Do Firm-Specific Factors Matter for ESG Performance Disclosure? Evidence from Environmentally Sensitive Sectors in India

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Abstract
This study examines the influence of various firm-specific factors on overall ESG performance disclosure and its three dimensions, namely, Environment, Social, and Governance, on listed companies from environmentally sensitive sectors in India. This study considered the sustainability (ESG) scores of the selected companies for a period of 10 years, from 2013 to 2022. This study employs a panel data regression analysis. The results of the study revealed that firm characteristics such as age and size have a significant positive impact, whereas leverage has a significant negative influence on the overall ESG performance disclosure of selected companies. Similar results are obtained for the environmental dimension, and profitability is also found to have a negative impact on it. Firm age, size, and liquidity are found to have a significant positive influence on social performance disclosure, whereas leverage has a significant negative effect. Surprisingly, Government ownership is found to have a significant negative influence on governance disclosure.

Keywords – ESG disclosure, Sustainability reporting, Firm characteristics, Environmentally sensitive industries (ESI), Panel data analysis, India

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1. Introduction

Recently, the Global Environmental Performance Index (EPI) released in 2024 ranked India 176th out of 180 countries in terms of environmental health, climate change performance, and ecosystem vitality. India has performed poorly, particularly in areas such as air quality, water quality, and biodiversity conservation. The State of India's Environment Report 2025 stated that India's greenhouse gas emissions hit their highest global share since 1970, reaching 7.8 percent. Even more concerning is the accelerated pace of emissions growth, which increased by nearly 1 percent between 2020 and 2023 alone. These figures highlight the fact that economic development and growth have been achieved at a high cost of environmental damage. Therefore, this calls for immediate policy intervention to tackle the problem of rapidly increasing pollution and hazards to the environment.

The Ministry of Environment and Forest, Government of India, has formed a working group of pollution boards in India to classify various industries based on certain parameters of the Pollution Index. In 2016, the Central Pollution Control Board (CPCB) of India classified different types of industrial sectors under four categories based on their pollution potential: 'Red' (most polluting), 'Orange' (high polluting), 'Green' (moderately polluting), and 'white' (least polluting) to ensure that industrial sectors are established and operated in a manner to achieve environmental objectives and with no or minimum pollution. Firms with high pollution are gaining the attention of researchers because of their impact on the environment and sustainability.

Environmental, Social, and Governance factors have become increasingly important in evaluating corporate performance, reflecting a growing awareness of the interconnectedness between business operations, societal well-being, and ecological sustainability (Shaikh, 2022). The increasing emphasis on Environmental, Social, and Governance factors in the investment and corporate landscape has spurred significant interest in understanding the drivers and implications of ESG disclosure (Zhan, 2023). Specifically, the environmental component of ESG has gained prominence, particularly in industries with a high environmental impact (Robinson et al., 2023). These environmentally sensitive industries face heightened scrutiny from investors, regulators, and the public, making transparent ESG disclosures crucial for maintaining legitimacy and accessing capital.

ESG (sustainability) reporting has become paramount for corporations and policymakers. Sustainability reporting refers to the practice of disclosing information about a company's environmental, social, and governance (ESG) performance. It encompasses environmental aspects such as air, water, biodiversity, and energy, as well as social and governance aspects such as human rights, health and safety, labor rights, customers, bribery, and corruption (Wang, 2017). ESG disclosure practices by Indian companies are a comparatively recent phenomenon and are largely under-researched (Kumar and Prakash, 2019).

SEBI (Securities and Exchange Board of India) has mandated the top one thousand listed companies in India to report their sustainability performance in the form of BRSR, i.e., business responsibility and sustainability report, from the financial year 2022-23 (SEBI, 2021). In May 2023, SEBI introduced the Business Responsibility and Sustainability Reporting (BRSR) Core framework, focusing on nine critical ESG metrics, including greenhouse gas emissions, water and energy usage, circular economy practices, employee well-being, and governance structures. This framework mandates "reasonable assurance" from independent third parties to ensure the accuracy of disclosures.

The motivation behind this study emanates from the fact that there is little research on ESG performance disclosure in the Indian corporate sector, particularly in the case of companies

from environmentally sensitive industries (ESI) such as materials and mining, energy and gas, chemicals, construction, capital goods, and automobiles. A review of the existing literature revealed that only a handful of studies have been undertaken in this area on the ESI sector in the Indian context (Aggarwal, 2021; Kansal et al., 2014; Kumar et al., 2021; Narolia and Sapra, 2023; Pareek et al., 2019). Hence, the present study seeks to fill this gap in the existing academic literature on the determinants of ESG performance disclosure for companies in India's environmentally sensitive sectors. The broad objectives of this study are as follows:

1. To analyze the influence of various firm-specific characteristics - such as age, size, government ownership, profitability, leverage, liquidity, promoter ownership, and international presence on the overall ESG performance disclosure of publicly listed companies in India operating in environmentally sensitive sectors.

