Journal of Manufacturing Technology Management

Sustainable supply chain collaboration: incentives in emerging economies
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Received 5 May 2017
Revised 13 September 2017
4 November 2017
Accepted 11 November 2017

Abstract

Purpose – The purpose of this paper is to investigate the relationship between sustainable supply chain collaboration (SSCC) and sustainability performance, and examine whether two types of incentives moderate this relationship. This empirical investigation of the Thai food manufacturing industry provides insight in the context of an emerging economy.

Design/methodology/approach – Survey data were collected from 215 food manufacturing firms in Thailand, and the hypotheses were tested by exploratory factor analysis, hierarchical regression analysis, and cluster analysis.

Findings – The results indicate that SSCC leads to better economic and social performance, but not necessarily better environmental performance; incentives provided by firms in the supply chain enhance the effects of SSCC on social performance.

Practical implications – The findings provide useful suggestions for supply chain managers and policy makers about effective collaboration and the use of incentives to improve the sustainability of individual firms in the supply chain. They also reveal the challenges faced by manufacturing firms in improving environmental performance in an emerging economy.

Originality/value – This study contributes to the literature on the implementation of sustainable supply chain management by explaining the role of incentives.

Keywords Manufacturing industry, Emerging economies, Buyer-supplier relationships, Sustainable production

Paper type Research paper

1. Introduction

In the past decade, the Thai Government has promoted Thailand as "the kitchen of the world" as it is one of the world's largest producers and exporters of processed food items (Thailand Board of Investment, 2013). Consequently, Thai food manufacturers have increasing potential for global competitive advantage. Typical food supply chain members – growers, manufacturers, distributors, and retailers – work to deliver food products from agricultural sectors to consumers, as shown in Figure 1 (Maloni and Brown, 2006). They must realize the importance of responding to not only the quality of food products and consumer health but also global food security and sustainability challenges (e.g. fair trade, environmental and organic foods, labor and human rights, animal welfare) (Shokri *et al.*, 2014). Therefore, Thai food manufacturers must focus on sustainability issues and implement sustainability practices along the supply chain to achieve sustained competitive advantage and better sustainability performance.

Food manufacturing companies address sustainable supply chain management (SSCM) through collaboration (Beske *et al.*, 2014) and incentives (Wiese and Toporowski, 2013). Upstream firms in agriculture and food supply chains located in emerging economies mostly incur challenges (Gold and Heikkurinen, 2013). Such challenges include their limited organizational capabilities in implementing sustainability practices in Thailand (Setthasakko, 2009) and the differing capabilities of small-scale upstream and large-scale downstream firms in the supply chain in Brazil (Hall and Matos, 2010) and India (Lokesh *et al.*, 2017).

Sustainable supply chain collaboration (SSCC) is one of the most important practices in SSCM. Many researchers highlight the importance of collaboration between firms to

Journal of Manufacturing Technology Management
Vol. 29 No. 2, 2018
pp. 273-294

1741-038X
DOI 10.1108/JMTM-05-2017-0081

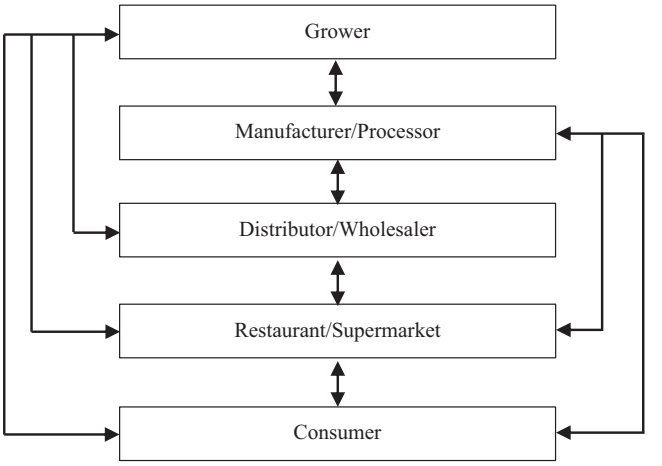

Figure 1.
Food supply chain

Source: Adapted from Maloni and Brown (2006)

improve sustainability performance (Vachon and Klassen, 2008; Blome *et al.*, 2014). Moreover, a higher level of collaboration leads to sustained competitive advantage (Cao and Zhang, 2011). Major stakeholders, including customers and governments, have pressed firms to comply with sustainability requirements (Eltayeb *et al.*, 2010; Huang *et al.*, 2015). In response, early adopters of sustainability practices have been able to develop their internal resources and capabilities (Pagell and Wu, 2009; Wolf, 2011) and coordinate vertically with strategic supply chain partners to improve sustainability (Paulraj, 2011).

Although many scholars suggest that SSCC improves corporate performance, the findings vary with regard to environmental aspects, especially for emerging economies. SSCC is effective in manufacturing firms in developed economies such as the USA, Germany, and Japan (Gimenez *et al.*, 2012) as well as China (Zhu and Sarkis, 2007), while it is not yet evident in emerging economies in Asia such as Malaysia (Eltayeb *et al.*, 2011), India (Dubey *et al.*, 2014), and especially Thailand (Laosirihongthong *et al.*, 2013). In addition, several small- and medium-sized firms lag behind in the adoption of sustainability practices with lower levels of perceived environmental risk (Holt and Ghobadian, 2009).

Although previous studies have investigated incentives as a driver of sustainability initiatives, further empirical research is required to emphasize their additional role in enhancing the effects of SSCC. Indeed, a greater understanding of transforming sustainability practices in the manufacturing industry is needed rather than simply exploring drivers and barriers (Touboulic and Walker, 2015). According to Paulraj (2011), the involvement of suppliers (e.g. through incentives) should be explored beyond the antecedents of sustainability practices. In particular, Wong *et al.* (2012) suggest that the influence of customer incentives on the sustainability practices-performance relationship should be examined.

Incentive alignment is an important tool to facilitate collaboration between the common supply chain and each individual firm. Supply chain partners and policy makers should provide more financial and non-financial incentives to overcome barriers and promote sustainability practices in firms in food supply chains (Shokri *et al.*, 2014; Huang *et al.*, 2015) and in emerging economies (Lokesh *et al.*, 2017). For example, buyers can incentivize farmers to supply materials that meet environmental and labor standards through long-term contracts, paying above market prices, and education (Pagell and Wu, 2009). In addition, governments can incentivize small-scale producers and farmers with limited

knowledge and resources through tax exemptions, special credits, and technical assistance (Hall and Matos, 2010; Yudi *et al.*, 2016). The pull of positive rewards can induce firms to adopt sustainability initiatives (Gunningham, 2007; Roehrich *et al.*, 2014). In food supply chains, incentives have been adopted to align sustainability practices and performance (Pagell and Wu, 2009; Gold and Heikkurinen, 2013).

