

Impact of green supply chain management on competitive advantage and firm performance in Vietnam

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ABSTRACT

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The objective of the article is to evaluate the influence of green supply chain management on firm performance through a mediate variable which is competitive advantage and moderate variable which is supply chain integration. Research was conducted on 313 Vietnamese enterprises and the data analyzed by Smart PLS software shows that green supply chain management has a positive impact on firm performance. At the same time, competitive advantage and supply chain integration both have a statistically significant mediating and moderating role. The research results are meaningful for managers to come up with green supply chain integration policies and strategies to improve competitive advantage and firm performance.

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1. Introduction

Following the trend of accelerating industrialization of countries, environmental protection issues are becoming increasingly acute and important (Shang et al., 2010). This has led to strong pressures on these businesses to act environmentally (Chan, 2010). In addition to government intervention, businesses also need to upgrade their strategic environmental capabilities through logistics management or supply chain management (Shang & Marlow, 2005) to better fit the current context. This urgency has caused businesses to expand their focus beyond internal activities for surrounding issues, especially environmental issues with partners. Prominent among them, the function of the supply chain is tied to environmental initiatives (Preuss, 2005). As a result, green supply chain management (GSCM) has become a widely discussed issue, combining elements of environmental management and supply chain management (Yang et al., 2013). The concepts of supply chain management (SCM) as well as later supply chain integration (SCI) emerged and received enthusiastic contributions from the scientific community in the last years of the 20th century (Zhu et al., 2012). Since then, research into the applications of SCM and SCI has been widely developed, and one of the important trends is green supply chain management. Previous literature has documented a range of factors, such as eco-design (e.g., Kirchoff et al., 2016; Younis et al., 2016), environmental cooperation (e.g., Perotti et al., 2012; Lee et al., 2012), internal environmental management (e.g., Kirchoff et al., 2016; Lee et al., 2012) are aspects of GSCM. However, the divisions are mostly relatively discrete and do not cover the entire supply chain of the business. Besides, although researchers have long believed that improving GSCM will solve some problems of the business and thereby enhance competitive advantage (e.g., Sharabati, 2021) or improve operational efficiency

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(e.g., Choi & Hwang et al., 2015; Foo et al., 2018). Despite receiving great attention, the importance of practicing these strategies is focusing primarily on multinational enterprises or on the context of developed countries (e.g., Chan et al., 2012; Laari et al., 2016). The lack of empirical evidence in developing regions makes the issues surrounding the GSCM controversial. As a result, this will likely cause assessments of the importance of SCM in general and GSCM in particular to be skewed for businesses. In the foregoing context, this study aims to enrich existing literature by selecting two key aspects to accommodate the GSCM assessment. Additionally, based on the Triple-Bottom Line, this study builds on how to measure performance in a sustainability-oriented manner. In addition, RBV theory is also used to explain the mechanism of influence of GSCM on operational efficiency through the competitive advantage model of enterprises. Finally, the regulatory role of supply chain integration levels for the influence of GSCM on firm performance is also examined and through this it is possible to better understand the importance of GSCM to each group of businesses. In summary, this research not only inspires researchers to pursue investigations into this important area in emerging regions, but also provides useful insights into GSCM for today's businesses.

2. Conceptual framework and hypothesis development

For reference, the research model on the mechanism of impact of GSCM on HQHD in this study is proposed in Fig 1. Under this mechanism, the implementation of GSCM will help businesses increase their competitive advantage, and thereby improve sustainable operational efficiency. In particular, the Price/Cost, Quality, Innovation, Delivery Dependability and Time To Market aspects will mediate the impact of GSCM on the performance of enterprises. These proposed relationships are consistent based on RBV and TBL in terms of leveraging exploitable resources to achieve competitive advantage and sustainable operational efficiencies (e.g., Shang et al., 2010; Feng et al., 2018). The study of this intermediate influence is important because SCM in general and GSCM in particular both have an impact on the interconnection of (global) value chains of enterprises today. In addition to this mechanism of influence, the assessment of SCI's regulatory role in the influence of GSCM on the performance of enterprises is also reflected in Fig 1. A series of previous studies have shown that better supply chain management has positive effects on the business, but also depends on the context. Therefore, without assessing the regulatory factors, the results obtained will be skewed and no longer reasonable. In this section, the conceptual framework of the factors in the model and the two theories (RBV, TBL) will be presented first and then proposed research hypotheses on the mechanism of influence of GSCM on the performance and regulatory role of SCI.

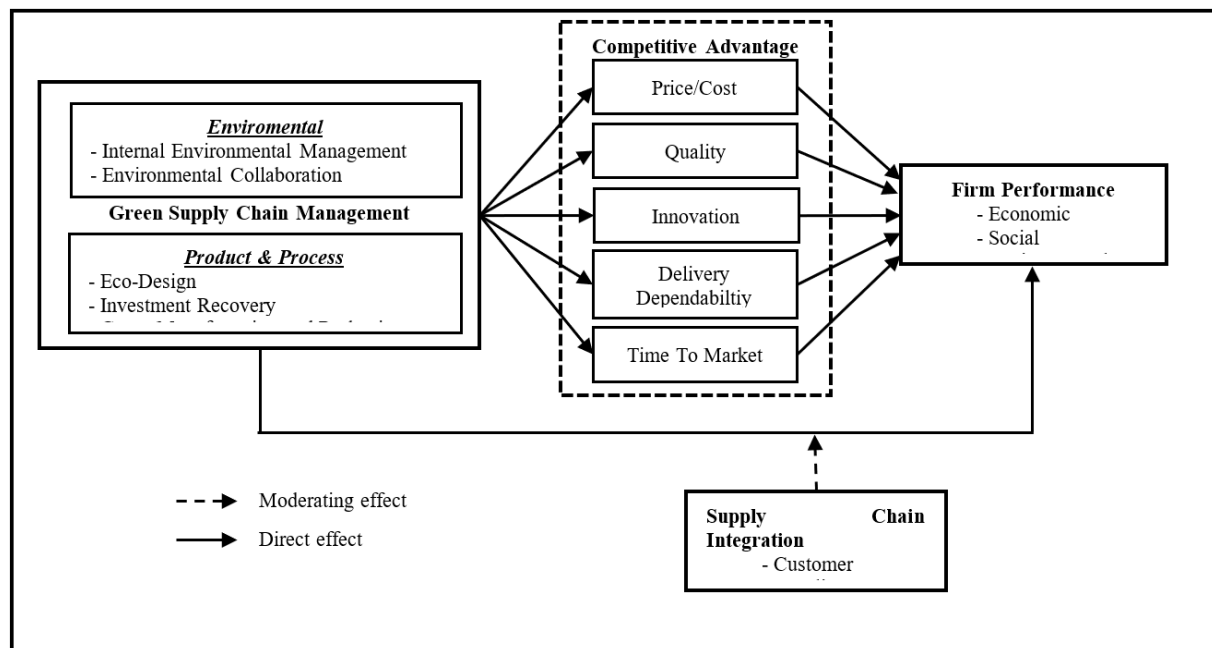


Fig. 1. The conceptual model

2.1. Green supply chain management

In recent literature, researchers have attempted to give a definition for GSCM using a variety of specialized terms. Ahi & Searcy (2013) paper focusing entirely on GSCM definitions has shown that there are 22 different definitions for GSCM. Some Trends in developing definitions for GSCM are

- (1) Closed loop supply chain - sustainable supply chain (e.g., Spengler et al., 2004; Linton et al., 2007);

- (2) Socially responsible supply chain (Salam, 2009)
- (3) Ethical or environmental supply chain (e.g. Beamon, 2005; Dian et al., 2022); and the list can continue.

