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Article

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OPERATIONS, INFORMATION & TECHNOLOGY | REVIEW ARTICLE

The links between supply chain risk management practices, supply chain integration and supply chain performance in Southern Vietnam: A moderation effect of supply chain social sustainability

Ngoc Hong Duong¹ and Quang-An Ha^{1*}

Abstract: This research examines the impact of supply chain risk management on supply chain integration, supply chain performance, and the moderation effects of supply chain social sustainability on these relationships. The results showed that supply chain risk management has a significant impact on supplier integration, internal integration, and customer integration. However, only supplier integration and internal integration significantly impact supply chain performance, while the relationship between customer integration and supply chain performance is not significant. The moderation effects of supply chain social sustainability positively enhance the impact of supply chain risk management on supplier integration and customer integration, while it reduces the impact of supply chain risk management on internal integration. The theoretical and practical implications are also provided in the current study.

Subjects: Production, Operations & Information Management; Operations Management; Supply Chain Management

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PUBLIC INTEREST STATEMENT

Social sustainability practices are essential to the supply chain performance as well as to the long-term development of the global supply chain. These social sustainability incentives should be widely encouraged in the global supply chain to raise managers' awareness about its benefits and significance not only to firm performance but also to the stakeholder's interests. This paper revealed that supply chain integration can be significantly enhanced thanks to supply chain social sustainability incentives. Moreover, employees within an organization believe that firms that perform well in business ethics and social responsibility can reduce the role of a supply chain risk management system. Last but not least, it is highly posited that supply chain integration plays a critical role to help firms gain competitive advantages and achieve a firm's goals effectively and efficiently.

Keywords: Supply chain performance; supply chain social sustainability; risk management; supply chain integration

1. Introduction

In the context of a growing globalization trend together with the turbulent dynamics of the social-economic environment, many multinational corporations worldwide, particularly those focusing on supply chain performance, are standing in front of both opportunities and challenges. A window of opportunities includes more access to capital flows, technology applications, human and knowledge capitals, cheaper imports, and scalable export marketplaces (Choi et al., 2012). In the meantime, these firms are facing a vast array of challenges that force them to cope with uncertainties, complexity, and intense competition in the global supply chain (Christopher et al., 2011; Tang, 2006). The literature has well-documented that risk management is prohibitively critical to supply chain performance, in which supply chain risk management identifies and manages risks by enhancing firms' relationships with customers and suppliers (Jüttner et al., 2003; Kauppi et al., 2016). Indeed, risks associated with the supply chain management process have raised many concerns and asked for the firm's agility in response. Various sources of risks including political risks, social-culture risks, and business risks, might result in disadvantages and inefficiency of the supply chain integration (Aron et al., 2005). Thereby, to mitigate risks and achieve business goals effectively and efficiently, managers are striving to cultivate collaborative power among stakeholders through implementing supply chain integration strategies (Flynn et al., 2010; Zhao et al., 2008). Though several scholars have proposed feasible approaches to manage risks in supply chain operations, such as contingency planning (Tomlin, 2006), mitigation practices (Ellis et al., 2011), dual sourcing (Trkman & McCormack, 2009), and postponement (Yang & Yang, 2010). On a global basis, supply chain integration is still largely considered as an effective strategy that helps the firm to enhance supply chain performance by avoiding disruptions caused by risks associated with the supply chain (Chaudhuri et al., 2018; Kim, 2009; Glenn Richey et al., 2009) (Horvath, 2001). The supply chain integration approach is typically portrayed by both internal and external collaborations with strategic stakeholders, since then, firms can actively control both demand and supply risks from customers and suppliers (Riley et al., 2016). According to Frohlich and Westbrook (2001), internal collaboration could solve risk exposure issues.

Together with risk management objectives, both scholars and practitioners are also paying more attention to the significance of sustainability in the firm's supply chain (Dubey et al., 2015; Hao et al., 2018; Mani et al., 2020; Tsao, 2015). Firm managers attempt to embrace values of sustainability into the supply chain process, which in turn increase the firm's operational performance and gain competitive advantages (Yadlapalli et al., 2018). Generally, these sustainability incentives can convey plenty of positive effects to the local community by driving towards long-term development, improving corporate social responsibilities, supporting employee's well-being. Several studies have emphasized the essential roles of sustainability practices in enhancing supply chain collaborations as well as supply chain performance (Flynn et al., 2010; Wang et al., 2016). However, not many works of literature over the past decade have focused on the relationship between sustainability practices and collaboration in the supply chain risk management (Mani et al., 2018; Mani, Gunasekaran, et al., 2016). As a result, our research realizes the importance of a further study to examine how supply chain risk management practices impact the global supply chain with a consideration of social sustainability's effects. Therefore, the current study is developing a research framework at the aim to address the following questions: (1) Is supply chain risk management related to supply chain integration? (2) How do the three dimensions of supply chain integration (internal, supplier, and customer) affect supply chain performance? (3) To what extent can social sustainability practices influence the relationship between supply chain risk and supply chain integration? By examining these research questions, our study will provide insightful understandings of the current literature in multiple aspects. To the best of our knowledge, this will be the first study that explores the impact of supply chain risk management on supply chain integration with the moderating role of supply chain social sustainability. In addition, our research further analyzes the relationship between supply chain risk management and supply chain integration and supply chain performance. Finally, this study investigates three dimensions of supply chain integration, the collaboration between

external linkage and internal linkage, and the influence of supply chain integration on supply chain performance.

The remaining sections of this paper are structured as follows. First, we reviewed theoretical backgrounds of supply chain risk management, supply chain social sustainability, supply chain integration, and supply chain performance. Second, a research framework and hypotheses were developed based on the previous literature review. Next, methodology and data analysis were presented. Then we discussed both managerial implications and theoretical contributions following research results and findings. Last but not least, some limitations and future research were further provided.

2. Literature reviews

2.1. Supply chain risk management

Risk is identified as a “combination of probability or frequency of occurrence of a defined hazard and magnitude of the occurrence” (BS 4778, 1991). When dealing with the subject of the supply chain, risk can be considered an unpredictable failure or undesirable outcome. Supply chain risk means any risks that occurred during information flows, raw material, and production from the input suppliers at the initial stage to the end-users in the whole supply chain (Jüttner et al., 2003). Previous studies suggest that supply chain risk refers to “the negative deviation from the expected value of a certain performance measure, resulting in negative consequences for the focal firm” (Wagner & Bode, 2008) and “the potential variation of outcomes that influence the decrease of value-added at any activity cell in a chain” (Bogataj & Bogataj, 2007). In the context of supply chain risk management, it can be defined as the recognition and control of supply chain risks to decrease supply chain susceptibility through a collaborated access between supply chain actors (Jüttner, 2005; Jüttner et al., 2003). Moreover, supply chain risk management has been identified as the administration of risks through allocation and association among participants to secure effectiveness and efficiency for the supply chain (Tang, 2006). Findings have further indicated that to reduce supply chain susceptibility within the supply network, it is crucial to identify and manage risks through strong collaborations among stakeholders in the supply chain (Goh et al., 2007). The supply chain risk management process is an access including an adapted risk management process to justify, control, and approach risks in the supply chain (Ellegaard, 2008; Manuj & Mentzer, 2008; Schoenherr et al., 2008). There are four main stages in the supply chain risk management process, which will be introduced in the following section.

Risk identification: The first stage in the supply chain risk management process is risk identification, potential risks relevant to the given problems in the supply chain will be identified in this stage. Previous attempts have demonstrated that an analytic hierarchy process technique can be used to explore possible risks (Tsai et al., 2008). There are several approaches introduced to discover risks in the supply chain such as a conceptual model (Trkman & McCormack, 2009) and a supply chain vulnerability map (Blos et al., 2009). Moreover, some researchers have developed a supply chain risk identification system (Kaya & Özer, 2009) and a quality value-focused process engineering methodology (Neiger et al., 2009).

Risk assessment: In this stage, supply chain managers involve in identifying effects and evaluating consequences that would be caused by uncertainties (Raiffa, 1982). The dedication of the possibility of each risk element will be considered. Objective information can determine uncertainties; hence, the outcome of this action can be extracted. In other words, risk assessment means an assessment of the likelihood of something happening and the importance of upcoming results (Harland et al., 2003). Over the past years, many authors and experts have introduced several different methods to examine supply chain risk assessment. In general, there are two main methods used in risk assessment that are categorized based on the types of risk, including macro-risk assessment and micro-risk assessment (Ho et al., 2015).

Risk mitigation: In this stage, supply chain managers will propose possible strategies to manage and accommodate risks. The hazard totem pole (HTP) technique is considered a useful solution (Tummala & Mak, 2001), since it introduces an approach for the standardized assessment of supply chain risks and

accommodating the risk assessment conditions of their harshness. In addition, many other scholars and experts suggest a variety of methods applied in the risk mitigation process, including the buyer's risk adjustment model (Shin & Benton, 2007), multiple regression model (Hung & Ryu, 2008), simulation model (Schmitt & Singh, 2012), and newsvendor model (Tang et al., 2012). Once risks were identified in the second stage, their issue harshness was evaluated, and as such, risk contingency plans might be promoted then. Since it is complicated to propose avoidance and mitigation plans for a single identified risk above, it begins by evaluating the total costs to apply each avoidance activity to mitigate and control the recognized risks.

Risk monitoring: In the final stage, supply chain managers will decide potential precautionary measures and provide some necessary guidance for further development in the future (Tummala & Mak, 2001). Risk data and information should be updated in this step. It is beneficial for the extended development of risk planning and assessment and efficient controlling and correcting activities. Information system management is particularly critical to the risk monitoring process, including authority policies, law and regulations, risk contingencies, and supply chain risk causes (Tummala & Schoenherr, 2011). A prior study has posited that an integrated abnormality diagnosis method could be helpful (Zhang et al., 2011). However, this approach remains some limitations, including accurate data will be not validated, and they can be only applied to quality risk.

2.2. Supply chain integration

Over the past decades, supply chain integration has been largely highlighted as an effective strategy to help multinational organizations deal with globalization's dynamics and challenges (Frohlich & Westbrook, 2001; Zhao et al., 2008). Firms are making efforts to reinforce collaborative relationships with stakeholders who have both interests and responsibilities relevant to the supply chain operation at all stages (Wisner & Tan, 2000). In the literature, there are several definitions to conceptualize supply chain integration (Lee & Whang, 2004; Swink et al., 2007; Vickery et al., 2003). According to (Zhao et al., 2008), supply chain integration denotes the linkage and collaboration between firms and partners such as customers, suppliers as well as controlling the internal and external processes within the supply chain to achieve a firm's objective goals effectively and efficiently. Although the concept of supply chain integration is incompatible and dissimilar from different pieces of literature, it is given much helpful knowledge to managers about the significance of collaboration and the necessity of a collective power among the firm's stakeholders in the supply chain.

