

How Financial Performance Shapes Corporate ESG Performance under China's "Dual Carbon" Agenda: Mechanisms and Heterogeneity

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Abstract

China's "dual carbon" agenda has pushed listed companies to treat ESG performance not only as a disclosure item, but also as a measurable dimension of sustainable competitiveness. Against this background, this study examines whether stronger financial performance gives firms the capacity and incentive to improve ESG outcomes. Using A-share listed companies in Shanghai and Shenzhen from 2011 to 2022, the paper applies panel regressions with firm fixed effects and conducts additional model checks. The evidence indicates that Return on Assets is positively associated with corporate ESG ratings in the baseline model, and the conclusion remains supported when alternative ESG and control-variable measures are used. The analysis also shows two boundary conditions: the positive association is weaker for firms with longer listing age, and it is more visible among eastern-region firms and large-scale enterprises. The study contributes to the discussion on how financial resources are converted into ESG practices under low-carbon transition pressure, and it offers implications for resource allocation, differentiated ESG governance, and market-oriented policy incentives.

Keywords

Dual Carbon Goals; Financial Performance; ESG Performance; Listed Companies; High-quality Development.

1. Introduction

China's commitment to carbon peaking and carbon neutrality has changed the way firms evaluate investment, disclosure, and long-term competitiveness. For listed companies, the low-carbon transition is no longer limited to environmental compliance; it increasingly affects financing conditions, investor expectations, public reputation, and governance assessment. ESG, which combines environmental, social, and governance dimensions, therefore provides a useful framework for observing whether enterprises can transform financial resources into sustainable-development capacity. Financial performance represents the current operating base of a company, while ESG performance reflects how that base is used in environmental management, social responsibility, and governance improvement. Examining the link between the two can help clarify whether profitability merely improves short-term returns or also supports the broader transformation required by the dual carbon goals.

In China, ESG practice is expanding quickly, but it remains uneven across firms and regions. Some companies treat ESG as a strategic investment, while others use selective disclosure or symbolic projects to satisfy external pressure. This mixed reality makes the direction of causality difficult to judge. Strong profitability may relax resource constraints and make ESG investment more feasible; improved ESG performance may also feed back into financing advantages, risk control, and market recognition. The present study focuses on the first direction: whether financial performance can become a practical driver of ESG improvement, and under what firm or regional conditions this driver is strengthened or weakened.

Accordingly, this paper places the financial performance-ESG relationship in the context of the dual carbon transition. It first tests the overall association between ROA and ESG ratings, then examines the moderating role of listing age and compares the results across regions and firm-size groups. On this basis, the paper discusses how firms and regulators can turn financial capacity into more credible ESG practices rather than short-term or symbolic responses.

2. Literature Review and Research Hypotheses

2.1. Literature Review

2.1.1. Related Research on Financial Performance

Research on financial performance has mainly developed along two lines. The first line explains performance differences from internal capabilities and governance arrangements. For example, Zhu Naiping et al. (2014) and Zhou Xuan et al. (2012) both emphasize the role of technological innovation, while Wu Chaopeng et al. (2016) show that stronger intellectual-property enforcement can amplify the financial return from patent output. Ye Chengang et al. (2016) further link governance structure and internal control quality with performance, although their effects differ by ownership type. The second line examines channels for improving performance. Bai Fuping et al. (2022) identify digital transformation as a path for cost reduction and efficiency gains. Zhang Zhaoguo et al. (2013) and Zhang Chi et al. (2020) find that environmental and social responsibility may influence financial results with a time lag, suggesting that non-financial responsibility investment should be evaluated dynamically rather than only through immediate profit indicators.

2.1.2. Related Research on Corporate ESG Performance

Studies on ESG performance usually combine institutional and firm-level explanations. From the institutional perspective, policy regulation, market supervision, and capital-market preferences shape ESG incentives. Qiu Muyuan et al. (2019) show that environmental performance has become increasingly relevant to financing capacity under ecological-civilization construction. Hu Jie et al. (2023) argue that ESG ratings can work with formal regulation by transmitting market pressure, especially in heavily polluting and competitive industries. Zhou Fangzhao et al. (2020) find that institutional investors in the A-share market display ESG preferences, which creates an external governance force for listed companies. At the firm level, ESG performance is associated with operating efficiency, lower financial risk, and corporate value (Wang Linlin, 2022). It may also ease financing constraints, support employee innovation (Fang Xianming et al., 2023), and improve investment efficiency by reducing agency costs (Gao Jieying et al., 2021).

