

Establishing linkages between circular economy practices and sustainable performance: the moderating role of circular economy entrepreneurship

The
moderating
role of CEP

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Abstract

Purpose – This paper aims to examine the mechanism of how circular economy practices (CEP) and circular economy entrepreneurship (CEE) promote sustainable supply chain management (SCM) and facilitate sustainable performance (SP) for small and medium-sized enterprises (SMEs) in the food value chain in emerging economy. In this context, this mechanism involves the mediating role of sustainable SCM in the relationship between CEP and SP. Simultaneously, it involves the moderating role of CEE in the link between CEP and sustainable SCM.

Design/methodology/approach – The paper follows a quantitative approach. Based on systematic literature review on the field, the nexus amongst the constructs were proposed. The Smart partial least square (PLS) version 3.3.2 was employed to analyze structural equation modeling (SEM) to investigate the relationships between constructs and latent variables. There were 457 valid responses obtained from the survey participants, those are managers at senior and middle levels. The data collected was then used for quantitative analysis and assessment.

Findings – The main finding of this study is twofold. First, it sheds light on how CEE associates in strengthening the influence of CEP on sustainable SCM. By this way, the better the CEE, the stronger the impact of the CEP on the sustainable SCM, leading to long-term sustainability. Second, it reveals how sustainable SCM mediates the link between CEP and SP. By this way, the better the CEP, the more the SCM is sustainable, ultimately leading to SP. This contribution is paramount because experimental research on this mechanism has not been intensively explored in the current literature.

Originality/value – The originality of this study is the provision of scientific knowledge and practical mechanisms for the introduction and application of CEP to business behaviors and practices in a real-world context that exists as a research gap in the current literature. In this respect, this study contributes to expanding the existing literature in the field by providing empirical evidence for the mechanism as stated. Furthermore, it provides a practical mechanism for SMEs in given context to enable them apply efficiently the circular economy perspective to their businesses to help them achieve SP. These contributions may be of interest to business practitioners, business leaders, academics and policymakers in the areas that are of their concerns.

Keywords Circular economy practices, Circular entrepreneurship, Sustainable supply chain management, Sustainable performance, Emerging market

Paper type Research paper



1. Introduction

Ecosystems are becoming degraded. It is warning based on scientific evidence (Global Footprint Network, 2020; WWF, 2020). According to Hazen *et al.* (2021), the adverse impacts

that are readily observable, such as climate change, widespread land degradation and rapid loss of biodiversity, destabilize the ecosystems, are crucial for the sustainment and development of mankind. In addition, [Heikkurinen \(2018\)](#) argues that human activity, in general, is driving the Earth towards several “tipping points” that potentially trigger drastic changes in environmental conditions to support modern society. Therefore, transitioning from traditional forms of production and consumption to more environmentally sustainable is imperative. According to [\(Geissdoerfer et al., 2018\)](#), a more environmentally and socially sustainable economy is becoming a topic of high interest by various stakeholders. In this context, a circular economy (CE) is introduced as an optimal solution for sustainable development on a tripod cornerstone (economic, environmental and social) [\(Cullen and De Angelis, 2021\)](#).

In developed and developing economies, CE initiatives are being held [\(Hazen et al., 2021\)](#). The heart of these initiatives is to advance the core supply chain management (SCM) processes that underlie production and consumption patterns in the new era [\(Hazen et al., 2021\)](#). Among the various methods developed mainly for economic development, the CE concept emerges to help businesses and industries achieve dual profits [\(Singh Sanjay and Singh Ajai, 2019\)](#). Furthermore, the role of circular economy entrepreneurship (CEE) is getting more attention to understand why and how it involves creating startups inside the CE [\(Visser, 2018\)](#). Entrepreneurship in CE means pursuing value creation for the broader system of which the business is a part. Particularly, the pursuit of ecological and social value is at the heart of the logic of value creation and typical of the entrepreneurial process [\(Cullen and De Angelis, 2021\)](#). Entrepreneurship contains enterprising and opportunity for those who can realize business opportunities and capable of responding those opportunities, regardless of existing assets and resources [\(Tubulingane, 2020; Sahasranamam et al., 2021\)](#).

According to the flow of nature, population growth is inevitable and consumer demand is increasing with population growth [\(Govindan, 2018\)](#). Therefore, how to sustain the supply chain is of particular concern to stakeholders. From a CE perspective, sustainable supply chain management (SSCM) is the cornerstone of the world economy [\(Behl et al., 2022; Lang et al., 2021\)](#). Therefore, in today’s volatile environment, the SSCM practices and processes require the highest attention and the most immediate action [\(Min et al., 2019\)](#). Despite the growing popularity of the CE, its concept has attracted relatively little attention in SCM literature [\(Tjahjono and Ripanti, 2019\)](#). The current literature on the supply chain sector reveals that various aspects of circular economic thinking are applicable in the supply chain sector, particularly SSCM [\(Liu et al., 2018; Govindan and Soleimani, 2017; Lang et al., 2022\)](#). However, the application of circular economic thinking in this area is still fragmentary [\(Geissdoerfer et al., 2018\)](#). The current literature shows that empirical research on the correlation between CE and SCM is scarce [\(Hazen et al., 2021\)](#), as is the literature on the link between CE and entrepreneurship [\(Heshmati, 2017\)](#). In addition, according to [De Angelis et al. \(2018\)](#), there is a shortage of literature as a bridge between CE and SCM. At the same time, there is a lack of empirical evidence on introducing circular-based SCM into the real-world context.

Furthermore, according to [Cullen and De Angelis \(2021\)](#), it is worth noting that the insight and exploitation of entrepreneurship in the CE context remains limited in the existing literature. In addition, the current literature on the supply chain sector reveals that various aspects of circular economic thinking are applicable in the supply chain sector, particularly SSCM [\(Liu et al., 2018; Govindan and Soleimani, 2017\)](#). However, the application of circular economic thinking in this area is still fragmentary [\(Geissdoerfer et al., 2018\)](#). For instance, [Cullen and De Angelis \(2021\)](#) studied circular entrepreneurship from a business model perspective. CEP, SSCM and sustainable performance (SP) were not covered in this study; [Geissdoerfer et al. \(2018\)](#) studied the association of business models and supply chains in a circular context in different loops. In this study, SSCM, SP and CEE were not covered.

Manea *et al.* (2021) studied the role of policy, technology and innovative sustainable models in transitioning to a CE. Also, this study did not cover SSCM, SP and CEE. Overall, empirical research on this extent has not been identified in the current literature. It is worth noting that the field is going in the direction of spillover, which could create conditions and opportunities for the development of a revision.

In response, this study aims at filling this gap by examining how CEE moderates the effect of CEP on SSCM for SP. In this scenario, SSCM is assumed to mediate the link between CEP and SP, and CEE is assumed to moderate the influence of CEP on SSCM. This study focuses on small and medium-sized enterprises (SMEs) in the food value chain in a developed economy for the following reasons. First, supply chains act as the main arteries of the global economy (Ivanov, 2020). In the current context of many volatile environments such as climate change and ecological imbalance, supply chain security has become a theme of world concern as a response to population growth (Ching *et al.*, 2019).

Second, SMEs are the core force of the national, regional and world economy. According to Molotoks *et al.* (2020), population growth increases food demand. Meanwhile, food supply chains are vulnerable to environmental fluctuations (Davis *et al.*, 2021). Suppose the food value chain continues to operate in the traditional linear manner. In that case, natural resources will be exhausted prematurely and at the same time create a burden on the environment and society.