As an energetic ability, collaborations between supply chain partners can significantly improve a firm's adaptive capability and enhance corporate awareness in the public eyes (Handfield et al., 2015). There are three priority aspects of supply chain integration, namely: supplier integration, customer integration, and internal integration (Frohlich & Westbrook, 2001; Zhao et al., 2011b). Internal integration means "the degree to which a manufacturer structures its organizational strategies, practices, and processes into collaborative, synchronized processes to fulfill its customers' requirements and efficiently interact with its suppliers" (Flynn et al., 2010). In preference, customer integration is a "firm's collaboration and coordination with the customers about the product designs, customer demands, and after-sales services" (Zhao et al., 2011b), while the supplier integration is "a firm's collaboration in activities and information-sharing processes with suppliers of the supply chain" (Vickery et al., 2003).

2.3. Supply chain social sustainability

Over the past few decades, many large multinational companies have paid a great concern to sustainability practices due to the rising awareness of environmental and social manners. The definition of sustainability refers to satisfying the demands of the current generation without harming the demands of future generations (WCED, 1987). Sustainability comprises three salient dimensions: economic, environmental, and society (Carter et al., 2011). A previous study has conceptualized the term of supply chain social sustainability as "the creation of coordinated supply chains through the voluntary integration of social, environmental, and economic considerations with key inter-organizational business systems designed to effectively and efficiently manage the capital, information, and material flows associated with the production, procurement, and distribution of services and products to improve the resilience of the

organization over the long and short-term and increase profitability and competitiveness and meet stakeholder requirements” (Ahi & Searcy, 2015). A large volume of evidence has indicated that social sustainability practices can considerably benefit firms, for instance, gain competitive advantages and win customer trust; hence, these lead to an increase in operational performance and supply chain performance (Klassen & Vereecke, 2012; Rao & Holt, 2005). Moreover, firms have further achieved the firm’s objective goals effectively and earn a reputation worldwide if they actively encourage social sustainability incentives in their supply chain management which emphasize improving employees’ working conditions (i.e., well-being, health, and safety ...) (Freire & Alarcón, 2002; Yuan & Woodman, 2010). Therefore, many firms also have proactive plan and green policies to enhance the their performance (Gharaei et al., 2021; Shu et al., 2020). In a meantime, several scholars have introduced various methods to measure supply chain social sustainability based on different countries and markets (Domingues et al., 2015; Huq et al., 2014; Kozłowski et al., 2015). For example, “safety, wages, and labor practices” are three significant aspects of social sustainability practices in India (Mani et al., 2015; Mani, Gunasekaran, et al., 2016). Meanwhile, “health, safety, quality of life, and worker rights” are four significant factors relevant to social issues in Bangladesh’s industry (Huq et al., 2016). In the current study, social sustainability incentives are illustrated by five main factors that influence social sustainability practices in emerging markets such as “philanthropy, safety, equity, human rights, and health & welfare”.

3. Hypotheses development

3.1. *The relationship between supply chain risk management and supply chain integration*

According to Information Processing Theory, there is a positive relationship between supply chain risk management and supply chain collaboration (Galbraith, 1974). In this study, the authors recommend that to overcome the complexity and unpredictable changes from the environment; firms should focus on improving information processing systems and updating quality information. Supply chain managers must improve tasks and perform skills to deal with uncertainties and risks; they also need to process and update information and data. Furthermore, internal linkage can not only prevent firms from internal interruptions but also help firms to respond to unpredictable changes inside quickly and accurately. Furthermore, early recognition of supply chain risks can result from solid internal collaboration (Riley et al., 2016). Meanwhile, external collaboration provides trustable and updated information from the micro and macro environment; therefore, firms can quickly detect traditional risks and improve their ability to effectively respond to supply chain risks (Kauppi et al., 2016; Schoenherr & Swink, 2012a). To mitigate supply chain risks, firms should enhance internal collaboration to increase their adaptive capability and process information from their customers and suppliers (Schoenherr & Swink, 2012a). Through advanced information processing operations, supply chain managers can predict and recognize risks timely. In addition, managers can prepare warning schemes and develop plans to mitigate risks efficiently (Fan et al., 2017). Moreover, firms often exchange information and data with their strategic suppliers, and customers will gain competitive benefits, including shortening bullwhip effects, predicting risks quickly, and knowing the exact demands (H. L. Lee et al., 1997). In brief, these studies have outlined the positive relationship between supply chain integration and supply chain risk management.

In an analysis of supply chain risk management and supply chain integration, the Information Processing Theory has suggested a positive interaction between these two concepts (Galbraith, 1974). This theory examines the importance of information and the quality of information to overcome environmental unpredictability. Through a considerable amount of information quality, decision-makers must manage risk and eliminate tasks to achieve effective and efficient supply chain performance. Additionally, they must enhance traditional risk discovery, avoidance, and response abilities for the local firms, customers, and supplier integration to improve collecting timely and trustable outside information (Kauppi et al., 2016; Schoenherr & Swink, 2012b). Therefore, by improving the collecting and preparing of information connected to scheduling, operational, and logistics activities, external integration supports organizations to deal with unpredictability and control supply chain risks.

Supply chain risk management can be enhanced by making a joint decision, sharing information, and pairing systems among firms, suppliers, and customers. For example, before risks occur in the supply chain, firms and their partners can predict and discover risks quickly through greater information sharing and effective response (Flynn et al., 2010). To reduce the information asymmetry in the supply chain; external integration helps to validate the number of demands, allocate resources efficiently, and reduce the bullwhip effect (H. L. Lee et al., 1997; Schoenherr & Swink, 2012b). Moreover, previous research has indicated that supply chain partners often coordinate and share information, which leads to reducing the bullwhip effect. Firms can quickly predict supply and demand changes through joint decision-making with their customers and suppliers (Danese et al., 2013). It is also stated that supply chain risk management can be enhanced when firms receive on-time and accurate data from the business environment. It is worth recognizing that organizations can frequently improve the decision-making process by sharing problems and communicating transparent information with their partners. Following the above arguments, there are two hypotheses established that:

Hypothesis 1: Supply chain risk management has a positive impact on supplier integration.

Hypothesis 2: Supply chain risk management has a positive impact on customer integration.

Previous research showed that information clarity is an essential factor for better decision-making within a firm. To examine the clarity induced by the firm's systems, the firm needs the ability to process and interpret information (Williams et al., 2013). The information processing ability has been found in the supply chain internal integration. For instance, cross-functional groups will illustrate, examine, and make decisions and processes on the information systems (Schoenherr & Swink, 2012b; Williams et al., 2013). Moreover, internal integration applies the consumption and function of knowledge collected from the outside environment. Hence, a firm's managers will decide strategic decisions more accessible and reliable (Schoenherr & Swink, 2012b; Wiengarten et al., 2014). By sharing information and collaboration, different teams and functional departments allow managers to identify and clarify information effectively and efficiently. This leads to modify operational settings on time and manage risks in the supply chain quickly (Flynn et al., 2010; Riley et al., 2016). Through internal linkage, managers can take advantage of economic benefits in the research and development of information technology. Managers can significantly acquire the ability to master information sharing and data processing in their supply chain. To respond to unpredictable changes and risks in the supply chain, firms should enhance their internal collaborations, since it helps to reduce disruptions and mitigate supply chain risks. Furthermore, outstanding internally integrated systems can increase risk identification and decrease the negative impact of results (Riley et al., 2016). Therefore, it is hypothesized that:

Hypothesis 3: Supply chain risk management has a positive impact on internal integration.

3.2. Supply chain integration and supply chain performance

From the viewpoint of a firm's abilities, it is examined that when a firm has a robust internally integrated system, it will accomplish a high level of external collaboration. In addition, the absorptive capability is one of the critical factors for a firm to achieve outstanding performance. Absorptive capability denotes "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). Hence, the firm can analyze, understand, examine, and figure out new information relevant to its suppliers and customers. The more likely a firm can learn from external partners, the more easily the firm can understand its business to enhance external linkage. Therefore, an effective internal linkage will perform an impressive absorptive capability, including a technique for external collaboration (Takeishi, 2001) and skills to master external partners (Hillebrand & Biemans, 2004; Lane et al., 2006). The relationship between internal linkage and external linkage can be involved with

three main factors of supply chain integration: sharing information, strategic alliance, and collaborating (Zhao et al., 2011a). Without an Enterprise Resource Planning (ERP) system, a firm might face many difficulties in collecting and delivering data among its cross-functional departments. Hence, it might lead to inefficiency in connecting a firm with its strategic partners. By comparison, firms that have well-established ERP systems can share data and distribute information among their internal units effectively and efficiently. In other words, firms cannot respond to their external partners on time and precisely if they cannot manage their internal linkage properly. Therefore, internally integrated firms are more connected with their strategic suppliers and customers (Bhatt, 2000). It can be seen that sharing information within a firm is crucial for successful operational performance. It reduces unpredictable risks and realizes analytical problems relevant to external partners (Crocitto & Youssef, 2003). As a result, we suggest that developed internal linkage leads to impressive customer and supplier linkages. We hypothesize:

Hypothesis 4: Internal integration has a positive impact on supplier integration.

Hypothesis 5: Internal integration has a positive impact on customer integration.

Supply chain performance refers to “the extended supply chain’s activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner” (Grimm, 2004). In a dynamic environment, firms should continuously and intensively improve their supply chain performance to cultivate competitive advantages and win customers from their competitors in the marketplaces. Previous research has suggested that internal linkage will increase the effectiveness of the process, management of demand and materials within an organization (Stevens, 1989). Internal linkage focuses on the collaboration between departments and units and the values and norms of employees (Germain & Iyer, 2006). With the development of internal linkage, information and data might be generated and delivered efficiently (Rosenzweig et al., 2003). Moreover, managers from different departments can form a team and work together to effectively satisfy the demands of their customers. Meanwhile, firms that frequently exchange stock information and order with their suppliers will collect the raw materials and goods on time at an acceptable price (H. L. Lee et al., 1997). To shorten upstream complications, supplier linkage will enhance the relationship between firms and their suppliers, information sharing systems, and the status of available stock (Das et al., 2006). In addition, supplier linkage is beneficial for firms, such as empty stock, increasing the productivity of customer service and enhancing the speed and quality of delivery (Frohlich, 2002). At the same time, to develop demand prediction systems and satisfying customers’ needs, firms should pay more attention to customer linkage (Swink & Song, 2007). Collaboration between firms and their strategic customers leads to reducing the bullwhip effects. Also, firms can control their inventory and schedule their production efficiently when working together with their customers (H. L. Lee et al., 1997). Furthermore, many studies have identified that firms can gain competitive advantages with the supports of customer linkage (Germain & Iyer, 2006; Koufteros et al., 2005; Swink et al., 2007). To meet customers’ preferences, firms should frequently integrate with their customers and update product design and function based on customers’ requirements. Thus, all these examined works of literature above show a positive relationship between supply chain integration and supply chain performance.

