

Profit, Perception, and the Planet: Selection Bias-Corrected Evidence from Pakistani Textile Sector

Nasir Ali¹, Falik Shear² and Zahid Hussain³

ABSTRACT

This study examines the impact of Corporate Sustainability Disclosure (CSD) on the performance of Pakistani textile firms. CSD is measured by analyzing the word count of sustainability-related disclosures in annual reports of firms listed on the Pakistan Stock Exchange (PSX) from 2012 to 2023. Given the potential for selection bias in firms' disclosure decisions, the study applies the Heckman selection model to ensure robust estimation. The findings highlight that sustainability disclosure is positively associated with profitability. Firms that engage in CSD experience an increase in profitability, demonstrating that responsible business practices can translate into real financial gains. These results emphasize the role of sustainability initiatives in enhancing industry competitiveness and long-term financial stability. The study draws valuable insights for businesses, investors, and policymakers, emphasizing the need for stronger corporate disclosure practices and regulatory incentives to promote sustainability-driven growth in Pakistan's textile industry.

ملخص

تبحث هذه الدراسة في أثر الإفصاح عن الاستدامة المؤسسية (Corporate Sustainability Disclosure - CSD) على أداء شركات النسيج الباكستانية. وقد تم قياس الإفصاح عن الاستدامة من خلال تحليل عدد الكلمات المتعلقة بالاستدامة الواردة في التقارير السنوية للشركات المدرجة في بورصة باكستان (PSX) خلال الفترة الممتدة بين 2012 إلى 2023. ونظرا لاحتمال وجود تحيز في الاختيار (Selection Bias) في قرارات الشركات المتعلقة بالإفصاح، اعتمدت الدراسة نموذج

¹ Faisalabad Business School, National Textile University, Faisalabad, Pakistan.
E-mail: nasirali@ntu.edu.pk

² Faisalabad Business School, National Textile University, Faisalabad, Pakistan.
Corresponding author. E-mail: Falik.shear@ntu.edu.pk

³ Faisalabad Business School, National Textile University, Faisalabad, Pakistan.
E-mail: zahid@ntu.edu.pk

هيكمان للاختيار (Heckman Selection Model) لضمان الحصول على تقديرات أكثر متانة وموثوقية. وتبرز النتائج وجود علاقة إيجابية بين الإفصاح عن الاستدامة والربحية. فالشركات التي تمارس الإفصاح عن الاستدامة المؤسسية تحقق زيادة في مستويات الربحية، مما يدل على أن ممارسات الأعمال المسؤولة يمكن أن تترجم إلى مكاسب مالية حقيقية. وتؤكد هذه النتائج الدور الذي تؤديه مبادرات الاستدامة في تعزيز القدرة التنافسية للصناعة وتحقيق الاستقرار المالي على المدى الطويل. كما تقدم الدراسة رؤية قيمة للشركات والمستثمرين وصانعي السياسات، مؤكدة أهمية تعزيز ممارسات الإفصاح المؤسسي ووضع حوافز تنظيمية وتشريعية أقوى لدعم النمو القائم على الاستدامة في صناعة النسيج الباكستانية.

RÉSUMÉ

Cette étude examine l'impact de la communication d'informations sur le développement durable (CSD) sur les performances des entreprises textiles pakistanaises. La CSD est mesurée en analysant le nombre de mots consacrés aux informations relatives au développement durable dans les rapports annuels des entreprises cotées à la Bourse du Pakistan (PSX) entre 2012 et 2023. Compte tenu du risque de biais de sélection dans les décisions des entreprises en matière de communication, l'étude applique le modèle de sélection de Heckman afin de garantir une estimation robuste. Les résultats soulignent que la publication d'informations sur le développement durable est positivement associée à la rentabilité. Les entreprises qui s'engagent dans la CSD enregistrent une augmentation de leur rentabilité, ce qui démontre que des pratiques commerciales responsables peuvent se traduire par des gains financiers réels. Ces résultats mettent en évidence le rôle des initiatives de développement durable dans le renforcement de la compétitivité du secteur et de la stabilité financière à long terme. L'étude fournit des informations précieuses aux entreprises, aux investisseurs et aux décideurs politiques, soulignant la nécessité de renforcer les pratiques de publication d'informations par les entreprises et les incitations réglementaires afin de promouvoir une croissance axée sur le développement durable dans l'industrie textile pakistanaise.

Keywords: Corporate Sustainability Disclosure, Firm performance, Market valuation, Pakistan stock exchange, Heckman selection model, Textile sector

JEL Classification: C33, G32, L67, M14, Q56

1. Introduction

Sustainability is now a key focus worldwide (Szolnoki, 2013). According to World Commission on Environment and Development (WCED⁴) sustainable development seeks to meet the needs and goals of the present without sacrificing the ability to satisfy future ones. Despite its widespread use, the concept continues to be interpreted in various ways across different situations. One popular approach is the triple bottom line (TBL) i.e., people, planet, profit approach (Gbejewoh et al., 2021). Introduced by (Elkington, 1994), provides a framework for evaluating business performance based on three key dimensions: social responsibility (People), environmental responsibility (Planet), and financial performance (Profits). In terms of sustainability, TBL encourages firms to balance between, promoting social welfare, reducing environmental impact, and achieving financial success (O'Neil, 2018) in a way that assures long-term viability rather than focusing just on short-term gains (Purvis et al., 2019).

Stakeholder theory extends this view by emphasizing that such a balance is shaped by the expectations and interests of diverse stakeholders, offering a valuable framework for understanding the link between sustainability and corporate performance. This theory posits that businesses should consider the interests of a wide range of stakeholders, including shareholders, employees, customers, suppliers, communities, and the environment (Freeman, 1984). By addressing the needs and expectations of these stakeholders, companies can create long-term value (Roberts, 1992). Stakeholder theory perceives the corporate sustainability disclosure as the primary means through which companies respond to stakeholder concerns, spanning diverse issues, including sustainability (KPMG, 2008).

Understanding how broader sustainability factors are linked to and affect a company's overall financial performance is a central focus of attention (Cheung et al., 2018). However, literature presents mix evidence. For instance, few studies e.g. (Habib et al., 2021; Jum'a et al., 2021; Pham et al., 2021) show that sustainability has positive impact on financial performance of firms. On the other hand, studies like (Hussain et al., 2018) find that sustainability has negative impact on financial

<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>

performance of firms. Some studies e.g., (Ching et al., 2017) find no impact of sustainability on financial performance.

