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Research Article

Legal environment, social trust, and ESG Performance of enterprises: A case study of a-share listed companies on the Shanghai and Shenzhen stock exchanges in China from 2010 to 2019

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ABSTRACT

Under the background of implementing "carbon peak and carbon neutrality" targets, the ESG performance of enterprises has attracted the attention from the public. This study selects Chinese listed companies from 2010 to 2019 as samples, constructs an ESG evaluation system using the entropy method and AHP method, and investigates the impact of the legal environment on corporate ESG performance and the moderating role of social trust through multiple regression models. The study finds that a well-developed legal environment promotes corporate ESG performance, and the synergistic effect of social trust and the legal environment significantly enhances ESG performance. Further research reveals that the positive effect of the legal system on corporate ESG performance is stronger in resource-based cities and economically underdeveloped regions. Industry heterogeneity analysis further shows that companies in resource-based and traditional heavy industries experience more significant improvements in ESG performance under the influence of the legal environment. The findings enrich the research on the factors influencing corporate ESG performance and provide strategic guidance for promoting corporate sustainable development.

Keywords: legal environment; social trust; formal institutions; informal institutions; ESG

1. Introduction

In the 1990s, technological advancements spurred rapid global economic development. However, this growth also revealed issues such as energy shortages, climate change, and corporate governance challenges resulting from excessive resource consumption. Increasingly, investors have begun to incorporate corporate sustainability into their investment considerations. Against this backdrop, ESG (Environmental, Social, and Governance) emerged as a new metric for evaluating corporate sustainability.

First introduced by the United Nations Environment Programme in 2004, ESG outlines requirements for corporations across three dimensions: environmental protection, social responsibility, and corporate governance. It also explores how these factors can be better integrated into asset management, financial services, and related research. As the world's largest developing country, China has gradually recognized the importance of ESG standards. The government and enterprises have actively responded to and embraced this global trend.In recent years, China's national strategies, such as the "carbon peak and carbon neutrality"

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goals and the "rural revitalization" initiative, have placed new demands on corporate sustainability. Companies that widely adopt ESG principles and consciously fulfill their social responsibilities can improve resource utilization efficiency and accelerate the realization of rural revitalization.On the policy front, significant steps have been taken to promote ESG practices. For example, in September 2018, the China Securities Regulatory Commission revised the **Code of Corporate Governance for Listed Companies,** requiring listed companies to disclose environmental information (E), fulfill poverty alleviation and other social responsibilities (S), and provide corporate governance-related information (G) as mandated by laws and regulations. The Hong Kong Stock Exchange introduced the "comply or explain" policy for ESG disclosures in its latest ESG reporting guidelines, positioning ESG as a critical indicator for evaluating corporate sustainability. From 2022 to 2023, major stock exchanges in Beijing, Shanghai, and Shenzhen successively released **Guidelines for Self-Regulation of Listed Companies: Sustainability Reports (Trial).** Additionally, the Ministry of Finance issued the **Corporate Sustainability Disclosure Standards: Basic Guidelines (Draft for Comments),** and the State-owned Assets Supervision and Administration Commission released the **Guidance on High Standards for Fulfilling Social Responsibilities in the New Era by Central Enterprises.** These policies have established robust standards and requirements for ESG disclosures, laying a solid foundation for ESG ecosystem development.Driven by policy initiatives, China's ESG investment market has experienced rapid growth. The booming investment landscape has significantly enhanced the awareness and acceptance of ESG among the government and enterprises, further reinforcing its importance in sustainable development.

This study aims to explore the role of the legal environment and social trust in driving ESG performance in Chinese enterprises, particularly in the context of China's rapid development. ESG serves as a key indicator for assessing a company's sustainable development capabilities and plays a significant role in improving corporate social responsibility, environmental management, and governance. This study examines how the legal environment and social trust, as external institutional factors, influence corporate ESG decisions, and further analyzes how social trust, as an informal institution, moderates the impact of the legal environment on corporate ESG performance. The study provides practical policy and corporate strategy recommendations with significant implications for practice.