According to Jia *et al.* (2018), SSCM is an issue of global concern; however current literature shows a lack of empirical research in countries other than developed Western countries. Meanwhile, SMEs lack knowledge in CE and SSCM practices; therefore, improving the firm performance of SMEs towards sustainability (environmental, social and economic) means making a significant contribution to the country and the world in the implementation of sustainable development goals.

Therefore, this study aims to intensively understand how CEP in association with SSCM to achieve SP. In addition, how CEE involves moderating the influence of CEP on SSCM in the context of food value chain in the emerging economy. In this study, the relationships in this study can be explained by resource-based view (RBV) theory (Barney, 1991) and stakeholder theory (Freeman, 1984). Given RBV theory, CE business thinking, CE initiatives in the supply chain and core processes of SSCM can be seen as an intangible resource of the enterprise. According to RBV perspective, these resources can differentiate one company's product from another by adding value to products, creating economic, environmental and social benefits. From a stakeholder theory perspective, the enterprise's attempts to practice CEP to SCM towards sustainability demonstrate the business's cohesion. This flexibility in responsive strategy demonstrates the responsibility of businesses to stakeholders. In return, businesses receive good coordination from stakeholders, especially partners from the upstream and downstream supply chains. As a result, this leads to SP that improves resource efficiency, increases productivity and recycling intensity, and reduces emissions. In order to address the above objective, the following questions need to be responded to:

- RQ1. How CEP associates with SSCM to promote SP for SMEs in the food value chain in emerging economies?
- RQ2. How CEE involves moderating the influence of CEP on SSCM for SMEs in the food value chain in emerging economies?

This study makes a theoretical and managerial contribution by analyzing the panorama of CEE in the practice of circular economic principles in sustainable food SCM towards sustainability. The novelty of this study is the provision of verifiable map on the involvement of CEE in the association of circular economic practices with the core management process of the food supply chain towards sustainability (economic, social and environmental).

Because empirical studies on this extent have not been identified in the current literature, therefore, this study aims to provide an influence map on how CEE involves in realizing CEP to promote SSCM to achieve greater sustainability.

The structure of this study consists of six main sections. The first section introduces the research. [Section 2](#) presents the background theory, concepts and hypothesis development. [Section 3](#) covers study design and research methodology. [Section 4](#) presents the research results, including statistics on representative characteristics of the research sample, and describes the research results from the analytical results. [Section 5](#) discusses the research results and proposes theoretical and managerial implications based on the research findings. [Section 6](#) presents the conclusions, outlines the limitations and suggests a scope for future research.

2. Literature review

This section includes subsections that cover the underlying theory. This section includes subsections covering the underpinning theory, relevant concepts, discussion and hypothesis development, and model and scales development. The content of each section is presented in the following subsections.

2.1 Underpinning theories

In this study, RBV theory ([Barney, 1991](#)) and stakeholder theory ([Freeman, 1984](#)) were used as the underpinning theory to explain the relationships in the model. According to the RBV theory, resources are fundamentals for forming competitive advantage and improving firm performance. From this approach, resources must be highly capable of creating competitive advantage through differentiation. To achieve this, resources must be unique, rare and inimitable. In this study, the alternatives to improving resource efficiency by extending the total life cycle materials can be seen as a significant competitive advantage at the enterprise and industry levels. In this context, CEP is seen as critical resource in facilitating SSCM to achieve SP because its practices stimulate sourcing materials from the economy, not from ecological resources. In addition, CEE is seen as strategic resource for thinking about business opportunities that respond to trends and align with CEP. Importantly, it includes the enterprising to realize CE business opportunities in the new era. Accordingly, increase the ability to meet the increased demand for food while improving resource efficiency, reducing waste and emissions, positively contributes to the environmental and social benefits.

According to the stakeholder theory perspective, stakeholders refer to the subjects that can be affected by the business outcomes; simultaneously, they can affect the business outcome in various ways. In this context, the application of CEE in finding and exploiting business opportunities in the CE shows the company's efforts towards the interests of its stakeholders in a way that is more economically, environmentally and socially sustainable. In this way, enterprises can address the issues of particular concerns to its stakeholders and improves its SP. Through this, raising awareness among stakeholders of their efforts in implementing innovation oriented towards the CE principles. In this way, businesses can enhance their reputation and influence in the supply chain, leading to good coordination from upstream and downstream supply chain stakeholders in implementing sustainable consumption and production pattern and ultimately leading to SP.

2.2 Circular economy practices (CEP)

A CE is defined as a model of production and consumption whose principles and practices focus on extending the product lifecycle to the maximum and reducing waste to the minimum. CE stimulates the creation of more progressive, cleaner and more efficient alternatives

capable of turning waste into the input of the production chain (Kuzma *et al.*, 2021). In a traditional linear economy, profit is the ultimate goal and focus. According to Kuzma *et al.* (2021), traditional linear economic business practices contribute significantly to environmental problems in various ways. However, this is no longer the case in a CE where financial performance indicators are no longer the sole objective of a business but are expanded to include environmental and social objectives. These goals are the core driving factors that guide all business activities (Kuzma *et al.*, 2021). Above all, aim at maintaining the value of resources to sustain the supply chain (Amoako *et al.*, 2021). This is considered a triple bottom line representing SP.

When the economy is circular, it regenerates the waste of resources and energy in economic opportunities (Pizzi *et al.*, 2020, 2022). The regenerative nature of CE dramatically changes consumption and demand patterns (Hazen *et al.*, 2021). Its practices are applied at three levels from narrow to broad. Specifically, the first level is at individual enterprise or a small group of enterprises. The second level is at the supply chain level, whereby the vast majority of businesses involved in that supply chain shares certain resources to improve collective efficiency. The third level can be said to be the macro level because it is related to the government's policy factor (Mathews and Tan, 2011). In this context, CEP takes precedence at the first and second levels. Accordingly, CEP is implemented by an individual enterprise to improve the SP of the enterprise. It is also a premise for sharing specific resources to improve the collection efficiency of the entire supply chain. In this respect, CEP construct is composed of eight items developed based on reference to relevant studies of Kuzma *et al.* (2021), Hazen *et al.* (2021), Pizzi *et al.* (2022) and adjusted for the extent of this study. These items represent typical practices about (e.g. converting waste into input for production; sharing resources; saving energy; promoting sourcing from economy; adding value to products and materials; creating valuable inputs for business partners in the supply chain and enabling responding to fluctuations) those are designed according to the 5-point Likert scale. In which, 1 represents "totally disagree"/"totally unlikely" while 5 represents "totally agree"/"totally likely". Accordingly, respondents are asked to choose 1 out of these 5 points, which is closest to their thoughts about the corresponding question. Details of items and sources are presented in Table A1 in Appendix.

Through the given discussions the above, CEP is assumed to drive SSCM in ways that increase the circulation of resources within the supply chain systems, reduce consumption of virgin materials, address the problem of resource scarcity and prolong product lifecycle (Velenturf and Purnell, 2021). In this respect, this leads to SP in such a way that it maximizes the value creation of resources by remaining them in the economy for as long as possible, save energy consumption, reduce operational costs and environmental costs, increase productivity, improve entrepreneurial performance and improve market efficiency through innovative entrepreneurial opportunities. On this basis, it can be argued that CEP has a positive relationship with SSCM and SP. This argument is consistent with RBV theory and stakeholder theory. Therefore, the hypothesis of the relationship between CEP and SSCM and that of the connection between CEP and SP are proposed as follows:

H1. CEP positively affects SSCM.

H2. CEP positively affects SP.

