

The Impact of Environmental Information Disclosure on Corporate Resilience

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Abstract

Resilience refers to an organization's ability to rapidly adapt to changes in its external environment. Corporate resilience represents the core capacity for firm survival and serves as a key driver of sustainable socioeconomic development. Using data from Chinese listed companies, this study investigates whether environmental information disclosure (EID) enhances corporate resilience. The empirical results show that EID significantly improves corporate resilience. Heterogeneity analyses reveal that the positive effect of EID on resilience is more pronounced among firms operating in less uncertain external environments and those in the maturity stage of their life cycle. Mechanism tests further demonstrate that EID strengthens resilience by improving the information environment and enhancing innovation efficiency. To address potential endogeneity concerns, this study employs instrumental variable estimation and alternative variable substitutions, and the findings remain robust across various tests. This research enriches the literature on environmental information disclosure and corporate resilience, and provides policy and managerial implications for promoting high-quality EID practices and advancing sustainable economic development.

Keywords

Environmental Information Disclosure, Corporate Resilience, Corporate Innovation

1. Introduction

The intensification of global climate risks and the loss of biodiversity have created severe environmental challenges worldwide. In terms of environmental climate,

the Intergovernmental Panel on Climate Change of the United Nations released the AR6 Synthesis Report: Climate Change 2023, which pointed out that the global average temperature has risen by 1.1°C compared with the pre-industrial period, and the frequency and intensity of extreme weather events continue to escalate. Meanwhile, the World Wide Fund for Nature's Living Planet Report 2024 reveals a 69% average decline in global wildlife populations since 1970, with tropical regions experiencing losses exceeding 90%. The degradation of ecosystem services now directly threatens food security, human health, and long-term socioeconomic stability.

Domestically, since the implementation of the reform and opening-up policy in 1978, China's economy has achieved remarkable growth, narrowing the gap with developed countries. However, this economic expansion has also been accompanied by severe environmental degradation and governance challenges. Against this backdrop, environmental governance has evolved from a single ecological issue into a central pillar of global economic stability, social resilience, and sustainable development. Enterprises, as both major creators of social wealth and key contributors to environmental pollution, play a pivotal role in this process. They depend heavily on natural resources for production and are simultaneously responsible for pollution control and environmental protection. Consequently, their environmental responsibilities—particularly the quality of environmental information disclosure (EID)—have become focal points of both academic inquiry and policy formulation.

In this context, enterprises, especially those in highly polluting industries, are expected to integrate environmental investments and EID into their operational and strategic frameworks. The realization of ecological civilization, the promotion of green industrial transformation, and the pursuit of the “Beautiful China” vision fundamentally rely on enterprises as both the economic engine and the institutional pillar of sustainability. As members of a community of shared interests with the environment and government, enterprises are obligated to actively disclose high-quality environmental accounting information. Such disclosure serves not only as an effective instrument for fulfilling environmental responsibilities but also as a cornerstone of modern environmental governance systems and a foundation for achieving China's green transition and carbon neutrality goals. Nevertheless, as profit-oriented entities, firms often evaluate environmental investments from the perspective of their strategic and financial returns—particularly, whether EID contributes to enhancing corporate resilience. Academic research on this specific relationship, however, remains limited.

Corporate resilience, as a distinctive organizational capability, reflects a firm's ability to anticipate, mitigate, and respond to internal and external environmental disruptions (Lengnick-Hall et al., 2011), emphasizing recovery and sustainable growth under adversity. In a volatile and uncertain environment, resilience has become a crucial determinant of sustainable business development and a key guarantee for the high-quality advancement of the broader socioeconomic system.

With the rise of the digital economy, corporate informatization provides technical support for environmental disclosure, making it feasible to strengthen resilience through improvements in EID quality.

