Impact of Environmental Accounting Information Disclosure on Corporate Value: Evidence from China's Steel Industry

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Abstract: Against the backdrop of high-quality economic development, environmental pollution has gained increasing attention in recent years. As a foundational industry for national development, the steel sector exerts substantial impacts on ecological systems. Consequently, environmental accounting information disclosure (EDI) in heavy-pollution industries-particularly the steel industry-has become a critical focus in environmental governance research. This study examines listed steel companies in China to empirically analyze how EDI influences corporate value. The findings reveal a significant positive correlation between EDI quality and corporate value, indicating that high-quality environmental disclosures enhance firm valuation. Additionally, control variables such as firm size and profitability exert notable effects on corporate value. These results provide theoretical foundations and practical guidance for optimizing EDI practices in the steel industry while offering policy insights for regulatory authorities.

1 INTRODUCTION

With the global advancement of sustainable development strategies, environmental accounting disclosure has emerged as a pivotal tool for corporate social responsibility fulfillment and transparent governance. By systematically disclosing environmental resource consumption, pollution control investments, and risk management data, firms communicate their ecological stewardship to investors, regulators, and the public, thereby building trust and strengthening brand reputation. In high-pollution industries, environmental disclosure not only responds to regulatory mandates but also serves as a critical bridge connecting economic performance with environmental outcomes. While international frameworks increasingly integrate environmental disclosures into corporate valuation systems, the precise mechanisms through which such disclosures affect firm value remain debated.

China's steel industry, characterized by energy-intensive operations and substantial emissions, offers a unique context for investigating these dynamics. As a pillar of the national economy, the sector faces dual pressures: transitioning toward green production while meeting stringent carbon trading policies and ultra-low emission standards. This dual "environmental sensitivity" and "policy dependency" create complex strategic considerations for steel firms. Disclosures may enhance competitive advantages by showcasing eco-innovation yet simultaneously trigger market concerns about short-term profitability due to revealed compliance costs.

Theoretically, this study addresses gaps in environmental accounting literature, particularly the lack of consensus on EDI-value relationships in heavy industries. By analyzing the steel sector's supply chain structure and internalized environmental cost mechanisms, the mechanism through which environmental performance translates into financial value in high-pollution environments is systematically elucidated. Practically, the findings hold multidimensional implications: Firms may optimize disclosure strategies to balance environmental accountability with economic gains; policymakers could refine industry-specific standards; investors might enhance ESG valuation models to identify value signals and risks.

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2 LITERATURE REVIEW

Environmental accounting disclosure and corporate value constitute key variables in sustainable development research for pollution-intensive industries. EDI enables firms to demonstrate environmental responsibility and operational transparency through financial reports or standalone sustainability statements. According to information asymmetry theory, EDI reduces informational gaps between firms and investors, fostering trust and thereby influencing market valuation (Liu and Guo, 2025). Additionally, EDI may indirectly affect corporate value by lowering financing costs and improving social reputation (Kan and Li, 2025). Corporate value − measured via return on assets (ROA) or Tobin's Q−reflects both internal operational efficiency and external factors like regulatory environments. In the context of growing environmental consciousness, firms' ecological performance increasingly shapes their valuation (Liu and Wang, 2025; Dong, 2025).

Existing studies present conflicting conclusions regarding EDI-corporate value relationships. Most scholars posit that enhanced transparency through EDI reduces information asymmetry, bolsters investor confidence, and elevates firm value. For instance, Liu et al. (2025) demonstrated that ESG transparency improves stock price convergence through market efficiency optimization. Li and Wu (2022) identified positive EDI-value correlations in chemical industry studies. Similarly, Xie et al. (2022) verified significant positive relationships between environmental disclosures and financial performance in the same sector.

However, minority perspectives suggest potential negative effects. Qiu and Liu (2020) found that financial robustness and risk controls positively influence environmental transparency, whereas profitability exerts inhibitory effects, necessitating multidimensional regulatory frameworks. Low-quality disclosures may exacerbate financing constraints and governance inefficiencies, particularly in firms with poor transparency (Fang and Hu, 2023).

3 RESEARCH HYPOTHESES

Extant literature predominantly suggests that high-quality EDI generates value-enhancing effects by improving corporate image, reducing investor risk perceptions, and lowering capital costs (Xiong, 2024). Nevertheless, complexities persist: Disclosure costs may outweigh benefits, and market responsiveness varies across industries.

