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This is the author's manuscript

Original Citation:

Availability:

This version is available <http://hdl.handle.net/2318/2040750> since 2024-12-21T09:50:55Z

Published version:

DOI:10.1002/sd.3301

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RESEARCH ARTICLE OPEN ACCESS

The Impact of Voluntary Environmental Standards on Domestic and Foreign Sales Growth: Evidence From Pakistan

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Received: 6 September 2024 | **Revised:** 4 November 2024 | **Accepted:** 22 November 2024

Keywords: domestic sales growth | eco-labeling | environmental management standards | foreign sales growth | voluntary environmental standards

ABSTRACT

In the current business environment, voluntary environmental standards (VES), including environmental management standards (EMS) and eco-labeling schemes, have become important organizational tools to increase firms' market competitiveness and sustainability. This study provides novel insights by empirically examining the effects of EMS (ISO 14001) and eco-label certifications on domestic and foreign sales growth, specifically in the context of Pakistani firms. The study utilized data from 245 listed firms from 2009 to 2023 to accomplish this objective. The study applied panel econometric regression analysis to estimate the results empirically. The results showed a positive impact of VES on firms' domestic and foreign sales growth. In particular, manufacturing firms that comply with ISO 14001 standards and textile firms with eco-label certification have exceptionally high domestic and foreign sales growth. The study's outcomes indicate that adopting VES can serve as a valuable strategy for enhancing firms' market competitiveness and expanding their sales in both domestic and international markets. The result suggests that VES enhances market competitiveness and offers a pathway for sustainable growth strategies, specifically in developing economies like Pakistan. Notably, by promoting VES, policymakers can support firms in improving their international market presence and contributing to broader sustainable development goals.

1 | Introduction

In today's dynamic business landscape, achieving profitability and sales growth remains a primary objective for organizations (Haessler 2020). However, this pursuit of economic success often comes at a significant environmental cost when business practices prioritize short-term financial gains over long-term sustainability (Haessler 2020). Business practices became evident as firms grew their operations, attempting to gain a larger market share (Amini and Rahmani 2023). This recognition has been converted into a change in company strategies by focusing more on sustainability. Companies that do not deal with the environment will lose their competitive advantage in domestic as well

as international markets (Cerciello, Busato, and Taddeo 2023). They figured out that with time, their long-term success and their competition advantage largely hinged on getting to incorporate sustainable practices into their operations (Cerciello, Busato, and Taddeo 2023).

Consequently, firms are implementing voluntary environmental standards (VES). This indicates that adopting VES proves a company is serious about sustainability (Hayat, Hussain, and Lohano 2020). By doing so, firms can decrease their negative environmental impact and increase operational efficiency. VES-compliant companies are willing to reduce their environmental impacts and participate in sustainable development (Alfredo

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and Nurcahyo 2018). Crucially, eco-labeling and environmental management standards (EMS) (ISO 14001) are the most significant types of VES. It refers to the certification of products that meet specific environmental standards. These labels are like seals of certification, which means that the products were made in an environmentally friendly way. Companies that go for eco-labeling certifications (ISO 14024, ISO 14021, and ISO 14025) can inform consumers that their products are sustainable. Nevertheless, the companies that have obtained ISO 14000 certification show a strategic approach to environmental considerations in all their activities. They actively seek to reduce waste and emissions and improve resource efficiency (Brandi 2017; Ojiako et al. 2024). It is essential to highlight that many developing economies, like Bangladesh and India, have also begun implementing similar sustainability initiatives, particularly in micro, small, and medium-sized enterprises (MSMEs) (Dhar, Zaman, and Dhar 2024; Shetty and Kumar 2017). This broader adoption of VES in developing countries highlights the global relevance of sustainability practices in fostering competitive advantage.

This current world, has been facing with increasing awareness of the environment and the need to run sustainable businesses (Olawumi and Chan 2018). Consequently, it has become essential to analyze the market outcome influence of VES for businesses that seek to remain in the competitive global markets. Beyond compliance with regulatory requirements on sustainability, these standards also reach out (Tole and Koop 2013). According to the literature, eco-labeling and ISO 14001 certifications allow firms to contend with market complexities in the contemporary world (Khan and Jehan 2023). They are the blueprint for operational excellence and competitive advantage in local and international markets. The adoption of VES can further improve a firm's reputation and strengthen its ties with stakeholders (Chen, He, and Qiao 2022). Organizations that commit to sustainability gain the trust of consumers,

investors, and other businesses. Increased customer loyalty, higher investor confidence, and more opportunities for strategic partnerships are just a couple of things that can result from an enhanced reputation. This, in turn, is favorable for sales growth (Whelan and Kronthal-Sacco 2019). Additionally, VES enables firms to acquire market recognition as they have an edge over other firms in the market for the production of environmentally certified products (Bennett 2018; Young and Reeves 2020). This not only supports the firms in fulfilling the increasing requirement for green products but also enables the firms to emerge as market leaders in domestic as well as international markets (Tian et al. 2024). Figure 1 elucidates the transmission mechanism by which adherence to VES helps firms achieve a competitive edge in domestic and international markets by increasing their sales performance.

Despite the significant importance of VES (eco-labeling and ISO 14000 certification) in modern business practices, the relationship between VES adoption and firm-level sales growth still needs to be explored, especially in developing economies like Pakistan. While existing research has primarily concentrated on the broader advantages of VES, such as regulatory compliance and operational efficiencies. Only a few studies have been conducted to measure the business outcomes of these standards, where domestic and foreign sales growth are the tangible outcomes. Moreover, this gap in the information is particularly acute as the demand for products with environmental certification increases worldwide, and as firms are increasingly pressured to demonstrate their actions toward sustainability. In Pakistan, where sustainable business practices are still developing, there must be empirical evidence that VES adoption can impact core financial metrics in sectors like manufacturing and textiles, such as sectors that are critical to the economy. Despite this growing demand, it is surprising that there have not been more focused research efforts into VES, especially given the rising expectations from

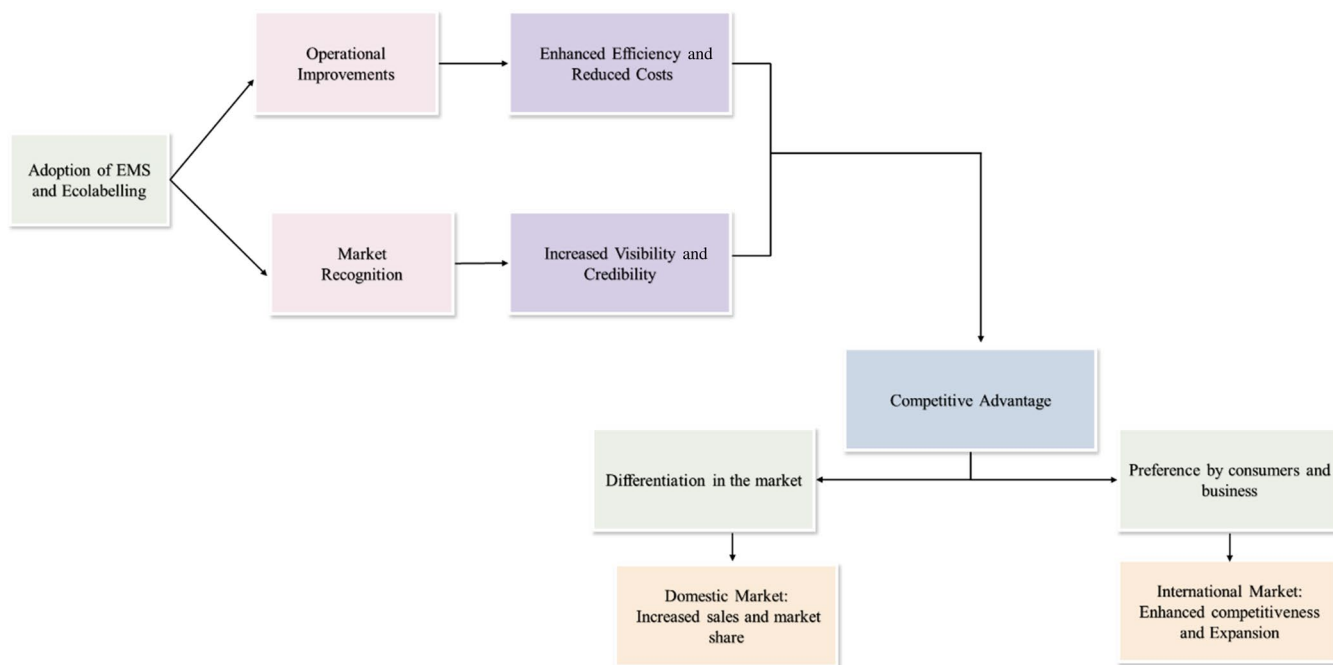


FIGURE 1 | Transmission channel between adherence to VES and sales growth. *Source:* author's elaboration.