This study investigates the relationship between SSCC and sustainability performance, and examines whether incentives moderate this relationship. Thus, it bridges the gaps in prior SSCM research and helps Thai food manufacturing companies improve their sustainability performance by implementing SSCC and stakeholder incentives. This study provides empirical findings by developing a conceptual model from the literature on SSCM and verifying it in a real-life business context. This quantitative study approach satisfies the serious need for empirical evidence to explain the factors influencing SSCM (Wu and Pagell, 2011; Beske, 2012).

The remainder of this paper is organized as follows. In Section 2, the relevant SSCM literature is reviewed to establish the links between sustainability performance, SSCC, and incentives. Next, the proposed model and hypotheses are presented. In Sections 3 and 4, the research methodology is explained and the analysis and study results are presented. The key findings and implications of the study are discussed in Section 5. The paper concludes in Section 6.

2. Literature review and research hypotheses

2.1 Sustainability of Thai food manufacturers

Thai food manufacturers gain sustainable competitive advantages in the global market. According to Setthasakko (2012), Thailand's industrial development – like most emerging economies – is based on its major resources. As Thailand is an agriculture-oriented country, Thai food manufacturers not only meet the needs of domestic consumption but also provide export-oriented food products for the global market. They produce and export various products, such as rice, canned fruit and vegetables, frozen shrimp, seafood, tuna, and chicken. This is possible through coordination with suppliers and/or clients, particularly in Thai rice-milling firms (Ritthaisong *et al.*, 2014). This indicates that Thai food manufacturers have successfully implemented supply chain management practices.

Competing in the global market, Thai food manufacturers and their suppliers often face sustainability issues. They use natural resources such as freshwater in cleaning processes, electricity to operate machinery, air conditioners, and fuel (i.e. natural gas and diesel oil) for boilers and transportation, which causes environmental degradation (Setthasakko, 2009). Using large quantities of water and energy in the production process also generates large quantities of wastewater, solid waste/by-products, and air pollution (Chavalparit *et al.*, 2006). In addition, the Thai agricultural sector, which is the upstream of the food industry, also faces sustainability issues, such as land tenure and water shortage (Praneetvatakul *et al.*, 2001).

The Thai Government and the customers of Thai food manufacturers help them perform sustainable development practices. The government realizes these sustainability issues and provides incentives for sustainable production. Many supportive government policies, in general, help Thai manufacturers develop sustainability. For example, the Ministry of Industry provides green industry certification and grants for producing biogas from waste material carbon. The Thailand Greenhouse Gas Management Organization (public organization) provides carbon footprint labels. In addition, the National Food Institute also supports product safety and quality improvement, as an independent organization specifically for the food industry (Thailand Board of Investment, 2013). Moreover, growing concerns about health and food safety has driven demand for sustainable products; for example, despite its higher price, organic food has steadily increased in the market.

Wongprawmas *et al.* (2015) found that consumer demand by willingness to pay for certified products is the best market incentive for adopting good agricultural practices in the Thai fresh produce industry.

2.2 SSCM and sustainability performance

SSCM has been defined by integrating the concept of sustainability into the traditional functions of supply chain management (Linton *et al.*, 2007). Carter and Easton (2011) find that sustainable development in business has evolved from individual practices in social and environmental areas to the convergence of sustainability perspectives as the triple bottom line (TBL) (Elkington, 1998): economic, environmental, and social. Firms need to be responsible for not only their own economic benefits but also the environmental and social performance of the entire supply chain (Walker and Jones, 2012).

Sustainability performance can be defined as the goal of SSCM; this means linking sustainability operations to business outcomes (Markley and Davis, 2007; Carter and Rogers, 2008). Sustainability performance is composed of the three TBL aspects. The performance of SSCM should be economically viable (i.e. revenue should exceed costs); ecologically sustainable (i.e. the environment should not decrease in value); and provide an equitable distribution of costs and benefits among all participants.

Two additional factors, social and environmental performance, render sustainability performance more complex and difficult to achieve than traditional organizational financial goals (Wolf, 2011). In general, businesses aim to maximize profits and growth. Environmental performance has been widely described as the resultant ecological impact and compatibility. Based on the natural resource-based view (RBV) of the firm (Hart, 1995), environmental performance is derived from pollution prevention and product stewardship. A firm's responsiveness to social aspects is indicated by social equity and equilibrium to maintain legitimacy, for existing and possible future regulations (Carter and Rogers, 2008). These aspects reflect a firm's image and reputation among stakeholders.

Performance indicators for sustainability have been interpreted in various ways for use as business goals. Moreover, there are concerns about conflicts within and between aspects (Winter and Knemeyer, 2013). For example, sustainability cannot exist – even in leading companies – if firms are not profitable because trade-off decisions often mean the short-term prioritization of profits (Wu and Pagell, 2011). Thus, it would be better for sustainability if firms could simultaneously achieve economic, environmental, and/or social performance (Carter and Rogers, 2008).

2.3 SSCC

SSCC can be defined as a firm's willingness to devote specific resources to joint activities with suppliers and customers to address sustainability goals (Blome *et al.*, 2014). SSCC includes joint goal setting, shared planning and mutual understanding, exchanges of technical information and feedback, and working together, leading to performance improvement (Vachon and Klassen, 2006; Paulraj, 2011; Blome *et al.*, 2014). It can be a single construct representing collaborative organizational practices on the supply and demand sides (Cao and Zhang, 2011), involving buyers and suppliers simultaneously in a one-tiered collaboration (Grekova *et al.*, 2014), reflecting the firm's role as both purchaser and supplier (Vachon and Klassen, 2008). For example, existing upstream production can be transformed into sustainable practices by investment in time and resources, information sharing, acquiring new skills, and infrastructure improvements, such as technological upgrades (Faisal, 2010). The downstream side needs to adopt traceability, which requires information sharing on the materials and methods used by their suppliers to minimize the distribution of risks from the upstream side (Pagell and Wu, 2009).