Information disclosure quality is the cornerstone of efficient capital markets. By mitigating information asymmetry between firms and stakeholders, disclosure promotes fairness and transparency, ensuring the healthy functioning of financial systems (Liu et al., 2023; Kong et al., 2021; Shen et al., 2012). According to information asymmetry theory, transaction participants in imperfect markets possess limited knowledge of one another and cannot fully understand the traded objects. When one party—usually the seller—holds informational superiority, it can exploit this advantage for higher returns. The same issue exists between corporations and their stakeholders. By disclosing sufficient and transparent information, firms can reduce opportunities for information monopolization, improving market efficiency and investor confidence. From the perspective of corporate social responsibility (CSR) theory, firms are not isolated economic entities but are closely intertwined with their stakeholders—including investors, consumers, and the general public. EID acts as a primary mechanism for communicating firms' environmental commitments and for demonstrating the effectiveness of environmental management. The quality of disclosure therefore directly reflects the firm's degree of CSR fulfillment. Furthermore, high-quality environmental information enhances the information increment effect (Clarkson et al., 2004), mitigates asymmetry, and facilitates communication between firms and stakeholders (Wu et al., 2017). This not only reduces decision-making bias and maintains stakeholder trust but also improves corporate adaptability to environmental change, thereby strengthening resilience.

Resilience, a concept originally proposed in ecological studies (Holling, 1973; Lu et al., 2021), describes an organization's capacity to withstand shocks and recover from disruptions. Prior studies define corporate resilience as a firm's ability to anticipate, manage, and rebound from adverse events (Li, 2020). Existing research identifies several determinants of resilience, including CSR engagement (Guo et al., 2025) and digital transformation (Chen et al., 2023). However, as the global sustainability landscape evolves and regulatory scrutiny intensifies, stakeholders are increasingly emphasizing EID—not merely as a compliance obligation but as a strategic tool for risk management, resource optimization, and competitive differentiation.

While prior studies have examined the economic consequences of EID, such as reduced financing costs (Ye et al., 2015) and enhanced firm value (Tang et al., 2021), they have largely overlooked their role in strengthening corporate resilience. Few have explored the intrinsic link between disclosure quality and firms' capacity to adapt to environmental volatility. This study seeks to bridge that gap by constructing a direct causal relationship between EID and corporate resilience—an approach that better reflects firms' real-world practices of proactively disclosing environmental information to enhance their risk resistance. Moreo-

ver, the heterogeneity of this relationship across different firm types and environments remains underexplored. Prior studies suggest that the signaling effects of EID lack contextual specificity (Huang & He, 2020). For example, firms in heavily polluting industries may exhibit stronger resilience signaling effects, as their disclosures are directly tied to environmental risks. Yet, empirical evidence validating such differences remains limited. Wu et al. (2017) further demonstrate that higher EID quality reduces information asymmetry and alleviates financing constraints. However, existing research generally treats this as a unidirectional relationship and neglects the dynamic, bidirectional interactions between EID and other corporate factors—potentially obscuring the full complexity of their linkage.

In conclusion, the sustainability of socioeconomic development hinges on whether enterprises can balance wealth creation with effective pollution control to maximize economic, social, and ecological benefits. This study contributes to both theory and practice by providing micro-level empirical evidence on how environmental information disclosure enhances corporate resilience. The findings are expected to guide firms in building differentiated resilience advantages amid growing environmental uncertainty and to inform policymakers seeking to refine environmental governance mechanisms and promote green economic transformation—thereby achieving synergy between micro-level corporate resilience and macro-level sustainable development goals.

2. Literature Review and Hypotheses Development

2.1. Environmental Information Disclosure

While EID is a core component of the broader ESG (environmental, social, and governance) disclosure framework, this study focuses specifically on its environmental dimension to isolate its unique role in shaping corporate resilience, distinct from social or governance factors. The effects of environmental information disclosure (EID) have been extensively examined in both domestic and international studies. Wang (2008) investigated the relationship among EID, industry heterogeneity, and external institutional pressure using listed firms in the Shanghai Stock Exchange. The results show that EID levels differ significantly between heavily polluting and non-polluting industries, and that this difference is highly correlated with variations in external institutional pressures, suggesting that regulatory oversight plays a key role in enhancing transparency. Similarly, Shen et al. (2010), focusing on heavily polluting firms, found that high-quality EID significantly reduces the cost of equity, and that the implementation of “green finance” policies further strengthens this effect.

Using panel data from 2015–2019, Cheng & Liu (2022) revealed a U-shaped relationship between EID and firm value, indicating that while low levels of disclosure may not immediately improve firm value, beyond a certain threshold, greater transparency yields stronger positive effects—especially in firms subject to stricter environmental regulation. Furthermore, Tang et al. (2021) used unbalanced panel

data from 2010–2016 to examine the mediating role of internal control level. Their findings suggest that improvements in EID quality significantly enhance firm value; however, as internal control strengthens, the marginal benefit of disclosure gradually declines, indicating a substitutive relationship between internal governance and external transparency.