Textile sector is one of the largest manufacturing sectors in Pakistan. The textile industry consists of spinning, weaving, and printing sectors (Barros et al., 2023). It contributes almost a quarter of industrial value-added and employs around 40% of the industrial workforce (Recorder, 2022). Textile products consistently account for roughly 61.24% of national exports (Recorder, 2022). Like other developing countries, Pakistan textile sector is endeavouring to establish sustainable resource and ecological practices. It is making efforts to adopt sustainable practices, such as the Net Zero Pakistan initiative (Sattar, Shahid & Urooj, 2022). This trend is driving businesses to innovate and offer eco-friendly products, which are currently in high demand and provide a competitive edge (Moreira et al., 2023). Moreover, sustainability has long been viewed as essential for breaking into foreign markets and growing exports (Arora & De, 2020).

Despite the growing body of literature on sustainability and its benefits, research on the Pakistani textile industry remains limited. Specifically, the direct impact of sustainability initiatives on key financial metrics within this context is underexplored. This study aims to address this research gap by examining the relationship between sustainability initiatives and financial performance in the Pakistani textile sector. Corporate Sustainability Disclosure (CSD) is used as a proxy for firms' sustainability initiatives, while firm's performance is assessed through both accounting-based (ROA) and market-based (Tobin's Q) measures.

CSD has gained significant attention as regulatory bodies, investors, and consumers increasingly demand greater transparency regarding firms' environmental commitments. Regulatory frameworks such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the Task Force on Climate-related Financial Disclosures (TCFD) have set guidelines for firms to disclose non-financial information, particularly regarding their environmental impact (Hahn & Kühnen, 2013). Investors now consider Environmental, Social, and Governance (ESG) disclosures as critical factors in decision-making, recognizing that sustainability-related risks and opportunities can significantly affect long-term financial performance (Clarkson et al., 2008; García-Sánchez et al., 2020). Consumers, too, are increasingly

favouring brands that demonstrate environmental responsibility, further incentivizing firms to disclose their sustainability efforts (Michelon et al., 2015). CSD serves as a key instrument for firms to communicate their sustainability initiatives, allowing them to signal commitment to environmental responsibility, enhance corporate reputation, and build stakeholder trust (Liesen et al., 2015; Kolk, 2008).

Transparent reporting of sustainability practices allows firms not only to meet regulatory expectations but also to differentiate themselves in the market by attracting responsible investors and environmentally conscious consumers (Ioannou & Serafeim, 2017). High-quality CSDs have been linked to improved resource management, stronger brand reputation, greater stakeholder trust, and enhanced operational efficiency, all of which contribute to stronger financial outcomes (Loew et al., 2021; Rachmat et al., 2024; Suhatmi et al., 2024). Prior research also shows that economic and social sustainability indicators exert a positive influence on profit management and overall firm performance, highlighting the strategic value of embedding sustainability within corporate policies (Hanifah & Wijayanti, 2023). While environmental disclosures may involve upfront costs, the long-term advantages, including risk mitigation, broader access to sustainability-focused investors, and competitive positioning, justify these investments (Loew et al., 2021). The increasing emphasis on rigorous sustainability reporting across industries and regions underscores its importance as a driver of profitability and firm value in today's socially conscious business environment.

Building on this body of work, our study makes a distinct contribution by addressing a methodological concern often overlooked in prior research, i.e., self-selection bias. Earlier studies have typically relied on conventional regression models, which risk producing biased estimates since firms that choose to disclose sustainability information are systematically different from those that do not. To overcome this limitation, we employ the Heckman selection model. This two-step method first models the likelihood of a firm engaging in CSD based on firm characteristics and then estimates its effect on financial outcomes, correcting for the selection process. By integrating this methodological refinement, our study not only reinforces the positive association between CSD and financial performance but also provides a more precise assessment of its impact in the textile sector, where sustainability

practices are becoming increasingly central to both strategic positioning and financial success.

The study makes valuable contributions. 1) it adds to the growing literature that assesses the role of CSD in firms' financial performance (Razak et al., 2022; Wasara & Ganda, 2019). 2) it offers robust empirical evidence by using CSD as a proxy for sustainability initiatives and employing Heckman selection model to address selection bias particularly within the Pakistani textile sector. 3) it provides practical insights for investors and policymakers, highlighting how enhanced disclosure practices can improve market efficiency and support sustainable business strategies.

The rest of the paper is organized as follows. The next section reviews the relevant literature. Section 3 discusses the data and methodology of the study, followed by results section. And final section presents the conclusion of the study.

2. Literature Review

The projected growth in the global economy presents significant challenges for future generations (Ullah, 2020). Projections indicate a quadruple increase in economic output by 2050, resulting in an 80% increase in energy consumption, largely from fossil fuels (OECD, 2016). This trajectory accelerates greenhouse gas emissions and worsens climate change. Adopting sustainable development practices is vital for reducing these impacts on human well-being (Linnenluecke et al., 2016; Ullah, 2020). Industries are key contributors in emissions and resource depletion. International efforts, such as the Paris Agreement 2015 (COP 21) and other summits, reflect a rising commitment to address these challenges and issues. The agreement highlights a shift towards a low-carbon, resilient future (Ullah, 2020). To encourage ecologically friendly practices in enterprises, nations are establishing sustainable finance regulations. The importance of sustainability is being prioritised by many businesses as environmental concerns spread among stakeholders (Flammer, 2013).

Firms wanting to improve their investment in sustainability activities in order to avoid high cost of debt, because superior sustainability score companies are rewarded by a lower interest rate (Niklander, 2020). Stocks

having higher sustainability scores have higher returns and low volatility in return and also higher operating profit during COVID-19 first part (Albuquerque et al., 2020).

The complex relationship between sustainability and finance has garnered significant attention from both researchers and the business community. Sustainability draws inspiration from a variety of fields, but a comprehensive theorization remains challenging (Amis et al., 2020). Several scholars have categorized sustainability differently (Bellandi, 2023). However, some common themes emerge from these classifications. One school of thought views posit that a business's social responsibility lies in wealth creation and profit-making within the bounds of the law, following by (Friedman, 2007). Another cluster asserting that companies should be morally accountable for their actions (Wood, 1991). A third set of theories centre on ethical values and the promotion of stakeholders' rights, building upon (Freeman, 1984). A fourth category highlights a corporation's role as a responsible participant in the political life of the community (Logsdon & Wood, 2002). Overall, sustainability draws insights from a variety of theories and viewpoints, and depending on the particular lenses with which it is viewed, different interpretations may be made of it (Bellandi, 2023). Although companies involved in the sustainability activities to signal compliance and also to achieve high financial returns, but still the link between financial performance and sustainability are not established and a mixed approaches and conflicting results are present from many scholars (Khan, 2022).