international markets for sustainability compliance, and without this gap filled, businesses and policymakers may be missing vital knowledge about how to use VES in the pursuit of both competitive advantage and market penetration. Thus, it is crucial to close this gap by examining the direct influence of eco-labeled and ISO 14001-certified products on firm sales to understand how VES can contribute to the growth of firms in developing market environments. Given this research gap, our study distinguished itself by addressing this gap. To this end, our study examines the impact of eco-labeling and ISO 14001 certification on the domestic and international sales growth of Pakistani firms, with a particular emphasis on the manufacturing and textile sectors. Our goal is to investigate the extent to which firms that meet these environmental standards observe a material increase in the sales metrics for these firms relative to firms that do not. This research provides critical insights into how VES adoption can positively contribute to market competitiveness and sales growth, especially in sectors where sustainability trends continue to be a point of influence. It is essential for business leaders who attempt to incorporate sustainability into their strategic decisions to understand these dynamics and for policymakers looking to spur the adoption of VES to enhance economic growth. This study contributes significantly to the body of knowledge on the economic impact of VES on sales growth by completing a detailed analysis of the success of sustainable business practices in generating a competitive advantage and long-term success in the increasingly competitive global business environment.

The structure of this paper is presented as follows: Part 2 gives a detailed literature review with the study's theoretical foundation. In Section 3, we develop the methodology, data, and economic models used in this study. In Section 4, this analysis is presented and discussed. In the final section, we conclude the study by discussing policy implications, remaining limitations, and future research directions.

2 | Literature Review

Literature has often focused VES, including eco-labeling and ISO 14001. Scholars have studied the effectiveness of these standards in different contexts and with different methodological approaches, and many studies have been conducted. The collective body of research suggests that eco-labeling and ISO 14001 confer several firm advantages (Rubio-Jovel et al. 2024), particularly in terms of market outcomes such as enhanced market competitiveness, profitability, sales growth, operational efficiency, and innovation performance.

Bu, Qiao, and Liu (2020) investigated the impact of voluntary environmental certification, specifically ISO 14001, on firm innovation. The study found that firms with ISO 14001 certification tended to allocate more resources to innovative activities. This helps them achieve tangible outcomes regarding new products and improves their sales growth. Their findings were similar to those of Dangelico (2017). The author found that ISO 14001 certification helps introduce new products into the market that meet high environmental standards. The product innovation of these attractions appeals to consumers who consider sustainability necessary, thus increasing domestic sales.

Ye, Yeung, and Huo (2020) performed their study on the effects of eco-labeling. Some studies have established that products with recognized eco-labels sell well in local markets. In conclusion, this study found that eco-label certification not only assists the firms in meeting environmental standards but also moves the firms to sustainable development and increases the competitiveness of their product in the market. Nishitani et al. (2012) suggest that firms embracing ISO 14001 practices enjoy higher sales growth and profitability and excel in terms of their sustainability performance metrics. Sigurdsson et al. (2022) examined the effects of sustainability labels and certifications on consumers' willingness to pay. According to the findings of the research, products with sustainability and eco-labels had a higher rate of sales growth. It shows that VES significantly affects the firm's sales growth. Le, Ferraris, and Dhar (2023) investigated how circular economy, eco-innovation, and cleaner production contribute to the resilience of production systems and found the positive impact of all these factors on the resilience of the production system. The author concluded that integrating eco-innovation in production processes not only mitigates environmental impacts but also strengthens firms' market competitiveness. In this way, their study provides a framework that supports the idea that VES can lead to significant improvements in the operational efficiency of the firm.

Neves et al. (2023) extended the research to the overall effect of ISO 14001 certification on corporate performance and found that firms with environment certification have better corporate performance. In particular, the study demonstrates that ISO 14001 allows one to enter foreign markets, thus extending sales to other countries. Iraldo, Testa, and Frey (2009) stated that following environmental standards positively affects the organization's image and its relations with stakeholders. Arocena, Orcos, and Zouaghi (2021) showed how ISO 14001 certification gives an edge to the firms over their competitors through increased reputation in the global markets.

Ali, Chen, and Hao (2021) showed that ISO 14001 fosters the firm's sustainable product innovation that caters to the growing consumer demand for eco-friendly options. Wojnarowska, Sołtysik, and Prusak (2021) found that consumers are likely to be guided by eco-labeling when purchasing. That is, the firms employing eco-labeling are likely to achieve high sales growth rates. Lutfi et al. (2023) also discussed the significant influence of environmental certifications on the firm sales performance. Grolleau, Mzoughi, and Pekovic (2013) found that firms adhering to environmental standards experience high sales growth because such standards enhance consumer trust and market differentiation. Neves et al. (2023) focused on the effects of ISO 14001 and ISO 9001 certification on the performance of the Euronext Lisbon listed companies from Portugal. The research findings showed that both ISOs enhance the market competitiveness of Portuguese firms. Shima and Fung (2019) showed that due to the firms' compliance with environmental and quality standards, they can receive an international certification and become more competitive in the global market. Similarly, Bukhari and Hayat (2024a, 2024b) also documented the favorable impact of VES.

By synthesizing the above literature, it is clear that while there has been extensive research on VES like eco-labeling

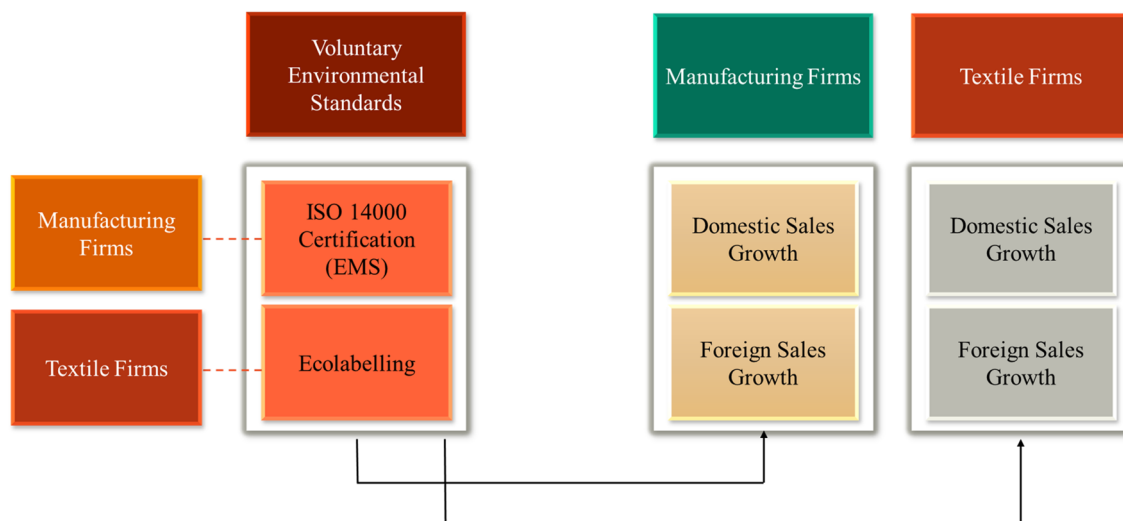


FIGURE 2 | Conceptual framework.

and ISO 14001 on broader benefits, including improvement in operational efficiency, regulatory compliance, and environmental performance, very little empirical work has been done trying to assess their direct impact on sales growth. While much of the existing research focuses on the ways in which these standards lead to an overall improvement in firm market position, minor explores the direct effects on domestic and foreign sales. Determining whether packaging design can draw greater demand for the same products while reducing throughput, inventory, and packaging scrap using less material is in its infancy, and issues of scale still remain to be resolved. Given the increasing global focus on sustainability as a driver of competitive advantage, this lack of specific inquiry highlights a significant limitation in the current body of research. Understanding how VES impacts sales growth is critical, particularly in regions like Pakistan, where adopting these standards could provide firms with tangible competitive benefits. Addressing this gap will enhance the understanding of the economic value of VES and its strategic importance for businesses in emerging markets.