From a market performance perspective, Li (2017) found that EID quality is positively correlated with stock market returns, and that stronger environmental regulation amplifies this positive relationship. Similarly, Li & Feng (2015) demonstrated that political connections moderate the link between environmental regulation and EID quality: politically connected private firms exhibit steeper inverted U-shaped sensitivity curves, implying higher responsiveness but lower tolerance to environmental regulation intensity.

Early international research also provides supporting evidence. Jaggi & Freedman (1992) reported a negative correlation between EID quality and firm performance. Despite these mixed results, the majority of studies (e.g., Ye et al., 2015) confirm that EID primarily exerts positive effects by optimizing financing costs, improving market reputation, and aligning with regulatory requirements—factors that are inherently linked to firms' ability to withstand external shocks, a core dimension of corporate resilience.

2.2. Determinants of Corporate Resilience

Building on the link between EID and firm stability, research on corporate resilience has identified multiple influencing factors that interact with disclosure-related mechanisms. Ren et al. (2023) used A-share private enterprises from 2009 to 2020 to show that reverse mixed-ownership reform improves resilience by expanding directors' network centrality and structural hole richness. However, as digital transformation deepens, the marginal effect of reform declines, suggesting that reform timing should align with each firm's digital maturity. This positive effect is more pronounced when state-owned shareholders act as investment-oriented investors and under conditions of high environmental uncertainty—contexts where transparent information (including environmental disclosure) may further amplify governance effects.

At the institutional level, Hu et al. (2020) examined listed firms across 38 countries during the 2008 global financial crisis and found that stronger investor protection mechanisms are positively correlated with resilience. Mechanism analysis indicates that investor protection mitigates financing constraints by increasing access to both internal and external funding sources—an effect that EID also achieves by reducing information asymmetry for investors. Extending this perspective, Liu & Xu (2024) found—based on Chinese A-share data (2019–2022)—that higher ESG performance substantially enhances firm resilience, enabling companies to better withstand and recover from crises. Since environmental disclosure is a critical pillar of ESG, this finding further bridges the gap between EID research and resilience studies.

2.3. Hypotheses Development

Firms' environmental information disclosure (EID) directly influences the decisions and behaviors of multiple stakeholders—including shareholders evaluating long-term value and risk, investors assessing environmental compliance and sustainability potential, employees concerned about future corporate development, and analysts forming environmental performance ratings. When firms enhance the quality of their EID, they provide more transparent, accurate, and systematic information to these stakeholders, thereby fostering trust, reducing uncertainty, and gaining broader social support. Theoretically, based on information asymmetry theory, high-quality EID reduces the degree of information asymmetry between firms and external stakeholders. This improved information environment enables investors and other stakeholders to more accurately evaluate firms' environmental risks and management capabilities, leading to better decision-making and more efficient resource allocation. Consequently, firms can improve their adaptability and recovery capacity when facing environmental shocks or crises. Accordingly, we propose the following hypothesis:

H1: The quality of environmental information disclosure positively enhances corporate resilience.

High-quality environmental information disclosure improves the firm's information environment and reduces asymmetry between the firm and stakeholders, thereby strengthening its resilience. EID also conveys transparent and systematic information about firms' practices in pollution control, resource utilization, and environmental risk management. Such transparency allows investors and other stakeholders to obtain key environmental data at a lower cost, accurately assess environmental risks, and evaluate sustainability capacity. This process mitigates decision biases and resource misallocations caused by information scarcity, enabling firms to secure more targeted external support when encountering sudden environmental events or regulatory changes. Furthermore, high-quality EID discourages selective disclosure behavior, enhances firms' credibility and flexibility in capital markets, and reinforces their adaptability, buffering capacity, and recovery ability in the face of environmental uncertainty. Thus, the following hypothesis is proposed:

H2: Environmental information disclosure enhances corporate resilience by reducing information asymmetry.

Beyond improving information transparency, EID may also influence corporate resilience through innovation efficiency. High-quality EID not only communicates environmental responsibility to external stakeholders but also induces internal transparency, accountability, and incentive mechanisms. As firms disclose environmental information more openly, stakeholders develop higher expectations regarding environmental performance, which translates into internal pressure and motivation for innovation. This dynamic encourages firms to optimize R&D decisions, prioritize green technologies, and increase the effectiveness of environmental innovation investments.

