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Exploring the Roles of Circular Supply Chain Management Practices and Supply Chain Dynamic Capabilities in Vietnamese SMEs' Sustainability Performance

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ABSTRACT

The literature has increasingly indicated the direct effects of circular supply chain management (CSCM) practices and supply chain dynamic capabilities (SCDCs) on firm sustainability performance (FSP). However, are a few studies examing the indirect role of SCDCs in the relationship between CSCM practices and FSP, especially in the context of developing countries. This study examines both the direct and indirect roles of SCDCs in the relationship between CSCM practices and FSP in Vietnamese small and medium-sized enterprises (SMEs). We surveyed 53 SMEs in Vietnam in several sectors such as agriculture, textile, electronics, chemicals. Data was analyzed using Smart PLS software. Our research results indicate that while CSCM practices positively impact on both firm economic, social and environmental performance, SCDCs merely affect environmental performance. Interestingly, the present study reveals the moderating roles of SCDCs in facilitating the relationships between CSCM practices and FSP in Vietnamese SMEs. It highlights the importance of building SCDCs in implementing CSCM practices in order to enhance sustainability performance of SMEs in developing countries.

Keywords: Circular Supply Chain Management, Supply Chain Dynamic Capabilities, Firm Sustainability Performance, Small and Medium-Sized Enterprises, Vietnam

JEL Classification: L25, M11, O31

1. INTRODUCTION

Over the last decade, firms in developed and developing countries have faced increasing pressures to implement CSCM practices to achieve sustainability performance goals (Mangla et al., 2018; Batista et al., 2019; Patwa et al., 2021; Tseng et al., 2024). While the sustainability concept is well-documented in existing literature, the circularity aspect of supply chains has only been recently adopted (Batista et al., 2018; Kumar et al., 2021; Modgil et al., 2021). CSCM emphasizes the principles such as reuse, reduction, recycling, and recovery of products, components and materials rather than the traditional "end-of-life" concept (Walker et al., 2021). Research has shown that CSCM practices maximine the utilization of input resources, reduces emissions, energy consumption, and waste, and thus contribute to enhancing FSP (Atabaki et al., 2020; Dey et al., 2022; Rodríguez-Espíndola et al., 2022). Although CSCM practices in developing countries has been acknowledged to have positive impact on firm sustainability performance, its adoption and specific forms of relationships with FSP are still open to debate (Mangla et al., 2018; Chen et al., 2021; Mhatre et al., 2023; Sharma et al., 2023; Agyabeng-Mensah et al., 2023). In developing countries, firms have coped different challenges from firms in developed countries to implement CSCM and therefore require specific firm resources to achieve circurlar economy goals (Batista et al., 2019; Rodríguez-Espíndola et al., 2022; Agyabeng-Mensah et al., 2023).

Supply chain dynamic capabilities (SCDCs) have recently been attributed to be an important resources to enhance firm sustainability performance (Amui et al., 2017; Hong et al., 2018; Köhler et al., 2022). The literature on sustainable supply chain management has shown that SCDCs play both direct and mediating roles in enhance some aspects of FSP (Beske, 2012; Seifert, 2015; Hong et al., 2018). There are increasing studies indicating that firms practicing sustainable supply chain management will enhance their SCDCs and thus foster sustainability performance (Beske, 2012; Hong et al., 2018). However, there is a lack of research on the role of SCDCs in the context of CSCM where firms transform from linear to circular production systems. There are a few studies indicating that SCDCs might play a direct or moderating role in facilitating CSCM practices and FSP (Hong et al., 2018; Isnaini et al., 2020; Köhler et al., 2022). SCDCs can be considered as a strategic resource for firms to practice CSCM effectively and thus FSP is contingent to firms' SCDCs (Chari et al., 2022; Köhler et al., 2022). In the context of developing countries, SCDCs vary according to market and industrial contexts (Batista et al., 2019; Chari et al., 2022). For example, Vietnam like many other developing countries set the goals toward a circular economy in many industries for international integration, adaptation to climate change, efficient use of natural resources, enhancing added value and sustainable development (Van Kiem and Huong, 2023; Chau et al., 2023). However, Vietnam also faces with many challenges and barriers in terms of legal, economic and operational infrastructure as well as supply chain, firm capabilities (Mangla et al., 2018; Van Kiem and Huong, 2023; Chau et al., 2023). As such, Vietnamese firms, especially SMEs, might rely on their supply chains and their dynamic capabilities to transform business models, processes and collaboration and thus effectively overcome the emerging and local challenges to achieve circular economy goals (Tseng et al., 2022; Chari et al., 2022; Bui et al., 2023).