2.1.3. Literature Commentary

Overall, existing literature confirms that ESG and financial performance are connected, but the emphasis is uneven. Many studies ask whether ESG activities improve financial outcomes. Zhang Xianhua (2024) discusses the synergistic relationship between ESG responsibility fulfillment and financial performance, and Wang Shuangjin et al. (2022) report a nonlinear U-shaped relationship in industrial enterprises. Other studies identify boundary conditions: external pressure (Cai Wenxia et al., 2023), institutional environment (Luo Jinghua et al., 2022), and executives' green cognition (Su Ling et al., 2024) can all change the strength of the relationship; technological innovation and corporate reputation may also act as transmission channels. Compared with this literature, less attention has been paid to the reverse question of whether better financial performance enables firms to improve ESG performance. This paper addresses that gap by testing the direct effect, the moderating role of listing age, and heterogeneity across region and scale in the setting of China's dual carbon transition.

2.2. Research Hypotheses

2.2.1. Financial Performance and Corporate ESG Performance

Financial performance can be regarded as the resource base from which firms decide whether to fund environmental management, social responsibility, and governance improvement. From the perspective of resource dependence theory, firms with higher profitability and more stable cash flow are better able to absorb the cost of green technology upgrading, emission-reduction management, employee welfare, and compliance improvement. Strong performance can also reduce short-term survival pressure and allow management to allocate resources to projects whose returns are long term or indirect. By contrast, firms under financial stress are more likely to prioritize liquidity, production continuity, and immediate profitability, leaving limited room for ESG investment. Therefore, this study expects that stronger financial performance will be associated with better ESG performance and proposes Hypothesis 1:

H1: Better financial performance is positively associated with corporate ESG performance.

2.2.2. The Moderating Effect of Firm Age

Listing age captures an important stage difference in corporate development. Firms that have been listed for a shorter period often face stronger pressure to build credibility, gain market recognition, and demonstrate growth potential. When such firms improve their financial performance, ESG investment may become a way to signal long-term capability and align with policy expectations. Firms with longer listing histories may have more established routines, more stable stakeholder relationships, and a stronger preference for maintaining existing profit models. In such cases, additional financial performance may not translate into the same marginal increase in ESG investment. On this basis, this paper argues that listing age may weaken the positive financial performance-ESG relationship and proposes Hypothesis 2:

H2: Listing age negatively moderates the relationship between financial performance and corporate ESG performance.

2.2.3. Regional and Scale Heterogeneity

The conversion of financial performance into ESG improvement may also vary by external environment and firm capacity. Regional differences in marketization, green-finance infrastructure, regulatory enforcement, and investor attention can affect whether profitable firms receive clear incentives to invest in ESG. Eastern provinces generally have stronger capital markets and more mature disclosure expectations, while central and western regions may rely more heavily on compliance pressure or government guidance. Firm scale creates another boundary condition. Large firms usually have more resources, more formal governance systems, and greater public visibility, which makes ESG investment both more feasible and more valuable. Small and medium-sized firms often face tighter financing constraints and may allocate new profits first to production, market expansion, or debt pressure. These differences lead to the following hypotheses:

H3a: The association between financial performance and ESG performance differs across regions.

H3b: The association between financial performance and ESG performance differs across firm-size groups.

3. Data Processing and Descriptive Statistics

3.1. Data Sources and Processing

The empirical sample consists of Chinese A-share listed companies observed from 2011 to 2022. Firm-level variables are mainly obtained from the CSMAR database, and supplementary regional or macro information is collected from the China Statistical Yearbook. Companies in

bankruptcy status are excluded from the sample. To reduce the influence of extreme observations, all continuous variables are winsorized at the 1st and 99th percentiles before regression analysis.