Evidence from several countries supports the notion that sustainability drives financial success. In Italy, (Ahsan, 2024) demonstrated a strong and positive correlation between corporate social responsibility (CSR) and financial performance, indicating that firms engaging in CSR typically see improved financial results. This trend is not limited to certain countries; rather, it extends across economic blocs. According to a thorough analysis conducted over a multiple years across BRICS nations by (Udeagha & Ngpah, 2023) concluded that environmentally friendly technologies and renewable energy support both sustainability and overall economic growth. Similar trends have been observed Sweden and Australia, where (Pham et al., 2021) and (Habib et al., 2021) established that corporate sustainability directly enhances financial performance In Jordan, (Jum'a et al., 2021) reached the same conclusion, emphasizing the direct financial benefits firms reap from sustainability initiatives. In South

Asia, particularly in India, (Sardana et al., 2020) found that sustainable environmental practices play a direct role in improving corporate performance. Meanwhile, (Soytas et al., 2019) showed that financial performance improves when endogeneity is accounted for, supporting the claim that sustainability is not merely a cost but a driver of profitability. Across Europe, (Lassala et al., 2017) provided further validation of this viewpoint, finding that firms with strong sustainability profiles benefit from lower debt costs, which in turn results to higher returns on equity. Similarly, (Wagner & Blom, 2011) examined firms in Germany and the UK and discovered that sustainability initiatives typically boost financial performance, particularly in well-established firms already performing well in their markets.

However, not all research aligns with this extremely optimistic view. Some studies argue that sustainability's financial benefits are not as definitive as they clear-cut as they seem. In India, (Sachin & Rajesh, 2022) analysed companies from 2014 to 2018 and found no significant link between ESG (environmental, social, and governance) practices and financial success. A similar study in Brazil by (Ching et al., 2017) also reported disagreement over whether financial performance improves when firms focus on sustainability indices. Additionally, (Nazim.Hussain, Rigoni & Cavezzali, 2018) examined U.S. firms and identified a negative correlation between economic sustainability and market-based financial performance. Suggesting that while sustainability efforts might enhance internal efficiency, they do not necessarily result into better stock market outcomes. In Australia, (Siew et al., 2013) found only a weak correlation between financial performance and ESG scores, indicating that while sustainability efforts may generate long-term benefits, their immediate financial impact remains uncertain.

When combined, these studies illustrate a complex and nuanced relationship between environmental sustainability and financial performance. While majority portion of the literature support sustainability as a valuable financial strategy, some evidence suggests that its benefits may depend on firm size, market conditions, and time horizons.

2.1 Stakeholder Theory

Climate change, ecosystem degradation, and a worrying decline in biodiversity have all been shown by scientific evidence (Kortetmäki et al., 2023; Steffen et al., 2015; Watson et al., 2019). In the context of climate change and carbon reporting in particular (Daddi et al., 2018), different organisational and management practises theories have been employed to explain variations in corporate sustainability reporting methods (de Grosbois & Fennell, 2022; Hahn & Kühnen, 2013). Stakeholder theory has become a well-known framework for analysing organisational sustainability among these initiatives (Hörisch et al., 2014; Schaltegger et al., 2019).

The concept of stakeholders interpreted in a variety of ways, but the most common and inclusive definition provided by Freeman (Freeman, 2010) is that they encompass "groups and individuals capable of influencing or being influenced" by a company's activities related to trade and value creation (Malmström & Ekström, 2022). The support of a company's stakeholders is necessary for long-term success, according to the stakeholder theory (Roberts, 1992). Understanding how businesses that prioritise their stakeholders tend to be more actively involved in sustainable initiatives is made easier by adopting the stakeholder perspective (Freeman, 2010; Hörisch et al., 2014). In order to balance the competing interests and needs of stakeholders (de Grosbois & Fennell, 2022), businesses modify their operations (Ansoff, 1965). Stakeholder theory perceives the disclosure of sustainability as the primary means through which companies respond to stakeholder concerns, spanning diverse issues, including sustainability (KPMG, 2008). By using a stakeholder framework, researchers can examine the relationship between sustainability, and financial performance (Malmström & Ekström, 2022).

2.2 Sustainability and Textile Sector

Sustainability of the textile sector production and operational efficiency heavily depend on having access to abundant resources, energy, and water (Halog & Abbas, 2021). A sustainable textile industry includes resource-efficient and renewable resources, manufacturing clothing services and products that are non-toxic, of superior quality, and affordable, all while ensuring safe and secure livelihoods (Halog & Abbas, 2021).

The textile industry which employs millions worldwide and satisfies a fundamental human need (Desore & Narula, 2018). It plays a vital role as the second most essential necessity after food and water (Madhav et al., 2018). The industry's intricate transformation process involves converting fibres and yarns into fabrics through various operations, yielding diverse products such as agrotextiles, automotive textiles, and medical textiles (Roy et al., 2020; Sun et al., 2018). Valued at over USD 1.04 trillion in 2021 (Wire, 2024), the textile industry is expected to grow due to digitalization, e-commerce, and evolving consumer demands.

Environmentalists are pleading with businesses to adopt sustainable manufacturing practises. Textiles utilise the second-highest amount of water globally throughout the course of their whole existence, contributing 5–10% of the world's greenhouse gas emissions (Zhang et al., 2023) . Widely acknowledged as a major source of environmental pollution, contributing to a variety of ecological problems such water pollution, waste creation, and air pollution along the whole supply chain from fibre manufacturing to fabric finishing (Desore & Narula, 2018). Numerous textile products use textile wet processing, which includes dyeing, printing, and finishing, to create brilliant colours, detailed patterns, and unique performance characteristics. However, because to the use of dyes and other chemicals, these practises have come under intense environmental scrutiny (Chen & Burns, 2006). Despite the textile industry's efforts in waste reduction and recycling, the overall environmental impact of textile wet processing remains a pressing concern (Kadolph & Langford, 2007). The excessive use of chemicals and inadequate labour conditions lead to sustainability challenges due to weak ecological norms and unfavourable social conditions for workers (Warasthe et al., 2022).

