Understanding the Impact of Sustainability Practices on Export Performance: A Case of Industrial Exporting Firms in Sri Lanka

H. D. M. T. Karunaratne

Research Student of GSID Nagoya University

Corresponding email: midorikarunaratne@gmail.com

Abstract

The export sector in Sri Lanka relies heavily on industrial exporters who are increasingly facing global pressure to adopt sustainability practices in response to elevating international standards of sustainable development. This study investigates how economic, social, and environmental sustainability practices impact export performance among industrial exporting firms located in Katunayake, Seethawaka, Biyagama, and Horana export processing zones registered under the Board of Investment Sri Lanka, during the period from 2017 to 2021. Drawing on the Triple Bottom Line Framework, this study employed survey data from 80 firms and applied Structural Equation Modelling to analyze the impact of sustainability practices on export performance at the firm level. Study findings reveal that economic and social sustainability practices enhance export performance, while environmental sustainability practices pose significant challenges to industrial exporting firms in Sri Lanka. Insights from this study would be useful to enhance export performance and develop forward-looking sustainability strategies across industrial sectors in Sri Lanka, extending beyond the studied zones and sustainable even under challenging economic conditions.

Keywords: *BOI Export Processing Zones; Sustainability Practices; Industrial Exporting Firms; Triple Bottom Line; Structural Equation Modelling*

JEL Codes: C30, F18, O14, L23, Q56

Introduction

Sustainability is the silent handshake in global trade. Intrinsically, sustainability ensures that current needs are met without compromising the ability of future generations to meet their own needs. Popularly referred to as the 'new black', sustainability is now at the forefront of attention in enhancing the resilience and long-term prosperity at the firm level. At first, it prioritized environmental conservation, but it has broadened to economic and environmental dimensions over time. The mounting international apprehension of environmental dilemma has led to heightened pressure on firms to adopt sustainability practices into their operations (Chabowski et al.,2011).

Firm-level sustainability practices are generally based on economic, social, and environmental dimensions aligned with the triple bottom line concept (Elkington, 1998). Within the environmental dimension, the focus is mainly on responsible resource use and reducing negative impact on the environment while the economic sphere concentrates on financial stability and long-term economic growth and generating profit. Central points of the social dimension are inclusivity, equity, and fair working conditions at the firm level. Firms walk towards sustainability by adopting various practices to affirm the responsible use of resources, preserving resources for future generations, and reducing the social and environmental consequences of production. Nevertheless, there are debatable points. On one hand, firms have to incur additional costs and decrease profit by incorporating sustainability practices. On the other hand, being sustainable firms can reduce costs in the long run in terms of water, energy, and also increase firm performance. The vast body of literature supports the argument that the green approach has led firms to increase their performance (Fraj et al., 2011). As the argument illustrates that adopting sustainability practices have generated numerous benefits such as gaining competitive edge in the market, expanding market share by product differentiation to address the demand of eco-conscious customers and building firm reputation as a result of genuine commitment of adopting sustainability practices into operations of firms which ultimately boost export performance at firm level. This has a significant impact on developing countries, capturing those opportunities in the international market and positioning themselves globally. However, developing countries such as Sri Lanka have low to moderate adoption levels of sustainability practices at the firm level due to various reasons. Most importantly, firms' additional costs that have to be afforded by adoption, which reflect an unfavorable effect on international competitiveness, less awareness of the benefits to boost performance, and limited expertise, can be seen as major causes for low adoption levels (Weerasinghe et al., 2023).

The adoption trend of sustainability has influenced firms to incorporate sustainability practices into their operations and stay ahead with the benefit of such adaptation. A wealth of research illustrates how a green approach can impact firm performance in the domestic context while very few researchers have gathered empirical evidence on how sustainability practices impact export performance at a firm level, which is in the international context (Chan et al.,2010). As a developing country, it is crucial to understand the impact of sustainability practices on export performance at the firm level in Sri Lanka to capture niche market opportunities and boost export performance, as well as achieve international benchmarks like net zero. Although interest in sustainability is increasing a notable void in existing literature remains in understanding the impact of sustainability practices adoption and how it impacts export performance at the firm level, particularly for developing countries like Sri Lanka where the industrial sector plays a crucial role in exports but remains understudied in sector-specific studies. Therefore, this study aims to address this gap by examining the impact of economic, social, and environmental sustainability practices on the export performance of industrial exporting firms in Sri Lanka. The research objective of this study is to examine the impact of multidimensional sustainability practices on export performance at the firm level in Sri Lanka from 2017 to 2021. This study consists of five sections, namely, the introduction in section one, reviewing relevant literature in section two, describing the methodology in section three, interpreting the empirical results of the study in section four, and concluding with implications and future research directions.

Literature Review

Theoretical literature

The sustainability focus has shifted from the margin, influencing both operational and financial performance at the firm level. Multiple theoretical perspectives have been articulated to illustrate how sustainability practices impact firms' export performance. The Resource-Based View (RBV) suggests that internal capabilities, in particular advanced green technologies, eco-friendly production methods, and socially conscious labor forces, offer distinctive and high value that can boost a firm's competitiveness in global markets (Barney, 1991). Complimentarily, stakeholder theory highlights that meeting stakeholder expectations stimulates reputation and legitimacy, which are vital resources in export markets that prioritize ethical compliance (Freeman, 1984). Institutional theory further demonstrates how firms align with external expectations such as international environmental standards and fair-trade regulations, which tend to be mandatory for market entry in developed economies (Scott,2001). Collectively, these theoretical frameworks suggest that

sustainability adaptation does more than fulfill compliance and foster export growth at the firm level.

