Impact of Sustainable Supply Chain Management Practices on Triple-Bottom-Line Performance of Manufacturing Sector in Sri Lanka

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Abstract

This study focuses on identifying how sustainable supply chain practices impact Triple-Bottom-Line performance in the manufacturing sector in Sri Lanka. Moreover, the moderating effect of institutional pressure on the relationship between sustainable supply chain practices and triple-bottom-line performance was investigated. This study was carried out as a survey study and data was gathered using a structured questionnaire from relevant top managers in 100 large-scale manufacturing companies. Furthermore, data was analyzed employing PLS-SEM software. Results confirmed the significant positive impact of sustainable supply chain practices on triple-bottom-line performance. Further, findings clarified that the relationship between sustainable supply chain practices and triple-bottom-line performance is significantly moderated by institutional pressure i.e., regulation pressure and supply chain pressure. This study makes a novel contribution to our understanding of large-scale manufacturing companies by confirming the significant relationship between the considered independent and dependent variables, as well as the moderating effects of institutional pressure on the studied relationship.

Keywords: *institutional pressure, moderating effects, sustainable supply chain management practices, triple bottom line performance*

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Introduction

UN aims Seventeen (17) Sustainable Development Goals (SDG) i.e., “No poverty, Zero hunger, Good health and well-being, Quality education, Gender equality, Clean water and sanitation, Affordable and clean energy, Decent work and economic growth, Industry, innovation & infrastructure, Reduced inequalities, Sustainable cities & communities, Responsible consumption & production, Climate action, Life bellow water, Life on land, Peace, justice & strong institutions, and Partnership for the goals to achieve decent lives for all on a healthy planet by 2030.” Through these 17 SDGs, it is evident that the UN has focused primarily on the environmental and social (people and planet) aspects of the Triple Bottom Line (TBL). The primary goal of all for-profit businesses worldwide is to maximize profits. The serious issue is the harm that businesses, particularly manufacturers, due to the environment and society as a result of their profit-maximizing operations. Therefore, there is no disagreement that businesses worldwide are achieving economic sustainability to a greater or lesser extent. In order to set the SDG, the UN has so given the neglected pillars of people and the planet more consideration. Thus, through a variety of supply chain operations, the goals of sustainable supply chain management (SSCM) techniques also include attaining social well-being, environmental cleanliness, and economic sustainability.

SSCM has emerged as a critical strategic approach for organizations striving to enhance their economic, environmental, and social performance—the dimensions captured by the TBL framework (El Baz & Ruel, 2024). Despite the growing recognition of SSCM's significance, empirical evidence shows a considerable gap between firms' intentions to implement sustainable practices and their actual performance outcomes. Globally, while over 80% of companies report incorporating sustainability into their supply chain strategies, only 25% achieve measurable improvements across TBL indicators (Deloitte, 2023).

In Sri Lanka, the need for sustainable supply chain transformation is increasingly urgent. According to the Central Bank of Sri Lanka (2023), the manufacturing and agriculture sectors, which form the backbone of the supply chain, contributed significantly to the national GDP however, are facing sustainability challenges such as high carbon emissions, inefficient resource utilization, and weak social compliance. For instance, Sri Lanka's Environmental Sustainability Index ranked 109 out of 180 countries in 2023, reflecting gaps in environmental management practices (Environmental Performance Index, 2023). Furthermore, studies indicate that a majority of Sri Lankan firms (around 62%) have yet to integrate formal SSCM frameworks into their operational models (Fernando et al., 2022), revealing a critical performance gap compared to global benchmarks.

Adding to this complexity, institutional pressures—including regulatory demands, stakeholder expectations, and competitive norms—have been identified as key forces influencing firms' adoption of SSCM practices (Di Vaio et al., 2022). However, how such pressures moderate the relationship between SSCM practices and TBL performance remains underexplored, particularly within emerging economies like Sri Lanka, where regulatory enforcement is often inconsistent and market incentives for sustainability are relatively weak (Jayasinghe & Weerasinghe, 2024).

While existing research has extensively investigated SSCM in developed economies, there is a dearth of context-specific studies that capture the unique institutional, cultural, and economic dynamics shaping sustainability outcomes in Sri Lanka. Consequently, this study addresses the urgent need to bridge this gap by empirically examining the impact of SSCM practices on TBL performance and the moderating effects of institutional pressure within the Sri

Lankan context. By doing so, it contributes both to academic literature and practical insights, helping firms and policymakers design more effective strategies for sustainable development.

Therefore, the current study was conducted to achieve the following two objectives.

- Examine the impact of SSCM practices on the TBL performance of large-scale manufacturing companies in Sri Lanka
- Study the moderating effects of institutional pressure on the relationship between sustainable supply chain management practices and the triple-bottom-line performance

Literature Review and Hypothesis Development

A new paradigm known as "sustainable development" has emerged as a result of worries about how corporate operations affect the environment and society. Sustainable Development SD was first described by the World Commission on Environment and Development (WCED) in 1987 as *''Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs''* (WCED, 1987). At the World Summit on Sustainable Development (WSSD) in 2002, fifteen years later, it was stated that *"SD is not only balancing the economic benefits with environmental protection but also depends on another pillar named social development"* (White & Lee, 2009). The Triple Bottom Line (TBL) is the term used to describe the three pillars of sustainability, which are economic, environmental, and social. Elkington (1997) first proposed the idea of TBL in his book Cannibals with Fork. As a result, this phrase is the one that may encompass all three aspects of sustainability.

