

The moderating role export and firm size on the relationship between green supply chain management and operational performance

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ABSTRACT

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The objective of this study is to examine the impact of green supply chain management (GSCM) on operational performance as moderate of firm size and percentage of exported products. Based on the feedback of 313 manufacturing enterprises in four sectors (electronics, agriculture, food, textiles) operating in Vietnam, this study found some important findings. Firstly, GSCM has a positive and significant influence on the operational performance of businesses in Vietnam. Secondly, the resulting effect of implementing GSCM is better for enterprises with large scale and high export rates. This has reaffirmed the need to improve the overall supply chain management and green supply chain of this group of businesses. Overall, the findings suggest that improving GSCM practices is important not only for businesses in developed countries but also for businesses in emerging economic regions such as Vietnam.

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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 for environmentally oriented action by businesses today (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 concept of supply chain management emerged and received enthusiastic contributions from the scientific community in the last years of the 20th century (Zhu et al., 2012). Since then, the study of the applications of supply chain management 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 green design (e.g., Kirchoff et al., 2016; Younis et al., 2016), environmental collaboration (e.g., Perotti et al., 2012; Lee et al., 2012), internal environmental governance (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 the GSCM will solve some of the problems of the business and thereby enhance the competitive advantage (e.g., Sharabati, 2021) or improve operational performance (e.g., Choi &hwang et al., 2015; Foo et al., 2018). Despite receiving great attention, the importance of practicing these strategies is focusing

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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 supply chain management 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. In addition, based on triple bottom line (TBL) theory, this study builds on how performance is measured in a sustainability-oriented way. In addition, resource-based theory (RBV) is also used to explain the mechanism of influence of GSCM on the performance of enterprises in Vietnam. Finally, the Moderate role of enterprise size and export product ratio to the impact of GSCM on operational performance is also examined and through this it is possible to better understand the importance of GSCM to each group of enterprises. 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. Literature review

For reference, a study model of the mechanism of impact of GSCM on performance in this study is proposed in Fig. 1. Under this mechanism, the implementation of GSCM will help businesses improve their sustainable operational performance. These proposed relationships are consistent based on RBV and TBL on leveraging resources that can harness competitive advantages to achieve sustainable operational efficiencies (e.g., Shang et al., 2010; Feng et al., 2018). The study of this influence is important because supply chain management in general and GSCM in particular have an impact on the interconnection of global value chains of enterprises today.

In addition to this mechanism of influence, the assessment of the Moderate role of enterprise size and export product ratio for the impact of GSCM on the performance of enterprises is also shown in Figure 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 Moderate factors, the results obtained will be skewed and no longer reasonable. In this section, the conceptual framework of the factors in the model as well as the theoretical framework of RBV and TBL will be presented first and then proposed research hypotheses on the mechanism of influence of GSCM on operational performance and Moderate role of export product ratio and enterprise size.