2. To assess how these firm-specific factors individually affect the three pillars of ESG disclosure, namely environmental, social, and governance, among the selected companies.

3. To provide policy recommendations for various stakeholders in environmentally sensitive industries in India, based on the findings, with a focus on leveraging firm-specific factors to enhance ESG disclosure practices.

The study is organized as follows: Section 2 provides the literature review, and Section 3 establishes the theoretical framework through the lens of various theories, such as agency theory, legitimacy theory, stakeholder theory, and signaling theories, while developing the main hypotheses of the study. Section 4 explains the methodology, data, variables, and models used. Section 5 discusses the results and findings of the study, and the last section 5 concludes the paper with research implications, limitations, and further scope of research.

2. Literature Review

Many studies worldwide have provided evidence that sustainability (ESG) disclosure is dependent on different firm-based characteristics, such as size, ownership, age, leverage, profitability, and industry. (Hackston and Milne, 1996; Dam and Scholtens, 2012; Istianingsih, 2015; Dissanayake, Tilt, and Qian, 2019; Orazalin and Mahmood, 2020; Chen *et al.*, 2022). Researchers worldwide are trying to explore the factors driving sustainability (ESG) disclosures in corporations, but there are very few studies in developing nations like India. In the Indian context, many studies have analyzed the impact of these variables on sustainability reporting (Kansal et al., 2014; Bhatia and Tuli, 2017), but very few have studied it for environmentally sensitive industries (Jha and Rangarajan, 2020; Kumar et al., 2021). Hence, to fill this gap, the present study endeavors to investigate the impact of various firm characteristics, such as age, size, profitability, government ownership, leverage, liquidity, promoter ownership, and international location, on sustainability (ESG) disclosure in selected environmentally sensitive industries (ESI) in India. The literature review presented in Table 1 shows that research on ESI companies in India is limited.

Table 1. Empirical studies on sustainability/environment reporting relating to environmentally sensitive industries in India and abroad

Authors & Year	Nature of companies	Focus/Area	Major findings
Foreign Context			

Kilic and Uyar (2014)	138 companies listed in Istanbul from the manufacturing (ESI) sectors.	Content analysis is employed to analyse the extent of social and environmental reporting and the impact of corporate characteristics on it using multiple regression.	Board size, independent directors, and auditor firm size have a significant positive effect on disclosure.
Bani-Khalid et al., (2017)	66 manufacturing companies listed in the Amman Stock Exchange (ASI), Jordan	Content analysis of social and environmental disclosure practices and examination of their determinants using panel data regression.	Firm size, type of audit firm, and financial performance are the significant determinants, while profitability, age, type of industry, and ownership are insignificant.
Ezhilarasi and Kabra (2017)	The 177 most polluting companies in India	Impact of corporate governance attributes on environmental reporting.	FII (Foreign institutional ownership), size, and environmental certification are the major attributes affecting environmental disclosure.
Dyduch and Krasodomska (2017)	60 companies listed in Poland (both ESI and non-ESI)	Content analysis of CSR (Corporate social responsibility) disclosure and investigation of its determinants through Tobit regression analysis	Environmental sensitivity of industry has a significant influence on CSR disclosure and has a relationship with company turnover and share of foreign capital.
Orazalin and Mahmood (2018)	The 144 largest oil and gas companies in the public sector in Russia.	Analysis of sustainability reporting and the impact of various determinants.	Age, publishing a standalone sustainability report, and auditor type are mainly influencing sustainability reporting.
Fallah and Mojarrad (2019)	64 heavy polluting firms listed on the Tehran stock exchange in Iran	Content analysis of CSR reporting and analyzing the effect of corporate governance elements on CSR disclosure through multiple linear regression.	The composition of the audit committee, tenure of the BOD (board of directors), and concentration of ownership have a positive impact.
Radhouane et al. (2019)	91 environmentally sensitive listed French firms	Examined the assurance and value relevance of voluntary environmental disclosure of selected firms.	Shareholders assign a negative value to environmental disclosure and its assurance in the case of ESI firms, posing greater challenges to them in the capital market than to other firms.
Nicolo et al. (2023)	265 entities in the utilities/ ESI sector (electricity, natural gas, water, and power generation)	Influence of corporate governance mechanisms on ESG reporting	Board independence, formation of sustainability/CSR committee, positively impacts total ESG disclosure, while board size