According to Liu et al. (2017), supply chain management (SCM) is following the trend of SD, which is the inevitable choice for the growth of human civilization. Sustainability thinking is "driving innovation, innovation in technology, production, marketing and innovation in business models" (Seuring, 2013). Sustainable company models of today should concentrate on more than just establishing objectives and vision statements (Hall et al., 2012). New behaviors and activities that will alter the company's interactions with the outside environment must be outlined in the actionable sustainable business model. Companies must concentrate on altering their operations throughout their organization to discover new methods to add value to the company and the communities in which they operate, even though these new initiatives might include lowering the company's carbon footprint, improving the benefits of water use, or educating and involving the community (McPhee, 2014).

Porter and Kramer (2006) stress that their value chain model is a useful instrument for incorporating sustainability into corporate strategy. It can be difficult to incorporate sustainability into an organization's operations across the value chain, though. Finding new business models and challenges is crucial to overcoming this obstacle (McPhee, 2014).

Sustainable Supply Chain Management

Fine (1998) defines a Supply Chain as *"the material, information, and cash flows, typically crossing several different organizations, involved in producing and delivering a product or service to an end-user"*. Seuring and Muller (2008) amalgamate the definitions for SCM and sustainability and define SSCM as *"the management of material, information, and capital flow as well as cooperation among companies along the supply chain while taking goals from all three dimensions of SD i.e., economic, environmental and social into account which is derived from customer and stakeholder requirements"*. The definition

given by the Sustainable Supply Chain Foundation (SSCF) is clearer than the above-mentioned definitions.

Carter and Rogers (2008) developed the idea of "true sustainability" to overcome inconsistent definitions of sustainability in the body of existing SCM literature. They maintained that social and environmental concerns have to be "combined with economic objectives" and integrated into the business's long-term strategic planning (Carter & Rogers, 2008). Although not new, this notion of sustainability is founded on the widely accepted TBL approach. The term "TBL," which was first used by Elkington (1997), is the only one that can encompass the economic, environmental, and social aspects of sustainability. The TBL strategy, which aims to attain the lowest performance in the environmental, economic, and social dimensions, was noted by Seuring and Muller (2008), who also affirmed the wide range of sustainability understanding in SCM. This can be understood as being consistent with the idea of order qualifiers, which are requirements that a business must meet before it can even compete for orders. “Sustainable supply chain includes measures of profit and loss as well as social and environmental dimensions” (Carter & Rogers, 2008; Linton et al., 2007). However, prior literature indicates that the majority of SSCM research investigations have focused exclusively on one component, namely environmental practices (Banterle et al., 2013; Nagurney & Yu, 2012; Perotti et al., 2012) or on social responsibilities (Gold & Heikkurinen, 2013; Tencati et al.,2010). Additionally, several academics have resear ched SSCM and its impact on financial perf ormance (Ortas et al., 2014; Shi & Yu, 2013; Wang & Sarkis, 2013). This analysis also found that there aren't many studies on SSCM and how it relates to social obligations and environmental practices in the body of existing literature (Ashby et al., 2012; Koplin et al., 2007; Seuring & Muller, 2008). Nonetheless, Koksal et al. (2017) claim that socially relevant elements are still overlooked in the relevant discourse. In order to determine how each of the three aspects of sustainability affects businesses' TBL performance, this study concentrated on all three.

Triple Bottom Line

In order to broaden the environmentalist agenda and specifically address sustainability goals, Elkington established TBL in 1994 (Elkington, 2004). Elkington (1998) explains TBL as “economic prosperity, environmental quality, and social justice” in the book Cannibals with Fork. This TBL framework goes beyond the conventional sustainability standards (economic sustainability) i.e., profit, Return On Investment (ROI), Return on assets (ROA), and shareholder value, and thus, the social and environmental pillars are also considered. Consequently, TBL makes it possible for researchers and practitioners to gauge true sustainability (economic, environmental, and social). Although profit is defined in terms of money (for instance, dollars), there are no standard metrics for social and environmental aspects. Researchers and practitioners in this specific field of study have a genuine problem. Nonetheless, prior research has indicated that a variety of instruments (criteria) have been employed in academia to assess environmental performance (Eltayeb & Zailani, 2009; Sarkis, 2001; Syukron & Solovida, 2020; Zailani et al., 2012; Zhu & Sarkis, 2007) and social performance (Hutchins & Sutherland, 2008; Kuo et al., 2010; Mani et al., 2016a; Matos & Hall, 2007; Veleva & Ellenbecker, 2001). Therefore, this study measures TBL performance using specific instruments or standards that have been employed by previous studies; these metrics will be provided in the methodology and conceptual framework.

Relationship between Economic Practices and Firm’s TBL Performance

Each manufacturing company's quality improvement practices (QIPs) (Freiesleben,

2005) and cost minimization practices (CMPs) (Gandhi et al., 2017) were considered as the economic practices of this study. Every corporate organization constantly works to reduce the costs related to each and every sector, including marketing, operations, manufacturing, administration, human resources, and all other sectors. Manufacturing firms have not adopted quality improvement as a cost-effective strategy to increase profits. Freiesleben (2005), however, makes it abundantly evident that enhancing quality raises a business's profitability.

