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The effects of dynamism, relational capital, and ambidextrous innovation on the supply chain resilience of U.S. firms amid COVID-19

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ABSTRACT

Supply chain resilience has become a topic of revitalized interest amid COVID-19. Amongst other anomalies, COVID-19 continues to disrupt global supply chains; thus, it remains critical to understand resilience in supply chains as a mechanism with which to respond to pandemic-related disruptions. Supply chains remain an important determinant of firm capital consumption and, as such, this study aims to examine the relationships between ambidexterity and relational capital as they relate to the resilience of U.S firms' supply chains during the contemporary market irregularities. A sample of 227 firms located in the United States were collected to analyse these convictions. PLS-SEM was utilized to test both direct and mediation results. Results suggest relational capital may have a significant role in facilitating supply chain resilience. Relational capital also acts as a strong mediator between ambidextrous innovation and resilience. Nevertheless, ambidexterity is less influential upon supply chain resilience than anticipated. This study therefore contributes towards existing supply chain resilience literature by providing a novel approach to including relational capital; something not previously considered. This paper also contributes to a greater understanding of the notions of ambidextrous innovation and relational capital amid extreme supply chain disruptions caused by the COVID-19 pandemic.

Keywords: supply chain resilience, dynamism, innovation, relational capital, ambidexterity

1. INTRODUCTION

Since its onset, the COVID-19 pandemic has caused major disruptions in global supply chains the world over (Ivanov, 2020). Furthermore, bottlenecks and other complexities in supply chains (SCs) caused by changes in consumer purchasing trends resulting from the pandemic (Addo *et al.*, 2020) have created serious disparities between the supply and demand features of market offerings (Rubbio *et al.*, 2019). Moreover, the swelling rate at which global supply chains have become more dynamic has put additional pressures on the abilities of firms to succeed and create competitive advantages (Addo *et al.*, 2020). All these pressures have forced the majority of firms to rethink their approaches towards the dynamism, flexibility, and resilience of their supply chains. Supply chain resilience (hereafter SCR) has remained a popular topic in literature since the early 2000s (Rice and Caniato, 2003). However, the question of resilience, as it relates to a firms' supply chain, has recently re-emerged as a major point of interest since the arrival of the COVID-19 pandemic (Addo *et al.*, 2020). Consequently, this research hopes to delve deeper into the SCR construct and examine various firm elements which could help strengthen a firms' supply chain. Rubbio *et al.* (2019) noted that while resilience in the supply chains of firms can help to mitigate disruption caused by the pandemic, little attention has been given to this topic and thus further research is needed (Ivanov, 2020). Hence, the current research additionally considers the orientation of U.S. organizations towards being aware and conscious of disruptions when they occur in the supply chain.

According to the dynamic capability theory (Teece, *et al.*, 1997), resources within a firm may be reconfigured over a period of time in an effort, by the firm, to respond to changes in the business environment. These resources are thus dynamic in their own right and can be integrated or built into firm processes to match the needs of changing market requirements (Teece *et al.*, 1997). Organizations spent a great deal of resources conditioning their supply chains to deliver sufficient components and materials to match production schedules, while at the same time maintaining costs efficiencies. Therefore, resources need to continuously be reworked to benefit the firm's requirements for success, meaning that resources need to be utilized in several, often contradictory methods. In order to achieve a level of success when utilizing firm resources in such manners, ambidexterity often emerges as a dynamic capability which allows organizations the ability to deal with paradoxical situations to create complementary resources, while simultaneously attaining competitive advantages (Li *et al.*, 2013). Based on organizational learning literature, ambidexterity refers to a firm pattern in which two resources can be developed concurrently in a way that both resources

complement each other, or are balanced (Li *et al.*, 2013). In the current study, two resources, namely, exploitation and exploration innovation are introduced as constructs which could benefit the resilience of SCR. Past literature suggests that the cooperative impact of exploitation and exploration innovation will be maximized when both patterns are balanced or complementary, especially in dynamic environments (Raisch and Birkinshaw, 2008). These assumptions are measured further in the current research. While the direct effects of supply chain dynamism on the implementation of supply chain disruption orientation and resilience are covered in past research (Lu *et al.*, 2019), the current paper contributes further to the literature by including the mediation effects of ambidexterity in the aforementioned relationship.

Though the utilization of resources affords organizations additional benefits in maximizing SCR, social capital theory suggests that resilience can be further enhanced through meaningful relationships (Brusset and Teller, 2017). Internal firm processes require constant monitoring in dynamic environments and can benefit from harmonization and alliances with partners in the supply chain to ensure greater efficiency. Relational capital therefore provides a means in which organizations could benefit under the current market conditions from developing closer ties with fellow suppliers, manufacturers, or buyers (Yu and Huo, 2019). Accordingly, relational capital is measured further to test its role in supply chain resilience (Brusset and Teller, 2017).

While it is largely accepted that 'tight' market conditions typically provide greater opportunities for firms to improve their market share at the expense of their competitors, supply-chain disruptions experienced under the current pandemic makes it challenging for businesses to fully capitalize (Rubbio *et al.*, 2019). Consequently, to provide guidance for organizations and mitigate the negative effects of supply chain disruptions during the pandemic, the current research addresses the following questions: (1) How will relational capital influence the resilience of the supply chains of firms? (2) In what manner will SC dynamism and SC disruption orientation facilitate ambidextrous innovation? (3) To what degree will the exploitative and explorative innovativeness of firm resources lead to SC resilience? To test these convictions further, data were collected from a sample of 227 firms located in the United States. These samples were analysed using PLS-SEM to better understand the results.

The study therefore contributes to the literature on SCM in several ways. This research makes a novel contribution to literature by evaluating the antecedents which leads to success in SCR recorded during a specific period of disruption (namely, the COVID-19 pandemic). Further, this paper provides an additional understand of the mediating role between innovative exploitation and innovative exploration, SC dynamism, relational capital, SC disruption orientation and SCR which establishes linkages to assist theoretical findings on SCR. The rest of the paper will be organized as follows. A review of the literature and theoretical analysis of the research will be discussed as we develop our conceptual model. Following this, a discussion of the methodology, analysis, and results of the empirical analysis will be considered. Thereafter, the concluding remarks will provide theoretical and practical implication of the findings. Finally, the study will highlight certain limitations of the research and provide directions for future research to consider.

2. LITERATURE REVIEW

Research regarding supply chain management, in particular, supply chain resilience has been contextualized through the resource-based view and the dynamic capabilities framework (Baz and Ruel, 2021; Brusset and Teller, 2017; Chowdhury and Quaddus, 2017); accordingly, the dynamic capabilities framework, as described by Teece *et al.*, (1997) is utilized as the theoretical underpinning for this empirical model. Regarding the resource-based view, Barney (1991) understood firms as bundles of resources that should be optimally organized to create competitive advantages. In a static environment with few and infrequent changes to how a business operates, a firm should be able to succeed without frequently reconfiguring resources; however, firms do not operate in a vacuum without change (Eisenhardt *et al.*, 2000). Supply chains have proven to be particularly dynamic, especially amid COVID-19. Teece *et al.* (1997) described dynamic capabilities as the higher order ability to continuously reconfigure firm resources to create competitive advantage amid dynamic business environments. As COVID-19 has created a particularly dynamic business environment, it is likely that dynamic capabilities have become a critical means of maintaining competitive advantages for firms.