			positively impacts social and environmental disclosure.
Indian context			
Kumar et al. (2021)	57 energy and mining companies listed in the NIFTY500 index at the National Stock Exchange (NSE) of India	Examined sustainability reporting practices through content analysis and their determinants through panel data regression.	The size of the firm, its market capitalization, and publishing a standalone SR (sustainability report) have a positive relationship with the ESG disclosure.
Porchelvi (2019)	50 manufacturing companies from environmentally sensitive industries in India	Content analysis is used to examine environmental reporting practices.	Industry type is the most important factor affecting environmental reporting practices, as shown by the disclosure score obtained by environmentally sensitive companies.
Motwani and Gupta (2023)	9 largest Indian Energy companies (oil and gas; coal and power) listed on NSE	Content analysis of BRSR of the environmental dimension of large energy sector companies	Nature and quality of environment disclosure appear to be more due to legitimization than transparency.
Narolia and Sapra (2023)	52 most polluting companies from the seven red category industries listed on the NSE in India	Content analysis of environmental reporting practices and analysis of factors through an independent sample t-test.	Significant variations were found in the environmental disclosure of companies on the basis of size, industry, and environmental certifications.

Source: Authors' compilation

3. Theoretical Framework and Development of Hypotheses

3.1 ESG Disclosure

Researchers have applied various theoretical lenses to explain why firms engage in ESG reporting. The theoretical framework of the present study comprises four major theories on ESG disclosure: legitimacy, agency, stakeholder, and resource-based theory.

Legitimacy theory posits that organizations seek to operate within the bounds of societal norms and expectations (Suchman, 1995). When their legitimacy is threatened by environmental harm, social issues, or governance failures, companies often use sustainability reports to restore public trust and align with stakeholder expectations. Agency theory (Jensen and Meckling, 1976) addresses the conflict of interest between managers (agents) and shareholders (principals). Sustainability disclosure helps reduce information asymmetry and signals good governance practices.

Stakeholder theory (Freeman, 1984) argues that firms are accountable not only to shareholders but also to all stakeholders, including employees, customers, communities, regulators, and NGOs. Companies disclose sustainability information to demonstrate their responsiveness to

diverse stakeholder demands. Whereas resource-based theory views organizations as dependent on external resources (e.g., capital, legitimacy, talent), and thus responsive to the expectations of those who control these resources (Pfeffer and Salancik, 1978).

3.2 Firm-Specific Factors

3.2.1 *Age*

Legitimacy theory postulates a positive relationship between firm age and corporate sustainability disclosure, and older companies are expected to report more on sustainability (ESG) because of their greater experience in reporting (Deegan, 2002; Kumar et al., 2021). Many empirical studies have found that the age of a firm is positively and significantly associated with its sustainability disclosure (Khan et al., 2014; Nidheesh and Fahad, 2020; Orazalin and Mahmood, 2018; Pareek et al., 2019), while a few found a negative or insignificant association between the two (Hossain and Reaz, 2007; Maurya and Singh, 2023). Based on legitimacy theory, the following hypothesis is proposed:

H1: Firm age has a positive influence on all dimensions of ESG disclosure of Indian ESI companies

3.2.2 Size

According to legitimacy theory, larger firms have more public visibility and face greater scrutiny from various stakeholders (Branco and Rodrigues, 2008; Kumar et al., 2021), so they tend to disclose more on sustainability performance. Numerous studies have documented a positive association between firm size and sustainability disclosure (Kilic and Uyar, 2014; Bhatia and Tuli, 2017; Kumar et al., 2021; Maurya and Singh, 2023), while few have reported a negative relationship between them (Pareek, Pandey, and Sahu, 2019). Hence, the following hypothesis is developed:

H2: Firm size has a positive influence on all dimensions of ESG disclosure of Indian ESI companies

3.2.3 Government ownership

Legitimacy theory posits that government-owned companies are supposed to disclose more sustainability information (Kumar and Prakash, 2020), while companies with private ownership are not likely to adopt sustainability reporting practices due to the goal of profit maximization (Jain and Winner, 2016). Many previous studies reported a significant positive relationship between Govt ownership and sustainability disclosure (Chang et al., 2019; Kumar, 2020; Kumar et al., 2022), while some found a negative relationship (Dam and Scholtens, 2012). Hence, the hypothesis is framed as follows:

H3: Government ownership of a firm has a positive influence on all dimensions of ESG disclosure of Indian ESI companies

3.2.4 Leverage

Agency theory suggests that companies with high leverage disclose more information to reduce agency costs and asymmetry in information between lenders and management (Jensen and Meckling, 1976; Artiach et al., 2010). Therefore, many studies have found that companies with high debt/leverage tend to adopt more ESG reporting practices because of the positive association between the two (Maurya and Singh, 2023; Nidheesh and Fahad, 2020; Rahman and Alsayegh, 2021). Some studies have found a negative association between sustainability disclosure and firm leverage (Bhatia and Tuli, 2017; Kumar et al., 2021), while others have not

found any significant association (Kilic and Uyar, 2014). To examine this relationship, the following hypothesis was developed:

H4: The Leverage of a firm has a positive influence on all dimensions of ESG disclosure of ESI companies in India

3.2.5 Liquidity

This variable has been comparatively less examined for its relationship with sustainability disclosure. However, companies with more liquidity or cash flow are likely to engage more in sustainability performance and disclosure (Orazalin and Mahmood, 2018). According to stakeholder theory, companies with less liquidity or cash flow may consider only financial stakeholders, ignoring the social needs of other important stakeholders, such as employees and society (Artiach et al., 2010). Therefore, the hypothesis is given as follows:

H5: The Liquidity position of a firm has a positive influence on all dimensions of ESG disclosure of Indian ESI companies

3.2.6 Profitability

Earlier empirical studies have provided mixed results regarding the relationship between profitability and sustainability/CSR reporting. Following legitimacy theory, some studies have suggested a positive significant relationship between profitability and CSR reporting practices of firms as they resorted to CSR to legitimize their growth (Andrikopoulos, Samitas and Bekiaris, 2014) while others found no significant (Kumar et al., 2021) or negative relationship between them (Kansal, Joshi and Batra, 2014; Bhatia and Tuli, 2017; Ezhilarasi and Kabra, 2017).

H6: Firm profitability has a positive effect on all dimensions of ESG disclosure of ESI companies in India

3.2.7 Promoter ownership

As per agency theory, if ownership of a company is not widely diffused or concentrated in promoters, then agency costs will be less due to less information asymmetry, and hence there will be less CSR disclosure (Jensen & Meckling, 1976; Nidheesh & Fahad, 2020). Previous studies have found mixed results, as some found no significant relationship between promoter ownership and CSR reporting (Kilic and Uyar, 2014) while others found a negative association (Nair et al., 2019; Nidheesh and Fahad, 2020). Thus, based on agency theory, the following hypothesis is developed:

H7: High promoter ownership has a negative impact on all dimensions of ESG disclosure of ESI companies in India

3.2.8 International operations

Based on the resource-based view of sustainability reporting, Bansal (2005) identified international operations as an important determinant. It leads to exposure to international laws, cultural differences, and a wider range of foreign stakeholders, resulting in a proactive approach towards CSR initiatives. Further, stakeholder theory suggests that firms with international operations disclose more information on sustainability due to existing foreign shareholders and to further induce foreign investors (Maurya and Singh, 2023). Several past studies hypothesized a positive relationship between international experience and sustainability performance disclosure (Bansal, 2005; Branco and Rodrigues, 2008; Bhatia and Tuli, 2017). Thus, the following hypothesis is proposed:

H8: Internationality of a firm has a positive influence on all dimensions of ESG disclosure of ESI companies in India

4. Research Methodology

4.1 Sample and Sources of Data

The present study is empirical in nature, based on secondary data. The sample of the study was drawn from the top 500 Indian companies listed on the S&P BSE (Bombay Stock Exchange) index. The sample of this study comprises 43 companies classified under 'Red' and 'Orange' categories as defined by MEFCC (Ministry of Environment, Forest and Climate Change) and CPCB (Central Pollution Control Board, 2016) in India. Data for the dependent variables of the study is collected from Thomson Reuters Refinitiv (EIKON) database on various dimensions of ESG performance disclosure scores (Overall ESG score, Environment, Social, and Governance pillar scores). While data for the explanatory variables, i.e., firm characteristics like age, size, Government ownership, profitability, leverage, liquidity, promoter ownership) is extracted from the PROWESS IQ database managed by the Centre for Monitoring Indian Economy (CMIE). The study has considered the sustainability (ESG) scores of the selected companies for a period of 10 years, from 2013 to 2022.

This study used a short and balanced panel data. Panel data models can better identify and measure effects that cannot be detected in pure cross-section or pure time-series data (Baltagi, 2005). In our sample, the companies from the consumer staples and energy sectors are the top two sectors forming part of the sample, with a share of 19 percent and 18 percent, respectively, followed by healthcare and metals & mining. The companies from sectors like materials, construction, consumer discretionary, capital goods, and chemicals are in smaller proportions.

4.2 Description and Measurement of Variables

4.2.1 Dependent Variables

Based on the previous literature (Sharma, Panday and Dangwal, 2020; Yadav, 2020; Rahman and Alsayegh, 2021; Disli, Yilmaz and Mohamed, 2022; Nicolo *et al.*, 2023), the study has used a third party approach to define the dependent variables i.e. ESG performance disclosure and its three dimensions namely, environment, social and governance disclosure. These variables are respectively measured through four categories of ESG scores - overall ESG combined (ESGC) score, discounted for major ESG controversies impacting the companies, Environment Pillar (ENV) Score, Social Pillar (SOC) Score, and Governance Pillar (GOV) Score, adopted from Refinitiv (EIKON) database by Thomson Reuters.