Although the textile industries in many Asian nations produce a sizable amount of textile products each year, very few of them place a high priority on eco-friendly materials and recycling techniques (Vafadarnikjoo et al., 2021). Pakistan, a rapidly developing country (Ali et al., 2022, 2023; Shear et al., 2024), is projected to become the 20th largest economy in the world by 2030 and the 16th-largest by 2050 (D. Hussain, 2017). Like other developing countries, Pakistan endeavours to establish sustainable resource and ecological practices. They are making efforts to adopt sustainable practices, such as the Net Zero Pakistan initiative (Sattar, Shahid & Urooj, 2022). Implementing measures to

enhance their environmental performance, which includes establishing enduring supplier relationships and implementing waste recycling programmes, compliance with international standards like GOTS and BCI helps increase sales and revenues (Sattar, Shahid & Urooj, 2022). As these eco-labels have a notable positive impact on the environmental and financial performance of these textile firms, encouraging sustainable growth (Hayat et al., 2020). The Government regulations also in support to strengthen environmental management in textile companies. Market forces and customer demand also encourage the adoption of sustainable practices. Adopting sustainability can help the textile industry strengthen its competitive edge, leading to higher profits, better environmental practises, streamlined production processes, and a more reputable reputation (Hayat et al., 2020).

Making their products more sustainable is one of the main issues facing the fashion and textile industries. Sustainability examines how products impact the economy, society, and environment (Richardson, 2013). According to (Frigon et al., 2020) there is a need to increase consumer motivation to buy green products, develop green capabilities within businesses, and spread knowledge. International customers are increasingly interested in environmentally friendly items, even though they may be more expensive (Moreira et al., 2023). This trend encourages businesses and companies to develop innovative and eco-friendly products, which are currently in high demand and provide a competitive edge right now. These products frequently have recognised value chains and come with environmental certificates. The fact that consumers believe these products have a sustainable lifecycle adds to their appeal (Moreira et al., 2023). The significant advantages of putting creative environmental policies into practice is to increase exports (Galera-Quiles et al., 2021).

3. Data and Methodology

3.1. Data

The data for this study is drawn from textile companies listed on the Pakistan Stock Exchange (PSX) for the period 2012–2023. The analysis began with 140 textile firms. Firms that had diversified away from textiles or had incomplete data were excluded, leaving a final sample of 116 firms. Financial data, including return on assets, leverage ratio, Liquidity, assets turn-over, inventory turn-over, growth, and Turbin Q, were retrieved from

the State Bank of Pakistan (SBP). Market price data were obtained from Investing.com.

3.1.1. Corporate Sustainability Disclosure

The main independent variable, Corporate Sustainability Disclosure (CSD), serves as a proxy for firms' sustainability initiatives. CSD is quantified by the volume of sustainability-related textual content in annual reports, including references to carbon emission reduction, 3R practices (reduce, reuse, recycle), and other green initiatives. Following (Wendai et al., 2022), the measure is operationalized by counting the frequency of relevant words, with higher scores indicating greater emphasis on sustainability disclosure. The following excerpt from a firm's financial statement illustrates the calculation procedure.

“Ban on use of any chemical outside MSRL list, only REACH certified chemical are used in production process. We are successfully implementing ZDHC (Zero Discharge of Hazardous Chemicals) program We have installed an RO Plant which performs Tertiary Wastewater Treatment. A notable initiative is the Water Recycling Plant at Hosiery Plant-5, now operational, recycling 100% of our process water. Most of our recent equipment employs nano-bubble technology for washing, markedly cutting water usage. Hosiery Plant 4 and 5, designed for zero liquid discharge using this technology, represents a significant stride towards our goal of a 25% water consumption reduction by 2026. Ecofriendly technologies have replaced traditional polluting processes and chemicals in the facility. Water conservation and Green Chemistry have been key initiatives, maintaining overall 90% developments as low Environmental Impact (rated on EIM by Jeanologia). The implementation of new, more efficient, and environmentally friendly technologies will have favourable impacts on both people and the planet.”

This excerpt contains **156 words**, representing the extent of the company's disclosure of its environmental sustainability initiatives.

3.1.2. Description of Variables

The following Table explains our variables and their calculations.

Variable	Definition	Description
ROA (%)	Return on Assets	Net Income/Total Assets
CSD	Corporate Sustainable Disclosure	Natural logarithm calculation based on the final number of words.
Liq	Liquidity	Current Assets/Current Liabilities
Lev (%)	Leverage	Long-Term Debt/Total Assets
Growth	Growth of total Assets	Annual Growth of total Assets
Asst-Tvr	Asset Turnover	Net Sales/Average Total Assets
Inv-Tvr	Inventory Turn-over	Cost of goods sold/Average inventory
TQ	Tobin's Q	(Market Value of Equity + Total Liabilities)/Total Assets

Table 1 shows the details description of the variables used in the study

3.2. Methodology

The Corporate Sustainability Disclosure (CSD) decision consists of two interrelated aspects: (1) the firm's decision to disclose sustainability initiatives and (2) the potential impact of this disclosure on financial performance. The sequential and interconnected nature of these decisions introduces potential selection bias, as firms that choose to disclose may systematically differ from those that do not. To account for this bias, we employ the Heckman selection model, which corrects for non-random selection by first modelling the likelihood of disclosure and then assessing its impact on financial performance. This approach ensures that the estimated relationship between CSD and financial performance is not distorted by unobserved firm characteristics influencing disclosure decisions. The first stage of the Heckman model estimates the selection equation, identifying the factors influencing a firm's decision to engage in Corporate Sustainability Disclosure (CSD), as outlined below.

$$CSD_{it}^* = Z_{it} + \alpha_i + \varepsilon_{it}$$

$$CSD_{it} = \begin{cases} 1, & \text{if } CSD_{it}^* > 0 \\ 0, & \text{otherwise} \end{cases}$$

Where:

- CSD_{it}^* is the latent variable indicating the firm's decision to engage in CSD.
- CSD_{it} is the observed binary variable, which takes the value 1 if firm i discloses sustainability information in year t , and 0 otherwise.
- Z_{it} is a vector of explanatory variables affecting disclosure decisions, including previous disclosure, leverage, Liquidity, Asset Turn-over, Inventory Turn-over, Growth, export status of firm and Tobin's Q .
- α_i captures firm-specific unobserved heterogeneity (random or fixed effects).
- ε_{it} is the normally distributed error term

The second stage estimates the impact of sustainability disclosure on financial performance (ROA), correcting for selection bias:

$$Y_{it} = CSD_{it} + X_{it} + \lambda_{it} + \theta_i + \varepsilon_{it}$$

Where:

- Y_{it} is either the financial performance (Return on Assets), market valuation (Tobin's Q) or Z score for firm i in year t .
- CSD_{it} is natural logarithmic of number of words regarding sustainability disclosure of firm i at time t .
- X_{it} is a vector of control variables i.e., leverage, Liquidity, Asset Turn-over, Inventory Turn-over, Growth, export status of firm and Tobin's Q .
- λ_{it} (Inverse Mills Ratio) corrects for selection bias, derived from the first-stage equation.
- θ_i captures firm-specific unobserved heterogeneity
- ε_{it} is the error term.