SSCC leads to more sustainable firm-level competitive advantage (Paulraj, 2011; Peters *et al.*, 2011; Blome *et al.*, 2014). According to the RBV of the firm, its resources and capabilities (i.e. value, rareness, imitability, and substitutability) have the potential to generate sustained competitive advantage (Barney, 1991). Synergistic linkages emerge in supportive buyer-supplier relationships, resource acquisition, the development of knowledge-sharing routines, and the capability to integrate external resources for improved manufacturing, financial, and environmental outcomes (Vachon and Klassen, 2008).

The level of effectiveness of firms may differ among countries. Firms that are effective in a developed country (Gimenez *et al.*, 2012) may become ineffective in an emerging economy (Eltayeb *et al.*, 2011). Although previous studies have investigated the impacts of SSCC on sustainability performance in different contexts, consensus is still lacking, as shown in Table I. There are two possible explanations. First, firms must incorporate collaboration with their supply chain partners into their internal processes to improve sustainability (Blome *et al.*, 2014; Drohomeretski *et al.*, 2014; Mitra and Datta, 2014). Second, the benefits of collaborative practices will only be fully realized when all parties in the supply chain cooperate closely with one another (Cao and Zhang, 2011).

Previous research explicitly supports the idea that collaborative practices in the manufacturing industry lead directly to improved environmental and economic outcomes (Vachon and Klassen, 2006; Paulraj, 2011). It is necessary to share know-how and expertise with supply chain partners for both process-based and product-based performance (Vachon and Klassen, 2008). For example, cooperation with customers for eco-design and green packaging can benefit manufacturers by decreasing hazardous material consumption and saving costs through waste management (Zhu and Sarkis, 2007). When training and education helps their suppliers reduce waste, firms too can reduce pollution and waste further, and improve their reputation and

Author(s)	Context of the study	Major findings
Zhu and Sarkis (2007)	Chinese manufacturers	Market and regulatory pressure influences firms to improve environmental performance, especially when these pressures cause the adoption of eco-design and green purchasing practices
Vachon and Klassen (2008)	North American manufacturers	Environmental collaboration with primary suppliers and major customers has a significant positive impact on both manufacturing and environmental performance
Eltayeb *et al.* (2011)	Manufacturing firms in Malaysia	Green purchasing does not have a significant effect on environmental, economic, cost, and intangible outcomes
Large and Gimenez Thomsen (2011)	German purchasing and supply managers	The degree of green supplier assessment and green collaboration exert a direct influence on environmental performance
Paulraj (2011)	Members of the Institute for Supply Management who work in US firms	Sustainable supply management leads directly to increased sustainability performance
Gimenez *et al.* (2012)	Manufacturing firms in 19 countries (mostly developed countries)	Supply chain collaboration contributes to improve all three aspects of sustainability performance
Blome *et al.* (2014)	European manufacturing firms	SSCC needs to be operated at an ideal profile in collaboration with advanced internal practices to generate improved environmental performance
Dubey *et al.* (2014)	Indian rubber industry	Supplier relationship management has a significant positive effect on economic performance but not on environmental performance
Mitra and Datta (2014)	Indian manufacturing firms	There is no significant impact of environmental purchasing practices on economic performance

Table I.
A summary of empirical studies relating to SSCC

compliance with environmental laws (Large and Gimenez Thomsen, 2011). They also increase profitability by providing suppliers with environmental training and auditing (Dubey *et al.*, 2014).

Collaborative activities can generate intangible outcomes, such as corporate image and reputation (Shang *et al.*, 2010), while developing trust and long-term relationships (Scholtens and Kleinsmann, 2011; Beske, 2012). According to the RBV, firms can gain access to resources, learn new capabilities, and combine relationship-specific resources with capabilities in unique and productive ways through collaborative activities (Paulraj, 2011). These advantages will improve sustainable capabilities (e.g. value, rareness, imitability) of both firm and supply chain, while enhancing cooperative relationships (Carter and Rogers, 2008). Ehrgott *et al.* (2011) indicate that integrating social standards into the supplier selection process positively influences a firm's customer relationships, global reputation, and the quality of its supplier portfolio, particularly in emerging economies. Supply chain partners perceive relationship building as encouraging cooperation in sustainability practices, and essential to environmental operations (Scholtens and Kleinsmann, 2011). Furthermore, Hsu *et al.* (2013) argue that the inimitable competitive advantages derived from customer goodwill can be translated into profitability.

As most previous studies, this study assumes that a higher level of sustainability-related collaborative practices lead to improved firm performance. This hypothesis follows:

H1. SSCC has a positive relationship with (a) economic performance, (b) environmental performance, and (c) social performance.

2.4 Sustainability incentives

In this study, sustainability incentives can be defined as the reward mechanism for implementing sustainability initiatives that go beyond regulatory requirements. The reward mechanism generally plays the role of a pull strategy, driving and encouraging someone to do something. Firms are subject to stakeholders' sustainability-related pressures and incentives (Seuring and Muller, 2008). Scholars suggest that customer and government incentives are crucial strategies in promoting corporate sustainability activities (Mangla *et al.*, 2014; Dam and Petkova, 2014; Wu and Pagell, 2011), particularly with small-scale suppliers (Hall and Matos, 2010). Customers play the role of internal stakeholders who provide incentives to upstream suppliers in their supply chain. The government serves as the external stakeholder, which may directly provide incentives to one member in the supply chain. Therefore, this study examines two types of incentives separately: supply chain and government incentives.

2.4.1 Supply chain incentives. Supply chain incentives can be defined as financial or non-financial SSCM interventions, whereby downstream customers pass on benefits to upstream suppliers to enhance their capabilities and reduce risks for supply chain members. Buyers provide incentives by sharing financial returns and longer-term contracts with their suppliers, particularly in the case of SME partners (Faisal, 2010). According to the agency theory (Eisenhardt, 1989), this also fosters the buyer-supplier (principal-agent) relationship, whereby the buyer (principal) delegates authority to the supplier (agent) who performs the task. The principal-agent relationship is based on contractual agreements.

Incentive alignment by the principal can help avoid SSCM failures (Wiese and Toporowski, 2013). Commitment to incentives can reduce uncertainty in demand for suppliers and supply for buyers, and can ensure SSCM success. The transparency and economic prosperity of the entire chain are fundamental for the long-term well-being and social equity of every member (Pagell and Wu, 2009). Incentives are provided to an agent who performs positively; on the contrary, when an agent's actions are not beneficial to the principal, they incur costs (Stock, 1997). Low incentives may cause conflicts of interest in the

relationship between a buyer and supplier (Ketchen and Hult, 2007). Supply chain incentives generate common benefits for providers and receivers in the chain.

