

# Study on the Impact of ESG Rating Discrepancies on the Sustainability of Corporate Green Innovation

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**Abstract.** As ESG principles have become increasingly influential in guiding investment strategies and corporate decisions, notable variations in ESG evaluations across different rating organizations have become a frequent occurrence. Yet, the precise mechanisms through which these variations affect corporate efforts in sustainable innovation are not fully understood. This study focuses on Chinese A-share companies listed in Shanghai and Shenzhen between 2015 and 2022, analyzing how divergences in ESG ratings influence the long-term viability of corporate green innovation and the underlying dynamics. The findings reveal that discrepancies in ESG ratings undermine the enduring nature of corporate green innovation. Further analysis of mechanisms indicates that limited access to financing and heightened business risks serve as critical pathways through which ESG rating divergences impair the continuity of green innovation. Results from heterogeneity analysis suggest that, in contrast to non-heavy-polluting firms and state-owned entities, the adverse effects of ESG rating divergences on green innovation persistence are more pronounced in heavy-polluting firms and non-state-owned entities. This study sheds light on the consequences of ESG rating divergences for the persistence of corporate green innovation, broadens the scope of research on ESG rating variations and the durability of green innovation, and offers empirical support for enhancing China's ESG rating framework and fostering the long-term viability of corporate green innovation.

**Keywords:** ESG Rating Disagreement; Sustainability of Corporate Green Innovation; Financing Constraints.

## 1. Introduction

Over the past few years, the introduction of the "dual carbon" objectives (achieving carbon peak and neutrality) has deeply embedded the idea of eco-friendly and sustainable progress in public consciousness. In April 2025, a set of guidelines titled "Coordinated Digital and Green Transformation Development Plan for 2025," released by ten governmental bodies including the Cyberspace Administration of China and the National Development and Reform Commission, called for leveraging digital technologies to drive environmental transitions and to foster low-carbon growth within the digital sector. Clearly, achieving a holistic shift toward sustainability heavily relies on the persistent advancement of green technological breakthroughs [1]. Unlike mere green innovation, the enduring impact of such innovation stems from embedding it as a fundamental principle and skill within the long-term strategic vision of businesses, characterized by "build-up" and "retention" dynamics [2]. This approach represents a nature-friendly growth paradigm for companies to meet societal obligations and pursue excellence in development, prioritizing ecological gains alongside enhanced operational productivity [3]. Within the competitive market landscape, businesses, as pivotal economic actors, actively adopt sustainable and green strategies, persistently innovating in eco-technologies to align with emerging environmental trends. This not only responds to expectations from key stakeholders like governmental bodies, markets, and investors but also serves as a critical avenue for companies to secure enduring growth.

ESG (Environmental, Social, and Governance) serves as a vital framework for evaluating a company's capacity for sustainable growth and enduring worth through the lenses of ecological impact, societal responsibility, and corporate oversight. It corresponds closely to the goals of high-quality economic progress and the essence of the innovative development philosophy [4]. The Shanghai Stock Exchange has introduced a Three-Year Strategy (2024–2026) to enhance the quality

of ESG data disclosure for listed firms and has sought public feedback on drafting guidelines for sustainability reporting by these companies. The significance of ESG outcomes in the marketplace is growing, with corporate ESG scores becoming the primary method for external parties to gauge a firm's ESG achievements. Despite China's ongoing efforts to standardize ESG information sharing in recent times, considerable variations persist in the ESG evaluations of the same company across different rating bodies [5]. Moreover, while most research has concentrated on how ESG rating disparities affect financial markets [3–5], less focus has been given to their influence on a company's day-to-day operations.

Disparities in ESG ratings diminish the reliability of the assessment outcomes. When a single company receives varying ESG scores, it creates uncertainty for investors making decisions. Significant discrepancies are often interpreted by investors as indicators of ESG data imbalance or potential "greenwashing" by the company, leading them to seek greater risk premiums, which in turn raises the company's debt financing costs and complicates equity funding. On the financial front, tightened funding restrictions directly hinder the company's access to affordable capital, compelling it to scale back on green research and development spending, thereby reducing the long-term impact of green innovation. On the operational front, rating inconsistencies signal ambiguity about the company's ESG standing to the market, potentially resulting in client attrition and regulatory penalties, which further pressure the company to slash green R&D allocations. Thus, ESG rating disparities for a firm can undermine the lasting nature of its green innovation by intensifying financial limitations and operational uncertainties.