News stories have reported on frequent supply chain disruptions that have plagued companies since the advent of COVID-19 in early 2020 (Ali *et al.*, 2021). Amid COVID-19, supply chain resilience has proven to be particularly beneficial for both maintaining and building competitive advantage for large airline and automobile firms (Belhadi *et al.*, 2021). Firms that maintain supply chains, especially amid disruptive dynamism are theorized to be better able to continue operations; thus, keep customers, and even attract new agitated customers from interrupted firms (Gu *et al.*, 2021; Wong *et al.*, 2020). Given the competitive advantages gained through supply chain resilience, it is particularly important to confirm how firms develop supply chain resilience.

Brusset and Teller (2017) framed supply chain resources and capabilities in order to emphasize supply chain capabilities; according to their work, multiple firm resources were bundled, then capabilities were hierarchically organized with lower order capabilities first, followed by operational capabilities, and finally, dynamic capabilities. Supply chain resources included, information, human capital and relational capital among others; lower order capabilities included external and internal processes as well as integration; furthermore, supply chain resilience was framed as an operational capability that leads to dynamic capabilities (Brusset and Teller, 2017). In this regard, supply chain resilience is viewed as an operational capability while relational capital, exploration innovation, and exploitation innovation are viewed as lower order capabilities. Finally, for this framework, supply chain disruption orientation is considered a strategic orientation.

Ali *et al*. (2021) considered the activities that build up supply chain resilience according to a time and cost matrix. Logically, firms would invest in low cost and fast (not time

consuming to acquire) activities first; such activities would produce quick and apparent results. According to Ali *et al*. (2021) low cost and quick to achieve activities include, (1) SC agility built through communication, information sharing and quick supply chain design; (2) SC flexibility developed through distribution channels, back-up suppliers, flexible production and volume flexibility; (3) SC collaboration enforced through coordination and cooperation; (4) human resource management developed through employee training and experienced employees for crisis management; and (5) SC redundancy build through multiple suppliers and resources slack. It is likely that slow but low-cost activities would also be adopted by many firms as well; low-cost options are attractive even if they are not rapidly apparent as the associated costs are low. Accordingly, SC human resource management enhanced through a multi-skilled workforce, and an organizational culture conclude slow and low-cost activities mentioned by Ali *et al*. (2021). Higher cost activities are less attractive as they require more resources; nevertheless, they are viable options. Higher cost activities that are quick to enact but costly include: (1) SC flexibility built up through contract flexibility, back-up suppliers and easy supplier-switching; and (2) collaboration developed through knowledge sharing; furthermore, high cost and slow to enact activities include: (1) collaboration enhanced through mutual created knowledge and joint decision making; and (2) redundancy developed with inventory buffering and back-up capacity (Ali *et al.*, 2021). Most of these activities have been coalesced into multiple empirical variables including, relational capital, supply chain disruption orientation, exploitation innovation and exploration innovation. Theoretically and empirically many of these supply chain activities correspond to the constructs within this empirical model.

According to Hohenstein *et al*. (2015) there are four phases of supply chain resilience: (1) readiness, measures that emphasise what is being done before disruption; (2) response, countermeasures that happen after a disruption; (3) recovery, the restoration of supply chain performance; and (4) growth, energies focused on improving pre-disruption supply chain performance. Spieske and Birkel (2021) reviewed 62 research papers regarding supply chain resilience to distil and emphasize the phases of supply chain resilience; accordingly, they proposed a theoretical framework: readiness, disruption, response, recovery, and growth. The framework of this paper utilizes their framework with disruption as dynamism, supply chain disruption orientation and relational capital as readiness, response as both exploration and exploitation innovation and supply chain resilience as recovery.

Recently several authors have studied supply chain resilience amid COVID-19 (Mubarik *et al.*, 2021; Belhadi *et al.*, 2021; Muarik *et al.*, 2021). Mubarik *et al.*, (2021) found that relational capital (a dimension of intellectual capital), was critical in developing supply chain resilience among Pakistani food processing companies. It is surmised that relationships have an impact on supply chains. Mubarik *et al.* (2021) a separate study, found that supply chain mapping and visibility improved supply chain resilience for Malaysian electrical and electronics firms; additionally, Belhadi *et al*. (2021) found that development and reliance on new technology was key to the development of supply chain resilience; thus, it can be theorized that innovation is critical to the development of supply chain resilience amid COVID-19.

Supply chains and operations remain particularly dynamic amid COVID-19 (Gu *et al.*, 2021; Belhadi *et al.*, 2021; Wong *et al.*, 2020). Dynamism in business refers to volatility and unpredictability within the business environment (Dess and Beard, 1984; Miller and Friesen, 1983). Much contributes to dynamism including social change, innovation, market demand and technological advancement (Miller and Friesen, 1983); additionally, it is evident that pandemics, war, revolution, and climate change play a role in the supply chain dynamism of the global supply chain. Regarding the definition of supply chain dynamism, Zhou and Benton (2007) emphasise the rate of change for both products and processes in their widely accepted definition of supply chain dynamism.

Supply chain dynamism likely leads to both disruption (interruption of normal operations) and innovation (an adaptation that allows operations to be maintained or resume). Contingency theory suggests that firms adapt to their environment; moreover, firm responses to environmental stimuli are key to the success and failure of firms (Zeithaml *et al.*, 1988; Lee and Miller, 1996). Strategic fit between the organizational strategy and environmental stimuli does result in improved performance (Robertson and Chetty, 2000; Sinkovics *et al.*, 2018); therefore, it is imperative that organizations fit (adapt) to the situation even if the situation is dynamic.

Supply chains are interconnected operations. According to normal accident theory, supply chains are affected by interruptions whether caused by a simple deficit of materials or complicated coupling of activities and deliveries (Perrow, 1994; Sagan, 1995). Globalization has driven the complexity of supply chains internationally; as the coupling of activities increase within these markets, the opportunities for failure intensify in the supply chain channels (Sagan, 1995). Although innovation is noted as a critical cause of disruption (Miller and Friesen, 1983), it has also served as a key proponent for improving supply chain interruptions when they do occur (Golgeci and Pnomarov, 2013). Innovation impacts both product (the end result) and process (the operational process of production); thus, it is important to supply chain management.

Amid supply chain dynamism many researchers have found that supply chain resilience develops advantages for competing firms (Sheffi and Rice, 2005; Ali *et al.*, 2017; Yu *et al.*, 2019). While a firm's supply chain is interrupted, it cannot produce products to deliver to its customers. If two firms are competing and one company can deliver products to customers while the other cannot, there is a good chance that the delinquent firm's customers would seek out the still operating company's products; thus, a market advantage is realized. Additionally, financial benefits should also be realized. When a firm is not operating there remain many fixed costs with less income to cover those costs. Considering the value of supply chain resilience, it is important to understand its development.