This study combines the resource-based view and contingency approaches to explore the roles of CSCM practices and SCDCs in firm sustainability performance based on the investigation of Vietnamese manufacturing SMEs. We argue that CSCM practices are the key for firms to achieve sustainability performance goals, but contingent to their SCDCs. There is scant research to this topic in the literature on CSCM and this study thus aims to address the following research questions:

- Research Question 1: How do CSCM practices and SCDCs impact firm sustainability performance?
- Research Question 2: How do SCDCs moderate on the relationship between CSCM practices and firm sustainability performance?

In the next section, the theoretical background and hypotheses are developed from the resource-based view and contingency approaches. The proposed research methodology is explained in section 3. The data analysis and result discussion are elaborated in section 4. In section 5, the conclusion of the study is highlighted with the limitations and future research directions.

2. THEORETICAL BACKGROUND AND HYPOTHESES

2.1. CSCM Practices and FSP

CSCM refers to *"the integration of circular thinking into the management of the supply chain and its surrounding industrial and natural ecosystems. It systematically restores technical materials and regenerates biological materials toward a zero-waste vision through system-wide innovation in business models and supply chain functions from product/service design to end-of-life and waste management, involving all stakeholders in a product/service lifecycle including parts/product manufacturers, service providers, consumers, and users"* (Farooque et al., 2019). CSCM practices include (1) circular product design, (2) circular procurement, (3) circular production, (4) sustainable distribution and (5) end-of-life product and waste management (Esfahbodi et al., 2016; Farooque et al., 2022). Circular product design primarily focus on extending product life, creating durable products, and implementing streamlined disassembly and reassembly processes to facilitate closed-loop resource utilization and minimize waste (Esfahbodi et al., 2016; Den Hollander et al., 2017). Circular procurement aims to utilize natural, non-virgin, renewable, biodegradable/restorable, and non-hazardous resources to close the energy and material loops in the supply chain, leading to the development of circular resource flows, the addition of new procurement channels, and cost reduction through resource sharing or reuse (Farooque et al., 2022; Tseng et al., 2023). Circular production refers to manufacturing systems that promote resource efficiency, address waste generation, and operate as closed loops by producing products with extended lifespans that can be repaired, recycled, remanufactured, and refurbished (Hoveling et al., 2024; Esfahbodi et al., 2016). Sustainable distribution addresses environmental concerns related to transportation, packaging, warehousing, storage maintenance, inventory control, and facility location-allocation decisions in order to minimize negative environmental impacts (Esfahbodi et al., 2016; Green et al., 2012). It aims to improve environmental performance by reducing emissions associated with product transportation along the supply chain (Green et al., 2012). Effective end-of-life (EoL) product and waste management practices are crucial for managing circular resource flows, including waste-to-energy generation, anaerobic digestion for biological materials, and efficient reuse, refurbishing, remanufacturing, and recycling procedures for technical materials (Farooque et al., 2022). These practices aim to recover residual value from the product system and establish circularity in supply chains. Circular supply chains go beyond traditional reverse logistics systems and networks by collaborating with others within and beyond their respective sectors to maximize resource utility instead of disposing of used or end-of-life items and materials in landfills (Farooque et al., 2022).

Firm sustainability performance (FSP) refers to a company's effectiveness in managing environmental, social, and governance (ESG) factors to achieve long-term economic success while contributing positively to society and minimizing environmental impact (Esfahbodi et al., 2016; Ali et al., 2021). Recent academic research underscores the significance of FSP in enhancing overall firm performance. Ali Qalati et al. (2023) reveal that such initiatives positively influence financial outcomes by improving operational efficiency and corporate reputation. The research also highlighted the role of green innovation in mediating this relationship, suggesting that firms investing in sustainable technologies gain competitive advantages.

Several studies have examined how CSCM practices can enhance firm sustainability performance. However, there is still debate about whether CSCM practices can effectively address all three dimensions of sustainability performance: economic, environmental, and social. A survey of 209 Chinese manufacturing companies by Hong et al. (2018) found that SSCM practices positively impacted all three dimensions of FSP. Another study by Wang and Dai (2018) demonstrated that internal SSCM practices had a positive influence on environmental and social performance. Esfahbodi and Zhang (2016) focused on the environmental and economic dimensions of Chinese and Iranian manufacturing firms and revealed that the adoption of SSCM practices merely positively affected environmental performance, but unnecessarily lead to improved cost performance. As more and more firms have recently committed with circular supply chain management practices, there is evidence that circular economy practices positively and significantly impact on FSP (Dey et al., 2022). As the result, we hypothesize that:

H_1: CSCM practices are positively associated with firm sustainability performance.