This evolution is most comprehensively defined through the Triple Bottom Line (TBL) framework, which aggregates economic, social, and environmental dimensions into a holistic framework for sustainable firm performance (Elkington, 1998). At its core, economic sustainability focuses on stability, financial resilience, and long-term growth while generating profits. Social sustainability reflects the ability to foster inclusivity, fair labor conditions, and community engagement (Carroll, 1991; Spangenberg, 2005). Meanwhile, environmental sustainability involves minimizing ecological harm and responsible use of resources (Hart & Milstein, 2003). This study applies the TBL framework to examine the three pillars of sustainability and their influence on the export performance of BOI industrial exporting firms in Sri Lanka. This study defines sustainability pillars as follows, by adaptation of the TBL framework.

Economic sustainability involves stability and long-term economic growth, reflected in cost reduction and financial resilience, which allows firms to serve consistent quality and reliable products (Dyllick & Hockerts, 2002; Elkington, 1997). Social sustainability through fair labor conditions and inclusive employment enhances corporate image in ethically conscious markets (Labuschagne et al., 2005; Carroll, 1999). Similarly, environmental sustainability through the adaptation of green technology, recyclable materials, and low-carbon approaches boosts eco-conscious global market share (Hart, 1995; Porter & Van der Linde, 1995).

This study examines export performance in modern international trade theory, particularly New Trade Theory and the heterogeneous firm model. While classical trade theories like Ricardian comparative advantage and the Heckscher-Ohlin model present country level specialization yet fail to account for heterogeneity in firm level export participation. New Trade Theory (Krugman, 1980) explains economies of scale and product differentiation as major drivers of international competitiveness, presenting that firms serving unique or higher quality products are more likely to succeed in international markets. Melitz's (2003) extended model illustrates that only the most productive firms self-select into exporting due to fixed entry costs and market specific capabilities. Accordingly, the study aims to examines the impact of economic, social and environmental sustainability practices on export performance at industrial exporting firms in Sri Lanka.

Among the various theoretical lenses employed to establish a relationship between sustainability and firm-level export performance, product differentiation theory offers a particularly relevant perspective for developing countries like Sri Lanka. Originating from Chamberlin (1933) and further developed in international trade

theory by Krugman (1980), the theory posits that firms can gain a competitive advantage by offering products with unique features that distinguish them from competitors, non-price attributes. In premium markets like the European Union, Economic, social, and environmental sustainability practices have always been considered due to buyers' expectations, regulatory standards, and consumer preferences. In particular, this signals a turning point for developing economies that are incorporating sustainability practices, which enable differentiation from competitors; cost advantage alone is no longer sufficient for firms in developing nations. Environmentally responsible production offers a fair and transparent work environment, enhances credibility, and improves product appeal and trust, ultimately improving access to premium export markets (Porter & van der Linde, 1995; Menguc & Ozanne, 2005). Such sustainability-led differentiation reflects long-term consistency and commitment, reduces reputational risks, and supports firms in meeting non-tariff requirements (Menguc & Ozanne, 2005).

Sustainability incorporation is not only a compliance measure but also a path of intangible value that strengthens brand reputation and export competitiveness. Grounded in Product differentiation theory, this theory strongly supports the research objective that sustainability practices influence export performance at the firm level. Empirical evidence from countries such as Vietnam, Colombia, and Kenya depicts that firms adopting environmental certifications such as ISO 14001 often boost brand reputation and price premiums (Nguyen et al., 2019; Rivera et al., 2002; Jaffee & Henson, 2004). However, the potential of sustainability-driven differentiation in Sri Lanka remains uneven in practice. Most SMEs experienced challenges like limited expertise, financial constraints, and weak institutional support (Weerasinghe et al., 2022). Product differentiation theory continues to provide crucial insights into how the incorporation of sustainability practices can boost export performance at the firm level.

Empirical Literature

Economic sustainability practices focus on stability and long-term growth, not only driving internal efficiency but also creating a competitive edge in the market. These practices focus on cost reduction in production and promote resilience. On one hand, in most of the developed economies the relationship between sustainability practices adoption and export performance is strongly supported by empirical evidence. For instance, adopting sustainability practices by Spanish SMEs has been associated with significant growth driven by adaptive capacity and operational agility, indicating a positive impact on firm-level export performance (Villena & Souto-Pérez, 2016). Interestingly, South Korean firms incorporating these practices experienced enhanced productivity, fostering access and expansion into international markets (Lee & Min,

2015). Zhu (2013) found that resource-efficient production processes significantly enhanced Chinese manufacturing firms' export volume and market diversification due to lowering operational costs and facilitating price competitiveness through adaptation. On the other hand, in developing nations, the relationship between economic sustainability practices adoption and export performance remains more uncertain. In the Sri Lankan context, small and medium enterprises incorporating these practices led to cost reduction, latest manufacturing techniques, and supply chain transparency, leading to enhanced export resilience in the post-crisis recovery period of Sri Lanka (Weerasinghe et al., 2022). These practices facilitated firms to mitigate volatility in the cost of inputs and exchange rate instability, in turn reinforcing more stable export activities. Economic practices such as strategic investment in digital platforms enable firms to increase agility to global demand shifts to support macroeconomic disruptions (Jayarathne & Dewasiri, 2021)

Social sustainability at the firm level mainly focuses on fair labor conditions and welfare, community engagement, and inclusivity, which have increasingly been recognized as a crucial factor of firm competitiveness in international markets. These initiatives play an important role in developed economies for customer loyalty and access to new markets (Villena & Souto-Pérez, 2016; Pozzobon Palma et al., 2012; Leonidou et al., 2017). For case in point, in Spain, SME's incorporating social sustainability practices into their operations led to improved corporate image, which ultimately enhanced export performance at the firm level (Villena & Souto-Pérez, 2016). Similarly, Pozzobon Palma et al. (2012) established that Brazilian firms in the gem and jewelry sector adapted labor standards and community partnerships to capture ethically driven markets, turning social sustainability into a market differentiator. On the contrary, the track record of developing countries, including Sri Lanka, uncovers a more complex and conditional relationship between social sustainability practices adoption and export performance at the firm level. Weerasinghe et al. (2022) bring in to focus that adapting social sustainability initiatives into firm level operations of apparel firms like providing healthcare programs, employee working conditions and effective stakeholder involvement plan and corporate responsibility observed positive impact on employee satisfaction and stakeholder trust which enhanced export competitiveness by addressing international buyers' needs and improving reputational capital. But institutional environment and limited policy support restrict the adaptation of social sustainability initiatives at the firm level in Sri Lanka (Acheampong & Boateng, 2020).