Lately supply chain innovation has been understood as happening in two polar opposite comportments, exploitative and explorative innovation; yet, some organizations are able to do both at the same time (Gu *et al.*, 2021) to benefit supply

chain resilience. Exploitation innovation is defined with words including, "refinement, choice, production, efficiency, selection, implementation, execution", while explorative innovation includes words such as, "search variation, risk taking, experimentation, play, flexibility, discovery, innovation" (March 1991, p.71). Exploitation innovation underscores the utilization of existing solutions while explorative innovation stresses finding new solutions. Accordingly, firms must balance both exploitative and explorative innovation at the same time in order to achieve the best innovative results (Tushman and O'Reilly, 1996); furthermore, this is termed ambidexterity (Tushman and O'Reilly, 1996; Gupta *et al.*, 2006). Eisenhardt *et al.* (2000) theorised that given the dynamic nature of business environments today, firms must develop ambidexterity in order to remain competitive. Studies have found that ambidexterity positively impacts firm performance (Junni *et al.*, 2013; Mathias *et al.*, 2018; Wenke *et al.*, 2020). Indeed, a large meta-analysis found that ambidexterity leads to improved performance for SMEs as well as for larger firms.

Although many authors orate that ambidexterity can resolve many problems, Doblinger *et al.* (2020) found that ambidextrous German firms were actually less able to mitigate variability (instil performance stability) amid crisis periods. Based on their findings, it is reasonable to test how ambidexterity impacts supply chain resilience; moreover, firms that achieve ambidexterity may have better supply chain resilience; therefore, this type of innovation and its impact upon supply chain resilience is further explored in this research.

Relational capital accentuates the trust, respect, friendship and obligations that firms maintain while working together (Villena *et al.*, 2011). Relational capital within the supply chain is emphasized as external relationship capital (Yu and Huo, 2019). Dyer and Singh (1998) note that all inter-organizational transactions and behaviours are opportunities to improve relational capital. Based on transaction cost economics, relational capital reduces the cost of transactions and diminishes the incentives for opportunistic behaviours (Dyer and Singh, 1998). With reduced transaction costs and more inter-organizational trust, operational costs are improved; thus, firm performance is enhanced. Consequently, relational capital is considered a key component to improving supply chain cooperation including resource exchange, information sharing, and the integration of assets (Krause *et al.*, 2007; Lawson *et al.*, 2008).

Dynamism within the business environment implies volatility; something that has been remarkable amid COVID-19. Several authors have studied dynamism and its impacts upon firm capabilities and performance (Yu *et al.*, 2019; Wamba *et al.*, 2020; Song and Yang, 2019; Kumar and Bhatia, 2021). Eisenhardt *et al.* (2010) suggest that ambidexterity is a response to dynamic business environments; moreover, firms can only be competitive amid dynamism if they develop ambidexterity. Researchers have established that ambidexterity does improve supply chain management (Wamba *et al.*, 2020); albeit, they did not see the same results amid dynamic environments. Nevertheless, it is likely that either exploitative innovation or explorative innovation led to improved supply chain resilience amid volatility. Doblinger *et al.* (2020) found that ambidextrous German firms did not develop performance stability amid crises. It seems that dynamism amid crisis negates the positive impacts of ambidexterity (Doblinger *et al.*, 2020; Wamba *et al.*, 2020). Given research that indicates ambidexterity does not lead to stability, it is possible that one type of innovation or the other (exploitative or explorative) improve supply chain resilience during a crisis. Therefore, the first two hypotheses are proposed to be tested:

- *H1: Supply chain dynamism improves exploitation innovation.*
- *H2: Supply chain dynamism improves exploration innovation.*

Supply chain management is an inter-organizational endeavour whereby firms rely on each other to successfully perform, especially amid dynamism. Chung *et al.* (2021) found that B2B relationships were key to improving both the strategic and financial performance of New Zealand firms amid dynamism. Furthermore, it was theorized that dynamism helped those firms to sift out competitive competencies within the relationship to reveal better performance (Chung *et al.*, 2021). When firms experience change there is an urgency to adapt. Good inter-organizational relationships which stand to benefit from greater cooperation likely see improved cooperation. At the same time, poor inter-organizational relationships may see a disintegration of their relationship or improved relationships as indicated by Chung *et al*. (2021). Supply chain change is different from organizational change as it is interconnected with multiple firms. Yu and Huo (2019) found that relational capital was a key component of successful green management amid changing environmental requirements; they theorized that demand for change drove firms to connect and cooperate in order to better compete together. Dynamism drives urgency within the supply chain which likely leads to cooperation among suppliers to adapt; thus, dynamism leads to relational capital, the third hypothesis:

- *H3: Supply chain dynamism improves relational capital.*

Yu *et al.* (2019) concluded that firms which maintain supply chain resilience also have improved financial performance; moreover, they discovered that supply chain dynamism leads to greater supply chain resilience via a strategic orientation, supply chain disruption orientation. As Yu *et al.* (2019) theorized, supply chain dynamism leads to improved supply chain resilience because firms are forced to adapt to their environment; furthermore, competing firms develop certain capabilities. Firms operating within dynamic environments must develop agility in order to rapidly adapt to new situations; accordingly, the organizational culture is used to such rapid change. A study of Indian firms by Kumar and Bhatia (2021) found that environmental dynamism drove internal organizational change (adaptation to industry 4.0) through organizational, human and technological factors. Organizational culture and people within the organization facilitated organizational adoption of industry 4.0 changes (Kumar and Bhatia, 2021); therefore, organizational culture is a primary facilitator of change. Supply chain dynamism creates an organizational culture that is ready for the next move. Based on this reasoning, the fourth hypothesis is proposed:

- *H4: Supply chain dynamism improves supply chain disruption orientation.*

Firms concentrate on mitigating the impacts of disruptions, and how to treat any upcoming interruptions within supply chains. Lai *et al.* (2020) found that organizational culture was critical to implementing supply chain innovation for firms implementing lean SCM in Singapore. Recently, supply chains are more dynamic as disruptions have occurred from the latest pandemic. Such organizational culture plays a critical role in developing both the exploitation innovation and exploratory innovation (Parast *et al.*, 2018). Cristopher and Peck (2004) insisted that corporations are required to establish an organizational culture for dealing with severe disruptions in order to build a resilient institution. Such an incorporated supply chain disruption orientation brings about the slightest change of existing technologies with regard to process, product, design, feature, and so on as an incremental (exploitation) innovation (Garcia and Calantone, 2002). Firms that maintain supply chain disruption orientation also strive to create new technologies, channels of distribution and/or products by constructing new demands from markets not yet realized by existing markets as radical (exploratory) innovation (Jansen *et al.*, 2006). Thus, we predict the following:

- *H5: Supply chain disruption orientation improves exploitation innovation.*
- *H6: Supply chain disruption orientation improves exploration innovation.*

The corporation's supply chain disruption orientation is a crucial strategy to conduct within dynamic supply chains (Ambulkar *et al.*, 2015). For the organization to possess supply chain disruption orientation, it must be able to reconfigure its processes and operations promptly in the entire supply chain (Parast *et al.*, 2018). This kind of organizational culture constructs the close relationship, mutual respect and trust among the supply chain's members. On the other hand, firms are not likely to achieve the intimate relationship and informal social relations without supply chain disruption orientation. Therefore, it is assumed that supply chain disruption orientation promotes and reinforces the level of reciprocity between partners in supply chains; consequently, the hypothesis of H7 could be composed as the following:

- *H7: Supply chain disruption orientation improves the level of relational capital.*

