

Supply chain innovation and financial performance in ASEAN manufacturing firms: The moderating role of organisational innovation

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ABSTRACT

This study investigates the relationship between supply chain innovation and financial performance in ASEAN manufacturing firms. Also, the study examines the moderating effect of organisational innovation in facilitating the impact of supply chain innovation on financial performance. The study utilises data regarding supply chain innovation, firm financial performance, and organisational innovation collected from the WorldBank Enterprise Survey. We employ the multilevel mixed-effects linear model to analyse the hierarchical data structure. The results confirm the important role of supply chain innovation in improving firms' financial performance in ASEAN countries. Moreover, organisational innovation significantly moderates the relationship between supply chain innovation and firms' financial performance.

1. Introduction

Globalisation with intensive competitiveness has required organisations to adapt quickly to dynamic environments. In this context, innovation associated with the latest knowledge and technologies has been considered as one of the crucial driving forces for economic growth (Na & Kang, 2019). Remarkably, innovation appearing along various supply chain elements, including business processes, information technologies, sourcing, logistics, distribution, and other supporting practices, is suggested as a tactical weapon to achieve competitive advantages and sustain long-term performance (Gao et al., 2017).

As innovation often requires enormous investment, updated technology, and high risk, innovation activities are found more successful in developed nations. Thus, research on supply chain innovation has been published mainly in the context of North America and Europe (Jajja et al., 2020; Wong & Ngai, 2019) and left the innovation situation in developing regions relatively unknown. However, with a dramatic movement of manufacturing operations from advanced nations to the Asian region, the role of Asian countries has become more critical in the global value chain. Particularly, the ASEAN (Association of Southeast Asian Nations) is a promising region in terms of both production and market potential with its young and huge population as well as increasing consumption power (Na & Kang, 2019). The ASEAN was one of the world's fastest developing regions, with a growth rate of 4.4% in 2022, and is forecasted to maintain this trend in the coming years (Asian Development Bank, 2023). If the ASEAN is considered as one economy, it is possible to become the fourth largest in the world by 2050 (Asian Development Bank, 2023). The region is strengthening its role in the global supply chain which offers investors various opportunities to access not only the ASEAN market but also other world-leading economies through this area.

In the global supply chain, the ASEAN region represents a complex production network with suppliers, transit nodes, and ultimate markets. Particularly, the manufacturing sector has substantially contributed to the economic growth and social development in ASEAN countries. Innovation is regarded as a crucial way to seek improvement opportunities across the manufacturing value chain. As such, this trend has attracted the attention of scholars investigating supply chain innovation in transition economies. However, due to resource constraints, the effect of supply chain innovation has been relatively unclear or at a low level in developing countries (Ling & Nasurdin, 2010). As a result, there is a lack of literature on supply chain innovation as well as its benefits for firms' improvement in transition economies (Na & Kang, 2019).

Moreover, previous studies in the field of supply chain innovation confined themselves to a limited geographic scope, such as in the USA (Ojha et al., 2016); Taiwan (Cheng et al., 2014), and European countries (Munksgaard et al., 2014). Therefore, there is a need to study from a more extensive perspective and diverse sample. Some recent studies employed data sets collected worldwide to look for broader insights into how innovation implementation at a firm level. These studies primarily discussed a single aspect of innovation, such as product innovation (Ali et al., 2023), process innovation (Goel & Nelson, 2018), and logistics innovation (Holl & Mariotti, 2022). Although there are studies about the linkage between organisational innovation and other innovation types, such as product and process innovation (Anzola-Román et al., 2018), the interaction between supply chain innovation and different types of innovation still lacks evidence.

To address these research gaps, this study aims to examine the effect of supply chain innovation practices on firms' financial performance, with a moderating effect from organisational innovation in the context of manufacturing firms in ASEAN. The results of this study contribute to enriching the literature on innovation and its benefits for manufacturing firms in emerging countries. Also, the study provides practical implications for managers on effective resource allocation into innovative activities to achieve higher performance.