Environmental sustainability practices adoption and its impact on export performance at the firm level are widely debated, with contrasting results when compared with global trends to those observed in the developing country context. Environmental sustainability initiatives like adopting renewable energy and eco-innovation are

basically associated with improved export competitiveness. European exporters who adopted green technologies achieved substantial improvements in export intensity, and this positive impact was driven by environmental regulations and increasing demand from eco-conscious customers (Costantini & Mazzanti, 2012; De Marchi, 2012; Borghesi et al., 2015). Germany and Scandinavian countries have incorporated environmental certifications like ISO 14001 to access green supply chains and markets, thereby fostering their export performance at the firm level (Leonidou et al.,2017).

In contrast, outcomes in the developing regions are notably more nuanced, where the path towards environmental sustainability is often marked by resource-intensive challenges. Chinese exporters encountered performance declines due to adjustment costs and operational disruptions with compliance under mandatory audits (Zhang et al.,2022). Similarly, SMEs of Africa and Latin America often did not prioritize investments in environmental initiatives due to misalignment with their export objectives and resource constraints (Pozzobon Palma et al., 2012; Mensah et al., 2019). This complexity is particularly acute in Sri Lanka, where firms face significant challenges in adapting environmental sustainability practices. Due to the high cost of certification and limited technical expertise, most firms are hindered from meeting environmental standards, resulting in insignificant improvements in export performance in the apparel sector (Weerasinghe et al., 2022).

In conclusion, existing evidence on the relationship between sustainability practices and firm-level export performance provides mixed insights, especially in the context of developing countries. Many studies present a positive impact of sustainability practice adoption which enhances brand reputation and innovation in developed countries (Leonidou et al., 2013; López-Gamero et al., 2009). Conversely, the relationship is more complex in developing countries like Sri Lanka. Sri Lankan firms often face difficulties in adaptation due to high implementation costs, limited access to green technologies, and a lack of institutional support (Wickramasinghe & Ramanayake, 2021). Global studies illustrate that the integration of environmental sustainability practices can gain a competitive advantage. Sri Lankan exporters have similarly followed these footsteps, especially to comply with regulations rather than innovate proactively (Fernando et al., 2017). Furthermore, the adoption of sustainability practices in developing countries like Sri Lanka is influenced by a combination of economic constraints and structural challenges. The high costs associated with environmental compliance and limited technical expertise hinder firms from fully capitalizing on potential export benefits. This situation underscores the importance of examining sustainability not only as a regulatory obligation but also as a strategic dimension intertwined with firm capabilities and market demands.

Understanding these contextual factors is essential for developing effective approaches that enable firms to overcome barriers and achieve meaningful improvements in export performance through integrated sustainability practices.

Conceptual Framework

Independent Variables   **Dependent Variable**
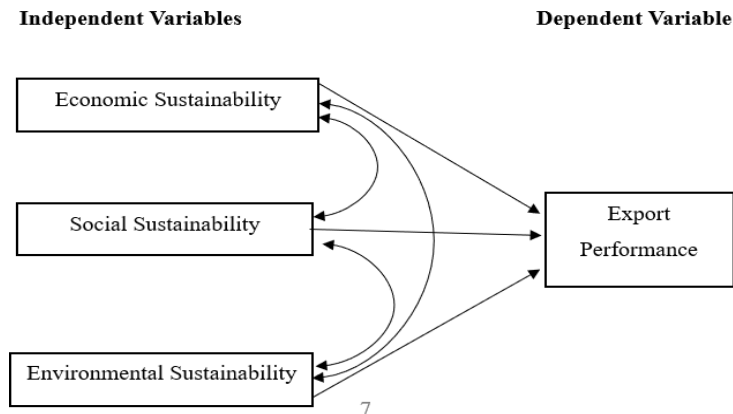
Figure 1-Conceptual Framework Aligning with the Triple Bottom Line (TBL) Approach

Note: This conceptual framework is constructed by the author based on the TBL concept, illustrating the influence of Economic, Social, and Environmental Sustainability on Export Performance.

Source: Developed by the Author Based on the Triple Bottom Line (TBL) Framework (Elkington, 1997).

This conceptual framework offers how economic, social, and environmental sustainability practices affect export performance at the firm level. Each sustainability dimension is treated as an independent variable, establishing direct impact on the dependent variable export performance. Through resource efficiency, financial resilience, and cost reduction, economic sustainability practices contribute positively to export performance (Leonidou et al., 2015; Paul et al., 2017). Social sustainability practices consist of fair labor conditions and inclusivity, which are critical in export markets, especially those that demand ethical practices (Martínez-Conesa et al., 2017). Environmental sustainability practices suggest a more nuanced relationship, especially in developing country contexts while reducing emissions, complying with international standards has a positive impact on export performance (Zeng et al., 2017; Triguero et al., 2013). Meanwhile, adaptation increased in terms of operational costs, challenges in maintaining productivity in green transitions, which negatively impact export performance at the firm level, especially in

developing countries due to financial constraints and institutional factors (Ambec & Lanoie, 2008; Testa et al., 2011).