3.2. Selection and Construction of Main Indicators

Dependent Variable: Corporate ESG Performance (ESG). Following the measurement logic used by Gao Jieying et al., this study uses the annual median Huazheng ESG rating disclosed through the Wind database to represent corporate ESG performance. The Huazheng system evaluates listed companies across environmental, social, and governance dimensions and reports nine ordered rating categories: AAA, AA, A, BBB, BB, B, CCC, CC, and C. Referring to Cai Wenxia et al., these categories are converted into numerical scores from 9 to 1, so that a larger value denotes stronger ESG performance.

Core Independent Variable: Financial Performance (ROA). In line with common practice in studies of corporate performance and ESG, this paper measures financial performance with Return on Assets. ROA is calculated as net profit divided by average total assets, and it captures how efficiently a firm uses its asset base to generate earnings. A higher ROA indicates stronger profitability relative to the scale of assets under management.

Moderating Variable: Firm Age (Age). This paper selects firm age as a moderating variable for analysis and research.

Control Variables: To reduce omitted-variable bias, the model controls for firm size (Size), ownership concentration (Top1), cash ratio (Cash), operating profit (OP), the number of independent directors (IDN), and the SA financing-constraint index (SA). These variables capture differences in scale, governance, liquidity, profitability structure, board independence, and external financing pressure.

The specific definitions and measurements of the above variables are shown in Table 1.

Table 1. Specific Definitions of Main Variables

Variable Type	Variable Name	Variable Symbol	Variable Definition
Independent Variable	Financial Performance	ROA	Return on Assets
Dependent Variable	Corporate ESG Performance	ESG	Annual median of Huazheng ESG score
Moderating Variable	Firm Age	Age	Firm's age since listing
Control Variables	Company Size	Size	Natural logarithm of total assets
	Ownership Concentration	Top1	Shareholding ratio of the largest shareholder = Number of shares held by the largest shareholder / Total number of shares
	Cash Ratio	Cash	Net cash flow generated from operating activities / Total assets
	Operating Profit	OP	Firm's current operating profit
	Number of Independent Directors	IDN	The actual number of incumbent independent directors at the end of the year
	SA Index	SA	$SA = -0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.04 \times \text{Age}$, where Size is the natural logarithm of total assets at year-end, and Age is the firm's listing age.

3.3. Descriptive Statistics

Table 2 reports the descriptive statistics. The mean ESG score is 4.0385, roughly between the B and BB rating levels, and the standard deviation of 1.1607 indicates noticeable variation in ESG performance among listed companies. ROA has a mean of 0.0309, while its minimum and maximum values show substantial dispersion in profitability even after sample processing. The SA index averages -3.7932, suggesting that financing constraints are a relevant background condition for many firms. Top1 averages 33.3478 percent, meaning that ownership is relatively concentrated overall, although the large standard deviation indicates meaningful cross-firm differences.

Table 2. Basic Statistical Characteristics of Main Variables

Variable	Observations	Mean	Std. Dev.	Min	Median	Max
ESG	29649	4.0385	1.1607	1.0000	4.0000	8.0000
ROA	30458	0.0309	0.2163	-14.5860	0.0318	20.7876
Size	31379	22.4084	1.5554	14.9416	22.2109	31.3101
Top1	30421	33.3478	15.1191	0.2900	30.6700	99.0000
Cash	30589	0.8829	2.5223	-5.0555	0.3560	167.5440
OP	31379	1.48e+09	1.32e+10	-7.16e+10	1.35e+08	4.24e+11
IDN	30422	3.2072	0.6299	0.0000	3.0000	8.0000
SA	27881	-3.7932	0.3178	-5.3179	-3.8178	-0.4463

4. Econometric Model and Estimation Methods

4.1. Baseline Model

To test the relationship between financial performance and corporate ESG performance under the dual carbon agenda, the following panel model is specified:

$$ESG_{i,t} = \beta_0 + \beta_1 ROA_{i,t} + \sum \beta_k Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

In the model, *i* denotes the firm and *t* denotes the year. Controls_{it} includes Size, Top1, Cash, OP, IDN, and SA. Firm fixed effects and year effects are included to absorb unobserved time-invariant firm characteristics and common annual shocks, while epsilon_{it} represents the random disturbance term.