2.3 Circular economy entrepreneurship (CEE)

CEE refers to discovering and exploiting opportunities in the domain of CE (Cullen and De Angelis, 2021). Accordingly, all business-related activities of the enterprise are oriented in a way that incorporates environmental and social issues towards sustainable development. In the context of many fluctuations and the possibility of supply chain disruption affecting food

supply chain security, the factor of resource depletion and environmental degradation has a very significant influence. Therefore, entrepreneurship towards sustainability to enhance resource efficiency and protect the environment and people is of serious concern to stakeholders. In this way, more advanced, cleaner, more efficient alternatives are valued, driving progress towards sustainability and in line with the sustainable development goals (Nikolaou *et al.*, 2018). In addition, according to Lynde (2020), exploiting new opportunities to create environmental and social values means gradually forming the capacity to protect the environment and people.

According to Alonso-Almeida *et al.* (2021), in the context of entrepreneurship, the approach to CE and business creation needs to be multidimensional in different fields of knowledge. This approach is intended to add to the existing knowledge about corporate socially and environmentally responsible practices. CEE involves promoting CE through innovative products, services and business models. Those are risk-takers and ready for positive innovation by taking advantage of new opportunities. In this context, CEE pertains to the enterprising and breakthrough innovation spirit of existing businesses or startups, focusing on moving the supply chain towards sustainability. Because in the supply chain context, only new players entering in new ways is not sufficient to sustain the supply chain in CE context. What matters is how the existing business innovates, entrepreneurship in a sustainable way towards CE. This creates an essential cornerstone for sustainable development.

In this study, CEE construct was developed based on reference to previous researches of Cullen and De Angelis (2021) and Lynde (2020). Accordingly, CEE is constituted with 5 items including practices (for e.g. exploring and exploiting entrepreneurial opportunities; incorporating environmental and social benefits into exploring and exploiting entrepreneurial opportunities; innovating business models towards CE; sharing resources to improve the overall performance of the communities in the supply chain and continuously innovating to contribute to the wider community towards national and global sustainable development goals) those are designed according to the Likert 5-point scale. In this respect, 1 represents “totally disagree”/“totally unlikely” while 5 represents “totally agree”/“totally likely”. Respondents are asked to indicate the score corresponding to their response to the respective question. Table A1 in Appendix presents the details of items and sources.

In the supply chain domain, circular economic thinking is applicable in the supply chain sector, especially SSCM, according to Liu *et al.* (2018) and Govindan and Soleimani (2017). Given the above discussion, CEE can associate with CEP in driving SSCM in such a way that continuously discovers and explores entrepreneurial opportunities in the field of CE. In this respect, entrepreneurial opportunities aimed at converting wastes into economic values. Within the traditional production and consumption patterns, such so-called wastes are usually discarded immediately regardless of the economic value they may create in one form or another. This problem can be addressed within the CE model where the waste of one entity is rotated to become the input material of another entity. In this sense, resources are maintained in the economy for as long as possible that enables maximizing their value creation. Above all, the linkage of CEE and CEP can facilitate SSCM in the ways that engages stakeholders to promote the circularity of resources in the supply chain systems. This flow of debate is in line with RBV theory and stakeholder theory. Based on the above argument, the hypothesis of the relationship between CEE and SSCM and that of the association of CEE and CEP-SSCM are proposed as follows:

H5. CEE positively affects SSCM.

H6. CEE moderates the influence of CEP on SSCM.

2.4 Sustainable supply chain management (SSCM)

SSCM is defined as the integration of environmental and social metrics into SCM processes to improve business performance in a sustainable way (Kirchoff *et al.*, 2016). In the context of CE, SSCM is tied to core management processes for different supply chain stages. It includes the management practices and processes of supply, consumption, demand, order fulfillment, production flow, product development, commercialization and return, as long as they adhere to circular economic principles such as improving resource efficiency, reducing energy consumption, increasing recycling, shifting to renewable energy, etc (Hazen *et al.*, 2021). In this context, a circular approach reduces volatility and improves supply security (Hazen *et al.*, 2021). The demand for virgin materials is gradually shifting to the demand for recycled materials, thereby increasing the close collaboration with suppliers and downstream customers, and at the same time reducing the risks of supply chain disruptions (Hazen *et al.*, 2021). In addition, the role of the supply chain in CE is no longer just at the point of sale but at all stages of the product lifecycle.

Furthermore, resources are managed to improve resource efficiency. In contrast, demand is managed to contribute to forecasting accuracy and cost-efficiency. In addition, sustainable operation begins with cleaner and leaner process improvement initiatives. With this approach, resources are used more efficiently due to fewer resources and energy consumed. In this context, businesses deal with product development and product commercialization based on harmonizing downstream and upstream supply chains. In this way, products are designed to maximize the total product life cycle as a circular life cycle. On that basis, remanufacturing, recycling and reuse are at heart simultaneously. This practice enhances the ability to cocreate value through close coordination of upstream and downstream partners (Hatcher *et al.*, 2014). In addition, managing returns plays a vital role in SSCM to achieve sustainable values according to the triple bottom line. It is an integral part of the process of avoiding disposal and retaining resource values, which in turn strengthens the resource base in a way that extends and retains resource values (Hazen *et al.*, 2021).

In this study, SSCM construct is developed composing of eight items based on reference to previous studies of Petljak *et al.* (2018), Kirchoff *et al.* (2016) and Monczka *et al.* (1998). Accordingly, these items include series of sustainable management practices such as improving the procurement process to accommodate upstream supply chain conditions; improving the procurement process to adapt to the state of the downstream supply chain; improving the production process to improve resource efficiency and save energy; staying connected systematically upstream and downstream partners to improve efficiency and responsiveness to fluctuations; stimulating increased recycling intensity by promoting the involvement of stakeholders along the supply chain; establishing common goals amongst stakeholders in the supply chain; and applying technology and real time big data. These items are designed in accordance to 5-point Likert scale, in which, 1 represents “totally disagree”/“totally unlikely” while 5 represents “totally agree”/“totally likely”. Respondents are asked to choose one among the given range to answer the corresponding question. Full items and sources are presented in Table A1 in Appendix.

Given the above discussions, SSCM can lead to SP in such a way that it enhances resources efficiency, maximize value creation of materials, reduce waste and emission, prolong product lifecycle and increase productivity. Consequently, this can help business reduce operational costs and environmental costs, improve market performance, enhance competitive advantage and reputation, and gain better profitability. In addition, as discussed above, CEP can drive SSCM. Based on the above arguments and theoretical framework, the hypotheses of the relationships between SSCM, CEP and SP in this context can be proposed as follows:

H3. SSCM positively affects SP.

H4. SSCM mediates the link between CEP and SP.

2.5 Sustainable performance (SP)

From a sustainable perspective, SP refers to the sustainable performance of a corporation that incorporates environmental and social performance with the economic performance of the business (Hourneaux *et al.*, 2018). From Jha *et al.* (2020), SP refers to a state in which business performance indicators are expanded to include financial and nonfinancial aspects, rather than purely financial as the traditional way. According to Das (2018), the concept of SP in the context of SSCM encompasses four dimensions: environmental, social, operational and competitive performance. From a more central approach, SP is the triple bottom line of SP based on the balance of economic, social and environmental values, also known as profit, people and planet (Tjahjadi *et al.*, 2021; Weidner *et al.*, 2020).

According to Zailani *et al.* (2012), operational practices significantly influence SP. The concept of SP on three dimensions of social, economic and environmental values in SSCM was introduced early by Carter and Easton (2011). In addition, according to Wang (2019) and Abbas (2020), SP refers to the growth of customer base, market share and financial outcomes. A sole financial performance indicator is no longer appropriate to measure business performance in the context of the global struggle for sustainable development goals. Therefore, in this study, SP is assumed to include the core environmental, social and economic values of the business due to efforts in applying circular economic business thinking in discovering and exploiting business opportunities in accordance with circular economic principles. In this study, SP construct is referred to previous studies of Wang (2019), Abbas (2020), Hourneaux *et al.* (2018) and adapted for the scope of this study. Accordingly, SP is composed of six items including growth and improvement in profitability, market share, customer database, resource efficiency, environmental performance and social performance those are presented in Table A1 in Appendix. Five-point Likert scale is used in designing them, in which, 1 represents “totally disagree”/“totally unlikely” while 5 represents “totally agree”/“totally likely”. The respondent’s answer choice was one of these five points, corresponding to their thoughts on the respective question.