4.2.2 Independent Variables

There are 8 independent or explanatory variables for the study, which are the various firm-specific factors like age, size, Government ownership, profitability, leverage, liquidity, promoter ownership, and international location of business, which may affect overall ESG disclosure and its three pillars. Table 2 presents the description and operationalization of explanatory variables.

Table 2. Measurement and operationalization of explanatory variables

Explanatory variables (Acronym)	Operational definition	Formulae /Measure
Firm Age (AGE)	Number of years since incorporation	No. of years as on year ending
Firm Size (SIZE)	Value of total assets	Natural logarithm of total assets as on year ending

Government (GOVT) ownership (Dummy variable)	Holding more than 50% stake in shareholding by the state/ central government.	1- Central/state Govt. ownership 0- Private/Foreign ownership
Leverage (LEV)	Debt-equity ratio	Book value of total debt/total assets
Liquidity (LIQUID)	Quick ratio	Current assets/Current liabilities
Profitability (PROFIT)	ROA (Return on total assets)	Net Profit after tax/ Total assets
Promoter ownership (PROM)	Percentage of equity shares held by corporate and individual promoters	No. of shares held by promoters/total no. of shares
International location (INTNL) (Dummy variable)	Branches or offices located outside India in any country of the world.	1- Office/branch located outside India 0- Domestic branches only

Source: Authors' compilation

4.3 Econometric model specification

The study has used a panel data regression model for econometric modelling for determining the effect of different firm characteristics on ESG performance disclosure, as well as its three pillars, viz. environment, social, and governance. Four econometric models have been used to estimate the effect of various corporate characteristics on ESG combined score (model 1) and on ENV score (model 2), SOC score (model 3) and GOV score (model 4) as given below:

$$ESGCS_{i.t} = \alpha + \beta_1 AGE_{i.t} + \beta_2 GOVT_{i.t} + \beta_3 SIZE_{i.t} + \beta_4 LEV_{i.t} + \beta_5 LIQUID_{i.t} + \beta_6 PROFIT_{i.t} + \beta_7 PROM_{i.t} + \beta_8 INTNL_{i.t} + \mu_{i.t} \quad \text{(Model 1)}$$

$$ENV_{i.t} = \alpha + \beta_1 AGE_{i.t} + \beta_2 GOVT_{i.t} + \beta_3 SIZE_{i.t} + \beta_4 LEV_{i.t} + \beta_5 LIQUID_{i.t} + \beta_6 PROFIT_{i.t} + \beta_7 PROM_{i.t} + \beta_8 INTNL_{i.t} + \mu_{i.t} \quad \text{(Model 2)}$$

$$SOC_{i.t} = \alpha + \beta_1 AGE_{i.t} + \beta_2 GOVT_{i.t} + \beta_3 SIZE_{i.t} + \beta_4 LEV_{i.t} + \beta_5 LIQUID_{i.t} + \beta_6 PROFIT_{i.t} + \beta_7 PROM_{i.t} + \beta_8 INTNL_{i.t} + \mu_{i.t} \quad \text{(Model 3)}$$

$$GOV_{i.t} = \alpha + \beta_1 AGE_{i.t} + \beta_2 GOVT_{i.t} + \beta_3 SIZE_{i.t} + \beta_4 LEV_{i.t} + \beta_5 LIQUID_{i.t} + \beta_6 PROFIT_{i.t} + \beta_7 PROM_{i.t} + \beta_8 INTNL_{i.t} + \mu_{i.t} \quad \text{(Model 4)}$$

5. Discussion of Results

5.1 Summary Statistics

Table 3 provides the summary statistics of all continuous variables of the study. As shown in Table 3, it can be observed that the level of overall ESG disclosure considered in this study is moderately high, as its average is found to be 51.44.

Table 3. Summary Statistics of continuous variables

Variable Names	No. of observations	Mean	Std. Dev.	Min.	Max.
ESGCS	430	51.44	15.53	12.69	85.13
ENV	430	51.23	23.68	3.98	98.01
SOC	430	60.88	21.00	9.75	96.75
GOV	430	52.38	21.90	11.63	96.48
Age	430	48.82	25.15	7	116
Size (log Total assets)	430	12.70	1.22	10.41	16.09
Leverage	430	0.417	0.567	0	2.885
Liquidity	430	0.938	0.867	0.053	7.826

Profitability	430	9.289	10.53	-13.19	73.79
Promoter shares (%)	430	0.512	0.184	0	0.9

Source: Authors' computation

Regarding the three pillars of ESG performance disclosure, the mean of governance disclosure (52.38) is found to be a little higher than environmental disclosure (51.23), while social disclosure is found to be the highest among all sustainability scores, with a mean of 60.88. It shows that the sample companies are performing and disclosing most under the social pillar of ESG reporting. Further, the mean age of the sample companies is found to be about 49 years, with the maximum age of a company being 116 years, suggesting that the companies are fairly mature to adopt sustainability reporting practices.