2.1 | Theoretical Background

The theoretical framework of this study is drawn from the vertical differentiation model, which has been established as a sound theoretical framework for explaining the role of eco-labeling and environmental certification in enhancing firms' sales growth in the domestic and international marketplace (Baron 2020). This model indicates that products differ based on quality, and higher quality means it experiences higher consumer demand and can charge premium prices (Ferreira and Thisse 1996). Regarding VES, certifications such as eco-labeling and ISO 14000 are evidence of a firm's intentions to use quality and environmentally sound production practices. This can be related to the Signaling Theory, as described by Spence (1978), regarding how firms signal or convey a quality that might otherwise be impossible to confirm by the consumers. In the world of VES, when talking about eco-labeling, adhering to the ISO 14000 certification means product quality. Companies adhere to these standards and signal their commitment to sustainable, high-quality production to

consumers. The unique thing about this signaling effect is that it attracts environmentally conscious consumers who seek to purchase products that meaningfully reflect the said consumer's values of contributing to positive, sustainable development (Testa et al. 2015). For instance, eco-labels and ISO 14000 certification assure consumers that the products are manufactured under environmental responsibility (Prieto-Sandoval et al. 2020). In today's market, with increasing customer awareness and concern for environmental matters, this is becoming increasingly important. These certifications are readily displayed and can serve to help firms differentiate their products from those of firms not meeting these standards. Such differentiation helps to fulfill the expectations of existing environmentally old clients and extends the market's reach for new clients affected by such standards. This could, therefore, give rise to greater product demand and increased sales growth as firms are fed into a rising market for sustainable products.

In addition to this, these standards give firms a huge competitive advantage in international markets (Arocena, Orcos, and Zouaghi 2021). ISO 14000 certifications and eco-labels are recognized worldwide and are therefore used to access markets that have very high environmental regulations requirements (e.g., in the European Union and North America). For instance, firms that adhere to such standards can enter these markets easily and have a competitive advantage over other firms because they can meet the high environmental expectations of consumers and regulators. The compliance will allow firms to enter new market opportunities and higher sales revenues due to the ability to charge premium prices for their certified products.

First, it is worth noting that the vertical differentiation model has been used in analyses to measure the economic implications of VES on market performance, this was first done by Ben Youssef and Abderrazak (2009) They also showed that adopting such standards also came attached to positive economic outcomes by increasing product differentiation and fulfilling consumer expectations on product quality and sustainability. Building on their foundational insights, we aim to apply this model to analyze how eco-labeling and ISO 14001 impact the sales growth of manufacturing and textile firms

in Pakistan. We explore how these two types of VES—eco-labeling and ISO 14001—affect the domestic and international sales growth of Pakistani firms. Specifically, our research assesses whether textile firms that follow eco-labeling and manufacturing firms that adopt ISO 14001 experience a notable increase in their sales performance compared to those that do not.

Accordingly, the conceptual framework of the study is presented in Figure 2.

Accordingly, the proposed hypotheses that need to be tested are stated as follows:

H1a. *The adoption of environmental management standards has a positive and significant impact on firm local sales growth.*

H1b. *The adoption of environmental management standards has a positive and significant impact on firm foreign sales growth.*

H2a. *Ecolabeling have a positive and significant impact on firm local sales growth.*

H2b. *Ecolabeling have a positive and significant impact on firm foreign sales growth.*

3 | Econometric Methodology

3.1 | Data Sources and Sample Description

This study utilizes panel data from 245 firms across 12 manufacturing industries listed on the Pakistan Stock Exchange (PSX) from 2009 to 2023. The sample includes 94 firms from the textile sector and 151 firms from other manufacturing industries, such as cement and chemicals. The time period from 2009 to 2023 was specifically chosen because it captures a phase of significant global and national shifts toward sustainability. During this time, Pakistan's industrial sector experienced rapid growth while simultaneously facing increasing global pressures to comply with stricter environmental standards, particularly from major export markets like Europe and North America. These trends make this period ideal for analyzing the impact of VES adoption on firms' performance.

This is important because textile and manufacturing firms contribute substantially to the Pakistani economy. The country's textile sector plays a particularly important role in contributing to the country's export earnings and operates in a competitive global market, and ensuring compliance with international environmental standards, for example, in terms of eco-labels, is essential to market access (Akhund and Abbas 2023). Since demand for sustainable products is rising worldwide, including in markets with high environmental regulations, and Pakistan depends significantly on its textile exports, this is a critical case to study how eco-labeling affects firm performance. However, compliance with eco-labeling standards is not only compliance with the law but also a strategic tool for Pakistan to increase the competitiveness of its textile firms and to be able to continue access to these markets.

The manufacturing sector, comprising industries such as cement and chemicals, holds an important position in Pakistan's industrial output but is also responsible for considerable environmental problems (Tanveer et al. 2021). However, these industries are under more and more pressure from domestic and international stakeholders (e.g., governments, investors, consumers, and nonprofit organizations) to adopt sustainable practices. In these sectors, the adoption of ISO 14001 certification is a strategic demonstration to reduce environmental impact and improve companies' operational efficiency (Saleem et al. 2023). Pakistani firms must comply with such standards to maintain their position as an advantage in global markets, as these require certified proof of having sustainable operations. Pakistan serves as an ideal case through which one can examine the effect of VES adoption on sales growth in firms that are caught between economic growth and environmental responsibility.

The proposed study variables and their measurement/proxies are presented in Table 1. The measurement and the proxies of the modeled variables have been adopted from the existing studies (Bukhari and Hayat 2024a, 2024b; Hayat, Hussain, and Lohano 2020; Hayat et al. 2024; Malikova, Agadullina, and Tuktarova 2022).

3.2 | Econometric Techniques

3.2.1 | Panel Heterogeneity Test

After collecting the data, the foremost step is to check the econometric properties of the data by employing precautionary tests. This evaluation ensures that the most appropriate econometric techniques are applied, based on data characteristics. We begin our preliminary analysis by detecting panel heterogeneity. This is the most common issue in longitudinal datasets where multiple entities (such as firms) are observed over time. Panel heterogeneity occurs because each firm may possess unique attributes that influence its behavior, and the independent variables do not capture these variations. These differences could be ignored in the analysis, which may lead to an overestimation or underestimation of the parameters of interest. To overcome the panel heterogeneity problem in our study, we applied the Tilde and Tilde Delta tests. As we wanted to find out if there was a difference in the variances in the firms that we have in our panel, we conducted the following tests. The null hypothesis of these tests is that there is no heteroscedasticity; that is, the variance of the firms is constant. The null hypothesis is that there is no panel heterogeneity in the data, so the decision is made to reject the null hypothesis. The econometric forms of these tests are presented in Equations (1) and (2), respectively:

$$\text{Tilde (Delta): } \Delta_{\text{sch}} = (M^{1/2})(2K^{-1/2}) + \left(\frac{1}{M}V - K\right) \quad (1)$$

$$\text{Adjusted tilde (Delta): } \Delta_{\text{asch}} = (M^{1/2})\left(\frac{2k(T-k-1)}{T+1}\right)^{-1/2} + \left(\frac{1}{M}V - 2K\right) \quad (2)$$

TABLE 1 | Variables and their measurements.