Obtaining quality-related certification (ISO 9000, SLS), enhancing durability, avoiding harmful raw materials or ingredients, and creating attractive finishing or fashionability are all part of QIPs. In particular, "avoiding harmful raw material/ingredients" has a direct impact on improving environmental performance, including lowering carbon emissions, wastewater, hazardous material consumption, and solid waste (Diabat & Govindan, 2011; Zhu et al., 2010b; Zhu et al., 2005). Additionally, from the standpoint of the consumer, quality enhancement makes it possible for them to buy durable, cost-effective items free of dangerous substances. Customer satisfaction and community relations improved as a result of these quality improvement initiatives. In other words, it can be said that QIPs benefit corporate organizations in terms of social and environmental performance in addition to strong financial performance.

Thus, this study examines whether CMPs and QIPs have a favorable impact on enterprises' TBL performance, specifically focusing on Sri Lankan manufacturing companies. Economic performance is positively impacted by cost reduction, as is well acknowledged. Under the CMPs in economic practices, this study considers "use of the minimum quantity of raw material" and "preventing or limiting the waste" to be the Least-Cost Manufacturing (LCM) approaches (Chaudhari et al., 2014). The aforementioned LCM techniques promote community relations and environmental performance by using the least number of raw materials and preventing or limiting waste in a manufacturing process.

As a result, the following hypotheses were created based on economic practices and TBL performance.

H1a; Economic practices have a significant positive impact on economic performance

H1b; Economic practices have a significant positive impact on environmental performance

H1c; Economic practices have a significant positive impact on social performance

Relationship between Environmental Practices and Firms' TBL Performance

The environmental aspect of SSCM practices is where GSCM activities are considered in this study (Weerathunga & Herath, 2018). Zhu, et al. (2010a) pointed out that many Japanese corporations have significantly improved their environmental and financial performance even at the early stages of GSCM deployment. Furthermore, Green et al. (2012) stress that, on the whole, manufacturing firms that adopt GSCM techniques see improvements in their economic and environmental performance, which in turn have a beneficial effect on their operational performance. Consequently, organizational performance is improved by operational performance. Green product innovation has a major positive impact on business performance and competitive competence, according to Ar (2012). Green logistics management, (GLM), has been shown to improve operational and environmental performance (Lai & Wong, 2012).

Azmawani et al. (2014) investigated GSCM among 112 manufacturing companies in Malaysia that were ISO14001 certified with the specific goal of analyzing the impact of different pressures on the degree of green

practices and the interrelationships between drivers, practices, and performance. This study confirmed the relationship between GSCM and firm performance. Examining the moderating influence of partner connections is one of the study's additional goals. According to Azmawani et al. (2014), GSCM procedures have an impact on a company's customer satisfaction and financial/market performance. Environmentally friendly supply chain methods have been shown to increase corporate financial (economic) performance, particularly ROA and ROE (Wang & Sarkis, 2013).

Eltayeb et al. (2011) represent another Malaysian experience pertaining to GSCM methods and firm performance. Their study's conclusions demonstrate that eco-design significantly improves all four categories of outcomes—economic, environmental, cost-cutting, and intangible—and validate that green supply chain activities have a beneficial impact on results. Furthermore, as revealed by Eltayeb and Zailani (2009) and Eltayeb et al. (2011), green supply chain activities can be crucial in attaining the triple bottom line (TBL) of social, environmental, and economic advantages, thereby promoting the sustainable transformation of society.

Using data from 186 respondents on GSCM practices in Chinese manufacturing companies, Zhu and Sarkis (2004) investigate the connections between GSCM practices and economic and environmental performance. They discover multiple connections between GSCM practices and performance. Furthermore, through their scholarly work, Zhu et al. (2012) reaffirm that GSCM practices and company performance are related. Furthermore, Lee et al. (2012) highlight how achieving operational efficiency can enhance business performance after a company implements GSCM strategies.

According to Green et al. (1998), "green supply" or "green purchasing" can be proven to be a successful strategy for enhancing an industry's environmental performance. The findings of a study conducted by Jayarathna and Lasantha (2018) on the effect of GSCM practices on the financial performance of Sri Lankan manufacturing enterprises demonstrate that GSCM practices—such as green purchasing and investment recovery—have a major impact on financial performance. Furthermore, GSCM practices have a good correlation with both economic and environmental performance, as confirmed by Vanalle et al. (2017).

Researchers discovered the connection between GSCM practices and business performance in the latter half of the 20th century (Hart, 1995; Klassen & McLaughlin, 1996; Klassen & Whybark, 1999; Porter & Linde, 1995). In particular, Gunasekara (2023) pointed out that Zhu and Sarkis (2004, 2007) and Zhu et al. (2007, 2008, 2012) verify this connection of GSCM practices i.e., “the existence of IS0-14001 certification or comparable environmental management systems; providing design specifications to suppliers for supplied items that include environmental compliance; suppliers’ ISO-14001 certification; co-operation with customers for eco-design, cleaner production, and green packaging; design of products for reduced consumption of materials and energy; design of products to avoid or reduce the use of hazardous materials; design of products for reuse, recycle and recovery of materials; investment recovery; utilization of renewable sources of energy; commitment of GSCM from senior managers; support for GSCM from mid-level managers;” with the dependent variable of firm performance. Furthermore, research studies conducted in the early 21st century (Diabat & Govindan, 2011; Eltayeb & Zailani, 2009; Green et al., 2012; Laosirihongthong et al., 2013; Marshall et al., 2015; Mitra & Datta, 2014; Rao & Holt, 2005; Rao et al., 2009; Zailani et al., 2012;) have reflected the above findings.