5.2 Diagnostic and Specification tests

The existence of multicollinearity in the data can lead to inflated standard errors of the regression coefficients, which may lead to misleading results. To detect this problem, the study has used VIFs (Variance Inflation Factors) and correlation matrix which is given in Table 4. VIF values in all the regression models are found to be much lesser than the threshold value of 10 with mean VIF equal to 1.74 implying that there is no multicollinearity problem (Gujarati, 2003). Further, Pearson correlation matrix is also not indicating any high correlation (> 0.6) between any pair of explanatory variables. Thus, multicollinearity issue was not detected in the data for the study. However, results indicate that there is significantly high correlation between most of the ESG variables such as ESGCG, ENV and SOC with each other except GOV.

Further, to address the issue of heteroscedasticity, Breusch–Pagan/Cook–Weisberg test (Hettest) was performed and found to be insignificant indicating constant variance among error terms hence no heteroscedasticity. However, the problem of serial correlation in the data was detected by the results of Breusch-Godfrey LM test with highly significant statistic (174.34***). It is essential to account for autocorrelation while analysing panel data to ensure accurate and reliable results. This can be achieved through techniques such as fixed effects or random effects models with robust standard errors or generalized least squares method. Therefore, we have used GLS estimators through random effect FGLS regression model as suggested by Hausman test to get reliable results. Further, robust standard errors have been used (available in STATA software based on Huber-white sandwich estimator of variance) (White, 1980).

Since the present study employs panel data regression which involves estimation of 3 kinds of regression models i.e. Ordinary Least Squares (OLS), Fixed effects (FE) and Random effects (RE). Therefore, in order to choose the best fit model, certain specification tests were performed such as F test to choose between FE and OLS, Breusch Pagan Lagrangian multiplier test (BP LM test) to choose between RE and OLS, then finally Hausman test to select between FE and RE and their results are shown in Table 5.

Table 4. Pearson Correlation Matrix for all variables

	ESG	ENV	SOC	GOV	AGE	GOVT	SIZE	LEV	LIQUID	PROFIT	PROM
ESG	1										
ENV	0.740***	1									
SOC	0.734***	0.711***	1								
GOV	0.346***	0.105*	0.0680	1							
AGE	0.412***	0.530***	0.454***	0.0745	1						
GOVT	-0.0620	0.0810	0.140**	-0.579***	-0.108*	1					
SIZE	0.215***	0.477***	0.413***	-0.262***	0.230***	0.471***	1				
LEV	-0.103*	-0.0566	-0.0522	-0.132**	-0.0560	0.241***	0.400***	1			
LIQUID	-0.0434	-0.0811	-0.0136	0.00778	-0.00308	0.0426	-0.242***	-0.389***	1		
PROFIT	-0.0370	-0.121*	0.0339	-0.0670	0.0516	0.0356	-0.354***	-0.439***	0.527***	1	
PROM	-0.252***	-0.393***	-0.114*	-0.175***	-0.414***	0.323***	-0.164***	0.0205	-0.0566	0.103*	1

*** p<0.01, ** p<0.05, * p<0.1 denotes significance at 0.01, 0.05 and 0.10 levels respectively.

Table 5. Results of Random effects (Robust) models for ESG combined scores, Environment, Social and Governance pillars scores

	ESG	ENV	SOC	GOV
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
AGE	0.201**	0.478***	0.430***	0.0128
	(2.42)	(3.97)	(3.53)	(0.11)
GOVT	-7.021	-1.031	-2.217	-39.22***
	(-1.24)	(-0.12)	(-0.32)	(-5.39)
SIZE	5.095**	8.542***	10.19***	1.729
	(2.52)	(2.94)	(3.91)	(0.61)
LEV	-7.232***	-8.867***	-8.732***	0.914
	(-3.19)	(-3.63)	(-3.16)	(0.23)
LIQUID	0.652	-1.067	2.043*	2.319
	(0.45)	(-0.57)	(1.86)	(1.31)
PROFIT	-0.0710	-0.254	-0.0437	-0.185
	(-0.46)	(-1.02)	(-0.20)	(-0.97)
PROM	1.477	1.297	-1.369	16.41
	(0.18)	(0.19)	(-0.12)	(1.46)
INTNL	-2.091	0.153	-2.402	-3.777
	(-0.43)	(0.02)	(-0.37)	(-0.83)
_cons	-17.79	-74.11**	-84.39***	30.83
	(-0.66)	(-2.11)	(-2.67)	(0.89)
N	430	430	430	430
Hausman Test	. 5695	.0689	.0001	.9299
BP LM Test	449.05***	827.46***	793.74***	673.66***
F statistic	11.22***	22.71***	23.30***	23.28***
Adjusted R^2 (%)	20.85	48.22	34.47	33.62