2. Literature review and hypothesis development

2.1. Supply chain innovation

The field of Supply Chain Innovation (SCI) has grown significantly over the past decades (Hoang et al., 2023). Not only scholars in supply chain management but also those from other management disciplines have become interested in the innovations occurring along the supply chain, such as information management systems, network design, technology development, and so on (Jajja et al., 2020).

Many studies are working on the supply chain innovation field to provide a better understanding of this concept. Kabadurmus (2020) defines SCI as "incremental to radical changes in product, process, marketing, technology, resource and/or organisation, which are associated with all related parties" (Kabadurmus, 2020, p. 145). Yuan et al. (2019, p. 01) believe that SCI includes "new production, marketing, or logistics processes that use technology and process innovations to generate information processing and new logistics services" to improve the firm performance. From the literature, innovation in the context of the supply chain has previously been described from a variety of angles. The level of innovation in the supply chain would range from incremental to radical size (Kabadurmus, 2020) with the common purposes of improving firm performance and bringing higher values to stakeholders in the entire supply chain (Jajja et al., 2020). The scope of the innovation in the supply chain expands beyond the

traditional innovation types to include not only product and process innovation but also tech-based supporting activities (Abdelkafi & Pero, 2018; Kabadurmus, 2020) and logistics systems (Yuan et al., 2019). Luomaranta and Martinsuo (2020) highlighted the importance of innovation activities across various stages of the supply chain, ranging from business processes, technology, structure, and supportive environment. As such, all related partners in the whole supply chain network would benefit from these practices.

Based on the literature, we understand SCI in the manufacturing context as the improvement or new practices in the internal operations (production methods, maintenance), the logistics and IT-enabler supporting activities for both upstream supply chain (purchasing or distribution of inputs), downstream one (delivery), and the whole network (accounting, computing systems).

2.2. The relationship between supply chain innovation and firms' financial performance

Previous studies have worked on numerous theoretical perspectives to explain the linkage between supply chain innovation and firm performance. Resource-based view is among the most widely advocated theories in the literature (Wong & Ngai, 2019; Yuan et al., 2019). It refers to a collection of assets and capabilities that are unique and critical to the firms' superior performance as well as enable firms to create and sustain competitive advantages (Barney, 2001). The lens of resource-based theory has been employed to explain various aspects of supply chain management such as network collaboration and technology-enabled operations capability (Nandi et al., 2020); sustainable supply chain (Khan et al., 2023; Shibin et al., 2020), and supply chain innovation (Andersen, 2021; Manocha & Srail, 2020).

Among a bundle of resources, supply chain innovation and its role in building firm competitive advantages have attracted research interest from many scholars. To understand the impact of SCI, different research approaches have been applied such as *case studies* (Trautrimis et al., 2017) or *empirical survey-based approach* (Turkulainen & Swink, 2017). Many studies focus on advanced countries such as the US (Lui et al., 2016; Ojha et al., 2016), developed country group including Austria/Germany/Finland Italy/Japan/South Korea/Sweden/U.S. (Salvador & Villena, 2013), and European countries (Trautrimis et al., 2017). Meanwhile, besides a few studies investigating SCI in a single developing country such as China (Lee & Shen, 2020; Wang & Hu, 2020) and Pakistan (Afraz et al., 2021), there is a lack of evidence from other developing countries, especially in emerging ASEAN area. This study addresses this limitation of existing literature by offering empirical evidence on SCI in ASEAN manufacturing firms.