Supply chain incentives can interact with collaborative practices to encourage sustainability performance, and incentives can stimulate the effectiveness of sustainability practices (Kaya, 2010). Incentives provided by the buyer typically influence the supplier's practices. For example, when a buyer offers long-term contracts and defines the environmental and social criteria of a supplier's products, the buyer ensures the supplier's continuity and fosters a relationship (Pagell and Wu, 2009). Unless customers are willing to pay higher prices, the investment costs in sustainable products become a barrier to sustainability activities and performance (Wolf, 2011). In addition, the degree of market requirements can enhance the effect of green purchasing on stronger economic performance (Zhu and Sarkis, 2007). Supply chain incentives can be more than just antecedents of sustainability-related collaborative practices and performance. As an organization gains a higher level of supply chain incentives, its collaborative practices become more explicit and effective. Therefore, an interaction between collaborative activities and supply chain incentives to improve sustainability performance can be proposed which is hypothesized as:

H2. Supply chain incentives positively moderate the relationship between SSCC and (a) economic performance, (b) environmental performance, and (c) social performance.

2.4.2 Government incentives. Government incentives refer to financial or non-financial assistance given to firms. The government sets up policy instruments such as subsidies, tax exemptions, credits, certification, expertise, and technical assistance to persuade and support firms in the implementation of corporate sustainability initiatives (Clemens, 2006; Sarkis *et al.*, 2010; Sheu and Chen, 2012). In particular, firms with limited adoption of sustainability practices need the technical advice and consultant services provided by national institutes (Massoud *et al.*, 2010). For example, subsidies are advised to minimize the abatement costs of waste management. Firms can also gain private benefits from government incentives.

Government incentives can increase the effect of SSCC on sustainability performance. For traceability, government certification can guarantee both sustainable products and the process through the entire chain for public use; therefore, most manufacturers will need to cooperate with their suppliers to develop the capability to gain certification (Pagell and Wu, 2009). Moreover, firms' concerns about economic efficiency in using sustainable materials from certified suppliers can be mitigated by grants or tax exemptions (Gunningham, 2007). The more knowledge and funding provided by the government, the more firms will take part in this initiative (Lee, 2008). Hall and Matos (2010) mention that government incentives lead to greater increase in social benefits when they are passed onto small farmers by producers purchasing raw materials, rather than when large suppliers and producers obtain them directly. This means that firms can acquire greater benefits, such as fostering relationships with their suppliers by integrating government incentives with collaborative practices. Thus, it can be proposed that more government incentives can bolster the positive relationship between SSCC and sustainability performance, which can be hypothesized as:

H3. Government incentives positively moderate the relationship between SSCC and (a) economic performance, (b) environmental performance, and (c) social performance.

Figure 2 summarizes the relationships in the hypotheses of this study.

3. Research methodology

3.1 Sample and data collection

Data were collected through a questionnaire-based survey of Thai food manufacturing companies. The sample comprised 1,161 food manufacturing companies with the largest

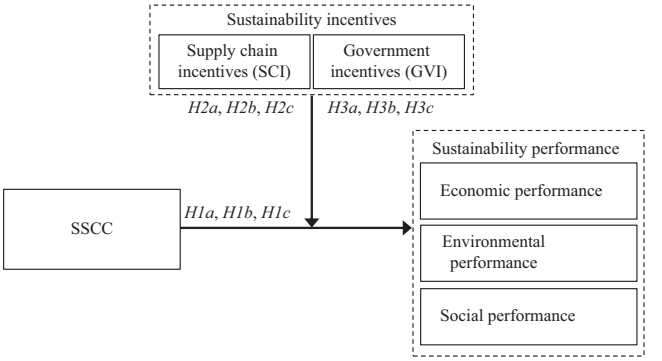

Figure 2.
Research model

incomes in 2012, according to government records. This sample consisted of large food companies, as they may be under more pressure from their global customers, competitors, and the government than small companies (Ali *et al.*, 2017). Data were collected via a mail survey between October 2013 and February 2014. The survey targeted top or middle management responsible for production or supply chain management. The questionnaires, with accompanying cover letters, and stamped return envelopes, were mailed to potential respondents. In total, 215 (18.5 percent) valid and usable responses were received; Table II shows the profiles of respondents.

Non-response bias was accounted for by comparing early and late respondents (Armstrong and Overton, 1977). The data were evaluated using two statistical techniques (χ^2 and *t*-test) to compare early (143) and late (72) responses. The results showed no significant differences in the responses pertaining to ownership, sales volume, or 23 randomly selected variables.

Characteristics of respondents (sample size, $n = 215$)	Frequency	%
Number of employees		
Less than 200	99	46.0
Equal to or more than 200	116	54.0
Annual sales volume		
Less than $10 million or 330 million baht	66	30.7
$10-$49 million or 1,650 million baht	68	31.6
$50-$99 million or 3,300 million baht	36	16.7
$100-$499 million or 16,500 million baht	38	17.7
Equal to or more than $500 million or 16,500 million baht	7	3.3
Type of industry (ISIC code)		
Processing and preserving of meat (101)	18	8.4
Processing and preserving of fish, crustaceans, and mollusks (102)	21	9.8
Processing and preserving of fruit and vegetables (103)	30	13.9
Manufacture of vegetable and animal oils and fats (104)	19	8.8
Manufacture of dairy products (105)	7	3.3
Manufacture of grain mill products, starches, and starch products (106)	46	21.4
Manufacture of other food products (107)	54	25.1
Manufacture of prepared animal feeds (108)	20	9.3
Target market		
Domestic	58	27.0
Overseas	39	18.1
Both	118	54.9

Table II.
Profile of the responding companies

In addition, the characteristics of the companies that responded were compared with those of the complete population of 1,161 companies; no statistically significant differences in ownership, ISIC codes, or sales volume were found. Thus, these results indicate that non-response bias was not significant.

3.2 Instrument development

The questionnaire was developed through an extensive review of the literature and a series of interviews with industry experts to identify major sustainability issues facing food manufacturing companies. First, the literature was reviewed to identify the key variables of the constructs, including SSCC, incentives, and performance. Next, seven semi-structured interviews were conducted with executives in food manufacturing companies concerned with organic food products and biogas from waste material. After these expert interviews, the constructs and items were refined and clarified; the questionnaire was then submitted for a final review by four of these experts. As the survey targeted Thai companies, the questionnaire was translated into Thai from English. Before the full-scale study was launched, a pilot survey using a sample of 35 respondents was conducted. This development stage helped ensure the questionnaire's content validity, practicality, and accuracy.