Against such a background, the present study selects Chinese A-share listed firms on the Shanghai and Shenzhen Stock Exchanges over the period 2015–2022 to empirically examine the influence of ESG rating discrepancies on corporate green innovation sustainability and the corresponding mechanisms. The results reveal that higher ESG rating disparities correlate with reduced longevity of corporate green innovation; mechanism analysis highlights financial restrictions and operational uncertainties as key pathways through which ESG rating disparities dampen the persistence of green innovation; additional findings show that ESG rating disparities hinder the continuity of green innovation by exacerbating financial constraints and operational challenges; moreover, the detrimental effect of ESG rating disparities on corporate green innovation levels is more pronounced in heavily polluting firms and non-state-owned companies.

The prospective marginal contributions of this study are evident in three key areas: First, it broadens the exploration of the economic ramifications of ESG rating disparities. Much of the current literature centers on the structural basis of ESG [6], its determinants [7], and economic impacts [8]. However, the origins and economic effects of ESG rating disparities have received limited attention. This study emphasizes the strong connection between ESG and the lasting impact of green innovation, investigating how ESG rating disparities influence green innovation continuity, thereby adding to the body of work on ESG rating disparities.

Second, it extends the body of knowledge on the enduring nature of green innovation from an ESG viewpoint. Existing research on green innovation longevity primarily addresses policy influences, stakeholder expectations [9], and internal company resources and competencies [10]. Building on prior studies, this research explores the functional dynamics of how ESG rating disparities impact the sustained nature of corporate green innovation from a distinct angle, further enriching the understanding of factors affecting green innovation persistence.

Third, it dissects the operational pathways and influence mechanisms of ESG rating disparities on the sustained impact of corporate green innovation. Through the lenses of financial limitations and operational uncertainties, this study delves into the varying degrees to which green innovation persistence in different types of firms is impacted by ESG rating disparities, offering empirical insights into how variations in ESG ratings shape the long-term trajectory of corporate green innovation.

## 2. Theoretical Analysis and Research Hypotheses

### 2.1. ESG Rating Disagreement and the Sustainability of Corporate Green Innovation

ESG rating disagreement fundamentally pertains to the variations in evaluations of a company's environmental, social, and governance performance by different rating organizations using distinct criteria. This discrepancy is more than just inconsistent scores; it represents a significant display of "signal distortion" within the market's information landscape. It highlights issues like inadequate ESG data disclosure by companies and the lack of standardized assessment frameworks in the industry, ultimately worsening the information gap between companies and their stakeholders. In theory, such disagreement heightens the information divide between firms and stakeholders, undermines investor confidence in corporate eco-friendly initiatives, induces short-sighted reasoning among managerial staff, and eventually exerts a negative impact on the long-run sustainability of eco-friendly innovation. Drawing from the theory of information asymmetry, green innovation is marked by significant external impacts, substantial investment needs, and extended timelines. Its enduring success largely hinges on market acknowledgment of corporate environmental efforts and resource backing. According to the principal-agent framework, the decision-making inclinations of management play a crucial role in shaping the continuity of corporate green innovation. With this foundation, the following hypothesis is put forward:

H1: ESG rating disagreement diminishes the long-term persistence of corporate green innovation.

### 2.2. Impact Mechanism of ESG Rating Disagreement on the Sustainability of Corporate Green Innovation

The theory of information asymmetry suggests that ESG rating disagreement arises from variations in how different agencies evaluate a company's environmental, social, and governance performance. These variations result from differences in evaluation criteria, data origins, and weighting methods, ultimately deepening the information asymmetry between firms and investors. According to this theory, ESG rating discrepancies offer fresh insights for stakeholders to monitor how companies meet their social obligations, potentially heightening the external pressures felt by firms. Against this backdrop, we hypothesize as follows:

H2: ESG rating disagreement hampers the long-term viability of green innovation by amplifying corporate financing limitations and operational challenges.