Source: Authors' computation
Notes: *t* statistics in parentheses
*** Significant at 1%, ** Significant at 5%, * Significant at 10% level

While taking ESGCS as a dependent variable in regression, test statistics of all the specification tests are highly significant at 1% level. F test (11.22***) chooses FE over OLS while BP LM test (449.05***) chooses RE over OLS and finally Hausman test (.5695***) selects RE over FE. Hence, the study has used the RE model as the best fit regression model for examining the relationship between dependent and explanatory variables. All the results of the Hausman test suggested a random effects model for all dimensions of ESG disclosure except for SOC. However, the RE model has been used for all dimensions due to theoretical considerations of the study.

5.3 Results and Findings

The results of the random effects regression (robust) models for all dependent variables ESGCS, ENV, SOC and GOV are presented in Table 5. The discussion of results for each model is as follows:

5.3.1 Impact on ESG combined scores (ESGCS)

As per Table 5, the results of model 1 (with ESGCS as the dependent variable) reveal that firm characteristics such as firm age, firm size, and financial leverage have a significant impact on overall ESG performance disclosure of companies belonging to ESI sectors in India. The impact of corporate characteristics like age and size of a firm on ESG disclosure is positive at 1% significance level. But leverage is negatively influencing ESG reporting of selected companies at 1% significance level, in line with the results of Bhatia & Tuli (2017). Thus, H1 and H3 are accepted. However, other characteristics like Government ownership, liquidity, profitability, promoter ownership, and international location of a firm are found to have an insignificant impact on ESG reporting. Hence, the results of the study do not support H2, H4, H5, H6, H7 and H8.

5.3.2 Impact on Environment Pillar Scores (ENV)

According to the results of model 2, which has used environment pillar scores (ENV) as the dependent variable, age and size of a firm are found to have a significant positive impact on environmental reporting of ESI companies in India at 1 % level of significance. Hence, H1 and H3 are supported. These findings are consistent with many recent studies, which have provided evidence that age and size of the firm are positively associated with environmental disclosure (Baldini et al., 2018; Ezhilarasi & Kabra, 2017; Khalid et al., 2022; Kumar, Kumari & Kumar, 2021; Nidheesh & Fahad, 2020; Pareek et al., 2019).

While the leverage of a firm is found to significantly and negatively affect the environmental disclosure. These results do not support H4 but are in line with (Belkaoui and Karnik, 1989; Kilic and Uyar, 2014). Similarly, as per the results of the study, profitability has a significant negative influence on environmental reporting, as found by Baldini et al. (2018) also. However, other variables like Government ownership, liquidity, promoter ownership, and international location of a firm are found to be insignificant in influencing the environmental performance disclosure of ESI companies in India. Thus, H2, H4, H5, H6, H7 and H8 stand rejected.

5.3.3 Impact on Social Pillar Scores

The results of model 3 show that characteristics of a firm, like age, size, and liquidity, have a positive and significant influence on the social dimension of ESG disclosure of ESI companies in India, as found in (Kumar *et al.*, 2021; Kumar, Kumari and Kumar, 2021) while leverage is found to have a significant and negative relationship with social disclosure (Belkaoui and Karnik, 1989).Thus, H1, H3 and H5 get supported by the results. On the other hand, characteristics like Government ownership, promoter ownership, and international location of a firm are found to have a negative but insignificant impact on social disclosure of ESI companies in India. Hence, H2, H4, H6, H7 and H8 do not get supported by the results. These findings are in contradiction to some earlier studies, as they found a positive relationship between these variables and CSR/ ESG reporting (Branco and Rodrigues, 2008; Kumar, Kumari and Kumar, 2021). However, Ismail & Ibrahim (2009) also documented a negative relationship between Government ownership and social disclosure as indicated by the results of this study.

5.3.4 Impact on Governance Pillar Scores

The results of model 4 show that only Government ownership is found to have a significant effect on the governance dimension of ESG reporting of ESI companies in India. Surprisingly, Government ownership is significantly and negatively related to governance disclosure at 1% significance level. As the influence of Govt. ownership is significant but negative, it violates

our theoretical hypothesis. Since this dimension of sustainability disclosure is least explored by researchers, these findings contribute to the existing literature because no other study has found these results regarding factors influencing corporate governance disclosure. On the other hand, characteristics like age, size, leverage, liquidity, profitability, promoter ownership, and international location of a firm are found to be insignificant in impacting governance disclosure. Hence, other than H5, all other hypotheses are not accepted.