Sarkis (2012) argues that defining boundaries between terms in SCM, as well as boundaries between parties involved in GSCM, is one of the things that makes unifying definitions of GSCM impossible. In this study, the concepts of GSCM will not be covered again but instead focus on the aspects that GSCM "covers". In other words, using existing materials, measurement aspects for GSCM that are relevant to the context in Vietnam will be selected and presented. It can be seen that, no matter how diverse the definition for GSCM is, the bottom line is that the "environment" remains the same in most studies. This aspect of GSCM refers to reducing the environmental impact of corporate operations through collaboration between businesses and partners such as suppliers or customers (Olugu et al., 2011). Vachon and Klassen (2006, 2008) mentioned two types of external GSCM practices: cooperating, and monitoring. Environmental monitoring is generally linked to the practice of supplier and material selection, while environmental cooperation focuses on building supplier environmental capacity (Vachon & Klassen, 2006, 2008; Lee et al., 2014). These two aspects are already relatively adequate for the external supply chain management of the enterprise but not to mention the internal supply chain. Therefore, this study adds internal environmental management to aspects of the environmental dimension of GSCM. Internal environmental management refers to the processes and procedures that support environmental goals within an organization. Management support is considered an important strategic resource and a catalyst for implementing cross-functional cooperation to improve environmental impact in business operations and enact overall quality environmental management (De Giovanni & Vinzi, 2014). Environmental Cooperation and Monitoring reflects the company's focus on working with clients to better understand environmental issues and issues from a downstream perspective. Includes product development, manufacturing processes, and packaging to reduce environmental impact. Considered a strategic resource that integrates customers into decision-making processes to help reduce costs and improve customer satisfaction (Perotti et al., 2012). However, at the enterprise level, if you only care about the environmental aspect, a comprehensive assessment of GSCM is not really convincing. GSCM not only focuses on the environmental aspect, but its essence is still related to the supply chain, in which product & process must be included. This study approaches the product & process aspect through 3 dimensions: eco-design, investment recovery (Choi & Hwang, 2015) and manufacturing & packaging (Shang et al., 2010). According to Choi & Hwang's GSCM research model based on a closed loop supply chain (Fig. 1), it can be seen that two aspects, eco-design and investment recovery, are covering manufacturing & packaging. However, in this study, manufacturing & packaging was used as an independent dimension. The manufacturing & packaging dimension, as described by Shang et al. (2010), is an overall product & process aspect of GSCM. In so competitive advantages, six dimensions of GSCM used in this study were established, including three related to the environment (internal management, cooperation, monitoring) and three related to product & process (eco-design, investment recovery and manufacturing & packaging). This is a chief basis to approach the measurement for GSCM in this study through a hierarchical component model.

2.2. Resource-based view and triple bottom line

A resource-based view (RBV) is a theoretical framework used to explain the importance of effective exploitation of strategic resources for enhancing the sustainable competitive advantage of enterprises (Barney, 1991, Lynch et al., 2000). The resources in the enterprise can be tangible assets or intangible assets and they are very diverse such as human resources, capital, knowledge, etc. According to Choi & Hwang (2015), the RBV-based approach emphasizes the importance of strategic assets as a special asset, a rare and irreplaceable resource for the business. In fact, RBV is an important theoretical framework for any study of GSCM because it is a premise to tie the close relationship between strategic resources and the development of the business. Through the implementation of green strategies or specifically green supply chain management strategies such as pollution reduction, process management and green products, businesses can reduce environmental costs or at least build a reputation for stakeholders. The management of the environment or process & product will ensure the equal sharing of environmental responsibilities of the parties involved in the life cycle of the product. In summary, RBV has been increasingly improved by researchers, thereby showing the importance of evaluating green strategic resources in improving the sustainable competitive advantage of enterprises (Shi et al., 2012).

Although RBV can explain well how GSCM affects competitive advantage as well as firm performance, it does not provide much significance for measuring firm performance in empirical studies. In fact, measuring performance in GSCM studies accordingly is still met with mixed reviews. This suggests that a suitable theory is needed to measure firm performance, and the theoretical framework for triple bottom line (TBL) is proposed in this study.

In light of this research, Elkington (1994) has provided 3 core bases for TBL that are based on profit, people and planet, and with a greater degree of generalization, economic, social and environmental respectively (Ahi & Searcy, 2013; Seth et al., 2016). While there are still debates about the combination of these 3 aspects in measuring a business's sustainable performance, there is probably no better metric to evaluate firm performance in the context of green strategy studies. By combining RBV and TBL, an assessment could not be more plausible for the mechanism of impact of GSCM on business performance. Indeed, in the most necessary efforts to save the Earth, the urgency of adding economic and social aspects instead of being limited to manufacturing was declared in United Nations Framework Convention on Climate Change 2015. At the organizational level, GSCM involves coordinating "green" corporate activities, taking into account economic, social and obviously environmental issues (Khan & Qianli, 2017). GSCM is the process of integrating environmental strategies into an organization's activities (Gilbert, 2001) to first minimize environmental impacts, and then toward economic benefits

through built-in competitive advantages (Green et al., 2012). *Finally, social responsibility concerns will also be given more attention by businesses as they begin to implement GSCM strategies.* In summary, the RBV and TBL have very well supported the approach to this study.

2.4. GSCM and firm performance toward sustainability

The hierarchical component model approach, namely the tier 2 structure model, will be applied to measurement in both GSCM and firm performance. The advantage of measuring through a second-order structural model, as proposed by Hair et al. (2017), will make measuring research variables more comprehensive and objective, and the model will be simpler and easier to evaluate. As mentioned above, this study approaches measuring the performance of the business based on 3 dimensions and for GSCM it is 6 dimensions (3 of environmental and 3 of product & process). This study uses formative measurement for firm performance and reflective measurement for GSCM (Fig. 3). Here, it can be seen that the measurement of GSCM is based on 6 dimensions, but in the hierarchical model, GSCM is measured through 7 aspects by environmental monitoring dimensions that are specifically divided towards 2 groups of suppliers and customers.

Going deeper into aspects of firm performance, economic performance evaluates the performance of the business in terms of financial aspects such as production costs, profits, revenues and revenue growth (Chowdhury, 2014; Foo et al., 2018). In terms of social performance, this aspect refers to the ability to reduce pollution, the ability to manage waste, reduce dependence on toxic materials or improve environmental accidents and save energy (Zhu et al., 2012; Chowdhury, 2014; Foo et al., 2018). Finally, environmental performance relates primarily to positive corporate behaviors to issues of experience, fairness and safety or welfare, etc. of employees or employees in the workplace (Tsoi, 2010; Chowdhury, 2014; Foo et al., 2018).

Past literatures have reached a consensus about positive relationship between GSCM and firm performance, especially GSCM's positive influence on each sustainability aspect of firm performance (e.g., Choi & Hwang et al., 2015; Foo et al., 2018; Feng et al., 2018; Han & Huo, 2020). It is an undeniable fact that any aspect of GSCM will have a positive effect on environmental performance for businesses. Indeed, according to Wiengarten et al. (2013), internal management activities related to the environment improve the social performance of the organization. implemented across the entire supply chain to improve environmental performance. In addition, strengthening cooperation with partners to achieve common goals can also make the environmental activities of both businesses and partners improve (Foo et al., 2018). In addition, through investment recovery, the problem of minimizing scrap waste, excess materials of enterprises is also solved (Zhu et al., 2008). Finally, through rapid production and packaging, as well as eco-design, potential negative environmental problems of the product or environmental pollution in the production process will also be controlled and ensured to an appropriate extent (Shang et al., 2010; Foo et al., 2018). From this, it can be concluded that there is almost no controversy regarding the positive influence of GSCM on social performance.

Despite this, there are still debates regarding the impact of GSCM on economic and environmental performance, in which positive effects, negative influences, or unclear influences are all found. For example, research by Lee et al. (2012) shows that the implementation of GSCM cannot directly improve the economic efficiency of enterprises but can only be mediated through certain factors. In the Yildiz and Sezen (2018) study, the effect of internal environmental management and investment recovery on economic performance was also not found. However, most of these conclusions are based on a small number of aspects of the GSCM, so it is likely that these effects have been distorted by other factors. In fact, the number of studies finding a positive relationship between GSCM and economic and environmental performance remains overwhelming and growing. This is also in line with the fact that good implementation of GSCM not only brings environmental benefits but also helps businesses earn profits from reusing, recycling, or reselling scrap or excess materials (Zhu, Sarkis, & Lai, 2008) through investment recovery. Likewise, eco-design not only solves the environmental problems of the process or product, but also minimizes waste, as well as avoids the associated penalty fees. As a result, the firm's economic performance is also improved through the reduction of related product & process costs. On the other hand, although less well understood and confirmed (Rajeev et al., 2017), positive effects of GSCM on environmental performance have also been found in previous studies. For example, Yildiz and Sezen (2018) found a positive influence of all three important aspects of GSCM (internal environmental management, investment recovery and green manufacturing and packaging) on environmental performance. In fact, the implementation of appropriate GSCM policies will make businesses think more about the issues surrounding employees and employees, especially pollution in the employee's workplace. Intangible in general, this will make businesses receive trust, satisfaction and

loyalty of the employees. Therefore, the social efficiency of the business is also improved.