In the era of supply chain collaboration, external collaboration means how firms include their external members to organize their inter-organizational practices, systems, processes, and activities. These external members consist of suppliers and customers (Chen & Paulraj, 2004; Zhao et al., 2011a). Supplier linkage refers to the collaboration and sharing of information with a firm’s strategic suppliers that present the overview picture of the suppliers’ processes, abilities, and restraints. In other words, it will not only lead to a more impressive planning and forecasting system but also effective product and service designs (Bowersox et al., 1999; Ragatz et al., 2002). On the other hand, customer linkage comprises close relationships and data-sharing activities with leading customers. Hence, the firm will enhance its

capabilities to identify and understand market demands and needs on time and effectively (Bowersox et al., 1999; Wong et al., 2011). Additionally, it increases operational plants to improve a high level of knowledge about customers' behaviors and establish customer loyalty (Swink et al., 2007). Notably, it can be noted from these studies that better external integration will lead to the whole supply chain (Jayaram & Tan, 2010; Wong et al., 2011). Hence, we hypothesize:

Hypothesis 6: Supplier integration has a positive impact on supply chain performance.

Hypothesis 7: Customer integration has a positive impact on supply chain performance.

Previous studies have reported that internal linkage includes teamwork, sharing information and data across all departments within a firm. In the supply chain integration analysis, the internal linkage is an essential factor that leads to the success of supply chain performance (Rosenzweig et al., 2003; Zhao et al., 2011a). From an operational ability, internal linkage might affect external linkage through many activities, such as information sharing systems, teamwork, and critical collaboration (Zhao et al., 2011a). In addition, the internal linkage will improve the communication across all departments; hence, it leads to manufacturing activities efficiently and effectively (Williams et al., 2013; Won Lee et al., 2007). Product development time and product varieties can be improved through internal integration practices (Koufteros et al., 2005). Overall, the above findings have proved that internal linkage is positively related to supply chain performance (Flynn et al., 2010; Swink et al., 2007). As a result, we hypothesize:

Hypothesis 8: Internal integration has a positive impact on supply chain performance.

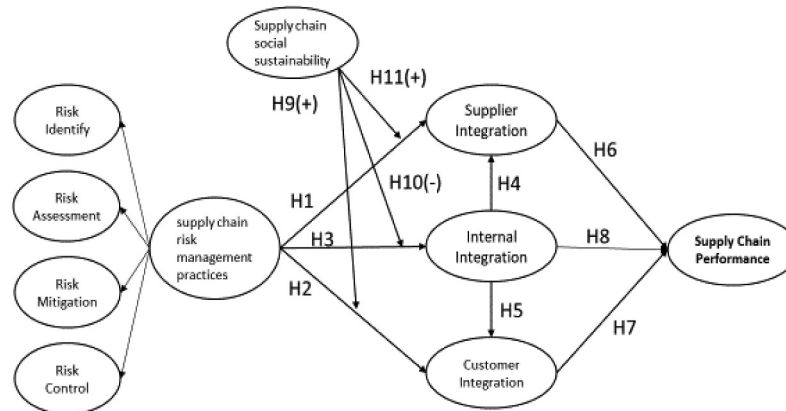
3.3. The moderation effects of supply chain social sustainability

Organizations that incorporate their strategic customers into their operational process and supply chain systems will increase their opportunities, benefits, and revenues by distributing high-quality products and services. Previous research has indicated that strategic customers can support organizations in developing the flow of information and enhancing integration systems. Hence, it enables organizations to better understand their customers' insights and social manners (Gelhard & Von Delft, 2016). These organizations will take more commitments and responsibilities to society and local environment (Paulraj, 2011). As mentioned previously, the supply chain risk management practices play an important role in increasing that customer integration. The incorporation of social sustainability into that relationship will create the higher performance of customer linkage, and, therefore, decrease customer pressure in the supply chain (Pullman et al., 2009). Therefore, we have the hypothesis [Figure 1](#):

Hypothesis 9: Supply chain social sustainability will positively enhance the relationship between risk management and customer integration.

Go along with the important role of risk management, organizations must enhance the risk management process to secure their staff's health, safety, well-being (Das et al., 2008; Okun et al., 2016), and employees' working conditions (Jørgensen, 2008) to guarantee the supply chain performance. Besides risk management, previous studies reported that the inner organization's attitude toward social sustainability could enhance the supply chain performance (Pagell & Gobeli, 2009; Voorde et al., 2011). For instance, staff welfare performs will improve operational performance (Pagell & Gobeli, 2009), or recent accidents and injuries reported at workplaces around the world also affect the supply chain performance. Therefore, when the organization promotes social sustainability, the role of supply chain risk management could be less important. Moreover, by applying cross-functional partnership and teamwork, internally integrated collaboration can play an important role in pursuing advanced techniques and abilities linked with sustainability (Wolf, 2013, 2014). As a result, the existence of supply chain

Figure 1. Research framework.



social sustainability in an organization will lead to better internal integration while reducing the impact of supply chain risk management. Base on these argument, we thus propose the following hypothesis:

Hypothesis 10: Supply chain social sustainability will decrease the relationship between risk management and internal integration.

Supply chain risk management could increase the external collaboration when it could provide suppliers a piece of information that is reliable and updated information from the micro and macro environment; therefore, firms can timely respond to supply chain risks (Kauppi et al., 2016; Schoenherr & Swink, 2012a). In a dynamic environment, supplier linkage is an essential key to the success of supply chain performance (Perols et al., 2013). Firms that often collaborate with their strategic suppliers also identify social issues and sustainability threats quickly and correctly (Huq et al., 2016; Klassen & Vereecke, 2012). Furthermore, it has been indicated that firms work with their major suppliers to contribute to society and achieve objective goals effectively and efficiently. These practices include: reducing pollution, protecting the eco-environment, volunteers, and charities (Vachon & Klassen, 2008). Traditionally, previous research has revealed that long-term relationships with suppliers will enhance the firms' ability to perform social sustainability practices in the supply chain (Elkington & Fennell, 1998). By improving mutual trust and consistent traditions, firms and leading suppliers will preserve long-term relationships and share their common goals (Gimenez & Tachizawa, 2012). Hence, we hypothesize:

Hypothesis 11: Supply chain social sustainability will enhance the relationship between risk management and supplier integration.

4. Methodology

4.1. Participants and data collection

This study was conducted by distributing an online survey to employees working in companies located in the southern Vietnam areas. These firms must have at least five years of experience running businesses in Vietnam with a registered capital commitment of USD 200,000 minimum. We based on these criteria to guarantee that all of these firms are in the mature growth stage of operation and they might have some awareness and concerns to sustainable practices. Furthermore, we only select participants who have at least 4 years of working experience in their current position. We got 378 replies in total, and after

screening to fulfill the above-mentioned conditions, 286 responses from 286 companies were retained and consumed for further data analyses. Table 1 shows the sample characteristics of this study:

4.2. Measurement

All revised measurement items used a 7-point Likert scale (ranging from Strongly disagree to Strongly agree) for these measurement items (Appendix A). The measurement for risk management practices was adapted from (El Baz & Ruel, 2021), with four factors and 15 items in total: Risk identity (4 items), Risk assessment (4 items), Risk mitigation (3 items), Risk control (4 items). The supply chain social sustainability was adapted from the research of Mani, Agarwal, et al. (2016) and Mani and Agrawal (2015). The supply chain social sustainability is the first-order factor that included six second-order factors: Philanthropy (4 items), Safety (3 items), Equity (4 items), Health & Welfare (2 items), Human Rights (3 items), Ethic (2 items). The measurements from a prior study by Jajja et al. (2018) were used to measure the Supply Chain Integration, including Supplier Integration (4 items), Internal Integration (4 items) and Customer Integration (4 items).

5. Results and data analysis

5.1. Descriptive statistics, reliability and discriminant validity

We employed SmartPLS 3.0 to test the measurements of this study and identify their reliability and validity (Ringle et al., 2015). First of all, factor analysis was conducted, and most of items that have a factor loading greater than 0.7 are retained (J. F. Hair et al., 2011). Regarding the reliability test, composite reliability (C.R.) and Cronbach's Alpha are greater than 0.7 to guarantee the high reliability of the measurements (Bagozzi, 2011; Fornell & Larcker, 1981). The convergent validity is also met when the average variance extracted (AVE) of all constructs is bigger than 0.50 (Chin, 1998). Tables 2 and Tables 3 show the results of the descriptive statistics and reliability measurements.

To assess the discriminant validity of measurements, the Fornell-Larcker criterion and Heterotrait-Monotrait ratio (HTMT) were applied (Henseler et al., 2015). In Table 3, the results have shown that the square root of the AVE of each construct was more significant than other inter-construct correlations, which means discriminant validities of the constructs are met. Moreover, all Heterotrait-Monotrait ratios of the correlations between the constructs were in the range of 0.604 to 0.814, smaller than the threshold of 0.85, which means the discriminant validity was not an issue for this study.

5.2. Common method bias

As a self-answered survey, the relationship between one construct and another might be inflated, which leads to the common method bias (CMB). We follow Podsakoff et al. (2003) to adopt two tests to confirm whether our data is free from CMB. First, Harman's single-factor test was conducted in SPSS, and the result of this test showed that CMB was not a serious issue, as a single factor extracted from this method only explains 46% of the variance below the threshold of 50%. Moreover, the collinearity assessment approach (Kock, 2015) is also used to assess the CMB by examining the VIF generated for all constructs from PLS-SEM. The results showed that all VIF values in the model were well below the 3.3 thresholds, indicating CMB is not an issue (Kock, 2015).

5.3. Hypothesized model testing

We employed SmartPLS 3.0 (Ringle et al., 2015) to evaluate the structural model based on the significance of the estimated path coefficient and R-squared (J. J. F. Hair et al., 2016). Following J. F. Hair et al.'s (2011) recommendation, we examined the model with 5,000 bootstrap samples to ensure the results of estimated path coefficients are stable. The result of PLS-SEM is shown in Table 4. The adjusted R-squared values obtained for the four endogenous variables are also substantial: Supplier Integration (0.497), Internal Integration (0.622), Customer Integration (0.433), and Supply chain performance (0.509).