2. Literature review

In academia, research on corporate ESG (Environmental, Social, and Governance) practices has predominantly focused on the "outcomes" of implementing ESG initiatives. For instance, strong ESG performance has been shown to enhance corporate value in mitigating operational risks[1,2]. Actively fulfilling social responsibilities can boost short-term financial performance[3] and reduce the risk of stock price crashes[4]. Moreover, ESG practices enable companies to secure various stakeholder resources, thus lowering bankruptcy risks[5].In terms of alleviating financing constraints, ESG improves transparency between companies and investors, effectively mitigating agency problems[6] and attracting more investors. Additionally, ESG can serve as a reputation management tool, enhancing corporate image and easing financing challenges[7]. Regarding competitive advantages, ESG acts as an external supervisory mechanism, boosting employee productivity[8]. The widespread application of ESG ratings further compels companies to adopt innovative and eco-friendly practices to meet government requirements and improve their ESG scores[9]. In addition, ESG and its three sub-dimensions can significantly improve corporate value and innovation levels[10].Conversely, research on the "antecedents" of ESG remains relatively sparse and primarily focuses on corporate governance. For example, larger and more diverse boards positively influence ESG disclosure and performance [11]. A higher number of female directors improves the quality and scores of

ESG disclosures[12]. State-owned enterprises tend to exhibit superior ESG performance[13], and the participation of foreign shareholders enhances ESG disclosure practices[14].However, there is a significant research gap concerning the "antecedents" of ESG at the institutional level, particularly the role of the legal environment as an external driving force. Limited attention has been paid to how legal frameworks influence corporate ESG performance. This study addresses this gap by exploring the impact of the legal environment on ESG performance from an institutional perspective, examining its role as an external driver. By doing so, it contributes to the literature by offering new insights into the institutional antecedents of corporate ESG performance.

Simultaneously, according to the theory of new institutional economics, corporate behavior results from the interaction between formal and informal institutions[15]. Formal institutions are explicit norms established through laws, regulations, policies, industry standards, and internal corporate rules. These institutions are enforceable and mandatory, requiring companies to adhere to specific rules and procedures in their operations. They are formulated by legislative and regulatory bodies, with non-compliance resulting in legal liabilities and penalties.In contrast, informal institutions consist of unwritten norms, cultures, and values that are widely recognized but lack legal enforceability. These institutions profoundly influence corporate decision-making and operations, with corporate culture and values playing a central role. Compared to formal institutions, informal institutions offer greater flexibility, allowing companies to adapt and develop them according to specific environmental and cultural characteristics to better respond to market changes.Regarding the relationship between formal and informal institutions, three main perspectives exist in academia. Some scholars argue that they have overlapping functions[16]. Others suggest a substitutive relationship [17], where the effectiveness of one undermines the other. A third perspective views the relationship as complementary [18], with the two supporting and reinforcing each other.While there is academic debate about the relationship between formal and informal institutions, little research has examined their specific mechanisms and interactions in the context of ESG performance. In particular, the role of social trust, as an informal institution, in the relationship between the legal environment and corporate ESG performance remains unclear. It is yet to be determined whether social trust acts as a complement, substitute, or mitigating factor in this dynamic. Further investigation into these interactions could significantly advance theoretical understanding.This study introduces social trust as an informal institution to explore its moderating role in the relationship between the legal environment and corporate ESG performance. This innovative approach not only integrates the interaction between formal and informal institutions but also provides a fresh perspective for examining whether they exhibit complementary, substitutive, or mitigating effects.

3. Theoretical basis and research hypotheses

Corporations operate within a broader socio-political environment, where the authority and incentives established by rules and regulations undoubtedly exert a lasting impact on organizational behavior. Under the constraints of formal institutions, companies will make performance and achievements that contribute to social sustainable development[19]. Under the constraints of formal institutions, businesses are often required to demonstrate performance that contributes to social sustainability.Existing research highlights the positive influence of formal institutions on corporate performance in environmental responsibility, social responsibility, and corporate governance:

1）Environmental Responsibility:

As governments place increasing emphasis on environmental issues, corporations actively respond to environmental regulations to align with governmental expectations. The implementation of environmental

laws and heightened public scrutiny of corporate environmental performance have driven businesses to improve their environmental responsibility to maintain legitimacy. Institutional pressure and corporate environmental responsibility show a positive correlation[20].

2）Social Responsibility:

Campbell (2007) identified government regulation as the primary factor influencing corporate social responsibility (CSR)[21]. Similarly, studies by Shen et al. (2014) [22]and He & Gao (2017) [23]found that regulatory pressure within formal institutions has a significant positive effect on corporate social performance.

3）Corporate Governance:

La Porta et al. (1997) argued that robust legal systems reduce the incidence of internal expropriation[24]. For instance, directors, supervisors, and senior executives of listed companies in China are required to submit a "Statement of Directors, Supervisors, and Senior Management Commitments" to stock exchanges at the beginning of their tenure, pledging compliance with relevant laws and regulations. Any violations by individuals or companies can result in penalties, thereby reducing the likelihood of internal expropriation. Brockman & Chung (2003) also demonstrated that well-developed formal institutions optimize corporate governance[25], thereby enhancing stock liquidity.