Additionally, Adebambo et al. (2014) discovered favorable correlations between operational, financial, and environmental performance and sustainable environmental

manufacturing techniques. Furthermore, GSCM techniques typically have win-win linkages in terms of economic and environmental performance, as confirmed by Zhu and Sarkis (2004).

According to Zailani et al. (2012), SSCM practices—such as eco-friendly purchases and sustainable packaging—have a favorable impact on sustainable performance, particularly social and economic performance. Hasan (2013) examines five typical companies, including Eastman Chemical Company and Coca-Cola Enterprises, and demonstrates how SSCM improves operational and environmental performance. Wang and Sarkis (2013) justified that SSCM practices are favorably related to financial performance measured through ROA and ROE. Luthra et al. (2014) provide empirical evidence that a green supply chain has a favorable effect on a firm's TBL and operational performance, using the Indian mobile sector as an example.

According to Vanalle et al. (2017), GSCM practices have a favorable correlation with both environmental and economic performance. Further, they used and recognized Green Purchasing, Cooperation with Customers including environmental requirements, Eco-design, and Investment Recovery; as GSCM practices in their research study. Additionally, Vanalle et al. (2017) look into how these GSCM methods affect operationa l, environmental, and economic performance . Consequently, they consider “the reduction of wastewater, reduction of solid wastes, and improvement of a company’s environmental situation” as environmental performance, “a decrease of fee for waste treatment, a decrease of fee for waste discharge, and a decrease of fine for environmental accidents” as the economic performance, and “increase the number of goods delivered on time, decrease inventory levels, decrease scrap rate” as operational performance. They do, however, affirm that GSCM activities only have an impact on environmental and economic performance.

Wang et al. (2018) confirm that SSCM initiatives improve an organization’s social and environmental performance. By using cutting-edge environmental technology, workers may enhance their working conditions and reduce pollution emissions while also improving the quality of life for the locals who live close to their factories (Wang et al., 2018).

Therefore, the study hypotheses:

H2a; Environmental practices have a significant positive impact on economic performance

H2b; Environmental practices have a significant positive impact on environmental performance

H2c; Environmental practices have a significant positive impact on social performance

Relationship between Social Practices and Firms’ TBL Performance

In comparison to the environmental dimension, a significant number of research studies have not been conducted to examine the influence of social practices, such as SSCM practices, on company performance (Das, 2018). Nonetheless, Wang et al. (2018) attest that supply chains that use socially responsible practices can increase corporate financial (economic) performance, particularly ROA and ROE.

To determine the association between Social Sustainability Practices (SSPs) and firm performance, research works on Corporate Social Responsibility (CSR) that consider social dimensions with firm performance were reviewed. *Since “the commitment of a business to contribute to sustainable economic development, working with employees, their families, the local community, and society at large to improve their quality of life"* is part of the World Business Council for Sustainable Development's (WBCSD, 2004) definition of

CSR, the literature review on the subject of CSR and firm performance is highly relevant to the current study. Furthermore, social sustainability has up till now primarily been utilized as a bare extension of CSR in the supply chain literature (Hutchins & Sutherland, 2008). Furthermore, problems with products and processes that have long-term effects on people—especially stakeholders in upstream and downstream supply chains in emerging economies—are the focus of social sustainability in the supply chain (Mani et al., 2016b).

Using social CSR, Choongo (2017) examines the connection between CSR practices and business success in a developing nation in Sub-Saharan Africa. Choongo (2017) also finds that CSR activities have a favorable impact on financial performance.

Numerous academics have confirmed the beneficial correlation between a company's economic and environmental performance and its CSR activities (Agan et al., 2016; Hutchins & Sutherland, 2008; Wang & Dai 2018). According to Wang and Dai (2018), internal SSPs improve the company's social and environmental performance. Furthermore, there is a positive correlation between economic performance and social and environmental performance. Environmental Supplier Development (ESD) has a beneficial impact on financial performance, and CSR is positively correlated with ESD, according to Agan et al. (2016). Nonetheless, these scholarly endeavors validate the relationship between social behaviors and the economic, environmental, and social performance of the company. SSPs significantly improve supply chain dynamic capabilities and all three performance parameters, according to Hong et al. (2018).

Few studies have examined the connection between a business's performance and its use of socially responsible practices (Das, 2018). Nonetheless, businesses and academic institutions began paying more attention to CSR (Zhu et al., 2016). According to McGuire et al. (1988), companies with low CSR performance will have lower ROA. According to Das (2018), social practices can be divided into two categories: social practices for the community and social practices for employees. Social practices for employees encompass "provision for fair wages and perquisites; safe, healthy, and positive working environment; health care benefits; leave and other fringe benefits; and growth opportunities" have been taken into consideration by numerous academics (Hutchins & Sutherland, 2008; Lu et al., 2012; Mani et al., 2016a, 2016b; Marshall et al., 2015; Welford & Frost, 2006; Zhu et al., 2016). In order to make a company seem progressive to its stakeholders, prior researchers have taken into account investments made by the company on behalf of the community in the form of business and employment creation as well as the provision of healthcare, education, and training facilities (Hutchins & Sutherland, 2008; Lu et al., 2012; Mani et al., 2016a, 2016b; Zhu et al., 2016) under the community's social customs.