Variable	Definitions
Dependent variable	
Domestic sale growth	The rate at which a firm's revenue from sales within its home country increases over a year.
Foreign sale growth	The rate at which a firm's revenue from sales outside its home country increases over a year.
Independent variable	
Firm age	The firm's age indicates the duration it has been functioning since its inception.
Firm size	The total number of its employees determines the size of a firm.
Energy consumption	The amount of energy utilized in the production process.
Gross production	Gross production is assessed through total factor productivity (TFP), indicating how well inputs are converted into outputs.
Raw material consumption	Refers to the logarithmic measure of the raw materials used by the firm in its production processes.
Resource efficiency index	This index measures how efficiently a firm utilizes its resources to produce output.
Inventory turnover ratio	This measures the frequency with which a firm sells and replenishes its inventory over a specified period.
Trade debt	Refers to the logarithmic measure of the debt owed by the firm to its suppliers and other creditors.
Market share	The market share of a company represents its percentage of total sales relative to the combined sales of all companies in the sample.
Gross profit	Refers to the logarithmic measure of the firm's total revenue minus the cost of goods sold (COGS).
Selling and distribution expenses	Refers to the expenses associated with selling and distributing products, including advertising, sales salaries, and delivery costs.
depreciation	Refers to the logarithmic measure of the reduction in the value of the firm's tangible fixed assets due to wear and tear over time.
Capital intensity ratio	The capital intensity ratio measures a firm's reliance on capital investments, calculated as the inverse of the asset turnover ratio.

3.2.2 | Cross-Sectional Dependency (CSD)

Moving forward, we examined the issue of the CSD. The problem of CSD is a significant concern in panel datasets, and ignoring it leads to distorted outcomes. CSD occurs when observations across different entities within the panel are correlated and disturb the outcomes of one another. We applied the Bruesch Pagan LM and Pesaran CD tests to identify the presence of CSD in our dataset. Both tests are widely employed in literature to detect CSD. Both tests detect the issue of the CSD under the null hypothesis of cross-sectional independence. The rejection of the null hypothesis states that the data suffers from the problem of CSD. The econometric forms of both tests are presented in Equations (3) and (4).

$$\text{Breusch - Pagan LM: } LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \quad (3)$$

$$\text{Pesaran CD: } CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij} \quad (4)$$

3.2.3 | Panel Regression

After confirming the econometric properties of the data, we took support from the panel regression model to test the hypothesized relationship among the pertinent variables.

Moreover, the econometric specification of our models is presented in Equations (5) and (6), respectively.

$$DSG_{it} = \alpha_i + \lambda_t + \alpha_1 DECO_{it} + \alpha_2 DEMS_{it} + \alpha_3 Z_{it} + \mu_{it1} \quad (5)$$

$$FSG_{it} = \alpha_i + \lambda_t + \alpha_1 DECO_{it} + \alpha_2 DEMS_{it} + \alpha_3 Z_{it} + \mu_{it2} \quad (6)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

here DSG_{it} is the domestic sales growth of the i th firm in time t , FSG_{it} is the foreign sales growth of the i th firm in time t , $DECO_{it}$ is an independent dummy variable that represents 1 if the firm is eco-label certified in time t and 0 if the firm is not eco-label certified, $DEMS_{it}$ is an independent dummy variable that represents 1 if the firm is ISO 14001 certified in time t and 0 if the firm is not ISO 14001 certified, Z_{it} is the set of time-variant independent variables that affect the domestic and foreign sales growth of the firm, and μ_{it1} and μ_{it2} are the disturbance terms. The coefficient α_i represents the firm effect and replicates left-out variables which remain roughly the same over time for the i th firm and capture unobservable firm heterogeneity. λ_t represents the time/year effect and replicates omitted variables that affect the i th firm in time period t . Equations (1) and (2) are the generalized form of the two-way fixed effect panel data models. Lastly, the parameters such as α and β are the coefficients that will be estimated. We started by comparing random and fixed effect models in our analysis. We then applied the Hausman test to determine which of these two approaches was most appropriate. The fixed effect model proved to be the best because of the reasons it solved issues like endogeneity and panel heterogeneity (Hayat et al. 2024). The problem of endogeneity is mitigated using a fixed effect model in which unobservable and time-invariant but firm-specific characteristics that might impact both the adoption and performance of IMS are controlled for. By doing this, we are removing a potential source of bias from omitted variable issues and obtaining better estimates of the actual relationship between the variables. We also controlled for varying time and firm-specific effects by including time and firm-specific dummies. By utilizing this approach, the impact of IMS adoption is not confounded by time period or industry-specific external factors affecting firm performance metrics, hence providing an unbiased view of the relationship between IMS and firm performance metrics. Therefore, with a fixed effect model, it becomes possible to understand more clearly and with more robustness how adopting IMS impacts firm performance without including the effect of unobservable or time-invariant factors.

4 | Empirical Results

4.1 | Descriptive Analysis

Before conducting a detailed analysis, we computed some stylized facts through descriptive analysis. The results are presented in Table 2. The table presents data for two types of firms: manufacturing and textile firms. Each type was further categorized into two groups. For manufacturing firms, the categories are those that follow ISO 14001 and those that do not (without ISO 14001). For textile firms, the categories follow eco-labeling (with eco-labeling) and those that do not (without eco-labeling). The table reports the means and standard deviations (SDs) for various variables, along with t-values indicating the statistical significance of the differences between the groups.

Our analysis reveals that manufacturing firms with ISO 14001 exhibit a notably higher mean value of domestic sales growth (16.513) than those without ISO 14001 (14.487). Furthermore, firms with ISO 14001 also demonstrate a slightly higher

mean value of foreign sales growth (6.893) than firms without ISO 14001 (6.409). Similarly, for textile firms, the data indicate that textile firms with eco-labels have a higher mean value for domestic sales growth (14.281) than those without eco-labels (13.625). More strikingly, the mean value for foreign sales growth for firms with eco-labels (14.778) is substantially greater than those without eco-labels (9.114). These insights are shown in Figure 3. The result suggests that compliance with ISO 14001 and eco-labeling tends to achieve higher domestic and foreign sales growth.

4.2 | Correlation Analysis

After reviewing the relevant variables' characteristics, we tested correlations among the modeled variables to check for multicollinearity. Identifying multicollinearity is essential because it can inflate the variances of coefficient estimates, making the model less stable and more complicated to interpret. This could clear the relationships between variables, potentially leading to unreliable results. The heat plot matrix in Figure 4 presents the correlations between our explanatory variables, none exceeding 0.80. This indicates that multicollinearity is not an issue in our dataset. The absence of multicollinearity is essential for ensuring the accuracy of our findings, as it allows us to interpret the individual effects of each explanatory variable confidently. We can draw more valid conclusions from the analysis by ensuring our model is stable and reliable.

4.3 | Panel Heterogeneity

After detecting the problem of multicollinearity, we move forward to test the problem of heterogeneity in our data set. We have employed Tilde and Tilde Delta tests to detect this issue. The results are reported in Table 3. The significant test statistics show substantial differences in variances across the firms. These findings confirm the presence of panel heterogeneity, suggesting that each firm has unique characteristics that significantly affect their variances. In simpler terms, the test reveals that firms in our study are not the same or homogenous. They differ in ways that affect their performance. For example, differences could arise from firm size, industry type, market conditions, or management practices. One firm might benefit more from environmental certifications because of its larger export market, while another might have less impact due to its focus on domestic sales. Recognizing these variations allows us to account for them in our analysis, making our results more accurate. Therefore, we applied a fixed effect model. This strengthens the study's validity by ensuring that we do not treat all firms as if they respond similarly to environmental standards.