According to Blonska *et al.* (2013) relational capital may subsidize the development of relationships between supply chain participants; with these relationship improvements contributing to benefits for all members involved. While a relationship between relational capital and innovation is less known (Birkinshaw and Gupta, 2013), support for the influence of relationships on innovative utilization in supply chain literature has grown (Wenke *et al.*, 2021). There seems to be a consensus in social capital theory that relationships foster innovative behavior in firms (Rosenbusch *et al.*, 2019). From a theoretical viewpoint, relational capital facilitates greater cooperation and a sense of belonging between supply chain actors (Rajaguru and Matanda, 2013). As a result of the cooperation between channel actors, firm capacity and efficiency is developed, as firms create linkages with like-minded institutions throughout the channel (Birkinshaw and Gupta, 2013). These associations between channel 'partners' allow individual organizations to build greater environmental resilience, which allows for a greater buffering of the firm against dynamism in the market (Yu and Huo, 2019). This safeguard gives organizations, which are normally resource scarce, an opportunity to exploit innovative techniques to enhance their competitiveness. Further to this, work conducted by Laursen *et al.*, (2012) concluded that relational capital remains a key determinant with which organizations are able to successfully utilize their innovation. Organizations are able to better identify unique opportunities in markets when they have channel partners to consult with. Once channel partners provide insight or support, individual firms are able to confidently exploit their innovative approaches in the supply chain (O'Reilly and Tushman, 2013). Thus, we make the following suggestion:

- *H8: Relational capital will positively impact exploitation innovation.*

As mentioned earlier, relational capital refers to the relationships built alone the supply chain, including participants in both upstream and downstream processes (Yu and Huo, 2019). Over time, these relations foster greater levels of trust and respect among members (Wu et al., 2012). As trust becomes reciprocal, interactions between the various members becomes more regular and the communication among these individuals leads to a greater amount of knowledge being shared (Wu *et al.*, 2012). According to Yu and Huo (2019), the acquisition of knowledge by firms, introduces these organizations to new methods and processes of business. It is during this time that firms may become more comfortable with exploring alternative approaches to their commercial procedures (Birkinshaw and Gupta, 2013). For the average firm, exploring new or unique approaches to conduct their 'day-to-day business' remains an idea. While many managers see themselves as creative, their ability to explore innovative firm tactics is bounded by the organizations rational, meaning that these notions or concepts remain in the company pipeline (Yu and Huo, 2019). However, with the development of new partnerships or institutional relationships along the supply chain, firms have a greater exposure to one another (O'Reilly and Tushman, 2013). This new coverage to other organizations allows all these firms to learn and acquire knowledge from each other. Hence, through the collaboration between various channel participants, firms are able to gather important information about the ways in which their counterparts are able to modernize and improve their business operations (Yu and Huo, 2019). This process gives individual organizations several options when considering their explorative capabilities regarding innovation. Either these organizations could assess processes in the market they admire and 'leapfrog' their competition, or they could save a large number of resources by avoiding exploratory operations which are found to be less effective by channel individuals. Accordingly, the following is assumed:

- *H9: Relational capital positively influences exploration innovation.*

Social capital theory suggests that relationships act as resources for firms (Villena *et al.*, 2011). These resources could be considered as indispensable intangible assets that allow firms to gain a foothold over their organizational affairs and build sustainable advantages. For the majority of firms, a lack of new market knowledge or information results in poor firm performance as these institutions are unable to

act accordingly to market anomalies (Brusset and Teller, 2017). Thus, having the ability to obtain, and use knowledge from an organizations' supply chain partners can provide much needed support when they conduct their daily operations. Accordingly, relational capital provides firms with an opportunity to learn from other channel actors on how best to manage their supply chains. Darendeli and Hill (2016) found that more personal relationships between actors contributed particularly well to situations when the market was dynamic in nature. It seems that the vigorous escalation of market uncertainty resulted in a greater establishment of communal support through social capital (Darendeli and Hill, 2016). Also, Bakshi and Kleindorfer (2009) found that cooperative partnerships along supply channels were likely to improve the anticipation of firms towards dynamic situations, making these organizations more prepared and resilient to environmental changes. Consequently, effective management of the firms' operations is achieved through social knowledge acquirement of supply chain information, which could mitigate the negative effects certain forms of disruptions could have on the firm's position in the supply chain. Hence, with reference to the above literature, the following is assumed:

- *H10: Relational capital will have a positive impact on supply chain resilience.*

Huddiniah and ER (2019) argue that increasingly more complex supply chains require technology in order to develop better innovative performance; such technology was fundamental to an organization implementing change, whether that innovation was exploratory or exploitative. Yang *et al.* (2021) noted that exploitation innovation allows organizations to enhance their existing skills and become more specialized in their approach to the development of their supply chain processes. Therefore, firms are able to facilitate their organizational learning practices over time through carefully monitoring their surrounding commercial environment. Further to this, Birkinshaw and Gupta (2013) confirmed that exploitation innovation adds to the efficiency and effectiveness of a company in its supply chain channels on an incremental basis. For example, an organization can use existing knowledge or information to improve or broaden their understanding of the supply chain; thus, they are able to expand on existing services or products to build competency and enhance resilience of their supply chain (Laursen *et al.*, 2012). As a result, firms located at various phases in the supply chain can adapt or reinforce their business processes and structures to better deal with any changes in the business environment (Tushman and O'Reilly, 1996). By gradually assessing fluctuations in the business situation, organizations can steadily allocate resources to where they are most needed to avoid rigidity in the operations of the firm. This approach to supply chain resilience is particularly useful to more resource-stricken firms which sometimes react late to market changes or who are unable to offer-up large amounts of capital to alleviate commotions or incongruities in their supply chains (Yang *et al.*, 2021). Hence, we assume:

- *H11: Exploitation innovation will positively influence supply chain resilience.*

Exploration innovation is characterized by the firm's ability to transcend their traditional supply chains and develop new technologies, processes, or products in the channel (Yang *et al.*, 2021). While various institutions are able to scan and interpret newly acquired knowledge as they see fit, the acquisition of this original or rare knowledge affords these organizations an ability to safeguard themselves against any current or future supply chain disruptions (Raisch *et al.*, 2009). Consequently, channel participants are able to become more flexible in their overall business operations as exploratory innovation provides these firms with an opportunity to be more creative in the development and design of product, or service offerings in the supply chain (Brusset and Teller, 2017). This flexible approach is especially prudent when organizations focus on the resilience of their supply chain (Bode and Wagner, 2015). As firms procure knowledge associated with novel approaches to strengthen their supply chains, they are therefore afforded additional abilities to allocate scarce resources towards the success of their channel procedures. As a final thought on the matter, this approach towards reinforcing the supply chain, is consequently made possible, in large part, because of the additional resources exploratory innovation allows a firm to 'free up' and commit to their supply chain procedures (Yu and Huo, 2019). Therefore, according to the literature, we take on that:

- *H12: Exploration innovation will positively influence supply chain resilience.*