The results showed that supply chain risk management positively impacts Supplier Integration ($\beta_{H1} = 0.589$, $p < 0.001$), Customer Integration ($\beta_{H2} = 0.466$, $p < 0.001$), and Internal Integration ($\beta_{H3} = 0.372$,

Table 1. Sample characteristics

| Characteristics | Frequency (N = 286) | Percent (100%) |
|---|---------------------|----------------|
| Company's operation time | | |
| 4-5 years | 45 | 15.7 |
| 6-10 years | 76 | 26.6 |
| 11-15 years | 71 | 24.8 |
| 16-20 years | 58 | 20.3 |
| Above 20 years | 36 | 12.6 |
| Firm's capital investment | | |
| Less than 1 million USD | 106 | 37.1 |
| 1-5 million USD | 117 | 40.9 |
| More than 5 million USD | 63 | 22.0 |
| Industry | | |
| Agriculture/Agro-based food products | 114 | 39.9 |
| Mechanics and chemicals products | 11 | 3.7 |
| Fast-moving consumer goods | 4 | 1.3 |
| Retailer and Distribution | 8 | 2.8 |
| Logistics | 46 | 16.1 |
| Services | 103 | 36.0 |
| Respondent's working experience | | |
| 4-5 years | 71 | 24.8 |
| 6-10 years | 135 | 47.2 |
| 11-15 years | 66 | 23.1 |
| 16-20 years | 11 | 3.8 |
| More than 20 years | 3 | 1.0 |
| Respondent's position in the company | | |
| Employee | 106 | 37.1 |
| Middle Manager | 117 | 40.9 |
| Executive and top-level | 63 | 22.0 |

$p < 0.001$); hence, H1, H2, and H3 are supported. For the hypothesis 4 and 5, Internal Integration only has a significant impact on Customer Integration ($\beta_{H5} = 0.167, p < 0.05$) while its impact on Supplier Integration is trivial ($\beta_{H4} = 0.085, p > 0.05$). The results also showed that Supplier Integration and Internal Integration positively impact Supply chain performance ($\beta_{H6} = 0.234, p < 0.01$ and $\beta_{H8} = 0.405, p < 0.001$ respectively); however, the relationship between Customer Integration and Supply chain performance is insignificant ($\beta_{H7} = 0.158, p > 0.05$); thus, H6 and H8 are supported while H7 is unsupported. When it comes to the moderation effects of supply chain social sustainability on the relationship between supply chain risk management and supply chain integration, only two hypotheses (H9 and H10) are supported while the H11 is not supported ($\beta_{H11} = 0.061, p > 0.05$). In which, the supply chain social sustainability enhanced the relationship between risk management and Customer Integration ($\beta_{H9} = 0.121, p < 0.01$) while decreasing the relationship between risk management and Internal Integration ($\beta_{H10} = -0.092, p < 0.05$). This study also showed that a firm's capital investment or its years of operation doesn't affect the supply chain performance. The results of PLS-SEM are shown in [Figure 2](#).

5.4. PLS SEM multigroup analysis

We further the analysis by investigating the differences between the group of manufacturers (agriculture/agro-based food products, Mechanics and chemicals products and Fast-moving consumer goods) and the group of nonmanufacturing firms (services, logistics, retailers and

Table 2. Descriptive statistics and factor analysis results

| Construct | Items | Mean | SD | Factor Loading | Cronbach's Alpha | C.R. | AVE |
|---|--------|-------|-------|----------------|------------------|-------|-------|
| SUPPLY CHAIN RISK MANAGEMENT—1st order | | | | | | | |
| Risk identity (RID) | rid1. | 5.457 | 1.43 | 0.826 | 0.741 | 0.837 | 0.563 |
| | rid2. | 5.641 | 1.294 | 0.664 | | | |
| | rid3. | 5.408 | 1.39 | 0.718 | | | |
| | rid4. | 5.624 | 1.198 | 0.784 | | | |
| Risk assessment(RAS) | ras1. | 5.947 | 1.129 | 0.828 | 0.808 | 0.874 | 0.636 |
| | ras2. | 5.612 | 1.085 | 0.834 | | | |
| | ras3. | 5.776 | 1.100 | 0.789 | | | |
| | ras4. | 5.800 | 1.079 | 0.734 | | | |
| Risk mitigation(RMI) | rmi1. | 6.024 | 1.046 | 0.860 | 0.802 | 0.885 | 0.720 |
| | rmi2. | 5.865 | 1.151 | 0.912 | | | |
| | rmi3. | 5.959 | 1.109 | 0.767 | | | |
| Risk control(RCT) | rct1. | 5.192 | 1.391 | 0.827 | 0.900 | 0.930 | 0.770 |
| | rct2. | 5.261 | 1.336 | 0.853 | | | |
| | rct3. | 5.396 | 1.295 | 0.912 | | | |
| | Rct4. | 5.51 | 1.241 | 0.915 | | | |
| SUPPLY CHAIN SOCIAL SUSTAINABILITY (SCSS)—1st order | | | | | | | |
| Philanthropy(PHIL) | ssph1 | 5.661 | 1.441 | 0.892 | 0.927 | 0.945 | 0.773 |
| | ssph2 | 5.38 | 1.503 | 0.890 | | | |
| | ssph3 | 5.327 | 1.52 | 0.865 | | | |
| | ssph4 | 5.482 | 1.436 | 0.887 | | | |
| | ssph5 | 5.163 | 1.527 | 0.862 | | | |
| Safety(SAFE) | ssaf1. | 6.265 | 0.985 | 0.922 | 0.857 | 0.913 | 0.778 |
| | ssaf2 | 6.118 | 1.009 | 0.887 | | | |
| | ssaf3 | 6.196 | 0.966 | 0.836 | | | |
| Equity(EQUJ) | sseq1 | 6.139 | 0.976 | 0.886 | 0.881 | 0.918 | 0.738 |
| | sseq2 | 6.008 | 1.014 | 0.877 | | | |
| | sseq3 | 5.951 | 1.041 | 0.880 | | | |
| | sseq4 | 5.694 | 1.259 | 0.791 | | | |
| Health & Welfare(HEWE) | sshw1 | 5.951 | 1.135 | 0.943 | 0.862 | 0.935 | 0.879 |
| | sshw2 | 5.702 | 1.283 | 0.932 | | | |
| Human Rights(HURI) | sshr1 | 6.033 | 1.01 | 0.804 | 0.795 | 0.880 | 0.710 |
| | sshr2 | 6.037 | 1.14 | 0.842 | | | |
| | sshr3 | 6.102 | 1.019 | 0.879 | | | |

(Continued)

Table 2. (Continued)

| Construct | Items | Mean | SD | Factor Loading | Cronbach's Alpha | C.R. | AVE |
|---|-------|-------|-------|----------------|------------------|-------|-------|
| SUPPLY CHAIN RISK MANAGEMENT—1st order | | | | | | | |
| Ethic (ETHI) | ethi1 | 6.102 | 1.027 | 0.916 | 0.801 | 0.910 | 0.834 |
| | ethi2 | 6.155 | 0.998 | 0.911 | | | |
| SUPPLY CHAIN RISK MANAGEMENT—2 nd order | RID | 5.595 | 0.992 | 0.887 | 0.928 | 0.937 | 0.503 |
| | RAS | 5.825 | 0.833 | 0.859 | | | |
| | RMI | 5.994 | 0.882 | 0.824 | | | |
| | RCT | 5.405 | 1.162 | 0.892 | | | |
| SUPPLY CHAIN SOCIAL SUSTAINABILITY (SCSS)—2 nd order | PHIL | 5.347 | 1.373 | 0.770 | 0.951 | 0.955 | 0.531 |
| | SAFE | 6.214 | 0.943 | 0.832 | | | |
| | EQUI | 5.953 | 0.994 | 0.888 | | | |
| | HEWE | 5.799 | 1.174 | 0.826 | | | |
| | HURI | 6.056 | 0.974 | 0.844 | | | |
| | ETHI | 6.101 | 0.824 | 0.830 | | | |
| SUPPLIER INTEGRATION (ISP) | isp2 | 5.143 | 1.52 | 0.905 | 0.775 | 0.870 | 0.693 |
| | isp3 | 5.306 | 1.471 | 0.879 | | | |
| | isp4 | 5.931 | 1.026 | 0.697 | | | |
| | icu1 | 5.31 | 1.457 | 0.838 | | | |
| CUSTOMER INTEGRATION (ICU) | icu2 | 5.543 | 1.263 | 0.858 | 0.807 | 0.874 | 0.637 |
| | icu3 | 5.155 | 1.474 | 0.814 | | | |
| | icu4 | 6.132 | 0.982 | 0.668 | | | |
| | iin1 | 5.727 | 1.237 | 0.869 | | | |
| INTERNAL INTEGRATION (INTE) | iin2 | 5.796 | 1.215 | 0.858 | 0.883 | 0.919 | 0.740 |
| | iin3 | 5.747 | 1.297 | 0.876 | | | |
| | iin4 | 5.865 | 1.189 | 0.838 | | | |
| | scpf1 | 5.824 | 1.009 | 0.911 | | | |
| SUPPLY CHAIN PERFORMANCE(SCPF) | scpf2 | 5.804 | 1.097 | 0.915 | 0.891 | 0.932 | 0.821 |
| | scpf3 | 5.882 | 0.997 | 0.892 | | | |

Table 3. Correlations between research constructs

| | ICU | INTE | ISP | RISK | SCPF | SSCM |
|------|-------|-------|-------|-------|-------|-------|
| ICU | 0.798 | | | | | |
| INTE | 0.575 | 0.861 | | | | |
| ISP | 0.693 | 0.521 | 0.832 | | | |
| RISK | 0.678 | 0.652 | 0.698 | 0.709 | | |
| SCPF | 0.553 | 0.617 | 0.554 | 0.703 | 0.906 | |
| SSCM | 0.572 | 0.678 | 0.513 | 0.625 | 0.711 | 0.728 |

* Diagonal elements are the square root of the average variance extracted

distributors) due to their differences in operational functions within their organizations. was performed to generate the results. We perform the Multigroup Analysis on SmartPLS with the 5,000 re-sampling bootstrapping (Sarstedt et al., 2011) and the differences in group-specific path coefficients is significant when the MGA p-value is <0.05 or >0.95 for a specific

The results showed that there are several differences between two groups of firms in some hypotheses. We found that the impact of Internal Integration on Supplier Integration (H4) is significant among the nonmanufacturing group while it is not significant in the manufacturer group. In contrast, the impact of Internal Integration on Customer Integration (H5) is more substantial with the manufacturers than the nonmanufacturing firms. Moreover, in nonmanufacturing firms, Customer Integration has a significant impact on Supply chain performance which might suggest the importance of customer integration for services, logistics, retailing and distributing firms to achieve success. However, the results of MGA coefficients differences are not significant in all examined paths.

6. Discussion and implications

6.1. Theoretical contributions

The findings of this research contribute several insightful knowledge to the current literature and practices in the field of supply chain management. First, our study confirms that supply chain risk management has a positive impact on supply chain integration. This finding is aligned with previous research investigating risk management in the supply chain (Fan et al., 2017; Galbraith, 1974; Kauppi et al., 2016; H. L. Lee et al., 1997; Riley et al., 2016; Schoenherr & Swink, 2012b). Moreover, our research has further proved that when companies always exchange information with their main suppliers and customers, the operational performance will be enhanced through reducing bullwhip effects, predicting potential risks, and knowing the updated demands (H. L. Lee et al., 1997). It is suggested that external collaboration can significantly increase the supply chain performance when firms are deals with uncertainties and risks in the supply chain.

Second, the empirical result shows that supply chain collaboration plays an important part in accomplishing supply chain performance. To achieve a firm's goals effectively and efficiently, it is necessary to integrate collaboration between firms and their strategic suppliers in the supply chain. Hence, our study supports previous research on supply chain integration (Koufteros et al., 2005; Swink et al., 2007; Vickery et al., 2003; Zhao et al., 2013). Through the development of internal linkage, information and data can be exchanged and delivered quickly and sufficiently (Rosenzweig et al., 2003). This leads to the addition of mutual understanding across departments within an organization. In addition, our study has revealed that when companies actively keep in touch and sharing information related to inventory management and inventory status with their suppliers, the production progress will be ensured once the raw materials and goods are supplied on time at a reasonable price (H. L. Lee et al., 1997).