The questionnaire comprised four sections: the demographic profile of the company and its respondents; items related to sustainability performance; items related to SSCC practices; and items related to incentives. First, the company profiles included the number of employees, annual sales volume, industry type (ISIC code), and target market, while the respondents' profiles included their position and years of experience. Second, 11 measures were adopted to evaluate a firm's performance according to three dimensions of sustainability: the four items of economic performance used by Rao and Holt (2005) and Mitra and Datta (2014), four items of environmental performance used by Zhu and Sarkis (2007) and Zailani *et al.* (2012), and three items of social performance adapted from Shang *et al.* (2010) and Paulraj (2011). Respondents could indicate their firm's performance improvement on a seven-point Likert-type scale (1 = decreased significantly, 7 = increased significantly). Table III lists the sustainability performance indicators.

Next, SSCC practices were measured using seven items adapted from Vachon and Klassen (2006), Zhu and Sarkis (2007), Shang *et al.* (2010), Cao and Zhang (2011), and Blome *et al.* (2014). Finally, supply chain incentives were measured by using four items adapted

Item	Description
Economic performance	
ECP1	Sales
ECP2	Net profits
ECP3	Market share
ECP4	New market opportunities
Environmental performance	
EVP1	Consumption of chemical or hazardous materials
EVP2	Energy consumption
EVP3	Emission of water and/or solid waste
EVP4	Emission of air pollutants
Social performance	
SCP1	Customer satisfaction
SCP2	Relationships with suppliers
SCP3	Stakeholder welfare

Table III. Measurement items of the dependent variables

from Chan and Wong (2012) and Juwaheer *et al.* (2012). Government incentives were measured using three items adapted from Lee (2008), Massoud *et al.* (2010), and Zailani *et al.* (2012). Respondents were asked to indicate the levels of SSCC implementation and incentives gain. All answers were based on a seven-point Likert-type scale for SSCC practices (1 = never or not at all, 7 = very highly implemented) and for incentives (1 = never or not at all, 7 = very highly gained). Table IV lists the indicators of the independent variables.

The measures of firm size and types of major customers were included to control for their effects on sustainability performance. Both control variables were dummy variables: a major customer was the customer's location (0 = only domestic, 1 = others) and firm size was the number of full-time employees (0 = less than 200, 1 = equal to or more than 200).

4. Analysis and results

The survey data were first verified and the complexity of the constructs was reduced using exploratory factor analysis (EFA). Next, hierarchical regression analysis was applied to test the hypotheses, and a cluster analysis and Mann-Whitney non-parametric test were conducted to support the results further.

Item	Description
SSCC	
SSCC1	My company clearly specifies environmental and social criteria in the selection of suppliers or requirements for items to be purchased
SSCC2	My company cooperates with its supply chain partners to improve transportation methods or plan transportation routes to use less energy or make changes to alternative energy sources
SSCC3	My company uses interorganizational teams for environmental and social improvements with its supply chain partners
SSCC4	My company exchanges expertise and performance feedback, offers training and technical assistance, and informs supply chain partners of changes in advance as well as environmental and social matters
SSCC5	My company periodically evaluates its suppliers in their environmental and social performance by self-assessment reports, certified standards, or on-site visits
SSCC6	My company cooperates with its supply chain partners to take part in the environmental and social activities of other organizations
SSCC7	My company periodically releases information about environmental management and social responsibility to the public, for example, website, advertising and public relations, annual reports
Supply chain incentives	
SCI1	My company buys raw materials from suppliers who certify or satisfy environmental and social standards at higher prices than others
SCI2	My company offers long-term contracts to suppliers who certify or satisfy environmental and social standards
SCI3	My company sells its products at certified environmental and social standards at higher prices than others
SCI4	My company obtains long-term contracts from customers when it certifies or satisfies their environmental and social criteria
Government incentives	
GVI1	The government provides environmental and social certifications or labels for commercial use and guarantees the trustworthiness of my company
GVI2	The government provides information or technical assistance for my company to implement environmental and social practices
GVI3	The government provides fees or tax exemptions for my company when environmental and social criteria are met

Table IV.
Measurement items of the independent variables

4.1 Validity and reliability

The validity and reliability of the multiple-item constructs were ensured by testing each scale with Cronbach's α and EFA. First, following Hair *et al.* (2006), reliability was assessed using Cronbach's α test, which rendered a value larger than 0.70, confirming an acceptable degree of internal consistency for all constructs. Second, EFA was conducted to evaluate scale validation and unidimensionality. The value of the KMO measure of sampling adequacy and the eigenvalue of all six constructs exceeded the minimally acceptable points, 0.60 and 1, respectively. All constructs were explained by a variance above 60 percent, and the factor loading values of each item above 0.60. The EFA results confirm the unidimensionality of all the indicators in each construct. Table V reports the results of these analyses and the descriptive statistics of the items.

Furthermore, the common method bias may be due to a single latent factor accounting for all indicators (Podsakoff *et al.*, 2003). As both the independent and dependent variables were obtained from the same questionnaire (i.e. from a single respondent in a particular firm), Harman's single-factor test was conducted. The factors had eigenvalues above 1, which explained over 60 percent of the variance, with the first factor explaining below 50 percent of the variance. Thus, the common method bias did not appear to be significant for the data. Therefore, the observed data could be used for hypotheses testing.

Item	Mean	SD	Cronbach's α	EFA Eigenvalue	EFA % of variance	EFA Loading
Independent variables				KMO 0.907	Total 71.024	
SSCC			0.90	4.153	29.664	
SSCC1	4.12	1.52				0.604
SSCC2	4.27	1.68				0.771
SSCC3	3.65	1.71				0.828
SSCC4	3.67	1.52				0.811
SSCC5	4.07	1.51				0.711
SSCC6	3.96	1.52				0.708
SSCC7	3.93	1.67				0.624
SCI			0.92	3.525	25.176	
SCI1	4.12	1.42				0.810
SCI2	4.25	1.49				0.859
SCI3	3.91	1.55				0.828
SCI4	4.14	1.51				0.851
GVI			0.78	2.266	16.185	
GVI1	4.12	1.72				0.738
GVI2	4.03	1.53				0.794
GVI3	3.83	1.75				0.817
Dependent variables				KMO 0.858	Total 72.310	
ECP			0.86	3.367	30.613	
ECP1	4.75	1.32				0.809
ECP2	4.30	1.31				0.847
ECP3	4.52	1.12				0.802
ECP4	4.74	1.07				0.619
EVP			0.85	2.812	25.568	
EVP1	4.37	1.41				0.820
EVP2	3.79	1.48				0.851
EVP3	4.35	1.37				0.878
EVP4	4.82	1.16				0.757
SCP			0.81	1.774	16.129	
SCP1	5.09	0.91				0.744
SCP2	4.95	0.96				0.729
SCP3	4.90	0.99				0.677