- H_{1a}: CSCM practices are positively associated with economic performance.
- H_{1b}: CSCM practices are positively associated with environmental performance.
- H_{1c}: CSCM practices are positively associated with social performance.

2.2. SCDCs and FSP

Dynamic capabilities theory extends the resource based view, refering to the firm abilities to renew resources in response to rapidly changing environments and thus gain competitive advantage (Ambrosini and Bowman, 2009). SCDCs can be defined as a firm's ability to integrate, develop and adjust the supply chain to achieve a strategic goal (Teece et al., 1997; Hong et al., 2018). In the context of firm sustainability, SCDCs help firms to utilize and align both internal complex system and external resources to response with economic, environment and social pressures from the market (Beske, 2012; Hong et al., 2018). SCDCs thus may consist of a few sub-capabitlities that help firms to sense, seize economic, environmental and social changes in the markets and transform the supply chain to response with those changes (Hong et al., 2018; Chari et al., 2022). The literature on CSCM indicates that SCDCs can include integration capability, learning capability, flexibility capability, and collaboration capability (Chari et al., 2022; Yan et al., 2022). Integration capability refers to the ability to integrate operational activities through the use of digital technologies to facilitate a shared understanding of sustainability issues and involve supply chain partners in co-developing innovative solutions (Frank et al., 2019; Chari et al., 2022; Qiao et al., 2023; Osei et al., 2023). Learning capability refers to the ability to generate, acquire, disseminate, and integrate information/knowledge across partners in the supply chain (Chari et al., 2022; Qiao et al., 2023; Osei et al., 2023). Flexibility capability refers to the ability to quickly adjusting the supply chain to response to changing customer demands, market uncertainties, increased customer service level, and faster delivery, known as supply chain flexibility (Bai et al., 2020; Castro-Lopez et al., 2023). Collabration capability refers to the ability to work with others to complete tasks and reach shared objectives (Hussain and Malik, 2020; Liao et al., 2021).

Recent studies provide evidence on the impact of SCDCs on FSP. Hong et al. (2018) explored that SCDCs directly influence the firm environmental performance. Chari et al. (2022) indicate a variety of dynamic capabilities assist manufacturing firms to sense, seize circular issues and transform supply chains into circular supply chains. Those capabilities can contribute to different stages of dynamic capability processes. For example, integrative information technologies can be used to analyze data and provide information for a better understanding of how to design supply chain processes, coordinate networks and operations, and enable supply chain partners to collaborate with employees on the circular economy paradigm to develop dynamic capabilities (Gupta and Gupta, 2019). Supply chain flexibility is crucial for quick and cost-effective reactions to market changes that improve supply chain and organizational competitiveness (Bai et al., 2020). Liao et al. (2021) showed that supply chain collaboration is a type of dynamic capability comprising of information sharing, mutual trust between the members, and formation of a problem solving team and executive involvement. Employees with an understanding of circular knowledge and skills of key customers and suppliers can also share knowledge across supply chain and thus support firm sustainability performance (Chari et al., 2022). Hence, this study theorizes that:

H_2: SCDCs are positively associated with firm sustainability performance.

- H_{2a}: SCDCs are positively associated with economic performance.
- H_{2b}: SCDCs are positively associated with environmental performance.
- H_{2c}: SCDCs are positively associated with social performance.

2.3. The Moderating Effect of SCDCs on the Relationship between CSCM and FSP

Most circular supply chains are situated in dynamic environments and thus SCDCs should be applied to adapt with changes (Beske, 2012; Hong et al., 2018). However, the combination of CSCM and SCDCs and their impact on FSP are rarely researched and thus the roles of SCDCs in FSP are still open to debate (Amui et al.,2017; Hong et al., 2018; Chari et al., 2022). The recent research points out that SCDCs are the results of sustainable supply chain management practices and thus SCDCs play a mediating role in facilitating FSP (Hong et al., 2018; Köhler et al., 2022; Raza et al., 2021). However, SCDCs can be viewed as firm specific resources and the efficiency of sustainable supply chain management practices and FSP might be contingent to firms' SCDCs (Chari et al., 2022; Yan et al., 2022; Köhler et al., 2022). As CSCM practices have been recently adopted by firms in developing countries, It should therefore be in line with firms' SCDCs in order to be operated efficiently (Köhler et al., 2022). Although SCDCs could moderate the relationship between CSCM practices and FSP, there has not been any research examing this moderating relationship. Firms in developing countries have increasingly integrated their operations with global value chain and when they adopt CSCM practices, they should implement them in accordance with their SCDCs. In this study, we argue that SCDCs play a moderating roles in facilitating CSCM practices and FSP, especially for small and medium-sized manufacturing firms in developing countries. Firms having SCDCs might tend to adopt CSCM and thus achieve sustainability performance. Thus, we hypothesize the following:

H_3: SCDCs significantly moderate in the relationship of CSCM Practices and firm sustainability performance.