Table 3 presents the baseline estimates using pooled OLS, random effects, and fixed effects. The ROA coefficient is 0.350 in the pooled OLS model, 0.120 in the random-effects model, and 0.0858 in the fixed-effects model. The smaller coefficient in the fixed-effects specification suggests that part of the pooled estimate may reflect unobserved firm heterogeneity. In the fixed-effects column, ROA remains positive and statistically significant at the 1 percent level, indicating that better financial performance is associated with higher ESG scores after controlling for firm characteristics and fixed effects. Several control variables, including firm size, ownership concentration, cash ratio, operating profit, number of independent directors, and SA index, also show significant coefficients in the fixed-effects specification.

The Hausman test is used to choose between random effects and fixed effects. The test statistic is 2982.08 with a p-value of 0.0000, which rejects the null hypothesis at conventional

significance levels. Therefore, the fixed-effects model is used as the preferred baseline specification.

Table 3. Baseline Regression Results

	(1) POLS	(2) RE	(3) FE
ROA	0.350 (11.00)***	0.120 (5.05)***	0.0858 (3.60)***
Size	0.225 (40.62)***	0.198 (25.18)***	0.230 (22.36)***
Top1	0.00402 (8.79)***	0.00732 (11.48)***	0.00867 (11.40)***
Cash	0.0309 (12.15)***	0.0164 (7.56)***	0.0132 (5.98)***
OP	1.93e-12 (1.21)	9.52e-12 (4.84)***	1.40e-11 (6.38)***
IDN	0.0746 (6.39)***	0.0870 (6.39)***	0.0830 (5.56)***
SA	0.335 (13.00)***	0.716 (20.24)***	0.960 (21.45)***
_cons	-0.156 (-1.08)	1.781 (10.36)***	1.952 (9.95)***
N	26674	26674	26674
R²	0.107		0.045

Note: t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

4.2. Potential Model Issues and Solutions

4.2.1. Multicollinearity Test

Variance Inflation Factors are calculated to examine multicollinearity. As shown in Table 4, all VIF values are well below the commonly used threshold of 10, and the mean VIF is 1.15. These results indicate that severe multicollinearity is unlikely to distort the regression estimates.

Table 4. VIF Test Results

Variable	VIF	1/VIF
Size	1.360	0.735
OP	1.270	0.786
SA	1.140	0.875
IDN	1.100	0.909
Top1	1.090	0.915
Cash	1.050	0.949
ROA	1.010	0.993
Mean VIF	1.150	

4.2.2. Robustness Test

Following the robustness-testing approach used in related empirical research, this paper conducts two indicator-substitution checks. First, the dependent variable is replaced with the annual average ESG rating (ESG_mean). Second, gross profit margin (GPM) is introduced in place of operating profit (OP) as an alternative control variable.

Table 5 reports the robustness results. When ESG_mean is used as the dependent variable, the ROA coefficient remains positive and significant at the 1 percent level. When GPM replaces OP in the control set, the sign and significance pattern of the main variables remain broadly consistent with the baseline model. These tests suggest that the positive association between financial performance and ESG performance is not driven by a single measurement choice.

Table 5. Robustness Test Results

	(1) Replace Dependent Variable	(2) Replace Control Variable
	ESG_mean	ESG
ROA	0.0713 (3.23)***	0.0876 (2.83)***
Size	0.227 (23.80)***	0.241 (23.70)***
Top1	0.00833 (11.83)***	0.00798 (10.42)***
Cash	0.0139 (6.79)***	0.0122 (5.51)***
OP	1.31e-11 (6.46)***	
IDN	0.0819 (5.93)***	0.0834 (5.60)***
SA	0.948 (22.88)***	1.027 (23.01)***
GPM		0.453 (10.10)***
_cons	1.995 (10.98)***	1.884 (9.49)***
N	26674	26638
R ²	0.050	0.049

Note: t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

4.2.3. Endogeneity Test

Potential omitted-variable bias is addressed in two ways. First, firm fixed effects are included to control for unobserved characteristics that do not vary over time within a firm. Second, the model includes controls for Size, Top1, Cash, OP, IDN, and SA, thereby accounting for observable differences in scale, governance, liquidity, operating condition, board structure, and financing constraints.