Based on these findings, this study proposes the following hypotheses:

Hypothesis 1: There is a positive correlation between corporate ESG performance and the level of legal environment, that is, a sound legal environment can promote corporate ESG performance.

The optimal explanation for corporate performance and behavior should consider the combined effects of formal and informal institutions[15] Formal institutions, such as legal frameworks, provide mechanisms for property rights protection, contract enforcement, and opportunistic behavior constraints, establishing clear rules for market conduct. By reducing uncertainty and fostering a transparent trading environment, these institutions enable businesses to operate efficiently in the marketplace.However, formal institutions often face practical limitations, such as high enforcement costs, incomplete contracts, and limited coverage. Relying solely on formal institutions may not sufficiently safeguard a company's long-term interests. Social trust, as an informal institution, complements formal institutions by promoting cooperation and reducing information asymmetry[26].The synergy between formal and informal institutions lies in their complementary roles. Formal institutions enhance transparency and stability in transactions, providing businesses with a regulated market environment and legal safeguards, which enable them to invest and integrate resources with greater confidence. At the same time, social trust reduces transaction costs associated with contract creation, negotiation, and enforcement[27], further improving institutional efficiency.In high-trust environments, societal members are more inclined to resolve issues through collaboration rather than confrontation, allowing businesses to save time and resources otherwise spent on compliance and conflict resolution. Moreover, a high level of social trust motivates companies to exceed mere legal compliance and pursue higher ESG standards. Such proactive behavior not only enhances corporate social reputation but also fosters long-term value chain relationships with customers, suppliers, and other stakeholders.

Based on this, the following hypothesis is proposed:

Hypothesis 2: The synergy between social trust and legal frameworks significantly enhances corporate ESG performance.

4. Research design

4.1. Construction of corporate ESG indicator system

Given that China's ESG evaluation system is still in its early stages and lacks significant influence, there is no unified official standard for assessing ESG indicators. Taking data availability into account, this study constructs an ESG evaluation framework using ten indicators across three dimensions: environment, social responsibility, and corporate governance.

For the environmental dimension, two indicators are selected: environmental performance and the total number of corporate green patents. In the social responsibility dimension, four indicators are included: employee responsibility, shareholder responsibility, consumer responsibility, and public responsibility. For the corporate governance dimension, this study references Zhang and Lu's (2012) principal component analysis-based corporate governance efficiency framework[28], which utilizes eight major indicators. Following Hu (2022), the four indicators with the highest load coefficients were selected: the shareholding ratio of the largest shareholder, equity concentration, executive shareholding ratio, and ownership structure[29].

To calculate the weights of the ESG evaluation indicators, previous scholars have used the entropy method, which determines weights based on the degree of data dispersion—the greater the dispersion, the higher the indicator's influence on the overall evaluation[30]. However, relying solely on the entropy method may lead to results that are objective but potentially inconsistent with real-world scenarios. On the other hand, using the Analytic Hierarchy Process (AHP) alone can result in overly subjective outcomes, as AHP heavily depends on expert opinions, which may introduce significant biases, particularly in complex, multi-layered evaluation systems[31].

To address these limitations, this study adopts a combined AHP-entropy weighting method, as suggested by C. Su and Chen (2022)[32]. This hybrid approach leverages the strengths of both methods: the entropy method provides objective data-based support, while AHP incorporates expert judgment to account for the hierarchical relationships and importance of indicators. By integrating the weights derived from both methods, this approach mitigates the shortcomings of using a single method, enhancing the comprehensiveness and accuracy of the evaluation.

The combined method offers several advantages: it ensures that the evaluation results are both data-driven and reflective of expert experience, thereby improving their scientific validity and practical applicability. In practice, the weights are calculated separately using the entropy method and AHP, and the final comprehensive weight is determined by assigning an equal 50% coefficient to each method[33]. The comprehensive weights are then applied to the TOSIS evaluation model to calculate the ESG score, denoted as ESG_Score[32]. The specific data sources and weights are presented in **Table 1**.

Table 1. ESG evaluation system and weights.