- H_{3a}: SCDCs significantly moderate in the relationship of CSCM Practices and economic performance.
- H_{3b}: SCDCs significantly moderate in the relationship of CSCM Practices and environmental performance.
- H_{3c}: SCDCs significantly moderate in the relationship of CSCM Practices and social performance.

The above-mentioned hypotheses in the present study are summarized in the below Figure 1.

3. METHODOLOGY

3.1. Measurements and Questionnaire Design

In the present study, CSCM practices include five first-order constructs: circular product design, circular procurement, circular production, sustainable distribution, and EoL product and waste management. These constructs capture a holistic view of CSCM practices. The measurements of CSCM practices were adapted from the studies of Esfahbodi et al. (2016), Farooque et al. (2022), and Hoveling et al. (2024). A five-point Likert scale was used to measure CSCM practices, where respondents evaluate the level of implementation in their organizations on a scale of 1 (no implementation) to 5 (fully implemented).

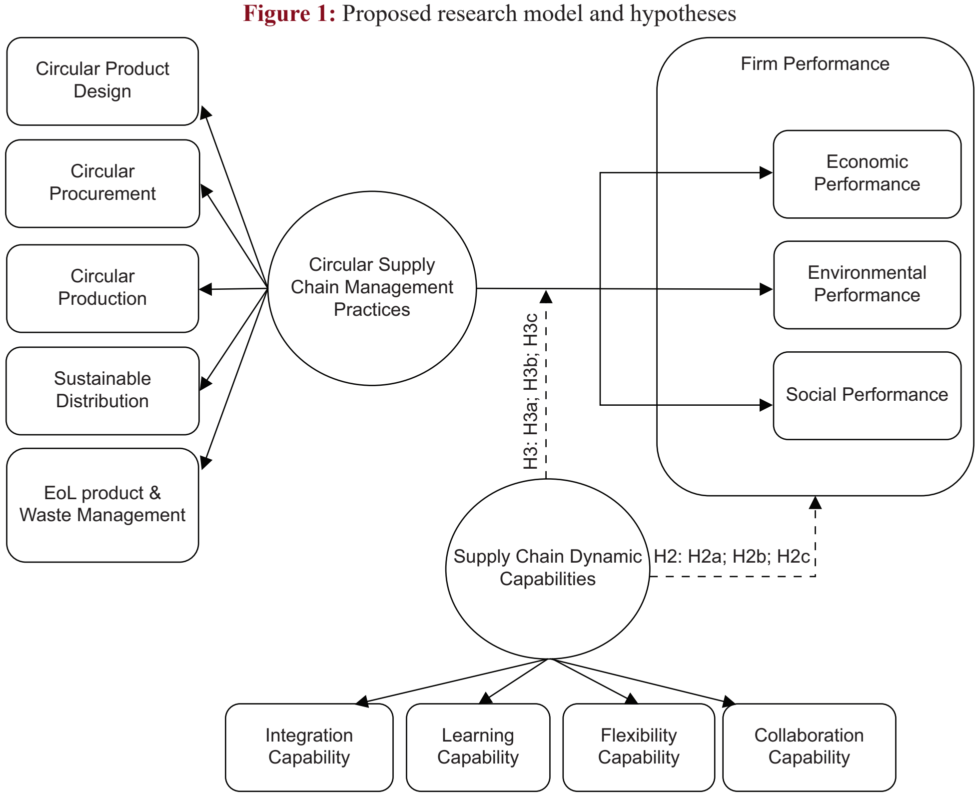
Similarly, four first-order constructs are used to measure SCDCs including integration capability (IC), learning capability (LC), flexibility capability (FC), and collaboration capability (CC). The measurements of IC focus on technology-enabled integration capability and was adapted from Frank et al. (2019); Chari et al. (2022); Qiao et al. (2023). Meanwhile, LC measurement was from the studies of Qiao et al. (2023). FC measurements was adapted from Bai et al. (2020). Finally, CC measurement was adapted from Hussain and Malik (2020). Potential respondents were asked if their company has achieved each of the capabilities by using the scale from 1 (not at all) to 5 (significant).