Enhanced innovation efficiency enables firms to develop cleaner production processes and eco-friendly products at lower cost and faster speed. The resulting technological accumulation and intellectual property reserves provide firms with buffers and solutions to future environmental challenges, improving their adaptability and elasticity under environmental uncertainty. Therefore, we propose the third hypothesis:

H3: Environmental information disclosure enhances corporate resilience by improving innovation efficiency.

3. Research Design

3.1. Data Sources

Since the concept of environmental accounting information disclosure began to emerge in China around 2008, this study selects A-share listed companies in China from 2008 to 2022 as the research sample. The sample is processed as follows: 1) Financial industry observations are excluded; 2) Observations of ST/PT firms are excluded; 3) Observations with missing values in key variables or control variables are excluded. After screening, a total of 37,254 firm-year observations are obtained. The data are primarily drawn from the CSMAR database. To mitigate the influence of outliers, all continuous variables are winsorized at the 1% and 99% levels.

3.2. Variable Definitions

- Corporate Resilience

Following [Ortiz & Bansal \(2016\)](#), corporate resilience (Resilience) is measured from two dimensions: growth capacity and financial stability. Growth capacity is proxied by the cumulative sales over a three-year period, while financial stability is measured by the standard deviation of monthly stock returns within a year. The composite resilience score is calculated as the arithmetic mean of the standardized values of growth capacity and financial stability, after reversing the sign of the standard deviation of stock returns (to align with the notion that lower volatility indicates higher stability). A higher composite score indicates stronger corporate resilience.

- Environmental Information Disclosure

Based on [Kong et al. \(2021\)](#), the environmental information disclosure index (ED) is constructed by classifying environmental information into monetary and non-monetary types. For monetary information, a score of 2 is assigned if both quantitative and qualitative details are disclosed, 1 if only qualitative information is disclosed, and 0 if there is no disclosure. For non-monetary information, a score of 2 is assigned if disclosed, and 0 otherwise. The total disclosure score is obtained by summing across all items, and the natural logarithm of this sum is taken as the final ED score.

- Control Variables

To account for firm-level characteristics that may affect corporate resilience, the

following variables are included as controls: firm size (Size), leverage (Lev), return on assets (ROA), proportion of fixed assets (Fix), and liquidity (Liquid). In addition, firm governance and internal control factors are also controlled for, including firm age (Age), board size (Board), and the ownership concentration of the largest shareholder (TOP1). Finally, year fixed effects ($Year_t$) and industry fixed effects ($Industry_j$) are included to control for time and industry heterogeneity.

3.3. Model

To test whether environmental information disclosure influences corporate resilience, the following regression model is constructed:

$$Resilience_{i,t} = \beta_0 + \beta_1 ED_{i,t} + \beta_k X_{i,t} + Industry_j + Year_t + \varepsilon_{it} \quad (1)$$

In Equation (1), Resilience is the dependent variable, representing the resilience score of firm i in year t . ED is the key explanatory variable, measuring the quality of environmental information disclosure. The primary coefficient of interest is β_1 , which captures the impact of environmental information disclosure on corporate resilience. β_0 denotes the intercept term, and $X_{i,t}$ represents the vector of control variables discussed above.

4. Empirical Results

4.1. Descriptive Statistics

This study first conducts descriptive statistical analysis. **Table 1** presents the summary statistics of the main variables. The dependent variable, corporate resilience,

Table 1. Descriptive statistics.

Variable	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>P25</i>	<i>P50</i>	<i>P75</i>	<i>Max</i>
$ED_{i,t}$	37,254	1.583	0.977	0.000	0.693	1.609	2.398	3.611
Resilience _{<i>i,t</i>}	37,254	0.874	0.087	0.000	0.852	0.897	0.923	0.998
$Age_{i,t-1}$	37,254	2.765	0.397	1.386	2.565	2.833	3.045	3.466
$Size_{i,t-1}$	37,254	22.068	1.307	19.369	21.127	21.882	22.811	26.080
$SOE_{i,t-1}$	37,254	0.380	0.485	0.000	0.000	0.000	1.000	1.000
$Lev_{i,t-1}$	37,254	0.423	0.208	0.052	0.256	0.416	0.579	0.916
$Liquid_{i,t-1}$	37,254	2.551	2.723	0.294	1.127	1.660	2.787	17.078
$Fix_{i,t-1}$	37,254	0.216	0.163	0.002	0.088	0.182	0.308	0.704
$ROA_{i,t-1}$	37,254	0.042	0.060	-0.235	0.016	0.040	0.070	0.255
$CF_{i,t-1}$	37,254	0.048	0.072	-0.187	0.009	0.048	0.089	0.258
$Growth_{i,t-1}$	37,254	0.411	1.195	-0.722	-0.030	0.132	0.415	9.235
$Board_{i,t-1}$	37,254	2.248	0.178	1.792	2.079	2.303	2.303	2.773
$Top1_{i,t-1}$	37,254	34.891	15.006	8.600	23.140	32.830	45.100	75.100