In summary, although there are differing opinions around the influence of GSCM on firm performance, the positive relationship is generally supported by most researchers. From the above observations, the following hypothesis is proposed:

H₁: *Green supply chain management positively affects firm performance.*

2.5. The mediating roles of competitive advantage

At a generalized level, competitive advantage refers to the ability, the extent to which the business can defend its current position compared to its competitors (Porter, 1985), and the potential for the business to go further in the future. To achieve

these, the business must have its own strengths or differentiate itself from the rest of the competitors (Tracey et al., 1999; Al-khawaldah et al., 2022). The approach to differentiation was analyzed by researchers in the 1980s, notably Porter's (1980) study. Porter (1980) proposes that the trade-off between cost leadership and differentiation strategies is something that businesses need to consider in their efforts to improve operational efficiency. Based on this approach, many competitive strategic models have been proposed to analyze a variety of aspects of the business (e.g., Hill, 1988; Kim et al., 2004; Pertusa-Ortega et al., 2009). However, this approach is somewhat inappropriate because it is not always good to be different, especially when the business environment becomes saturated, focusing only on differentiation will cause businesses to miss other opportunities. Ferdows and De Meyer (1990) rejected Porter's traditional trade-off model and suggested that competing priorities should be cumulative and complementary, rather than mutually exclusive, since one aspect can well promote other aspects of a firm's competitive advantage. In addition, Ferdows and De Meyer (1990) proposed a new model, a more synthetic improved model and called "the sand cone model". According to this model, there are 4 aspects of competitiveness mentioned: quality, dependability, flexibility and cost efficiency. Although the sand cone model inherited all four of these aspects from Nanake's (1986) research, Ferdows & De Meyer (1990) proposed a different mechanism for the interaction between these factors. Specifically, these factors do not trade off or exclude each other, but they complement each other, in order from quality to dependability, then flexibility and finally cost efficiency. Sometime later, empirical studies have been relatively consistent when using measures of quality, dependability, flexibility and cost/price in defining competitive advantage (Tracey et al., 1999).

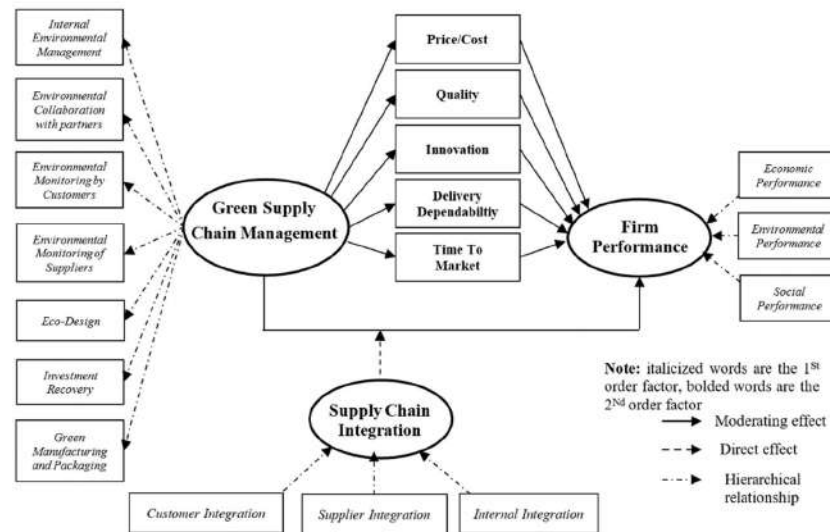


Fig. 2. The conceptual model (hierarchical component model)

On the basis of previous literature, Koufteros et al. (1997) describe the research framework for competitiveness and identify the following five aspects: competitive pricing, premium pricing, value-to-customer quality, dependable delivery, and production innovation. These dimensions are also described by Tracey et al. (1999). By linking these facts, Li et al. (2006) propose a competitive model consistent with supply chain research that includes 5 factors: price/cost, quality, innovation, delivery dependability, and time to market. These are also the aspects used by these studies. SCM practices not only impact an organization's overall performance, but also an organization's competitive advantage. They are expected to improve an organization's competitive advantage through price/cost, quality, ability to depend on distribution, time to market, and product innovation. Previous studies have shown that different components of SCM practices (such as strategic supplier partnerships) have an impact on different aspects of competitive advantage (such as price/cost). However, previous efforts were primarily internal within the company to improve, such as those reflected by quality management, restructuring, downsizing, and restructuring (Li et al., 2006). Because Chinese companies face higher levels of resource constraints and uncertainty than their Western counterparts (Lee, Pae & Wong, 2001), they have stronger external search demands. Supplier and customer engagement can play an important role in the search for external knowledge of the business (Carr & Pearson, 2002; Nambisan, 2002; Lundkvist & Yakhlef, 2004; Chang et al., 2006). Customer engagement and unique suppliers, strategically oriented to accomplish the company's goals, helps the company maintain its competitive advantage (Ramsay, 2001).

Having a competitive advantage often ensures that an organization can have one or more of the following capabilities when compared to competitors: lower prices, higher quality, higher reliability, and shorter delivery times. These capabilities, in turn, will enhance the overall performance of the organization (Mentzer et al., 2000). Competitive advantage can lead to high levels of economic efficiency, customer satisfaction and loyalty, and relationship effectiveness. Brands with higher consumer loyalty face less competitive conversions in their target segments, thus increasing sales and profits (Moran 1981). An organization that offers high-quality products can charge a higher price and thus increase the profit margin on sales and return on investment. An organization with a short time to market and rapid product innovation can be the first in the market, thus having a higher market share and sales volume. Thus, a positive relationship between competitive advantage and organizational performance can be proposed. The intermediate relationship between GSCM has been verified by many

previous studies, but few have focused on the mediating role of GSCM. From the RBV perspective, it can be seen that when businesses implement green supply chain management strategies, the costs associated with products in general and environmental costs in particular can be reduced. Thereby, the competitiveness in terms of cost, cost and quality of the enterprise will be formed. As a result, this will help businesses improve their sustainable performance. Li et al. (2006) and Azizi et al. (2016) both argue that the practice of SCM indirectly improves operational efficiency through maintaining and enhancing product price, product quality, product innovation, delivery dependability, and time to market. Quality and innovation can also explain how businesses improve firm performance through supply chain collaboration (Cao & Zhang, 2011). However, the practice of GSCM has not been mentioned in these studies. In the context of manufacturing enterprises, the practice of GSCM through green purchasing, green operation and green selling can be effective solutions to promote competitiveness (Sharabati, 2021). This is still true for the general context for businesses, because green purchasing, green operation and green selling are all considered components of the product & process aspect of GSCM. Among the aspects of competitive advantage, the intermediary role of innovation is the most explored. Innovation here can be product, process & managerial innovation (Chiou et al., 2011), green innovation (Abu Seman et al., 2019; Khaksar et al., 2015) or technology innovation (Lee et al., 2014). Following the trend of international integration, improving the ability to manage green supply chains will help businesses be more flexible in aspects, thereby creating a premise to promote competitiveness and sustainable operational efficiency of enterprises. From the above observations, the following hypothesis is proposed:

H₂: (a) Price/cost, (b) quality, (c) innovation, (d) delivery dependability, and (e) time to market mediate the relationship between green supply chain management and firm performance.

