive, Ivanov (2020) contended that firms could galvanize relations with the secondary supplier as a way of meeting inventory shortages. This approach would allow firms an opportunity to disseminate their operational requirements and build a reliance on additional actors in their industry (Sharma *et al*., 2020). The exploration of strategic processes such as inventory management, inbound material visibility, or the re-routing of production capacity to other locations has been shown to manage disruptions over the long term (Choi, 2020; Clauss *et al*., 2021). While these tactics are noted as 'risky' in the literature (Azadegan *et al*., 2020), as they are affiliated with a longer timeframe for success – the exploration of organizational strategies could benefit from a firm's attitude of concerning itself with being orientated to supply chain disruptions. Consequently, this research confirms the first hypothesis:

***Hypothesis 1:*** *Supply chain disruption orientation positively improves exploration innovation.*

When an organization orientates its operations toward managing supply chain disruptions, the firm can effectively reduce the negative impacts of those disruptions. For example, Swafford *et al*. (2006) determined that a response to unexpected events such as a disruption could benefit an organization's competitiveness. The assumption exists that aligning an organization with changes or disruptions in the market encourages an organization to exploit its existing operations to remain competitive. Importantly, under situations of supply chain disruptions, exploitation emphasizes the creation of attentive knowledge, rather than establishing a comprehensive set of knowledge in varied areas of business (Sharma *et al*., 2020).

As an organization becomes exposed to disruptions and progresses toward exploitation innovations, it's meant to advance the development of its operational proficiencies (Munir *et al.*, 2020). In this regard, organizations become competent at responding to environmental changes through the reconstruction of scarce resources and the development of novel procedures necessary for functioning. Within the supply chain, the processes related to dynamic capabilities are often interrelated. For example, an organization may introduce or seize new opportunities by combining its existing capabilities and resources to manage changes in the environment. However, this option is made possible through the sensing capacity of an organization to accumulate novel information by assessing both threats and opportunities as changes in the environment evolve. Thus, the next hypothesis is:

***Hypothesis 2:*** *Supply chain disruption orientation positively improves exploitation innovation.*

## *2.3 Explorration Innovation*

Gölgeci and Kuivalainen (2020) contend that dynamic capabilities can be ubiquitous in certain scenarios where organizational routines are coerced into changing. This could transpire from the development of new product lines, new market exploration, or the analysis of disruptive technologies (Choi, 2020). These features become particularly appealing to organizations when the commercial environment is inconsistent or uncertain, as firms are required to innovate their operations as a means of survival. The appeal of exploration innovations lies in its focus on discovering new knowledge and therefore is rather flexible as an approach.

Another noteworthy appeal of exploration innovations is that it allows organizations an opportunity to create knowledge through the acquisition of market information (Jurksiene and Pundziene, 2016). However, while access to large amounts of information in a particular industry or market is advantageous (Munir *et al*., 2020), the process of exploration is noted as being at times tedious and time-consuming. For example, Parida *et al*. (2016) advised that exploration innovation may be characterized by longer time horizons and therefore could be related to greater levels of uncertainty. Despite the possible drawbacks to exploration activity, it is still primarily a strategy that reinforces organizational skills involved with market research, new information analysis, the diffusion of innovation, etc. (Jurksiene and Pundziene, 2016).

According to the resource-based theory, organizations are expected to advance resources that hold a particular mold of being valuable, rare, non-substitutable, and costly to imitate. Because of these constraints placed on what constitutes a resource of value, firms are reassured to grow intangible resources. These types of resources are normally elusive but contribute greatly to an organization's strategic competitiveness. An immensely respected resource that contributes to the pattern of being intangible is organizational learning. Teece (2012) suggested that organizational learning is one of the most central components of dynamic capabilities. When a business environment is dynamic, organizational learning is required to manage the novelty of subsequent situations. During a period of learning, several researchers have recommended that innovation exploration and exploitation remained beneficial to business enterprises (Gomes *et al*., 2020; Sahi *et al*., 2020). Consequently, a dynamic capability focused on organizational learning acts as an instrument that an organization can deploy to update and refine its organizational knowledge (Teece, 2018). According to the process of learning, an organization is able to obtain above-average returns on their operations when they exploit the sustainable properties of exploratory innovation which could enhance the exploitation of business practices required for the continuity of the supply chain (Wenke *et al*., 2021). Therefore, this study hypothesizes the following:

***Hypothesis 3:*** *Exploration innovation positively improves exploitation innovation.*

Conferring to the theory of organizational learning (Jurksiene and Pundziene, 2016), successful firm performance is reliant on the organization's ability to learn from and familiarize itself with the environment through exploring and building dynamic capabilities (Gölgeci and Kuivalainen, 2020). This learning process provides the organization with an opportunity to respond more efficiently to novel market conditions and build the resilience of its operations (Hsu and Wang, 2012). Clauss *et al*. (2021) noted that organizational strategies concerned with exploration practices allow for the diagnosis of new market opportunities. Exploration innovation implies radical solutions based on new procedures and pursuing to satisfy existing consumers' needs (Patel *et al*., 2012; Wang *et al*., 2021). Exploration strategies also give firm access to potential information about consumer desires, allowing enterprises to identify customer needs and cultivate a demand for their products and services (Herzallah *et al*., 2017). These strategies give the organization an opportunity to strengthen its knowledge base and expand its resilience to manage changes in the market. Accordingly, the resulting hypothesis is:

***Hypothesis 4:*** *Exploration innovation positively improves supply chain resilience.*

Literature concerned with exploratory innovation seems to suggest that the construct is counter-productive to the needs of organizations, as the timeframe for measuring success is unknown. Therefore, research implies that exploratory techniques are challenging to leverage, as firms try to justify the payoffs (Mathias *et al*., 2018). However, it remains important to consider the characteristics of the organizational structure attached to exploration innovations. Wenke *et al*. (2021) stated that exploration activities accompany a decentralized chain of command in the organization. Additionally, as autonomous behavior increases, organizations evolve as less formalized and standardized, allowing decisions to be made more promptly (Clauss *et al*., 2021). In these types of situations, autonomous individuals may self-manage disruptive occurrences more efficiently and create solutions to issues more promptly (Pettit *et al*., 2019). Furthermore, Fainshmidt *et al*. (2016) argued that dynamic capabilities inspire organizations to accumulate knowledge about dynamism in commercial environments in a cost-effective and explorative manner. This procedure assists enterprises to correspond more closely with the situational anomalies.