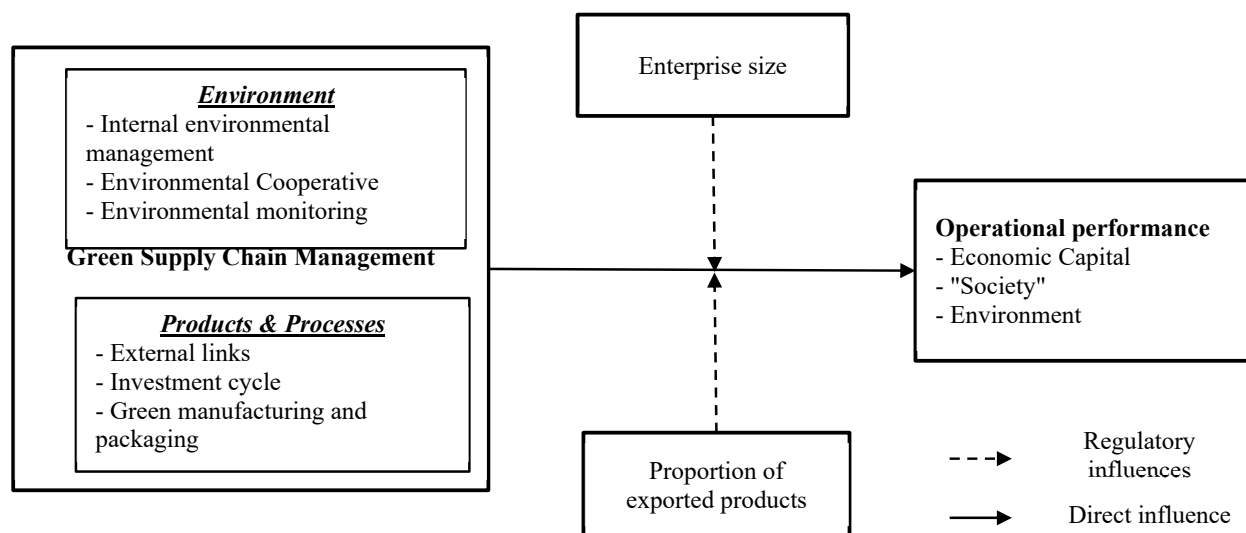


Fig. 1. Theory research model

2.1. Green Supply Chain Management

In recent literature, researchers have tried to come up with a definition for GSCM using a variety of specialized terms. However, in practice, a uniform definition of GSCM is non-existent. Ahi & Searcy's (2013) research paper focusing entirely on GSCM definitions has shown that there are 22 different ways of defining GSCM. This has shown that the study of GSCM is non-trivial because access to any aspect of GSCM will depend heavily on the context of the study. Some of the trends developing definitions for GSCM are

- (1) closed supply chains – sustainable supply chains (e.g., Linton et al., 2007);
- (2) supply chains associated with social responsibility (Salam, 2009)
- (3) supply chains tied to ethics and the environment (e.g., Beamon, 2005); and the list can be listed further.

Sarkis (2012) argues that defining boundaries between terms in supply chain management, as well as boundaries between GSCM stakeholders, is one of the things that makes it impossible to unify definitions of GSCM. 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 your operations through collaboration between you and partners such as suppliers or customers (Olugu et al., 2011). Vachon and Klassen (2006, 2008) mentioned two types of external GSCM practices: collaboration, and supervision. Environmental monitoring is generally linked to supplier and material selection practices, while environmental collaboration 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 governance to the environmental aspects of the 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 collaboration and monitoring reflect the company's focus on working with customers 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 products & processes need to be present. This study approaches measurement dimensions for products & processes through: ecological design, investment revolving (Choi & Hwang, 2015) and green manufacturing & packaging (Shang et al., 2010). According to the research model on GSCM based on Choi & Hwang's closed supply chain model (figure 1), it can be seen that two aspects, ecological design and investment cycle, are covering green production & packaging. However, in this study, green manufacturing & packaging is used as an independent aspect. The green manufacturing & packaging aspect, as described by Shang et al. (2010), is an aspect that can cover the overall product & process aspect of GSCM.

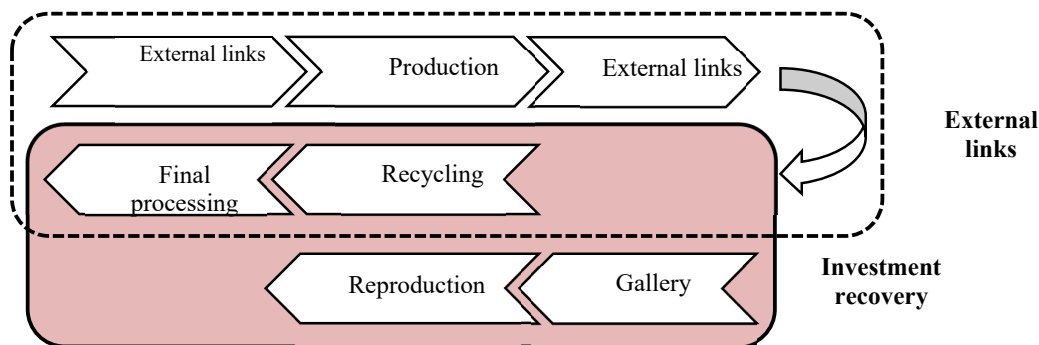


Fig. 2. GSCM based on a closed supply chain model (Choi & Hwang, 2015)