has a mean value of 0.874 and a standard deviation of 0.087, with a maximum of 0.998. These results indicate that, overall, firms in the sample exhibit a moderately high level of resilience, though there is noticeable heterogeneity across firms—some firms achieve nearly full resilience scores, while others show relatively weak resilience performance. The key explanatory variable, environmental information disclosure with a mean of 1.583, a standard deviation of 0.977 and a maximum value of 3.611. This suggests substantial variation in disclosure quality among firms, displaying a distribution characterized by concentration in the middle and dispersion at both ends. In terms of corporate governance, the average board size is 2.248, and the ownership share of the largest shareholder averages 34.891%. These values are broadly consistent with prior literature and reflect realistic corporate governance structures observed in Chinese listed firms.

4.2. Baseline Regression

To test whether environmental information disclosure enhances corporate resilience, this paper conducts an OLS regression based on Model (1). **Table 2** reports the baseline regression results for Hypothesis 1. Column (1) presents a univariate analysis between the dependent variable and the key explanatory variable. The coefficient of ED is significantly positive at the 1% level, providing preliminary support for the proposed hypothesis. After controlling for firm characteristics, governance, industry, and year fixed effects, Column (2) shows that the coefficient of ED remains significantly positive at the 5% level, indicating that higher-quality environmental information disclosure contributes to stronger corporate resilience. These results confirm Hypothesis H1, suggesting that environmental transparency effectively improves firms' adaptability and stability in the face of uncertainty.

Table 2. Baseline regression results.

	(1)	(2)
	Resilience _{<i>it</i>}	
ED _{<i>it</i>}	0.003*** (15.519)	0.001** (2.348)
Age _{<i>it-1</i>}		0.002*** (3.571)
Size _{<i>it-1</i>}		0.005*** (27.772)
SOE _{<i>it-1</i>}		0.002*** (4.882)
Lev _{<i>it-1</i>}		-0.019*** (-14.596)
Liquid _{<i>it-1</i>}		-0.000*** (-4.646)

Continued

$Fix_{i,t-1}$		0.002 (1.071)
$ROA_{i,t-1}$		0.012*** (3.704)
$CF_{i,t-1}$		0.009*** (3.408)
$Growth_{i,t-1}$		-0.000 (-1.285)
$Board_{i,t-1}$		0.002 (1.504)
$Top1_{i,t-1}$		0.000 (0.378)
Constant	0.520*** (214.630)	0.415*** (85.640)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	37,254	37,254
Adjusted R ²	0.862	0.866

4.3. Heterogeneity Analysis

- External Environmental Uncertainty

Following [Shen et al. \(2012\)](#) in *Economic Research Journal*, this study measures external environmental uncertainty based on the standard deviation of the residuals from firms' operating revenues over the past five years, scaled by the mean value of those revenues. The measure is industry-adjusted to better capture the environmental uncertainty faced by firms. Firms are then divided into "High-Uncertainty" and "Low-Uncertainty" groups according to the median of this indicator, and grouped regressions are conducted. The results are reported in [Table 3](#). The coefficient of ED is 0.001 and significantly positive at the 10% level ($t = 1.920$) for the low-uncertainty group, but insignificant for the high-uncertainty group. This indicates that when external environmental volatility is relatively low, firms' environmental disclosures more effectively convey their sustainable development capabilities, helping investors and stakeholders form stable expectations and thereby enhancing resilience. In contrast, when uncertainty is high, the market tends to focus more on short-term risk management capabilities, weakening the long-term value of environmental information disclosure and its effect on resilience.