While the nature of exploration is interrelated with higher levels of risk and uncertainty, the success of organizations ultimately relies on firm practices that aim to differentiate organizations from one another. Therefore, the following hypothesis is proposed:

***Hypothesis 5:*** *Exploration innovation positively improves market performance.*

## *2.4 Exploitation Innovation*

Exploitation innovations are focused on the realization of short-term targets, which requires the commitment of participants throughout the organization (Mathias *et al*., 2018). To reduce the uncertainty during the development of exploitation, various tasks, and the process of decision-making is generally linear, standardized, and centrally planned when making refinement considerations regarding the market (Wenke *et al*., 2021). Exploitation innovations

involve organizational efficiency through the holistic improvement of the company (Clauss *et al*., 2021).

Resource scarcity is often cited as a factor prevalent in the vast majority of organizations. Because of this dilemma, firms are encouraged to maximize the potential properties of their existing operations. One such approach to managing efficiency in an enterprise is through the improvement of existing products and services. The alteration of technologies or adjustment of production processes is referred to as exploitation (Clauss *et al*., 2021). The appeal of exploitation is significant as organizations maintain existing practices while transforming their prevailing processes to meet the needs of the market (Herzallah *et al*., 2017). This is particularly useful when the commercial environment is dynamic. Organizations can respond to market needs through the incremental adjustment of their technologies, products, or organizational processes (Clauss *et al*., 2021). In a scenario such as the recent COVID-19 pandemic, the business environment was quite unpredictable. In situations such as these, organizations are required to adapt to market changes. Herzallah *et al*. (2017) mention that the exploitative pursuit of innovations prepares firms to become especially sensitive to variations in the environment, making them strategically flexible, and superior at mitigating market anomalies (Wong *et al*., 2020).

To remain competitive and improve resilience, organizations deploy their prevailing products or services, using existing knowledge of the market to increase productivity (Parida *et al*., 2016) while simultaneously developing reengineered intelligence to reduce the risk of the organizations' competitiveness deteriorating during disruptions (Clauss *et al*., 2021). With regard to these conventions, the current research considers the following:

***Hypothesis 6:*** *Exploration innovation positively improves supply chain resilience.*

Exploitation innovations present unique opportunities for organizations to reinforce and refine their existing market position during periods of disruption (Chang *et al*., 2011). This is partly possible due to the rather remedial procedure of requiring the organization to adjust their processes or technologies during disruptive episodes (Gölgeci and Kuivalainen, 2020). Exploitation innovation preserves benefits for the performance of organizations in a few important areas of business. The incremental pursuit of improving the organization's operations following a disruption could contribute to increases in firm productivity (Wenke *et al*., 2021). This is possible as the organization is less constrained during the process of exploitation as the firm is essentially only remodeling its available product range. Consequently, the opportunity to profit from exploitation innovations is found to be substantial (Gölgeci and Kuivalainen, 2020). This technique presents an organization with a contingency where they preserve competitiveness by proposing existing products or services to consumers or incrementally updating their offerings to the market based on changes experienced during disruptions (Clauss *et al*., 2021). Regarding the above expectations, the next hypothesis is presented as:

***Hypothesis 7:*** *Exploration innovation positively improves marketing performance.*

## *2.5 Supply Chain Resilience*

From an aggregated viewpoint, resilience represents the attentiveness of a supply chain to confront, and recuperate from unexpected disruptions (Pettit *et al*., 2019). Past research has noted the challenges of measuring constructs such as resilience and firm or market performance (Wong *et al*., 2020). Building resilience requires funding and therefore necessitates an investment in a supply chain that is demanding to quantify over a longer period of time (Pettit *et al*., 2019). Likewise, the assessment of resilience remains a challenge as disruptions are heterogeneous in nature.

Examples of practices that could benefit supply chain resilience may include an organization's ability to invest in the modification of its inventory policies (Ivanov, 2020). Here an organization could inflate its inventory positions (Butt, 2021) or identify tier 1 or tier 2 suppliers to fulfill inventory needs (Sharma *et al*., 2020). In these examples, a dynamic capabilities approach is categorized by the organization's ability to build capacity through a renewed competency in inventory management and relational capital; structuring resilience through a congruence with the fluctuating commercial environment (Teece, 2018). Additionally, a suitable degree of supply chain resilience empowers the dynamic capabilities to enhance business performance under environmental uncertainty and innovate supply chain functions and structures (Laguir *et al*., 2022; Sharma and Singla, 2021). Thus, the subsequent hypothesis is:

***Hypothesis 8:*** *Supply chain resilience positively improves marketing performance.*

## *2.6 Comparative Analysis*

Throughout much of the latter half of the twentieth century South Korean firms were rushing to catch up with Western (American and European firms) that had relatively more advanced processes, technology, and products (Lee and Lim, 2001). South Korean firms developed unique capabilities described by Rhee and Stephens (2020) as innovation-orientated technology assimilation, the ability to rapidly implement changes regarding both process innovation and/or product innovation in order to compete with Western counterparts. Based on that competitive agility gained, it can be surmised that South Korean firms possess an enhanced ability to adopt market-relevant innovations than U.S. firms; therefore, we expect that South Korean firms will outperform their U.S. counterparts; moreover, that will be evident in the research model.

***Hypothesis 9:*** *South Korean firms will exhibit stronger evidence of market-relevant innovation than the United State firms.*

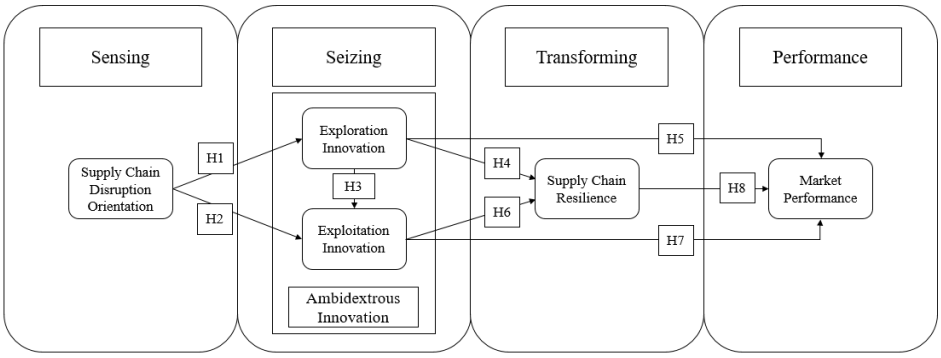


**Figure 1** Theoretical framework

# 3. METHODOLOGY

## *3.1 Sample*

The sample for this research consists of a combination of two separate company-level surveys, one administered in the U.S. and another in South Korea. Managers were asked to represent their companies as is customary in firm-level research. The surveys were collected in April of 2021 amid significant supply chain disruptions; thus, assessing the sentiment of companies that have experienced and likely continued to experience disruptions. The total sample includes 427 companies: 200 South Korean and 227 American firms respectively. When conducting a comparative analysis of two samples it is customary to pool them together to describe the sample as is presented in **Table 1**, which displays the demographics of the sample. Demographics were collected regarding the size, age, and industrial sectors of companies.