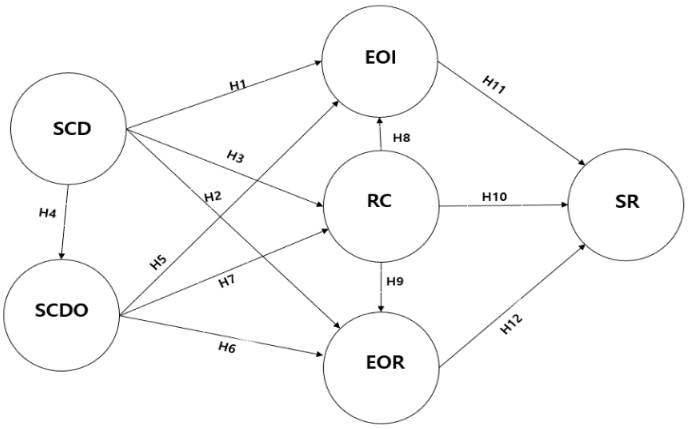

Figure 1 Conceptual Framework
Note: Supply chain dynamism (SCD), Supply chain disruption orientation (SCDO), Exploitation innovation (EOI), Relational capital (RC), Exploration innovation, and supply chain resilience (SR)

Table 1 Operationalization of the Research Instrument

Variable	Operational definition	Measurement items	Prior research
Supply Chain Dynamism	The degree to which supply chains are changing.	〔SCD1〕 At my company, new products account for most of total revenue.	Zhou and Benton (2007)
		〔SCD2〕 At my company, products and services are changed frequently.	
		〔SCD3〕 At my company, operations become outdated quickly.	
		〔SCD4〕 At my company, unexpected and disruptive events happen frequently(e.g. shocks, disruptive technologies).	
Supply Chain Disruption Orientation	The degree to which an organization 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.	
Exploration Innovation	The degree to which an organization 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 organization 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.	
Supply Chain Relational Capital	The degree to which an organization develops and maintains good relations within its supply chain	〔RC1〕 Our relationship with our partners is characterized by close interactions.	Carey *et al.* (2011)
		〔RC2〕 Our relationship with our partners is characterized by mutual trust.	
		〔RC3〕 Our relationship with our partners is characterized by mutual respect.	
		〔RC4〕 Our relationship with our partners is characterized by high levels of reciprocity.	
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)
		〔SR2〕 Our firm's supply chain has the ability to maintain a desired level of connectedness among its members at the time of disruption.	
		〔SR3〕 Our firm's supply chain has the ability to maintain a desired level of control over structure and function at the time of disruption.	
		〔SR4〕 Our firm's supply chain has the knowledge to recover from disruptions and unexpected events.	
		〔SR5〕 Our firm's supply chain is well prepared to deal with the financial outcomes of supply chain disruptions.	
		〔SR6〕 Our firm's supply chain can move to a new, more desirable state after being disrupted.	

3. METHODOLOGY

The survey questions are presented and can be viewed in **Table 1** with corresponding operational definitions and references. Additionally, the development of each construct from the extant literature and corresponding items are found in the text that follows.

Supply chain dynamism refers to the level of volatility within a firm's supply chain (Zhou and Benton, 2007). Additionally, several authors have utilized the construct developed by Zhou and Benton (2007) while researching supply chain dynamism (Yu *et al.*, 2019). Accordingly, four items were adopted to measure supply chain dynamism.

Bode *et al.* (2011) described supply chain disruption orientation as the collective organizational effort to both learn from and prepare for disruptions. Regarding this research, four items were adapted from Bode *et al.* (2011). The construct developed by Bode *et al.* (2011) is a popular choice for those investigating supply chain disruption orientation (Yu *et al.*, 2019).

Ambidextrous innovation is frequently measured using two distinguished measures of innovation, specifically, exploration innovation and exploitation innovation (Wenke *et al.*, 2021). Exploration innovation stresses the innovation activities that correspond to new solutions either creatively developed or adopted from outside the firm through exploring what others have done. This construct is frequently measured by four items developed by He and Wong (2004).

Exploitation innovation highlights the implementation of tried and tested solutions that usually originate from within the organization (Chang *et al.*, 2011; Wenke *et al.*, 2021). A four-measurement construct was adopted from the work of Chang et al (2011) for this study.

Relational capital is a measure of the feelings between a focal firm and its supply chain partners; moreover, there are five items that measure that relationship including, close interactions, trust, respect, friendship and reciprocity (Carey *et al.*, 2011). Several authors have utilized this construct as a measure of relational capital (Yu and Huo, 2019).

Supply chain resilience refers to a firm's ability to either maintain operations or quickly recover and improve their operations after a supply chain disruption (Golgeci and Ponomarov, 2013). Six items are used to measure supply chain resilience including questions that measure the firm's ability to recover from disruptions and maintain operations when supply chain disruptions occur. As this topic has become quite popular of late, several authors have referred to this measurement of supply chain resilience (Yu *et al.*, 2019; Wong *et al.*, 2020).

Data collection was conducted by a third party that specialized in data collection in April of 2021 using an online survey process distributed by email to connect with the sample base. Although 1000 companies were initially contacted, a total of 245 responses were returned within the specified collection period. Of the 245 responses returned, 227 responses were deemed acceptable for use in the current study. The remaining questionnaires were excluded due to missing data and unengaged responses. A 5-point Likert scale was utilized to measure the items of each construct. The majority of the companies, 189 companies (83%), had a turnover of less than 50 billion USD. More than 78% of the companies that were analysed had been in operation for over 6 years. Finally, PLS-SEM analysis was conducted; the results are available in the following section.

4. RESULTS

Liao and Widowati (2021) found that PLS-SEM has emerged as a predominant SEM method; thus, this is the selected method for analysis. The outer model (items representing their constructs) of a psychosomatic empirical model should be confirmed utilizing several measures before the inner model (the relationships between the variables) can be examined when using PLS-SEM (Hair *et al.*, 2014). The values for reliability and validity can be viewed in **Table 2**: Outer Model Assessment. Composite reliability (CR), a measure of internal consistency reliability should be examined; moreover, the threshold for an acceptable value is above 0.7 (Hair et al., 2014). Another measure of internal consistency reliability is Cronbach's Alpha (Cα); moreover, its threshold while studying variables at the organizational level is any score above 0.6 (Hair et al., 2014; Nunnally and Bernstein, 1994). As indicated in **Table 2**, all values are above their respective thresholds, thus internal consistency and reliability is confirmed for all variables.

Table 2 Outer Model Assessment

Variable	Factors	Standard load	AVE (AVE > 0.5)	Construct Reliability (C.R > 0.7)	Cronbach's Alpha (α > 0.6)
Supply Chain Dynamism	SCD1	0.774	0.567	0.839	0.749
	SCD2	0.820			
	SCD3	0.717			
	SCD4	0.697			
Supply Chain Disruption Orientation	SCDO1	0.806	0.661	0.886	0.828
	SCDO2	0.771			
	SCDO3	0.875			
	SCDO4	0.797			
Exploration Innovation	EOR1	0.813	0.693	0.900	0.852
	EOR2	0.842			
	EOR3	0.859			
	EOR4	0.815			
Exploitation Innovation	EOI1	0.845	0.599	0.856	0.776
	EOI2	0.853			
	EOI3	0.746			

Table 2 Outer Model Assessment (Con't)

Variable	Factors	Standard load	AVE (AVE > 0.5)	Construct Reliability (C.R > 0.7)	Cronbach's Alpha (α > 0.6)
Relational Capital	RC1	0.757	0.659	0.885	0.827
	RC2	0.828			
	RC3	0.848			
	RC4	0.812			
Supply Chain Resilience	SCR1	0.737	0.543	0.877	0.831
	SCR2	0.778			
	SCR3	0.760			
	SCR4	0.762			
	SCR5	0.698			
	SCR6	0.681			