4. Empirical Results

4.1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
ROA	829	0.479673	9.494799	-48.5052	29.57717
CSD	540	4.089635	1.212959	0.693147	7.202661
Liq	828	1.162376	1.020403	0.00305	9.660066
Lev	829	0.167144	0.177446	0	2.096426
growth	829	0.094033	0.209204	-0.52501	0.997353
Asst-Tvr	829	0.979549	0.598589	0	2.84973
Inv-Tvr	819	8.678526	17.66037	0	134.8077
TQ	829	0.668887	0.501523	0.02442	6.301264

Table 2 show descriptive statistics where ROA is the return on assets. CSD represents the natural log of Corporate Sustainability Disclosure. Liq represents liquidity, Lev represents the leverage ratio, growth is Annual Growth of total Assets and Asst-Tvr present assets turn-over, Inv-Tvr is inventory turnover and TQ refers to Tobin's Q ratio.

This table presents descriptive statistics for variables of the study. Return on Assets (ROA), based on 829 firm-year observations, shows a low mean (0.48) but high variation (SD = 9.49), ranging from -48.51 to 29.58, demonstrates significant heterogeneity in profitability. Corporate Sustainability Disclosure (CSD) has a mean of 4.09 (range: 0.69–7.20), suggesting moderate but varying sustainability reporting. Liquidity average 1.16, and SD (1.02) ranges widely, while leverage mean (0.17) indicates generally conservative debt levels. Firm growth averages 0.09 with some negative values, pointing to uneven expansion. Asset turnover averages 0.98, reflecting differences in operational efficiency, whereas Tobin's Q mean 0.67, range 0.02–6.30 highlights variation in market valuation.

4.2. Heckman Two-Stage Estimates: Selection and Outcome Analysis
Heckman model's selection equation

VARIABLES	(1) DCSD
preCSD	3.739*** (0.219)
Liq	0.034 (0.086)
Lev	-0.026 (0.416)
growth	-0.436 (0.534)
Asst-Tvr	0.294* (0.166)
ROA	0.017 (0.012)
Insig2u	-13.866 (17.414)
Constant	-1.852*** (0.346)
Observations	825
Number of Con	116
Year Fe	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: the table reports the selection equation estimates from the Heckman model, where DCSD is a dummy variable equals to 1 if a firm engages in CSD. The key explanatory variable, preCSD, is a dummy indicating prior-year disclosure (1 = Yes, 0 = No). Control variables include liquidity (Liq), leverage ratio (Lev), annual asset growth (Growth), asset turnover (Asst-Tvr), and return on assets (ROA).

Table 3 presents the Heckman model's selection equation estimates, assessing the probability of firms engaging in corporate sustainability disclosure (CSD). The selection equation results show that the most powerful predictor of current disclosure is previous year disclosure (preCSD), with a coefficient of 3.739 (p<0.01). This indicates strong persistence in sustainability reporting practices: firms that disclosed in the past are overwhelmingly more likely to disclose again. Asset turnover is

weakly significant, suggesting some role of operational efficiency, while liquidity, leverage, profitability, and growth do not significantly influence disclosure. These results underscore that disclosure is primarily path-dependent rather than driven by short-term financial conditions.

4.2.2. Heckman Outcome Analysis: Corporate Sustainability Disclosure and Firm Performance

VARIABLES	(1) ROA	(2) TQ
CSD	0.954*** (0.329)	-0.032 (0.028)
Liq	3.515*** (0.739)	-0.114*** (0.035)
Lev	-8.948 (5.894)	0.943** (0.447)
growth	9.697*** (2.026)	-0.097** (0.043)
Asst-Tvr	2.611** (1.097)	-0.095 (0.062)
Inv-Tvr	-0.066** (0.033)	0.001 (0.001)
mylambda	0.310 (0.540)	-0.003 (0.020)
Constant	-10.308*** (2.160)	0.748*** (0.138)
Observations	537	537
Number of Con	76	76
Year Fe	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4 presents the outcome equation estimates from the Heckman model, where CSD represents the natural log of Corporate Sustainability Disclosure. The variable Liq represents liquidity, Lev represents the leverage ratio, growth is Annual Growth of total Assets and ROA is the return on assets, Asst-Tvr present assets turn-over, Inv-Tvr is inventory turnover. TQ refers to Tobin's Q ratio. The inverse Mills ratio (λ) is included to correct for potential selection bias.

Table 4 presents the Heckman outcome equation results, assessing the impact of Corporate Sustainability Disclosure (CSD) on firm performance and market valuation. Column (1) uses Return on Assets (ROA) as the dependent variable, while Column (2) uses Tobin's Q (TQ). In terms of profitability, CSD shows a strong positive relationship with ROA (0.954), indicating that greater disclosure is linked to improved profitability. These results support the view that sustainability reporting enhances both operational outcomes and investor perception. Our findings are in line with (Ahsan, 2024; Habib et al., 2021; Pham et al., 2021). This implies that companies more concerned and focused on sustainability activities, more engaged in social initiatives, have seen an increase in their financial performance (Malmström & Ekström, 2022). These results contrast with (Nazim.Hussain, Rigoni & Cavezzali, 2018), who reported a negative effect of environmental sustainability performance in US firms. Liquidity is highly significant (3.515), suggesting that both sustainability disclosure and liquidity enhance operational outcomes. Growth positively influences ROA (9.697), underscoring the financial benefits of expansion, while asset turnover also contributes positively (2.611). Overall, firms combining environmental transparency with financial and operational efficiency achieve higher profitability.

The impact of CSD on market valuation (Tobin's Q) is negative but statistically insignificant, with a coefficient of (-0.032) ($p < 0.10$), suggesting that while profitability clearly benefits from disclosure, investors in emerging markets may not yet fully reward these practices in valuation. Similar results were also reported by (Kaupke & zu Knyphausen-Aufseß, 2023). Liquidity shows a negative but significant relationship, while leverage supports valuation, reflecting investor trust in firms with sustainable financing structures. The inverse Mills ratio is insignificant across all models ($p < 0.10$), indicating that selection bias is not a concern.