Financial performance is positively correlated with CSR practices (Lee et al., 2009; Zhu et al., 2016). According to Wu and Shen (2013), CSR initiatives can raise net interest income, non-interest income, ROA, and ROE. Additionally, the beneficial correlation between CSR practices and both financial and non-financial success is confirmed by Mishra and Suar (2010). Employees, consumers, investors, the community, the environment, and suppliers are the six stakeholders for whom they take CSR activities into account. Financial performance was measured using ROA, and Personnel Development and Employee Health and Safety have been considered as social performance. Their results confirm both personnel development and employee health and safety have been improved by specific CSR or social practices.

Hence the study hypothesized:

H3a; Social practices have a significant positive impact on economic performance

H3b; Social practices have a significant positive impact on environmental performance

H3c; Social practices have a significant positive impact on social performance

The Moderating Effects of Institutional Pressures on the Relationship between SSCM Practices and Firms' TBL Performance

There is more than one connection between SSCM practices and TBL success in businesses. The way that SSCM procedures translate into performance outcomes can be greatly impacted by outside factors, such as institutional pressure. Institutional theory states that organizations' strategic activities are shaped by external actors' pressure to comply with conventions, regulations, and expectations (DiMaggio & Powell, 1983; Scott, 2001). Regulatory pressure and supply chain pressure are two important types of institutional pressure that are pertinent to supply chain sustainability.

Regulatory Pressure as a Moderator

The formal laws, regulations, and standards established by governmental entities that organizations are required to abide by are referred to as regulatory pressure (Zhu & Sarkis, 2007). Businesses have been compelled to implement more sustainable practices across their supply chains due to rising environmental legislation and social accountability standards (Testa et al., 2016). The influence of SSCM practices on TBL performance is strengthened when regulatory pressure is severe because businesses are more likely to step up their sustainability efforts to maintain compliance and prevent fines (Liu et al., 2018).

The success of SSCM projects may be enhanced or limited by regulatory contexts, according to several studies. Government rules pertaining to waste management, labor rights, and carbon emissions, for instance, might encourage businesses to enhance their operational effectiveness and social performance results (Delmas & Toffel, 2008). Therefore, it is conceivable that the relationship between SSCM practices and firms' TBL performance is moderated by regulatory pressure.

Therefore, the following hypothesis was developed

H4a Regulatory pressure positively moderates the relationship between Sustainable Supply Chain Management practices and firms' Triple-Bottom-Line performance.

Supply Chain Pressure as a Moderator

In addition to regulatory agencies, businesses are also affected by supply chain pressure, which comes from parties including suppliers, customers, and competitors in the same industry (Vachon & Klassen, 2006). As a requirement for business partnerships, supply chain partners may require adherence to sustainability standards, such as fair labor practices or environmental certifications (Tachizawa et al., 2015).

Pressure from the supply chain can encourage businesses to apply SSCM techniques more creatively and successfully, which will enhance their TBL performance results. Companies may be pushed beyond simple compliance and toward proactive sustainability leadership, for example, by supplier obligations for environmental management or customer expectations for ethical sourcing (Lee, 2008). According to empirical data, businesses that are a part of networks with robust sustainability standards have a higher chance of achieving better social, economic, and environmental outcomes (Pagell & Wu, 2009).

Thus, it makes sense to anticipate that the SSCM–TBL link will be moderated by supply chain pressure.

H4b Supply chain pressure positively moderates the relationship between Sustainable Supply Chain Management practices and firms' Triple-Bottom-Line performance.

Therefore, the following conceptual framework is developed through a deep literature review.

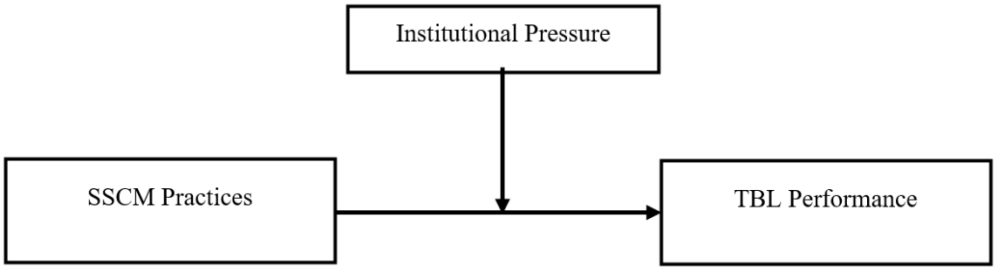

Figure 01: Conceptual Framework

Methodology

In this study, SSCM practices i.e., environmental practices used by Zhu et al. (2005), economic practices mentioned by Freiesleben (2005), and social practices used by Many et al. (2015) were considered and a questionnaire was developed to identify what extent of those practices are being used by Sri Lankan manufacturers.

Questionnaire Development

Therefore, the questionnaire was developed to collect information related to Economic practices (two indicators of Cost Minimization Practices (CMP), and Quality Improvement Practices (QIP)), Environmental practices (four indicators of Internal environmental management practices, External green supply chain management practices, Eco-design, and Investment recovery), and Social practices (two indicators of Internal social sustainability practices, and External social sustainability practices). Eight questions were employed on economic practices while 22 questions were used to collect data on environmental practices. Further, 13 questions were asked to gather data on social practices. Moreover, the common 15 questions were employed for each dimension of SSCM to collect information on TBL performance. Since the study needs to collect data related to the moderating effect of institutional pressure on the relationship between SSCM practices and TBL performance, seven (7) questions i.e., two questions on regulatory pressure and five questions on supply chain pressure were asked from particular top managers in the manufacturing companies in the sample. Questions were answered by using a seven-point Likert scale (1-strongly disagree, 2-disagree, 3-somewhat disagree, 4-neither agree nor disagree, 5-somewhat agree, 6-agree, 7-strongly agree). Therefore, since all the characteristics are shown according to the quantitative approach, this study was conducted as a survey study which comes under the positivism research paradigm.