- Corporate Life Cycle

Drawing on [Dickinson \(2011\)](#), this study identifies firms' life cycle stages using

the cash flow pattern method, which classifies firms into growth, maturity, and decline stages based on the signs of net cash flows from operating, investing, and financing activities. Model (1) is then estimated separately for each stage. As shown in **Table 3** (Columns 3 - 5), the coefficient of ED is significantly positive mainly for firms in the maturity stage, while it is insignificant for firms in the growth and decline stages. These results indicate that the positive effect of environmental information disclosure quality on corporate resilience is concentrated among mature firms. The reason is that mature firms typically have stable operations and sufficient resources, allowing them to leverage standardized environmental disclosure to establish a good social reputation and stakeholder trust, which translates into stronger resilience. In contrast, growth-stage firms tend to focus on market expansion and R&D investment, often underinvesting in environmental disclosure, while declining firms face resource constraints and operational challenges, making it difficult for them to enhance resilience through disclosure improvement.

Table 3. Heterogeneity analysis results.

	(1)	(2)	(3)	(4)	(5)
	High-Un	Low-Un	Growth	Maturity	Decline
	Resilience _{<i>i,t</i>}				
ED _{<i>i,t</i>}	0.000 (0.872)	0.001* (1.920)	0.000 (0.891)	0.001*** (3.063)	0.000 (0.335)
Age _{<i>i,t-1</i>}	0.002** (2.020)	0.002*** (2.717)	0.002** (2.172)	0.002*** (2.955)	0.001 (0.672)
Size _{<i>i,t-1</i>}	0.004*** (16.219)	0.006*** (23.381)	0.006*** (19.573)	0.005*** (18.327)	0.004*** (8.892)
SOE _{<i>i,t-1</i>}	0.003*** (3.947)	0.001** (2.424)	0.002*** (3.309)	0.002*** (3.481)	0.001 (0.586)
Lev _{<i>i,t-1</i>}	-0.016*** (-8.782)	-0.023*** (-12.536)	-0.018*** (-8.508)	-0.018*** (-9.655)	-0.022*** (-7.399)
Liquid _{<i>i,t-1</i>}	-0.000*** (-3.125)	-0.000*** (-3.547)	-0.001*** (-2.836)	-0.000*** (-3.057)	-0.001*** (-4.056)
Fix _{<i>i,t-1</i>}	0.003 (1.482)	-0.001 (-0.691)	0.003 (1.503)	0.001 (0.582)	0.003 (0.746)
ROA _{<i>i,t-1</i>}	0.018*** (4.170)	-0.007 (-1.215)	0.004 (0.629)	0.030*** (5.998)	0.001 (0.191)
CF _{<i>i,t-1</i>}	0.004 (1.157)	0.017*** (4.172)	0.005 (1.045)	-0.005 (-1.282)	0.027*** (4.323)
Growth _{<i>i,t-1</i>}	-0.000 (-0.501)	-0.000 (-0.930)	0.000 (1.139)	-0.001** (-2.291)	-0.000 (-0.428)

Continued

Board _{<i>i,t-1</i>}	0.004** (2.329)	-0.001 (-0.887)	-0.002 (-0.981)	0.001 (0.476)	0.008*** (2.941)
Top1 _{<i>i,t-1</i>}	0.000 (0.418)	-0.000 (-0.108)	-0.000 (-0.920)	0.000 (0.689)	0.000 (1.498)
Constant	0.419*** (58.928)	0.415*** (63.091)	0.415*** (53.078)	0.427*** (61.619)	0.407*** (32.986)
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	19,396	17,858	15,507	13,880	7582
Adjusted R ²	0.854	0.882	0.865	0.901	0.819

4.4. Mechanism Tests

- Information Environment Mechanism

To further examine whether environmental information disclosure enhances corporate resilience by reducing information asymmetry, this paper constructs an information asymmetry index, denoted as ASY. A higher value of ASY indicates lower information quality and greater asymmetry. A two-stage regression approach is employed to test the mediating effect. In Column (1) of **Table 4**, the first-stage regression shows a significant negative correlation between environmental disclosure quality ED and the information asymmetry index ASY, suggesting that better environmental disclosure improves firms' information environment. In Column (2), both ED and the mediating variable ASY are included in the regression (1). The coefficient of ED remains significantly positive at the 1% level, confirming that environmental information disclosure enhances corporate resilience by improving the information environment, that is, by reducing information asymmetry between firms and external stakeholders. This mechanism is particularly salient in China's capital markets, where information opacity is often high and regulatory enforcement is evolving, making voluntary environmental disclosure a credible signal of managerial transparency and commitment.