## 3. Research Design

### 3.1. Sample Selection and Data Sources

This study uses data from Chinese A-share listed firms on the Shanghai and Shenzhen exchanges spanning 2015 to 2022, applying the following filters: (1) removing ST and \*ST designated companies; (2) omitting firms from the financial and insurance sectors; (3) discarding records with absent critical variables; (4) In order to mitigate the disturbance caused by outliers, all continuous variables are trimmed at 1% on both the upper and lower ends. As a result, a total of 27,619 firm-year observations is retained. Data concerning the long-term impact of corporate green innovation for these listed entities are sourced from the CNRDS database, while supplementary firm-level data are sourced from the CSMAR database.

### 3.2. Variable Definition

#### 3.2.1. Explanatory Variable: ESG Rating Disagreement (RT)

Following the approaches of Christensen et al. (2022) and He et al. (2023), ESG rating disagreement (RT) is determined by calculating the standard deviation of ESG rating scores for the same company across 6 different ESG rating agencies. Specifically, this study focuses on six prominent domestic rating organizations with comprehensive data: FTSE Russell, China Social Value

Investment Alliance, Huazheng, Menglang, SynTao Green Finance, and Wind. The scoring systems of these agencies are standardized, with scores adjusted to a scale of 0–9 to ensure balanced impact on ESG rating disagreement. Ultimately, the standard deviation of these normalized scores from the various agencies is computed to derive the ESG rating disagreement (RT)..

**3.2.2. Dependent Variable: Sustainability of Corporate Green Innovation (SGI)**

Referring to the method of Zhou & Ren (2025), the sustainability of corporate green innovation (SGI) is measured by the month-on-month growth rate of the sum of patent applications of an enterprise in years t and t-1 compared with the sum of patent applications in years t-1 and t-2, multiplied by the sum of patent applications in years t and t-1.

**3.2.3. Control Variables**

Drawing on the methods of Zhou & Gao (2024) and Hou et al. (2024), this paper selects the following control variables: firm size (Size), asset-liability ratio (Lev), return on assets (ROA), total asset turnover (ATO), inventory ratio (INV), number of board directors (Board), operating income growth rate (Growth), loss status (Loss), shareholding ratio of the largest shareholder (Top1), firm listing age (ListAge), Big4 (audited by Big Four accounting firms), and equity balance (Balance1). Definition of Variables are shown in table 1.

**Table 1.** Definition of Variables.

Variable Symbol	Variable Name	Definition
SGI	Sustainability of Corporate Green Innovation	See detailed definition above
RT	ESG Rating Disagreement	See detailed definition above
Size	Firm Size	Natural logarithm of total assets of listed companies
Lev	Asset-Liability Ratio	Total liabilities / Total assets
ROA	Return on Assets	EBIT / Average total assets
ATO	Total Asset Turnover	Operating income / Average total assets
INV	Inventory Ratio	Inventory / Current assets
Board	Number of Board Directors	Total number of board members
Growth	Operating Income Growth Rate	Growth in operating income / Operating income of the previous year
Loss	Loss Status	1 if net profit < 0, otherwise 0
Top1	Shareholding Ratio of the Largest Shareholder	Number of shares held by the largest shareholder / Total shares
ListAge	Listing Age	Years since the firm’s listing
Big4	Big Four Audit	1 if audited by Big Four accounting firms, otherwise 0
Balance1	Equity Balance	Sum of shareholding ratios of the 2nd to 5th largest shareholders / Shareholding ratio of the largest shareholder

**3.3. Model Design**

Drawing on the method of Liang et al. (2020), this paper adopts a two-way fixed effects model to examine the impact of ESG rating disagreement on voluntary information disclosure. The specific model is as follows:

$$SGI_{i,t} = \beta_0 + \beta_1 RT_{i,t} + \sum \beta_k Control_{k,i,t} + Industry_i + Year_t + \epsilon_{i,t} \tag{1}$$

In Model (1), this paper focuses on the coefficient  $\beta_1$  of RT. According to Hypothesis H1,  $\beta_1$  is expected to be significantly negative, meaning that greater ESG rating disagreement leads to lower sustainability of corporate green innovation. In addition, the model controls industry and year fixed effects, and conducts firm-level clustering.