Data Collection and Sample Characteristics

Since large-scale companies follow SSCM practices comparatively higher than medium and small-scale companies, the population consists only of large-scale manufacturers of the current study. Moreover, 721 large-scale manufacturing companies are operated in the country, and among them, 37 companies are established as public companies which are listed companies under the Colombo Stock

Exchange (CSE). Therefore, data was gathered from selected top managers in the area of supply chain and operations in the 100 large-scale manufacturing companies in Sri Lanka. Moreover, the purposive sampling method was employed to select the sample due to the difficulties of using a random sampling method. Table 01 shows the composition of industries in the sample and table 02 presents the composition of respondents.

Table 01: Composition of Industries in the Sample

Industry	Number of respondents (companies)
Apparel	52
Food & beverages	13
Electric & electronic	10
Plastic & rubber	10
Chemical & lubricants	07
Ceramics &Cement	05
Pharmaceutical products	03
Total	100

Source; Gunasekara (2023)

Table 02: Composition of Respondents

Field of management	Number of respondents
Supply chain management	46
Operations management	22
Production management	20
Logistics management	12

Source; Gunasekara (2023)

Data Analysis and Results

This study exhibits all the traits of quantitative research since it produces numerical data, which is then analyzed to produce findings and draw conclusions. For data analysis, partial least square (PLS) structural equation modeling (SEM) software was used.

Measurement Model Assessment

Indicator reliability and internal consistency reliability are used to assess the measurement model's dependability in this investigation. Furthermore, the validity of the reflective indicators was tested using convergent and discriminant validity tests (Cronbach, 1951; Hair et al., 2014). Every indicator's factor loading value exceeds the 0.7 threshold requirement, and every T-statistic value exceeds the 1.96 minimum standard value. Just two CMP T-statistics values are less than 2.57, however, larger than 1.96. Therefore, it can be confirmed that the indicator reliability of all other SSCM practices indicators in this study is at a statistically significant level of 0.01 since, aside from these two values, all other T-statistics values are more than 2.57.

The internal consistency reliability of each indicator of economic, environmental, and social practices is tested in this study using Cronbach's alpha and composite reliability. As a result, all eight SSCM practice indicators have values over the 0.7 cutoff point for both Cronbach's alpha and composite reliability (Table 03). Thus, it can be said that every indication (08) of social, environmental, and economic behaviors validated the reliability of internal consistency.

All of the Average Variance Extracted (AVE) values are higher than the minimal standard value of 0.5, which was utilized to assess the convergent validity of the current study's first-order constructs. Consequently, it can be verified that the first-order constructs of SSCM practices in this study have satisfied the convergent validity.

Table 03: Reliability and Convergent Validity Assessment

	Cronbach‟s Alpha	Composite Reliability	AVE
Cost Minimization Practices (CMPs)	0.741	0.800	0.571
Quality Improvement Practices (QIPs)	0.802	0.871	0.728
Internal Environmental Management Practices (IEMPs)	0.975	0.978	0.849
External GSCM Practices (EGSCMPs)	0.972	0.976	0.834
Eco-Design (ED)	0.903	0.939	0.838
Investment Recovery (IR)	0.812	0.889	0.727
Internal Social Sustainability Practices (ISSPs)	0.942	0.952	0.715
External Social Sustainability Practices (ESSPs)	0.922	0.942	0.766

The indicator loadings and their cross-loading values are compared in order to assess the discriminant validity (Hair et al., 2012). The findings from the current investigation are shown in Table 4. As a result, each construct's AVE square root is higher than its highest correlation with other constructs. Therefore, by empirical standards, it may be determined that these constructs are truly different from other constructs. This demonstrates that first-order constructs are appropriate for interpreting the links between components and meets the criterion of discriminant validity of first-order constructs.

Table 04: Discriminant Validity of First-Order Constructs

	CMPs	QIPs	ED	EGSCMP	IEMP	IR	ESSP	ISSP
CMPs	**0.755**							
QIPs	.325**	**0.853**						
ED	.364**	.723**	**0.915**					
EGSCMP	.239*	.775**	.657**	**0.913**				
IEMP	.288**	.807**	.720**	.911**	**0.921**			
IR	.541**	.627**	.686**	.690**	.659**	**0.852**		

ESSP	.281**	.803**	.694**	.783**	.779**	.565**	**0.874**	
ISSP	.434**	.844**	.751**	.804**	.862**	.682**	.843**	**0.866**

Findings and Discussion

The structural model involves verifying the hypothesized relationships in the study. The study developed hypotheses regarding a direct positive effect of SSCM practices on TBL performance. Table 05 presents the descriptive statistics of all the variables and all the variables have considerably higher averages (greater than 5), and only the CMPs show a comparatively lower average however, it is also greater than 4. Table 06 presents all beta values related to the nine hypotheses that are greater than 0.1. Hence it can be concluded that all hypotheses are highly supported at a 0.01 significance level. Numerous studies (e.g., Carter & Rogers, 2008; Seuring & Müller, 2008) find that SSCM practices enhance TBL performance by balancing economic gains, environmental protection, and social responsibility. Therefore, this study agrees with the mainstream research.