For firm sustainability performance, economic, environmental, and social performance are the measured variables and their measurements was adapted from Ali et al. (2021). Appendix 1 shows the key measurement iteams used to collect data from participant firms. Participants are asked to assess their company's CSCM practices, SCDCs and firm sustainability performance in the most recent years in relation to each criterion and the industry's top rival.

3.2. Sampling Method and Data Collection

Manufacturing small and medium-sized firms (SMEs) in emerging markets are the focus of this study. According to the OECD (2021), the size of an organization is primarily determined by the total number of employees. Based on this criterion, companies with 10 to 49 employees are classified as small businesses, while those with 50–249 employees are considered medium-sized companies. Since manufacturing SMEs play a crucial role in the economic development of nations they were chosen as the target population for this study. The survey's target respondents are senior workers, managers, or directors in Vietnamese manufacturing SMEs who have an in-depth understanding of the whole supply chain and the success of their company.

Figure 1: Proposed research model and hypotheses



The sampling process followed specific criteria to maximize sample eligibility and quality. SME associations in the manufacturing sectors were selected as the sampling sources. Firms in the associations were invited to participate as respondents through an open letter that explained the research and emphasized its legitimacy as a scientific study. A total of 53 eligible responses were obtained. Table 1 below shows the demographic characteristics of the surveyed sample.

4. RESULTS AND DISCUSSIONS

4.1. Preliminary Test Results

The Cronbach's alpha, composite reliability (C.R), correlation coefficient, factor loading, average variance extract (AVE), Fornell and Larcker criterion, and the heterotrait-monotrait ratio of correlations (HTMT) indices were used to evaluate convergent validity, discriminant validity, and reliability of the scales. All of the Cronbach's Alpha and C.R values in this study are higher than 0.7, and the correlation coefficient is higher than 0.3. The findings also indicate that factor loading and AVE are, respectively, above 0.7 and 0.5. Thus, it is confirmed that the measurement model is acceptable for further analysis. Table 2 shows the details.

Additionally, discriminant validity test was employed using the Fornell and Larcker criterion, and HTMT criterion. In this study, the discriminant validity is assured because the square root of AVE values (shown at the top of each column and in bold in Table 3) is larger than the correlation coefficients (Fornell and Larcker, 1981).

Table 1: Sample demographic characteristics

SMEs	Characteristic	Frequency
Firm Industry	Basic metals/Metal product	9
	Machinery/Equipment	12
	Chemicals	3
	Automotive/Transport equipment/ Vehicle	4
	Electrical appliances/Household appliances	1
	Pharmaceutical/Treatment	1
	Food/Beverage/Wine/Tobacco	5
	Building material/Building and decorative	5
	Coke/Petroleum	2
	Electronics/Communication	4
	Textile/Apparel/Leather	2
	Rubber/Plastics	2
	Wood/Furniture	3
Firm type	Private	12
	State-owned	6
	Joint venture	13
	Foreign owned	12
	Collective	1
	Limited company	9
Firm age	1-4	8
	5-10	23
	11-20	16
	>20	6
Respondent's position	CEO	7
	R&D manager	9
	Production manager	7
	Operation manager	18
	Senior employee	12

Following Henseler et al. (2016), discriminant validity is supported if the achieved value of HTMT is smaller than 0.85. The results show that the values from HTMT analysis are smaller than 0.85 as presented in Table 3, meaning that discriminant validity is confirmed.

4.2. Hypothesis Testing

In order to test the hypotheses, PLS-SEM was applied using Smartpls 4.0. We evaluated R^2 of three dependent variables (Falk and Miller, 1992) i.e. economic performance, environmental performance and social performance. Table 4 shows that R^2 of three variables were 0.616, 0.457, and 0.409, respectively. Moreover, Q^2 values were 0.551, 0.404, and 0.304, respectively.

Then we assessed the significance and the relevance of the structural model relationships using bootstrapping technique (Table 5).

The results indicate the P-values of H_{1a}, H_{1c} and H_{2b} are very significant, P-value (<0.05) of H1b is also significant, so H_{1a}, H_{1b}, H_{1c}, H_{2b} are supported. The P-values of H_{2a} and H_{2c} are slightly <0.05, which means they are not significant. So H_{2a} and H_{2c} are not supported.