The interconnected paths investigate covariance between sustainability dimensions, suggesting a covariance between dimensions. The mutual linkages among economic, social, and environmental sustainability practices dimensions in the conceptual framework depict that these dimensions are not addressed independently, but often evolve together. Empirical evidence points out that firms aiming to improve environmental sustainability by adopting practices like renewable energy and reducing waste have often experienced cost reduction and boosted efficiency, thereby supporting their economic goals (Porter & van der Linde, 1995). Similarly, firms that focus on fair labor conditions and community engagement often cultivate employee loyalty and stakeholder trust, which can reinforce both social and economic sustainability (Orlitzky et al., 2003; Aguilera et al., 2007). Modelling these interrelationships allows the capture of the complex and holistic setting of sustainability practices at the industrial exporting firm level in Sri Lanka.

The hypothesis formulation in this study is constructed by both theory and existing empirical evidence. The triple Bottom Line (TBL) approach (Elkington,1998) serves as a foundation for illustrating the role of economic, social and environmental sustainability. Accordingly, this study proposes hypothesis investigate the impact of sustainability practices on export performance in Sri Lankan industrial exporting firms.

Building on a growing body of empirical research, this study proposes that economic, social, and environmental sustainability significantly contribute to the export performance of BOI industrial exporting firms in Sri Lanka. Firms that demonstrate economic sustainability through cost efficiency, innovation, and long-term financial resilience and tend to be better positioned to compete in international markets, as evidenced by Leonidou et al. (2013) and Villar et al. (2022). Social sustainability, reflected in fair labor practices, employee well-being, and strong stakeholder relationships, has been shown to enhance reputation and operational effectiveness, which are vital for building trust in export markets (Famiyeh et al., 2018; Zeng et al., 2022). Meanwhile, environmental sustainability, particularly through green innovation and regulatory compliance, supports access to environmentally sensitive markets and strengthens global competitiveness (Wang & Song, 2021; Dangelico & Pujari, 2010). Furthermore, empirical studies suggest these sustainability dimensions do not function in isolation. Research by Bansal (2005) and Eweje (2014) illustrates that social and environmental initiatives often reinforce economic outcomes, pointing to strong interdependencies among the three pillars. Accordingly, this study also

hypothesizes significant covariances between economic, social, and environmental sustainability.

Methodology

This study employed a quantitative research design for cross-sectional data to discover the impact of sustainability practices on the export performance of industrial exporting firms in Sri Lanka. The Target Population consists of 445 BOI registered industrial exporting firms under Katunayake, Biyagama, Horana, and Seethawaka BOI export processing zones, as 75% of industrial exporting firms in Sri Lanka are represented under these export processing zones. Due to the Board of Investment (BOI) in Sri Lanka's reputation as the most updated industrial exporting firms list, it has been selected as the primary reference (Weerasinghe et al., 2021). Originally, there are 18 sub-categories under the industrial exporting sector in BOI, but for the study, it has been rearranged into five categories: I. Plastic and Rubber II. Food, Beverages, and Tobacco III. Textiles, Textile Articles, Garments and Leather IV. Machinery, Printing, and Transport V. Other. A sample of 80 BOI industrial firms was selected using Stratified Random Sampling (by industrial category and zone) and Simple Random Sampling (for selecting the firm list and creating a sampling frame from the BOI registry).

Primary data was obtained through structured direct interviews, while secondary data was gathered from BOI publications, annual reports of BOI, and existing literature such as research articles. A structured questionnaire was tailored by Weerasinghe (2021), and each latent variable was quantified through indicators representing sustainability practices, which are more aligned with the Sri Lankan industrial sector and World Bank Enterprise Survey (2021), specifically section H. To secure the validity and relevance, the measurement scale was adapted from Pozzobon et al. (2010) and Villena-Manzanares & Souto-Pérez (2016). Responses were captured through a Likert Scale format. Data analysis basically consists of descriptive analysis and inferential analysis. Descriptive analysis summarized the basic characteristics of the data, while inferential analysis, Structural Equation Modelling (SEM), was utilized using STATA 18 version software to analyze the impact of economic, social, and environmental sustainability practices on export performance at the firm level.

Structural equation modelling offers an acclaimed approach to modelling complex relationships among latent variables from latent constructs and respective observed indicators, enabling it to be well-suited for sustainability, multidimensional constructs, and export performance. It facilitates measurement and structural models into the analysis while controlling for measurement to improve the accuracy of the results (Kline, 2015; González-Benito & González-Benito, 2005). SEM analysis, well matched for cross-sectional survey data (Ringle et al., 2012), can accommodate both

continuous and Likert scale indicators under the same latent variable, which is also used in this study, incorporating cross-sectional data with Likert Scale and continuous indicators (Byrne, 2016; Kline, 2015). The equations define the latent independent variables (Economic, Social, and Environmental sustainability practices) that influence the latent dependent variable (Export Performance), which can be stated as follows.

$$\text{EXP}_{jt} = \beta_1 \cdot \text{ECON\_S}_{jt} + \beta_2 \cdot \text{SO\_S}_{jt} + \beta_3 \cdot \text{ENV\_S}_{jt} + \zeta_{jt}$$

where:

- EXP_{jt} denotes the export performance of firm j at time t
- ECON_S_{jt}, the economic sustainability practices
- SO_S_{jt}, represent the social sustainability practices
- ENV_S_{jt} represent the environmental sustainability practices
- β_1, β_2, β_3 are the path coefficients indicating the strength and direction of the relationships,
- ζ_{jt} is the structural disturbance term,
- j indexes individual firms
- t indexes time period

The following model offers the measurement model structure for each latent variable in Structural Equation Modelling framework.

$$x_i = \lambda_i \cdot \xi + \varepsilon_i$$

Where:

- x_i is the observed indicator
- ξ is the latent construct
- λ_i is the factor loading
- ε_i is the measurement error

This formulation reflects the core structure of the measurement model in SEM, emphasizing the link between latent constructs and their observed indicators. It serves as the basis for evaluating construct validity through techniques like factor loading analysis and reliability testing. Exploratory Factor Analysis (EFA) was conducted to group related variables and identify appropriate indicators for each construct. This approach ensured that only conceptually and statistically coherent items were retained for further analysis in the measurement model.