Table 3 FornellLarcker Criterion

	EOI	EOR	RC	SCD	SCDO	SCR
EOI	**0.816**					
EOR	0.782	**0.833**				
RC	0.411	0.357	**0.812**			
SCD	0.491	0.460	0.244	**0.753**		
SCDO	0.621	0.585	0.342	0.561	**0.813**	
SCR	0.574	0.509	0.541	0.357	0.581	**0.737**

Notes: EOI: Exploitation Innovation; EOR: Exploration Innovation; RC: Relational Capital; SCD: Supply Chain Dynamism; SCDO: Supply Chain Disruption Orientation; SCR: Supply Chain Resilience

Validity can be confirmed through two tests: (1) average variance extracted (AVE) values above 0.5 and (2) the Fornell and Larcker (1981) Criterion test (Hair *et al.*, 2014). Convergent validity can be confirmed when the variable AVE score is above 0.5 (Hair *et al.*, 2014). All AVE values are above 0.5, therefore convergent validity is confirmed. Finally, discriminant validity should be considered. The most stringent (hardest to prove) test for discriminant validity is the Fornell and Larcker (1981) Criterion test (Henseler *et al.*, 2009). According to Fornell and Larcker (1981) if the squared AVE scores are more than the squared correlation scores discriminant validity can be confirmed; that is indicated in **Table 3**.

After the outer model has been confirmed the relationships between the variables can be examined. While utilizing PLS-SEM both pathway coefficients and associated significance scores should be assessed in order to understand the impacts of the variables (Hair *et al.*, 2014). Pathway coefficient significance was measured by bootstrapping to 600. Hair *et al.* (2014) suggests p-values above 0.10 be rejected; according to the bootstrapping results two pathways were rejected while all others were accepted. The results can be reviewed in **Table 3**. Hypothesis 3, supply chain dynamism to exploration innovation and hypothesis 12, exploration innovation to supply chain resilience are rejected based on high p-values.

Table 4 Pathway Assessment

Hypotheses	Pathways	Pathway Coefficient	t-stats	p-value	Results
H1	SC Dynamism → Exploitation Innovation	0.192	3.200	0.001	**Accepted**
H2	SC Dynamism → Exploration Innovation	0.179	2.750	0.003	**Accepted**
H3	SC Dynamism → Relational Capital	0.077	0.936	0.175	Rejected
H4	SC Dynamism → SC Disruption Orientation	0.561	9.736	0.000	**Accepted**
H5	SC Disruption Orientation → Exploitation Innovation	0.440	7.092	0.000	**Accepted**
H6	SC Disruption Orientation → Exploration Innovation	0.428	5.567	0.000	**Accepted**
H7	SC Disruption Orientation → Relational Capital	0.299	3.119	0.001	**Accepted**
H8	Relational Capital → Exploitation Innovation	0.214	3.792	0.000	**Accepted**
H9	Relational Capital → Exploration Innovation	0.167	2.483	0.007	**Accepted**
H10	Relational Capital → SC Resilience	0.361	4.720	0.000	**Accepted**
H11	Exploitation Innovation → SC Resilience	0.332	3.624	0.000	**Accepted**
H12	Exploration Innovation → SC Resilience	0.121	1.319	0.094	Rejected

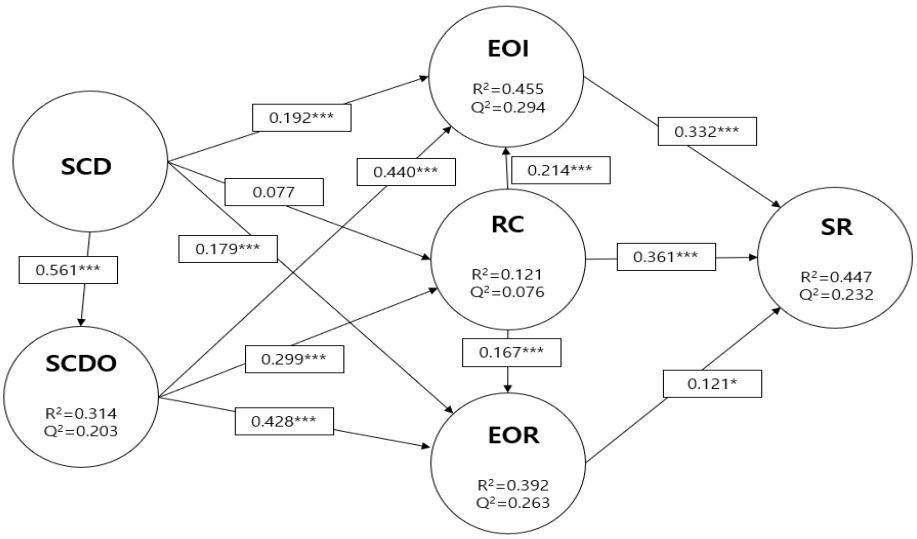

Figure 2 Results of the Analysis
Note: Supply chain dynamism (SCD), Supply chain disruption orientation (SCDO), Exploitation innovation (EOI), Relational capital (RC), Exploration innovation, and supply chain resilience (SR)

Additional consideration should go toward the effects of each variable and the summation of those effect. Pathway coefficients represent the percentage of total explained variance for each variable's impact (Hair *et al.*, 2014); for example, considering the first pathway coefficient is 0.192 that implies that 19.2% of the explained variance is a result of supply chain dynamism; moreover, supply chain dynamism explains 19.2% of exploration innovation variance explained in this model. The remainder of the pathways can be interpreted as above. Supply chain dynamism positively impacted exploratory innovation (0.179), and supply chain disruption orientation (0.561). Supply chain disruption orientation positively affected exploitation innovation (0.440), exploration innovation (0.428), and relational capital (0.299). Relational capital positively impacted exploitation innovation (0.214), exploration innovation (0.167), and supply chain resilience (0.361). Finally, exploitation innovation (0.332) improved supply chain resilience and exploration innovation (0.121) both advanced supply chain resilience respectively

After estimating the pathway coefficients of the inner model, it is essential to probe the coefficient of determination (R^2) and the cross-validated redundancy (Q^2) (Hair *et al.*, 2014). R^2 (coefficient of determination) is a value of the research model's predictive accuracy for the endogenous variables: values are evaluated according to the impacts: substantial impact (greater than 0.75), moderate impact (greater than 0.50 but less than 0.75) and weak impact (greater than 0.25 but less than 0.50) (Hair *et al.*, 2014). According to the above criteria, all dependent variables of the inner model exhibit a weak impact. Nevertheless, structural equation models with weak predictive impacts are recognized as valuable for practitioners and scholars alike.

Cross-validated redundancy (Q^2) is a value of predictive relevance; any value above 0 is designated to be acceptable (Hair *et al.*, 2014). Values for Q^2 of endogenous variables are 0.203 for supply chain disruption orientation, 0.263 for exploration innovation, 0.294 for exploitation innovation, 0.076 for relational capital, and 0.232 for supply chain resilience. Figures for both R^2 and Q^2 can be reviewed in **Table 5**: Structural Model Assessment.