2.5. The moderating roles of SCI

There have also been numerous attempts to come up with definitions for SCI in previous studies. So, similar to GSCM, this study does not attempt to redefine SCI but only the dimensions of SCI. Considering sci dimensions is important in understanding how integrating supply chain operations in the enterprise works. Some authors study SCI as a unidirectional structure (e.g., Rosenzweig et al., 2003) while others have divided SCI into two internal and externally integrated aspects (e.g., Zailani & Rajagopal, 2005; Aljawarneh et al., 2021). Some have taken an even broader view of dividing SCI into multidimensional structures such as Gimenez and Ventura (2005), Vickery et al. (2003). Although adding different dimensions will add the adequacy of supply chain integration for businesses, it is easy to cause overlap between dimensions. This makes it even more difficult to link the relationship between SCI and other aspects of the business. Through an overview of previous studies, the key players of SCI in this study include customers, suppliers, and insiders. This is the way some studies agree (e.g., Flynn et al., 2010; Leuschner et al., 2013; Huo, 2012). Customer and supplier integration is often referred to as external integration, which is the degree to which a manufacturer collaborates with its external partners to structure cross-organizational strategies, practices, and processes into collaborative, synchronous processes (Stank et al., 2001b). In contrast, internal integration focuses on operations within a manufacturer. It is the degree to which a manufacturer structures its organizational strategies, practices, and processes into collaborative, synchronous processes, to meet customer requirements (Kahn and Mentzer, 1996) and interact effectively with its suppliers.

Considering the integrated levels of the supply chain is important for businesses. According to RBV theory, supply chain integration capabilities are the driving force behind a company's performance (e.g., Huh et al., 2008). This leads to the possibility of supply chain integration that can interact well with a few other capabilities of the business. Specifically, when at a higher level of integration, businesses will gain more important information when cooperating with partners. This creates better efficiency when maintaining and operating your green supply chain. The interaction between supply chain integration and GSCM is also reflected internally by the business. Through internal supply chain integration, businesses will optimize operational capabilities through improving information systems and management systems. This makes implementing GSCM easier thanks to the effective level of interaction between departments in the enterprise. In summary, based on the above information, the following hypothesis is proposed:

H₃: Supply chain integration moderates the effect of green supply chain management on firm performance.

3. Methodology

3.1. Data collection

To experimentally test the hypotheses given in the previous section, survey data for businesses in Vietnam in many fields were used. Vietnam is a developing country, with outstanding economic growth in recent years, especially during the Covid-19 pandemic negatively affecting the global economy. However, industrial activity in Vietnam is making pollution and environmental degradation worse in most manufacturing sectors. There have been many efforts by the government to reduce the environmental impact of Vietnamese enterprises, but the most important factor still comes from the businesses themselves. In addition, the implementation of GSCM is mainly studied in highly industrialized countries and developed economies but there is little evidence in developing regions. The above has shown that the research context in Vietnam is an ideal way to experimentally test the model.

The four manufacturing sectors focused on in this survey are (1) electronic, (2) agriculture, (3) food, and (4) textile. The reason for this is that production in these sectors has an impact on the environment to a certain extent.

In terms of the electronic sector, Electrical and Electronic Equipment Manufacturing (EEE) is one of the fastest growing global manufacturing activities (Babu et al., 2007) and generates large amounts of e-waste. As countries strive to boost economic growth, demand for electronics production and consumption increases. E-wastes harmful to the environment constantly accumulate and become a major risk to the environment and sustainable economic growth (Babu et al., 2007). Agricultural waste issues were discussed a long time ago, but they remain unresolved (Loehr, 2012). The lack of supply chain management capabilities for agricultural products causes environmental problems such as stink, water pollution. Although the integration keeps the fairness and efficiency of alternative technologies to agricultural production, this problem still has a lot of backlogs in developing countries such as Vietnam. Hence it is also an industry of interest in this study. Similar to agricultural waste, wasted food sources also cause many economic and environmental problems. Every year, billions of dollars of food are wasted around the world and cause many environmental problems (Melikoglu et al., 2013). The impact of food waste on climate change is catastrophic. The problem of food waste tends to increase over the next 25 years due to economic and population growth rates mainly in Asian countries (Melikoglu et al., 2013). The textile and garment industry is one of the industries that has been occupying a unique position in Vietnam by taking advantage of abundant labor resources. However, the textile industry is also considered one of the biggest threats to the environment by its dyeing, printing, pretreatment and finishing operations. In addition to using large amounts of energy, they also generate a significant amount of waste, and they can cause environmental problems if they are not treated appropriately (Madhav et al., 2018). These issues have caused serious concerns from policymakers in Vietnam as a whole and have thus led to tightening environmental regulations and increased oversight of businesses in these four sectors. In response to these challenges, businesses in Vietnam started different methods and prominent among them was the implementation of green supply chain management (GSCM), although evidence of the influence of GSCM on firm performance has not been found. Therefore, this study selects the four industry groups mentioned above to be able to confirm the relationship between GSCM and firm performance.

Through a directory of businesses (electronic, agriculture, food, and textile), research samples are constructed. This study only concerns manufacturing enterprises in these four areas because of the specifics of the supply chain and has a direct impact on the environment. A total of 500 enterprises were randomly selected through stratification by enterprise size and area of operation (north, central and south). Survey respondents must be top-level leaders because only the top-level leaders have a grasp of general information about GSCM and corporate performance. In order to eliminate inappropriate surveys, the survey is combined with a number of reverse questions. Finally, to encourage business participation, all respondents are guaranteed anonymity and, depending on their needs, will be provided with a report summarizing the results of this study. After direct data collection efforts, this study obtained a total of 313 valid responses. Thus, the valid response rate in this study was 62.6% (313/500) and it can be seen that direct survey efforts have resulted in a relatively good valid response rate. A total of 51 (16%), 54 (17%), 86 (27%) and 121 (39%) respondents produce in electronic industry, agriculture sector, food industry, and textile industry, respectively.

3.2. Measures

Internal and external environmental orientations

The measurements of GSCM were adapted from several research and each of them was coded on a five-point scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". Five items for Internal Environmental Management were adapted from Kirchoff et al. (2016) and Lee et al. (2012). The example is "environmental performance metrics are used regularly by corporate management". Four items for Environmental Collaboration with Partners were adapted from Laari et al. (2016). The example is "working together with partners to take environmental issues into account in product design". Four items each for Environmental Monitoring by Customers and Environmental Monitoring of Suppliers were also adapted from Laari et al. (2016). The examples are "customers have used environmental impacts as an essential criterion in supplier selection" and "use environmental impacts as an essential criterion in supplier selection". Six items for Eco-Design were adapted from Kirchoff et al. (2016) and Lee et al. (2012). The example is "The design or redesign of products to reduce consumption of material and/or energy". Three items for Investment Recovery were adapted from Choi and Hwang (2015) and Chan et al. (2012). The example is "Sale of excess inventories/materials to recover product investments". Eight items for Green Manufacturing and Packaging were adapted from Shang et al. (2010). The example is "Substitution of polluting and hazardous materials/parts".

The measurements of supply chain integration were adapted from the research of Flynn et al. (2010), Leuschner et al. (2013) and Huo (2012). Each of them was coded on a five-point scale ranging from 1 = "not at all" to 5 = "extensive". The example for 11 items for Customer integration is "The level of linkage with major customers through information networks". The example for 13 items for Supplier integration is "The level of information exchange with major suppliers through information networks". The example for 9 items for Internal integration is "Data integration among internal functions".

The measurements of competitive advantage were adapted from the research of Li et al. (2006), Kristal et al. (2010) and Liao et al. (2017). Each of them was coded on a five-point scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". Two items for Price/cost are "provide the lowest price" and "provide prices as low or lower than our competitors". The example for four items for Quality is "use the product or service quality to compete with rivals". The example for three items for Product Innovation is "adapt according to different needs of customers to provide customized products". The example for three items for Delivery Dependability is "guarantees to provide the market demand for the product or service". The example for four items for Time to Market is "quickly launch new products".

The measurements of firm performance were adapted from the research of Zaid et al. (2018). Each of them was coded on a five-point scale ranging from 1 = “very low extent” to 5 = “very high extent”. The example for three items for Economic Performance is “have adequate sales and business volume”. The example for eight items for Environmental Performance is “take adequate measures to control air pollution”. The example for eight items for Social Performance is “provides standard wages and overtime payments”.