The following table presents a detailed description of the observed indicators used in this study with respect to the dimensions.

Table 1: Description of Observed Indicators

Construct (Latent)	Indicator Description	Measurement
Economic Sustainability (ECON_S)	sp1-Using the latest manufacturing techniques	Likert Scale (1-5)
	sp2-Entering new markets.	
	sp3-Recycling / repacking returned goods.	
Social Sustainability (SO_S)	sp4-Considering employee working conditions & health	
	sp5-Employment of disabled employees.	
	sp6-Action plan to improve stakeholder involvement.	
Environmental Sustainability (ENV_S)	sp7-Ecologically friendly packaging.	
	sp8-Route optimization using technology	
	sp9-Using renewable energy sources.	
Export Performance (EXP)	CI-Improvement of corporate Image	
	PR-Increase in profitability	
	EP_D-Product portfolio development	
	EXP_G-Average Export Growth Rate (2017-2021)	Percentage

Note: This table provides a detailed description of the observed indicators with respect to the latent constructs of economic, social, and environmental sustainability, as well as export performance dimensions.

Source: Author's compilation.

Results and Discussion

This section presents the findings of this study, consisting of descriptive as well as inferential analysis. Basic characteristics were illustrated using Microsoft Excel, while analysis was performed using STATA version 18. Structural equation Modelling applied to examine hypothesized relationships among variables.

The distributions of BOI-registered industrial exporting firms across five rearranged categories: leather, textiles and other articles, plastic and rubber, food and beverages, machinery, and printing and other categories. The leather, textiles, and other articles category holds the highest share of 34%, highlighting its dominant role in Sri Lanka's industrial exporting sector, where the apparel industry accounts for approximately 44% of the nation's total exports (Sri Lankan Apparel Exporters Association, 2024). The other category, recorded at 33%, holds the second-largest share, while the plastic and rubber, machinery, printing, and food and beverages categories hold 17%, 15%, and 1%, respectively.

The distribution of BOI-registered industrial exporting firms mainly located in Katunayake, Biyagama, Seethawaka, and Horana export processing zones. Katunayake holds the largest share, 39%, while Biyagama follows with a 30% share, which depicts the benefit of early development of export processing zones as well as being closer to major transportation hubs. Horana recorded as 21% while Seethawaka depicts the least share recorded as 10%.

Table 2 indicates the descriptive statistics of the economic sustainability observed indicators, which suggests moderately high levels of adoption across firms, the adoption of entering new markets and recycling to reclaim materials or manufacturing and repacking returned goods illustrates a relatively high mean, implying that these practices are relatively common, and results indicate marginal adoption of the latest manufacturing techniques.

Across the indicators, indicating roughly normal distributions, these characteristics demonstrate that the practices are broadly perceived as important across the sample. There is a moderate adoption of social sustainability practices among the firms, with descriptive statistics of three practices suggesting these practices have mild negative skewness, specifically the practice of providing health and safety, indicating higher agreement levels among respondents. Overall, these results indicate moderate implementation of social practices. Among all the sustainability dimensions, environmental sustainability adoption indicates the lowest adoption across the firms. Most of the responses were slightly low, particularly the adoption of environmentally friendly packaging at a low level. The results illustrate that environmental sustainability practices may not be a primary focus for most firms at this stage and have significant room to improve. Export performance observed indicators demonstrate favorable responses among firms. This is consistent with the export growth rate, which is a continuous variable, as well as corporate image, export diversification, and profitability, which are Likert scale variables. Corporate image, export diversification, and profitability indicators exhibit slight negative skewness, reflecting higher-end agreement among firms. The positive skewness of the export growth implies the low growth of most firms. These findings suggest varying levels of integration among the three dimensions of sustainability. Economic sustainability appears more widely adopted, likely due to its alignment with profitability and market competitiveness. In contrast, environmental sustainability shows limited implementation, potentially reflecting cost constraints, lack of awareness, or weaker regulatory enforcement. Social sustainability is moderately adopted, with emphasis on health and safety practices. Overall, the uneven adoption patterns highlight differing strategic priorities and capacity limitations across firms.

Table 2: Summary of the Descriptive Statistics for Observed Indicators of Sustainability Practices and Export Performance

Dimension	Observed Indicator	Mean	SD	Skewness	Kurtosis
Economic Sustainability	Using the latest manufacturing techniques	3.21	1.198	-0.282	2.454
	Entering new markets	3.42	1.091	-0.319	2.56
	Recycling/repacking returned goods	3.43	1.146	-0.405	2.564
Social Sustainability	Considering employee working conditions & health	3.2	1.036	-0.613	2.963
	Employment of disabled employees	3.26	0.991	-0.456	2.835
	Action plan to improve stakeholder involvement	3.18	0.951	-0.454	3.158
Environmental Sustainability	Ecologically friendly packaging	2.12	1.048	0.944	3.457
	Route optimization using technology	2.31	1.014	0.592	2.817
	Using renewable energy sources	2.32	0.952	0.377	2.635
Export Performance	Improvement of corporate image	3.25	1.073	-0.51	2.695
	Increase in profitability	3.27	0.981	-0.248	2.93
	Product portfolio development	3.31	1.109	-0.416	2.498
	Average Export Growth Rate (2017–2021)	0.15	0.054	0.625	2.909

Note: This table summarizes the descriptive statistics for observed indicators of sustainability practices and export performance, adapted from Weerasinghe et al. (2023) framework.
Source: Authors' compilation based on STATA 18 output

Structural equation modelling was utilized to examine the impact of economic, social, and environmental sustainability practices on export performance at the firm level. The following diagram presents the standardized structural equation results, depicting the relationships and covariance among latent constructs and their observed indicators. The reliability of the latent constructs was examined using Raykov's reliability coefficient, and all constructs demonstrated acceptable reliability above the threshold of 0.7. These results confirm that the latent constructs are reliable for structural equation modelling. As summarized in Table 8, the model fit statistics indicate that the structural equation model depicts an excellent overall fit. The R^2 value reflects that the model has 70% of observed variability, and Tucker Lewis index (TLI) and Comparative Fit Index (CFI) are above 0.9, confirming strong model adequacy.