Table 5 Structural Model Assessment

Endogenous variables	R^2	Q^2
Supply Chain Disruption Orientation	0.314	0.203
Exploration Innovation	0.392	0.263
Exploitation Innovation	0.455	0.294
Relational Capital	0.121	0.076
Supply Chain Resilience	0.447	0.232

Finally, goodness-of-fit is measured for all structural equation models. However, it is understood that there is no universal measure (Hair *et al.*, 2014). Consequently, others dispute that it should be the decision of the researcher to determine a measure (Henseler and Sarstedt, 2013). Two frequently acceptable measures have emerged while using PLS-SEM (Sarstedt *et al.*, 2014; Wetzel *et al.*, 2009) For this research, we chose the measurement to be introduced by Wetzel *et al.* (2009), due to the fact that it provides a better resolution to judge the grade of fit as minor (0.1 or above), moderate (0.25 or above) or great (0.36 or above). Accordingly, the goodness-of-fit for this research model is great (0.4158); this information is available in **Table 6**: Goodness-of-fit.

Table 6 Goodness-of-Fit

Description	Value	Baseline value	Reference
Goodness of Fit (GoF)	$\sqrt{\text{Cut} - \text{off of AVE X average of R\_}square}$ = $\sqrt{0.5\text{X } 0.3458}$ = **0.4158**	GoF *small* = 0.1 GoF *medium* = 0.25 GoF *large* = 0.36	Wetzels *et al.* (2009)

Evaluating the mediation effects is an opportunity to review the value of the relationships between the variables; moreover, several assessments exist for testing mediation, but the Sobel test is the most commonly used test (Hair *et al.*, 2014; Nitzl *et al.*, 2016; Cepeda *et al.*, 2018). In order to conduct the mediation effect, the Sobel test was utilised; the values can be reviewed in **Table 7**: Mediation Effects of the Sobel Test. Accordingly, several mediation effects were revealed. Exploitation innovation mediated the relationship between supply chain dynamism and supply chain resilience. Supply chain disruption orientation was found to be a particularly strong mediation variable. It mediated the relationship between supply chain dynamism and three other variables, exploitation innovation, relational capital, and exploration innovation. Relational capital was found to mediate the relationship between supply chain disruption orientation and supply chain resilience. Exploitation innovation mediated the relationship between supply chain disruption and supply chain resilience. At the same time, exploitation innovation mediated the relationship between relational capital and supply chain resilience. Other pathways were tested but did not prove to be significant. A detailed discussion of the results is available in the subsequent section.

Table 7 Mediation Effects of the Sobel Test

Mediating Pathways:	Mediation Effect (Z-value)	P-value
H11: Supply Chain Dynamism → **Exploitation Innovation** → Supply Chain Resilience	2.3942***	0.008
H12: Supply Chain Dynamism → **Supply Chain Disruption Orientation** → Exploitation Innovation	5.7218***	0.000
H13: Supply Chain Dynamism → **Supply Chain Disruption Orientation** → Relational Capital	2.9646***	0.001
H14: Supply Chain Dynamism → **Supply Chain Disruption Orientation** → Exploratory Innovation	4.1893***	0.000
H15: Supply Chain Disruption Orientation → **Exploitation Innovation** → Supply Chain Resilience	3.2167***	0.000
H16: Supply Chain Disruption Orientation → **Relational Capital** → Supply Chain Resilience	2.6045***	0.004
H17: Relational Capital → **Exploitation Innovation** → Supply Chain Resilience	2.6237***	0.004

Note: Mediating variables are in bold.

5. DISCUSSION

COVID-19 has led to major disruptions in the production and supply of products, while social distancing procedures in organizations have created additional pressures on both managers and employees. Consequently, organizations have been forced to recondition and realign their supply chains to produce product offerings based on the resilience of their supply chains. As a result of this, the current study draws on the hypotheses presented to discuss the findings in greater detail. Brusset and Teller (2017) notes that resilience is viewed as an operational capability that requires internal firm processes and coordination and collaboration with partners in the supply chain to ensure the efficient flow of information. Accordingly, competitive advantages in the resilience of supply chains are best achieved when resources are deployed and shared efficiently and effectively through supply chain partnering and organizational partnering (Rajaguru and Matanda, 2013). The current research has found strong support for relational capital as a construct, which improved both the processes of exploitation innovation and exploration innovation in firms, while increasing the resilience of an organizations SC.

Regarding the results of the inner model analysis and mediation effects, there is much to consider. Supply chain dynamism has its greatest impact upon organizational culture (supply chain disruption orientation) with a pathway coefficient of 0.561 and a high degree of significance. This indicates that rapidly changing supply chains impact an organization's culture as was corroborated by others (Kumar and Bhatia, 2021; Yu *et al.*, 2019). It seems American organizational culture is similarly impacted as with those found in Chinese and Indian firms. Dynamic supply chains force organizations to remain alert and ready for action as Hohenstein *et al.* (2015) suggested. When changing supply chains disrupt the organization, the organization's culture responds.

Supply chain disruption orientation (the organization's culture) also induces a high degree of change within the organization. The culture significantly impacts relational capital (0.299***); therefore, the organization builds better relationships with its suppliers in order to improve capabilities. This is in line with what was theorized, as supply chain disruption orientation, a powerful strategic orientation amid dynamism, will induce important relational factors such as trust, respect, etc.; thus, relational capital is improved.

When an organization is able to recognise the critical roles, suppliers play in maintaining operations, they will emphasize ways to build better relations with that supplier, as it is critical to operational success. Other have emphasized the role of supply chain disruption orientation in developing critical capabilities; this is evidence of its ability to benefit relational capital, something not previously proven.

Organizational culture (supply chain disruption orientation) also improves both exploitation innovation (0.440 and exploration innovation (0.428***) similarly; thus, indicating innovation ambidexterity. As suggested by Hohenstein *et al.* (2015), readiness (supply chain disruption orientation) leads to response (innovation). Organizations that are ready for change rapidly respond to change (Spieske and Burkel, 2021). A disruptive culture will readily induce change.

Supply chain dynamism also significantly impacted both exploitation innovation and exploration innovation indicated some degree of ambidexterity as theorized by Eisenhardt *et al.* (2000). Changes to the supply chain invoke changes to both exploitation innovation and exploration innovation. Indeed, dynamism seems to impact both types of innovation remarkably the same. This is in line with contingency theory suggesting that organizations will adapt to changes in their environment (Dess and Beard, 1984; Miller and Friesen, 1983). The impacts of each type of innovation upon supply chain resilience is different. Exploitation innovation significantly improves supply chain resilience (0.332***) while exploration innovation is much less impactful (0.121*). This indicates that one type of innovation (exploitation) is more meaningful to supply chain resilience than the other. The findings confirm that firms might benefit from a focus on either exploration or exploitation depending on the environment the firm operates within. While several studies (Tushman and O'Reilly, 1996) find support for the simultaneous support of exploitation and exploration of innovation, Birkinshaw and Gupta (2013) established that these constructs were distinct choices. Firms may be located in the same SC; however, the diverse architecture of each firm would sometimes require a company to focus on either exploration or exploitation to conserve resources (O'Reilly and Tushman, 2013). Thus, switching between exploration and exploitation innovation may represent a practical alternate to ambidexterity (Wenke *et al.*, 2021). This corroborates what other authors suggested regarding ambidexterity and crisis (significant dynamism). Doblinger *et al.* (2020) noted that ambidextrous German firms did not improve stability amid dynamism. Additionally, Wamba *et al.* (2020) concluded that ambidexterity did not improve performance amid dynamism. It seems that dynamism may lead to ambidexterity (agility and flexibility as is theorized by Eisenhardt *et al.* (2000)), but exploitation innovation improves supply chain resilience. This is possible because exploitation activities are mostly rapid solutions as indicated by March (1991). Exploration innovation requires more time. By the time exploration innovation solutions have been enacted they may well be outdated; worse, they took time that left the organization inoperable. Exploitation innovation modifications are changes that are already available to the firm. They are changes that are quick to implement because they are already known to the organization. It seems dynamism may instigate ambidexterity, but ambidexterity may not bring on supply chain resilience.