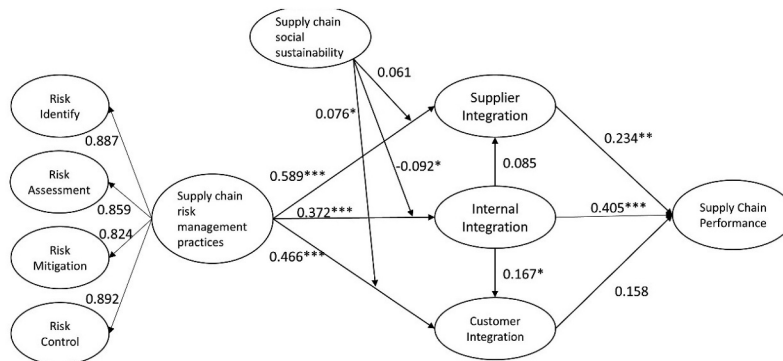
Third, the finding indicates that customer linkage does not significantly influence supply chain performance, it turns out to be contrary to previous studies (M. Frohlich & Westbrook, 2001; Lee & Whang, 2004;

| Table 4. The PLS-SEM results | | | |
|---|-------------|----------------|---------------|
| Path | Beta | t-value | Result |
| Main paths | | | |
| H1: SC Risk Management → Supplier Integration | 0.589*** | 7.598 | Supported |
| H2: SC Risk Management → Customer Integration | 0.466*** | 6.348 | Supported |
| H3: SC Risk Management → Internal Integration | 0.372*** | 5.558 | Supported |
| H4: Internal Integration → Supplier Integration | 0.085 | 0.914 | N.S. |
| H5: Internal Integration → Customer Integration | 0.167* | 2.189 | Supported |
| H6: Supplier Integration → Supply chain performance | 0.234** | 2.674 | Supported |
| H7: Customer Integration → Supply chain performance | 0.158 | 1.839 | N.S. |
| H8: Internal Integration → Supply chain performance | 0.405*** | 5.904 | Supported |
| Moderation Effect | | | |
| H9: SC Risk Management*SC Social Sustainability → Customer Integration | 0.076* | 2.236 | Supported |
| H10: SC Risk Management*SC Social Sustainability → Internal Integration | -0.092* | 2.076 | Supported |
| H11: SC Risk Management*SC Social Sustainability → Supplier Integration | 0.061 | 1.588 | N.S. |
| Control Variables | | | |
| Years of operation → Supply chain performance | -0.018 | 0.682 | N.S. |
| Firm's capital investment → Supply chain performance | -0.045 | 0.458 | N.S. |

*Note. Significance level at ***: p -value < 0.001; **: p -value < 0.01; *: p -value < 0.05; NS: non-significant

Schoenherr & Swink, 2012b). This conflict conclusion can be explained due to the differences in respondent's perceptions which are probably influenced by employee's positions, job tenure, and managerial knowledge. Empirical results have revealed that customer linkage does not weigh the same significance with internal linkage as supplier linkage, especially in some aspects. This finding is similar to a previous study by (Wiengarten et al., 2014) which that means when it comes to cost and innovation performance, the effect of internal collaboration on customer collaboration is weaker than that through supplier collaboration. There are no questions relevant to the cost between firms and their strategic customers; however, customers need to know the cost of purchasing a firm's products and services. Hence, it leads to a low connection between internal and customer collaboration.

Figure 2. The results of PLS-SEM.



Last but not least, our study can be considered as one of the first-ever studies investigating the moderating effects of supply chain social sustainability on the relationship between supply chain risk management and supply chain integration. The results have indicated the importance of the supply chain social sustainability when it can significantly enhance the impact of supply chain risk management on customer integration. Indeed, when social sustainability values are encouraged in the organizational culture and presented in the firm’s strategies, the customers will recognize its existence, and it will have a positive impact on them, making it easier for them to cooperate with the organization and help the organization overcome risk issues. As a result, risk management practices even have a stronger impact on supplier and customer integration. Especially, social sustainability negatively decreases the impact of risk management on internal integration. This can be explained that when internal employees acknowledge the existence of social sustainability incentives, employees will disregard the importance of risk management because they think that social sustainability can ensure internal integration can take place smoothly. In other words, the role of supply chain risk management on internal integration will be decreased as social sustainability becomes stronger. This finding contributes new insights into understandings of the role of supply chain social sustainability in facilitating supply chain integration and supply chain performance.

In addition, through perceiving social sustainability in emerging markets, our study attempts to fill the current research gap by interpreting different dimensions of supply chain social sustainability in developed nations (Mani, Gunasekaran, et al., 2016). The finding indicates that companies frequently contribute to the local community and support their employees; which in turn helps firms to improve their corporate reputation and credibility. Customers are also willing to purchase products and services from these firms that perform social sustainability commitments to the whole communities. While implementing these sustainable and responsible commitments, companies should call for the collaboration of their strategic customers to participate in these meaningful campaigns. Besides, companies can encourage their suppliers to act ethically and responsibly to enhance supply chain performance. Additionally, from the perspectives of employees as the firm’s internal customers, they are more likely to be satisfied and engaged with firms due to positive perceptions of workplace safety, employee’s well-beings.

6.2. Managerial contributions

In addition to theoretical contributions, this study also conveys several insights into managerial practices to enhance operational performance and supply chain performance through proper supply chain risk management, social sustainability practices, and supply chain integration. First, our findings provide evidence of the positive relationship between supply chain risk management and supply chain integration. It suggested that managers should pay more attention to the role of supply chain risk management. Supply chain managers need to improve their task performance and skills to deal with uncertainties and risks quickly and effectively. Besides, the result of the moderation effect of supply chain social

sustainability on the relationship between supply chain risk management and supply chain integration implies that managers should have a better understanding of the importance of sustainability practices and how they could contribute to supply chain performance. This study suggests that managers should be more actively collaborate and encourage their partners, including upstream suppliers and downstream customers, to act responsibly and contribute to the community. As a result, the supply chain performance will be significantly enhanced.

Second, firms' managers should place a greater emphasis on supply chain integration, especially in supplier integration and internal integration. The finding indicates that customer integration does not support the successful performance of the supply chain. It proves that different forms of integration have different influences on different aspects of performance in the supply chain. As a result, it provides many helpful guidelines for managers to increase supply chain integration in a specific situation following firms' objectives.

Third, the results help managers solve social issues responsively in several aspects. It encourages supply chain managers to enrich employees' welfare and working conditions and contribute interests to the local community. Moreover, this study provides critical guidance to the supply chain management practices toward sustainable development when it emphasized the importance of social sustainability motives and their impact on facilitating supply chain performance. Our empirical result also shows that employees working in an organization that acts ethically and kindly will increase internal integration, even if they do not have a supply chain risk management system.

Last but not least, to control and manage risks in the supply chain, managers should improve all processes of risk management. Hence, managers can predict and recognize risks quickly and effectively. The collaborative practices within their organizations and their strategic partners are highly recommended to implement to control risks and increase the firms' performance. Improving integrated internal communications will increase gathering and collecting information from external sources efficiently and sufficiently.

6.3. Limitations and future research

The current paper remains some limitations that should be addressed in future studies. First, there are several aspects in supply chain risk management, and we have taken only a few aspects in our research. Hence, future research could explore other aspects, such as environmental risks, Covid-19 pandemic risks, and micro-risks. These risks might provide many practical guiding principles for managers in different situations. Second, to gain more insight into the differences between the group of manufacturers (agriculture/agro-based food products, Mechanics and chemicals products and Fast-moving consumer goods) and the group of nonmanufacturing firms (services, logistics, retailers and distributors), the PLS MGA was carried out. However, the insignificant differences between the 2 groups might be due to the low number of each group. So, future research could invest in a larger number of firms to better identify these differences.

Third, this research uses data gathered from a single country (Vietnam); therefore, it may affect the generability of the sample. Further studies should investigate a cross-country study; this will broaden the relationship among supply chain risk management, social sustainability practices, and supply chain integration in more significant contexts. Fourth, future researches may examine the relevant relationships in other specific industrial fields to explore more observations for managers. Fifth, there are three main pillars of sustainable development, including economic (profit), environmental (planet), and social (people) (Purvis et al., 2019). In our research, we only examine the social aspect. Hence, further studies could explore the rest two pillars to find the differences between them. Finally, our study chooses five particular supply chain social sustainability dimensions because these are suitable for our country's situation. Therefore, other studies could investigate other dimensions rated higher and received better in their countries.

6.4. Conclusion

In brief, we conclude that our study contributes to both the literature and practices. Firstly, we prove that supply chain risk management is crucial and contributes to the success of supply chain performance. Secondly, social sustainability practices are essential to the supply chain performance as well as to the long-term development of the global supply chain. These social sustainability incentives should be widely encouraged in the global supply chain to raise manager's awareness about its benefits and significance not only to firm performance but also to the stakeholder's interests. Our findings also revealed that supply chain integration can be significantly enhanced thanks to supply chain social sustainability incentives. Moreover, we found that employees within an organization believe that firms that perform well in business ethics and social responsibility do not need to develop a supply chain risk management system. Last but not least, it is highly posited that supply chain integration plays a critical role to help firms gain competitive advantages and achieve a firm's goals effectively and efficiently.

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References

- Ahi, P., & Searcy, C. (2015). An analysis of metrics used to measure performance in green and sustainable supply chains. *Journal of Cleaner Production*, 86, 360–377. <https://doi.org/10.1016/j.jclepro.2014.08.005>
- Aron, R., Clemons, E. K., & Reddi, S. (2005). Just right outsourcing: Understanding and managing risk. *Journal of Management Information Systems*, 22(2), 37–55. <https://doi.org/10.1080/07421222.2005.11045852>
- Bagozzi, R. P. (2011). Measurement and meaning in information systems and organizational research: Methodological and philosophical foundations. *MIS Quarterly*, 35(2), 261–292. <https://doi.org/10.2307/23044044>
- Bhatt, G. D. (2000). An empirical examination of the effects of information systems integration on business process improvement. *International Journal of Operations & Production Management*, 20(11), 1331–1359. <https://doi.org/10.1108/01443570010348280>
- Blos, M. F., Quaddus, M., Wee, H., & Watanabe, K. (2009). Supply chain risk management (SCRM): A case study on the automotive and electronic industries in Brazil. *Supply Chain Management: An International Journal*, 14(4), 247–252. <https://doi.org/10.1108/13598540910970072>
- Bogataj, D., & Bogataj, M. (2007). Measuring the supply chain risk and vulnerability in frequency space. *International Journal of Production Economics*, 108(1–2), 291–301. <https://doi.org/10.1016/j.ijpe.2006.12.017>
- Bowersox, D. J., Closs, D. J., & Stank, T. P. (1999). *21st century logistics: Making supply chain integration a reality*. Council of Logistics Management, Michigan State University, East Lansing.
- BS 4778. (Ed.) (1991). British Standards Institute.
- Carter, C. R., Liane Easton, P., & Crum, M. (2011). Sustainable supply chain management: Evolution and future directions. *International Journal of Physical Distribution & Logistics Management*, 41(1), 46–62. <https://doi.org/10.1108/09600031111101420>
- Chaudhuri, A., Boer, H., & Taran, Y. (2018). Supply chain integration, risk management and manufacturing flexibility. *International Journal of Operations & Production Management*, 38(3), 690–712. <https://doi.org/10.1108/IJOPM-08-2015-0508>
- Chen, I. J., & Paulraj, A. (2004). Understanding supply chain management: Critical research and a theoretical framework. *International Journal of Production Research*, 42(1), 131–163. <https://doi.org/10.1080/00207540310001602865>
- Chin, W. W. (1998). Issues and opinions on structural equation modeling. *MIS Quarterly*, 22(1), 7–10. <https://www.jstor.org/stable/249674>
- Choi, K., Narasimhan, R., & Kim, S. W. (2012). Postponement strategy for international transfer of products in a global supply chain: A system dynamics examination. *Journal of Operations Management*, 30(3), 167–179. <https://doi.org/10.1016/j.jom.2012.01.003>
- Christopher, M., Mena, C., Khan, O., & Yurt, O. (2011). Approaches to managing global sourcing risk. *Supply Chain Management: An International Journal*, 16(2), 67–81. <https://doi.org/10.1108/13598541111115338>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128–152. <https://doi.org/10.2307/2393553>
- Crocitto, M., & Youssef, M. (2003). The human side of organizational agility. *Industrial Management & Data Systems*, 103(6), 388–397. <https://doi.org/10.1108/02635570310479963>
- Danese, P., Romano, P., & Formentini, M. (2013). The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network. *Transportation Research Part E: Logistics and Transportation Review*, 49(1), 125–140. <https://doi.org/10.1016/j.tre.2012.08.002>
- Das, A., Narasimhan, R., & Talluri, S. (2006). Supplier integration—Finding an optimal configuration. *Journal of Operations Management*, 24(5), 563–582. <https://onlinelibrary.wiley.com/doi/abs/10.1016/j.jom.2005.09.003>