6. Conclusion and Implications

The results and findings from this study have provided empirical evidence on the effect of firm-specific factors on sustainability (ESG) disclosure in the context of an emerging economy, i.e., India. The findings reveal useful insights about the effect of various corporate attributes, such as age, size, Government ownership, liquidity, leverage, profitability, promoter ownership, and international location, on the sustainability reporting of environmentally sensitive companies in India. The findings from the study can be used by the management, policymakers, and regulators in India to understand the factors that promote or hamper the engagement of such companies in sustainability reporting practices.

The study reports in its findings that there exists a positive association between the age of a company and its ESG score, implying that older companies have higher sustainability disclosure resulting in better ESG scores. Size is also found to have a significant positive influence on ESG disclosure of selected companies, which means larger companies outperform smaller companies in terms of ESG reporting. The probable reason for this result could be the large resources at the disposal of bigger firms, which they can use to improve their sustainability performance and disclosure. Also, legitimacy and stakeholder theories suggest that large firms have more visibility and accountability towards more diversified and large stakeholders, so they engage in CSR/sustainability reporting to enhance their reputation and legitimise their large-scale operations (Branco and Rodrigues, 2008; Kumar, Kumari and Kumar, 2021).

The findings of the study are in consonance with many previous empirical studies revealing the positive relationship between the age of the firm and sustainability/ESG reporting in their findings (Bhatia & Tuli, 2017; Kansal et al., 2014; Orazalin & Mahmood, 2020). Similarly, several recent empirical studies also evidenced a positive relationship between firm size and sustainability/ESG disclosures (Jha & Rangarajan, 2020; Kumar, Kumari, & Kumar, 2021; Merve Kiliç, 2017). These results are also in conformity with some recent studies, which have considered international companies such as (Rahman and Alsayegh, 2021) and (Vitolla *et al.*, 2023) which also evidenced the positive effect of size and age of the firm on ESG disclosure. However, a firm's leverage and profitability are found to have a negative impact on ESG performance, which is in contradiction to the given international studies.

Leverage has a significant negative effect on ESG reporting, so the companies that are environmentally sensitive and highly levered have low sustainability disclosure as compared to companies with less debt or leverage. It may be due to the pressure from debt holders to service their debts first, then to give attention to sustainability performance reporting. Similar results were obtained for the environment dimension, as in the case of overall ESG reporting, with only a difference with respect to profitability, which is found to have a significant negative impact on ESI companies.

Surprisingly, the results of the study revealed a significant and negative relationship between Government ownership and governance disclosure. It implies that in state or government-owned ESI companies, there is less sustainability disclosure in the governance dimension. On

the whole, the impact of government ownership is found to be negative but insignificant on sustainability disclosures like ESGCS, ENV, and SOC. These results indicate that ESI companies in the public sector are required to enhance all types of their sustainability disclosures and, in particular, the governance dimension. Characteristics of a firm, like age, size, and liquidity, have a significant positive influence on the social dimension of ESG reporting of ESI companies in India, while leverage has a significant negative influence on social disclosure. Thus, it implies that older, bigger companies with more liquidity belonging to ESI sectors tend to report more on the social dimension of ESG reporting. The results of the study support stakeholder and legitimacy theories.

The study focuses on sustainability reporting practices and their determinants on companies operating in environmentally sensitive industries (ESI) like energy and gas, chemicals, oil, and mining companies, etc., as they have a direct impact on the environment. Moreover, these companies are of particular interest to investors, regulators, society, and researchers, and are under strict monitoring. Hence, studying the influence of different firm characteristics on ESG performance disclosure in such firms will provide great insights to various stakeholders like the Government, regulators, policymakers, and practitioners. Sustainability executives of such companies can take into account the relevant firm characteristics that impact their sustainability reporting practices to improve their overall ESG disclosure, including its three dimensions: 'Environment', 'Social', and 'Governance'. Although this study focuses on companies from ESI sectors, its findings may have implications for other industries as well.

The present study has a few limitations, as its scope is limited to studying firm characteristics, excluding corporate governance variables (which is a separate area of research), in the case of environmentally sensitive companies in India. So, in the future, more studies can be undertaken by incorporating such variables as size and independence of the board, gender diversity, board meetings, etc., and in other industrial sectors like the financial sector and the manufacturing sectors of India. Further, a comparative analysis may also be undertaken on ESI and non-ESI firms in India with respect to sustainability reporting and its determinants. The findings from this study can be further investigated in the context of other kinds of industries to validate the determinants of ESG performance disclosure.

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