4.4 | Cross-Sectional Dependency

After detecting the issue of heterogeneity, we extend our estimation circle towards the detection of CSD. We have employed Bruesch Pagon and Pesaran CD tests to detect this issue. The results are reported in Table 4. The insignificant test statistics of Bruesch Pagon and Pesaran CD suggest that the data is free from the problem of CSD. The result implies that the observations in

TABLE 2 | Descriptive statistics.

Variable	Manufacturing firms			Textile firms		
	A firm with ISO 14001	Firm without ISO 14001	<i>t</i>	Firm with eco-label	Firm without eco-label	<i>t</i>
	Mean and SD	Mean and SD		Mean and SD	Mean and SD	
Domestic sale growth	16.513 (1.821)	14.487 (2.343)	-16.265	14.281 (2.537)	13.625 (2.783)	-3.237
Foreign sale growth	6.893 (6.827)	6.409 (6.503)	23.041	14.778 (2.674)	9.114 (0.249)	-13.078
Firm age	36.615 (25.828)	35.751 (16.850)	-13.963	35.285 (14.864)	33.388 (13.096)	-2.881
Firm size	1742.1 (2435.6)	687.548 (1265.2)	-10.167	3361.5 (4044.4)	1567.1 (2273.5)	-8.496
Energy consumption				0.011 (0.066)	0.006 (0.042)	-1.864
Firm production	14.228 (3.449)	12.706 (3.392)	-7.732	17.441 (0.971)	16.341 (1.312)	-12.011
Raw material	0.072 (0.151)	0.065 (0.164)	-0.787	0.0007 (0.0002)	0.0028 (0.053)	1.842
Resource efficiency	0.110 (0.185)	0.083 (0.171)	-2.68			
Inventories	13.408 (3.354)	12.616 (2.001)	-5.291	14.027 (1.712)	12.511 (2.332)	-9.322
Trade debt	13.183 (3.508)	11.268 (3.076)	-10.213			
Market share	0.006 (0.009)	0.001 (0.002)	-13.762	0.017 (0.016)	0.008 (0.011)	-10.032
Gross profit	14.279 (3.308)	11.416 (4.609)	-11.921	12.533 (3.846)	9.992 (5.013)	-7.223
Selling and distribution expenses	10.959 (4.972)	10.061 (3.546)	-3.762	11.879 (2.047)	9.549 (3.018)	-11.203
Depreciation	13.124 (1.619)	11.201 (2.021)	-17.749	12.066 (1.971)	10.973 (1.762)	-8.083
Capital intensity	1.749 (0.947)	1.728 (0.044)	-2.327			

different cross-sections are statistically independent. In simpler terms, this means that the observations for various firms in our dataset are statistically independent. For example, the performance of one firm does not directly influence or depend on another firm's performance. This is important because it suggests that the firms operate under different conditions or contexts without being influenced by one another, which makes the analysis more reliable.

4.5 | Hypotheses Testing

After preliminary analysis, we finally move towards the regression analysis to test the hypothesized relation among the pertinent variables. The results are reported in Tables 4 and 5. Table 5 reports the effects of VES on the firm's domestic sales growth, whereas Table 6 reports the impact of VES on the firm's foreign sales growth. In both Tables, we have two models; in each table, the first model focuses on the sales growth of manufacturing firms, while the second model in each Table focuses on the sales growth of textile firms.

4.5.1 | Effect of Voluntary Environmental Standards on the Firm's Domestic Sales Growth

4.5.1.1 | EMS (ISO 14001). The coefficient of ISO 14001 in the Model (1) is 0.298, positive and significant at 5% ($p < 0.05$), indicating that ISO 14001 adoption in manufacturing firms

leads to increased domestic sales. This can be attributed to three key factors: operational efficiency, improved reputation, and regulatory alignment. Firms adopting ISO 14001 often achieve cost savings through better resource management and waste reduction, which they can either reinvest into production or pass on to consumers via competitive pricing, boosting sales. Moreover, ISO 14001 enhances a firm's market reputation by signaling that the firm is environmentally responsible to consumers increasingly aware of environmental responsibility. Having this reputation helps to get and keep customers. Finally, compliance with ISO 14001 decreases regulatory risk and gives companies access to environmentally regulated markets. The findings regarding increased sales concerning ISO 14001 implementation are not far from the trends in other developing and developed countries. For instance, in China and Brazil, manufacturing firms have also realized improved sales and competitiveness through ISO 14001 certification (Jiang, Wang, and Zeng 2020; Monteiro, Pereira, and Barbosa 2023). EMS provide a strategic advantage for firms seeking to operate more efficiently and gain access to markets requiring tighter environmental standards in rapidly growing industrial sectors of such countries. Consequently, due to its expanding industrial base and increasing global pressure to adhere to sustainability benchmarks for export markets, Pakistan's case is especially relevant, where ISO 14001 has become highly valuable. However, in developed countries like Germany and the United States, ISO 14001 compliance is consistently pushed by consumer demand for ecologically friendly items and rigid regulatory requirements (Barreiro-Hurle

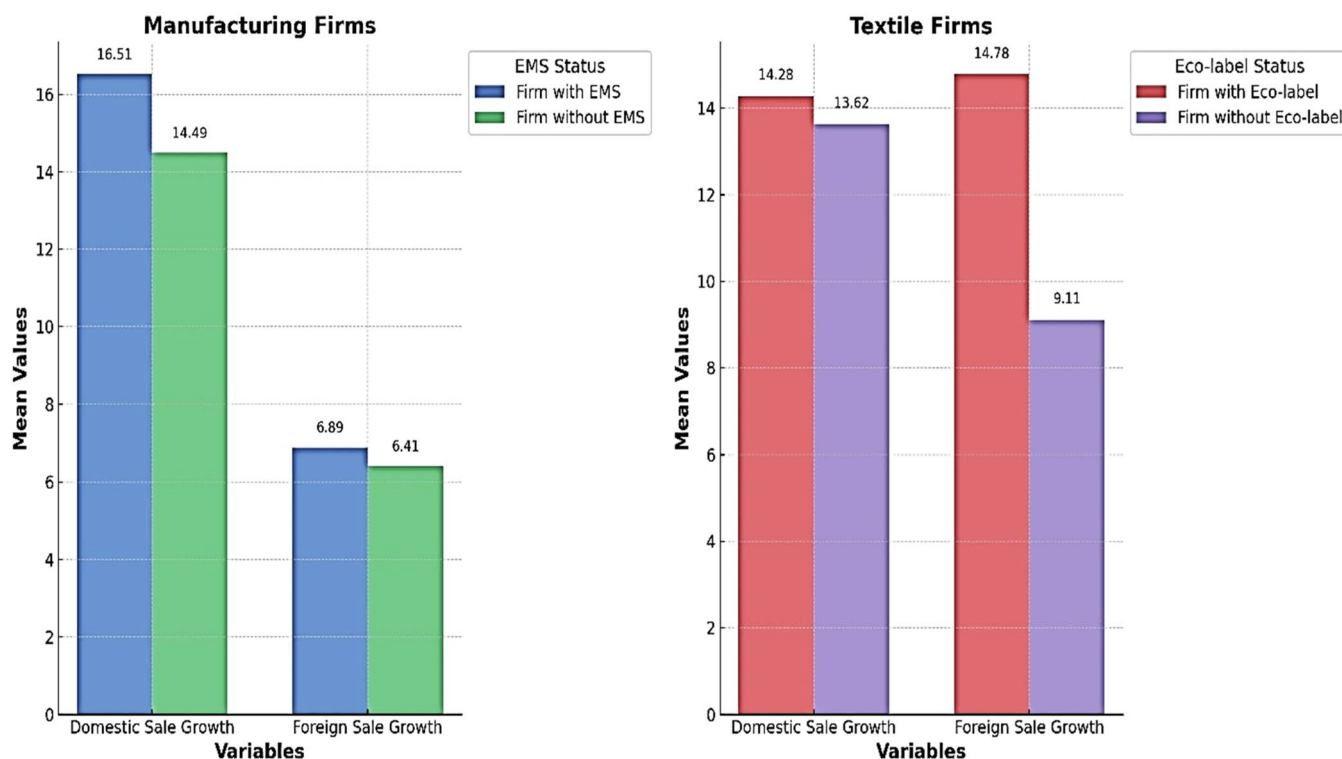


FIGURE 3 | Comparison of firm's domestic and foreign sales growth that adhering to VES standards. *Source:* provided data.