3.3. Data analysis methods

There are various methods for analyzing the relationship between a given set of variables, namely (1) Multiple Regression Analysis (MRA); (2) Path analysis (PA); (3) Factor analysis (FA); (4) Linear structure model (SEM). In this study, the linear structural model (SEM) was chosen as the method of analysis. SEM is a multivariate method that allows simultaneous examination of relationships between exogenous (independent) latent variables and endogenous (dependent) latent variables in a model (Kilne, 1998). The model is well suited for explaining the relationship of latent variables - a structure that is not visible or inherited from the available data. There are 2 currently outstanding SEM methods, CB-SEM and PLS-SEM, in which PLS-SEM was selected for use in this study by:

- This is a nonparametric processing method, very suitable for research data that do not ensure standard distribution such as survey data or small sample-sized data (Hair et al., 2014).

- This study develops a new latent relationship regarding the indirect influence of factors on DTDI readiness in the context that theories related to this influence have not been disseminated and agreed upon, according to Hair et al. (2014), PLS-SEM is more appropriate.

The implementation steps and evaluation criteria will be studied in detail in the research results section.

4. Results

Although there are different interpretations for an SEM model (Hair et al., 2019), this study focuses on model evaluation based on three basic steps: *measurement model*, *structural model*, and *hypothesis test*.

Measurement model

The purpose of evaluating the measurement model is to check the quality of items and factors. There are two research phases in the measurement model evaluation with phase 1 checking the quality of items. According to Henseler et al. (2009), items that do not guarantee a convergence value (outer loading < 0.7) will need to be discarded. The results shown in Table 1 show that GSCM_GMP8, SCI_CI2, SCI_CI11, SCI_SI7, SCI_SI8, and TM1 were all items with outer loading < 0.7 and were excluded from this study. After removing the above items, there are no longer any items with outer loading < 0.7 and therefore these items are accepted for next steps. The final assessments in stage 1 are of Internal consistency reliability with criteria such as Cronbach's alpha > 0.7 (Nunnally & Bernstein, 1994) and convergent validity with criteria of average variance extracted (AVE) > 0.50 (Hair et al., 2019). These criteria are all guaranteed, so the study will enter phase 2 in the evaluation of the measurement model.

Table 1

Measurement model (stage 1)

Factor	Item	Before		After deleting items	
		Outer Loading	Outer Loading	Cronbach's Alpha	AVE
Cp	CP1	0.867	0.867	0.713	0.777
	CP2	0.896	0.896		
Dd	DD1	0.848	0.848	0.804	0.719
	DD2	0.876	0.876		
	DD3	0.819	0.819		
FP_EC	FP_EC1	0.863	0.863	0.825	0.657
	FP_EC2	0.786	0.786		
	FP_EC3	0.753	0.753		
	FP_EC4	0.836	0.836		
FP_ENV	FP_ENV1	0.805	0.805	0.931	0.676
	FP_ENV2	0.806	0.806		
	FP_ENV3	0.752	0.752		
	FP_ENV4	0.847	0.847		
	FP_ENV5	0.845	0.845		
	FP_ENV6	0.779	0.779		
	FP_ENV7	0.867	0.867		
	FP_ENV8	0.870	0.870		
FP_SOC	FP_SOC1	0.853	0.853	0.925	0.655
	FP_SOC2	0.788	0.788		
	FP_SOC3	0.815	0.815		
	FP_SOC4	0.789	0.789		
	FP_SOC5	0.821	0.821		
	FP_SOC6	0.827	0.827		
	FP_SOC7	0.796	0.796		
	FP_SOC8	0.785	0.785		

Table 1
Measurement model (stage 1) (Continued)

Factor	Item	Before		After deleting items <i>Cronbach's Alpha</i>	AVE
		<i>Outer Loading</i>	<i>Outer Loading</i>		
GSCM_ECP	GSCM_ECP1	0.767	0.765	0.717	0.637
	GSCM_ECP2	0.806	0.806		
	GSCM_ECP3	0.822	0.823		
GSCM_ED	GSCM_ED1	0.778	0.779	0.876	0.617
	GSCM_ED2	0.821	0.821		
	GSCM_ED3	0.789	0.789		
	GSCM_ED4	0.770	0.769		
	GSCM_ED5	0.797	0.798		
	GSCM_ED6	0.756	0.753		
GSCM EMC	GSCM EMC1	0.740	0.740	0.757	0.579
	GSCM EMC2	0.748	0.748		
	GSCM EMC3	0.801	0.801		
	GSCM EMC4	0.753	0.754		
GSCM EMS	GSCM EMS1	0.756	0.757	0.753	0.574
	GSCM EMS2	0.729	0.727		
	GSCM EMS3	0.779	0.780		
	GSCM EMS4	0.765	0.765		
GSCM_GMP	GSCM_GMP1	0.786	0.790	0.883	0.589
	GSCM_GMP2	0.801	0.811		
	GSCM_GMP3	0.783	0.797		
	GSCM_GMP4	0.713	0.728		
	GSCM_GMP5	0.744	0.758		
	GSCM_GMP6	0.749	0.753		
	GSCM_GMP7	0.722	0.731		
	GSCM_GMP8*	0.532			
GSCM_IEM	GSCM_IEM1	0.825	0.825	0.917	0.752
	GSCM_IEM2	0.845	0.845		
	GSCM_IEM3	0.825	0.825		
	GSCM_IEM4	0.908	0.908		
	GSCM_IEM5	0.927	0.927		
GSCM_IR	GSCM_IR1	0.773	0.774	0.673	0.604
	GSCM_IR2	0.785	0.785		
	GSCM_IR3	0.774	0.773		
INNO	INNO1	0.843	0.843	0.813	0.728
	INNO2	0.818	0.817		
	INNO3	0.897	0.897		
QUAL	QUAL1	0.816	0.816	0.797	0.712
	QUAL2	0.866	0.866		
	QUAL3	0.848	0.848		
SCI_CI	SCI CI1	0.767	0.792	0.915	0.596
	SCI CI10	0.811	0.798		
	SCI CI11*	0.631			
	SCI CI2*	0.587			
	SCI CI3	0.768	0.793		
	SCI CI4	0.724	0.735		
	SCI CI5	0.704	0.736		
	SCI CI6	0.731	0.755		
	SCI CI7	0.745	0.752		
	SCI CI8	0.761	0.784		
SCI CI9	0.802	0.802			
SCI_II	SCI II1	0.715	0.716	0.903	0.564
	SCI II2	0.774	0.774		
	SCI II3	0.737	0.739		
	SCI II4	0.764	0.761		
	SCI II5	0.785	0.785		
	SCI II6	0.732	0.732		
	SCI II7	0.713	0.713		
	SCI II8	0.727	0.726		
	SCI II9	0.805	0.806		
SCI_SI	SCI SI1	0.758	0.768	0.941	0.633
	SCI SI10	0.778	0.792		
	SCI SI11	0.703	0.719		
	SCI SI12	0.760	0.766		
	SCI SI13	0.765	0.778		
	SCI SI2	0.880	0.887		
	SCI SI3	0.901	0.890		
	SCI SI4	0.794	0.799		
	SCI SI5	0.769	0.767		
	SCI SI6	0.790	0.802		
Tm	SCI SI7*	0.588		0.798	0.709
	SCI SI8*	0.643			
	SCI SI9	0.756	0.766		
	TM1*	0.692			
	TM2	0.755	0.764		
	TM3	0.832	0.861		
	TM4	0.877	0.897		

* Item is removed because outer loading < 0.7

In phase 2, the first order factors will be standardized into specific values and the second order factors will now become the first order factor. Similarly, the outer loading, Cronbach's alpha, and AVEs all met the criteria given in phase 1 (Table 2). Thereby, there is no need for any correction to the model. Finally, to evaluate the discriminant validity of the constructs, this study used the Heterotrait-Monotrait ratio of correlations < 0.9 (Henseler et al., 2015). As a result, the HTMT coefficients all < 0.9 , ensuring the discriminant validity as proposed by Henseler et al. (2015).