Furthermore, SCDCs are proved to moderate the association between CSCM practices and economic performance ($\beta = 0.239$, P-value = 0.000), environmental performance ($\beta = 0.112$, P-value = 0.008), and social performance ($\beta = 0.181$, P-value = 0.007). As a result, hypotheses H_{3a}, H_{3b} and H_{3c} were supported.

4.3. Discussion

Previous studies indicate that there are a number of challenges and barriers for firms in developing countries to adopt CSCM and that the contribution of CSCM to firm sustainability was unclear until recent studies' findings (Mangla et al., 2018; Batista et al., 2019; Rodríguez-Espíndola et al., 2022). The survey results of this study presented in Table 5 show that CSCM practices have significant effects on Vietnamese manufacturing SMEs' economic, environmental and social performance as hyphothesized in H_{1a}, H_{1b} and H_{1c}. These findings are in line with recent studies in other developing countries such as China, Mexico and Ghana (Agyabeng-Mensah et al., 2022; Agyabeng-Mensah et al., 2023; Farooque et al., 2022; Rodríguez-Espíndola et al., 2022). This study therefore provides an empirical support that circular economy principles adopted within supply chains are helping manufacturing SMEs in developing countries to enhance sustainable-oriented innovation and thus foster sustainability performance. Despite many challenges, firms who commit with CSCM practices will benefit in both short term and long run. Circular economy principles contribite to reduce costs in the short term as well as enable firms to fulfil their responsibilities to society, environment and stakeholders (Hong et al., 2018; Yan et al., 2022).

In addition to the contribution of CSCM practices to FSP, this study examine the direct effects of SCDCs on FSP. It is argued that firms adopting CSCM practices are always situated with in a dynamic environment and thus SCDCs become critical resources for firms to effectively implement CSCM and achieve sustainability

Table 2: Reliability and convergent validity analysis

Measurement index			Factor loading	AVE	C.R	Cronbach α
Constructs	Variables	Items				
SCDCs	Integration capability	IC1 IC2 IC3	0.733	0.608	0.861	0.897
	Learning capability	LC1 LC2 LC3	0.858			
	Flexibility capability	FC1 FC2 FC3	0.742			
	Collaboration capability	CC1 CC2 CC3	0.781			
CSCM Practices	Circular product design	CPD1 CPD2 CPD3	0.807	0.713	0.925	0.929
	Circular procurement	CP1 CP2 CP3	0.792			
	Circular production	CPr1 CPr2 CPr3	0.903			
	Sustainable distribution	SD1 SD2 SD3	0.906			
	EoL product and Waste management	EW1 EW2 EW3	0.807			
Firm sustainability performance	Economic performance	EP1 EP2 EP3	0.731	0.678	0.862	0.862
	Environmental performance	EnP1 EnP2 EnP3	0.905			
	Social performance	SP1 SP2 SP3	0.825			

CR: Composite reliability, AVE: Average variance extracted
Suggested value: AVE≥0.5; C.R≥0.6; Cronbach's alpha≥0.7

Table 3: Discriminant validity test results

Fornell and Larcker Criterion					
	CSCM Practices	EP	EnP	SCDCs	SP
CSCM Practices	0.751				
EP	0.731	0.846			
EnP	0.603	0.345	0.841		
SCDCs	0.520	0.444	0.572	0.813	
SP	0.525	0.594	0.633	0.534	0.829
Heterotrait-Monotrait Ratio of Correlations (HTMT)					
	CSCM Practices	**EP**	**EnP**	**SCDCs**	**SP**
CSCM Practices					
EP	0.705				
EnP	0.562	0.404			
SCDCs	0.595	0.494	0.703		
SP	0.514	0.560	0.795	0.527	

Table 4: Predictive relevance and R2 of the model

Firm sustainability performance	R2	Q2
Economic performance	0.616	0.551
Environmental performance	0.457	0.404
Social performance	0.409	0.304

performance (Köhler et al., 2022; Chari et al., 2022; Yan et al., 2022). In spite of important roles, there is a lack of research on the influence of SCDCs on FSP and the direct contribution of SCDCs to FSP remains unclear in the literature on circular economy (Hong et al., 2018; Yan et al., 2022; Köhler et al., 2022). The results of this study show that SCDCs significantly affect environmental performance of manufacturing SMEs but not economic or social performance (Table 5). These results confirm the findings of Hong et al., 2018, confirming that SCDCs do not directly affect all aspects of FSP. Only environmental aspects are found to be supported by SCDCs. These findings might fit with the context of circular economy in developing countries where SCDCs do not always improve cost performance but environmental performance (Green et al., 2012). These results are also in accordance to the recent studies on the roles of SCDCs in the relationships with CSCM practices and firm sustainability performance. There is increasing evidence that SCDCs facilitate sustainable-oriented innovation within supply chains and since SCDCs also have some effects on FSP, they might have played a moderating role in the