In considering the relationship of SP with other constructs in the present study, SP is assumed as a result of the implementation of CEP by enterprises and the practice of CEE which plays an important role in promoting SSCM. In this respect, SP depends on the extent to which the enterprise implements CEP and practices CEE, which in turn affects the ability to implement SSCM and SP as the outcome of this association. This logic is consistent with the perspective of RBV theory and stakeholder theory.

2.6 Model development

The model is developed based on the above discussion and proposed research hypotheses. Accordingly, the model has four variables with different roles as follows: CEP is an independent variable; SSCM is a mediating variable; SP is a dependent variable, and CEE is a moderating variable. The proposed research model is shown in Figure 1 below, and the scale of these variables is described in Table A1 in Appendix.

3. Methodology

This section includes subsections that present contents of target population and sampling, survey instrument, data collection and analysis. The content of each section is presented below.

3.1 Target population and sampling

The target population of this study is small and medium enterprises (SMEs) in the food supply chain sector in the emerging market of Southeast Asia, Vietnam. This study

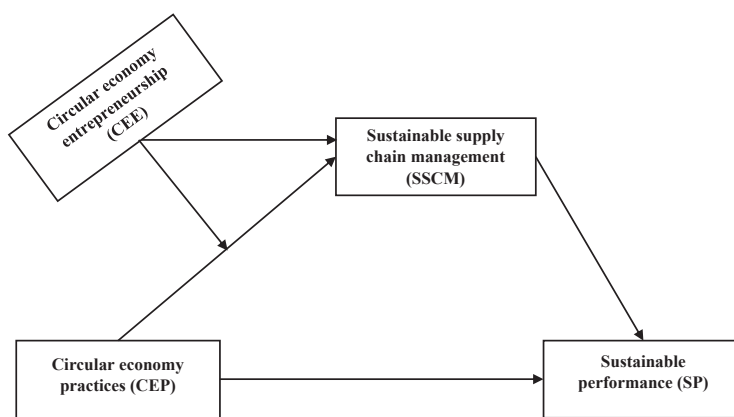


Figure 1.
Proposed
conceptual model

prioritizes SMEs because they are an important force for the socio-economic development of the country and of the world at large as they make up the vast majority of the business world, creating jobs and contributing to the development of the economy (Dey *et al.*, 2020). On the other hands, manufacturing SMEs estimated to account for a high proportion of environmental problem (Koirala, 2019). Likewise, this study focuses on food supply chain due to some critical reasons. First, it relates to one of the global sustainable development goals on eradicating hunger and feeding the world's future population that perceived as a major challenge to global society (van Dijk *et al.*, 2021; Mehmood *et al.*, 2021). In this respect, the transition from traditional linear system to CE system is imperative (Mehmood *et al.*, 2021). If the food supply chain continues to be operated and managed in the traditional linear way (exploit, produce, consume and dispose), the world is likely to be short of food and water by 2050 (Yatim. 2018). Therefore, scientific knowledge about circular economic practices and practical mechanisms for applying circular economic practices to achieve SP is critical, especially in the context of many social and environmental issues today. Second, the food sector is known to contribute significantly to environmental problems from pollution, waste and emissions (Tonini *et al.*, 2018; Poore and Nemecek, 2018). Therefore, it is critical to increase the attention of stakeholders along the food value chain in terms of the values that a CE can deliver to businesses, to the environment and society.

Samples were recruited from associations of small and medium enterprises in the food industry. Through the information exchange system of associations, the researcher addressed an open letter to the businesses about this research. Through that, invite businesses to participate in this study as a survey respondent. For the scope of this study, the firms invited to participate are manufacturing SMEs, in food industry, operation in compliance with ISOs (International Organization for Standardizations) standards on environment and social responsibility. Accordingly, sample eligibility is assessed on this basis. The target respondents for the survey are business owners or business executives or those who take on these two roles, which is quite common among SMEs in Vietnam. In this study, the criterion to define SMEs is the number of employees according to the guidelines of OECD (2021). Specifically, an enterprise with 50 to 249 employees is a medium-sized enterprise, while a business with 10 to 49 employees is a small-scale enterprise. Based on these criteria and the sample eligibility assessments, 600 samples were obtained without duplication, which were eligible for the formal survey.

3.2 Survey instrument

The main instrument for conducting the survey is the questionnaire that is developed based on the guideline of [Elangovan and Sundaravel \(2021\)](#). The steps in developing the questionnaire were carefully performed to ensure the questionnaire's appropriateness to the study's scope. This process begins with determining the purpose of the questionnaire. In this respect, the main purpose of this questionnaire is to collect primary data on how firms are doing in the field. To the extent of this study, primary data collection is needed for analysis to empirically examine the proposed relationships in the given context. The results derived from the collected data are not only important in examining the present model but also in generalizing the study's findings in a broader community through implications. In terms of measurement, this questionnaire aims at measuring the practices and behaviors of firms in the field.

The questionnaire was originally developed in English. According to the determined purpose of the questionnaire and the scope of measurement, its content was developed based on systematic literature review and adapted to be adequate and appropriate based on the views of academics and practitioners in the area. Because this is an empirical study using a quantitative approach, the relevance of survey question content and answerability make a lot of sense. In this respect, the adapted questionnaire was re-evaluated by academics and practitioners in the area to ensure its appropriateness, accuracy and completeness. After finalized, the questionnaire was translated into Vietnamese by a linguist who is fluent in both English and Vietnamese. After that, a pilot survey was conducted by participants those have similar background to the target respondents. This is a step to validate the appropriateness of the questionnaire in terms of content, clarity and answerability by the target respondents before being administered.

3.3 Data collection and analysis

This study applied a quantitative approach. Therefore, the primary data used in this study was primary data collected from the official survey. The survey was conducted from August 2021 to December 2021 on a technology application platform. The questionnaire was initially distributed as 600 according to the list of eligible samples above. In order to achieve the highest response rate and the most objective answers, the survey questionnaire was sent and accompanied by an open letter emphasizing the main objective of this study; accordingly, the researcher expects the accuracy of all the responses that best reflect the situation of the business. Simultaneously, it's committed that all information provided through the form of answering the survey questionnaire is confidential and only serves the purpose of this research. At the same time, a reminder system was established to help track and remind participants to respond. After the survey ended, there were 495 answer sheets collected, accounting for a response rate of 82.50%. Then, a re-evaluation of the answer sheets was carried out to remove the invalid (incomplete) answer sheets. As a result, there was 38 eliminated, the remaining was 457, accounting for a response rate of 76.17%. These valid answer sheets were then processed according to the appropriate steps for inclusion in the analysis. In this study, the analytical technique used is partial least square structural equation modeling (PLS-SEM) because of its suitability for models with complex structural relationships. The model of this study includes direct, indirect, mediating and regulatory relationships and is therefore considered a complex model ([Hair et al., 2017](#)).

4. Result

This section includes sub-sections such as statistical results of the collected sample characteristics, measurement model evaluation, model fit, structural model evaluation and hypothesized relationships.

4.1 Representative characteristics of the sample

The representative characteristics of the sample participating in the survey include criteria such as gender, age ranges of respondents, components of positions, age's ranges of businesses, components of company size as presented in [Table A2](#) in the following [Appendix](#). To the best of the authors' knowledge, these characteristics are well-represented for the desired population.