In summary, the six dimensions of GSCM measurement used in this study have been established, including environmental dimensions (internal environmental governance, environmental cooperation, environmental monitoring) and three dimensions related to products & processes (ecological design, investment recirculation and green production & packaging). This is the main basis for approaching GSCM measurement in this study through the higher order model.

2.2. Resource-based theory and sustainable three-pillar theory

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). 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 and 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. Environmental or process or product management ensures an equal sharing of environmental responsibilities by the parties involved in the product life cycle. 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 well explain how GSCM affects performance, it does not provide much significance for measuring performance in experimental studies. In fact, measuring performance in GSCM studies accordingly is still met with mixed opinions. This suggests that a suitable theory is needed to measure performance, and the theoretical framework for triple bottom line (TBL) is proposed in this study.

Following this research direction, Elkington (1994) laid out 3 core bases for TBL that are based on profit, people and planet, and with a greater degree of generalization, economy, society and environment respectively (Ahi & Searcy, 2013). 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 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 rather than being limited to the manufacturing sector was declared during the 2015 United Nations Summit on Climate Change. At the corporate level, GSCM involves coordinating the "green" activities of enterprises, 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 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, RBV and TBL have very well supported the approach to the research environment of this study.

2.3. Green supply chain management and business performance

The hierarchical structure model approach, namely the tier 2 structure model, will be applied to measure both GSCM and operational 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 conceptual model will become simpler and easier to evaluate. As mentioned above, this study approaches measuring the performance of the business based on 3 aspects and for GSCM it is 6 aspects (3 of the environment and 3 of the product & process). This study used formative measures for performance and reflective measures for GSCM (Figure 3). Here, it can be seen that the measurement of GSCM is based on 6 aspects, however in the hierarchical model, GSCM is measured through 7 aspects by environmental monitoring aspects that are specifically divided towards 2 groups of subjects: suppliers and customers.

Going deeper into aspects of operational performance, economic efficiency evaluates the performance of the enterprise in terms of financial aspects such as production costs, profits, revenue and revenue growth (Foo et al., 2018). In terms of social efficiency, 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; 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; Foo et al., 2018).

Past studies have reached consensus on the positive relationship between GSCM and performance, particularly the positive influence of GSCM on each sustainability aspect of performance (e.g., Choi & Hwang, 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. 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 circulation, the problem of reducing scrap waste and excess materials of enterprises is also solved (Zhu et al., 2008). Finally, through rapid production and packaging, as well as ecological design, potential negative environmental problems of products or environmental pollution during 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 efficiency.

Despite this, there are still debates regarding the effects of GSCM on economic performance and environmental performance, in which positive effects, negative influences, or unclear effects 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 Cankaya and Sezen (2018) study, the effect of internal environmental governance and investment cycles on economic efficiency 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 that have found 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 et al., 2008) through investment revolving. Likewise, ecological design not only solves the environmental problems of the process or product, but also minimizes and avoids waste, as well as avoids the associated fines. As a result, the company's economic efficiency is also improved through the reduction of related product & process costs. On the other hand, although little well understood and validated (Rajeev et al., 2017), the positive impact of GSCM on environmental performance has also been found in previous studies. For example, Cankaya & Sezen (2018) found the positive influence of all three important aspects of GSCM (internal environmental governance, investment cycle, and green packaging production) on environmental performance. In fact, implementing appropriate GSCM policies will cause businesses to consider issues around employees and workers more, especially pollution in the employee workplace. Invisibly, this will make businesses receive the trust, satisfaction and loyalty of employees. Therefore, the social efficiency of the business is also improved.