Table 5: Hypothesis testing results

Hypothesis	Path direction	Path coefficient	T value	P-value	Result
H_{1a}	CSCM Practices → Economic Performance	0.764	9.986	***	Supported
H_{1b}	CSCM Practices → Environmental Performance	0.432	3.251	0.002	Supported
H_{1c}	CSCM Practices → Social Performance	0.392	4.812	***	Supported
H_{2a}	SCDCs → Economic Performance	0.231	2.103	0.056	Not supported
H_{2b}	SCDCs → Environmental Performance	0.387	4.490	***	Supported
H_{2c}	SCDCs → Social Performance	0.226	1.934	0.057	Not supported
H_{3a}	CSCM Practices*SCDCs → Economic Performance	0.239	4.602	***	Supported
H_{3b}	CSCM Practices*SCDCs → Environmental Performance	0.112	2.950	0.008	Supported
H_{3c}	CSCM Practices*SCDCs → Social Performance	0.181	2.746	0.007	Supported

***Significant level=0.000

relationships between CSCM practices and FSP (Chari et al., 2022; Yan et al., 2022; Köhler et al., 2022).

In investigating the moderating roles of SCDCs in the relationships between CSCM practices and FSP, the results of this study explore that SCDCs significantly moderate both the relationships between CSCM practices and economic, environmental, and social performance of firms. This study therefore provides empirical support for the moderating roles of SCDCs in facilitating CSCM practices and firm sustainability performance (Chari et al., 2022; Köhler et al., 2022; Yan et al., 2022). These results imply the importance role of SCDCs in adopting circular economy principles in the supply chain. It highlights the enablers for circular supply chain management and firm sustainability performance. There are dynamic capabilities that are critical for firms to adopt CSCM practices and formulate a sustainable supply chain that enhances firm sustainability performance (Chari et al., 2022; Köhler et al., 2022). These dynamic capabilities become more importance in the context of developing countries where circular economy is still a new concepts and the infrastructure for it are still under construction (Mangla et al., 2018; Batista et al., 2019; Hong et al., 2018). As SCDCs are complex containing sub-capabilities, they are required to be built carefully in order to contribute to the sensing, seizing circular issues as well as transforming the supply chains to address changes in the market (Chari et al., 2022). The underlying moderating role of SCDCs thus implies that firms, especially the SMEs, tend to commit with CSCM should build their SCDCs at the same time in order to effectively adopt CSCM to achieve their sustainability goals.

5. CONCLUSION AND IMPLICATIONS

This study seeks to explore the roles of CSCM practices and SCDCs in firm sustainability performance. The integration of CSCM practices and SCDCs is an emerging topic in the literature and in practice (Agyabeng-Mensah et al., 2022; Chari et al., 2022). It is argued that firms in developing countries, especially the SMEs, implementing CSCM must pay attention to developing SCDCs at the same time because circular supply chains are always situated within dynamic environments (Beske, 2012; Chari et al., 2022, Hong et al., 2018). In response to the call for empirically explore the roles of SCDCs in firms' CSCM and sustainability performance, this study combine the resource based view and contingency approach to constructs a research model exploring the direct and moderating roles of SCDCs in firms' CSCM practices and sustainability performance in developing countries. It based on the investigation of Vietnamese manufacturing SMEs to test the research model. The results suggest that while CSCM practices significantly and positively affect firm sustainability performance, SCDCs only positively influence firm environmental performance. These findings empirically support the results of previous studies in other developing countries. Interestingly, the findings of this study prove that SCDCs play moderating roles in facilitating firms' CSCM practices and sustainability performance in terms of both economic, social and environmental performance. This study therefore is the first to empirically confirm the moderating role of SCDCs in firm sustainability performance. It clarifies that SCDCs promote CSCM practice and sustainable innovation which enhance firm sustainability performance in term of both economic, social and environmental performance (Chari et al., 2022; Köhler et al., 2022). Furthermore, the findings of this study provide implications for manufacturing SMEs in developing countries who are under greater pressure to implement CSCM to engage with global value chain, adaptation to climate change, efficient use of natural resources, enhancing added value and sustainable development. It is suggested that SMEs in developing countries should commit with CSCM practices but at the same time develop their SCDCs in order to achieve firm sustainability performance goals.