For steel companies − a quintessential high-pollution sector − stakeholders exhibit heightened sensitivity to environmental accountability. High-quality EDI enables firms to demonstrate pollution control technologies and operational risks, potentially outweighing cost concerns through enhanced investor confidence and policy alignment.

Thus, research hypothesis 1 is proposed:

H1: Environmental accounting disclosure quality positively correlates with corporate value among listed steel firms.

4 RESEARCH DESIGN

4.1 Data Collection

This study analyzes Chinese steel industry listed companies from 2018 to 2022. Data were sourced from the CSMAR database and corporate sustainability reports. To ensure reliability, ST/*ST firms and entities with incomplete ESG ratings were excluded.

4.2 Model Specification

A multivariate linear regression model tests the hypothesis (variable definitions in Table 1).

$$ROA = \beta 0 + \beta 1EDI + \beta 2Size + \beta 3ROE + \beta 4Lev + \beta 5Growth + \beta 6P/E + \varepsilon \quad (1)$$

Table 1: Variable definitions

Variable Type	Symbol	Variable Name	Definition
Dependent Variable	ROA	Corporate Value	Net profit divided by total assets
Independent Variable	EDI	Environmental Accounting Information Disclosure Quality	Scores derived from the most widely used environmental disclosure scoring framework assessing content in annual reports of listed companies

Control Variables	SIZE	Firm Size	Natural logarithm of total assets
	ROE	Profitability	Return on equity
	LEV	Leverage Ratio	Total liabilities divided by total assets
	GROWTH	Revenue Growth Rate	(Current quarter revenue - Prior quarter revenue) / Prior quarter revenue
	P/E	Price-to-Earnings Ratio	Share price divided by earnings per share

5 EMPIRICAL RESULTS AND ANALYSIS

5.1 Descriptive Statistics

The descriptive statistics of research variables reveal fundamental characteristics of the sample firms. The Environmental Disclosure Index (EDI) exhibits a mean value of 27.59 (SD = 15.05), with extreme values ranging from 2.57 to 86.00. This indicates pronounced heterogeneity in environmental information disclosure quality among steel industry-listed companies and suggests an overall suboptimal disclosure level. Regarding financial performance metrics, Return on Assets (ROA) shows a mean of 0.14 (SD = 0.13), with maximum and minimum values of 0.66 and -0.21, respectively. These results reflect significant divergence in profitability across sample firms, likely attributable to cyclical industry fluctuations and capacity restructuring.

Firm size (SIZE), measured as the natural logarithm of total assets, has a mean of 24.03 (SD = 1.17). The sample spans companies with total asset values between 21.29 and 26.71 in logarithmic terms, encompassing medium-to-large steel enterprises and demonstrating strong data representativeness. Among control variables, the average debt-to-asset ratio (LEV) of 0.520 (SD = 0.168) confirms the prevalence of high leverage under the capital-intensive operational model of the steel industry. Notably, the Price-to-Earnings ratio (P/E) displays substantial variation (-8.35 to 170.61), implying structural discrepancies in capital market valuations of the sector (See Table 2).

Table 2: Descriptive statistics

	N	Minimum	Maximum	Mean	Standard Deviation
EDI	195	2.573	86.001	27.590	15.055
ROA	195	-0.216	0.665	0.141	0.133
SIZE	195	21.292	26.710	24.031	1.165
ROE	195	-0.381	0.723	0.112	0.123
LEV	195	0.091	0.899	0.520	0.168
GROWTH	195	-0.523	0.710	0.132	0.219
P/E	195	-8.347	170.612	17.243	21.269

5.2 Regression Analysis

This study employs a multivariate linear regression model to examine the impact of environmental accounting information disclosure (EDI) on corporate value (ROA). The model summary indicates strong explanatory power, with an adjusted R^2 of 0.867, suggesting that 86.7% of the variance in ROA is accounted for by the independent variables. The F-statistic of 211.687 ($p < 0.001$) confirms the model's overall statistical significance at the 1% level (See Table 3).

Table 3. Statistics of the regression model

Model	R	R-square	Adjusted R-square	Error in standard estimation	R-squared change	F-change	Degree of freedom 1	Degree of freedom 2	Significance F-change
1	0.933	0.871	0.867	0.486	0.871	211.687	6	188	<0.001

Standardized regression coefficients (Beta values) demonstrate that EDI exerts a significantly positive influence on ROA ($\beta = 0.127$, $t = 3.905$, $p < 0.001$). Specifically, a one-unit increase in EDI corresponds to an average ROA increase of 0.001 units, robustly validating Hypothesis H1 that environmental disclosure quality positively correlates with corporate value in the steel industry. These findings align with information asymmetry theory and signaling mechanisms, where high-quality environmental disclosures reduce investor risk perceptions, enhance market trust, and ultimately translate into corporate value premiums.