4.2 Assessment of measurement model

The measurement model was evaluated through the criterion of reliability of the scale, convergent validity and discriminant validity. Specifically, the evaluation of scale's reliability was analyzed using Cronbach's Alpha values, composite reliability (C.R) and total correlation coefficient. The analysis results show that the Cronbach's Alpha values are all greater than 0.7; similarly, the C.R values are more significant than 0.7, and the total correlation coefficients are greater than 0.3. This result confirms that the scales in this model are reliable. The convergent validity assessment was evaluated using the factor loading values and average variance extract (AVE) values. The results show that the factor loading values are greater than 0.7, and all AVEs are more significant than 0.5; therefore, convergence is guaranteed ([Hair et al., 2014a, b](#)). Besides, discriminant validity was assessed by evaluating the values according to the Fornell and Larcker and Heterotrait-Monotrait ratio of correlations (HTMT) analysis criteria. According to Fornell and Larcker (1981), discriminant validity is guaranteed when the square root of AVE (the value presented on top of each column in the following [Table A3](#)) is greater than its correlation values (shown under square root value of AVE). Besides, HTMT values were used to evaluate discriminant validity further. According to [Henseler et al. \(2016\)](#), discriminant validity is guaranteed when the HTMT value is less than 0.85. [Table A4](#) below shows HTMT values are smaller than 0.85, thus reinforcing the conclusion that the discriminant validity is supported. The supporting values for this analysis are presented in the following [Tables A3–A5](#) in the following [Appendix](#).

4.3 Goodness of fit analysis

Goodness of fit of the model is evaluated by analyzing the values of goodness of fit (GoF), normed fit index (NFI), R^2 (R-squared values), standardized root mean square residual (SRMR). In which GoF criteria were used according to the guidelines of [Wetzels et al. \(2009\)](#). Accordingly, the extent of fit includes three levels (an oversized fit if the model achieves a GoF larger than 0.36; a medium fit if the model achieves a GoF larger than 0.25; and a small fit if the model achieves a GoF larger than 0.1). In this study, the model has a GoF of 0.74. Compared with the thresholds proposed by [Wetzels et al. \(2009\)](#), this model has a large fit; in addition, they are considering the values of the remaining indices. The results show that the index SRMR has a value of 0.045, smaller than 0.08 as the acceptance threshold suggested by [Henseler et al. \(2016\)](#). According to this criterion, the model has a good fit. In addition, the results indicate an NFI value of 0.933. According to [Hair et al. \(2019\)](#), when the NFI is greater than 0.9, the model is concluded to have a good fit. Simultaneously, the results show that the R^2 values are respectively 0.690 for SP and 0.675 for SSCM, greater than 0.1 as the minimum acceptance threshold recommended by [Falk and Miller \(1992\)](#). Above all, it concludes that the model involved in this study has a good fit.

4.4 Assessment of structural model

Before conducting the structural model evaluation, the problem of multicollinearity and general methodological bias was evaluated. For this purpose, variance inflation factor (VIF) values were used according to the guidelines of [Hair et al. \(2014a, b\)](#) and [Kock \(2015\)](#). Accordingly, when the obtained VIF values are below 3.3, it can be concluded that the model

is free from the problems of multicollinearity and common method bias. The results show that the VIF values are less than 3.3 (from 1.002 to 2.447). Therefore, there are no problems of multicollinearity and common method bias. In addition, Harman’s one-factor test method was used as a popular statistical method to further evaluate the common method bias. The results of exploratory factor analysis with the standard of extracting 1 factor (Fixed number of factors: 1) showed that the total variance extracted was 49.007 (<50%). Therefore, the collected data are free from the problem of indiscriminate responses or auto-responders (Podsakoff *et al.*, 2003). Furthermore, this study used *t*-test to evaluate the problem of nonresponse bias (Armstrong and Overton, 1977). The results show that the attributes of the early respondents and the late respondents are not significantly different. Therefore, nonresponse bias is not problematic in this study.

Thus, it is satisfactory to proceed with evaluating the structural model and the research hypotheses. Table 1 below shows the relevant values for structural model analysis and the relationships in this model. In which variance accounted for (VAF) was used to assess the extent of mediation following the guidance of Hair *et al.* (2014). Figure 2 and Figure 3 below show a diagram of the SEM analysis results without bootstrapping and with bootstrapping.

Table 1 above presents the results of the quantitative analysis method by applying bootstrapping technique. These results confirm that the research hypotheses are accepted. Specifically, CEP has a positive and significant relationship with SSCM and SP, that demonstrated respectively by the results ($\beta = 0.761, t = 26.889, p < 0.001$) and ($\beta = 0.404, t = 7.118, p < 0.001$). Therefore, H1 and H2 were accepted. Likewise, the results confirm that SSCM positively and significantly affects SP ($\beta = 0.479, t = 8.243, p < 0.001$). This affirmation supports H3. Furthermore, as in association with these results, the mediating role of SSCM in the link between CEP and SP is confirmed in this study ($\beta = 0.364, t = 7.373, 20 < VAF = 47 < 80; p < 0.001$). In this study, SSCM plays a partial mediation between CEP and SP. This means that the CEP facilitates SSCM for sustainability. This statement supports H4. In addition, the intermediate influence of SSCM on the relationship between CEP and SP was further evaluated using the upper-level and lower-level confident intervals. The results show that these values exclude zero; therefore, it is concluded that SSCM mediates the relationship between CEP and SP.

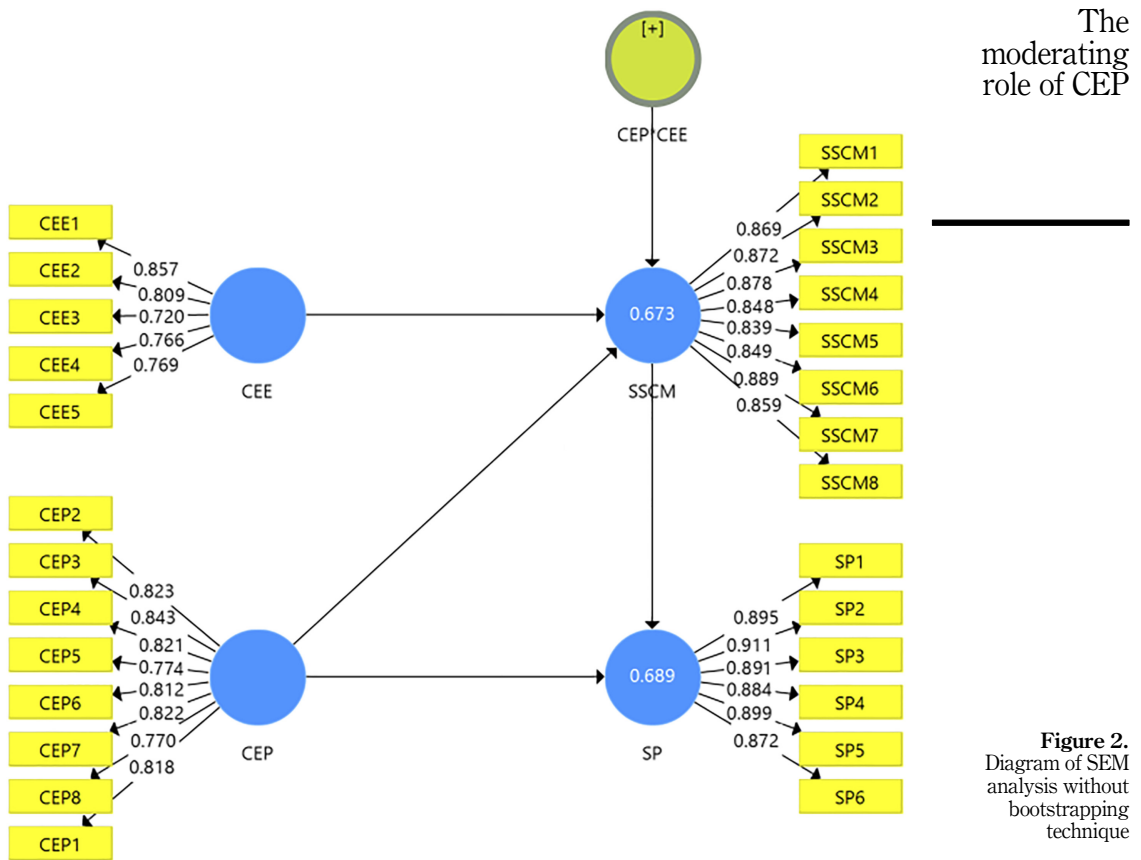
In addition, the results confirm that CEE plays a role in moderating the influence of CEP on SSCM. This relationship is demonstrated through the positive and significant effect of CEE on SSCM ($\beta = 0.184, t = 4.349, p < 0.001$) and its association with CEP (CEP*CEE) on SSCM ($\beta = 0.235, t = 4.927, p < 0.001$). This result supports H5 and H6, which indicate that the influence of CEP on SSCM varies from the different extent of CEE; in this context, the higher the CEE, the stronger the effect of CEP on SSCM, and vice versa.