ESG evaluation index system			Entropy weight(%)	AHP weight(%)	Comprehensive weight value (%)
E	Environmental Performance	Advantages of CNRDS Enterprise Environment	36.212	21.776	**28.994**
	Green innovation	Total number of green patents for enterprises	2.476	17.095	**9.7855**
S	Employee Responsibilities	Employee Responsibility Score of Hexun Network Enterprise	0.371	6.029	**3.2**
	Shareholder Responsibilities	Score of corporate shareholder responsibility on Hexun Network	5.141	8.822	**6.9815**
	Consumer responsibility	Hexun Enterprise Consumer Responsibility Score	0.435	19.08	**9.7575**

ESG evaluation index system			Entropy weight(%)	AHP weight(%)	Comprehensive weight value (%)
G	Social public responsibility	Corporate Social Public Responsibility Score of Hexun Network	24.913	2.774	**13.8435**
	Shareholding ratio of the largest shareholder	The ratio of the number of shares held by the largest shareholder to the total number of shares (negative indicator)	12.609	5.097	**8.853**
	ownership concentration	Total shareholding ratio of the second to tenth largest shareholders	3.042	3.804	**3.423**
	Executive shareholding ratio	The ratio of the number of shares held by executives to the total number of shares	0.817	9.771	**5.294**
	Nature of controlling equity	The value of state-owned control is 1, otherwise it is 0 (negative indicator)	13.986	5.752	**9.869**

Table 1. (*Continued*)

4.2. Sample selection and data sources

This study selected A-share listed companies on the Shanghai and Shenzhen Stock Exchanges from 2010 to 2019 in China as the initial research sample, and made the following treatments: (1) In China's capital market, "ST" (Special Treatment) refers to listed companies facing financial difficulties, operational problems, or other significant risks. These companies may exhibit financial irregularities, operational risks, and data distortion risks. Therefore, ST and *ST companies are excluded; (2) excluding the financial and insurance industries; (3) excluding samples with missing variables. After screening, 5,577 observations were obtained. The social trust data in this paper comes from the "China City Commercial Credit Environment Index (CEI) Blue Book," and the legal environment data comes from the "China Provincial Marketization Index Report." The CEI data is categorized by city, while the legal environment data is categorized by province.Other data sources come from CSMAR. To eliminate the influence of extreme values, this paper performed upper and lower 1% truncation processing on continuous variables.

4.3. Variable Selection

(1) Dependent variable: ESG score, which is calculated based on the ESG evaluation system constructed in the previous section using data from each company, namely the variable ESG_Score.

(2) Independent variables: Law, which represents the level of completeness of the legal environment in the region according to the data value, and the higher the score, the more complete the legal environment. Due to the large numerical value of this score, this paper divided it by 100 to eliminate the numerical gap with the dependent variable. Trust, representing the social trust index. Since the "China City Commercial Credit Environment Index (CEI) Blue Book" has been published for the years 2010, 2011, 2012, 2015, 2017, and 2019, considering the delayed impact of social credit, this paper adopted the recent substitution method proposed by Sun Zeyu (2022)[34], that is, using the data of the previous year to replace the missing data for the current year.

(3) Control variables: Following the methodology of Li Guolong (2022)[35], this paper selected enterprise age (Age), management scale (Size), leverage (Leverage), management cost (Managecost), return on assets (ROA), liquidity ratio (Liquid), and total asset turnover (Turnover), while considering industry and year fixed effects. The specific variable settings are shown **in Table 2**.

Table 2. Variable definitions.

Variable type	variable name	Variable Symbol	Variable Definition
Dependent variable	ESG score	ESG_Score	Based on the ESG evaluation system constructed in this article
Explanatory variable	Legal Environment Score	Law	Score of the Development and Legal System Environment of Market Intermediary Organizations in the China Provincial Marketization Index Report
	Social Trust Index	Trust	Blue Book of Commercial Credit Environment in Chinese Cities 'City data
Controlled Variable	enterprise age	Age	Years of establishment of the enterprise
	business scale	Size	Total Enterprise Assets (Logarithmic)
	Asset liability ratio	Leverage	Total liabilities/total assets
	Management rate	Managecost	Management expenses/main business income
	Total return on assets	Roa	Net profit/total assetsv
	Current ratio	Liquid	Current assets/current liabilities
	Total Asset turnover	Turnover	Total sales revenue/average total assets

(4) Model design

To study the correlation between formal institutions, that is, the legal environment, and corporate ESG performance, this paper constructed a multiple regression model as follows:

$$ESG_Score=\beta_0+\beta_1 Law+Controls+\Sigma Ind+\Sigma Year+\varepsilon \quad (1)$$

To verify the moderating effect of informal institutions, a multiple regression model with the interaction term of social trust was constructed as follows:

$$ESG_Score=\beta_0+\beta_1 Law+\beta_2 Trust+\beta_3 Law*Trust+Controls+\Sigma Ind+\Sigma Year+\varepsilon \quad (2)$$