Size is a significant matter regarding organizational research as it indicates available resources. Considering the number of employees, most of the companies could be considered small or medium-sized firms (SMEs): 220 of the 427 firms (51% of respondents). Companies with fewer than 20 employees are frequently regarded as micro-organizations, those made up of 132 firms (31% of respondents). Large institutions, firms with 500 or more employees, included 75 firms or 18% of respondents. While the number of employees can represent human capital, revenue can suggest available capital resources; therefore, companies were also surveyed by annual revenue. Compared with a number of employees, the 427 companies were more evenly spread across revenue scales: indicating a generalized set of companies.

The number of years of experience can indicate both experience and competency of a firm; thus, this data is normally collected. Most firms were in operation for more than 10 years: 126 (30%) for 11 to 25 years and 112 (26%) for 26 plus years of experience. Some of the firms were new with 5 years of experience or less making up 18% (77 firms) of respondents. An additional 26% (112 firms) of responding firms had experienced between 6 and 10 years.

Industry demographic information was also collected; albeit, remained less informative as 69% (295 firms) remained in the others category; thus, unspecified. At first, this might seem problematic. However, it should be noted that all organizations, manufacturers, service providers or otherwise rely on supply chains for normal operations and market performance.

**Table 1** Demographics of the sample

| **Number of Employees** | | | | | | |
|---|---|---|---|---|---|---|
| Interval | Less than 20 | 21 - 149 | 150 - 249 | 250 - 499 | 500 + | Total |
| Count (%) | 132 (31%) | 112 (26%) | 73 (17%) | 35 (8%) | 75 (18%) | 427 (100%) |
| **Number of Years in Operation** | | | | | | |
| Interval | 1 to 5 years | 6 to 10 | 11 to 25 | 26 + | | Total |
| Count (%) | 77 (18%) | 112 (26%) | 126 (30%) | 112 (26%) | | 427 (100%) |
| **Annual Sales** | | | | | | |
| Interval | $5mil. or less | $5-$10 mil. | $10-$20 mil. | $20-50 mil. | 50 mil. + | Total |
| Count (%) | 149 (35%) | 53 (12%) | 63 (15%) | 70 (16%) | 92 (22%) | 427 (100%) |
| **Industry** | | | | | | |
| Industry Type | Machinery, automobiles | Building materials | Chemical and petrochemical | Electronics and electrical | Others | Total |
| Count (%) | 28 (7%) | 36 (8%) | 24 (6%) | 44 (10%) | 295 (69%) | 427 (100%) |

## *3.2 Research Instrument*

The research instrument is a psychosomatic questionnaire with survey questions representing the research variables. The questions for both surveys are based on extant literature; the questions were modified to fit with the topic of the research; furthermore, the Korean survey was translated to Korean and back-translated to confirm quality. The American survey was administered in English while the Korean survey was administered in Korean. Each variable is made up of a series of questions; the origins of each variable

and the items are explicated in the following paragraphs. Finally, **Table 2** summarizes the origin of each variable and exhibits the corresponding survey questions in English.

Supply chain disruption orientation is both a measure of a firm's readiness for disruption and its ability to recover from disruptions (Bode *et al*., 2011). Most firms recognize that supply chain disruptions could occur; however, every firm's level of preparedness differs. If a firm has experienced recent reoccurring disruptions, it is also understood that they will develop a degree of preparedness to match the higher degree of tumult (Robb *et al*., 2022). Lately, COVID-19 supply chain disruptions have likely caused any company with a supply chain to develop some degree of supply chain disruption orientation. According to Bode *et al*. (2011), the survey items should measure multiple points, before, during, and after a disruption. Understanding a firm's pre-disruption attitude is necessary. Two points are measured, first, that a company is alert; second, a company is scanning for interruptions in the supply chain; both indicate a level of supply chain disruption orientation. Amid disruption, a firm should express its degree of competency to respond to disruption. Finally, a firm that exhibits supply chain disruption orientation also learns from disruptions to improve itself afterwards. All three points were acknowledged in this research instrument as suggested by Bode *et al*. (2011). Several studies have adopted this variable as previously described (Robb *et al*., 2022; Yu *et al*., 2019); thus, it is an appropriate measure of supply chain disruption orientation.

Innovation has been dichotomized into two distinct categories: exploratory innovation and exploitation innovation. Utilizing psychosomatic variables to measure the two requires careful consideration of the pertinent points of each type of innovation. Exploratory innovation emphasizes the adoption of applications that are new and from outside the organization; thus, seeking out new markets, new products, and new technology (He and Wong, 2004). Exploitation innovation finds solutions within the organization; moreover, resolving problems through established and trusted means (Chang *et al*., 2011). When both types of innovation are combined, they represent ambidextrous innovation.

Supply chain resilience is a measure of a firm's ability to maintain operations and recover from supply chain disruptions (Gölgeci and Ponomarov 2013). To measure this ability researchers first question a firm's ability to quickly recover from a disruption. Additionally, connectedness and control are scaled. Finally, the firm's ability to recover is measured. Lately, several publications have employed the variable detailed by Golgeci and Ponomarov (2013) (Robb *et al*., 2022; Yu *et al*., 2019).