- Das, A., Pagell, M., Behm, M., & Veltri, A. (2008). Toward a theory of the linkages between safety and quality. *Journal of Operations Management*, 26(4), 521–535. <https://doi.org/10.1016/j.jom.2007.06.005>
- Domingues, A. R., Pires, S. M., Caeiro, S., & Ramos, T. B. (2015). Defining criteria and indicators for a sustainability label of local public services. *Ecological Indicators*, 57, 452–464. <https://doi.org/10.1016/j.ecolind.2015.05.016>
- Dubey, R., Gunasekaran, A., Sushil, & Singh, T. (2015). Building theory of sustainable manufacturing using total interpretive structural modelling. *International Journal of Systems Science: Operations & Logistics*, 2(4), 231–247. <https://doi.org/10.1080/23302674.2015.1025890>
- El Baz, J., & Ruel, S. (2021). Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era. *International Journal of Production Economics*, 233, 107972. <https://doi.org/10.1016/j.ijpe.2020.107972>
- Elkington, J., & Fennell, S. (1998). Partners for sustainability. *Greener Management International*, 24, 48–60. <http://www.jstor.org/stable/45259318>
- Ellegaard, C. (2008). Supply risk management in a small company perspective. *Supply Chain Management: An International Journal*, 13(6), 425–434. <https://doi.org/10.1108/13598540810905688>
- Ellis, S. C., Shockley, J., & Henry, R. M. (2011). Making sense of supply disruption risk research: A conceptual framework grounded in enactment theory. *Journal of Supply Chain Management*, 47(2), 65–96. <https://doi.org/10.1111/j.1745-493X.2011.03217.x>
- Fan, H., Li, G., Sun, H., & Cheng, T. (2017). An information processing perspective on supply chain risk management: Antecedents, mechanism, and consequences. *International Journal of Production Economics*, 185, 63–75. <https://doi.org/10.1016/j.ijpe.2016.11.015>
- Flynn, B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management - J OPER MANAG*, 28(1), 58–71. <https://doi.org/10.1016/j.jom.2009.06.001>
- Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(3), 39–50. <https://doi.org/10.1177/002224378101800104>
- Freire, J., & Alarcón, L. F. (2002). Achieving lean design process: Improvement methodology. *Journal of Construction Engineering and Management*, 128(3), 248–256. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2002\)128:3\(248\)](https://doi.org/10.1061/(ASCE)0733-9364(2002)128:3(248))
- Frohlich, M., & Westbrook, R. (2001). Arcs of integration: An international study of supply chain strategies. *Journal of Operations Management*, 19(2), 185–200. [https://doi.org/10.1016/S0272-6963\(00\)00055-3](https://doi.org/10.1016/S0272-6963(00)00055-3)
- Frohlich, M. T. (2002). e-Integration in the supply chain: Barriers and performance*. *Decision Sciences*, 33(4), 537–556. <https://doi.org/10.1111/j.1540-5915.2002.tb01655.x>
- Galbraith, J. R. (1974). Organization design: An information processing view. *Interfaces*, 4(3), 28–36. <https://doi.org/10.1287/inte.4.3.28>
- Gelhard, C., & Von Delft, S. (2016). The role of organizational capabilities in achieving superior sustainability performance. *Journal of Business Research*, 69(10), 4632–4642. <https://doi.org/10.1016/j.jbusres.2016.03.053>
- Germain, R., & Iyer, K. N. (2006). The interaction of internal and downstream integration and its association with performance. *Journal of Business Logistics*, 27(2), 29–52. <https://doi.org/10.1002/j.2158-1592.2006.tb00216.x>
- Gharaei, A., Hoseini Shekarabi, S. A., Karimi, M., Pourjavad, E., & Amjadian, A. (2021). An integrated stochastic EPQ model under quality and green policies: Generalised cross decomposition under the separability approach. *International Journal of Systems Science: Operations & Logistics*, 8(2), 119–131. <https://doi.org/10.1080/23302674.2019.1656296>
- Goh, M., Lim, J. Y., & Meng, F. (2007). A stochastic model for risk management in global supply chain networks. *European Journal of Operational Research*, 182(1), 164–173. <https://doi.org/10.1016/j.ejor.2006.08.028>
- Grimm, C. M. (2004). The practice of supply chain management: Where theory and application converge. *Transportation Journal*, 43(2), 59. <https://www.jstor.org/stable/20713566>
- Hair, J. F., Ringle, C. M., & Marko, S. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–151. <https://doi.org/10.2753/MTP1069-6679190202>
- Hair, J. J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.
- Handfield, R. B., Cousins, P. D., Lawson, B., & Petersen, K. J. (2015). How can supply management really improve performance? A knowledge-based model of alignment capabilities. *Journal of Supply Chain Management*, 51(3), 3–17. <https://doi.org/10.1111/jscm.12066>
- Hao, Y., Helo, P., & Shamsuzzoha, A. (2018). Virtual factory system design and implementation: Integrated sustainable manufacturing. *International Journal of Systems Science: Operations & Logistics*, 5(2), 116–132. <https://doi.org/10.1080/23302674.2016.1242819>
- Harland, C., Brenchley, R., & Walker, H. (2003). Risk in supply networks. *Journal of Purchasing and Supply Management*, 9(2), 51–62. [https://doi.org/10.1016/S1478-4092\(03\)00004-9](https://doi.org/10.1016/S1478-4092(03)00004-9)
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hillebrand, B., & Biemans, W. G. (2004). Links between internal and external cooperation in product development: An exploratory study. *Journal of Product Innovation Management*, 21(2), 110–122. <https://doi.org/10.1111/j.0737-6782.2004.00061.x>
- Ho, W., Zheng, T., Yildiz, H., & Talluri, S. (2015). Supply chain risk management: A literature review. *International Journal of Production Research*, 53(16), 5031–5069. <https://doi.org/10.1080/00207543.2015.1030467>
- Horvath, L. (2001). Collaboration: The key to value creation in supply chain management. *Supply Chain Management: An International Journal*, 6(5), 205–207. <https://doi.org/10.1108/EUM000000006039>
- Hung, K.-T., & Ryu, S. (2008). Changing risk preferences in supply chain inventory decisions. *Production Planning and Control*, 19(8), 770–780. <https://doi.org/10.1080/09537280802550146>
- Huq, F. A., Chowdhury, I. N., & Klassen, R. D. (2016). Social management capabilities of multinational buying firms and their emerging market suppliers: An exploratory study of the clothing industry. *Journal of Operations Management*, 46(1), 19–37. <https://doi.org/10.1016/j.jom.2016.07.005>
- Huq, F. A., Stevenson, M., & Zorzini, M. (2014). Social sustainability in developing country suppliers: An