5. Empirical results

5.1. Descriptive statistics

Table 3 presents the descriptive statistics of the variables used in this study, revealing that the maximum ESG evaluation score is 0.903, the minimum is 0.0111, and the mean is relatively low. This indicates that most companies demonstrate low levels of ESG performance, which can be attributed to several factors. Firstly, the cultivation of ESG awareness among Chinese enterprises remains in its early stages, with many companies perceiving ESG as an "additional task" rather than a core strategy. Secondly, traditional business models and profit-driven motivations dominate many Chinese companies, particularly those in traditional industries, which prioritize short-term profit goals. Lastly, the ESG evaluation and disclosure systems are still underdeveloped, lacking unified industry standards and mandatory policies. The descriptive statistical results of the other control variables are basically consistent with previous research.

Table 3. Descriptive statistics.

	sample size	mean value	standard deviation	minimum value	Maximum value
Esg Score	**5,577**	**0.0416**	**0.0303**	**0.0111**	**0.903**
Law	5,577	0.0969	0.0292	-0.00220	0.143
Trust	5,577	3.5692	0.3354	2.9768	5.335
Law*Trust	5,577	0.348	0.116	-0.00790	0.558
age	5,577	17.475	5.732	0	40

	sample size	mean value	standard deviation	minimum value	Maximum value
Esg Score	**5,577**	**0.0416**	**0.0303**	**0.0111**	**0.903**
size	5,577	23.189	1.470	19.80	28.51
Leverage	5,577	0.480	0.194	0.0140	0.941
ROA	5,577	0.0466	0.0574	-0.724	0.482
managecost	5,577	0.0771	0.0676	0.00112	1.494
Liquid	5,577	2.009	2.410	0.0794	57.28
Turnover	5,577	0.662	0.513	0.00827	7.609

Table 3. (*Continued*)

5.2. Correlation analysis

The correlation test results in **Table 4** show that the legal environment has a positive correlation with the corporate ESG score at the significance level of 1%, which indicates that the better the legal environment, the better the comprehensive performance of companies in the environment, social responsibility, and corporate quality; the interaction term of the legal environment and social trust is positively correlated at the significance level of 5%. In addition, the coefficient values between each variable are relatively small, indicating that there is no multicollinearity problem among the selected variables in this paper.

Table 4. Correlation analysis.

Variables	Esg_Score	Law	LawTrust	age	size	Leverage	ROA	managecost	Liquid	Turnover
Esg_Score	1.000									
Law	0.048***	1.000								
LawTrust	0.031**	0.956***	1.000							
age	-0.053***	0.202***	0.254***	1.000						
size	0.140***	0.113***	0.123***	0.103***	1.000					
Leverage	-0.004	-0.030**	-0.036***	0.117***	0.563***	1.000				
ROA	0.070***	-0.009	-0.016	-0.083***	-0.082***	-0.359***	1.000			
managecost	-0.026*	0.017	-0.007	-0.092***	-0.338***	-0.348***	-0.020	1.000		
Liquid	0.021	0.015	0.005	-0.109***	-0.334***	-0.538***	0.187***	0.248***	1.000	
Turnover	0.053***	-0.063***	-0.061***	-0.051***	-0.010	0.056***	0.128***	-0.307***	-0.088***	1.000

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

5.3. Empirical result analysis

The empirical results are presented **in Table 5**. Column 1 shows the empirical results of the legal environment's impact on corporate ESG performance, while Column 2 examines the interaction effect of the legal environment and social trust on ESG performance.The results in Column 1 indicate a significant positive correlation between the legal environment and corporate ESG performance. This finding suggests that a well-developed legal framework promotes corporate social responsibility through mandatory regulations and incentives. In regions with a more robust legal environment, corporate ESG performance is notably better.In Column 2, after introducing social trust and its interaction term, the direct effect of the legal environment (Law) is partially absorbed by the moderating effect captured by the interaction term (LawTrust). This indicates that the impact of the legal environment relies on the support of social trust. This shift highlights the complex synergistic mechanism between the legal environment and social trust, offering

important insights for understanding corporate ESG performance.Furthermore, the significance of the Trust and LawTrust variables underscores the critical role of social trust in moderating the legal environment's influence on ESG performance. The significant positive correlation of the interaction term LawTrust suggests that social trust amplifies the positive effects of the legal environment. The synergy between these two factors effectively enhances corporate ESG performance.

Table 5. Empirical results.