**Table 2** Operationalisation of the research instrument

| Variable | Operational Definition | Measurement items | Prior Research |
|---|---|---|---|
| Supply Chain Disruption Orientation | The degree to which an organisation learns from and prepares for SC disruptions. | 〔DO1〕At my company, we are alert for possible supply chain disruptions at all times. | Bode *et al.* (2011) |
| | | 〔DO2〕At my company, we expect supply chain disruptions are always looming. | |
| | | 〔DO3〕At my company, we think about how supply chain disruptions could have been avoided. | |
| | | 〔DO4〕At my company, after a supply chain disruption has occurred, it is analysed thoroughly. | |
| Exploratory Innovation | The degree to which an organisation is seeking out new and untested solutions for innovation. | 〔EOR1〕My firm focuses on introducing new products. | He and Wong (2004) |
| | | 〔EOR2〕My firm focuses on extending product ranges. | |
| | | 〔EOR3〕My firm focuses on opening up new markets. | |
| | | 〔EOI4〕My firm focuses on entering new technology fields. | |
| Exploitation Innovation | The degree to which an organisation is utilising tried and tested solutions for innovation. | 〔EOI1〕My firm focuses on improving the provision efficiency of products. | Chang *et al.* (2011) |
| | | 〔EOI2〕. My firm focuses on increasing economies of scale in existing markets. | |
| | | 〔EOI3〕My firm focuses on expanding services for existing customers. | |
| | | 〔EOI4〕My firm focuses on entering new technology fields. | |

**Table 2** Operationalisation of the research instrument (cont')

| Variable | Operational Definition | Measurement Items | Prior Research |
|---|---|---|---|
| Marketing Performance | The degree to which this firm is able to perform well within the market. | 〔MP1〕Comparing with our major competitor(s), our firm has higher/better customer loyalty. | Carey *et al*. (2011) |
| | | 〔MP2〕Comparing with our major competitor(s), our firm has higher/better customer satisfaction. | |
| | | 〔MP3〕Comparing with our major competitor(s), our firm has higher/better company image. | |
| | | 〔MP4〕Comparing with our major competitor(s), our firm has higher/better growth in market penetration. | |
| | | 〔MP5〕Comparing with our major competitor(s), our firm has higher/better growth in industry competitiveness. | |
| Supply Chain Resilience | The degree to which a firm maintains its supply chain operations even amid disruptions. | 〔SR1〕Our firm's supply chain can quickly return to its original state after being disrupted. | Golgeci and Ponomarov (2013) |

# 4. ANALYSIS

## *4.1 PLS-SEM*

According to Ringle *et al*. (2012), it is always critical to reflect upon the sample size before choosing the analysis method when conducting empirical analysis. Traditional covariance-based structural equation modeling analysis would require 300 samples to affirm the results for each regional sample set. However, Barclay *et al*. (1995) suggest that when adopting PLS-SEM it is reasonable to apply the larger of either the greatest number of pathways going to a variable or the largest number of items representing a variable. Based on that stipulation, 50 samples would be enough for one empirical model. Therefore, PLS-SEM analysis is an appropriate methodology given the two sample sizes; it is capable of providing both the outer model assessment and inner model assessment results as well as multigroup analysis results (Hair *et al*., 2018).

## *4.2 Outer Model Assessment*

According to Hair *et al*. (2018), it is important to first substantiate the reliability and validity of the outer empirical model; in other words, verify that the survey questions fit with and represent the psychosomatic variables that they are meant to represent. Two measures of reliability are normally employed to endorse internal consistency reliability: composite reliability and Cronbach's alpha (Hair *et al*., 2018). Values above the recommended cut-off numbers can support reliability. Nunnally and Bernstein (1994) suggest 0.6 for Cronbach's alpha and 0.5 for composite reliability. When conducting a multigroup analysis with PLS-SEM it is appropriate to examine the two data sets separately; moreover, to corroborate the data sets fit the outer models they are meant to represent (Hair *et al*., 2018). Both reliability and validity can be reviewed in **Table 3**.

**Table 3** Outer model assessment

| Factors | Standard load | | AVE (AVE > 0.5) | | Construct Reliability (C.R > 0.7) | | Cronbach's Alpha (α > 0.6) | |
|---|---|---|---|---|---|---|---|---|
| | American | Korean | American | Korean | American | Korean | American | Korean |
| SCDO1 | 0.809 | 0.793 | 0.661 | 0.671 | 0.886 | 0.890 | 0.828 | 0.838 |
| SCDO2 | 0.766 | 0.782 | | | | | | |
| SCDO3 | 0.875 | 0.854 | | | | | | |
| SCDO4 | 0.798 | 0.844 | | | | | | |
| EOR1 | 0.809 | 0.881 | 0.693 | 0.773 | 0.900 | 0.932 | 0.852 | 0.902 |
| EOR2 | 0.838 | 0.892 | | | | | | |
| EOR3 | 0.866 | 0.881 | | | | | | |
| EOR4 | 0.816 | 0.862 | | | | | | |
| EOI1 | 0.840 | 0.867 | 0.666 | 0.777 | 0.856 | 0.913 | 0.747 | 0.856 |
| EOI2 | 0.847 | 0.872 | | | | | | |
| EOI3 | 0.759 | 0.859 | | | | | | |
| RC1 | 0.742 | 0.861 | 0.577 | 0.733 | 0.872 | 0.932 | 0.828 | 0.909 |
| RC2 | 0.757 | 0.862 | | | | | | |
| RC3 | 0.752 | 0.857 | | | | | | |
| RC4 | 0.727 | 0.859 | | | | | | |
| RC5 | 0.817 | 0.841 | | | | | | |

**Table 3** Outer model assessment (cont')

| Factors | Standard Load | | AVE AVE (AVE > 0.5) | | Construct Reliability (C.R > 0.7) | | Cronbach's Alpha (α > 0.6) | |
|---|---|---|---|---|---|---|---|---|
| | American | Korean | American | Korean | American | Korean | American | Korean |
| SCR1 | 0.764 | 0.761 | 0.640 | 0.673 | 0.877 | 0.925 | 0.812 | 0.902 |
| SCR2 | 0.830 | 0.827 | | | | | | |
| SCR3 | 0.817 | 0.852 | | | | | | |
| SCR4 | 0.787 | 0.804 | | | | | | |

Outer model assessment should also include the creation of both convergent validity and discriminant validity (Hair *et al*., 2018). Regarding convergent validity, the average variance extracted is normally utilized; furthermore, values above 0.5 confirm convergent validity (Hair *et al*., 2018). Discriminant validity can be confirmed in two manners: the Fornell and Larcker Criterion Test and an examination of factor loadings (Hair *et al*., 2018). Factor loadings can be examined to authenticate discriminant validity; loadings above 0.7 can be used to affirm that items belong together (Hair *et al*., 2018). Loadings can be reviewed in **Table 3**. According to Fornell and Larcker (1981) in order to explain discriminant validity, the square root of AVE values should be larger than all correlation numbers; in this regard, discriminant validity is explicated for both data sets; furthermore, the results can be reviewed in **Table 4** and **Table 5**. Both the reliability and validity of the two data sets are established.