In summary, although there are differing opinions around the effect of GSCM on 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 the performance of businesses.*

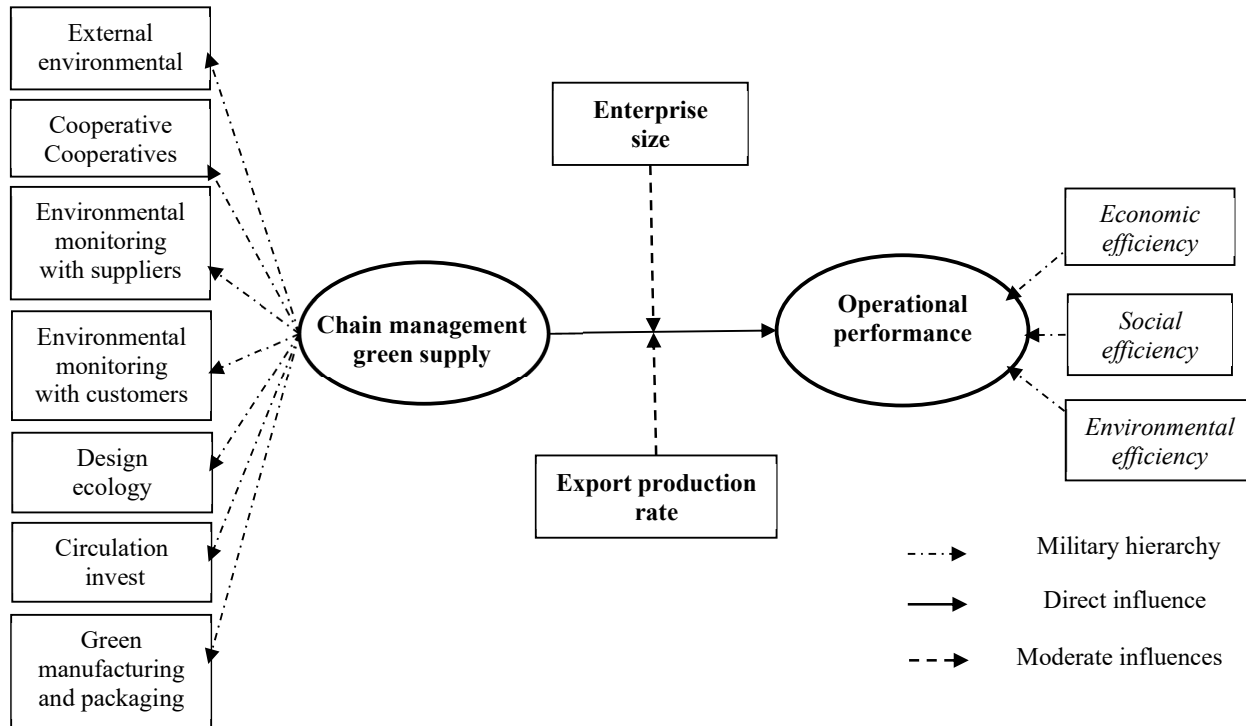


Fig. 3. Research model

2.4. Moderate role of the ratio of exported products

The ratio of exported products represents the level of international cooperation and the level of participation in the global value chain of enterprises. This makes a difference in the effectiveness and necessity of GSCM practice for businesses. Having a higher level of international cooperation will require them to perfect their green supply chain management capabilities in line with the world's sustainability goals. So if they promote better GSCM practices, they will reap more benefits. In contrast, businesses with lower export rates will often be more interested in the domestic market and so improving the GSCM may not be so necessary. In the context of Vietnamese businesses, this is no exception because Vietnam is a country with a relatively high level of international integration. Therefore, the study proposes the following hypothesis:

H2: The ratio of exported products moderates the impact of GSCM on operational performance

2.5. Moderate role of enterprise size

Larger businesses are more likely to work towards sustainability than small and medium-sized enterprises (Aras et al., 2010). Larger businesses will have a greater impact on the environment and, therefore, greater environmental responsibility. Good implementation of GSCM will become a shield to help large enterprises face this problem, or it may be better to turn these into advantages of the business and increase the efficiency of the business. From there, the study proposes the following hypothesis:

H3: Enterprise size moderates the impact of GSCM on operational performance

3. Methodology

3.1. Research Samples

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 study focuses on manufacturing enterprises in four industry groups: (1) electronics, (2) agriculture, (3) food, and (4) textiles. The reason for this is that production in these sectors has an impact on the environment to a certain extent.

In the electronics sector, electrical and electronics manufacturing 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. Environmentally harmful e-wastes are constantly accumulating and becoming 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. Despite the integration between the fairness and efficiency of alternative technologies for agricultural production, this problem still exists a lot 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 an important position in the Vietnamese economy by taking advantage of the abundant labor force. 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, these activities generate a significant amount of waste, which 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 have begun different methods and prominent among them is the implementation of green supply chain management (GSCM), although evidence of the impact of GSCM on operational 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 operational performance.

Through the directory of enterprises, the research sample is built. 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 common understanding of GSCM and business 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 response rate. The number of responses for each business group was 51 (16%), 54 (17%), 86 (27%) and 121 (39%) respectively for electronics, agriculture, food and textile enterprises.

3.2. Measurement of research variables

The GSCM scales are inherited and developed based on many previous studies. The scales are coded on a five-point scale, from 1 = "strongly disagree" to 5 = "strongly agree". Five entries for internal environmental governance have been developed from research by Kirchoff et al. (2016), Lee et al. (2012). An example is "Environmental performance metrics are used regularly by business management". Four sections on environmental cooperation with partners were developed from research by Laari et al. (2016). An example is "The business worked together with partners to take environmental issues into account in product design." Environmental monitoring for customers and environmental monitoring for suppliers are both measured based on four items, inherited from research by Laari et al. (2016). The corresponding examples for each variable are "The enterprise customer used environmental impacts as an essential criterion in supplier selection" and "The enterprise used environmental impacts as an essential criterion in supplier selection". Six entries for ecological design have been developed from research by Kirchoff et al. (2016), Lee et al. (2012). An example is "Businesses that design new or redesign products to reduce material and/or energy consumption". Three items for investment circulation have been developed from research by Choi & Hwang (2015) and Chan et al. (2012). An example is "Selling excess inventory/raw materials to recirculate investment in products". Eight categories for green manufacturing & packaging were developed from research by Shang et al. (2010). An example is "Replacing polluting and hazardous materials/parts".

The scales of performance were developed from research by Zaid et al. (2018). Each item is coded on a five-point scale, from 1 = "very little improvement" to 5 = "greatly improved". An example of four items that measure economic performance is "revenue and trading volume." An example of eight items measuring environmental performance is "taking appropriate measures to control air pollution". An example of eight items that measure social performance is "standard wages and overtime pay for labor".

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:

1. This is a nonparametric processing method, which is well suited to research data that do not ensure standard distribution such as survey data or small sample-sized data (Hair et al., 2014).

2. This study develops a new underlying relationship regarding the impact of GSCM on operational performance. given that theories regarding this influence have not been disseminated and agreed upon in emerging regions, 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. Research results

Although there are different interpretations for an SEM model (Hair et al., 2019), this study focuses on model evaluation based on two basic steps: *Measurement model evaluation*, *Structural model evaluation*, and *statistical hypothesis testing*.

Measurement model evaluation

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.