Despite the theoretical and practical contributions stated above, it is essential to acknowledge limitations of our study that might provide opportunities for future research. Firstly, this study is an exploratory and quantitative study with a limited number of samples in one developing countries. Its results should be tested in other contexts to verify the validity of the results obtained. Secondly, the measurement of supply chain dynamic capabilities aims to capture processes in various industries. Future research can focus on specific industries and use qualitative approaches to identify the kinds of SCDCs that contribute to help firms to capture market changes in circular economy and adjust supply chains to response to those changes. Finally, the results of this study represent the manufacturing SMEs in developing countries who still struggle in adopting CSCM and lack of supports from governments and market. Future research can focus to explore the role of SCDCs from the perspective of large firms to explore best practices for benchmarking.

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APPENDIX

Appendix 1: Constructs and measurement items

Constructs	Variables	Items	References
Circular supply chain management (CSCM) practices	Please indicate the extent to which you perceive that your company is implementing each of the following. (Five-point scale: 1=No implementation; 2=Planning to consider implementation; 3=Currently considering implementation; 4=Initiating implementation; 5=Implementing fully)		
	Circular product design	• We design our products for reduced consumption of material/energy. • We design our products for reuse, recycle, recovery of material, component parts. • We design our products for longevity and durability.	Esfahbodi et al. (2016)
	Circular procurement	• We require our main suppliers to use materials that are used (non-virgin), repaired, refurbished, remanufactured or recycled. • We prefer renewable energy sources when selecting energy providers. • We consider the amount of waste production in product use when purchasing products.	Farooque et al. (2022)
	Circular production	• We use the discarded product which is still in good condition and fulfils its original function again (e.g., second hand, sharing of products). • We repair and maintain the deficient or damaged products and their parts so products can be used longer. • We revive old products to give them new life so, products are transformed into updated products.	Hoveling et al. (2024)
	Sustainable distribution	• We cooperate with customers for using less energy during product transportation. • We cooperate with customers for green packaging. • We use of renewable energy in any mode of products transportation.	Esfahbodi et al. (2016)
	EoL products and waste management	• We collect expired/unsold products from distribution network. • We collect used/end-of-life products from customers. • We require your main suppliers to collect their packaging materials from your firm (i.e., packaging materials of supplied materials or components)	Farooque et al. (2022)
Supply chain dynamic capabilities (SCDCs)	Please indicate the extent to which you perceive that your company has achieved each of the following during the past year. (Five-point scale: 1=Not at all; 2=A little bit; 3=To some degree; 4=Relatively significant; 5=Significant)		
	Integration capability	• We use computerized production systems such as ERP, MRP or MRP II. for planning, tracking and ordering component and products with suppliers through manufacturing operations. • We monitor, trace and automate reverse flows by big data • We use Internet of Things to exploit information for a faster and more sustainable collection of waste, leading to lower costs and increased value added associated with the recovery process.	Frank et al. (2019); Chari et al. (2022); Qiao et al. (2023)
	Learning capability	• We have established a strong capability in understanding circular knowledge and skills of our major customers and suppliers. • We constantly learn better ways to work with our major suppliers and customers to jointly deal with environmental issues. • We have learnt new environmental management abilities from our major supplier and suppliers.	Qiao et al. (2023)
	Flexibility capability	• We quickly adjust the supply chains to respond to changes in green product changes. • We quickly adjust the supply chains to respond with the shortage of resources by using recycled resources. • We quickly adjust the supply chains to respond to changes in market demand toward circularity.	Bai et al. (2020)
	Collaboration capability	• We collaborate with supply chain partners within and beyond the immediate industrial boundaries to enable circular supply chain. • We enhance information sharing and technological support within the value chain. • We can effectively coordinate the interests and promote effective cooperation among members of the supply chain.	Hussain and Malik (2020)
Firm sustainability performance (FSP)	Please indicate the extent to which you perceive that your company has achieved each of the following during the past year. (Five-point scale: 1=Not at all; 2=A little bit; 3=To some degree; 4=Relatively significant; 5=Significant)		
	Economic performance	• We maintain lower operating cost • We maintain a growing profitability • We achieve growth in the market	Ali et al. (2021)
	Environmental performance	• We reduce environmental business wastages • We generate lower emissions/units per production • We achieve resource conservation and energy saving	
	Social performance	• We ensure employees' safety and health • We maintain good relationship with employees and provide regular training and education to them. • We receive fewer consumer complaints	