Table 2
Measurement model (stage 2)

Factor	Item	External loading	Cronbach's Alpha	Ave
Cost & Price	CP1	0.867	0.713	0.777
	CP2	0.895		
Delivery Dependability	DD1	0.850	0.804	0.719
	DD2	0.875		
	DD3	0.818		
Firm Performance	FP_EC	0.881	*	*
	FP_ENV	0.943		
	FP_SOC	0.861		
Green Supply Chain Management	GSCM_ECP	0.813	0.907	0.679
	GSCM_ED	0.802		
	GSCM_EMG	0.821		
	GSCM_EMS	0.800		
	GSCM_GMP	0.836		
	GSCM_IEM	0.870		
Innovation	INNO1	0.842	0.813	0.728
	INNO2	0.818		
	INNO3	0.897		
Quality	QUAL1	0.815	0.797	0.712
	QUAL2	0.866		
	QUAL3	0.850		
Supply Chain Integration	SCI_CI	0.702	*	*
	SCI_II	0.912		
	SCI_SII	0.953		
Time to Market	TM2	0.763	0.798	0.709
	TM3	0.861		
	TM4	0.897		

* formative measurement does not require (Hair et al., 2017)

Structure model

Structural model evaluation is a collection of assessments related to the quality of the SEM model with aspects of multi-linear, R-squares, and Q-squares. Regarding multilinearity, as proposed by Hair et al. (2019), VIF values < 3 will ensure that the model avoids the problem of multicollinearity. The results in Table 3 show that the VIF coefficients are all less than 3, satisfactory as suggested by Hair et al. (2019).

Table 3
VIF coefficients

	Cp	Dd	Fp	INNO	QUAL	Tm
Cp			2.034			
Dd			2.146			
GSCM	1.000	1.000	1.263	1.000	1.000	1.000
INNO			1.169			
QUAL			1.850			
Sci			1.215			
Tm			1.275			

The R-square coefficient represents the degree of interpretation of the model for the dependent variable in the study, and this level is also evaluated depending on the nature of the studies (Hair et al., 2019). At firm-level studies, this study takes the criteria of Chin (1998) with the corresponding levels being weak (R-square = 0.19), mean (R-square = 0.33), and substantial (R-square = 0.67). The results showed that the volatility of firm performance was explained by 44% by the model (R-square = 0.44). This is a fairly good level of explanation, although not as expected as it is appropriate because this study only analyzes the effect of GSCM and factors in competitive advantages on firm performance. This has largely ignored many factors that have a strong influence on firm performance such as business strategies or etc. Finally, to assess the degree of forecast for fluctuations in performance in the model, this study uses the Q-square coefficient as suggested by Hair et al. (2019). Q-square values higher than 0, 0.25, and 0.50 present small, medium, and large the predictive of the model, respectively. The tested model has Q-square = 0.345 for the independent variable, demonstrating a fairly good and acceptable level of forecasting.

Hypothesis testing

Table 4 and 5 display the results of the hypothesis testing. There are 6 supported hypotheses from initial 7 hypotheses (the rejected hypothesis is H2a) in the model without moderating effect and 5 supported hypotheses (the rejected hypotheses are H2a and H2b) in the model with moderating effect. Regardless of the model, the intermediate influence from GSCM to firm performance through quality is rejected. Although it can be seen that GSCM has a positive influence on quality these effects are relatively weak ($\beta=0.149$). However, the remaining aspects of competitive advantages explain the influence of GSCM on firm performance, so it can be seen that the application of the competitive advantage model is appropriate in this study.

Basically, improving GSCM also has a positive effect on the sustainable performance of businesses in Vietnam ($\beta=0.302$ or $\beta=0.318$ with moderating effect). This has confirmed that the enhancement of GSCM brings positive advantages to businesses, including in developing regions. When businesses improve their green supply chain management, they can achieve certain achievements for sustainable development. But not only that, they can also increase their competitive advantage over other businesses and thereby indirectly improve sustainable performance.

Table 4
Direct effects and moderating effect

Direct effect	Model 1	Model 2
GSCM → FP	0.131*	0.150**
Supply Chain Integration → FP	0.189***	0.153**
GSCM → Cost & Price	0.261***	0.261***
Cost & Price → FP	0.151*	0.165*
GSCM → Quality	0.149*	0.149*
Quality → FP	0.192**	0.169*
GSCM → Innovation	0.195**	0.195**
Innovation → FP	0.133**	0.114*
GSCM → Delivery Dependability	0.273***	0.273***
Delivery Dependability → FP	0.141*	0.133*
GSCM → Time to Market	0.286***	0.286***
Time to Market → FP	0.136**	0.133**
Moderating effect		
Q3: Supply Chain Integration * GSCM → FP		0.117** (Supported)

Table 5
Total effect and mediating effects

Total Effect	Model 1	Model 2
Q1: GSCM → FP	0.302*** (Supported)	0.318*** (Supported)
Indirect Effect		
H2a: GSCM → Quality → FP	0.029 (Not Supported)	0.025 (Not Supported)
H2b: GSCM → Innovation → FP	0.026* (Supported)	0.022 (Not Supported)
H2c: GSCM → Cost & Price → FP	0.039* (Supported)	0.043* (Supported)
H2d: GSCM → Time to Market → FP	0.039* (Supported)	0.038* (Supported)
H2e: GSCM → Delivery Dependability → FP	0.038* (Supported)	0.036* (Supported)

*, **, ***: the effect is significant at 5%, 1%, 0.1% * , ** , ***: the effect is significant at 5%, 1%, 0.1%

The regulatory role of Supply Chain Integration is also supported in the model (β Supply Chain Integration * GSCM = 0.117). The results are more clearly shown in Fig. 3 Co. that, for businesses with higher supply chain integration capabilities, the more GSCM is improved, the firmer performance is improved. Conversely, for businesses with lower supply chain integration, improving GSCM will still be beneficial for businesses, but not too effective. This has confirmed that businesses in Vietnam need to strike a balance between improving GSCM and improving supply chain integration to bring maximum efficiency.

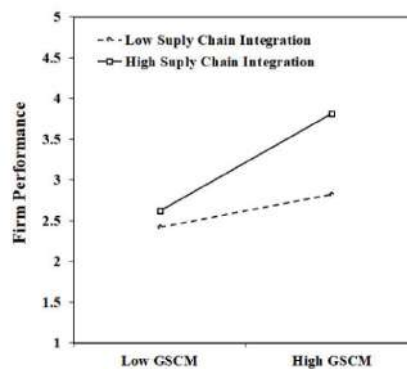


Fig. 3. Moderating role of supply chain integration

5. Discussion and conclusion

5.1. Theoretical implications

This study focuses on the practice of both internal and external GSCM at typical enterprises of each economic sector in Vietnam. In particular, customers and suppliers are two external objects that play an important role in the GSCM practice of the business. Moreover, this article continues and expands the research direction on the role of GSCM in business efficiency through direct and indirect impacts. Specifically, GSCM acts as a driving force for competitive advantages, helping businesses improve economic, social and environmental efficiency. The impacts will be commented on specifically.

GSCM and firm performance

This research contributes to findings on the relationship between GSCM and corporate effectiveness. The impact of GSCM has been widely discussed and scholars' debate whether businesses can improve operational efficiency by implementing GSCM and in what direction. Menguc and Ozanne (2005) found that studies on this issue were incomplete and clear. This research contributes a specific direction by demonstrating that environmental orientations can drive business efficiency directly and indirectly. The results of the study show that the implementation of GSCM practice is governed by quadratic factors, which are consistent with the research of SM. Lee et al. (2012) and reinforce that aspects of GSCM have correlated well with structures. GSCM's strong correlation with marketing activities such as eco-design use, investment in recycling and product packaging design, offers an interesting approach reminder. It's about whether an interdisciplinary approach to the environment offers benefits that help businesses achieve operational efficiencies that stand out from the competition.

Support for research by Choi and Hwang (2015), Cankaya and Sezen (2018), the results of this study show that the practice of GSCM has helped businesses and employees to fulfill their goals such as saving production costs, improving sales revenue, achieving environmental control targets and bringing many benefits to workers. The results of the analysis show that business performance can be improved and enhanced through the practice of GSCM.