4.2 Assessing Robustness: Impact of CSD on Financial Stability

4.2.3. Heckman model's Selection Equation

VARIABLES	(1) DCSD
predCSD	3.739*** (0.219)
Liq	0.034 (0.086)
Lev	-0.026 (0.416)
growth	-0.436 (0.534)
Asst-Tvr	0.294* (0.166)
ROA	0.017 (0.012)
Insig2u	-13.866 (17.414)
Constant	-1.852*** (0.346)
Observations	825
Number of Con	116
Year Fe	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: the table reports the selection equation estimates from the Heckman model, where DCSD is a dummy variable equals to 1 if a firm engages in CSD. The key explanatory variable, preCSD, is a dummy indicating prior-year disclosure (1 = Yes, 0 = No). Control variables include liquidity (Liq), leverage ratio (Lev), annual asset growth (Growth), asset turnover (Asst-Tvr), and return on assets (ROA).

Table 5 reports the selection equation results of the Heckman model, showing that the predicted probability of CSD is strongly positive and significant, asset turnover is marginally significant, and other firm-level variables are insignificant. This selection equation serves as the predecessor for the outcome equation, where the Altman Z-score is the dependent variable.

4.2.4. Heckman Outcome Analysis: Corporate Sustainability
Disclosure and Financial Stability (Z-score)

VARIABLES	(1) Z score
CSD	0.119 (0.082)
Liq	0.470*** (0.132)
Lev	-1.126 (1.255)
growth	-0.279 (0.212)
Asst-Tvr	1.350*** (0.194)
Inv-Tvr	-0.002 (0.007)
ROA	0.043*** (0.011)
mylambda	0.048 (0.096)
Constant	-0.599 (0.477)
Observations	537
Number of Con	76
Year Fe	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 presents the outcome equation estimates from the Heckman model for Z score, where CSD represents the natural log of Corporate Sustainability Disclosure. The variable Liq represents liquidity, Lev represents the leverage ratio, growth is Annual Growth of total Assets and ROA is the return on assets, Asst-Tvr present assets turnover. TQ refers to Tobin's Q ratio.

Table 6 reports the Heckman outcome equation results with the Altman Z-score as the dependent variable. CSD is positive but insignificantly associated with the Z-score (0.119, p<0.10), indicating no direct effect of disclosure on financial stability. In contrast, liquidity (0.470, p>0.10), asset turnover (1.350, p>0.01), and ROA (0.043, p>0.01) are positive and highly significant, while leverage, growth, and inventory turnover are

insignificant. The Mills ratio (0.048) is also insignificant, suggesting no selection bias. These findings imply that CSD alone does not improve financial health, but firms with strong liquidity, efficiency, and profitability achieve higher Z-scores, with disclosure potentially reinforcing rather than driving financial stability.

4.3. Discussion: Relevance in Emerging Markets

This study demonstrates that CSD has tangible financial benefits in Pakistan, an emerging economy where such reporting is not yet mandatory. The positive and significant association between CSD and profitability indicates that disclosure is strategically employed by firms to achieve efficiency gains, competitive advantage, and investor confidence, rather than as a compliance-driven activity. By contrast, the negative and insignificant effect of CSD on Tobin's Q suggests that capital markets in Pakistan have yet to fully incorporate sustainability practices into firm valuation, reflecting the relatively early stage of ESG integration. The persistence of disclosure practices nonetheless points to the gradual institutionalization of sustainability even without mandatory reporting requirements.

These findings are relevant for other emerging markets facing similar institutional conditions. In contexts where regulatory frameworks for sustainability are still developing, and capital markets are less responsive to ESG signals, CSD can nevertheless deliver measurable benefits through improved operations and stakeholder engagement. This highlights the dual role of CSD in emerging economies: as a firm-level strategy for profitability and as a building block for the eventual alignment of market practices with global sustainability standards.

5. Conclusion

This study shows that corporate sustainability disclosure (CSD) is a voluntary yet strategically valuable practice in Pakistan. Firms with prior disclosure remain committed to transparency, and CSD is found to significantly enhance profitability (ROA), though its effect on market valuation (Tobin's Q) is insignificant. The Altman Z-score analysis further indicates that financial stability is shaped primarily by fundamentals such as liquidity, efficiency, and profitability, with disclosure playing a complementary role. Overall, the results suggest that

while investors in emerging economies may not yet fully price sustainability practices, CSD contributes to operational and financial strength, positioning firms for long-term growth. Policymakers and industry stakeholders should therefore promote disclosure as a strategic investment rather than treating it solely as a compliance tool.

6. Limitations of the study

This study focuses on the Pakistani textile sector, which may limit the generalizability of the findings to other industries within the PSX or textile markets in different national contexts. Sector-specific dynamics, along with country-specific factors such as inflation, currency volatility, and supply chain disruptions, may influence the effectiveness of sustainability practices. Future research could extend the analysis to other PSX sectors or include textile industries from comparable economies like Bangladesh and Vietnam to broaden the understanding of CSD and its impact.

References

- Ahsan, M. J. (2024). Unlocking sustainable success: exploring the impact of transformational leadership, organizational culture, and CSR performance on financial performance in the Italian manufacturing sector. *Social Responsibility Journal*, 20(4), 783–803.
- Albuquerque, R., Koskinen, Y., Yang, S., & Zhang, C. (2020). Resiliency of environmental and social stocks: An analysis of the exogenous COVID-19 market crash. *The Review of Corporate Finance Studies*, 9(3), 593–621.
- Ali, N., Rehman, M. Z. U., Ashraf, B. N., & Shear, F. (2022). Corporate Dividend Policies during the COVID-19 Pandemic. *Economies*, 10 (11), 263.
- Ali, N., Shear, F., & Hussain, S. (2023). *Does Financial Development, Economic Growth and Industrial Growth Intensify Energy Consumption in Pakistan?*
- Amis, J., Barney, J., Mahoney, J. T., & Wang, H. (2020). From the editors—Why we need a theory of stakeholder governance—And why this is a hard problem. *Academy of Management Review*, 45(3), 499–503.
- Ansoff, H. I. (1965). *Corporate Strategy* McGraw Hill. New York.
- Arora, P., & De, P. (2020). Environmental sustainability practices and exports: The interplay of strategy and institutions in Latin America. *Journal of World Business*, 55(4), 101094.
- Barros, V., Matos, P. V., Sarmiento, J. M., & Vieira, P. R. (2023). High-tech firms: Dividend policy in a context of sustainability and technological change. *Technological Forecasting and Social Change*, 190, 122434.
- Bellandi, F. (2023). Equilibrating financially sustainable growth and environmental, social, and governance sustainable growth. *European Management Review*.
- Chen, H.-L., & Burns, L. D. (2006). Environmental analysis of textile products. *Clothing and Textiles Research Journal*, 24(3), 248–261.
- Cheung, A., Hu, M., & Schwiebert, J. (2018). Corporate social responsibility and dividend policy. *Accounting & Finance*, 58(3), 787–816.