et al. 2023). However, countries at different stages of development attain similar benefits through ISO 14001 as an internationally applicable standard, which underlines the universal relevance of the standard in markets where sustainability is increasingly a critical part of the competitive strategy in both developed and developing economies. This result aligns with, Iraldo, Testa, and Frey (2009) and Martín-de Castro et al. (2016), who also support this view that ISO 14001 certification provides firms with a competitive advantage by reducing compliance risks and improving access to environmentally regulated markets.

4.5.1.2 | Eco-labeling. The coefficient of eco-labeling in Model (2) is 0.704, positive and highly significant at the 1% level ($p < 0.01$), indicating that textile firms that adopt eco-labels experience substantial domestic sales growth compared to those that do not. Eco-labeling is a great tool to capture consumer attention and, specifically, the environmentally aware consumer that the products are of higher environmental standards. This positioning helps eco-labeled firms to segment themselves from other firms, target the green consumer market segment, and gain higher brand equity. Also, eco-labeling assists firms in associating with other international environmental standards, facilitating the firms' entry into new markets, such as the European Union and North America, which have strict standards. The positive effects of eco-labeling on the sales growth in the textile sector in Pakistan are similar to findings in other developing countries such as Bangladesh and Vietnam. Both countries have seen that through eco-labeling, textile firms have been able to open new markets and increase sales in response to the growing global concern for sustainable products (Dhar, Zaman, and Dhar 2024; Le, Ferraris, and Dhar 2023). These findings also fit a broader pattern in

developing countries where export sectors like textiles are coming to realize that sustainability certifications provide access to market share and meet international regulations. The Pakistani context is unique due to the scale of the contribution of textile products to the exports, which makes eco-labeling a critical strategy for accessing and expanding the market. Eco-labeling has been equally essential in developed markets like the European Union, serving to comply with but also promote consumer trust in environmentally certified products and, therefore, differentiate the marketplace (Prieto-Sandoval et al. 2020). The globally aligned suggestion is that eco-labeling should now be seen as a critical driver of competitiveness across widely differing contexts in economies and that firms are using it to meet regulation and consumer expectations. Consequently, the favorable implication for eco-labeling and domestic growth in sales in textile firms is justified. Overall, the findings of the study are aligned with Boulatoff, Boyer, and Ciccone (2013), Hayat, Hussain, and Lohano (2020), Iraldo, Testa, and Frey (2009), Wen and Lee (2020), and Margaret, Schoubben, and Verwaal (2024).

4.5.2 | Effect of Voluntary Environmental Standards on the Firms' Foreign Sales Growth

4.5.2.1 | Environmental Management Standards. In Model (3), the coefficient for ISO 14001 is 1.427 ($p < 0.01$), statistically significant and positive, indicating that ISO 14001 adoption is strongly associated with foreign sales growth in manufacturing firms. Several factors explain this positive relationship in that they permit firms to broaden their international reach. Specifically, compliance with ISO 14001 facilitates compliance with the stringent environmental policies administered in many international markets (particularly the European

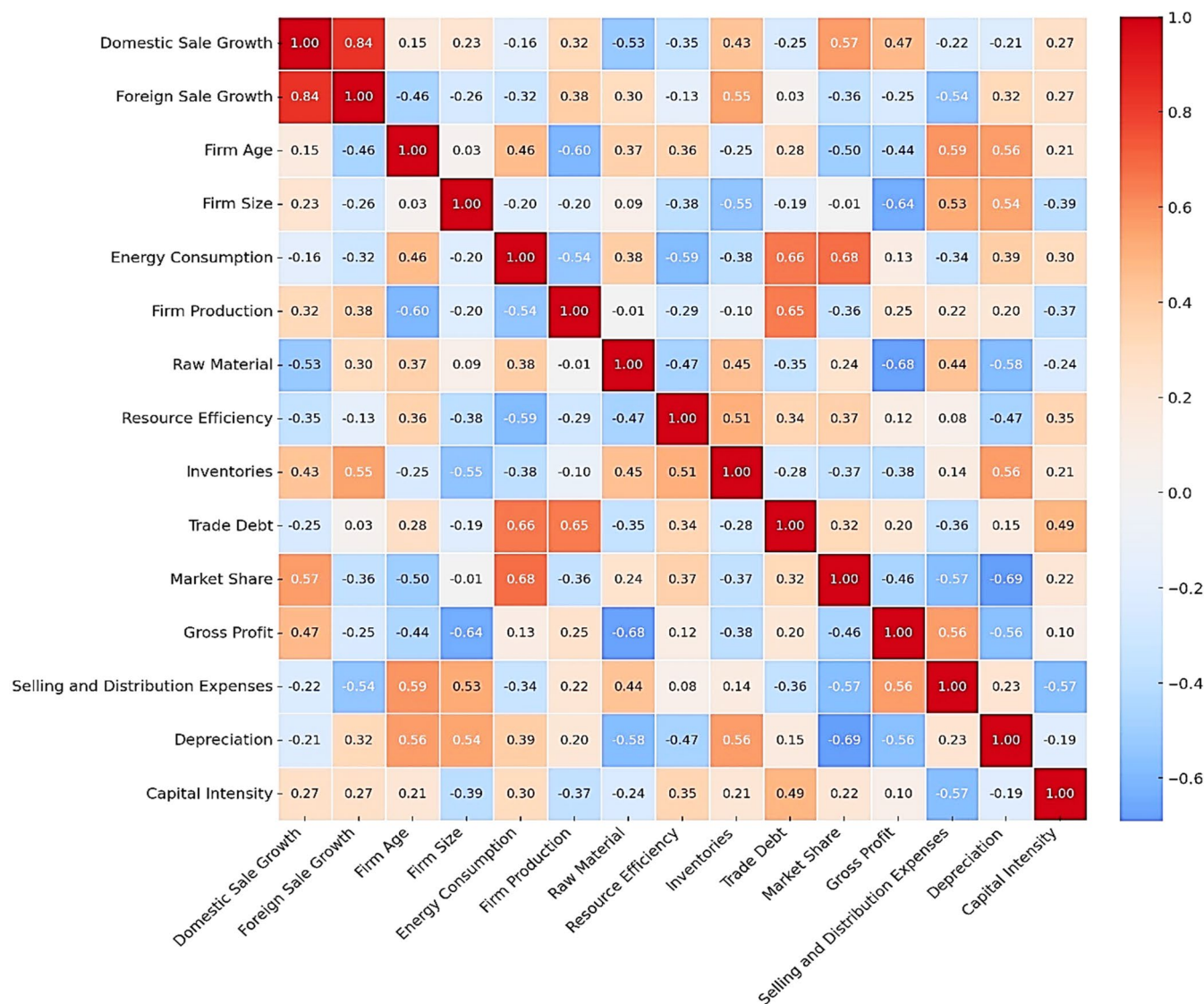


FIGURE 4 | Heat plot matrix.