Moreover, the RMSEA value is below 0.06, which implies the model's robust fit to the data.

Table 3: Measurement Models for Economic, Social, and Environmental Sustainability, and Export Performance

Raykov's Reliability coefficients	*Constructs*		*Value*
	ECO_S		0.852
	SO_S		0.828
	ENV_S		0.865
Goodness of Fit	*Criteria*		*Value*
	R²		0.706
	Tucker–Lewis Index (TLI)		0.989
	Comparative Fit Index (CFI)		0.992
	Root Mean Square Error of Approximation (RMSEA)		0.03
Fornell–Larcker	*Constructs*	*Compare with*	*Value*
	ECO_S	SO_S	0.612
	ECO_S	ENV_S	0.138
	SO_S	ECO_S	0.612
	SO_S	ENV_S	0.341
	ENV_S	ECO_S	0.138
	ENV_S	SO_S	0.341
	ECO_S	ECO_S	0.82
	SO_S	SO_S	0.80
	ENV_S	ENV_S	0.83
Heterotrait-Monotrait Ratio	SO_S	ECO_S	0.615
	ENV_S	ECO_S	0.138
	ENV_S	ENV_S	0.341

Note: *This table summarizes the reliability, model fit, convergent and discriminant validity of the latent variables. Reliability is confirmed through construct scores above the acceptable threshold.*
Source: *Author's compilation based on STATA 18 output*

To ensure convergent validity, Average Variance Extracted (AVE) values were calculated for each independent latent variable in line with SEM. According to the standard threshold of 0.5, the AVE values for economic sustainability (ECO_S,0.627), social sustainability (SO_S,0.615), and environmental sustainability (ENV_S,0.788) confirm that all independent latent constructs exhibit adequate convergent validity, indicating that the indicators appropriately reflect their respective latent dimensions. To assess discriminant validity, both the Fornell-Larcker criterion and Heterotrait-Monotrait analysis were used, and the results are depicted in Table 3. These results confirm the condition that the square root of each construct's AVE should be greater than its correlations with other constructs, and this was examined for all independent

latent constructs. Economic sustainability and social sustainability recorded values of 0.82 and 0.80, respectively, with environmental sustainability likewise reporting a value of 0.83. Each construct is well distinguished from each observed indicator in the model, thereby establishing discriminant validity.

In addition to the Fornell-Larcker criterion, Heterotrait-Monotrait (HTMT) was employed to evaluate discriminant validity with greater precision. The HTMT values present in Table 3 were below the recommended threshold of 0.9, including 0.615 (ECO_S–SO_S), 0.341 (SO_S–ENV_S), and 0.138 (ECO_S–ENV_S), which provide strong evidence of discriminant validity among the constructs.

Figure 2 Path diagram of the structural equation model demonstrates Economic sustainability (ECO_S), Social sustainability (SO_S), and Environmental sustainability (ENV_S) as exogenous latent constructs while export performance (EXP_P) denotes an endogenous latent construct, which is measured by multiple observed indicators.

The path diagram reveals that economic sustainability has a moderately positive (0.52) impact on export performance; social sustainability has a weak (0.26) but significant positive impact on export performance, while environmental sustainability has a significant negative impact on export performance of industrial exporting firms in Sri Lanka. This depicts that firms that adopt more sustainable economic practices, such as using the latest manufacturing techniques, entering new markets, and recycling to reclaim materials or manufacturing and repacking returned goods, tend to perform better in terms of export performance. The ability of these practices to reduce production costs, enhance operational efficiency, and improve product quality increases a firm's competitiveness in international markets, which boosts export performance at the firm level (Porter & van der Linde, 1995). As a developing country, Sri Lankan industrial exporting firms, specifically the apparel industry, by adapting these practices, achieved better performance at the firm level even under crisis conditions ((Jayarathne & Dewasiri, 2021)

Social sustainability practices such as considering employee working conditions, health and safety, offering job opportunities for disabled employees, and having an action plan to improve stakeholder involvement can foster export performance through several mechanisms. These social sustainability practices enhance productivity, employee satisfaction, and drive innovation by considering a sense of value and fairness, and employees reciprocate with higher engagement and employer loyalty. These satisfied employees are more motivated, willing to contribute ideas, and committed, which leads to consistent production quality and efficiency; both of which are essential for meeting international demand and maintaining schedules, and assist firms to innovate in terms of products and processes (Ali et al., 2021). These