- exploratory study in the ready made garments industry of Bangladesh. *International Journal of Operations and Production Management*, 34(1), 610–638. <https://doi.org/10.1108/IJOPM-10-2012-0467>
- Jajja, M. S. S., Chatha, K. A., & Farooq, S. (2018). Impact of supply chain risk on agility performance: Mediating role of supply chain integration. *International Journal of Production Economics*, 205(1), 118–138. <https://doi.org/10.1016/j.ijpe.2018.08.032>
- Jayaram, J., & Tan, K.-C. (2010). Supply chain integration with third-party logistics providers. *International Journal of Production Economics*, 125(2), 262–271. <https://doi.org/10.1016/j.ijpe.2010.02.014>
- Jørgensen, K. (2008). A systematic use of information from accidents as a basis of prevention activities. *Safety Science*, 46(2), 164–175. <https://doi.org/10.1016/j.ssci.2007.05.016>
- Jüttner, U. (2005). Supply chain risk management: Understanding the business requirements from a practitioner perspective. *The International Journal of Logistics Management*, 16(1), 120–141. <https://doi.org/10.1108/09574090510617385>
- Jüttner, U., Peck, H., & Christopher, M. (2003). Supply chain risk management: Outlining an agenda for future research. *International Journal of Logistics: Research and Applications*, 6(4), 197–210. <https://doi.org/10.1080/13675560310001627016>
- Kauppi, K., Longoni, A., Caniato, F., & Kuula, M. (2016). Managing country disruption risks and improving operational performance: Risk management along integrated supply chains. *International Journal of Production Economics*, 182, 484–495. <https://doi.org/10.1016/j.ijpe.2016.10.006>
- Kaya, M., & Özer, Ö. (2009). Quality risk in outsourcing: Noncontractible product quality and private quality cost information. *Naval Research Logistics (NRL)*, 56(7), 669–685. <https://doi.org/10.1002/nav.20372>
- Kim, S. W. (2009). An investigation on the direct and indirect effect of supply chain integration on firm performance. *International Journal of Production Economics*, 119(2), 328–346. <https://doi.org/10.1016/j.ijpe.2009.03.007>
- Klassen, R. D., & Vereecke, A. (2012). Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance. *International Journal of Production Economics*, 140(1), 103–115. <https://doi.org/10.1016/j.ijpe.2012.01.021>
- Kock, N. (2015). Common method bias in PLS-SEM. *International Journal of e-Collaboration*, 11(4), 1–10. <http://dx.doi.org/10.4018/ijec.2015100101>
- Koufteros, X., Vonderembse, M., & Jayaram, J. (2005). Internal and external integration for product development: The contingency effects of uncertainty, equivocality, and platform strategy. *Decision Sciences*, 36(1), 97–133. <https://doi.org/10.1111/j.1540-5915.2005.00067.x>
- Kozlowski, A., Searcy, C., Bardecki, M., & Rick Edgeman, Professor Andy Neely, D. (2015). Corporate sustainability reporting in the apparel industry: An analysis of indicators disclosed. *International Journal of Productivity and Performance Management*, 64(3), 377–397. <https://doi.org/10.1108/IJPPM-10-2014-0152>
- Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of Management Review*, 31(4), 833–863. <https://doi.org/10.5465/amr.2006.22527456>
- Won Lee, C., Kwon, I.G. and Severance, D. (2007). Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply Chain Management*, 12(6), 444–452. <https://doi.org/10.1108/13598540710826371>
- Lee, H. L., Padmanabhan, V., & Whang, S. (1997). Information distortion in a supply chain: The bullwhip effect. *Management Science*, 43(4), 546–558. <https://doi.org/10.1287/mnsc.43.4.546>
- Lee, H. L., & Whang, S. (2004). E-business and supply chain integration. In T. P. Harrison, H. L. Lee, & J. J. Neale (Eds.), *The practice of supply chain management: Where theory and application converge* (pp. 123–138). Boston, MA: Springer.
- Mani, V., Agarwal, R., Gunasekaran, A., Papadopoulos, T., Dubey, R., & Childe, S. J. (2016). Social sustainability in the supply chain: Construct development and measurement validation. *Ecological Indicators*, 71, 270–279. <https://doi.org/10.1016/j.ecolind.2016.07.007>
- Mani, V., Agrawal, R., & Sharma, V. (2015). Social sustainability practices in the supply chain of Indian manufacturing industries. *International Journal of Automation and Logistics*, 1(3), 211–233. <https://doi.org/10.1504/IJAL.2015.071721>
- Mani, V., Gunasekaran, A., Papadopoulos, T., Hazen, B., & Dubey, R. (2016). Supply chain social sustainability for developing nations: Evidence from India. *Resources, Conservation and Recycling*, 111, 42–52. <https://doi.org/10.1016/j.resconrec.2016.04.003>
- Mani, V., Jabbour, C. J. C., & Mani, K. T. N. (2020). Supply chain social sustainability in small and medium manufacturing enterprises and firms' performance: Empirical evidence from an emerging Asian economy. *International Journal of Production Economics*, 227, 107656. <https://doi.org/10.1016/j.ijpe.2020.107656>
- Manuj, I., & Mentzer, J. T. (2008). Global supply chain risk management strategies. *International Journal of Physical Distribution & Logistics Management*, 38(3), 192–223. <https://doi.org/10.1108/09600030810866986>
- Neiger, D., Rotaru, K., & Churilov, L. (2009). Supply chain risk identification with value-focused process engineering. *Journal of Operations Management*, 27(2), 154–168. <https://doi.org/10.1016/j.jom.2007.11.003>
- Okun, A. H., Guerin, R. J., & Schulte, P. A. (2016). Foundational workplace safety and health competencies for the emerging workforce. *Journal of Safety Research*, 59, 43–51. <https://doi.org/10.1016/j.jsr.2016.09.004>
- Pagell, M., & Gobeli, D. (2009). How plant managers' experiences and attitudes toward sustainability relate to operational performance. *Production and Operations Management*, 18(3), 278–299. <https://doi.org/10.1111/j.1937-5956.2009.01050.x>
- Paulraj, A. (2011). Understanding the relationships between internal resources and capabilities, sustainable supply management and organizational sustainability. *Journal of Supply Chain Management*, 47(1), 19–37. <https://doi.org/10.1111/j.1745-493X.2010.03212.x>
- Perols, J., Zimmermann, C., & Kortmann, S. (2013). On the relationship between supplier integration and time-to-market. *Journal of Operations Management*, 31(3), 153–167. <https://doi.org/10.1016/j.jom.2012.11.002>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 839–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Pullman, M. E., Maloni, M. J., & Carter, C. R. (2009). Food for thought: Social versus environmental sustainability practices and performance outcomes. *Journal of Supply Chain Management*, 45(4), 38–54. <https://doi.org/10.1111/j.1745-493X.2009.03175.x>

- Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14(3), 681–695. <https://doi.org/10.1007/s11625-018-0627-5>
- Ragatz, G. L., Handfield, R. B., & Petersen, K. J. (2002). Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *Journal of Business Research*, 55(5), 389–400. [https://doi.org/10.1016/S0148-2963\(00\)00158-2](https://doi.org/10.1016/S0148-2963(00)00158-2)
- Raiffa, H. (1982). Science and policy: Their separation and integration in risk analysis. *The American Statistician*, 36(3b), 225–231. <https://doi.org/10.1080/00031305.1982.10482843>
- Rao, P., & Holt, D. (2005). Do green supply chains lead to economic performance? *International Journal of Operations & Production Management*, 25(9), 898–916. <https://doi.org/10.1108/01443570510613956>
- Glenn Richey, R., Chen, H., Upreti, R., Fawcett, S. E., & Adams, F. G. (2009). The moderating role of barriers on the relationship between drivers to supply chain integration and firm performance. *International Journal of Physical Distribution & Logistics Management*, 39(10), 826–840. <https://doi.org/10.1108/09600030911011432>
- Riley, J. M., Klein, R., Miller, J., & Sridharan, V. (2016). How internal integration, information sharing, and training affect supply chain risk management capabilities. *International Journal of Physical Distribution & Logistics Management*, 46(10), 953–980. <https://doi.org/10.1108/IJPDLM-10-2015-0246>
- Ringle, C. M., Sven, W., & Jan-Michael, B. (2015). *SmartPLS. SmartPLS*.
- Rosenzweig, E. D., Roth, A. V., & Dean, J. W., Jr. (2003). The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. *Journal of Operations Management*, 21(4), 437–456. [https://doi.org/10.1016/S0272-6963\(03\)00037-8](https://doi.org/10.1016/S0272-6963(03)00037-8)
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup analysis in Partial Least Squares (PLS) path modeling: Alternative methods and empirical results. In M. Sarstedt, M. Schwaiger, & C. R. Taylor (Eds.) *Measurement and research methods in international marketing (Advances in International Marketing, Vol. 22, pp. 195–218)*. Bingley: Emerald Group Publishing Limited. [https://doi.org/10.1108/S1474-7979\(2011\)0000022012](https://doi.org/10.1108/S1474-7979(2011)0000022012)
- Schmitt, A. J., & Singh, M. (2012). A quantitative analysis of disruption risk in a multi-echelon supply chain. *International Journal of Production Economics*, 139(1), 22–32. <https://doi.org/10.1016/j.ijpe.2012.01.004>
- Schoenherr, T., & Swink, M. (2012a). Revisiting the arcs of integration: Cross-Validations and extensions. *Journal of Operations Management - J OPER MANAG*, 30. <https://doi.org/10.1016/j.jom.2011.09.001>
- Schoenherr, T., & Swink, M. (2012b). Revisiting the arcs of integration: Cross-validations and extensions. *Journal of Operations Management*, 30(1–2), 99–115. <https://doi.org/10.1016/j.jom.2011.09.001>
- Schoenherr, T., Tummala, V. R., & Harrison, T. P. (2008). Assessing supply chain risks with the analytic hierarchy process: Providing decision support for the offshoring decision by a US manufacturing company. *Journal of Purchasing and Supply Management*, 14(2), 100–111. <https://doi.org/10.1016/j.pursup.2008.01.008>
- Shin, H., & Benton, W. (2007). A quantity discount approach to supply chain coordination. *European Journal of Operational Research*, 180(2), 601–616. <https://doi.org/10.1016/j.ejor.2006.04.033>
- Shu, C., Liu, J., Zhao, M., & Davidsson, P. (2020). Proactive environmental strategy and firm performance: The moderating role of corporate venturing. *International Small Business Journal*, 38(7), 654–676. <https://doi.org/10.1177/0266242620923897>
- Stevens, G. C. (1989). Integrating the supply chain. *International Journal of Physical Distribution & Materials Management*, 19(8), 3–8. <https://doi.org/10.1108/EUM00000000000329>
- Swink, M., Narasimhan, R., & Wang, C. (2007). Managing beyond the factory walls: Effects of four types of strategic integration on manufacturing plant performance. *Journal of Operations Management - J OPER MANAG*, 25(1), 148–164. <https://doi.org/10.1016/j.jom.2006.02.006>
- Swink, M., & Song, M. (2007). Effects of marketing-manufacturing integration on new product development time and competitive advantage. *Journal of Operations Management*, 25(1), 203–217. <https://doi.org/10.1016/j.jom.2006.03.001>
- Takeishi, A. (2001). Bridging inter-and intra-firm boundaries: Management of supplier involvement in automobile product development. *Strategic Management Journal*, 22(5), 403–433. <https://doi.org/10.1002/smj.164>
- Tang, C. S. (2006). Perspectives in supply chain risk management. *International Journal of Production Economics*, 103(2), 451–488. <https://doi.org/10.1016/j.ijpe.2005.12.006>
- Tang, O., Musa, S. N., & Li, J. (2012). Dynamic pricing in the newsvendor problem with yield risks. *International Journal of Production Economics*, 139(1), 127–134. <https://doi.org/10.1016/j.ijpe.2011.01.018>
- Tomlin, B. (2006). On the value of mitigation and contingency strategies for managing supply chain disruption risks. *Management Science*, 52(5), 639–657. <https://doi.org/10.1287/mnsc.1060.0515>
- Trkman, P., & McCormack, K. (2009). Supply chain risk in turbulent environments—A conceptual model for managing supply chain network risk. *International Journal of Production Economics*, 119(2), 247–258. <https://doi.org/10.1016/j.ijpe.2009.03.002>
- Tsai, M. C., Liao, C. H., & Han, C. S. (2008). Risk perception on logistics outsourcing of retail chains: Model development and empirical verification in Taiwan. *Supply Chain Management: An International Journal*, 13(6), 415–424. <https://doi.org/10.1108/13598540810905679>
- Tsao, Y.-C. (2015). Design of a carbon-efficient supply-chain network under trade credits. *International Journal of Systems Science: Operations & Logistics*, 2(3), 177–186. <https://doi.org/10.1080/23302674.2015.1024187>
- Tummala, V. R., & Mak, C. (2001). A risk management model for improving operation and maintenance activities in electricity transmission networks. *Journal of the Operational Research Society*, 52(2), 125–134. <https://doi.org/10.1057/palgrave.jors.2601044>
- Vachon, S., & Klassen, R. (2008). Environmental management and manufacturing performance: The role of collaboration in the supply chain. *International Journal of Production Economics*, 111(2), 299–315. <https://doi.org/10.1016/j.ijpe.2006.11.030>
- Vickery, S. K., Jayaram, J., Droge, C., & Calantone, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships. *Journal of Operations Management*, 21(5), 523–539. <https://doi.org/10.1016/j.jom.2003.02.002>
- Voorde, K., Paaauwe, J., & Veldhoven, M. (2011). Employee well-being and the HRM-Organizational performance relationship: A review of quantitative studies.