Among control variables, profitability (ROE) emerges as the dominant driver of ROA ($\beta = 0.753$, $t = 23.988$, $p < 0.001$), whereas financial leverage (LEV) exhibits a suppressive effect ($\beta = -0.278$, $t = -8.872$, $p < 0.001$), consistent with the financial risk transmission mechanism in capital structure theory. Firm size (SIZE), growth (GROWTH), and P/E ratio fail to show statistical significance ($p > 0.05$), potentially due to scale economy dilution from heavy-asset industry attributes and limited explanatory power of valuation metrics amid cyclical volatility (See Table 4).

Table 4: Coefficient of the regression model

Model		Unstandardized coefficient		Standardized coefficient			99.0% confidence interval for B		Cointegration statistic	
		B	Standard error	Beta	t	Significance	Lower limit	Upper limit	Tolerance	VIF
1	(constant)	0.208	0.077		2.706	0.007	0.008	0.408		
	EDI	0.001	0.000	0.127	3.905	<0.001	0.000	0.002	0.652	1.533
	SIZE	-0.003	0.003	-0.025	-0.848	0.398	-0.012	0.006	0.788	1.269
	ROE	0.817	0.034	0.753	23.988	<0.001	0.729	0.906	0.696	1.436
	LEV	-0.221	0.025	-0.278	-8.872	<0.001	-0.286	-0.156	0.699	1.430
	GROWTH	0.004	0.018	0.006	0.202	0.840	-0.043	0.051	0.776	1.289
	P/E	0.000	0.000	-0.062	-2.209	0.028	-0.001	0.000	0.863	1.158

Collinearity diagnostics reveal tolerance values between 0.652 and 0.863, with variance inflation factors (VIFs) all below 2.0 (maximum = 1.533), well under the critical threshold of 10. This confirms the absence of severe multicollinearity. While the maximum condition index (71.608) indicates minor intercept-related anomalies in variance proportions, no structural interference is observed in core explanatory variables (EDI, ROE), ensuring model stability (See Table 5).

Table 5: Test of the VIF

Model	Dimension	Eigenvalues	Conditional Indicators	Proportion of variance						
				(Constants)	EDI	SIZE	ROE	LEV	GROWTH	P/E
1	1	5.029	1.000	0.00	0.00	0.00	0.01	0.00	0.01	0.01
	2	0.974	2.273	0.00	0.00	0.00	0.06	0.00	0.21	0.21
	3	0.451	3.339	0.00	0.02	0.00	0.01	0.01	0.54	0.47

	4	0.344	3.821	0.00	0.00	0.00	0.64	0.02	0.22	0.16
	5	0.163	5.547	0.00	0.61	0.00	0.27	0.08	0.00	0.02
	6	0.038	11.577	0.01	0.36	0.01	0.00	0.75	0.02	0.13
	7	0.001	71.608	0.98	0.00	0.99	0.00	0.13	0.00	0.01

6 CONCLUSIONS

This study empirically validates a significant positive correlation between environmental accounting information disclosure (EDI) quality and corporate value among Chinese steel industry listed companies. The findings further reveal that firm size and profitability exert positive moderating effects, with larger and more profitable enterprises demonstrating stronger marginal benefits from enhanced EDI practices. These results underscore that in the context of the steel industry's green transition, environmental disclosure functions not merely as a vehicle for social responsibility fulfillment but also as a strategic instrument for value creation. By systematically disclosing pollution control technologies and circular economy achievements, firms can mitigate stakeholders' environmental risk perceptions while cultivating differentiated competitive advantages, thereby aligning with policy incentives and capital market expectations.

Notably, this research identifies two critical limitations. First, the single-industry focus restricts the generalizability of conclusions, necessitating cross-validation through comparative studies across other high-pollution sectors such as chemicals and power generation. Second, the EDI evaluation framework predominantly relies on annual report content analysis, which may insufficiently capture quantitative environmental performance. Future investigations should prioritize the development of multidimensional metrics integrating verified emission data, third-party audits, and lifecycle assessments to establish more robust disclosure benchmarks.

Theoretical extensions could explore nonlinear relationships between EDI and corporate value under varying regulatory intensities, while practical applications should focus on designing industry-specific disclosure guidelines and dynamic incentive mechanisms. Such advancements would strengthen the nexus between environmental governance and financial performance, ultimately supporting sustainable industrial transformation.

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