5. Discussion

The main finding of this study is the provision of a map of the mechanism capable of driving businesses to lead production and consumption to be more sustainable-oriented. In this

Table 1. Results of bootstrapping analysis

Hypothesis	Paths	Coefficient	t-statistics	p-value	CI 2.5%	CI 97.5%	VAF (%)	Conclusion
H1	CEP → SSCM	0.761	26.889	0.000	0.706	0.815	n/a	Supported
H2	CEP → SP	0.404	7.118	0.000	0.296	0.518	n/a	Supported
H3	SSCM → SP	0.479	8.243	0.000	0.364	0.591	n/a	Supported
H4	CEP → SSCM → SP	0.364	7.373	0.000	0.274	0.464	47	Supported
H5	CEE → SSCM	0.184	4.349	0.000	0.097	0.257	n/a	Supported
H6	CEP*CEE → SSCM	0.235	4.927	0.000	0.115	0.308	n/a	Supported



respect, the finding includes the mediating effect of SSCM in the CEP-SP relationship and the moderating role of CEE on the influence of CEP on SSCM. Specifically, SSCM plays a partial mediation in the link between CEP and SP. Accordingly, CEP promotes SSCM to facilitate SP in food value chains in emerging economies. In other words, CEP is in association with SSCM to drive SP. In this context, CEP includes elements such as converting waste into input for production; sharing specific resources to improve collective efficiency; saving energy consumption; promoting waste recycling and sourcing input materials from the economy instead of ecological reserve; increasing added value for consumers by adding value to products and materials; creating valuable inputs for business partners in the supply chain; and responding to fluctuations with an appropriate business model in accordance to the CEP. These practices facilitate SCM to be sustainable for sustainability. This finding to some extent, supports previous studies of [Kuzma *et al.* \(2021\)](#) and [Amoako *et al.* \(2021\)](#) those stated that CEP facilitates more efficient alternatives that are capable of extending values of the resources to sustain the supply chain; [Geissdoerfer *et al.* \(2018\)](#) who holds that an economic system that minimizes resource inputs, reduces energy consumption and reduces emissions from all activities of actors along the supply chain is promising to drive towards sustainability and prosperity while ensuring a positive impact on the environment and society.

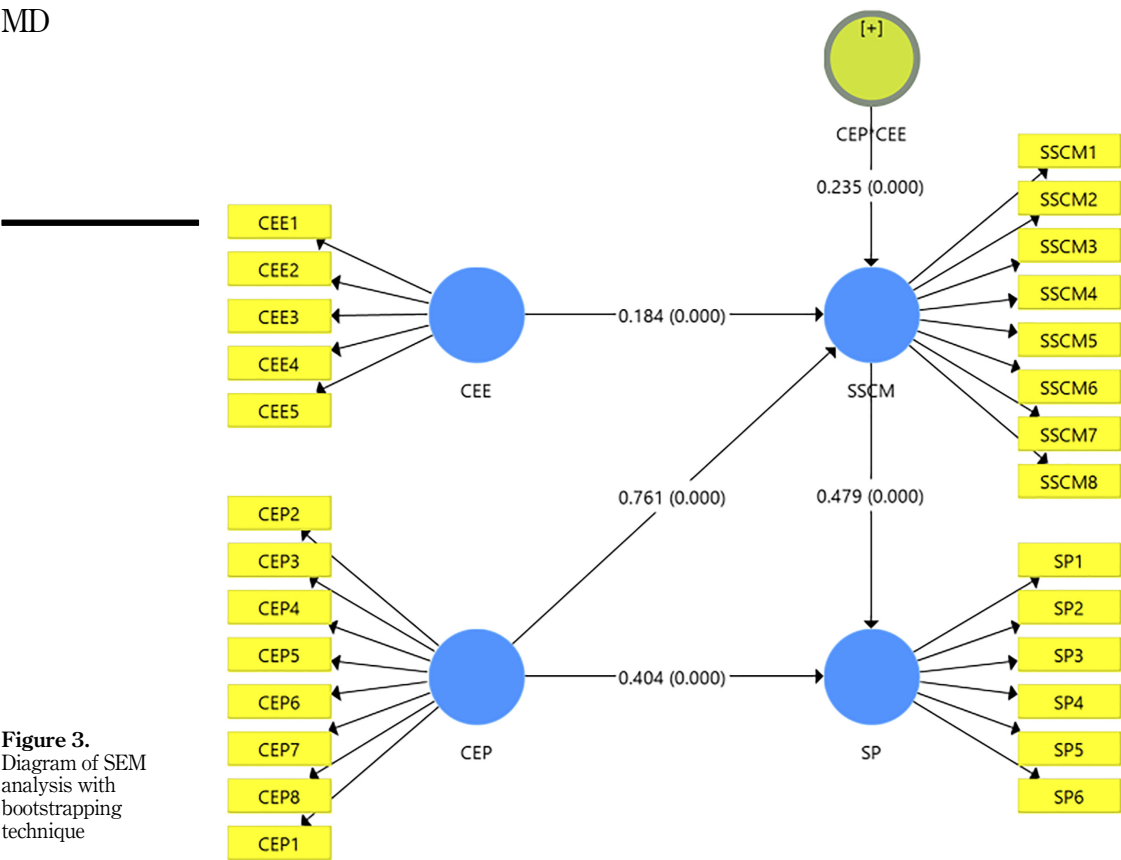


Figure 3. Diagram of SEM analysis with bootstrapping technique

In addition, this study finds that CEE moderates the influence of CEP on SSCM. In this context, CEE composes of exploring and exploiting new opportunities in the domain of CE in a continuous manner; consistency in thinking and action in practicing business management in accordance to a CE as the responsibility of the business to various stakeholders. Such practices include an ongoing effort to find and exploit business opportunities appropriate to the CE requirement; innovate to adapt to the requirements of CE is the responsibility of businesses to stakeholders in the implementation of the sustainable development goals; mindset of willingness to share knowledge, specific resources and data for businesses in the supply chain to better respond to changes in the environment. Importantly, in this scenario, CEE addressed start-up contexts and the innovative entrepreneurship expected for existing businesses in the food value chain. This finding supports previous studies of [Liu et al. \(2018\)](#) and [Govindan and Soleimani \(2017\)](#) stated that various aspects of circular economic thinking are applicable in the supply chain sector, particularly SSCM.