**Table 4** Fonell-Lacker criterion (American firms)

| | EOI | EOR | MP | SCDO | SCR |
|---|---|---|---|---|---|
| EOI | **0.816** | | | | |
| EOR | 0.780 | **0.833** | | | |
| MP | 0.563 | 0.515 | **0.760** | | |
| SCDO | 0.619 | 0.584 | 0.455 | **0.813** | |
| SCR | 0.520 | 0.459 | 0.624 | 0.567 | **0.800** |

**Table 5** Frnell-Lacker criterion (Korean firms)

| | EOI | EOR | MP | SCDO | SCR |
|---|---|---|---|---|---|
| EOI | **0.881** | | | | |
| EOR | 0.831 | **0.879** | | | |
| MP | 0.730 | 0.703 | **0.856** | | |
| SCDO | 0.729 | 0.702 | 0.704 | **0.819** | |
| SCR | 0.756 | 0.750 | 0.818 | 0.765 | **0.820** |

## *4.3 Inner Model Assessment*

The outer model assessment measures the fit of the items to the variables; however, the inner model assessment measures the inter-relationships between the variables (Hair *et al*., 2018); moreover, regarding pathway coefficients, three different inner models are tested: the combined data model, the American data model and the Korean data model. Each model is assessed with PLS-SEM by examining pathway coefficients, t-stats, and P-values. Pathway coefficients suggest the degree of impact from the proceeding variables upon each impacted variable; moreover, the results can be reviewed through hypothesis testing. P-values confirmed significance but must be incorporated through bootstrapping. In this case, bootstrapping to 2000 samples was done for each model.

Regarding the combined data model, seven hypothesized pathways were found to be significant, yet one was rejected, exploration innovation was not determined to positively and significantly impact market performance as suggested. Supply chain disruption orientation positively impacted exploration innovation (0.634***) and exploitation innovation (0.269***), respectively. Exploration innovation positively influenced exploitation innovation (0.638***), and supply chain resilience (0.253***). Additionally, exploitation innovation positively affected supply chain resilience (0.448***) and market performance (0.193***). Finally, supply chain resilience positively affected market performance (0.545***).

Pathway analysis regarding the American model returned somewhat different results. Two pathways were noticed to be insignificant; exploration innovation did not significantly impact supply chain resilience. Additionally, the influence on market performance was also insignificant. Supply chain disruption orientation did influence exploration innovation (0.584***) and exploitation innovation (0.248***). Exploration innovation was recognized to influence exploitation innovation (0.635***). Exploitation innovation affected both supply chain resilience (0.412***) and market performance (0.227*). Lastly, supply chain resilience positively impacted market performance (0.445***).

The Korean model also exhibited different results. Exploration innovation did not significantly impact market performance. Supply chain disruption orientation did positively impact both exploration innovation (0.702***) and exploitation innovation (0.286***). Exploration innovation did affect both exploitation innovation (0.630***) and supply chain resilience (0.392***). Exploitation innovation influenced supply chain resilience (0.430***) and market performance (0.213**). Finally, supply chain resilience impacted market performance (0.599***). All pathway coefficients can be reviewed in **Table 6**. Additionally, the combined data model with pathway coefficients can be reviewed in **Figure 2**.

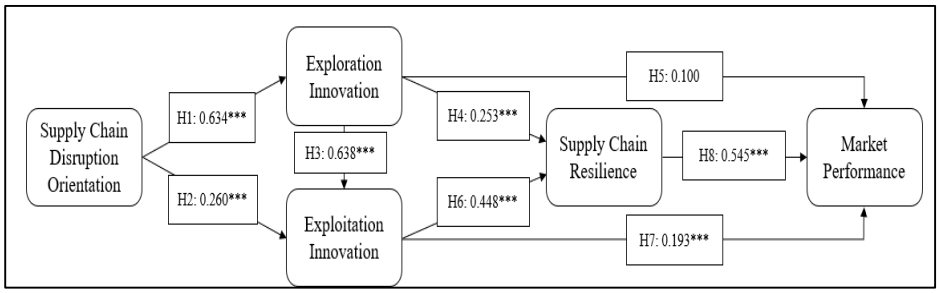


**Figure 2** Results

**Table 6** Pathway assessment

| Pathway Assessment (complete) | | | | | |
|---|---|---|---|---|---|
| **Hypotheses** | **Pathways** | **Pathway Coefficient** | **t-stats** | **p-value** | **Results** |
| H1 | SC Disruption Orientation à Exploration Innovation | 0.634 | 16.861 | 0.000 | **accepted** |
| H2 | SC Disruption Orientation à Exploitation Innovation | 0.260 | 7.152 | 0.000 | **accepted** |
| H3 | Exploration Innovation à Exploitation Innovation | 0.638 | 18.422 | 0.000 | **accepted** |
| H4 | Exploration Innovation à SC Resilience | 0.253 | 3.936 | 0.000 | **accepted** |
| H5 | Exploration Innovation à Market Performance | 0.100 | 1.430 | 0.077 | rejected |
| H6 | Exploitation Innovation à SC Resilience | 0.448 | 7.061 | 0.000 | **accepted** |
| H7 | Exploitation Innovation à Market Performance | 0.193 | 2.539 | 0.006 | **accepted** |
| H8 | SC Resilience à Market Performance | 0.545 | 9.118 | 0.000 | **accepted** |
| Pathway Assessment (American firms) | | | | | |
| **Hypotheses** | **Pathways** | **Pathway Coefficient** | **t-stats** | **p-value** | **Results** |
| H1 | SC Disruption Orientation à Exploration Innovation | 0.584 | 9.902 | 0.000 | **accepted** |
| H2 | SC Disruption Orientation à Exploitation Innovation | 0.248 | 5.110 | 0.000 | **accepted** |
| H3 | Exploration Innovation à Exploitation Innovation | 0.635 | 13.547 | 0.000 | **accepted** |
| H4 | Exploration Innovation à SC Resilience | 0.137 | 1.592 | 0.056 | rejected |
| H5 | Exploration Innovation à Market Performance | 0.134 | 1.375 | 0.085 | rejected |
| H6 | Exploitation Innovation à SC Resilience | 0.412 | 4.712 | 0.000 | **accepted** |
| H7 | Exploitation Innovation à Market Performance | 0.227 | 2.077 | 0.019 | **accepted** |
| H8 | SC Resilience à Market Performance | 0.445 | 5.632 | 0.000 | **accepted** |