Regarding the relationship between SCI and firms' performance, there are studies investigating different dimensions of SCI including product innovation (Babina et al., 2024), process innovation (Goel & Nelson, 2018), as well as the involvement of innovative partners along the supply chain (Amling & Daugherty, 2020; Lee & Shen, 2020). Among pioneering investigations within the business-to-business additive manufacturing context, Luomaranta and Martinsuo (2020) underscored the significance of innovation at different levels of the supply chain. Notably, in the research context of Asian countries, Afraz et al. (2021) examined the relationship between SCI and competitive advantage with the mediating role of risk management capabilities. Based on 240 responses collected from supply chain managers in Pakistan, the study provided empirical evidence on the positive impact of SCI that further offered insights into the necessity of investment in technology and process innovation in developing countries. Kwak et al. (2018) studied how supply chain innovation influences risk management capabilities and in turn, enhances competitive advantages. Analytical results from 174 manufacturers and logistics

intermediaries in South Korea show that supply chain innovation facilitates robustness capability and resilience capability, which in turn significantly contribute to the competitiveness of the firms. The results from previous studies support the contributions of supply chain innovation to firm performance.

From these arguments, we state our hypotheses as follows:

H1: New or significantly improved methods of manufacturing products or offering services have a positive impact on firms' financial performance

H2: New or significantly improved logistics, delivery, or distribution methods for inputs, products, or services have a positive impact on firms' financial performance

H3: New or significantly improved supporting activities for processes, such as maintenance systems or operations for purchasing, accounting, or computing, have a positive impact on firms' financial performance

2.3. Moderating effect of organisational innovation on the relationship between supply chain innovation and firms' financial performance

Organisational innovation could be understood as the acceptance and implementation of novel initiatives or behaviours that are new to the organisation (Hage, 1999). It could also be viewed as a broad concept comprising strategies, structural, and behavioural aspects (Bas et al., 2015). Therefore, the diffusion of these ideas may change the organisational structure, new types of management, and working conditions (Kahn, 2018). Also, organisational innovation represents a highly interactive relationship with most management practices in a firm.

Among different types of innovation, Damanpour and Aravind (2012) suggest organisational innovations as a part of managerial innovation and explain it as a separate approach compared to technological innovation. Previous studies explored the importance of organisational innovation in different contexts and provided empirical evidence about the supporting role of organisational innovation as an antecedent of other innovation types. Azeem et al. (2021), based on 294 responses collected from industrial managers in Pakistan, demonstrated that organisational culture facilitates knowledge-sharing and innovation activities and, in turn, contributes to improving manufacturing capabilities. By testing data from 204 SMEs in Ghana, Donbesuur et al. (2020) illustrated that elevated levels of organisational and technological innovations would jointly enhance the firms' performance. Anzola-Román et al. (2018) indicate the positive effect of organisational innovation on technological innovation in Spanish firms. Bas et al. (2015) figured out that Luxembourg firms tend to persist in product and process innovation more if they have organisational innovation. These studies highlighted organisational innovation primarily as a facilitator for product and process innovations. Nevertheless, the interaction between SCI and organisational innovation has been less taken into consideration in the current literature.

Supply chain innovation refers to innovative activities along the supply chain, including both primary and supporting activities from sourcing, and making to distributing products and services to ultimate customers. Organisational innovations would occur in various phases of supply chain innovation, from upstream processes to the downstream ones. Although the influence of organisational innovation on the success of different innovation types has not been fully demonstrated in the literature, some previous studies found potential benefits of combining it and other innovations to improve firm performance (Anzola-Román et al., 2018). To fill the scarcity of studies regarding organisational innovation and SCI, and to confirm the role of

organisational innovation in various stages of SCI, it is believed that higher organisational innovation can act as a positive moderator, enhancing the linkage between SCI and firms' financial performance. Therefore, we propose hypotheses as follows:

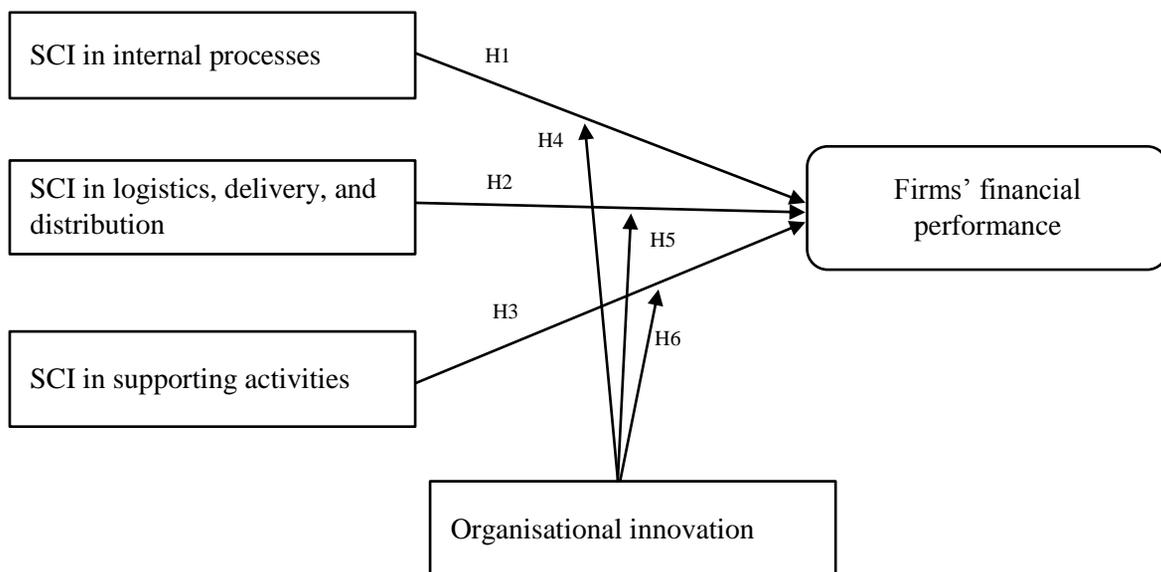
H4: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved methods of manufacturing products or offering services and firms' financial performance

H5: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved logistics, delivery, or distribution methods for inputs, products, or services and firms' financial performance

H6: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved supporting activities and firms' financial performance

Figure 1

Research Model



Note. Authors

3. Methodology

3.1. Data

The main data used in this article is derived from the World Bank's Enterprise Survey. A representative sample of an economy's private sector is surveyed at the firm level in the World Bank's Enterprise Survey. The surveys include a wide range of business environment themes, such as infrastructure, competition, access to finance, and performance indicators. A Global Methodology was created and has been used ever since within the Enterprise Analysis Unit, where practically all data-gathering efforts have been concentrated from 2005 - 2006. Over 180,000 interviews have been conducted so far using the Global Methodology in 154 different countries (World Bank, 2022).

We use data from seven economies from the World Bank's Enterprise Surveys for the context of the ASEAN region (Vietnam, Thailand, Indonesia, Philippines, Malaysia, Laos, and Cambodia). We base our study on the most recent polls, carried out either in 2015 or 2016. After excluding outliers, we have the dataset comprising 3,111 observations across 23 manufacturing sectors (code from 15 to 37) in ASEAN countries.

There are several reasons for using secondary data in this study. First, it is rather difficult to collect reliable primary data on firm-level innovation (Nguyen & Chang, 2021). Firms often consider their innovation strategies and activities as proprietary information. This can lead to a reluctance to share detailed information, making it challenging to collect comprehensive data on innovation processes. Moreover, the data from the enterprise survey by the World Bank is a reliable source for research. Thousands of papers in top journals have employed this data source to research firm-level issues in emerging countries (Wong & Ngai, 2019; World Bank, 2022). These rationales lead to the decision to employ the World Bank's Enterprise Survey data in this study.