- International Journal of Management Reviews*, 14(4), 391–407. <https://doi.org/10.1111/j.1468-2370.2011.00322.x>
- Wagner, S. M., & Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal of Business Logistics*, 29(1), 307–325. <https://doi.org/10.1002/j.2158-1592.2008.tb00081.x>
- Wang, B., Childerhouse, P., Kang, Y., Huo, B., & Mathrani, S. (2016). Enablers of supply chain integration: Interpersonal and interorganizational relationship perspectives. *Industrial Management & Data Systems*, 116(4), 838–855. <https://doi.org/10.1108/IMDS-09-2015-0403>
- WCED. (1987). World commission on environment and development. *Our Common Future*, 17(1), 1–91. <https://digitallibrary.un.org/record/139811?ln=en>
- Wiengarten, F., Pagell, M., Ahmed, M. U., & Gimenez, C. (2014). Do a country's logistical capabilities moderate the external integration performance relationship? *Journal of Operations Management*, 32(1–2), 51–63. <https://doi.org/10.1016/j.jom.2013.07.001>
- Gimenez, C., & Tachizawa, E. M. (2012). Extending sustainability to suppliers: A systematic literature review. *Supply Chain Management*, 17(5), 531–543. <https://doi.org/10.1108/13598541211258591>
- Williams, B. D., Roh, J., Tokar, T., & Swink, M. (2013). Leveraging supply chain visibility for responsiveness: The moderating role of internal integration. *Journal of Operations Management*, 31(7), 543–554. <https://doi.org/10.1016/j.jom.2013.09.003>
- Wisner, J. D., & Tan, K. C. (2000). Supply chain management and its impact on purchasing. *Journal of Supply Chain Management*, 36(3), 33–42. <https://doi.org/10.1111/j.1745-493X.2000.tb00084.x>
- Wolf, J. (2013). Improving the sustainable development of firms: The role of employees. *Business Strategy and the Environment*, 22(2), 92–108. <https://doi.org/10.1002/bse.1731>
- Wolf, J. (2014). The relationship between sustainable supply chain management, stakeholder pressure and corporate sustainability performance. *Journal of Business Ethics*, 119(3), 317–328. <https://doi.org/10.1007/s10551-012-1603-0>
- Wong, C. Y., Boon-Itt, S., & Wong, C. W. (2011). The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance. *Journal of Operations Management*, 29(6), 604–615. <https://doi.org/10.1016/j.jom.2011.01.003>
- Tummala, R., & Schoenherr, T. (2011). Assessing and managing risks using the supply chain risk management process (SCRMP). *Supply Chain Management*, 16(6), 474–483. <https://doi.org/10.1108/13598541111171165>
- Yadlapalli, A., Rahman, S., & Gunasekaran, A. (2018). Socially responsible governance mechanisms for manufacturing firms in apparel supply chains. *International Journal of Production Economics*, 196, 135–149. <https://doi.org/10.1016/j.ijpe.2017.11.016>
- Yang, B., & Yang, Y. (2010). Postponement in supply chain risk management: A complexity perspective. *International Journal of Production Research*, 48(7), 1901–1912. <https://doi.org/10.1080/00207540902791850>
- Yuan, F., & Woodman, R. W. (2010). Innovative behavior in the workplace: The role of performance and image outcome expectations. *Academy of Management Journal*, 53(2), 323–342. <https://doi.org/10.5465/amj.2010.49388995>
- Zhang, X., Shen, L., & Wu, Y. (2011). Green strategy for gaining competitive advantage in housing development: A China study. *Journal of Cleaner Production*, 19(2), 157–167. <https://doi.org/10.1016/j.jclepro.2010.08.005>
- Zhao, L., Huo, B., Sun, L. & Zhao, X. (2013). The impact of supply chain risk on supply chain integration and company performance: A global investigation. *Supply Chain Management*, 18(2), pp. 115–131. <https://doi.org/10.1108/13598541311318773>
- Zhao, X., Huo, B., Flynn, B. B., & Yeung, J. H. Y. (2008). The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *Journal of Operations Management*, 26(3), 368–388. <https://doi.org/10.1016/j.jom.2007.08.002>
- Zhao, X., Huo, B., Selen, W., & Yeung, J. H. Y. (2011a). The impact of internal integration and relationship commitment on external integration. *Journal of Operations Management*, 29(1), 17–32. <https://doi.org/10.1016/j.jom.2010.04.004>
- Zhao, X., Huo, B., Selen, W., & Yeung, J. H. Y. (2011b). The impact of internal integration and relationship commitment on external integration. *Journal of Operations Management*, 29(1–2), 17–32. <https://onlinelibrary.wiley.com/doi/abs/10.1016/j.jom.2010.04.004>

Appendix A Questionnaire

| Path | Beta(Nonmanu- facturing) | Beta(manu- facturer) | BetaDiffer-ences | MGA p-value |
|---|-----------------------------|-------------------------|------------------|-------------|
| H1: SC Risk Management → Supplier Integration | 0.575*** | 0.610*** | 0.036 | 0.427 |
| H2: SC Risk Management → Customer Integration | 0.523*** | 0.352*** | 0.171 | 0.881 |
| H3: SC Risk Management → Internal Integration | 0.430*** | 0.270*** | 0.16 | 0.896 |
| H4: Internal Integration → Supplier Integration | 0.164* | 0.001 | 0.163 | 0.768 |
| H5: Internal Integration → Customer Integration | 0.129 | 0.264*** | 0.135 | 0.187 |
| H6: Supplier Integration → Supply chain performance | 0.237* | 0.274* | 0.037 | 0.412 |
| H7: Customer Integration → Supply chain performance | 0.218* | -0.011 | 0.229 | 0.884 |
| H8: Internal Integration → Supply chain performance | 0.374* | 0.487* | 0.113 | 0.195 |
| H9: SC Risk Management*SC Social Sustainability → Customer Integration | 0.065 | 0.065 | 0 | 0.51 |
| H10: SC Risk Management*SC Social Sustainability → Internal Integration | -0.126* | -0.021 | 0.105 | 0.104 |
| H11: SC Risk Management*SC Social Sustainability → Supplier Integration | 0.04 | 0.102 | 0.062 | 0.238 |
| Years of operation → Supply chain performance | -0.012 | -0.193 | 0.181 | 0.941 |
| Firm's capital investment → Supply chain performance | -0.056 | 0.078 | 0.134 | 0.089 |

*Note. Significance level at ***: p-value < 0.001; **: p-value <0.01; *: p-value <0.05; NS: non-significant

| Construct | | Measurement |
|--|--------|--|
| SUPPLY CHAIN RISK MANAGEMENT | | |
| Risk identity (RID) | rid1. | We are comprehensively informed about basic possible risks in our supply chain |
| | rid2. | We are constantly searching for short-term risks in our supply chain |
| | rid3. | In the course of our risk analysis for all suppliers and SC partners, we select relevant observation fields for supply risks |
| | rid4. | In the course of our risk analysis for all SC partners, we define early warning indicators |
| Risk assessment(RAS) | ras1. | In the course of our risk analysis, we look for the possible sources of supply chain risks |
| | ras2. | In the course of our risk analysis, we evaluate the probability of supply chain risks |
| | ras3. | In the course of our risk analysis, we analyze the possible impact of supply chain risks |
| | ras4. | In the course of our risk analysis, we classify and prioritize our supply chain risks |
| Risk mitigation(RMI) | rmi1. | In the course of our risk analysis, we demonstrate possible reaction strategies |
| | rmi2. | In the course of our risk analysis, we evaluate the effectiveness of the possible reaction |
| | rmi3. | Supply chain risk management is an important activity in our company |
| Risk control(RCT) | rct1. | Our employees are highly sensitized for the perception of supply risks |
| | rct2. | Our risk management processes are very professionally designed |
| | rct3. | We have managed to minimize the frequency of occurrence of supply chain risks over the last three years |
| | rct4. | We have managed to minimize the impact of the occurrence of supply chain risks over the last three years |
| SUPPLY CHAIN SOCIAL SUSTAINABILITY (SCSS) | | |
| Philanthropy(PHIL) | ssph1. | Encourages supply chain partners to participate in philanthropic activities |
| | ssph2. | Volunteers at local charities |
| | ssph3. | Donates to charitable organizations |
| | ssph4. | Assists NGOs with societal development |
| Safety(SAFE) | ssaf1. | Ensures supply chain facilities adhere to strict safety regulations |
| | ssaf2. | Ensures women's safety across the supply chain |
| | ssaf3. | Ensures the safe incoming and outgoing movement of product to and from trading partner facilities |

(Continued)

| Construct | | Measurement |
|-------------------------------------|--------|--|
| SUPPLY CHAIN RISK MANAGEMENT | | |
| Equity(EQUI) | sseq1. | Ensures strict adherence to gender non-discrimination policies at trading partner locations |
| | sseq2. | Ensures workplace diversity at trading partners' facilities |
| | sseq3. | Ensures gender non-discrimination policies are in place at trading partners' facilities |
| | sseq4. | Periodically audits trading partners to ensure adherence to equality policies |
| Health & Welfare(HEWE) | sshw1. | Ensures welfare of stakeholders at trading partner locations |
| | sshw2. | Ensures availability of health care facilities in trading partner locations |
| Human Rights(HURI) | sshr1. | Has a human rights policy for our manufacturing facilities |
| | sshr2. | Audits trading partner locations and ensures non-employment of child and bonded labor |
| | sshr3. | Ensures non-employment of sweatshop labors in trading partner locations |
| Ethic (ETHI) | ethi1. | Established an ethical compliance team, department or division in our manufacturing facilities |
| | ethi2. | Has established a set of transparent, comprehensive, and stringent ethical codes of conduct in our manufacturing units |
| SUPPLIER INTEGRATION (ISP) | isp1. | We have a high degree of information exchange with our primary supplier through information networks. |
| | isp2. | We share our procurement or production plans with our major suppliers-farmers, farmer cooperatives, etc. |
| | isp3. | We share our demand forecasts with our major suppliers. |
| | isp4. | We have a high degree of a strategic partnership with our major suppliers |

(Continued)

| (Continued) | | |
|-------------------------------------|--------|--|
| Construct | | Measurement |
| SUPPLY CHAIN RISK MANAGEMENT | | |
| CUSTOMER INTEGRATION (ICU) | icu1. | We have a high degree of information sharing with major customers about market information |
| | icu2. | We have a high degree of joint planning and forecasting with major customers to anticipate demand visibility |
| | icu3. | We share our production plan with our major customers |
| | icu4. | We have a high degree of strategic partnership with our major customers |
| INTERNAL INTEGRATION (INTE) | iin1. | We realize data integration among all internal functions |
| | iin2. | We can real-time search the information of supply, production, and demand |
| | iin3. | We use cross-functional teams in the procurement process of agricultural products |
| | iin4. | We use cross-functional teams in new product development, e.g., developing new brands or introducing new product lines |
| SUPPLY CHAIN PERFORMANCE(SCPF) | scpf1. | Increased customer satisfaction with fulfillment |
| | scpf2. | Achieved compressed order lead time |
| | scpf3. | Increased customer service level |



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