Table 1

Evaluation of measurement model (stage 1)

Element	Clause	Before the type		After removing items	
		External loading	External loading	Alpha of Cronbach	Ave
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		
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		

* Item removed due to outer loading < 0.7

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 as shown in Table 1 showed that GSCM_GMP8 was an item with an outer loading < 0.7 and was

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 on Internal consistency reliability with criteria of 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 (Table 1), so the study will enter phase 2 in the evaluation of the measurement model. In phase 2, first-order structures will be standardized into specific values, and second-order structures will now become first-order factors. Conducting a similar phase 1 assessment, the criteria for outer loading, Cronbach's alpha, and AVE are shown in table 2. The results showed that apart from removing the item GSCM_IR there was no need to edit anything in the model anymore. Finally, to assess the distinguishing value for structures in the model, the 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).

Element	Clause	External load	Alpha of Cronbach	Ave
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 EMC	0.821		
	GSCM EMS	0.800		
	GSCM_GMP	0.836		
	GSCM_IEM	0.870		
	GSCM IR	0.574**		

* not required when in formative measurements (Hair et al., 2017)

** item removed due to outer loading < 0.7

Structural model evaluation

After removing the GSCM_IR, the study model is identified as shown in Fig. 4. It is also a model for use in structural model evaluation and statistical hypothesis testing.

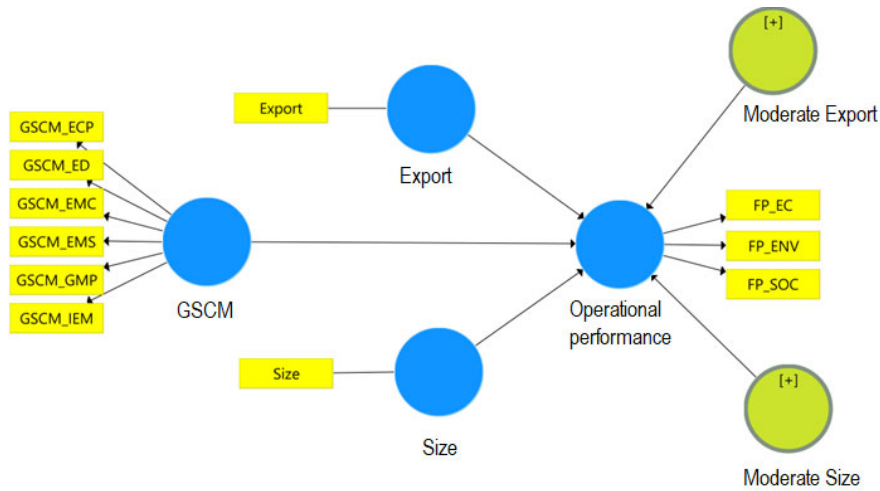


Fig. 4. Hypothesis testing results

Structural model evaluation is a set of assessments related to the quality of the SEM model with aspects of multilinearity, model suitability, and R-square determination coefficients. In terms of multicollinearity, as proposed by Hair et al. (2019), the Inner VIF coefficient can be used with a maximum threshold of 3. The results showed that no VIF coefficient exceeded 3, satisfactory as suggested by Hair et al. (2019).

Table 3
Inner VIF coefficient

Get lost	Internal VIF
Proportion of exported products	1.065
Green Supply Chain Management	1.070
Regulation of export rates	1.025
Regulating the size of the enterprise	1.017
Enterprise size	1.042

In terms of evaluating model suitability, the criterion used as SRMR < 0.08 (Hu & Bentler, 1999) is also satisfied and demonstrates the model is usable. 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 the enterprise level, this study takes chin 's (1998) standard with the corresponding levels of weak (R-square = 0.19), moderate (R-square = 0.33), and strong (R-square = 0.67). The results showed that the volatility of operational performance was explained by 19.9% by the model (R-square = 0.199). This is a low level of interpretation and has not been as expected. The reason the R-square coefficient is low is because the model ignores relatively many factors that have a strong impact on performance such as strategy, business orientation, etc. However, with the goal of analyzing the overall impact of GSCM on performance, this is an acceptable result.