In considering the relationships individually between variables involved in the found mechanism starting with the CEP-SSCM relationship, in this research, it's demonstrated that CEP has a positive and significant relationship with SSCM. In this respect, this advocates the argument of [Del Giudice et al. \(2021\)](#) on the linkage of CEP with SCM practices in driving sustainability from a CE perspective. Likewise, results prove that CEP positively and

significantly affect SP. This advocates the findings of [Dey et al. \(2020\)](#) asserting that CEP has the potential to improve the sustainability of a firm's performance (environmental, social and economic). Research of [Dey et al. \(2020\)](#) explores the influence of CEP on the sustainability performance of SMEs in developed economies (France, Greece, Spain and UK), their findings support the hypothesis that CEP positively and significantly affects firm's sustainability performance towards the environment, society and economy. In addition, this finding also supports the previous work of [Del Giudice et al. \(2021\)](#) asserts that CEP plays an important role in improving company performance from a perspective of CE.

In addition, the relationship of SSCM and SP proven to be positive and significant in this study, supporting the findings of the previous study of [Govindan et al. \(2020\)](#) that SSCM practices positively link with corporate performance for environmental, social and financial benefits. Besides, this finding supports previous research by [Ni and Sun \(2019\)](#) as it reveals that SSCM practices affect the business performance in many different ways. Furthermore, this finding may complement to address one of the limitations highlighted in the research by [Ni and Sun's \(2019\)](#) by examining business performance from a sustainability perspective (environmental, social and economic) rather than focusing solely on financial performance. In addition, the relationship between CEE and SSCM demonstrated to be positive and significant that supports the previous study by [Burkea et al. \(2021\)](#) on the field of exploring how to operationalize CE in the SCM from the perspective of integrating circular economic thinking into fundamental practices. In this respect, circular economic thinking is required in redesigning processes in SCM to maximize the value creation of resources and promote circularity of resources.

Theoretically, the stated empirical findings strengthen the theoretical framework of this study. Specifically, CEP and CEE adequately perform their primary role as the strategic resources of the enterprise and the context-based core fundamental for specific enterprise in driving businesses to practice SSCM to achieve SP. This path is consistent with the perspective of RBV theory. Importantly, it generates entrepreneurial opportunities to promote the circularity of resources to enhance the possibility of value creation of resources for sustainable development. Furthermore, the adoption of CEP and CEE into enterprises efficiently and effectively promotes SSCM and SP in a way that stimulates various stakeholders to participate in the supply chain from a CE perspective. In this respect, stakeholders in the supply chain move together towards the common goal, in which, stakeholder interests, environmental, social and economic benefits incorporated into entrepreneurial behaviors and practices. This logic is in line with the perspective of stakeholder theory.

6. Conclusions, implications and future scope of research

This section includes the conclusion, theoretical implication and managerial implication, certain limitations as the basis for outlining the scope of future research. The specific contents are described below.

6.1 Conclusions

This study finds that SSCM has a mediating relationship between CEP and SP. This finding addresses the research question of how CEP associates with SSCM to promote SP for SMEs in the food value chain in emerging economies. In addition, this study elucidates that the influence of CEP on SSCM varies depending on the extent of CEE. This finding addresses the research question of how CEE involves in moderating the influence of CEP on SSCM for SMEs in the food value chain in emerging economies. Above all, this study results in providing a practical mechanism on how circular economy practices and CEE promote SSCM

towards SP (environmental, social and economic) for small and medium enterprises in the food value chain in a given context. Based on a systematic literature review, the finding of this study deserves the novelty of this study because this extent has not been explored in the current literature.

In general, the stated results can address the defined objective of this study. In this regard, the found mechanism provides insight into scientific knowledge and applicable practices for SMEs in order to achieve sustainability by the adoption of circular economy practices and CEE to drive SSCM. This contribution is critical especially in the context of global population growth pressures and possible resource scarcity as discussed above. Furthermore, pressure on waste and environmental footprint forces businesses to innovate towards sustainability. This reinforces the necessity and topicality of this study's contribution to the current literature on both theoretical and practical aspects. Based on the findings, this study provides the theoretical and practical implications that may be of interest to academics and business practitioners as follows.

6.2 Theoretical implication

First, this study extends the existing literature on the domain of SCM by providing a map of the mechanisms capable of driving businesses to lead production and consumption to be more sustainable-oriented. Specifically, such mechanisms include the mediating role of SSCM in the CEP-SP link and the moderating role of CEE on the influence of CEP on SSCM. Second, this study extends stakeholder theory and resource theory by empirical examination of the applicability of these theories in the current research context. Such expansion is demonstrated through the findings of the present research that confirm CEP, SSCM and CEE are strategic resources in achieving SP in accordance with CE.

In this study, CEE was found to moderate the influence of circular economic practices on SSCM, ultimately leading to sustainability. In addition, enterprises consider efforts to find and exploit business opportunities in accordance with CE principles and practices as the responsibility of enterprises to various stakeholders consistently support the stakeholder theory. Once again confirms the extension of stakeholder theory in the current research context. The third theoretical contribution of this study is the expansion of the scale for variables related to the research model. These scales tie into a map of the mechanism by which the extent of CEE is involved in adopting circular economic practices to promote SSCM to sustain production and consumption.

6.3 Managerial implication

First, this study provides a mechanism for enterprises to achieve SP that sustains production and consumption. The findings of this study suggest that the existing enterprises and startups should consider CEE as their responsibility towards various stakeholders in the new era. From this approach, enterprises incorporate economic, environmental and social issues into their business strategy, and all activities accordingly are consistent to address economic, social and environmental benefits simultaneously. In the dynamic context, those three aspects are of great interest to different stakeholders. Therefore, when businesses show that the way they manage their businesses is geared towards solving these problems, businesses can improve their competitive advantages and improve SP through close collaboration of stakeholders along the supply chain. In the context where CE is proposed as a solution to sustainability and the increasing concern of stakeholders in this issue, businesses have no other choice if they want to survive and develop in the long term.

Second, in the context that food security is an issue of global concern because demand is expected to increase with the growth of the world's population and its vulnerability to fluctuations, it is suggested that businesses in the food value chain carefully consider the

findings of this study to make appropriate and timely innovations in accordance to the CE requirements. Such innovations proposed including entrepreneurship, core processes of SCM to be sustainable such as advanced procurement process to accommodate upstream supply chain conditions; advanced production process to improve resource efficiency and save energy; an advanced process of research and development of products; advanced marketing process to adapt to the state of the downstream supply chain; advanced systems to connect partners in upstream and downstream supply chains for sharing knowledge, information and data for efficient responsiveness to changes in the environment; advanced process to stimulate increased recycling intensity; and advanced technology to improve the accuracy of the forecast. Above all, these promote absorbing CE principles well to optimize business opportunities in the CE sector, ultimately leading to enhanced competitive advantage and SP.

Considering the present research context, SMEs in emerging economies are widely known for their lack of knowledge about circular economies. It is ambiguous how to apply CE to food value chains. Besides, the concept of SSCM is still in its infancy and practical application is lacking. Moreover, in terms of regulations and laws, in an emerging economy like Vietnam, the binding of corporate responsibility to environmental and social issues is still limited and inadequate. Therefore, it is suggested that enterprises should enhance their sense of responsibility as an entity in society. Accordingly, enterprises should voluntarily fulfill their obligations to various stakeholders by addressing economic, social and environmental issues methodically, strategically and with a specific roadmap. From a broader perspective, this is good for the business and stakeholders and good for society and the environment, the country and the world. Because the world strives to realize sustainable development goals, environmental, social and economic sustainability is the guideline for all activities. Therefore, how the business manages to achieve this sustainability and improve collective efficiency is of special interest to stakeholders. This is considered a challenge and an opportunity, particularly favorable for CEE that contains enterprising and informed-based risk-taking ability when taking necessary changes according to CE.