Table V. Descriptive statistics of the items studied, reliability, and factor analysis

4.2 Hypotheses testing

Hierarchical regression analysis was used to test the hypotheses, as the technique is suitable for testing a simple model with few independent and dependent variables (Lowry and Gaskin, 2014). This technique, which has been used to test the moderating effect, was adapted from the statistical theory, using standard or stepwise multiple regression, as suggested by Aiken *et al.* (1991) and Cohen *et al.* (2003).

After validating the scales, a summated score was computed to represent the multiple items of a concept in a single measure, as suggested by Hair *et al.* (2006). Multicollinearity can be a serious problem in multiple regression, especially in the interaction effect. First, bivariate correlation analysis was used to assess the association of two variables for multicollinearity. The correlation coefficients below 0.8 indicate low correlation between two variables in the dataset (Cohen *et al.*, 2013). Second, as proposed by Cohen *et al.* (2003), potential multicollinearity was mitigated by centering the independent variable (SSCC) and the moderating variables (SCI and GVI) before creating the interaction terms. As a result, the maximum of the variance inflation factor within the individual sustainability performance regression was 1.859, well below the cut-off point of 10 (Hair *et al.*, 2006), indicating that multicollinearity is not a concern. Table VI summarizes the descriptive statistics and correlation matrix for the constructs.

Using hierarchical regression analysis, the individual aspects of sustainability performance were identified as the dependent variable for each regression model. The interaction effect was tested in three steps. The control variables and main effect variable, SSCC, were introduced first, followed by the two incentive variables, and then by the interaction terms of SSCC and the incentive variables. The hypotheses were confirmed based on both the p-value associated with each path and the F statistic for regression below the 0.05 significance level.

Table VII displays the results for the nine models, separated according to sustainability performance: economic (models 1-3), environmental (models 4-6), and social (models 7-9). The main effects of SSCC on sustainability performance are shown in model 1 (*H1a*), model 4 (*H1b*), and model 7 (*H1c*). Models 1 ($\beta = 0.247$, $p < 0.001$) and 7 ($\beta = 0.360$, $p < 0.001$) are positively significant. The coefficient for SSCC does not have a significant association with model 4. These results indicate strong support for *H1a* and *H1c*, but not for *H1b*.

The results of the moderating effects are shown in models 3, 6, and 9. There is no statistical significance for economic performance in model 3; thus, there is no evidence to support *H2a* and *H3a*. Similarly, there is no statistical significance for environmental performance in model 6. As a result, *H2b* and *H3b* cannot be confirmed. In addition, with no statistical significance in model 9, the interaction coefficient for the relationship between SSCC and GVI is not significant. Thus, there is no evidence to support *H3c*. However, *H2c* can be confirmed because the interaction term for SSCC and SCI (see model 9,

Table VI.
Descriptive statistics and correlations of the constructs

	Mean	SD	1	2	3	4	5	6	7	8
1. Major customer	–	–	–							
2. Firm size	–	–	0.237***	–						
3. SSCC	3.95	1.26	0.079	0.079	–					
4. SCI	4.11	1.35	0.040	0.051	0.624***	–				
5. GVI	3.99	1.39	0.022	0.192**	0.515***	0.474***	–			
6. ECP	4.58	1.02	−0.125****	0.050	0.239***	0.227**	0.255***	–		
7. EVP	4.33	1.13	0.102	0.009	0.130****	0.102	0.131****	−0.233**	–	
8. SCP	4.98	0.81	−0.011	0.112	0.362***	0.319***	0.350***	0.759***	−0.066	–

Note: *,**,***,****Significant at the 0.05, 0.01, 0.001 and 0.1 levels, respectively (two-tailed)

	ECP			EVP			SCP		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Major customer	−0.161*	−0.152*	−0.147*	0.098	0.104	0.104	−0.062	−0.051	−0.036
Firm size	0.069	0.044	0.050	−0.024	−0.040	−0.032	0.098	0.067	0.081
SSCC	0.247***	0.117	0.104	0.124****	0.069	0.061	0.360***	0.201*	0.163****
SCI		0.087	0.117		0.012	0.044		0.104	0.183*
GVI		0.148****	0.136****		0.095	0.083		0.186*	0.156*
SSCC × SCI			0.101			0.115			0.258***
SSCC × GVI			−0.022			−0.101			−0.026
Adjusted R^2	0.070	0.085	0.085	0.012	0.010	0.013	0.130	0.159	0.211
Δ R^2	0.083	0.024	0.008	0.026	0.007	0.013	0.142	0.037	0.058
Δ F	6.343***	2.812****	0.946	1.868	0.739	1.391	11.636***	4.701*	7.811**
F	6.343***	4.996***	3.837**	1.868	1.414	1.411	11.636***	9.106***	9.160***

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.10$

Table VII. Hierarchical regression analysis results

($\beta = 0.258$, $p < 0.001$)) has a significant positive β for social performance. In addition, the adjusted R^2 values for the significant models (0.070, 0.130, and 0.211) are acceptable, as shown by Zhu and Sarkis (2007). In summary, there is strong evidence to support *H1a*, *H1c*, and *H2c*, while there is no evidence to support *H1b*, *H2a*, *H2b*, *H3a*, *H3b*, and *H3c*.

To provide additional confirmation for the interaction terms, Figure 3 plots the simple effects equation with predictor values at one standard deviation above and below the mean (Cohen *et al.*, 2003). With either low or high supply chain incentives, SSCC is positively related to social performance; however, the positive effect of SSCC on social performance is especially strong at a high level of supply chain incentives.