This study follows the literature related to GSCM. GSCM is increasingly being debated and is not only seen as an accurate demonstration of the dedication of businesses ecologically, but also serves as a strategic initiative for sustainable development for businesses. This study added strong evidence to the flow of research on the impact of GSCM on business performance. In addition, this study presented evidence of GSCM practices and the effectiveness of GSCM in enterprises in Vietnam, an economy that is attracting a lot of attention in Asia while studies on GSCM are largely conducted in western developed countries.

The role of competitive advantages

The practice of GSCM that enhances corporate efficiency has been explained through its role as an intermediary of corporate competitive advantages. This result is similar to Chiou et al. (2011), Azizi (2016) and Liao et al. (2015), demonstrate that GSCM can lead to competitive advantages for businesses. This shows that businesses can enhance their competitive advantage by practicing GSCM. The findings of this study support the view that implementing activities related to green products or green processes makes an important contribution to businesses gaining competitive advantages over competitors. GSCM becomes a competitive resource and helps businesses operate more efficiently, more productively, bring higher profits and many other values. Among the aspects of competitive advantage, GSCM has the strongest impact on Cost & Price, Delivery Dependability and Time to Market. GSCM can save costs and time in the supply chain, helping businesses solve problems such as clearing congested goods, reducing inventory, etc. Having competitive prices, saving costs and timely meeting the needs of the market helps businesses improve profits as well as other operational efficiency. Contrary to these factors, the impact of GSCM on innovation has not been confirmed with certainty, even GSCM does not have an impact on quality. This result is in stark contrast to Chiou et al. (2011). These findings need to be placed in the context of research for interpretation. While in order to meet the increasing demand for quality products and services, businesses need to make continuous efforts in improving and innovating technology (A. Agus, 2011), enterprises in Vietnam are mainly in small and medium form, do not have enough capital to access or innovate new technologies. In addition, many enterprises belong to specific industries such as textiles, mainly produced in the form of processing, so they have not obtained much added value in the supply chain. Therefore, Vietnamese enterprises will face many disadvantages when participating in the global supply chain, facing many competitors with superior technology platforms. Therefore, improving GSCM does not help businesses achieve many competitive advantages in product quality and innovation due to the inflexibility of processing contracts and the lack of capital for technology. However, aspects of competitive advantage still have a significant positive impact on business efficiency, showing that GSCM can help businesses achieve certain competitive advantages, thereby improving business efficiency.

The role of Supply chain Integration

The results of the study show that SCI has a significant regulatory role in the impact from GSCM on business efficiency. The use of supply chain integration can help businesses gain more benefits when practicing GSCM. Wu (2008) and Liao et al. (2017) share similar views, arguing that supply chain integration can create competitive value and improve business efficiency. The findings of this study reinforce the notion that SCI is one of the most important factors in business success. Once SCI is established, businesses can communicate effectively not only internally but also with customers and suppliers to adjust supply and demand appropriately. SCI can mitigate asymmetric information issues in the supply chain, minimize transactional risks, and coordinate stakeholders. Partners participating in SCI not only need to share information, but also receive the values and benefits from that sharing to improve and coordinate the supply chain. The ability to integrate

information throughout the supply chain provides businesses with a solid basis in resource allocation decision-making, risk management, and flexibility to changing market needs. When businesses establish good SCI, the higher the quality of a GSCM system, the more effectively information is shared and used, helping to achieve organizational goals more quickly and efficiently. Thus, by building information management systems to share, store and use with customers or suppliers as well as other stakeholders in the supply chain, businesses with quality GSCM will achieve more efficiency.

5.2. Managerial implications

The recommendations made are:

1) Businesses can improve their competitiveness by meeting environmental requirements in the supply chain. The operational efficiency and competitive advantages of the business are mainly based on the ability to combine different resources in the supply chain. To meet customer requirements for the environment, businesses need to enhance their GSCM practices. In addition, failure of suppliers to comply with environmental rules can adversely affect the operation and output of the business. Businesses may even be held accountable for the environmental unfriendliness of their suppliers. Therefore, to limit damages and improve operational efficiency, businesses need to choose suitable suppliers or have environmental monitoring measures at their suppliers.

2) The results of the study show that businesses should not only focus on internal GSCM practices, in the production of green products, implementing green processes or environmental management, but also expand their investment in relationships with partners, in which customers and suppliers are seen as incentives for businesses to regulate GSCM. In addition, some businesses do not achieve much efficiency when improving GSCM because they do not have an appropriate SCI system. The quality of GSCM depends on how you integrate information both internally and in other components of the supply chain. The results of the study show that businesses need to consider GSCM simultaneously in the company's internal operations, GSCM customer-oriented and GSCM to supplier if they want to improve and enhance business efficiency.

5.3. Limitations and future research

The limitations of this study are also new directions for future studies.

Firstly, the research sample focused on a small number of typical enterprises of each economic sector in Vietnam, so the level of explanation of the model has not been focused and may be diluted, leading to deviations due to the different nature of each industry. Moreover, the enterprises in this study are mainly small and medium-sized enterprises, which is also characteristic of most Vietnamese enterprises. Although close to the characteristics of the whole, the differences of impacts when placed in large, medium and small enterprises have not yet been considered. In particular, large enterprises may have a higher level of interest in GSCM and make more efforts in improving GSCM as well as SCI activities. Future studies may choose this research direction to consider whether there are differences in the impact of GSCM on aspects of competitive advantage.

Second, this study suggests that the practice of GSCM is a driver of corporate competitiveness while some view that customers and competitors are an incentive for businesses to enhance GSCM (Thun and Müller's, 2010). Therefore, future studies may consider the competitive strategy of the enterprise as a driving factor in GSCM activities.

Third, future research may add other explanations for the impact of GSCM on performance. For example, the intermediary role of environmental orientation can be considered, or the factor of market dynamics can explain the impact from GSCM on performance.

References

- Ahi, P., & Searcy, C. (2013). A comparative literature analysis of definitions for green and sustainable supply chain management. *Journal of Cleaner Production*, 52(1), 329-341.
- Al-khawaldah, R., Al-zoubi, W., Alshaer, S., Almarshad, M., ALShalabi, F., Altahrawi, M & Al-hawary, S. (2022). Green supply chain management and competitive advantage: The mediating role of organizational ambidexterity. *Uncertain Supply Chain Management*, 10(3), 961-972.
- Aljawarneh, N., Taamneh, M., Alhndawi, N., Alomari, K & Masad, F. (2021). Fog computing-based logistic supply chain management and organizational agility: The mediating role of user satisfaction. *Uncertain Supply Chain Management*, 9(3), 767-778.
- Aras, G., Aybars, A. & Kutlu, O. (2010), Managing corporate performance: Investigating the relationship between corporate social responsibility and financial performance in emerging markets, *International Journal of Productivity and Performance Management*, 59(3), 229-254.
- Babu, B.A., Parvã, AK, & Basha, CA (2007). Electrical and electronic waste: a global environmental problem. *Waste Research & Management*, 25(4), 307-318.
- Barney, J. (1991). Solid resources and sustainable competitive advantages. *Journal of Management*, 17(1), 99–120.
- Beamon, B.M. (2005). Environmental ethics and sustainability in supply chain management. *Ethics of Science and Engineering*; 11(1), 221–34.
- Cankaya, S.Y., & Sezen, B. (2018). The impact of green supply chain management practices on sustainable performance. *Journal of Manufacturing Technology Management*, 30(1), 98-121