Reverse causality is further considered by introducing the lagged financial-performance term with reference to Sun Churen (2015). Table 6 shows that the additional specification changes the magnitude and sign of the reported ROA coefficient, so this test should be read as an endogeneity diagnostic rather than as a stand-alone confirmation of the baseline direction. Taken together with the fixed-effects model and the indicator-substitution tests, the evidence supports a relationship between financial performance and ESG performance, while also suggesting that the dynamic channel deserves further verification in future work.

Table 6. Endogeneity Test Results

	(1) ESG
ROA	-1.965 (-10.77)***
Size	0.197 (21.97)***
Top1	0.00817 (10.99)***
Cash	0.0282 (8.42)***
OP	2.19e-11 (8.82)***
IDN	0.0810 (5.08)***
SA	0.691 (16.72)***
_cons	1.745 (8.32)***
N	24350
R ²	

Note: t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

5. Research on Impact Mechanisms

5.1. Analysis of Impact Mechanisms based on Regional Heterogeneity

Regional heterogeneity is examined because ESG incentives depend partly on local marketization, regulatory capacity, green-finance development, and investor attention. The sample is divided into eastern, central, and western groups according to the province of registration and the regional classification in the National Development and Reform Commission's Document No. 33 of 2000. The eastern group includes Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan; the central group includes Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, and Chongqing; and the western group includes Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi, Inner Mongolia, and Tibet. Fixed-effects regressions are then estimated separately for the three groups.

Table 7 indicates that ROA is positive and significant at the 1 percent level in the eastern sample, positive and significant at the 10 percent level in the central sample, and not statistically significant in the western sample. This pattern suggests that the financial performance-ESG link is strongest where market mechanisms and ESG-related institutions are more developed. Eastern-region firms may face clearer investor expectations and disclosure pressure, making it easier for financial resources to be converted into ESG actions. In the central region, ESG improvement appears more dependent on a mix of compliance pressure and gradual market development. In the western region, weaker ESG market attention and institutional support may reduce the incentive for firms to transform improved profitability into ESG investment.

Table 7. Regional Grouping Regression Results

	(1) Eastern	(2) Central	(3) Western
ROA	0.147 (4.63)***	0.148 (1.73)*	0.166 (1.41)
Size	0.255 (19.99)***	0.194 (7.76)***	0.183 (6.47)***
Top1	0.0107 (11.47)***	0.00427 (2.34)**	0.00197 (0.96)
Cash	0.00939 (3.96)***	0.0286 (2.99)***	0.0265 (3.42)***
OP	9.21e-12 (3.87)***	3.33e-11 (3.63)***	3.58e-11 (4.95)***
IDN	0.0503 (2.73)***	0.194 (5.85)***	0.121 (2.98)***
SA	1.139 (20.45)***	0.743 (6.96)***	0.528 (4.68)***
_cons	2.171 (8.82)***	1.602 (3.42)***	1.289 (2.41)**
N	18515	4832	3313
R²	0.053	0.041	0.037

Note: t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2. Analysis of Impact Mechanisms based on Scale Heterogeneity

Firm-size heterogeneity is tested because enterprises with different asset scales differ in resource endowment, governance capacity, public visibility, and access to external financing. The sample is divided into small, medium, and large groups using the one-third and two-thirds quantiles of total assets. Separate fixed-effects regressions are then estimated for each size group, and the results are reported in Table 8.

Table 8 shows a clear scale difference. In the large-firm group, the ROA coefficient is positive and significant at the 1 percent level. In the small-firm group, the coefficient is not significant, while in the medium-firm group it is negative and significant at the 10 percent level. These

results imply that financial performance is more easily transformed into ESG performance when firms already possess sufficient resources, formal governance structures, and strong market visibility. Large enterprises can use improved profitability to fund ESG projects and may also gain reputational and financing benefits from doing so. Smaller and medium-sized firms, by contrast, often face tighter financing pressure and more urgent operating needs. Even when profitability improves, available funds may be directed first to production expansion, working capital, or debt repayment rather than to ESG projects with longer payback periods.