Having implied that the adoption of CEP and CEE requires wide ranging innovations that relevant to the real-world context, in this respect, applying the CE perspective to entrepreneurship and practices on a large scale in the research context can present certain challenges taking into consideration the organizational practices. In practices, SMEs in Vietnam, in general, are quite innovative notably innovation in products and processes (OECD, 2021). Nonetheless, with financial constraints, most innovations aim at serving the purpose of expanding markets and targeting economic indicators (OECD, 2021) rather than incorporating social and environmental metrics into entrepreneurial orientation. In this regard, most innovations are on-site aim at addressing a specific problem rather than transforming the paradigm towards sustainability as a whole. Therefore, through the empirical results of this study, entrepreneurs expected to acquire well scientific knowledge and practical mechanisms for wide-ranging innovation, especially corporate behaviors and practices.

Given the possible challenges in adopting CEP and CEE into business as just highlighted above, it implies that entrepreneurs should broaden their horizons, put sustainable values beyond short-term values and do not hesitate to adopt CEP and CEE. The motives for corporate performance should be composed of stakeholders' interests, environmental, social and economic benefits. In this sense, when businesses operated on a foundation established to address environmental, social and stakeholder concerns, businesses will achieve SP. It is necessary to emphasize that, in the new era of integration, the incorporation of CE perspective into business practices and behaviors is imperative for businesses to survive and stay competitive. In addition, it implies that stakeholders in the supply chain need to engage in CE principles and closely collaborate in operating the chain because individual entity unable to succeed in a CE alone. Furthermore, it implies that enterprises may need support from the macro level to be able to apply CEP and CEE in enterprises. In this regard, the necessary support may be finance, preferential policies, resources, education and training, to facilitate

enterprises in transitioning from the as-usual paradigm to CE paradigm. Therefore, the role of policy makers and government authorities should pay due attention to this regard.

6.4 Limitations for future scope of research

This study has certain limitations that can be considered room for future research. First, this study approaches according to the quantitative method. At the same time, each method has different advantages. Therefore, future research may consider combining methods to enrich research approaches. Second, this study focuses on SMEs, although SMEs are the core force of the national and global economy, non-SMEs-size businesses also need to be further studied in different contexts to see how contextual factors influence the research findings.

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Table A1.
Variables and items

Variables	Items	Description	Sources
Circular economy practices (CEP)	CEP1	Enhance converting waste into input for production	Kuzma <i>et al.</i> (2021), Hazen <i>et al.</i> (2021), Pizzi <i>et al.</i> (2022)
	CEP2	Be proactive in sharing certain resources to improve collective efficiency	
	CEP3	Promote saving energy consumption	
	CEP4	Promote waste recycling	
	CEP5	Promote sourcing from economy instead of ecological reserve	
	CEP6	Increase added value for consumers by adding value to products and materials	
	CEP7	Be proactive in creating valuable inputs for business partners in the supply chain	
	CEP8	Be proactive in responding to fluctuations with an appropriate business model in accordance to the circular economy practices	
Sustainable supply chain management (SSCM)	SSCM1	Our procurement process is periodically improved to accommodate upstream supply chain conditions	Petjak <i>et al.</i> (2018), Kirchoff <i>et al.</i> (2016), Monczka <i>et al.</i> (1998)
	SSCM2	Our marketing process is periodically improved to adapt to the state of the downstream supply chain	
	SSCM3	Our production process is improved periodically to improve resource efficiency	
	SSCM4	Our production process is improved periodically to save energy	
	SSCM5	We have a system to connect partners in upstream and downstream supply chains to share knowledge, information and data to respond more effectively and promptly to changes in the environment	
	SSCM6	We have process in place to stimulate increased recycling intensity by promoting the involvement of stakeholders along the supply chain	
	SSCM7	We establish common sustainable development goals with stakeholders along the supply chain	
Sustainable performance (SP)	SSCM8	We apply technology and real time-based big data in forecasting market demand	Wang (2019), Abbas (2020), Hourneaux <i>et al.</i> (2018)
	SP1	We achieve profitable growth over time	
	SP2	We achieve market share growth over time	
	SP3	We achieve customer database growth over time	
	SP4	We improve resource efficiency over time	
	SP5	We improve environmental performance over time	
	SP6	Our contribution to improve social welfare increases over time	
Circular economy entrepreneurship (CEE)	CEE1	We explore and exploit new opportunities in the domain of circular economy in a continuous manner	Cullen and De Angelis (2021), Lynde (2020)
	CEE2	We have always thought that finding and exploiting new business opportunities in the circular economy will enhance our ability to make the environment and society better	
	CEE3	We always think that proactively innovating business models in accordance with the circular economy is the responsibility of businesses to stakeholders	
	CEE4	We always think that sharing resources with supply chain partners to improve the performance of communities involved in the supply chain is the responsibility of the business	
	CEE5	We always believe that proactively embracing and implementing alternative initiatives that are more resource-efficient, economic, environmental and social efficiency will make a significant contribution to the achievement of national and global sustainable development goals	

Characteristics	<i>n</i> = 457	Percentage (%)	The moderating role of CEP
<i>Gender</i>			
Male	224	49.02	
Female	233	50.98	
<i>Age ranges of respondents (years)</i>			
41 < 45	96	20.01	
45 < 50	115	25.16	
50 < 55	132	28.88	
>55	114	24.95	
<i>Components of positions</i>			
Nonownership executive	289	63.24	
Ownership executive	168	36.76	
<i>Age ranges of businesses (years)</i>			
8 < 15	78	17.07	
15 < 20	95	20.79	
20 < 25	126	27.57	
>25	158	34.57	
<i>Components of company size</i>			
Small-sized	315	68.93	
Medium-sized	142	31.07	

Table A2.
Representative characteristics of samples

Variables	Items	Factor loading	Cronbach's alpha	C.R	AVE
Circular economy practices (CEP)	CEP1	0.818	0.925	0.939	0.658
	CEP2	0.823			
	CEP3	0.843			
	CEP4	0.821			
	CEP5	0.774			
	CEP6	0.812			
	CEP7	0.822			
	CEP8	0.770			
Sustainable supply chain management (SSCM)	SSCM1	0.869	0.951	0.959	0.796
	SSCM2	0.872			
	SSCM3	0.878			
	SSCM4	0.848			
	SSCM5	0.839			
	SSCM6	0.849			
	SSCM7	0.889			
	SSCM8	0.859			
Sustainable performance (SP)	SP1	0.895	0.949	0.939	0.658
	SP2	0.911			
	SP3	0.891			
	SP4	0.884			
	SP5	0.899			
	SP6	0.872			
Circular economy entrepreneurship (CEE)	CEE1	0.857	0.848	0.889	0.617
	CEE2	0.809			
	CEE3	0.720			
	CEE4	0.766			
	CEE5	0.769			
CEP*CEE			1.000	1.000	1.000

Table A3.
Cronbach's alpha,
composite reliability
(C.R), factor loading
and AVE

		CEE	CEP	SP	SSCM
Table A4. Fornell and Larcker criterion	CEE	0.786			
	CEP	−0.017	0.811		
	SP	−0.077	0.772	0.892	
	SSCM	0.130	0.769	0.790	0.863

		CEE	CEP	SP	SSCM
Table A5. HTMT	CEE				
	CEP	0.054			
	SP	0.090	0.824		
	SSCM	0.139	0.818	0.829	

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