	(1) Esg_Score	(2) Esg_Score
Law	0,031***	-0.000905
	(5.33)	(-1.50)
Trust		-0.00379**
		(-2.16)
Law*Trust		0.000342**
		-2.01
age	-0,000***	-0.000239***
	(-8.19)	(-8.24)
size	0,001***	0.000798***
	(5.70)	-5.77
Leverage	-0,003*	-0.00266**
	(-1.96)	(-2.00)
ROA	0,025***	0.0247***
	(7.14)	-7.14
managecost	-0,008*	-0.00827**
	(-2.21)	(-2.27)
Liquid	0,000***	0.000452***
	(4.25)	-4.21
Turnover	-0,001**	-0.00139***
	(-3.16)	(-3.09)
Ind	YES	YES
Year	YES	YES
N	5572	5572
R-squared	0.264	0.264

***Note:** The values in parentheses are t-values, and * * *, * *, and * respectively represent significance levels of 1%, 5%, and 10%, the same below.*

5.4. Further analysis

In further analysis, companies are categorized based on whether they are located in resource-based or non-resource-based regions, as well as economically developed or underdeveloped regions. This categorization aims to examine the differential impact of formal and informal institutions on corporate ESG performance across various regions.

Resource-based regions are defined as areas that have been developed or established based on the exploitation of local non-renewable resources. The dominant industries in these regions are typically extraction and primary processing industries centered around non-renewable resource development. Due to the unique characteristics of resource-based regions, companies in these areas are often subject to stricter environmental regulations. Environmental regulations have been shown to significantly promote green total factor productivity in resource-based cities[36]. Thus, it is reasonable to hypothesize that the positive impact of legal frameworks on corporate ESG performance is stronger in resource-based regions than in non-resource-based regions.Based on this premise, the sample is divided into resource-based and non-resource-based cities, following the classification criteria outlined in the **National Plan for the Sustainable Development of Resource-Based Cities (2013–2020)** issued by the State Council. This process yields 617 samples from companies in resource-based cities and 4,958 samples from companies in non-resource-based

cities. **A Fisher permutation test is conducted**, with the results presented in **Table 6**, Columns (3) and (4). Here, resource_0 represents non-resource-based regions, and resource_1 represents resource-based regions.The findings indicate that a well-developed legal framework enhances corporate ESG performance in both resource-based and non-resource-based regions. However, the coefficients suggest that the impact of legal frameworks is more pronounced in resource-based regions.

Furthermore, economically underdeveloped regions refer to areas with a certain level of economic strength and potential but with a noticeable gap compared to developed regions. These areas are characterized by imbalanced productivity, underdeveloped technological capabilities, and slower progress in marketization and institutional transition. As a result, companies in these regions are more constrained by legal systems, government regulations, and financing mechanisms[37], making their behavior more reliant on institutional and policy norms.Based on this, it is hypothesized that the positive impact of legal frameworks on corporate ESG performance is stronger in economically underdeveloped regions than in developed regions. To test this, corporate samples are divided according to economic development levels. Companies from the underdeveloped Yunnan-Guizhou-Sichuan Southwestern Economic Zone in western China and the developed Jiangsu-Zhejiang-Shanghai region in eastern China are selected for regression analysis. This results in 326 samples from companies in the Yunnan-Guizhou-Sichuan region and 1,400 samples from the Jiangsu-Zhejiang-Shanghai region.**The Fisher permutation test results** are presented in **Table 6**, Columns (1) and (2), where region_0 represents underdeveloped regions, and region_1 represents developed regions. The findings indicate that a well-developed legal framework enhances corporate ESG performance in both underdeveloped and developed regions. However, the coefficients suggest that the positive impact of legal frameworks is more pronounced in underdeveloped regions.

The industry in which a company operates determines its operational model, market environment, and the legal constraints it faces[38]. Based on this, this study categorizes companies into three types to examine how firms from different industries respond to the legal environment in terms of ESG performance. The industry categories include: resource-based and traditional heavy industries, high-tech and modern services, and traditional manufacturing and consumer industries. Resource-based and traditional heavy industries, such as mining, metallurgy, and petrochemicals, rely on natural resources and are often associated with environmental pollution. As a result, governments impose strict legal regulations on these industries. Due to their significant environmental impact, the legal system plays a crucial role in promoting environmental management and corporate social responsibility. High-tech and modern services, including information technology and financial services, mainly rely on technological innovation, with the legal environment primarily influencing social responsibility and governance structures, while environmental regulations are relatively limited. Finally, traditional manufacturing and consumer industries, such as textiles and retail, cater to a broad consumer market and are subject to strict legal constraints, particularly in areas of social responsibility and consumer protection. The results of the Fisher permutation test for the three industries are shown in columns (5), (6), and (7) of **Table 6**, where ind1 represents resource-based and traditional heavy industries, ind2 represents high-tech and modern services, and ind3 represents traditional manufacturing and consumer industries. The results indicate that for resource-based and traditional heavy industries, improvements in the legal environment have a significant positive impact on ESG performance. In high-tech and modern services, the legal environment has a weaker effect on ESG performance, with companies relying more on innovation-driven strategies and market mechanisms. For traditional manufacturing and consumer industries, the positive impact of the legal environment on ESG performance remains significant.