- Innovation Efficiency Mechanism

Following the theoretical framework of [Clarkson et al. \(2004\)](#) and [Wu et al. \(2017\)](#), innovation efficiency (InnoEff) is used as the mediating variable. InnoEff is measured as the ratio of the number of granted patents to R&D expenditure. A higher value indicates more efficient conversion of R&D inputs into innovative outputs. A two-stage regression analysis is conducted to identify the mediating path. Column (3) of **Table 4** reports the first-stage regression, where the dependent variable is InnoEff. The coefficient of ED is 0.002 and significantly positive at the 1% level ($t = 3.711$), indicating that environmental information disclosure significantly promotes firms' innovation efficiency. Column (4) presents the second-stage regression, in which InnoEff and ED are simultaneously included to explain Resilience. The coefficient of ED remains significantly positive at the 1% level,

Table 4. Mechanism test results.

	(1)	(2)	(3)	(4)
	Information Environment		Innovation Efficiency	
	ASY _{<i>i,t</i>}	Resilience _{<i>i,t</i>}	InnoEff _{<i>i,t</i>}	Resilience _{<i>i,t</i>}
ED _{<i>i,t</i>}	-0.016*** (-7.126)	0.001*** (4.224)	0.002*** (3.711)	0.001*** (2.908)
ASY _{<i>i,t</i>} (InnoEff _{<i>i,t</i>})		0.021*** (42.522)		0.001 (0.408)
Age _{<i>i,t-1</i>}	0.011** (1.989)	0.002*** (3.490)	-0.008*** (-6.232)	0.002*** (4.237)
Size _{<i>i,t-1</i>}	-0.233*** (-126.523)	0.010*** (47.545)	0.027*** (60.984)	0.005*** (24.246)
SOE _{<i>i,t-1</i>}	0.004 (0.939)	0.002*** (4.624)	0.008*** (7.518)	0.002*** (5.158)
Lev _{<i>i,t-1</i>}	0.223*** (17.032)	-0.024*** (-19.198)	-0.020*** (-6.338)	-0.020*** (-13.617)
Liquid _{<i>i,t-1</i>}	0.007*** (7.557)	-0.001*** (-6.479)	-0.002*** (-12.544)	-0.000*** (-4.187)
Fix _{<i>i,t-1</i>}	0.093*** (6.421)	-0.000 (-0.161)	-0.039*** (-10.909)	0.001 (0.329)
ROA _{<i>i,t-1</i>}	-1.046*** (-30.841)	0.031*** (9.617)	0.080*** (10.036)	0.020*** (5.412)
CF _{<i>i,t-1</i>}	-0.319*** (-11.695)	0.016*** (6.033)	0.009 (1.397)	-0.000 (-0.133)
Growth _{<i>i,t-1</i>}	0.001 (0.955)	-0.000 (-0.781)	-0.002*** (-3.687)	-0.000 (-1.512)
Board _{<i>i,t-1</i>}	0.056*** (5.339)	0.000 (0.262)	0.004* (1.782)	-0.000 (-0.289)
Top1 _{<i>i,t-1</i>}	0.004*** (33.930)	-0.000*** (-6.919)	-0.000*** (-3.110)	0.000 (0.507)
Constant	4.726*** (95.635)	0.316*** (60.539)	-0.500*** (-42.587)	0.418*** (74.845)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	37,186	37,186	30,235	30,235
Adjusted R ²	0.541	0.875	0.358	0.807

confirming that improved innovation efficiency partially mediates the positive impact of environmental disclosure on resilience. From a long-term perspective, high-quality environmental disclosure fosters internal innovation incentives by enhancing transparency and accountability. This process drives more efficient R&D resource allocation, stimulates the development of green technologies, and ultimately improves firms’ adaptive capacity and resilience to external shocks.