**Table 6** Pathway Assessment (cont')

| Pathway Assessment (Korean firms) | | | | | |
|---|---|---|---|---|---|
| **Hypotheses** | **Pathways** | **Pathway Coefficient** | **t-stats** | **p-value** | **Results** |
| H1 | SC Disruption Orientation à Exploration Innovation | 0.702 | 17.244 | 0.000 | **Accepted** |
| H2 | SC Disruption Orientation à Exploitation Innovation | 0.286 | 4.888 | 0.000 | **Accepted** |
| H3 | Exploration Innovation à Exploitation Innovation | 0.630 | 10.821 | 0.000 | **Accepted** |
| H4 | Exploration Innovation à SC Resilience | 0.392 | 5.045 | 0.000 | **Accepted** |
| H5 | Exploration Innovation à Market Performance | 0.076 | 0.9444 | 0.173 | Rejected |
| H6 | Exploitation Innovation à SC resilience | 0.430 | 5.572 | 0.000 | **Accepted** |
| H7 | Exploitation Innovation à Market Performance | 0.213 | 2.619 | 0.005 | **Accepted** |
| H8 | SC Resilience à Market Performance | 0.599 | 10.301 | 0.000 | **Accepted** |

## *4.4 Structural Model Assessment*

It is necessary to examine the effects of the model on endogenous variables. Those effects can be reviewed through an assessment of the coefficient of determination and the cross-validated redundancy for each endogenous variable (Hair *et al*. 2018). When conducting a multigroup analysis, it is expected that both values will be examined within the individual data sets (Carranza *et al*., 2020; Cheah *et al*., 2020; Henseler *et al*., 2016); thus, values are provided for the American data and the Korean data independently.

The coefficient of determination (R2) is a measure of the endogenous variable's explained variance. It is expressed as a decimal but understood as a percentage; therefore, a value of 0.341 indicates that 34.1% of the variance for exploration innovation can be explained by the model. Additionally, values for the American data are as follow, exploitation innovation (0.667), market performance (0.477), and supply chain resilience (0.287). The Korean data set reveals improved values for the coefficient of determination: exploration innovation (0.493), exploitation innovation (0.733), market performance (0.699), and supply chain resilience (0.619); thus, indicating that the variables more closely model the development of supply chain resilience and market performance. Cohen (1988) recommends assessing the magnitude of the coefficient of determination accordingly, values between 0.02 and 0.13 are small, values between 0.13 and 0.26 are medium, and values between 0.26 and above are large. According to this analysis, all coefficients are large; thus, indicating a strong model.

When utilizing PLS-SEM, cross-validated redundancy (Q2) should also be examined as it is a measure of the predictive validity of the model (Hair *et al*. 2018); furthermore, values above zero indicate a degree of predictive validity that is sufficient for the model (Hair *et al*. 2018). The Korean data suggests predictive validity is confirmed: exploration innovation (0.373), exploitation innovation (0.558), market performance (0.502), and supply chain resilience (0.409). The American model also indicates predictive validity: exploration innovation (0.232), exploitation innovation (0.392), market performance (0.262), and supply chain resilience (0.177); albeit, to a lesser extent than the Korean model. Again, the model is better regarding predictive validity for the Korean data. All values for the coefficient of determination and cross-validated redundancy can be reviewed in **Table 7**.

**Table 7** Structural model assessment

| **Endogenous Variables** | **$R^2$** | | **$Q^2$** | |
|---|---|---|---|---|
| | **American** | **Korean** | **American** | **Korean** |
| Exploration Innovation | 0.341 | 0.493 | 0.232 | 0.373 |
| Exploitation Innovation | 0.667 | 0.733 | 0.392 | 0.558 |
| Marketing Performance | 0.477 | 0.699 | 0.262 | 0.502 |
| Supply Chain Resilience | 0.287 | 0.619 | 0.177 | 0.409 |

## *4.5 Goodness-of-Fit*

Goodness-of-fit (GoF) is required while conducting a psychosomatic SEM analysis; unfortunately, there is not a standard method for measuring it; moreover, this remains one of the greatest criticisms of PLS-SEM analysis (Hair *et al*., 2018). Substitutes for a standard measure of GoF are instead adopted and considered widely acceptable measures (Hair *et al*. 2018). Several measures for GoF have arisen as acceptable from the literature including both a measure suggested by Wetzels *et al*., (2009) and another by Hu and Bentler (1999). Both were adopted for this research in order to get a wider indication of GoF. Finally, when conducting a

comparative analysis, it is only necessary to check GoF with the combined datas*et al*one (Carranza *et al*., 2020; Cheah *et al*., 2020; Henseler *et al*., 2016). Firstly, GoF proposed by Wetzels *et al*. (2009) indicates a high degree of GoF, 0.513 is an excellent value. Secondly, the measure proposed by Hu and Bentler (1999), a standardized root mean square residual (SRMR) of 0.075 indicates GoF at the strictest level, an SRMR less than 0.080 (Henseler *et al*., 2014). Based on two widely accepted measures of GoF, global goodness-of-fit is established; furthermore, the goodness-of-fit can be reviewed in **Table 8**.