practices enhance supply chain collaboration as socially responsible firms often build strong relationships with other firms, improving export reliability (Tran et al., 2023).
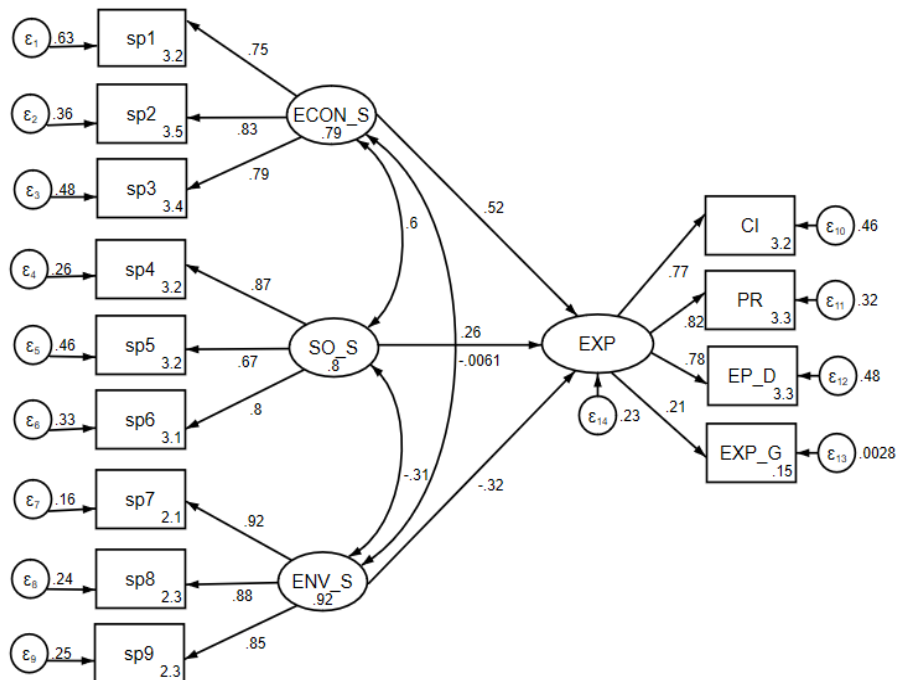
Figure 2- Path Diagram of SEM Analysis

Note: ECO_S = Economic Sustainability (sp1–sp3); SO_S = Social Sustainability (sp4–sp6); ENV_S = Environmental Sustainability (sp7–sp9); EXP_P = Export Performance.
Source: Author's compilation based on STATA 18 output; framework adapted from Weerasinghe et al. (2023)

Environmental sustainability practices like using ecologically friendly packaging, utilizing technology for transportation and route optimization, and using renewable energy sources can negatively impact export performance, especially for developing countries like Sri Lanka, due to increased operational burdens. Environmental sustainability practices, such as meeting international standards like ecologically friendly packaging, adopting renewable energy, often require substantial investment and expertise in technology, which many firms struggle to afford (UNCTAD, 2021). On one hand, it reduces the price competitiveness and profitability, which reduces the export performance at the firm level. On the other hand, transitioning to the adaptation of environmental sustainability practices may disrupt existing supply chains and slow export growth. Failure to comply with present regulatory challenges also leads to restricted market access, which ultimately impacts export performance.

Sri Lanka's seafood industry has been affected by this failure and suffered from a major export setback because of a temporary EU import ban (UNESCAP, 2019).

Export Performance = 0.52 Economic Sustainability + 0.26 Social Sustainability − 0.32 Environmental Sustainability + ζ (1)

This structural model investigates the impact of economic, social, and environmental sustainability on export performance among industrial exporting firms in Sri Lanka using structural equation modelling (SEM). The findings illustrate that all three sustainability dimensions are statistically significant latent constructs of export performance. Economic sustainability has a strong positive impact (β = 0.52, $p < 0.05$), reflecting that stabilized and resilient firms tend to enhance the export performance at the firm level. Social sustainability also illustrates a positive significant impact (β = 0.26, $p < 0.01$) on export performance, suggesting that the adoption of fair labor conditions and inclusivity boosts export performance at the firm level. On the contrary, environmental sustainability presents a negative but statistically significant impact (β = –0.32, $p < 0.01$) on export performance, indicating that while adapting environmental sustainability practices, firms face challenges that hinder export performance. Covariance coefficients of the model indicates that economic and social sustainability constructs have a positive and significant covariance (cov = 0.60), while a significant negative covariance was detected between environmental and social sustainability constructs (cov = −0.31). But economic and environmental sustainability was insignificant (cov = −0.0061), suggesting no significant covariance because it's closer to zero.

Overall, the structural model highlights the complexity of sustainability–performance dynamics, emphasizing that while sustainability practices are essential, their outcomes vary across dimensions. Firms may require targeted policy support and internal strategies to manage environmental goals without compromising export competitiveness (e.g., Leonidou et al., 2015; Geng et al., 2017).

The measurement model in this study reflects how well the latent variables are operationalized through their respective observed indicators. It assesses the reliability and validity of the constructs, ensuring that the indicators accurately represent the theoretical dimensions of sustainability and export performance. High factor loadings and satisfactory model fit indices confirm the robustness of the measurement model in capturing the underlying constructs.

Table 4: Economic, Social and Environmental Sustainability Measurement Models

Construct	Indicator	Measurement Model	Coefficient (Std. Error)	R² (%)
Economic Sustainability	sp1	$0.7459 \cdot \xi_1 + \delta_1$	0.7459 (0.0647) ***	55.64
	sp2	$0.8329 \cdot \xi_1 + \delta_2$	0.8329 (0.0710) ***	69.38
	sp3	$0.7942 \cdot \xi_1 + \delta_3$	0.7942 (0.0558) ***	63.07
Social Sustainability	sp4	$0.8697 \cdot \xi_2 + \delta_4$	0.8697 (0.0714) ***	75.63
	sp5	$0.6737 \cdot \xi_2 + \delta_5$	0.6737 (0.0713) ***	45.40
	sp6	$0.7969 \cdot \xi_2 + \delta_6$	0.7969 (0.0564) ***	63.50
Environmental Sustainability	sp7	$0.9212 \cdot \xi_3 + \delta_7$	0.9212 (0.0292) ***	84.87
	sp8	$0.8762 \cdot \xi_3 + \delta_8$	0.8762 (0.0286) ***	76.77
	sp9	$0.8649 \cdot \xi_3 + \delta_9$	0.8649 (0.0312) ***	74.80

*Note: *** indicates significance at the 1% level; ξ_1–ξ_4 represent latent constructs (Economic, Social, Environmental Sustainability, and Export Performance); δ denotes error terms; all coefficients are standardized.*

Source: Author's compilation based on STATA 18 output; framework adapted from Weerasinghe et al. (2023)

Economic sustainability is strongly illustrated by three sustainability practices, which are the adoption of the latest manufacturing techniques (sp1), entering new markets (sp2), and recycling or repacking returned goods (sp3). Among these, entering new markets (sp2) displayed the highest factor loading with 69% of explained variance, indicating that economic sustainability has a significant impact on market expansion. Similarly, latest manufacturing techniques (sp1) and recycling or repacking returned goods (sp3) also significantly contribute to this latent construct with 55% and 63% of explained variance, respectively.