Ching, H. Y., Gerab, F., & Toste, T. H. (2017). The quality of sustainability reports and corporate financial performance: Evidence from Brazilian listed companies. *Sage Open*, 7(2), 2158244017712027.

Cong, L. W., Liang, T., & Zhang, X. (2019). Textual factors: A scalable, interpretable, and data-driven approach to analyzing unstructured information. *Interpretable, and Data-Driven Approach to Analyzing Unstructured Information (September 1, 2019)*.

Daddi, T., Todaro, N. M., De Giacomo, M. R., & Frey, M. (2018). A systematic review of the use of organization and management theories in climate change studies. *Business Strategy and the Environment*, 27(4), 456–474.

de Grosbois, D., & Fennell, D. A. (2022). Determinants of climate change disclosure practices of global hotel companies: Application of institutional and stakeholder theories. *Tourism Management*, 88, 104404.

Desore, A., & Narula, S. A. (2018). An overview on corporate response towards sustainability issues in textile industry. *Environment, Development and Sustainability*, 20, 1439–1459.

Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36(2), 90–100.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3), 758–781.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.

Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge university press.

Friedman, M. (2007). The social responsibility of business is to increase its profits. In *Corporate ethics and corporate governance* (pp. 173–178). Springer.

Frigon, A., Doloreux, D., & Shearmur, R. (2020). Drivers of eco-innovation and conventional innovation in the Canadian wine industry. *Journal of Cleaner Production*, 275, 124115.

Galera-Quiles, M. del C., Piedra-Muñoz, L., Galdeano-Gómez, E., & Carreño-Ortega, A. (2021). A review of eco-innovations and exports interrelationship, with special reference to international agrifood supply chains. *Sustainability*, 13(3), 1378.

Gbejewoh, O., Keesstra, S., & Blancquaert, E. (2021). The 3Ps (profit, planet, and people) of sustainability amidst climate change: A South African grape and wine perspective. *Sustainability*, 13(5), 2910.

Habib, M. A., Bao, Y., Nabi, N., Dulal, M., Asha, A. A., & Islam, M. (2021). Impact of strategic orientations on the implementation of green supply chain management practices and sustainable firm performance. *Sustainability*, 13(1), 340.

Hahn, R., & Kühnen, M. (2013). Determinants of sustainability reporting: A review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production*, 59, 5–21.

Halog, A., & Abbas, S. (2021). *Analysis of Pakistani Textile Industry: Recommendations Towards Circular and Sustainable Production*. https://doi.org/10.1007/978-981-16-3698-1_3

Hanifah, R. U., & Wijayanti, P. (2023). Effect of sustainability disclosure performance indicators on profit management with company size as a control variable. *Jurnal Bisnis Strategi*, 32(1), 67–78.

Hayat, N., Hussain, A., & Lohano, H. D. (2020). Eco-labeling and sustainability: A case of textile industry in Pakistan. *Journal of Cleaner Production*, 252, 119807.

Hörisch, J., Freeman, R. E., & Schaltegger, S. (2014). Applying stakeholder theory in sustainability management: Links, similarities, dissimilarities, and a conceptual framework. *Organization & Environment*, 27(4), 328–346.

Hussain, D. (2017). Pakistan could become 16th largest economy by 2050. In *Dawn, Pakistan*. Dawn. <https://www.dawn.com/news/1313636>

Hussain, N., Rigoni, U., & Cavezzali, E. (2018). Does it pay to be sustainable? Looking inside the black box of the relationship between sustainability performance and financial performance. *Corporate Social Responsibility and Environmental Management*, 25(6), 1198–1211.

Jum'a, L., Zimon, D., & Ikram, M. (2021). A relationship between supply chain practices, environmental sustainability and financial performance: evidence from manufacturing companies in Jordan. *Sustainability*, 13(4), 2152.

Kadolph, S. J., & Langford, A. (2007). Textiles Pearson Education. Inc. Upper Saddle River, New Jersey.

Kaupke, K., & zu Knyphausen-Aufseß, D. (2023). Sustainability and firm value in the oil and gas industry—A vicious circle? *Corporate Social Responsibility and Environmental Management*, 30(3), 1129–1144.

Khan, M. A. (2022). ESG disclosure and Firm performance: A bibliometric and Meta Analysis. *Research in International Business and Finance*, 101668.

Kortetmäki, T., Heikkinen, A., & Jokinen, A. (2023). Particularizing Nonhuman Nature in Stakeholder Theory: The Recognition Approach. *Journal of Business Ethics*, 185(1), 17–31. <https://doi.org/10.1007/s10551-022-05174-2>

KPMG, T. (2008). KPMG International survey of corporate responsibility reporting 2008. Amsterdam, The Netherlands: KPMG.

Lassala, C., Apetrei, A., & Sapena, J. (2017). Sustainability matter and financial performance of companies. *Sustainability*, 9(9), 1498.

Linnenluecke, M. K., Smith, T., & McKnight, B. (2016). Environmental finance: A research agenda for interdisciplinary finance research. *Economic Modelling*, 59, 124–130.

Loew, E., Erichsen, G., Liang, B., & Postulka, M. L. (2021). *Corporate social responsibility (CSR) and environmental social governance (ESG)–disclosure of European banks*.

Madhav, S., Ahamad, A., Singh, P., & Mishra, P. K. (2018). A review of textile industry: Wet processing, environmental impacts, and effluent treatment methods. *Environmental Quality Management*, 27(3), 31–41.

Malmström, C., & Ekström, L. (2022). *Sustainability Performance Relation to Financial Performance: A quantitative study of companies in the textile industry within the European and North American markets*.

Moreira, L., Galvão, A. R., Braga, V., Braga, A., & Teixeira, J. (2023). Sustainability as a Gateway to Textile International Markets: The Portuguese Case. *Sustainability*, 15(5), 4669.

Nazim.Hussain, Rigoni, U., & Cavezzali, E. (2018). Does it pay to be sustainable? Looking inside the black box of the relationship between sustainability performance and financial performance. *Corporate Social Responsibility and Environmental Management*, 25(6), 1198–1211.

Niklander, E. (2020). *The payoff of doing good: The impact of ESG criteria on firms' cost of debt capital: European evidence*.