This study focuses on the manufacturing sector because there is a large difference between the manufacturing sector and the service one. In particular, manufacturing firms primarily produce tangible goods or physical products. Their innovation efforts are often focused on improving the production processes, developing new technologies, materials, and designs, and enhancing the functionality, quality, and efficiency of their products. On the other hand, service firms primarily deliver intangible services rather than physical products. Their innovation efforts revolve around improving the customer experience, developing new service offerings, enhancing service delivery processes, and leveraging technology to provide better and more efficient services (Reichstein & Salter, 2006). While both manufacturing and service firms engage in innovation, the specific challenges they face can vary. Manufacturing firms often deal with issues related to production scalability, supply chain management, quality control, and cost optimisation. They may face challenges in integrating new technologies into existing production systems and ensuring smooth transitions (Jitsutthiphakorn, 2021). Therefore, the SCI mentioned in the World Bank's Enterprise Survey used in this study is more related to the manufacturing sector rather than the service one, which leads to the concentration on the manufacturing sector in this study.

3.2. Empirical method

It is important to note that our dataset is hierarchical in nature. In particular, firms are nested within industrial sectors, and industrial sectors are nested within countries. The hierarchical data may cause a non-independence problem because observations within the same cluster tend to relate to each other, which consequently produces incorrect standard errors in traditional statistical analyses (McCoach, 2019).

To overcome the limitation of traditional regression models in estimating hierarchical data, multilevel modelling techniques are developed. They explicitly account for the nested structure and allow for random effects at different levels. These models provide a more flexible and accurate approach for estimating parameters in hierarchical data. Therefore, we will use the multilevel mixed-effects linear model, a refinement of the classic linear model, to analyse our hierarchical data (StataCorp, 2017). The "mixed" command in Stata is used to calculate a multilevel mixed-effects linear estimate. Details of variables used in the analysis are in Table 1.

4. Results

Table 1 presents the descriptive statistics. The average growth rate of sales (*FIRM_PERFORMANCE*) is 32%. More than 22% of firms had new or significantly improved methods of manufacturing products or offering services (*PRO_MANU_OFFER_SER*). More than 17% of firms had new or significantly improved logistics, delivery, or distribution methods for inputs, products, or services (*PRO_DELIVERY_DISTRIBUTION*). Additionally, more than

21% of firms had new or significantly improved supporting activities for their processes, such as maintenance systems or operations for purchasing, accounting, or computing (*PRO_SUPPORTING*). More than 15% of firms have organisational innovation activities.

Table 1

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FIRM_PERFORMANCE	3,111	32.106	95.795	-47.822	804.255
PRO_MANU_OFFER_SER	3,078	0.224	0.417	0	1
PRO_DELIVERY_DISTRIBUTION	3,057	0.174	0.379	0	1
PRO_SUPPORTING	3,076	0.212	0.409	0	1
ORGANISATIONAL INNOVATION	3,079	0.157	0.363	0	1
R&D	3,068	0.144	0.352	0	1
FOREIGN_OWNERSHIP	3,090	10.647	27.793	0	100
AGE	3,111	2.802	0.602	1.099	5.081
SIZE	3,111	3.966	1.471	0.693	11.523

Note. Authors

Table 2 reports the pairwise correlations. The pairwise correlation coefficients between the three components of supply chain innovation are higher than 0.5, suggesting that there are signals of multicollinearity (Dormann et al., 2013). Therefore, we will estimate the impact of each component separately.

Table 2 presents the linear mixed-effects estimation results. Regarding the hierarchical data issue, the likelihood-ratio tests comparing the linear mixed-effects with standard linear regression are reported in each model. It is interesting to find that the likelihood-ratio test statistics are statistically significant in all models. Therefore, the linear mixed-effects model is preferred to the standard linear regression in estimating this specific data set.

Regarding hypothesis testing, first, the coefficient of *PRO_MANU_OFFER_SER* is positive and statistically significant in Model 1, which provides strong support for H1: New or significantly improved methods of manufacturing products or offering services have a positive impact on firm performance.

Second, the coefficient of *PRO_DELIVERY_DISTRIBUTION* is positive and statistically significant in Model 2, which provides strong support for H2: New or significantly improved logistics, delivery, or distribution methods for inputs, products, or services have a positive impact on firm performance.