**Table 8** Goodness-of-fit

| Description | Value | Baseline value | Reference |
|---|---|---|---|
| Goodness of Fit (GoF) | $\sqrt{\text{Cut} - \text{off of AVE X average of R\_}square}$ = $\sqrt{0.5X0.527}$ = 0.513 | GoF *small* = 0.1<br>GoF *medium* = 0.25<br>GoF *large* = 0.36 | Wetzels *et al*. (2009) |
| | Standardized Root Mean Square Residual (SRMR) = 0.075 | Less than 0.08 | Henseler *et al*. (2014)<br>Hu and Bentler (1999) |

## *4.6 Multigroup Analysis*

The measurement invariance of composite models (MICOM) is the most common method for multigroup analysis with PLS-SEM (Carranza *et al*., 2020; Cheah *et al*., 2020; Henseler *et al*., 2016). This process ordinarily is a three-step process including, step 1 configuration invariance, step 2 compositional invariance, and step 3 equality of mean values and variances (Henseler *et al*., 2016). The first step, configuration invariance, should indicate that all the composite values are the same across all constructs (Henseler *et al*., 2016). The second step, Compositional invariance, also requires that all constructs are the same across the data sets (Carranza *et al*., 2020; Cheah *et al*., 2020; Henseler *et al*., 2016). Finally, step three, the equality of mean values and variances also supports the equality of the constructs across the data (Henseler *et al*., 2016). If the first two steps provide equality, we can move forward to the third step; moreover, it is necessary for the first two steps to be equal in order for any affirmative results; if the third step is unequal it is considered partial invariance while equal values in the third step indicate full invariance (Carranza *et al*., 2020; Cheah *et al*., 2020; Henseler *et al*., 2016). Because two points are unequal (market performance and supply chain disruption orientation) this whole model displays only partial invariance. The results can be viewed in **Table 9**.

Once either partial invariance or full invariance is accepted, it is necessary to conduct a multigroup analysis of the hypotheses using multigroup analysis tests and permutation tests with PLS-SEM (Henseler *et al*., 2016). The hypothesis testing verifies whether or not there are any significant differences between the American data and the Korean data (Carranza *et al*., 2020). Accordingly, there is a significant difference at one point, in the relationship between exploratory innovation and supply chain resilience. The results of the multigroup analysis testing can be reviewed in **Table 10**.

**Table 9** Results of invariance measurement testing using permutation

| Constructs | Configural invariance (same algorithms for both groups) | Compositional invariance (correlation=1) | | Partial measurement invariance established | Equal mean assessment | | | Equal variance assessment | | | Full measurement invariance established |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C = 1 | Confidence invariance | | Difference | Confidence interval | Equal | Difference | Confidence interval | Equal | |
| EOI | Yes | 1.000 | 〔0.999; 1.000〕 | Yes | 0.0623 | 〔-0.178; 0.142〕 | Yes | -0.1860 | 〔-0.223; 0.246〕 | Yes | Yes |
| EOR | Yes | 1.000 | 〔0.999; 1.000〕 | Yes | 0.1409 | 〔-0.162; 0.150〕 | Yes | -0.1347 | 〔-0.218; 0.231〕 | Yes | Yes |
| MP | Yes | 0.999 | 〔0.998; 1.000〕 | Yes | -0.1995 | 〔-0.171; 0.150〕 | No | 0.1215 | 〔-0.258; 0.266〕 | Yes | No |
| SCDO | Yes | 0.999 | 〔0.997; 1.000〕 | Yes | 0.1660 | 〔-0.148; 0.149〕 | No | -0.1706 | 〔-0.252; 0.261〕 | Yes | No |
| SCR | Yes | 0.999 | 〔0.998; 1.000〕 | Yes | -0.1077 | 〔-0.146; 0.144〕 | Yes | 0.0377 | 〔-0.279; 0.281〕 | Yes | Yes |

**Table 10** Results of hypothesis test

| Hypothesis relationship | Path coefficients | | Path coefficients difference | Confidence Interval (95%) | P-value difference (One-Tailed) | | Supported |
|---|---|---|---|---|---|---|---|
| | Korean firms | American firms | | | Henseler's MGA | Permutation p-values | |
| EOI -> MP | 0.213 | 0.190 | 0.024 | 〔-0.246; 0.257〕 | 0.431 | 0.458 | No/No |
| EOI -> SCR | 0.430 | 0.452 | -0.022 | 〔-0.199; 0.198〕 | 0.423 | 0.441 | No/No |
| SCDO -> EOI | 0.286 | 0.249 | 0.038 | 〔-0.120; 0.125〕 | 0.307 | 0.309 | No/No |
| SCDO -> EOR | 0.702 | 0.584 | 0.118 | 〔-0.127; 0.121〕 | 0.047 | 0.059 | Yes/No |
| SCR -> MP | 0.599 | 0.482 | 0.117 | 〔-0.210; 0.200〕 | 0.133 | 0.196 | No/No |

# 5. DISCUSSION

## *5.1 Scholarly Implications*

According to the coefficient of determination (R2), a measure of explained variance for the model, South Korean firms were better at building supply chain resilience and market performance. The R2 for supply chain resilience is most discerned with U.S. firms at 0.287 and Korean firms at 0.619. Market performance is also comprehended with 0.477 for U.S. firms and 0.699 for Korean firms. Overall, the results imply that South Korean firms were better able to leverage exploratory innovation than U.S. firms. Two principal differences can explain how Korean firms have outperformed U.S. firms amid the COVID-19 supply chain disruptions: technology transfer and open innovation. Previous research indicates how South Korean firms have built dynamic capabilities to improve technology transfer capabilities. A study by Rhee and Stephens (2020) describes how Korean manufacturers rapidly assimilated new technology and improved upon it before bringing it to market to compete with better-equipped Western companies. This cycle of rapid technology transfer and innovation led to a dynamic capability termed innovation-orientated assimilation strategy – a kind of open innovation. Open innovation is described as an exploratory innovation process where innovation happens inside and outside the firm (Almirall and Casadesus-Masanell, 2010). It is used to improve the innovation process; moreover, it is widely adopted by firms in lesser-developed countries to catch up with more demonstrated firms of developed economies (Andrade-Rojas *et al*., 2021; Rhee and Stephens, 2020); moreover, this was well noted in South Korean manufacturing (Lee and Lim, 2001).

Additionally, according to the multigroup analysis, only one pathway (exploration innovation to supply chain resilience) is significantly different. Noteworthy, this was also the divergent point in the pathway analysis. Again, this points to the inability of American firms to utilize exploration innovation to develop supply chain resilience as Korean firms do. This means Korean firms can innovate with new ideas that are likely less validated within the firm to develop supply chain resilience; yet, American firms cannot or do not successfully employ exploration innovation to develop resilience; moreover, American innovation conveys the impression of being closed, and is emphasized by exploitation innovation alone.