- Chan, R. Y. K. (2010). Pursue corporate environmentalism by foreign companies competing in China. *World Business Journal*, 45(1), 80–92.
- Chan, R. Y. K., He, H., Chan, H. K., & Wang, W. Y. C. (2012). Environmental orientation and operational performance of enterprises: Green supply chain management mediation mechanism and effective moderation of competitive intensity. *Industrial Marketing Management*, 41(4), 621–630.
- Chin, W. W. (1998). *Partial least squared approach to modeling structural equations*. In: Marcoulides GA(ed) *Modern Methods for Business Research*. Mahwah: Erlbaum.
- Choi, D., & Hwang, T. (2015). The impact of green supply chain management practices on corporate performance: the role of collaborative capacity. *Operations Management Research*, 8(3), 69–83.
- De Giovanni, P., & Vinzi, V. E. (2014). Benefits of a monitoring strategy for Emissions Trading System companies. *Transportation Research Part D: Transportation and the Environment*, 33, 220–233.
- Dian, W., Pambudi, W., Janny, D., Leonardus, S., Sukrisno, S & Kundori, K. (2022). The mediating role of environmental sustainability between green human resources management, green supply chain, and green business: A conceptual model. *Uncertain Supply Chain Management*, 10(3), 933–946.
- Elkington, J. (1994). Towards sustainable corporations: A win-win business strategy for sustainable development. *California Management Review*, 36(2), 90–100.
- Feng, M., Yu, W., Wang, X., Wong, C. Y., Xu, M., & Xiao, Z. (2018). Green supply chain management and financial efficiency: The intermediary role of operations and the environment. *Business Strategy and the Environment*, 27(7), 811–824.
- Foo, P. Y., Lee, V. H., Tan, G. W. H., & Ooi, K. B. (2018). A gateway to realizing sustainable performance through green supply chain management practices: A PLS–ANN approach. *Expert Systems with Applications*, 107(1), 1–14.
- Green, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: impact on performance. *Supply Chain Management: An International Journal*. 17(3), 290–305.
- Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced problems in the model of squared structural equations are at least partially*. Sage publications.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24.
- Han, Z., & Huo, B. (2020). The impact of green supply chain integration on sustainable performance. *Industrial Management & Data Systems*, 120(4), 657–674.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for evaluating discriminatory validity in a model of structural equations based on variance. *Journal of the Academy of Marketing Sciences*, 43(1), 115–135.
- Hu, L.T., & Bentler, P.M. (1999) Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55.
- Khan, S.A.R., & Qianli, D. (2017). The impact of green supply chain management practices on companies' performance: an empirical study from a Pakistani perspective. *Environmental Science and Pollution Research*, 24(20), 16829–16844.
- Kirchoff, J. F., Tate, W. L., & Mollenkopf, D. A. (2016). The impact of strategic organizational directions on green supply chain management and company performance. *International Journal of Physical Distribution & Logistics Management*, 46(3), 269–292.
- Laari, S., Töyli, J., & Ojala, L. (2018), The effect of a competitive strategy and green supply chain management on the financial and environmental performance of logistics service providers, *Business Strategy and the Environment*, 27(1), 1–24.
- Lee, S. M., Tae Kim, S., & Choi, D. (2012). Green supply chain management and organizational performance. *Industrial Management & Data Systems*, 112(8), 1148–1180.
- Lee, V. H., Ooi, K. B., Chong, A. Y. L., & Seow, C. (2014). Creating Technological Innovation through Green Supply Chain Management: An Empirical Analysis. *Expert Systems with Applications*, 41(16), 6983–6994.
- Linton JD, Klassen R, Jayaraman V (2007). Sustainable supply chain: introduction. *Journal of Operations Management*; 25(1), 1075–82.
- Loehr, R. (2012). *Agricultural waste management: issues, processes and approaches*. Elsevier.
- Madhav, S., Ahamad, A., Singh, P., & Mishra, P. K. (2018). Assessment of the textile industry: Wet processing, environmental impact and wastewater treatment methods. *Environmental Quality Management*, 27(3), 31–41.
- Melikoglu, M., Lin, C. S. K., & Webb, C. (2013). Global food waste problem analysis: accurate determination of facts and estimates of energy content. *Central European Journal of Engineering*, 3(2), 157–164.
- Menguc, B., & Ozanne, L.G. (2005). The challenges of the "green imperative": A natural resource-based approach to an environmental-business performance-oriented relationship. *Journal of Business Research*, 58(4), 430–438.
- Mentzer, J.T., Min, S., & Zacharia, Z.G. (2000). The nature of intercompany cooperation in supply chain management. *Journal of Retail*. 76(4), 549–68.
- Moran, W.T. (1981). The study of discrete consumer markets can direct resource shifts, helping to increase profits. *Marketing News*, 14(23), 4–23.
- Nunnally, J., & Bernstein, I. (1994). *Psychological theory*. McGraw Hill, New York
- Olugu, E. U., Wong, K. Y., & Shaharoun, A. M. (2011). Develop key performance measures for the green automotive supply chain. *Resources, Conservation and Recycling*, 55(6), 567–579.

- Perotti, S., Zorzini, M., Cagno, E., & Micheli, G.J. L. (2012). Green supply chain practices and corporate performance: the case of the 3PL in Italy. *International Journal of Physical Distribution & Logistics Management*, 42(7), 640–672. doi:10.1108/09600031211258138
- Porter, M.E. (1985). *Competitive advantage: create and maintain superior performance*. New York: Free Press.
- Preuss, L. (2005). Rhetoric and reality of corporate greening: a view from the supply chain management function. *Business Strategy and the Environment*, 14(2), 123-139.
- Rajeev, A., Pati, R. K., Padhi, S. S., & Govindan, K. (2017). The Evolution of Sustainability in Supply Chain Management: A Literature Review. *Journal of Cleaner Manufacturing*, 162, 299-314.
- Salam, M.A. (2009). Corporate social responsibility in purchasing and supply chain. *Journal of Business Ethics*, 85(2), 55–70.
- Sarkis, J. (2012) A Boundaries and Flows Perspective of Green Supply Chain Management. *Supply Chain Management: An International Journal*, 17, 202-216.
- Shang, K.-C., Lu, C.-S., & Li, S. (2010). A classification of green supply chain management capabilities among electronics-related manufacturing companies in Taiwan. *Journal of Environmental Management*, 91(5), 1218–1226.
- Shang, K.C., Marlow, P.B., (2005). Logistical capabilities and performance in large Taiwanese manufacturing companies. *Transportation Research Part E: A Review of Logistics and Transportation*, 41(3), 217–234.
- Sharabati, A. A. (2021). Green supply chain management and competitive advantage of the Jordanian pharmaceutical industry. *Sustainability*, 13(23), 13315.
- Shi, V. G., Koh, S. L., Baldwin, J., & Cucchiella, F. (2012). Green supply chain management based on natural resources. *Supply Chain Management: An International Journal*. 17(1), 54-67.
- Tracey, M., Vonderembse, M.A., & Lim, J.S. (1999). Production technology and strategic format: the key to enhancing competitiveness and improving performance. *Journal of Operations Management*, 17(4), 411–28
- Tsoi, J. (2010). Stakeholder awareness and future scenarios to improve corporate social responsibility in Hong Kong and mainland China. *Journal of Business Ethics*, 91(3), 391-404.
- Vachon, S., & Klassen, R.D. (2008). Environmental management and production performance: the role of collaboration in the supply chain. *International Journal of Manufacturing Economics*, 111(1), 299–315.
- Vachon S., & Klassen, R.D. (2006). Expanding green practices throughout the supply chain: the impact of upstream and downstream integration. *International Journal of Production Operations and Management*, 26(7), 795–821.
- Wiengarten, F., Fynes, B., & Onofrei, G. (2013). Explore the synergistic impacts between investments in the environment and quality/lean practices in the supply chain. *Supply Chain Management*, 18(2), 148-160.
- Yang, C. S., Lu, C. S., Haider, J. J., & Marlow, P. B. (2013). The effect of green supply chain management on green performance and firm competitiveness in the context of container shipping in Taiwan. *Transportation Research Part E: Logistics and Transportation Review*, 55(1), 55-73.
- Younis, H., Sundarakani, B., & Vel, P. (2016). The impact of implementing green supply chain management practices on company performance. *Competitiveness Assessment*, 26(3), 216–245.
- Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Green supply chain management implications for "closing the loop". *Transportation Research Part E: A Logistics and Transportation Review*, 44(1), 1-18.
- Zhu, Q., Sarkis, J., & Lai, K. H. (2012). Examine the impact of green supply chain management practices and their mediation on improving performance. *International Journal of Production Research*, 50(5), 1377-1394.



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