Third, the coefficient of *PRO_SUPPORTING* is positive and statistically significant in Model 3, which provides strong support for H3: New or significantly improved supporting activities for processes, such as maintenance systems or operations for purchasing, accounting, or computing have a positive impact on firm performance.

Table 2

Pairwise Correlations

Variable	1	2	3	4	5	6	7	8
1.PRO_MANU_OFFER_SER	1							
2.PRO_DELIVERY_DISTRI BUTION	0.52***	1						
3.PRO_SUPPORTING	0.55***	0.55***	1					
4.ORGANISATIONAL INNOVATION	0.36***	0.37***	0.47***	1				
5. R&D	0.37***	0.32***	0.41***	0.35***	1			
6.FOREIGN_OWNERSHIP	0.05***	0.02	0.04**	0.08***	0.08***	1		
7. AGE	0.02	0.01	0.02	0.04**	0.04**	-0.04**	1	
8. SIZE	0.18***	0.17***	0.22***	0.24***	0.25***	0.30***	0.21***	1

Note. Standard errors in parentheses. * $p < .10$; ** $p < .05$; *** $p < .01$. The data are from Authors

Fourth, the coefficient of the interaction term *PRO_MANU_OFFER_SER* x *Organisational innovation* is positive and statistically significant in Model 4, which provides strong support for H4: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved methods of manufacturing products or offering services and firm performance.

Fifth, the coefficient of the interaction term *PRO_DELIVERY_DISTRIBUTION* x *Organisational innovation* is positive and statistically significant in Model 5, which provides strong support for H5: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved logistics, delivery, or distribution methods for inputs, products, or services and firm performance.

Finally, the coefficient of the interaction term *PRO_SUPPORTING* x *Organisational innovation* is positive and statistically significant in Model 6, which provides strong support for H6: Organisational innovation has a positive moderating impact on the relationship between new or significantly improved supporting activities and firm performance.

5. Discussions and implications

5.1. Discussions

Positive results are found, verifying all presented hypotheses, when looking at the influence of several aspects of supply chain innovation on ASEAN manufacturers with a sample size of 3,111 firms. To begin, we can say with confidence ($p = 0.05$) that all of the coefficients about the three aspects of SCI - new or significantly improved (1) methods of production or service delivery; (2) logistics, delivery, or distribution methods; (3) process-supporting activities - are all confirmed (with coefficients of 8.148, 8.666, and 10.240 respectively). Hence, there is strong evidence supporting hypotheses 1, 2, and 3. The results are in line with what has been found in the past literature about the impact of innovative initiatives on the performance of businesses (for example: Lii & Kuo, 2016; Mandal, 2016; Na & Kang, 2019; Saragih et al., 2020).

More specifically, the results indicate that a favourable effect on a company's performance comes from implementing new or significantly improved methods of manufacturing products or offering services (Na & Kang, 2019). Involvement in the planning and creation of new products is within the purview of many manufacturing businesses. Introducing cutting-edge practices into the production or delivery of services would lead to customer-centric innovations in product design. To maintain a competitive edge in a market, it is critical to deliver high-quality, new items to consumers before the competition does (Murat & Baki, 2011). Part simplification, concurrent engineering, and value analysis are just a few examples of the kinds of internal business processes that may have a significant impact on a firm's performance (Saragih et al., 2020). Moreover, supporting activities for upstream supply chain management practices are also essential. The new or enhanced supporting activities would strongly link with innovation in different phases of the supply chain such as purchasing, operations, maintenance systems, or information technology initiatives (Chege et al., 2020). Certain benefits of innovating supporting processes include the enhancement of the company's productivity and market share by offering better insights into the ins and outs of the industry, allowing it to provide new goods and services, focus more on its customers, adapt more quickly to market shifts, and innovate for greater performance (Clauss et al., 2019). However, Chege et al. (2020) are concerned that manufacturers' attitudes toward innovations might vary depending on the surrounding technology and creative environments. Also, new and improved logistics practices for the downstream supply chain, such as logistics, delivery, and distribution are equally important. These supporting activities and logistics practices contribute to the smooth movement of the physical flows in the entire supply chain network and, in turn, improve the firm performance, as confirmed by past research such as Bag et al. (2020). Recent improvements in logistics and distribution practices make use of several smart technologies, such as the Internet of Things (IoT), big data, and cloud computing, to name a few. Such innovations not only reduce cycle times, boost quality, and make businesses more cost-competitive, but they also help them make sound, long-term strategic decisions (Bag et al., 2020). Nevertheless, Na and Kang (2019) declared a negative correlation between process innovation and the annual sales growth of the firms, as the changes resulting from such innovation may take a long time to start seeing results and require a timely adaptation process from staff. It has been noticed that process innovations comprise mostly routine operational improvements and may relatively bring minor changes in the way the firm operates.