Table 05: Descriptive Statistics

Variable	Mean	Standard deviation
Cost Minimization Practices (CMPs)	4.897	1.405
Quality Improvement Practices (QIPs)	5.902	1.393
Internal Environmental Management Practices (IEMPs)	5.50	1.390
External GSCM Practices (EGSCMPs)	5.236	1.448
Eco-Design (ED)	5.597	1.380
Investment Recovery (IR)	5.093	1.327
Internal Social Sustainability Practices (ISSPs)	5.905	1.145
External Social Sustainability Practices (ESSPs)	5.538	1.306

Since the path coefficient values (Beta values) for each of the three hypotheses pertaining to social behaviors and TBL performance are higher than 0.1, they were all accepted. Since the T-statistics values related to all three hypotheses of social practices appear as greater than 2.58 in Table 06, the significance level of all three hypotheses is 99%.

Table 06: Results of Hypotheses Testing

	Hypotheses	**Beta**	**T-Statistics**	
H1a	Economic Practices on Economic Performance	0.603	5.321***	Accepted
H1b	Economic Practices on Environmental Performance	0.573	8.356***	Accepted
H1c	Economic Practices on Social Performance	0.559	7.013***	Accepted
H2a	Environmental Practices on Economic Performance	0.621	7.057***	Accepted

H2b	Environmental Practices on Environmental Performance	0.872	32.729***	Accepted
H2c	Environmental Practices on Social Performance	0.305	3.320***	Accepted
H3a	Social Practices on Economic Performance	0.473	6.191***	Accepted
H3b	Social Practices on Environmental Performance	0.677	8.909***	Accepted
H3c	Social Practices on Social Performance	0.643	9.427***	Accepted

******* = significance level is 99%

Assessing the Level of R – Square

The R-square should then be assessed in the structural model evaluation process. In order to evaluate the R-square, Hair et al. (2014) introduce the standard level, which is the model with an R-square of 0.67, 0.33, and 0.19, respectively, regarded as substantial, moderate, and weak. Table 07 shows R-square values for SSCM practices and TBL performance.

Hence, the relationship between economic practices and economic performance is 0.363, which indicates a moderate correlation, the relationship between economic practices and environmental performance is 0.329, which also a moderate correlation, and the relationship between economic practices and social performance shows a weak correlation (0.313), and that is however, very near the moderate level.

Results highlight that the R-square value of 0.386 for the relationship between environmental practices and economic performance, 0.760 related to the relationship between environmental practices and environmental performance, and the R-square value for the relationship between environmental practices and social performance is 0.093. These values confirmed moderate, substantial, and weak correlations respectively for the considered three relationships.

Taking into consideration the R-square values of the relationship between social practices and TBL performance, we find that there is a weak correlation (r = 0.224) between social practices and economic performance, a moderate correlation (r = 0.458) between social practices and environmental performance, and a moderate correlation (r = 0.413) between social practices and social performance. Therefore, the strongest correlation between social practices and environmental performance was also validated by the R-square value.

Table 07: R-Square Values

	R-Square	**R-Square Adjusted**
Economic Practices on Economic Performance	0.363	0.357
Economic Practices on Environmental Performance	0.329	0.322
Economic Practices on Social Performance	0.313	0.306
Environmental Practices on Economic Performance	0.386	0.380
Environmental Practices on Environmental Performance	0.760	0.757
Environmental practices on Social Performance	0.093	0.084
Social Practices on Economic Performance	0.224	0.216
Social Practices on Environmental Performance	0.458	0.452

Social Practices on Social Performance	0.413	0.407

In this study, the relationship between economic practices and TBL performance dimensions showed moderate strength towards economic (0.363) and environmental (0.329) performance, while social performance (0.313) was slightly weaker but still close to moderate. These results align with previous studies, such as Zhu and Sarkis (2004) and Green et al. (2012), who found that the adoption of economic-oriented SSCM practices often leads to moderate improvements in both economic and environmental outcomes, but has a more limited impact on social dimensions due to the primary focus on cost efficiency and profitability rather than broader stakeholder engagement.

Regarding environmental practices, the findings revealed a substantial relationship with environmental performance (0.760), supporting the extensive literature emphasizing that environmentally sustainable practices (e.g., pollution prevention, eco-design, and green purchasing) have a strong and direct effect on environmental outcomes (Sarkis et al., 2011; Seuring and Müller, 2008). The moderate relationship with economic performance (0.386) also echoes findings by Paulraj (2011), who demonstrated that proactive environmental strategies could lead to economic benefits through cost savings, innovation, and improved brand reputation. However, the weak correlation with social performance (0.093) suggests that environmental initiatives alone may not automatically translate into social benefits, an observation consistent with findings by Awaysheh and Klassen (2010).

For social practices, the results indicated moderate correlations with environmental (0.458) and social performance (0.413) and a weaker relationship with economic performance (0.224). These findings are in line with the literature, where scholars like Pagell and Wu (2009) and Mani et al. (2018) argued that socially sustainable practices (e.g., fair labor practices, and community engagement) primarily enhance social and environmental outcomes but may not strongly contribute to economic performance in the short term. Investments in social sustainability often require time to yield measurable economic returns.

Overall, these findings confirm that different dimensions of SSCM practices have varied impacts on the three pillars of TBL performance, supporting the multidimensional nature of sustainability emphasized in prior research (Elkington, 1998; Carter and Rogers, 2008). Notably, environmental practices show the strongest predictive power for environmental performance, while social practices have meaningful impacts on both social and environmental performance but less on economic gains.