Union and North America), due to which manufacturing firms are likely to be denied access to those markets if they do not meet the regulations. There are also regions where firms must meet specific environmental standards before allowing them to enter their market. Adopting ISO 14001 provides firms with easier access to regulated markets and new business opportunities with multinational corporations and government bodies motivated by environmental compliance requirements (Hrdlicka and Kruglanskas 2010). A similar trend is observed in other developing economies like Brazil and India, where ISO 14001 has greatly assisted firms in entering the global market by meeting international environmental standards (Radomsky and Leal 2015). In these countries, just like in Pakistan, ISO 14001 is a critical tool for overcoming regulatory barriers, making it easier for firms to expand their global market presence. Second, in addition to legal compliance in an international market, ISO 14001 certification benefits a company's image. Many buyers now consider the sustainability of a product when making a purchasing decision, and any organization with the ISO 14001 certification is likely to stand out. It is essential in sectors where foreign buyers increasingly require suppliers with sustainability credentials.

For example, ISO 14001 certified firms in China can differentiate themselves in European markets, where sustainability is a significant issue (Gonzalez-Torres et al. 2023). This reputational boost not only attracts new clients but also strengthens the relationship with current foreign clients and maintains loyalty and long-term sales growth (Halis and Halis 2022). Third, with the implementation of ISO 14001, the firm's environmental management systems have been strengthened to prevent production disruptions caused by environmental incidents. Firms adopting ISO 14001 can more effectively deal with environmental risks, comply with international regulations and avoid costly consequences, such as pollution penalties or operational shutdowns. This is vital in meeting international orders since any disturbance can lead to the loss of the foreign buyer. Similar improvements have also been observed in other countries, such as Mexico and Turkey, where ISO 14001 has enabled firms to sustain production and meet the expectations of international buyers (Arroyo-Lambaer et al. 2022). In Pakistan, it is crucial to minimize the risk of production stoppages to ensure the foreign buyers' confidence and that they will order from the firm again, which is essential to foreign sales growth. Lastly,

TABLE 3 | Panel Heterogeneity.

Variables	Tilde	Tilde Delta
ISO 14001	7.845***	9.237***
Eco-label	6.389***	11.274***
Domestic sale growth	9.385***	10.375***
Foreign sale growth	12.895***	9.263***
Firm age	8.229***	5.289***
Firm size	9.026***	8.271***
Energy consumption	7.757***	9.112***
Firm production	8.623***	8.286***
Raw material	12.782***	10.379***
Resource efficiency	7.299***	7.022***
Inventories	5.892***	8.273***
Trade debt	7.352***	9.184***
Market share	8.025***	12.811***
Gross profit	7.338***	11.437***
Selling and distribution expenses	10.475***	4.456***
Depreciation	8.274***	5.289***
Capital intensity	7.378***	6.310***

Note: *, **, and *** shows the significance of results at 10%, 5%, and 1%, respectively.

ISO 14001 assists organizations in minimizing the possibility of legal liabilities and closures by continually meeting the pre-set environmental legal standards. This is particularly important for firms operating in markets where environmental laws are strictly enforced, such as the United States and the European Union. Firms that do not meet these requirements may lose access to these critical markets, but ISO 14001 certification reduces this risk and enables firms to focus on market development rather than spending time on compliance. However, in the developed markets, ISO 14001 has been an effective tool for winning contracts with foreign partners since they are looking for reliability and being environmentally responsible (Darnall and Aragón-Correa 2014). Hence, the relationship between EMS and the firm's foreign sales growth is justified. The overall findings are aligned with Hrdlicka and Kruglianskas (2010) and Halis and Halis (2022).

4.5.2.2 | Eco-Label. In Model (4), the coefficient for eco-labeling is 0.875 ($p < 0.01$), statistically significant and positive, indicating that eco-labeling is strongly associated with foreign sales growth in textile firms. Several factors contribute to this positive relationship: First, it improves the product's marketability, especially in the international market, especially in the areas that support environmental conservation. The earlier identified markets, like the European Union, North America, and some parts of Asia, have a considerable customer base looking for green products. It is therefore essential as eco-labels serve as a mark of assurance that these products have been produced to specific environmental standards, which will appeal

TABLE 4 | Cross-Sectional Dependence.

Variables	Bruesch Pagan LM	Pesaran CD
ISO 14001	2.374	1.278
Eco-label	1.324	2.239
Domestic sale growth	4.210	2.208
Foreign sale growth	2.916	0.263
Firm age	1.930	1.113
Firm size	2.783	3.724
Energy consumption	2.927	2.954
Firm production	3.264	2.429
Raw material	2.784	3.864
Resource efficiency	1.983	4.273
Inventories	2.624	3.723
Trade debt	1.841	2.273
Market share	2.076	1.374
Gross profit	0.836	0.273
Selling and distribution expenses	2.276	3.723
Depreciation	1.113	2.284
Capital intensity	2.278	3.274

to the environmentally conscious consumer (Prieto-Sandoval et al. 2020). This is a result of the organization's increased focus on meeting the needs of consumers concerned with sustainability; a factor that has boosted foreign sales. This ability to meet these consumer preferences puts firms with eco-labels in a vantage position in environmentally sensitive markets like trends in developing countries such as Vietnam where eco-labeling has boosted export chances (Le, Ferraris, and Dhar 2023). Second, eco-labeling is often a condition for entry and competition in foreign markets with green bias. These environmental standards are very stringent in various countries, especially developed ones, and firms have to comply with them before they enter the market. These international regulations are only certified by eco-labels, which can also be a mark of quality and sustainability. Eco-label standards can help textile firms with standards, differentiate their products from competitors who do not, and gain a competitive advantage in foreign markets (Khan and Jehan 2023). This compliance boosts credibility and access to markets with high sustainability standards, like what has been observed in Bangladesh, where eco-labels have enabled textile firms to access European markets (Dhar, Zaman, and Dhar 2024). Third, eco-labeling improves the firm's global brand image and reputation. In such a competitive marketplace, customers find it more intriguing to side with those brands showing that they are environmentally responsible. An eco-label is a certification of this commitment, and it increases customer loyalty and draws more consumers into the global marketplace. It not only enables companies to make a strong identity in foreign markets but also enhances sales by creating trust among consumers towards the company's

TABLE 5 | Effect of voluntary environmental standards on the firms' domestic sales growth.

Dependent Variables	(1)	(2)
	Domestic sales growth of manufacturing firms	Domestic sales growth of textile firms
Eco-label		0.704***
ISO 14001	0.298**	
Firm age	-0.0113***	0.014
Firm age square	0.206***	-0.198
Firm size	-0.00002	-0.0001***
Firm size square	-0.0408*	0.150***
Energy consumption index		-8.716***
Raw material consumption index	1.387***	-4.087***
Gross production (ln)	-0.0039**	0.511***
Inventories (ln)	0.0076	0.591***
Market share	-9.415*	-26.402***
Gross profit (ln)	0.124***	-0.0057
Selling and administrative expenditure (ln)	0.143***	0.0052
Depreciation (ln)	0.63***	0.182***
Resource efficiency index	-1.878	
Trade debt (ln)	0.122***	
Capital intensity (ln)	-0.083***	
Time fixed effect	Yes	Yes
Industry fixed effect	Yes	Yes
Constant	2.541***	2.645
R-squared	0.82	0.532
Root MSE	1.018	1.892
Number of observation (245-95 = 150*16 years)	2114	1316
F-statistics	189.60***	47.53***

Note: *, **, and *** shows the significance of results at 10%, 5%, and 1%, respectively.

sustainable activities (Tiboni-Oschilewski et al. 2024). The same trend has been noticed in the European Union, where ecological labels have been the primary driver of brand loyalty and consumer trust (Delmas and Grant 2014). Fourth, using eco-labeling, textile companies can easily adopt a premium pricing strategy. This paper identifies the current market trends of international consumers who are willing to spend more on products that are environmentally certified. The premium pricing of such firms allows them to offset additional costs incurred on sustainable production practices and enjoy higher profit margins. Thus, it is possible for firms to realize growth in foreign sales based on both volume and profitability terms, and therefore positive effects on financial performance are attainable in foreign markets (Prieto-Sandoval et al. 2020). Fifth, eco-labels are a clear competitive advantage in the global marketplace. This paper will seek to answer the following research question: How can firms in the textile industry differentiate themselves to capture consumers' attention as the industry becomes more

competitive? Eco-labeling, by differentiating products as sustainable, becomes a key factor in consumer decision-making, is a clear advantage (Khan and Jehan 2023). In the textile industry especially, the differentiation of brands is essential, as consumers' purchases are defined not only by brand values but also by the sustainability of those products. In order for firms to develop a strong sustainable identity, using eco-labeling for example, that positions them as a market leader, with increased consumer trust and market share. Hence, the positive relationship between eco-labeling and foreign sales growth is justified. The findings are consistent with Prieto-Sandoval et al. (2020), Khan and Jehan (2023), and Tiboni-Oschilewski et al. (2024).