Table 6. Further analysis results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	region_0	**region_1**	**resource_0**	**resource_1**	**ind1**	**ind2**	**ind3**
Law	0.00140***	0.000292*	0.000230***	0.00126***	0.0006***	0.0017	0.0007*
	-6.33	-1.67	-3.65	-6.95	-2.9582	-1.5035	-1.7433
age	-0.000167	-0.000495***	-0.000217***	-0.000425***	-0.0002*	191.1481	-0.0003
	(-1.35)	(-8.75)	(-7.20)	(-3.73)	(-1.7245)	-0.0003	(-1.1435)
size	-0.00213***	-0.000429	0.000832***	-0.000555	0.0018***	-0.002	0.0065***
	(-4.20)	(-1.59)	-5.77	(-1.05)	-4.5338	(-0.2483)	-7.0687
Leverage	0.0224***	0.00114	-0.00124	-0.00957**	-0.0041	-0.0109	-0.0320***
	-5.24	-0.43	(-0.88)	(-2.36)	(-1.1194)	(-0.7045)	(-3.8459)
Roa	0.0290***	0.0274***	0.0270***	0.0230**	0.0385***	-0.0114	-0.0032
	-2.82	-4.41	-7.27	-2.46	-3.801	(-0.4999)	(-0.1557)
Manage cost	0.0157	-0.00941	-0.00485	-0.0157	0.0027	-0.0418	0.0052
	-1.13	(-1.39)	(-1.28)	(-1.42)	-0.3041	(-1.1868)	-0.2883
Liquid	0.00260***	0.000262	0.000536***	-0.00024	0.0006**	0.0001	0.0001
	-6.04	-1.11	-4.57	(-0.57)	-2.5349	-0.2687	-0.0928
_cons	0.0614***	0.0484***	0.0180*	0.0611***	0	-0.005	0.0036*
	-4.76	-5.71	-1.75	-4.6	-0.0141	(-0.9554)	-1.6807
N	326	1400	4958	617	1190	383	1239

6. Robustness test

6.1. Replacing the dependent variable

In regression model (1), the original dependent variable, Esg_Score, which was self-constructed, is replaced with scores from the Runling ESG database (rks_score) and the Bloomberg ESG database (Esg_Disclosure_Score). Using the same control variables, a multiple regression analysis reveals that the legal environment is positively correlated with both rks_score and Esg_Disclosure_Score at a 1% significance level,the results are presented in **Table 7**. These results are consistent with the main conclusions of this study.

6.2. Lagging the dependent variable

Considering that the impact of legal institutions on corporate ESG performance has a certain lag effect, the dependent variable Esg_Score in regression model (1) was lagged for one year before conducting regression, i.e., L.Esg_Score. The regression results are shown in **Table 8**, which also show a positive impact and significant level of 1%, consistent with the original hypothesis.

Table 7. Multiple regression analysis with replaced dependent variables.

	(1)	(2)
	rks_score	**Esg_Disclosure_Score**
Law	30,209***	31.57***
	(4.61)	(3.432)
age	-0,007	0.0656***
	(-0.20)	(0.0175)

	(1) rks_score	(2) Esg_Disclosure_Score
size	4,534***	2.744***
	(27.49)	(0.0832)
Leverage	-6,066***	-3.531***
	(-3.78)	(0.794)
Roa	-8,259+	5.597***
	(-1.91)	(2.082)
managecost	13,764**	8.515***
	(3.15)	(2.195)
Liquid	-0,074	-0.155**
	(-0.52)	(0.0657)
_cons	-71,126***	-45.70***
	(-9.12)	(5.952)
N	3985	5180

Table 7. (*Continued*)

Table 8. Robustness test results.