Social sustainability is strongly captured through three observed indicators which are considering employee working conditions, health and safety (sp4), offering job opportunities to disabled employees (sp5), and having an action plan to improve stakeholder involvement (sp6). The strongest indicator is the firm's consideration of

employee working conditions, health, and safety, with 0.8697 and 75.63% of explained variance, illustrating the firm's commitment to internal social responsibility. Similarly, stakeholder involvement in effective plans and offering job opportunities to disabled employees are both significant observed indicators that explain the social sustainability latent construct with 63.5% and 45.4% of observed variability. This reflects that firms foster an inclusive and fair working environment at the firm level in industrial exporting firms in Sri Lanka.

Environmental Sustainability is prioritized through firms' commitment to responsible resource use and eco-friendly practices, which consist of three practices. The highest factor loading is for eco-friendly packaging (sp7), which depicts 84.9% of the variance explained, indicating a high level of attention to eco-friendly packaging at the firm level. Correspondingly, route optimization through technology (sp8) and renewable energy sources adoption (sp9) are also highly loaded with 76.8% and 74.8% of respective variance explained. These results suggest high consistency across three observed indicators, reflecting an integrated latent construct for environmental sustainability.

Export performance as a latent construct is evaluated through improvement of corporate image (CI), improvement of profitability (PR), product portfolio development (EP_D), and export growth rate (EXP_G). Profitability and product portfolio development both have high factor loadings with 66.7% and 60.5% explained variance, respectively. Corporate image explains 59.3% of the variance, while export growth rate only explains 4.3% of the variance. This divergence indicates that 77% of the variance is explained by observed indicators of the latent construct of export performance.

Conclusion and Policy Implications

This study analyzed the impact of economic, social, and environmental sustainability practices on export performance among industrial exporting firms in Sri Lanka, applying the Structural Equation Modelling (SEM) framework by STATA, aligning with the Triple Bottom Line (Elkington,1998). The study found that economic sustainability practices have statistically significant positive impact ($\beta = 0.52, p < 0.05$) on export performance, align to the Zhu et al. (2013) and Lee & Min (2015), indicating that cost reduction and efficiency improve export competitiveness ultimately tend to increase export performance at firm level ((Jayarathne & Dewasiri, 2021). Similarly, social sustainability practices also statistically significant positive impact ($\beta = 0.26$, $p < 0.01$), consistent with Villena & Souto-Pérez (2016) and Pozzobon Palma et al. (2012), who found that firms incorporating fair labor conditions, inclusivity and stakeholder engagement enhance firm reputation as well as employee motivation and satisfaction improve export performance, particularly

satisfies global buyers' expectations like apparel sector (Weerasinghe et al., 2022). On the contrary, environmental sustainability practices depict a negative, statistically significant impact on export performance (β = –0.32, p < 0.05). This outcome is reflected in other developing countries' empirical evidence, where the adoption of environmental sustainability practices increases operational cost (Zhang et al., 2022; Mensah et al., 2019). At the firm level, Sri Lanka often lacks financial capacity, technological infrastructure, and expertise to incorporate eco-friendly practices, resulting in a reduction of export competitiveness. In sum, all three dimensions of sustainability are important and clearly present opportunities for increasing export performance among industrial exporting firms in Sri Lanka, where environmental sustainability adaptation hinders performance due to financial constraints, technological infrastructure, institutional support, and expertise. This analysis points out the need for an advanced multidimensional framework for the sustainability practices of firms in developing countries.

According to the findings of this study, there are critical insights for policymakers and industrial exporting firms in Sri Lanka and also for developing countries. While economic and social sustainability practices boost export performance, environmental sustainability practice adoption hinders export performance due to high operational costs, limited financial capacity, and technological constraints. This highlights the required support through green financial schemes, subsidies, and technical assistance to support firms in adopting environmentally friendly practices without hindering competitiveness. By strengthening institutional capacity and providing expertise in this area, resource-efficient technologies can address this gap at the firm level. Policy makers should adopt a flexible regulatory framework aligned with sustainability and domestic industrial realities. Moreover, trade agreements and regional cooperation should also address sustainability transitions. These implications underscore the importance of context-sensitive, balanced sustainability strategies in developing economies.

While this study provides insights into how sustainability practices impact the export performance of industrial exporting firms in Sri Lanka, certain limitations should be acknowledged. As the study was based on a relatively small sample size and cross-sectional survey data, there were challenges including potential endogeneity and possibility of omitted variable bias and reverse causality. Nevertheless, the study aims to investigate the impact of economic, social and environmental sustainability practices on export performance at firm level. The model could be expanded into more dimensions, potential mediators, and the analysis does not account for variations between industries, which could shape how sustainability can impact export performance at the firm level. Additionally, the absence of firm level characteristics may bias the relationships and study acknowledge the selection bias

because of only focusing on exporting firms in a specific industrial context, limiting the generalizability to the broader population. These limitations provide valuable directions for future research with the contributed insights of this study, by expanding the framework and using longitudinal data with firm-level characteristics.

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