Testing statistical hypotheses

Fig. 5 shows the results of testing statistical hypotheses. The results showed that the effect from GSCM on operational performance was statistically significant at 1% due to p-value < 0.01.

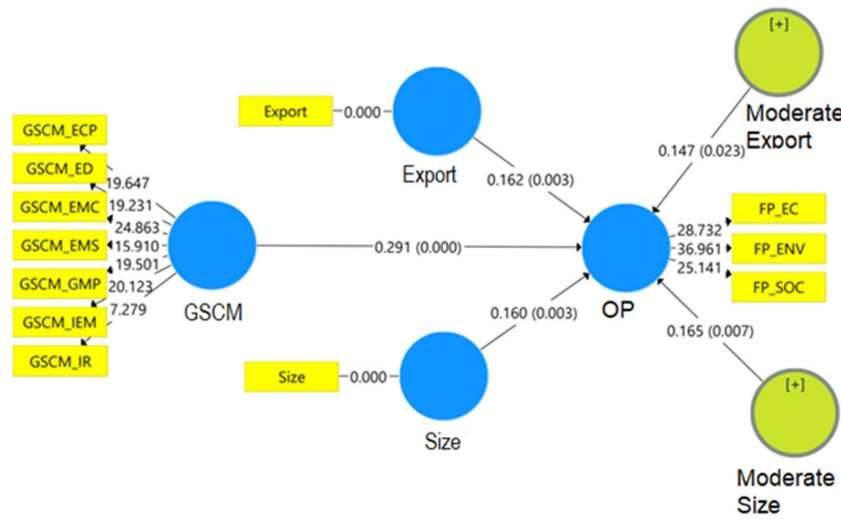


Fig. 5. Moderating hypothesis testing results

In addition, an impact factor of 0.291 > 0 indicates that this is a positive influence, so the H1 hypothesis is supported. In addition, it can be seen that the Moderate influence of two Moderate variables, enterprise size and export product ratio, are both statistically significant at 5%, so the H2 and H3 hypotheses are also supported. Thus, the improvement of GSCM also has a positive impact on the sustainable performance of businesses in Vietnam. 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. This can be explained by the theory of competitive advantage. When businesses perform good supply chain management, they can increase their competitive advantage over other businesses and thereby improve operational performance.