In addition to the direct effects, our results also confirmed the role of organisational innovation as a positive moderator in the relationship between firms' performance and the three aspects of SC innovation namely (1) new or significantly improved methods of production or service delivery; (2) logistics, delivery, or distribution methods; and (3) process-supporting activities in ASEAN manufacturing firms. In our data set, "organisational innovation" refers to the introduction of new or significantly improved organisational structures or management practices. These practices can foster an organisational and managerial environment that promotes knowledge sharing and collaboration across teams, departments, and individuals (Nguyen & Chang, 2021) and more efficient use of internal and external knowledge resources (Najafi-Tavani et al., 2018), particularly those involved in a wide range of supply chain innovation practices, which in turn improves the performance of businesses. In detail, the coefficients of the interaction term Supply chain innovation (which was broken into three aspects as mentioned) x Organisational innovation are positive and significant at the 1% and 10% level of significance across all models (i.e., Models 4, 5, and 6). These results strongly support the view that when businesses implement supply chain innovation initiatives, manufacturers' performance can be

enhanced through the promotion of new organisational methods for business management at work and/or in the relationship between business and external agents for innovation efforts, as well as through the promotion of inwardly focused activities to increase profit margins (Camisón & Villar-López, 2014). As to support, organisational innovation, as shown by the research of Camisón and Villar-López (2014), boosts a company's technical capacity to create cutting-edge products and processes, which in turn cushions the company's bottom line. As Piening and Salge (2015) demonstrate, the potential for a business to engage in process innovation activity and its profit margins improve when the organisation has the capabilities to handle a wide range of innovation-related activities. These results are especially significant for manufacturing firms in ASEAN, which generally adhere to a hierarchical organisational structure, causing them to fall behind European enterprises in terms of the breadth and efficiency of their innovative activities (Diez & Kiese, 2006). Nonetheless, it's important to keep in mind that not all businesses can actively participate in innovation activities due to resource constraints and potential risks in implementing different types of innovations (Amornkitvikai & Pholphirul, 2023).

5.2. Implications

Theoretically, our study enhances the current body of knowledge on Supply Chain Innovation (SCI) by presenting empirical data that strengthens and expands previous theoretical frameworks. Our research supports the notion that SCI has a beneficial impact on the financial performance of ASEAN firms, aligning with findings such as Saragih et al. (2020). In addition, our research contributes to the area by emphasising the moderating influence of organisational innovation, a feature that has received less attention in other studies (Camisón & Villar-López, 2014). The focus on the combined impact of SCI and organisational innovation aligns with the viewpoints presented by Camisón and Villar-López (2014), who highlight the significance of integrated innovation strategies in improving corporate performance. Altogether, our study enriches the understanding of how organisations may strategically utilise SCI and organisational innovation to attain sustained financial success in today's competitive environment by integrating these factors.