Furthermore, a cluster analysis (Hair *et al.*, 2006) and Mann-Whitney non-parametric tests were conducted to investigate the effect of SSCC on social performance moderated by supply chain incentives in terms of items. The K-means cluster approach was applied to classify respondents into two groups. First, all respondents were classified based on the seven items of SSCC. The first cluster includes 90 respondents with low SSCC and the second consists of 125 respondents with high SSCC. Second, the cluster with high SSCC was reclassified based on the four items of SCI. As a result, 105 respondents were in the high SCI group (cluster 1) and 20 respondents were in the low SCI group (cluster 2). Table VIII shows the cluster analysis results. Finally, Mann-Whitney non-parametric tests were applied to identify the significant differences in the 11 individual items of sustainability performance between the high SSCC group and clusters 1 and 2. The results (p-value < 0.05) revealed significant differences between high SSCC and high SCI as well as between high SSCC and

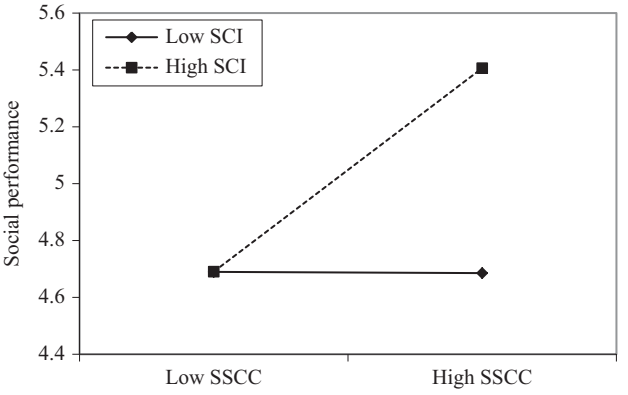

Figure 3. Interaction results

Item	Cluster		
	Low SSCC ($n = 90$)	High SSCC ($n = 125$)	F-value
SSCC1	3.08	4.86	108.699***
SSCC2	3.14	5.08	101.761***
SSCC3	2.17	4.72	256.123***
SSCC4	2.39	4.58	223.994***
SSCC5	3.00	4.84	121.408***
SSCC6	2.82	4.78	143.304***
SSCC7	2.70	4.82	137.980***
	Cluster 1: High SSCC with high SCI ($n = 105$)	Cluster 2: High SSCC with low SCI ($n = 20$)	
SCI1	4.90	3.00	78.878***
SCI2	5.12	3.15	66.020***
SCI3	4.69	2.85	41.653***
SCI4	4.97	2.65	94.802***

Table VIII. Cluster analysis results

Note: ***$p < 0.001$

low SCI for five items: one economic performance indicator, one environmental performance indicator, and three social performance indicators (Table IX). Although the significant difference in economic and environmental performance is not strong evidence, the difference in social performance confirms the results in Figure 3. In other words, there is a significant difference in social performance between high and low supply chain incentives in the high SSCC group.

Hence, these statistical results confirm significant relationships between the constructs. Table X summarizes the results of the hypotheses testing.

5. Discussion and implications

5.1 Relationship between SSCC and sustainability performance

The presented results indicate that SSCC leads to improved social and economic performance, while it does not have a significant positive relationship with environmental performance. The positive relationship of SSCC with economic performance is well established in supply chain management, as it is known that collaboration among supply chain members results in improved performance, and generally, long-term profitability for individual companies and for the supply chain as a whole.

Item	Mean		
	Cluster 1 ($n = 105$)	Cluster 2 ($n = 20$)	Z
ECP1	4.92	4.45	−1.600
ECP2	4.47	3.95	−1.802
ECP3	4.69	4.30	−1.728
ECP4	4.94	4.55	−2.094*
EVP1	4.46	4.25	−0.693
EVP2	3.98	3.40	−1.530
EVP3	4.41	4.00	−1.149
EVP4	4.99	4.35	−2.289*
SCP1	5.30	4.80	−2.590*
SCP2	5.26	4.60	−3.233**
SCP3	5.08	4.60	−2.290*

Table IX. Mann-whitney test results and mean

Note: *$p < 0.05$; **$p < 0.01$

Hypothesis	Support
H1	
H1a	Supported
H1b	Not supported
H1c	Supported
H2	
H2a	Not supported
H2b	Not supported
H2c	Supported
H3	
H3a	Not supported
H3b	Not supported
H3c	Not supported

Table X. Summary of hypotheses testing

In this study, SSCC includes collaboration in areas directly and indirectly related to economic performance. For example, transportation routing for lower energy consumption is directly related to economic performance; thus, companies that collaborate in this area will improve their performance economically. Similarly, other collaboration areas, while not directly related to economic performance, indirectly contribute to its improvement. For example, disclosing information about environmental management and social responsibility helps improve the company image and results in more sales and market opportunities. Additionally, in the interview, an industry expert mentions that a collaborative effort in setting criteria and periodic evaluation for small-sized farmers who supply materials helped his company reduce material waste and increase net profit.

The results also suggest a positive relationship between SSCC and social performance. They indicate that firms that collaborate with their supply chain partners, whether suppliers or customers, benefit from better supplier-customer relationships and improved customer satisfaction. Additionally, the strong correlation between social and economic performance is also worth noting. That is, firms that practice SSCC will improve social performance, which includes customer satisfaction, while also gaining economic benefits. Furthermore, collaboration among supply chain partners for social benefits will improve the welfare of other stakeholders. For example, a company in this study experienced an improved relationship with its suppliers – small-sized farmers – by cooperating closely through knowledge sharing and technical assistance. Owing to the high degree of collectivism in Thai society, building a good relationship with partners helps firms gain resources, such as labor and other facilities (Setthasakko, 2012).

The results do not show any statistically significant positive relationship between SSCC and environmental performance. This is contrary to previous studies in developed countries (Zhu and Sarkis, 2007; Vachon and Klassen, 2008; Gimenez *et al.*, 2012). However, the results support studies of Asian emerging economies by Eltayeb *et al.* (2011) and Dubey *et al.* (2014), which show that supply chain collaboration does not result in improved environmental sustainability. Rather, environmental performance is achieved through internal practices, such as product design and production processes (Blome *et al.*, 2014).

Further, emerging economies, including Thailand, still do not measure environmental performance. This implies that environmental performance receives little attention; therefore, firms could be unaware of improved performance. Alternatively, manufacturers may fail to recognize the importance of environmental performance due to few environmental practices in the supply chain, as mentioned by Holt and Ghobadian (2009), Barve and Muduli (2013), and Shokri *et al.* (2014). Environmental performance in the food industry is of less interest to customers in emerging economies compared to the quality,

safety, and price of food products (Massoud *et al.*, 2010). Similarly, most Thai food manufacturers maintain competitiveness in both domestic and export markets by focusing on offering standard quality at low prices.