Relational capital significantly improved both exploitation innovation (0.214***) and exploration innovation (0.167***); therefore, also contributing to ambidextrous innovation. It should be noted that relational capital was more beneficial to exploitation innovation. That is likely because it is regarding current relationships whereas exploration innovation is likely regarding unestablished relationships with new suppliers. Good relationships with current suppliers make it easier to implement proven innovative solutions. If organizations work to improve such relations, they can streamline rapid solutions even amid dynamism. Additionally, it seems that relational capital is less important to exploration innovation (new solutions); however, that may be because those relationships remain nascent. While this result might be considered an anomaly, research has shown that the relationship between SC dynamism and relational capital is better exercised when relational capital acts as a moderator between SC dynamism and SCR (Zhou and Benton, 2007). Relational capital seems to be the most important factor for developing supply chain resilience. Supply chain relationships can build up the sharing of information allowing firms to make plans when they are aware of disruptions before they occur. Knowledge sharing and sharing of solution generation are likely keys to developing supply chain resilience amid dynamism. Firms with good relations share information and work together better than those with poor relationships. From an institutional perspective, firms are able to benefit from relational capital (Peng *et al.*, 2009). Dynamism or a general insufficiency of resources means that firms benefit from closer formal and informal relational ties. Rosenbusch *et al.* (2019) echoes this sentiment and noted that the creation of external knowledge sources was fundamentally important to the safety and success of a firms SC. Knowledge on institutional influences remains an important condition (Peng *et al.*, 2009). Limitations to knowledge acquisition may leave firms over-exposed to SC disruptions. Therefore, an orientation towards minimizing SC disruption benefits organizations greatly (Raisch *et al.*, 2009). The hypotheses support the notion that SC disruption orientation also benefits the SC of firms. A firm that is able to use newly acquired knowledge and learn from previous disruptions and maintain an awareness of the business environment is considered orientated towards the management and survival of their SC (Bode and Wagner, 2015). As a final thought, exposure to SC dynamism is not necessarily a threat for firms. As the findings suggest, when organizations are introduced to greater dynamism in the environment, they are presented with additional opportunities where they can develop their SC disruption orientation (Yu *et al.*, 2019).

6. CONCLUSION

This paper has aimed to answer the call for more research related to the topic of SCR and the development of capabilities which can provide tactics to assist firms in achieving success (Hendricks, 2005; Yu and Huo, 2019). Also, this study focused on the development and testing of an integrated theoretical framework examining the relationships among supply chain dynamism, SCDO, SCR, and financial performance. Resilience in the supply chain is achieved when

the SC can withstand disruptions, unforeseen events, or upheavals and is still able to deliver products and/or services under these conditions (Brusset and Teller, 2017). These finding therefore enhance current research in supply chain literature. For managers and researchers alike, support for research suggesting an orientation towards mitigating disruption in the supply chain presents support for the apportionment of firm resources to manage outlier events (e.g., COVID-19) more efficiently (Addo *et al.*, 2020); resulting in organizational effectiveness and improved productivity (Wenke *et al.*, 2021).

When supply chains operate in an effective and efficient manner, they contribute towards the improvement of customer fulfilment requests and assist in freeing up scarce and valuable resources for these organizations. Therefore, the resilience of a firms supply chain may increase the returns on assets and investments for firms and expand on possible shareholder value. The current study has aimed to contribute to the advancement of both theory and practice in the field of supply chain management. The study was importantly able to establish a positive effect of exploitative innovation and relational capital on SCR providing insight into the importance of institutional relationships in developing the resilience of SCs. For example, support was found for positive impact of relational capital, exploitation innovation, and exploration innovation of organizational supply chain resilience. From a managerial perspective, these findings support the notion that firms should consider leveraging their current capabilities to develop core competencies related to relationship building and innovation development (Kumar and Bhatia, 2021). When considered from the viewpoint of research expansion, these findings suggest two important correlations: (1) that networking throughout the supply chain has a positive effect on resilience in that ecosystem, and therefore requires supplementary consideration (Sinkovics *et al.*, 2018), and (2) innovation exploitation and exploration benefits the dependability of the supply chain, additionally necessitating a more in-depth review in supply chain literature (Gu *et al.*, 2021).

While many companies could spend decades acclimatizing their supply chains to deliver just enough components or materials to tone with production schedules and to hold down costs, the absence of backup stocks due to supply chain disruptions have left a great deal of firms overexposed due to inconsistencies in order fulfilments. Developing robust SC initiatives such as SCDO and SCR can provide managers with effective strategies to deal with risk and recover from SC disruptions such as the ones mentioned. Consequently, the results provide guidelines for managers committing resources to supply chain initiatives in order to achieve superior performance when supply chain dynamism is greater.

Finally, an important issue has emerged from the current research regarding exploitation and exploration innovation. As noted in past literature (Tushman and O'Reilly, 1996), these two constructs are often 'bundled', or meshed into a single construct referred to as 'ambidexterity' (Li *et al.*, 2013). While in an unprejudiced setting these truths may hold; in the dynamic nature of a global supply chain, a closer inspection of these variables is required (Birkinshaw and Gupta, 2013). Results from the current study show that the exploitation and exploration of innovation were divergent adoptions an organization could utilize (Lu *et al.*, 2019). These findings are consistent with the work of (Wenke *et al.*, 2021) who found that firms were better able to manage their resource allocations by switching between exploration and exploitation innovation. Thus, by viewing these constructs independently, managers are presented with a more practical alternate with which to create sustained advantages for the company and greater returns for stakeholders (Baz and Ruel, 2021).

Limitations and Future Research

With the advent of the COVID-19 pandemic, the efficiency and effectiveness of the supply chains of firms have been called into question. While the current paper has focused on addressing antecedents responsible for greater resilience in the supply chain, several limitations are acknowledged. Firstly, the current research has focused on firms in the U.S. To reduce sample bias, future research could choose to conduct a cross-country analysis of the data. Furthermore, certain control variable (industry or product specific) could be included in future studies to better define the results.

With respect to the empirical approach of this research, the current paper relied on responses from owner, managers, or other individuals involved directly with the supply chain. Thus, the study did not investigate the perspective of employees and other stakeholders. Consequently, future studies could consider a wider range of stakeholders to produce in-depth findings.

Many studies select organizations currently in operation. Therefore, the constructs selected for study may be the very same which led to organizational success, thus maximizing the upside and not reduce the downside regarding SCR performance. Thus, future studies may consider comparative studies based on an organization's status (either operating or not in operation).

Finally, future research could also choose to investigate the location-specific advantages certain firms enjoy. For example, firms that benefit from agglomeration advantages, or are located in port cities and benefit from efficiency-specific advantages could respond to supply chain related questionnaires differently than firms that do not enjoy these advantages.

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