Supply chain disruption orientation, a proxy for organizational culture, is strongly associated with exploration innovation, less so with exploitation innovation. In other words, organizational culture dictates an organization's willingness to adopt novel or experimental ideas on both sides of the Pacific. Not surprisingly, organizations with a higher propensity (through organizational culture) to adopt new ideas are also, in this case, more likely to utilize exploration innovation to benefit the organization. Corporations with ambidextrous innovation are able to exploit prevailing abilities whilst exploring new possibilities (Wang *et al*., 2021). Organizational culture seems to be a vital ingredient to developing exploration innovation.

For all three pathway analyses, exploration innovation did not directly lead to market performance; therefore, untested ideas do not improve market performance unless it first improves supply chain resilience. Regarding firms from both regions, exploratory innovation is a useful means of improving an internal process that later leads to market performance. Nevertheless, exploration innovation was a significant factor in improving supply chain resilience and market performance for Korean firms. The practical implications must be further explored.

## *5.2 Practical Implications*

Korean innovation amid disruption is more effective at building both supply chain resilience and market performance. Critically, a well-developed open innovation process utilizing exploration innovation is likely the root of improved innovation and performance. U.S. firms may be able to improve supply chain resilience and market performance by investing in open innovation. Unfortunately, the innovative process is typically and deeply ingrained in organizational culture; thus, it cannot be easily changed. As implied by Rhee and Stephens (2020), decades of international competition developed the competencies of Korean firms. As advised by Porter (1980), the competitive environment plays a serious role in competitive competencies.

It's worth exploring the synchronized rejection of H5. According to the findings, both American and Korean firms did not exhibit a direct positive and significant relationship

between exploration innovation and market performance. This means that during the latest pandemic seeking new ideas or solutions did not lead to improved market performance. Amidst turbulent markets firms relied on exploitation innovation as a means of improving performance. Exploration innovation requires time to be properly implemented and utilized to achieve market performance (Parida *et al*., 2016). This was an acute study that did not allow for time-dependent returns to be established; longer-term studies might yield different results. Additionally, it is well known that amid crises exploitation innovation is the dominant method of innovation employed by organizations to achieve better performance (Clauss *et al*., 2021).

Nevertheless, as globalization continues to diminish the dominance of U.S. firms around the world, they will need to improve their innovation processes in order to compete with more innovative firms. As indicated by Andrade-Rojas *et al*. (2021), Western firms can adopt open innovation in order to compete. Indeed, amid the highly dynamic supply chains of the 21st century, it will be essential to develop an open innovation method for supply chain management. Open innovation makes sense as it is a process that happens both inside and outside the supply chain as supply chain management is both inside and outside the firm. The exploration innovation is conducive to supply chain management.

# 6. CONCLUSION

## *6.1 Contributions*

This research has contemplated how disruptive events are able to influence the performance of the supply chain. Therefore, the risk factor associated with events such as the COVID-19 pandemic, as well as other unforeseen proceedings has garnered much attention of late. Baryannis *et al*. (2019) define supply chain risk as a collapse of flows between different supply chain mechanisms. These risks cause disruptions to the supply chain of an organization, and subsequently damage the efficient management of supply chain networks (Parast, 2020). The relevance of advancing supply chain resilience to recover from disruptions in an appropriate timeframe relies on the capacity organizations possess in the supply chain (Wong *et al*., 2020). Unless a proactive approach to managing disruptions through resilience is directed, organizations are at the mercy of the environment, and are exposed to consequential outcomes, including their brand reputation becoming diluted, or worse, the firm's operations becoming insolvent (Koberg and Longoni, 2019).

While this research has contributed to supply chain literature, several comments to the findings are expected. Literature often denotes the importance of attaining dynamic capabilities. However, the pursuit of these types of capabilities oftentimes carries a cost burden with it. Winter (2003) initiated that change, for the sake of changing, could in itself contribute to additional disruptions to a supply chain. This operation would undermine the established processes of a firm and result in organizations losing their competitive values. Therefore, it remains imperative for organizations to justify their inquiry into dynamic capability development.

Differences in the samples between South Korean and US organizations present additional avenues for the examination of global supply chains. Parast (2020) predicted that regional effects in various supply chains could impact supply chains differently; leading to compounded challenges for organizations. These findings point to the complex nature of global supply chains creating diverse conditions dependent on a region or country (Koberg and Longoni, 2019). Also, the inclusion of both exploration and exploitation innovations into the study advances the literature on ambidextrous orientation. While issues related to ambidexterity are often poised to present conflicting findings regarding performance, the extraction of both exploration and exploitation elements has contributed to the literature regarding the organizational outcomes of these variables (Parida *et al*., 2016).

## *6.2 Limitations and Future Studies*

While the current research is projected to be as comprehensive as possible, several limitations were anticipated. Firstly, control variables were excluded from the analysis. The utilization of control variables might have altered some of the results. Future research might control for factors such as firm size, or industry type. Nevertheless, the demographic information is provided for the data.

Second, previous research (Wenke *et al*., 2021) suggests that the exploration and exploitation of innovation constructs are context-dependent. Therefore, results could vary based on the size of the firm or the level of environmental diversity. As a result, future research could measure innovative-based concepts in small and medium-sized enterprises, or distinguish their investigations with regard to the disruption characteristics (Mathias *et al*., 2018).

Third, while this review aimed to remain inclusive by introducing data from two countries (US and South Korea), the sizes of the samples could present certain shortcomings. Despite the collection of over 400 sample points, caution should be reserved when interpreting the results. As mentioned earlier in the text, supply chain disruptions could be experienced differently regarding the type of certain supply chain participants interviewed. Butt (2021) accepted that findings regarding disruptions could vary depending on the participants involved (e.g., supplier or distributor). Therefore, subsequent research could pay attention to the contrasting inspections of supply chain disruptions contingent on the perspectives of different individuals involved in the process.

Finally, as mentioned in the conclusion section, the importance of dynamic capabilities cannot, and should not be understated. However, future research should advance a distinction between the use of a capability and the cost associated with developing the capability is required. As with most operational procedures, an opportunity cost exists, and trade-offs will inevitably exist when organizations contemplate which capabilities to invest in as they measure the cost-benefits. Thus, forthcoming studies could benefit from introducing an assessment of multiple capabilities to measure or compare with supply chain performance.

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