## 4. Empirical Results

### 4.1. Regression Results of ESG Rating Disagreement and the Sustainability of Corporate Green Innovation

Table 2 presents the regression outcomes concerning ESG rating disagreement and the long-term viability of green innovation. In Column (1), the regression is conducted controlling only for year and industry factors. The coefficient for RT stands at -2.687 and is statistically significant at the 1% level, suggesting that an increase in ESG rating disagreement may lead to perceptions of "ESG greenwashing" or heightened ESG information asymmetry, consequently diminishing green R&D investments and reducing the durability of green innovation. Column (2) includes additional control variables incorporated into the regression analysis. Here, the coefficient for RT is -1.750, also significant at the 1% level, demonstrating that ESG rating disagreement notably hampers the enduring nature of corporate green innovation, thus supporting Hypothesis H1 of this study.

In Column (2), both the asset-liability ratio (Lev) and the duration since a firm's listing (ListAge) exhibit a significant negative relationship with the sustainability of green innovation at the 1% level. This could be attributed to the fact that a higher asset-liability ratio and extended listing duration often result in inflexible business structures and looming debt obligations, increasing the costs of green transformation and diminishing the sustainability of green innovation. Conversely, firm size (Size) shows a significant positive correlation with the sustainability of green innovation at the 1% level. This likely reflects that larger firms possess greater R&D funding, technological resources, and regulatory compliance capacity, enabling them to invest more effectively in green innovation and achieve better long-term outcomes. Interestingly, return on assets (ROA) displays a significant negative correlation with green innovation sustainability at the 1% level. This might stem from the substantial long-term capital required for green innovation, which can strain operational funds and elevate short-term costs, thus lowering immediate profitability. Additionally, equity balance (Balance1) and the size of the board of directors (Board) are positively correlated with green innovation sustainability at the 5% and 10% significance levels, respectively. This suggests that a larger board and greater equity balance contribute to more diverse decision-making perspectives, discouraging short-term profit-driven actions and encouraging a focus on sustained development. The relationship between ESG Rating Disagreement and the Long-Term Viability of Corporate Green Innovation is detailed in Table 2.

**Table 2.** ESG Rating Disparities and the Sustainability of Firms' Green Innovation.

Variable	SGI (1)	SGI (2)
RT	-2.687*** (-5.52)	-1.750*** (-3.58)
Size		15.302*** (17.38)
Lev		-7.979** (-2.43)
ROA		-19.509*** (-2.83)
ATO		0.996 (0.64)
INV		-6.004 (-1.17)
Board		4.932* (1.87)
Growth		0.968 (1.36)
Loss		-1.584 (-1.43)

Top1		2.167
		(0.31)
ListAge		-11.930***
		(-5.28)
Big4		1.254
		(0.46)
Balance1		6.090**
		(2.44)
cons	23.911***	-301.387***
	(45.25)	(-15.23)
N	22,492	22,492
ID	YES	YES
YEAR	YES	YES
R-Squared	0.732	0.738

t statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 5. Robustness Tests

To ensure the reliability of the research conclusions, this paper conducts multiple robustness tests:

### 5.1. Endogeneity Tests

#### 5.1.1. Instrumental Variable Method

To alleviate potential endogeneity issues, this paper uses the mean ESG rating disagreement of other listed companies computed by the three-way grouping of industry, province and year as an instrumental variable. The empirical results are consistent with the benchmark regression, demonstrating the robustness of the inhibitory effect that ESG rating disagreement imposes on the sustainability of corporate green innovation.

#### 5.1.2. Propensity Score Matching (PSM)

PSM is used to re-match samples to reduce the impact of sample self-selection bias. The results also show that ESG rating disagreement has a significant negative impact on the sustainability of corporate green innovation.

### 5.2. Other Robustness Tests

#### 5.2.1. Replacement of Explanatory Variables

To further verify the conclusion, this paper uses ESG rating quartile indicators and ESG rating fluctuation ranges as alternative measures for ESG rating disagreement, which is originally estimated by standard deviation. The results are consistent with those of the benchmark regression.

#### 5.2.2. Lagged Effect Test

The first-order and second-order lagged values of ESG rating disagreement are used for regression tests. The results still show that ESG rating disagreement has a significant negative impact on the sustainability of corporate green innovation.