Moderating Effects of Institutional Pressure on the Relationship between SSCM Practices and TBL Performance

The current study investigated how the relationship between SSCM practices and TBL performance is moderated by institutional pressure, particularly supply chain, and regulatory pressures which are considered under institutional pressure. Table 08 shows that the association between SSCM practices and social and environmental performance has been positively impacted by regulatory pressure. Additionally, the relationship between SSCM practices and economic performance is unaffected by regulation pressure. Consequently, the relationship between SSCM practices and environmental and social performances has benefited from regulatory pressure, i.e., regional and governmental environmental restrictions. The association between SSCM practices and TBL performance is positively impacted by

supply chain pressure, as Table 08 demonstrates.

These results are consistent with prior studies that highlight the role of regulatory frameworks in encouraging firms to enhance their environmental and social initiatives. Delmas and Toffel (2008) argued that strict environmental regulations compel organizations to adopt greener practices, leading to better environmental outcomes. Liu et al. (2018) similarly found that regulatory pressure positively influenced firms' environmental and social sustainability efforts but had less direct influence on their financial performance. Zhu and Sarkis (2007) reported that while regulatory pressure improved green supply chain practices and environmental/social results, the economic gains often depended on other internal capabilities, not regulations alone.

Thus, the current study's findings align with the understanding that regulatory interventions are strong drivers for improving environmental and social dimensions of TBL performance but may not guarantee immediate economic returns. Regulations typically impose costs or require compliance investments that may not directly or immediately boost profitability (Testa et al., 2016).

Second, the study found that supply chain pressure positively moderates the relationship between SSCM practices and overall TBL performance. This is also strongly supported by the literature.

Vachon and Klassen (2006) emphasized that supply chain pressures — especially from environmentally and socially conscious customers and buyers — encourage firms to implement more effective SSCM practices, improving environmental, social, and economic outcomes simultaneously. Lee (2008) found that supply chain actors such as major customers often impose sustainability standards that stimulate firms to seek innovations that improve not just compliance but also competitive advantages, thus boosting TBL performance. Pagell and Wu (2009) argued that firms embedded in sustainability-oriented supply chains often experience improvements across all three TBL dimensions due to collaboration, knowledge sharing, and network-based pressures.

Therefore, the current findings reinforce the view that supply chain pressure is a holistic driver of sustainability that enhances firms' environmental, social, and economic performance when they implement SSCM practices.

Table 08: Moderating Effects

	Direct relationship		**Moderating Effect**		**Effect**
	Beta	**T-Stat**	**Beta**	**T stat**	
Regulation pressure					
SSCM Practice on EcoPF	-0.054	1.152	-0.421	0.752	No effect
SSCM Practice on EnvPF	0.442	2.311	0.276	2.712	Positive effect
SSCM Practice on SocPF	0.476	2.569	0.156	2.632	Positive effect
Supply chain pressure					
SSCM Practice on EcoPF	0.157	2.835	0.152	2.682	Positive effect
SSCM Practice on EnvPF	0.419	3.873	0.234	2.631	Positive effect
SSCM Practice on SocPF	0.436	1.923	0.188	2.238	Positive effect

EcoPF=Economic Performance, EnPF=Environmental Performance, SoPF=Social Performance

Conclusion

This research project has two goals that must be accomplished. Using 100 manufacturing businesses as a sample of the population of 721 large-scale manufacturing companies in Sri Lanka, this research was carried out as a quantitative survey study to achieve particular two objectives. Therefore, the research study's conclusions or results have fulfilled its two goals,

which were to:

- Examine the impact of SSCM practices on the TBL performance of large-scale manufacturing companies in Sri Lanka

In recapitulating the study, it is noted that the findings demonstrate that objective one has been accomplished, which is relevant to the finding that SSCM practices significantly improve TBL performance. Stated differently, the findings show that all nine of the hypotheses that were created to investigate how SSCM practices affect TBL performance were accepted. Thus, when the study's findings and the responses to the first research question were examined, the first goal was evidently accomplished.

The second objective:

- Examine the moderating effects of institutional pressure (regulatory, and supply chain) on the relationship between SSCM practices and TBL performance

Through the study's findings, research question two has been addressed, and objective two has also been accomplished. All of hypotheses 4a and 4b have been accepted in light of the results. Thus, it can be said that the relationship between SSCM practices and TBL performance is significantly moderated by institutional pressure, including supply chain and regulatory pressure. Because of the demand from regulatory organizations, large manufacturing enterprises have fulfilled their obligation to include sustainable measures in their plans.

Many businesses and practitioners are concerned about obtaining a competitive edge through sustainable operations, particularly SSCM techniques, because of the intense rivalry in the domestic and international manufacturing sectors as well as the needs of stakeholders. Under this, manufacturing managers are greatly urged by numerous stakeholders to embrace SSCM methods inside their supply chain operations. Additionally, a variety of labor laws and the effects of trade unions direct and sway manufacturing companies to address the welfare and rights of their workers. According to the current study, TBL performances are improving as a result of large industrial organizations implementing SSCM methods. Additionally, research indicates that manufacturing firms are very interested in adopting SSCM methods in their operations.

Therefore, in order to obtain more competitive advantages, production and operation managers need to pay attention and implement more SSCM techniques. Because purchasing nations typically incorporate sustainable operations into their manufacturing processes, businesses that export their goods to other nations should be especially interested in adopting more SSCM practices at a higher level. It should be carried out to accomplish sustainable goals and objectives since managers of production and operations, in particular, are constantly focused on enhancing productive systems.

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