O'Neil, J. (2018). 'People, Planet, Profits' and Perception Politics: A Necessary Fourth (and Fifth) Bottom Line? Critiquing the Current Triple Bottom Line in the Australian Context. *The Goals of Sustainable Development: Responsibility and Governance*, 19–42.

OECD. (2016). *Better Policies for Sustainable Development 2016*. OECD. <https://www.oecd-ilibrary.org/content/publication/9789264256996-en>

Pham, D. C., Do, T. N. A., Doan, T. N., Nguyen, T. X. H., & Pham, T. K. Y. (2021). The impact of sustainability practices on financial performance: empirical evidence from Sweden. *Cogent Business & Management*, 8(1), 1912526.

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. *Sustainability Science*, 14, 681–695.

Rachmat, L. M., Sumirat, E., & Nainggolan, Y. A. (2024). The influence of sustainability disclosure on financial performance: a study of indonesian firms. *International Journal of Current Science Research and Review*, 7(3), 1857–1879.

Razak, N. A., Latif, R. A., & Kamardin, H. (2022). A conceptual paper on the model of sustainability disclosure on firm performance. *J. Glob. Bus. Soc. Entrepreneurship (GBSE)*, 7(23), 98–116.

Recorder, B. (2022). *Economic Survey of Pakistan 2021-22*. <https://www.brecorder.com/news/40179021>

Richardson, J. (2013). *The triple bottom line: Does it all add up*. Routledge.

Roberts, R. W. (1992). Determinants of corporate social responsibility disclosure: An application of stakeholder theory. *Accounting, Organizations and Society*, 17(6), 595–612.

Roy, M., Sen, P., & Pal, P. (2020). An integrated green management model to improve environmental performance of textile industry towards sustainability. *Journal of Cleaner Production*, 271, 122656.

Sachin, N., & Rajesh, R. (2022). An empirical study of supply chain sustainability with financial performances of Indian firms. *Environment, Development and Sustainability*, 24(5), 6577–6601.

Sardana, D., Gupta, N., Kumar, V., & Terziovski, M. (2020). CSR ‘sustainability’ practices and firm performance in an emerging economy. *Journal of Cleaner Production*, 258, 120766.

Sattar, Shahid & Urooj, A. (2022). *Sustainable Business Practices in Textile Sector of Pakistan*. APTMA. <https://aptma.org.pk/sustainable-business-practices-in-textile-sector-of-pakistan/>

Schaltegger, S., Hörisch, J., & Freeman, R. E. (2019). Business cases for sustainability: A stakeholder theory perspective. *Organization & Environment*, 32(3), 191–212.

Shear, F., Bilal, M., Ashraf, B. N., & Ali, N. (2024). Commodity Market Risk: Examining Price Co-Movements in the Pakistan Mercantile Exchange. *Risks*, 12(6), 86.

Siew, R. Y. J., Balatbat, M. C. A., & Carmichael, D. G. (2013). The relationship between sustainability practices and financial performance of construction companies. *Smart and Sustainable Built Environment*, 2(1), 6–27.

Soytas, M. A., Denizel, M., & Usar, D. D. (2019). Addressing endogeneity in the causal relationship between sustainability and financial performance. *International Journal of Production Economics*, 210, 56–71.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., De Vries, W., & De Wit, C. A. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.

Suhatmi, E. C., Dasman, S., Badarisman, D., Nahar, A., & Jaya, A. A. N. A. (2024). Sustainability reporting and its influence on corporate financial performance: a global analysis. *The Journal of Academic Science*, 1(6), 715–724.

Sun, Z., Sun, L., & Strang, K. (2018). Big data analytics services for enhancing business intelligence. *Journal of Computer Information Systems*, 58(2), 162–169.

Szolnoki, G. (2013). A cross-national comparison of sustainability in the wine industry. *Journal of Cleaner Production*, 53, 243–251.

Udeagha, M. C., & Ngepah, N. (2023). Towards climate action and UN sustainable development goals in BRICS economies: do export diversification, fiscal decentralisation and environmental innovation matter? *International Journal of Urban Sustainable Development*, 15(1), 172–200.

Ullah, M. (2020). *The Nexus Between Firm's Environmental Performance and Financial Resilience*. Université Clermont Auvergne [2017-2020].

Vafadarnikjoo, A., Badri Ahmadi, H., Liou, J. J. H., Botelho, T., & Chalvatzis, K. (2021). Analyzing blockchain adoption barriers in manufacturing supply chains by the neutrosophic analytic hierarchy process. *Annals of Operations Research*, 1–28.

Wagner, M., & Blom, J. (2011). The reciprocal and non-linear relationship of sustainability and financial performance. *Business Ethics: A European Review*, 20(4), 418–432.

Warasthe, R., Brandenburg, M., & Seuring, S. (2022). Sustainability, risk and performance in textile and apparel supply chains. *Cleaner Logistics and Supply Chain*, 100069.

Wasara, T. M., & Ganda, F. (2019). The relationship between corporate sustainability disclosure and firm financial performance in Johannesburg Stock Exchange (JSE) listed mining companies. *Sustainability*, 11(16), 4496.

Watson, R., Baste, I., Larigauderie, A., Leadley, P., Pascual, U., Baptiste, B., Demissew, S., Dziba, L., Erpul, G., & Fazel, A. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. *IPBES Secretariat: Bonn, Germany*, 22–47.

WCED. (n.d.). *Report of the World Commission on Environment and Development: Our Common Future*.
<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> (Accessed on September, 2024)

Wendai, L., Jing, F., & Bin, L. (2022). Does more voluntary environmental information disclosure cut down the cost of equity: heavy pollution industries in China. *Environmental Science and Pollution Research*, 29(42), 62913–62940.

Wire, B. (2024). *Textile Market Size| Industry Analysis Report, 2021–2028*. Grand View Research San Francisco, CA, USA.
<https://www.businesswire.com/news/home/20211018005850/en/Global-Textile-Market-Analysis-Report-2021-2028-by-Raw-Material-Wool-Chemical-Silk-Product-Natural-Fibers-Polyester-Application-Household-Technical---ResearchAndMarkets.com> (Access on November 18, 2024)

Wood, D. J. (1991). Toward improving corporate social performance. *Business Horizons*, 34(4), 66–74.

Zhang, L., Leung, M. Y., Boriskina, S., & Tao, X. (2023). Advancing life cycle sustainability of textiles through technological innovations. *Nature Sustainability*, 6(3), 243–253. <https://doi.org/10.1038/s41893-022-01004-5>