	BloomingESG	L.Esg_Score
Law	0,257***	0,024***
	(7.92)	(3.43)
size	0,020***	0,002***
	(25.37)	(9.15)
Leverage	-0,027***	-0,006***
	(-3.59)	(-3.78)
ROA	-0,017	0,006
	(-0.86)	(1.36)
managecost	0,034	-0,003
	(1.63)	(-0.65)
Liquid	-0,001*	0,000
	(-2.26)	(1.12)
Turnover	0,008**	-0,001*
	(3.19)	(-2.25)
age	0,001***	-0,000***
	(3.33)	(-6.28)
Ind	YES	YES
Year	YES	YES
N	4724	4005
R-squared	0.347	0.266

7. Conclusion

This study uses panel data of listed companies from 2010 to 2019 to analyze the impact of the legal environment, as a formal institution, on corporate ESG performance and investigates the moderating role of social trust as an informal institution. In addition, this paper further analyzes the data of enterprises in resource-rich regions, economically underdeveloped regions, and different industries to study the extent to which the legal environment affects ESG performance in these regions and industries. The empirical results show that:

1) there is a positive correlation between the legal environment and corporate ESG performance, and a better legal environment can promote corporate ESG performance;

2) the synergistic effect of social trust and the legal environment helps enhance corporate ESG performance;

3) in resource-rich regions and economically underdeveloped areas, the positive effect of the legal environment on corporate ESG performance is more significant;

4) enterprises in different industries respond differently to the legal environment, with resource-based and traditional heavy industries being most significantly affected by the legal environment, while the effect is weaker in high-tech and modern service industries.

This paper not only provides new empirical support for the relationship between institutions, trust, and corporate ESG performance but also extends the research framework on the interaction between formal and informal institutions. Furthermore, the findings have important practical implications for designing regionally differentiated and industry-specific ESG policies. Future research could further combine other institutional variables to explore the comprehensive impact of multidimensional institutional factors on corporate sustainable development behavior.

8. Policy suggestions

Based on the above research, this paper proposes the following policy suggestions:

1) **Enhancing the Legal Environment to Improve Corporate ESG Performance**

The study reveals that the legal environment significantly promotes corporate ESG performance. It is recommended to further develop and refine ESG-related laws and regulations, clearly defining corporate responsibilities in environmental protection, social responsibility, and corporate governance. Additionally, law enforcement should be strengthened to ensure fair implementation, complemented by incentives such as tax benefits and green finance initiatives to encourage proactive ESG practices. These measures would provide companies with a clear compliance framework, regulate their behavior, and enhance ESG performance.

2) Leveraging the Synergy Between Social Trust and the Legal Environment

The synergy between social trust and the legal environment plays a critical role in enhancing corporate ESG performance. In high-trust regions, this advantage should be fully utilized by promoting transparency in ESG information disclosure and strengthening public oversight. Companies should also be encouraged to engage with communities through public welfare activities and local projects to bolster their social reputation. Policies should aim to safeguard the effectiveness of trust mechanisms through legal means, fostering a virtuous cycle between trust and law to further advance corporate sustainability.

3) Implementing Stricter Environmental Regulations in Resource-Based Region

Companies in resource-based regions have a significant environmental impact, making the role of the legal environment particularly crucial. It is advised to establish higher environmental standards for resource-intensive industries and strengthen law enforcement in these areas. Supporting the development and application of green technologies can improve resource utilization efficiency and reduce environmental pollution. Furthermore, successful examples of green transformation in resource-based enterprises should be promoted to elevate ESG standards across the industry and foster sustainable regional economic development.

4) Strengthening Legal Support for Companies in Underdeveloped Regions

In underdeveloped regions with lower levels of marketization, the legal environment plays a vital role in driving corporate ESG performance. Legal compliance processes should be optimized to reduce the cost of compliance for businesses and incentivize them to fulfill ESG responsibilities. Policies such as tax benefits and financial subsidies should be provided to help companies achieve ESG goals. Additionally, fostering regional collaboration to transfer green technologies and best practices from developed to underdeveloped regions can help bridge regional development gaps.

5) Implement Industry-Specific Policies

It is crucial to design industry-specific policies based on the characteristics of different industries. For resource-based and traditional heavy industries, where companies often face significant environmental pollution, stricter environmental regulations and social responsibility requirements should be enforced, while providing support for green technologies and policy incentives to promote the green transformation of these industries. In high-tech and modern service industries, although the impact of the legal environment is weaker, policies should encourage innovation and enhance corporate governance to improve their performance in social responsibility and governance. For traditional manufacturing and consumer industries, the legal environment still plays an important role in their ESG performance. Policies should strengthen supervision of consumer rights protection and social responsibility, promoting continuous improvements in environmental and social performance in these industries. By implementing industry-specific policy measures, more effective promotion of sustainable development and the achievement of ESG goals across various industries can be achieved.

Conflict of interest

The authors declare no conflict of interest.

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