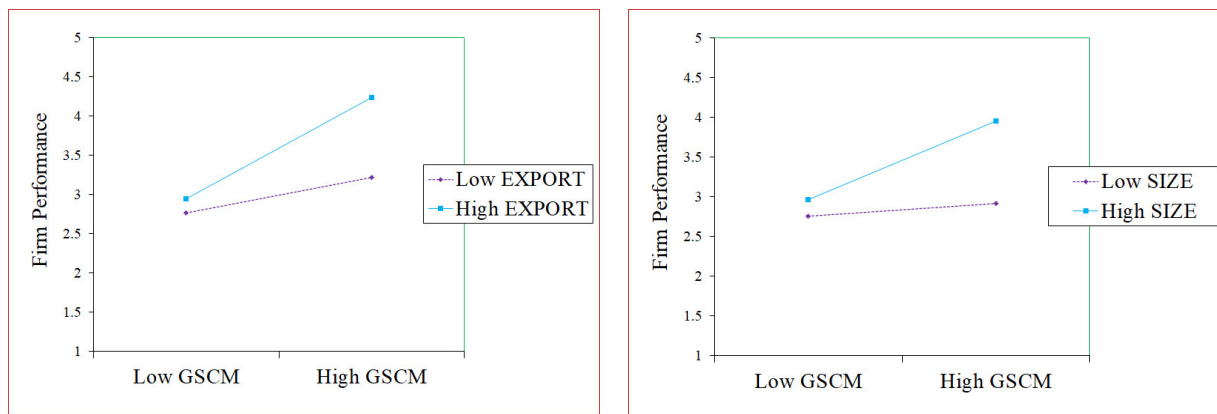


Fig. 6. Moderate role of export product ratio and enterprise size

In terms of Moderate role, Moderate outcomes are more clearly shown in Fig. 6. It can be seen that, for enterprises with a greater proportion of export products, the more GSCM is improved, the more operational performance is improved. For fewer exporters, improving the GSCM will still be beneficial for businesses, but to a lesser extent (due to the steep but relatively comfortable Low Export curve). This is explained by the fact that besides paying attention to international supply chains, domestic supply chains are also relatively important to Vietnamese businesses. However, the effectiveness of improving GSCM will not be as optimal as for enterprises with large exports. Similarly for the Moderate role of enterprise size, larger businesses will benefit more when it comes to improving green supply chain management capabilities. However, for small or very small-sized businesses it seems that the effect from improving GSCM is nonexistent (due to the almost horizontal Low SIZE line).

5. Discuss research findings and conclusions

5.1. Theoretical results

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. Furthermore, this article continues and expands the research direction on the impact of GSCM on business efficiency in developing countries. 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 performance by implementing GSCM and in what direction. Menguc & Ozanne (2005) found that studies on this issue were incomplete and clear. This research contributes to a specific direction by demonstrating that environmental orientations can drive business efficiency directly. The findings show that the implementation of GSCM practice is governed by quadratic factors, which are consistent with the Lee et al. (2012) study and reinforce that aspects of GSCM have correlated well with structures. In particular, GSCM's strong correlation with marketing activities such as the use of eco-design, investment in recycling, and product packaging design, provided an interesting approach prompt. It's about whether an interdisciplinary approach to the environment offers benefits that help businesses achieve operational efficiencies that stand out from the competition.

Supporting the studies of Choi & 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, achieve environmental control targets and bring 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 results of the study show that both the size of enterprises and the proportion of exported products have a significant Moderate role in the impact from GSCM on operational performance. The urgency of implementing GSCM will depend on the size of the enterprise as well as the proportion of export products of the enterprise. For larger businesses, both internal operations and collaboration with stakeholders are complex and important processes. At that time, implementing GSCM will promote effective environmental solutions not only for businesses but also supply chains. Thanks to this strengthening of the supply chain, not only the short-term performance of the business is improved, but also brings the business to sustainable business capabilities. In addition, businesses operating a lot in the export sector when improving GSCM will also facilitate more effective communication with partners, thereby strengthening the position of enterprises in the global value chain. As a result, businesses earn not only temporary economic profits but also long-term and quality international cooperation orders. In addition, when environmental goals and social values in the green supply chain are agreed with international partners, the environmental efficiency and social efficiency of enterprises will also be improved as a necessity.

5.2. Practical results

Through the results of the study, the study makes the following recommendations to stakeholders. First, businesses can improve operational performance by meeting environmental requirements in the supply chain. The performance of the business is 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 performance, businesses need to choose suitable suppliers or have environmental monitoring measures at their suppliers.

Secondly, the results of the study show that businesses should not only focus on internal GSCM practices, in the production of green products, in implementing green processes or environmental management, but also on expanding investment in relationships with partners, in which customers and suppliers are considered the motivations for businesses to adjust to GSCM. In addition, the decision to improve GSCM also depends on the size of the enterprise and the proportion of export products of the enterprise. The results of the study show that businesses need to consider both labor size and export scale to

make better decisions when implementing strategies to promote GSCM of enterprises. This study re-emphasizes that, for large-scale enterprises and heavy exporters, improving GSCM is urgent.

5.3. Limitations and future research orientations

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 been explained with certainty.

Second, focusing only on one effect of the overall GSCM without considering each aspect, as well as the interaction of the GSCM with other factors in the business has made the interpretation of the performance of the business biased. Future studies should explore and link GSCM to other factors affecting business performance.

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

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