5 | Conclusion and Policy Recommendations

In today's business environment, where sustainability has become integral to long-term success, firms increasingly recognize

TABLE 6 | Effect of voluntary environmental standards on the firms' foreign sales growth.

Dependent variables	(3)	(4)
	Foreign sales growth of manufacturing firms	Foreign sales growth of textile firms
Eco-label		0.875***
ISO 14001	1.427***	
Firm age	-0.0068	-0.101***
Firm age square (ln)	0.415	1.188***
Firm size	-0.0008***	0.0001**
Firm size square (ln)	0.670***	0.437***
Energy consumption (iec)		1.689
Raw material (irm)	-7.883***	0.325
Resource efficiency index (REI)	6.139**	
Gross production (ln)	0.0138	0.469***
Inventories (ln)	0.0429	-0.255***
Market share	10.284	-5.494
Gross profit (ln)	0.097**	-0.047**
Selling and administrative exp. (ln)	0.425***	0.589***
Depreciation (ln)	0.0327	0.291***
Export share		9.501***
Trade debt (ln)	0.0091	
Capital intensity (ln)	-0.076	
Time effect	Yes	Yes
Industry fixed effect	Yes	Yes
Constant	-10.247***	-17.277***
R-square	0.215	0.724
Root MSE	5.923	3.369
Number of observation	2114	1316
F-statistics	14.38	104.49

Note: *, **, and *** shows the significance of results at 10%, 5%, and 1%, respectively.

the importance of integrating environmental responsibility into their operations. The historical focus on short-term profitability often resulted in environmental degradation, prompting a shift towards practices that balance economic growth with ecological stewardship. VES including ISO 14001 and eco-labeling systems have been developed as potential solutions for reducing environmental effects and, at the same time, increasing market competitiveness within both domestic and international markets. Using data from 245 firms and 12 manufacturing industries in Pakistan over the period 2009–2023, this study aimed to determine the effects of VES on the domestic and foreign sales growth of firms.

Our findings provide critical insights into the role of VES in enhancing firm performance, contributing to the theoretical understanding of how sustainability initiatives translate into

tangible business outcomes. By demonstrating that adopting ISO 14001 and eco-labeling leads to increased sales, our study empirically supports the argument that sustainability-driven practices are not merely compliance tools but drivers of competitive advantage. This study fills a gap in the literature, particularly in the context of developing economies, where research on the direct impact of VES on sales growth has been limited. The results highlight that VES adoption can improve operational efficiency, reduce costs, and enhance a firm reputation, contributing to better market positioning and financial performance and closing the theoretical loop on the linkage between sustainability and firm competitiveness.

From a managerial perspective, the results of this study highlight the strategic importance of VES for firms aiming to

enhance domestic and foreign market performance. ISO 14001 and eco-labeling should be seen not as optional but as critical to maintaining a competitive advantage in increasingly sustainability-conscious markets. Adopting these standards allows firms to attract environmentally conscious consumers, maintain customer loyalty, and gain access to the market with environmental constraints. Yet VES also creates internal challenges for firms to overcome in implementation—namely, a need for technical expertise and ongoing compliance. Consequently, managers should invest in training and capacity building to increase the firm's capacity to fully capitalize on the benefits of VES with the awareness of sustainability embedded throughout the organization. Firms' failure to adopt VES jeopardizes losing out to competitors aligning with global sustainability expectations.

However, despite the apparent benefits of implementing VES standards, firms and minimal and medium-sized enterprises (SMEs) will need to overcome several significant impediments to adopting these standards. Upfront costs for certification, compliance fees on an ongoing scale, and required technical know-how can put smaller firms off employing VES, restricting their use to larger companies with enough resources. However, if not addressed, this could result in a two-tiered business environment, with large companies gaining from effective sustainability practices and SMEs failing to do so. Targeted interventional support mechanisms are required to overcome these challenges.

To make VES more broadly adapted, governments and policymakers must play a more active role in developing an enabling environment. Financial incentives, such as subsidies, tax breaks, or grants, can be provided to offset the initial costs of certification and compliance for companies, especially SMEs to achieve this. Additionally, policymakers should emphasize the need to harmonize national environmental regulations with international standards, for example, the European Union's eco-labeling prerequisites, making it significantly easier to get certified and, thus, to enter the global marketplace. The complexity of the certification process can also be overcome with technical support and training programs to enhance the firm's capacity. Governments and firms of all sizes support the adoption of VES through government financial and technical assistance, enabling the improvement of the environmental performance of key industrial sectors.

Financial institutions must formulate green financing products as a first step in promoting VES adoption. Firms can utilize low-interest loans, favorable credit conditions, or sustainability-linked bonds to meet the necessary financial resources to implement ISO 14001 and go for eco-labeling certification. In addition to reducing the financial burden on firms, green financing initiatives place sustainable practice within the private sector on a broader adoption path.

Similarly, this study suggests that industry associations should take a role in promoting VES adoption as well. They can assist a firm in meeting these certification requirements by becoming the intermediary and organizing workshops, training programs, and consulting services to help the firms develop this expertise. Local centers of excellence for sustainable business practices

provide firms with an ongoing resource to maintain certifications and/or remain competitive in global markets.

This research's findings align with broader global sustainability efforts such as the United Nations Sustainable Development Goals (SDGs). VES directly contributes to SDG Responsible Consumption and Production (SDG 12) by advocating sustainable business practices. Moreover, ISO 14001 and eco-labeling play their part in SDG 13 (Climate Action) by decreasing firms' environmental effects and aiding their resource management. In addition, adopting VES contributes to SDG 8 (Decent Work and Economic Growth) by helping achieve economic growth through improved competitiveness in foreign markets. Therefore, using the VES is in the best interest of individual firms and is consistent with the interests of national and global sustainability agendas, which facilitate countries such as Pakistan in fulfilling their SDG commitments.

Despite that, there are some limitations in this study. First, the study is restricted to ISO 14001 and eco-labeling and does not analyze other environmental voluntary standards that may be equally, or more, significant in affecting its firm performance. Further research could then investigate how multiple other standards, for instance ISO 45001 (OH&S) and ISO 9001 (QM), impact firm's growth. Second, this study was conducted within Pakistan's manufacturing and textile sector. Future research should replicate this study in other industries and emerging economies to determine how the relationship between VES and sales growth is generalized across different contexts. Further research could compare the effects of VES use in developed and developing economies and how they differ under differing regulatory and cultural conditions. Finally, additional research could be conducted into other performance metrics, such as profitability, innovation, and market share, as broader performance measures of the financial outcomes associated with VES adoption.

ACKNOWLEDGMENT

Open access publishing facilitated by Università degli Studi di Torino, as part of the Wiley - CRUI-CARE agreement.

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