5.2 Moderating effect of supply chain and government incentives on the relationship between SSCC and sustainability performance

The results show a moderating effect of supply chain incentives on the positive relationship between SSCC and social performance. However, supply chain incentives do not moderate the relationship between SSCC and other aspects of sustainability performance, and government incentives do not moderate the relationship between SSCC and all three aspects of sustainability performance.

The positive relationship of SSCC with social performance can be enhanced by supply chain incentives to satisfy environmental standards and being socially responsible. When one supply chain member incentivizes another, it will improve the supplier-customer relationship, which is an important part of social performance. The findings of Yang (2008) suggest that financial incentives can enhance the long-term relationships among supply chain partners as well as supply chain performance. Such incentives include price premiums and guaranteed orders provided by downstream customers and passed on through vertical coordination to share the costs and/or rewards of collaborative efforts. For example, the price of organic foods is higher than that of conventional foods due to farming and production costs. Hence, the only manufacturer producing ready-to-drink organic milk in Thailand, for instance, must have a good relationship with organic farmers to maintain access to raw materials in the long run rather than gain financial benefits in the short run at the expense of suppliers.

With respect to economic performance, incentives are generally awarded when a supply chain partner satisfies environmental standards and is socially responsible. The extra cost borne by the supply chain partner may prohibit improved economic performance. This result supports the findings of Pagell and Wu (2009), who state that buyer firms that incentivize their suppliers may not benefit directly; however, significant benefits accrue directly to their suppliers. An explanation of the lack of a moderating effect on environmental performance is that firms, especially in an emerging economy, may fail to recognize the importance of environmental performance or lack the proper performance measures, causing them to be unaware of improved performance. This argument supports the finding of Wiese and Toporowski (2013) that it is better to provide profit-sharing incentives based on a supplier's behavior by monitoring and evaluating a supplier's production process than considering the quality of outcomes in the food supply chain. In this context, the incentives to Thai food manufacturers signal a participation in sustainability implementation; however, they still do not improve performance.

Government incentives do not influence the relationship between SSCC and sustainability performance. Such incentives typically target the internal practices of a supply chain member or individual actions, rather than promote collaboration among partners. As Thai food manufacturers have implemented sustainability practices voluntarily, the Thai Government only need to certify their production processes. It is challenging to certify a whole supply chain, particularly raw materials from small-sized farmers. There is a lack of reliable verification and traceability of the credibility of national good agricultural practices in the Thai fresh produce industry (Wongprawmas *et al.*, 2015). As noted by Grekova *et al.* (2014), pressure from public authorities in developed countries such as the Netherlands, which aim to develop responsibility and initiatives in the industry or compliance with regulatory practices, do not stimulate practices such as collaboration. Therefore, government incentives that focus on a firm's internal practices as a means of improving its sustainability performance, without alignment with improved supply chain

performance, might not affect collaborative practices with supply chain partners. In addition, manufacturers in an emerging economy such as Thailand tend to engage in sustainability initiatives to ensure compliance with environmental standards and regulations (Laosirihongthong *et al.*, 2013), which does not promote collaboration. Therefore, in both developed and emerging economies, government incentives still benefit individual firms directly, not the whole supply chain.

5.3 Academic and practical implications

This study contributes to the literature on SSCM in terms of the effect of collaboration and incentives on performance from the perspective of manufacturers in an emerging economy. First, the findings reinforce the importance of SSCC on sustainability performance. Firms' resources and capabilities for collaboration with supply chain partners generate sustainable competitive advantage based on the RBV; this improves profitability and long-term relationships for both individual firms and the supply chain as a whole. Second, the principal-agent relationship can be adopted to explain that incentives provided by customers benefit the supply chain as a whole by balancing participants' interests. In addition, aligning incentives helps govern behavior across supply chain relationships in the implementation of SSCM (Fayezi *et al.*, 2012). Third, the findings extend the literature on SSCM by showing that in addition to incentives promoting sustainability practices such as collaboration, incentives also enhance the effect of sustainability practices on sustainability performance. By using statistical analysis, this empirical study also extends the scope of previous studies in SSCM (Wu and Pagell, 2011; Beske, 2012).

The findings also provide operational guidelines for executives to improve the sustainability performance of their firms through collaborative practices and incentives. First, supply chain managers should use incentives to enhance the effect of collaboration, especially on social performance, and promote supplier-customer relationships. A long-term and trusting relationship is necessary to develop and maintain the continuity of SSCM capabilities to achieve sustainability goals (Beske, 2012). Second, the positive effects of SSCC on economic and social performance support managers in making a collaborative effort. Third, manufacturers in an emerging economy should recognize the importance of environmental performance, which, in turn, will promote their collaborative efforts and improve all three aspects of sustainability.

Finally, this study suggests that policy makers should consider providing holistic incentives that extend beyond improving the performance of individual firms. Stakeholders' incentives should be more explicit, transparent, and effective to make SSCM viable (Dam and Petkova, 2014). For example, policy makers should avoid conflicts of interest between society and private companies, generated by environmental taxes based on the polluter-pays principle (Glazyrina *et al.*, 2006).

6. Conclusion

This study investigated the interaction effect between SSCC and incentives as well as their effect on sustainability performance, using survey research on Thai food manufacturing companies. The literature and real-world business context were reviewed to develop the hypotheses, which were tested by conducting EFA and hierarchical regression analysis. Moreover, the simple effect equation, cluster analysis, and Mann-Whitney non-parametric tests were performed to provide further support for the results. A positive relationship between SSCC and two aspects of sustainability, namely, economic and social performance, was found. Furthermore, a higher level of incentives is associated with a positive relationship between SSCC and social performance, but not with economic and environmental performance. This finding means that collaboration and incentives should be encouraged among supply chain partners to improve economic and social performance.

In addition, the study revealed the challenges to sustainability performance faced by firms in an emerging economy supply chain, where there is limited recognition of the importance of environmental aspects and where governments do not provide incentives to enhance sustainability performance through collaborative efforts among supply chain partners.

Although this study contributes to academic research and business management, a number of limitations suggest opportunities for further research. First, future research should investigate practices of SSCM other than SSCC, such as sustainable production and sustainable supply management. Second, future research should consider including other potential factors of influence. For example, trust may intervene in the relationship between sustainability practices and performance – one of the barriers to sustainability initiatives is a lack of trust among supply chain partners (Walker *et al.*, 2008). Finally, to ensure the generalizability of the findings, more attention should be given to conducting further large-scale, longitudinal, or experimental studies.

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