Since ASEAN is home to one of the world's fastest-growing economies, it is naturally gravitating toward globalisation in both the production and information sectors. To capitalise on these opportunities, ASEAN countries should invest more resources into developing their scientific, technological, and innovative capacities (OECD, 2023). Both the literature on organisational innovation and that on supply chain innovation benefit from our research. Given its proximity to China and its status as one of the top three global production hubs, the ASEAN region is attracting a growing number of international investors from places like the United States and China. This makes the backdrop of ASEAN manufacturing firms such an interesting topic to study.

In today's ever-changing business environment, the ability to make informed decisions and develop effective strategies hinges on having a firm grasp on the ramifications of supply chain innovation. This research provides an empirical investigation of the impact of supply chain innovation aspects and the moderating role of organisational innovation. Our research suggests two key potential applications. To begin, executives must understand that supply chain innovation practices can improve operational efficiencies and lower expenditures. Companies may improve their supply chain, operations, logistics, and distribution by implementing modern technologies like automation, the Internet of Things (IoT), and Artificial Intelligence (AI). By doing this, managers may make well-informed decisions about resource allocation, technology

investment, and the development and execution of supply chain strategies that support the achievement of their organisation's goals. Second, to better compete and adapt in the prevailing marketplace, ASEAN manufacturers may undertake innovations to their production, supporting activities, and/or logistical processes. Particularly, this research provides supporting evidence that supply chain innovation is critical to business success in ASEAN nations. We recommend routinely reviewing and enhancing the performance of all supply chain activities. The ASEAN developing countries are still behind the world's technological frontier and have a shortage of skilled workers (OECD, 2023), making innovative supply chain management strategies all the more crucial. We identify critical areas for supply chain managers to concentrate their efforts, such as methods of production/service operations, supporting activities, and logistics, in both the upstream and downstream areas of supply chain networks. The findings provide novel insight into the management strategy in ASEAN enterprises, illuminating opportunities to further boost firm performance.

6. Final remarks

All in all, this study investigates the impact of supply chain innovation practices on firm performance. Accordingly, managers must embrace supply chain innovation to expand and compete in the dynamic ASEAN manufacturing market. The dynamics of customers, technologies, and rivalry in today's corporate world are always shifting. It follows that supply chain innovation is viewed as a driving force that allows firms to gain an edge over rivals and boost their bottom line over the long haul. Scholars have paid increasing attention to emerging markets (such as ASEAN) during the past two decades (Peng et al., 2018), but more recent empirical evidence on the connection between supply chain innovation activities and performance at the firm level remains unexplored.

While this study offers new insights into the role of supply chain innovation as a mechanism for enhancing firms' financial performance, several limitations deserve future research. First, it is noteworthy that this study confines itself to supply chain innovation and its impact on firm performance. The impact on firm innovation of other aspects, such as R&D collaboration and organisational innovation, should also be investigated with a richer data set. In this way, we can have a more comprehensive view of the role of innovation in the ASEAN context. Moreover, the findings call for an enhanced effort to explore whether other factors may act as moderators enhancing (or perhaps lessening) the positive impacts of supply chain innovation on firm performance, or act as mediators elevating (or perhaps diminishing) the positive impacts of supply chain innovation on firm performance, given the prominent role that supply chain innovation plays in raising productivity and contributing to performance growth and the need for a better understanding of firm-level supply chain innovation dynamics. For instance, Skare and Soriano (2021), as well as Tsipoulanidis and Nanos (2022) mention the Globalisation Index (KOF) and the Global Competitiveness Index (GCI) as additional potential innovation-oriented moderating variables, yet they do not apply to the World Bank Enterprise Survey that we were using for this study.

7. Limitations and future research

The limitation of using secondary data in this study is the time lag. In particular, the survey years are 2015 - 2016, while the current context is 2024. This may affect the reliability of the implications drawn from the results for the current setting. Therefore, future research should update the data with the latest surveys. In this way, we can get more reliable findings about the supply chain innovation situation in ASEAN.

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