#### 5.2.3. Other Methods

Double clustering standard errors and sample size reduction are used for tests. The estimated results remain consistent with the baseline regression. In conclusion, through multiple robustness tests, the research conclusions of this paper are reliable and robust.

## 6. Mechanism Analysis

### 6.1. Channel of Intensified Financing Constraints

Based on information asymmetry and limited attention theory, ESG rating disparities deepen information asymmetry between firms and stakeholders, rendering genuine ESG performance difficult to identify accurately. This causes investors to demand higher risk compensation and banks to raise credit risk premiums, thereby intensifying corporate financing constraints. Green innovation is characterized by large investment, long cycles, and uncertain returns, and highly depends on continuous and stable capital support. The intensification of financing constraints directly squeezes the space for green R&D funds, weakening its sustainability. The mechanism test results (coefficient of RT = 0.018,  $p < 0.01$ ) show that ESG rating disagreement significantly intensifies corporate financing constraints.

### 6.2. Channel of Operational Risk Transmission

ESG rating disagreement directly increases corporate operational risks through the following paths:

**Superimposed compliance costs:** Contradictory rating standards force enterprises to invest additional funds to meet the requirements of different agencies or repeatedly conduct compliance verification, resulting in resource waste.

**Supply chain shocks:** Disagreement makes it difficult for suppliers and customers to judge the enterprise's performance capabilities, which may lead to cooperation interruptions or strict terms.

**Distracted management attention:** To address risks, management is forced to shift its focus from strategic planning to risk response.

In this context, enterprises tend to reduce non-rigid expenditures such as green R&D to maintain operational stability, thereby inhibiting the sustainability of green innovation. The mechanism test results (coefficient of RT = 0.003,  $p < 0.01$ ) show that the greater the ESG rating disagreement, the higher the corporate operational risks.

As shown in Column (3) of Table 3, the coefficient of RT is 0.003 and significantly positive at the 1% significance level, which suggests that higher ESG rating divergences result in greater corporate operational risks.

**Table 3.** Results of Mechanism Analysis.

Variable	(1) SA Index	(2) Risk
RT	0.018*** (7.77)	0.003*** (5.47)
Size	0.066*** (42.16)	-0.001 (-0.77)
Lev	-0.066*** (-6.70)	0.006 (1.42)
ROA	-0.323*** (-10.29)	-0.176*** (-21.31)
ATO	0.007 (1.64)	0.014*** (7.49)
INV	0.037** (2.47)	-0.018*** (-2.94)
Board	-0.066*** (-8.70)	0.005 (1.48)
Growth	-0.000 (-0.08)	-0.003*** (-3.21)
Loss	-0.006 (-1.12)	0.007*** (5.54)
Top1	0.044*** (3.23)	-0.044*** (-5.41)
ListAge	-0.185***	0.014***

	(-72.92)	(5.53)
Big4	0.113***	-0.001
	(18.08)	(-0.20)
Balance1	0.006	-0.001
	(0.89)	(-0.46)
cons	-4.814***	0.018
	(-146.26)	(0.77)
N	22,900	21,876
ID	YES	YES
YEAR	YES	YES
R-Squared	0.339	0.551

t statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 7. Conclusions and Implications

Using Chinese A-share listed companies in Shanghai and Shenzhen from 2015 to 2022 as the sample, this paper empirically tests the impact of ESG rating disagreement on the sustainability of corporate green innovation. The study finds that ESG rating disagreement significantly reduces the sustainability of corporate green innovation, and financing constraints and corporate operational risks are important transmission channels for this inhibitory effect. Heterogeneity analysis further shows that this negative impact is more significant in heavy-polluting enterprises and non-state-owned enterprises.

The implications derived from this study suggest that establishing and refining ESG evaluation systems, reducing information asymmetry, and improving rating transparency can provide useful references for enhancing the sustainability of corporate green innovation. The findings also provide insights for practice that alleviating corporate financing constraints through differentiated financing support, improving corporate governance mechanisms and implementing differentiated regulation may help ensure stable funding supply for corporate green innovation, so as to promote sustainable development.

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