4.5. Robustness Tests

- IV Test

To address potential endogeneity concerns—such as omitted variables and reverse causality—between environmental information disclosure quality (ED) and corporate resilience (Resilience), this study adopts the instrumental variable (IV) method. Following prior literature, the regional marketization index (Market) is selected as the instrumental variable for ED, and a two-stage least squares (2SLS) regression is conducted. In the first stage, the coefficient of Market is significantly positive at the 1% level, indicating a strong correlation between the marketization level of the region and the quality of firms’ environmental information disclosure. This satisfies the relevance condition of a valid instrument. From an exogeneity perspective, the degree of marketization in a given region is unlikely to directly affect a single firm’s resilience, except through its influence on disclosure behavior. Thus, Market can be regarded as a reasonable and exogenous instrument. In the second stage, the adjusted ED remains significantly positive at the 5% level, confirming that even after controlling for potential endogeneity, environmental disclosure quality continues to exert a positive effect on corporate resilience. This finding reinforces the robustness of the baseline results.

- Alternative Variable Specification

To further verify the robustness of the results, this study replaces the dependent variable $l_Resilience$ with its logarithmic transformation. This adjustment reduces the potential bias caused by right-skewed data distribution. The regression results show that the coefficient of ED remains significantly positive at the 1% level, consistent with the baseline findings. This confirms that the positive relationship between environmental information disclosure quality and corporate resilience is robust to alternative measurement methods.

Table 5. Robustness test results.

	(1)	(2)	(3)	(4)
	IV Tests		Alternative Variable	
	$ED_{i,t}$	$Resilience_{i,t}$	$l_Resilience_{i,t}$	
$ED_{i,t}$		0.019** (2.54)	0.002*** (14.471)	0.000** (2.100)
$Market_{i,t}$	0.017*** (5.98)			

Continued

Age _{<i>i,t-1</i>}	-0.042*** (-3.17)	0.002*** (3.73)		0.001*** (3.178)
Size _{<i>i,t-1</i>}	0.257*** (59.68)	0.000 (0.04)		0.003*** (26.296)
SOE _{<i>i,t-1</i>}	0.106*** (9.93)	0.000 (0.41)		0.001*** (4.145)
Lev _{<i>i,t-1</i>}	-0.227*** (-7.04)	-0.013*** (-5.52)		-0.011*** (-14.265)
Liquid _{<i>i,t-1</i>}	-0.007*** (-3.46)	-0.000** (-2.27)		-0.000*** (-4.561)
Fix _{<i>i,t-1</i>}	0.573*** (16.11)	-0.009** (-2.03)		0.001 (1.183)
ROA _{<i>i,t-1</i>}	0.802*** (9.48)	-0.002 (-0.33)		0.005*** (2.641)
CF _{<i>i,t-1</i>}	0.387*** (5.80)	0.003 (0.59)		0.006*** (3.741)
Growth _{<i>i,t-1</i>}	-0.014*** (-3.89)	0.000 (0.94)		-0.000 (-1.027)
Board _{<i>i,t-1</i>}	0.214*** (8.34)	-0.002 (-1.03)		0.001 (1.501)
Top1 _{<i>i,t-1</i>}	0.001*** (3.20)	-0.000 (-1.49)		0.000 (0.492)
Constant	-5.642*** (-47.72)	0.519*** (12.19)	0.419*** (294.271)	0.361*** (126.446)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	33,143	33,143	37,254	37,254
Adjusted R ²	0.402	0.856	0.855	0.858

5. Conclusions

Using data from Chinese A-share listed firms during 2008-2022, this study systematically examines the impact of environmental information disclosure on corporate resilience. The results show that environmental disclosure significantly enhances corporate resilience, particularly among firms operating in environments with lower external uncertainty and those in the mature stage of their life cycle. Mechanism analyses reveal that this positive effect operates through improved information environments and increased innovation efficiency. Robustness tests, including instrumental variable estimation and alternative measures, confirm the

reliability of the findings. Overall, the results suggest that environmental information disclosure not only reflects firms' environmental responsibility but also serves as a critical mechanism for strengthening resilience and sustaining long-term competitiveness, thereby enriching the literature on environmental disclosure and organizational adaptability.

Based on these findings, it is recommended that firms actively embrace green development policies and integrate environmental disclosure with technological innovation to reduce information asymmetry and enhance innovation-driven resilience. At the same time, regulators should strengthen supervision by mandating the disclosure of quantitative environmental data—such as emissions, energy consumption, and pollution control expenditures—which aligns with the monetary-nonmonetary classification used in this study's EID index, and by adopting differentiated regulatory measures based on firms' industry, size, and life cycle stage.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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