Table 8. Scale Grouping Regression Results

	(1) Small-scale	(2) Medium-scale	(3) Large-scale
ROA	0.0335 (1.21)	-0.424 (-1.65)*	1.524 (7.54)***
Size	0.564 (16.77)***	0.525 (12.10)***	0.358 (14.85)***
Top1	0.0168 (10.52)***	0.0117 (6.65)***	0.000910 (0.60)
Cash	0.00783 (2.86)***	0.0226 (2.26)**	0.0227 (1.94)*
OP	7.68e-11 (2.00)**	1.97e-10 (3.90)***	5.11e-12 (2.20)**
IDN	0.147 (4.80)***	-0.0220 (-0.76)	0.0747 (3.16)***
SA	1.905 (21.20)***	1.383 (13.40)***	0.425 (4.15)***
_cons	-1.981 (-3.77)***	-2.662 (-3.10)***	-2.943 (-4.36)***
N	9223	9147	8304
R²	0.103	0.051	0.048

Note: t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

5.3. Mechanism Analysis based on Moderating Effects

The final mechanism test examines whether listing age changes the relationship between financial performance and ESG performance. The results are shown in Table 9.

Table 9. Moderating Effect Results

	ESG
ROA	0.661 (6.07)***
Size	0.233 (22.59)***
Top1	0.00836 (10.97)***
Cash	0.0124 (5.61)***
OP	1.34e-11 (6.11)***
IDN	0.0829 (5.56)***
SA	0.925 (20.48)***
Age*ROA	-0.0309 (-5.41)***
_cons	1.768 (8.88)***
N	26674
R²	0.046

Note: t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

The interaction term Age*ROA has a coefficient of -0.0309 and is significant at the 1 percent level, while the ROA coefficient remains positive and significant. This indicates that listing age weakens the positive relationship between financial performance and ESG performance. In other words, the association between profitability and ESG improvement is stronger for firms with shorter listing histories and weaker for firms that have been listed for a longer time.

One possible explanation is that newly listed or relatively young listed firms are still building market credibility and stakeholder trust. For them, ESG investment can function as a signal of governance quality and long-term competitiveness, so improved financial performance is more likely to be allocated to ESG construction. Firms with longer listing histories may already have stable operating routines and established investor expectations. As a result, additional profitability may produce a smaller change in ESG strategy, especially when managers give priority to maintaining existing profit models or short-term return targets.

6. Conclusion and Policy Recommendations

6.1. Research Conclusion

Using data on Chinese A-share listed companies from 2011 to 2022, this paper examines how financial performance relates to corporate ESG performance under the dual carbon policy background. The main conclusions are as follows.

First, the baseline results show a positive relationship between financial performance and ESG performance. After firm fixed effects and other controls are included, the ROA coefficient is 0.0858 and is significant at the 1 percent level. This result suggests that stronger profitability can provide resource support for environmental governance, social responsibility fulfillment, and governance improvement, thereby helping firms raise their ESG ratings.

Second, listing age has a negative moderating effect. The interaction term between Age and ROA is significantly negative, indicating that the positive financial performance-ESG relationship becomes weaker as listing age increases. Relatively young listed firms may use ESG construction to build reputation and long-term competitiveness, while firms with longer listing histories may respond less strongly because their business models and governance routines are more settled.

Third, the relationship is heterogeneous across regions and firm sizes. Regionally, the ROA coefficient is strongest in the eastern sample, weaker but still significant in the central sample, and insignificant in the western sample. This pattern is consistent with differences in marketization, institutional support, and investor attention to ESG. By scale, the positive relationship appears mainly among large enterprises. Small and medium-sized firms may face resource and financing constraints that lead them to use improved profitability for immediate operating needs instead of long-term ESG investment.

6.2. Policy Recommendations

Based on these findings, the following recommendations are proposed for improving ESG practice among Chinese listed companies.

First, public policy should combine incentives with credible disclosure rules. Because profitable firms are more capable of investing in ESG, tax preferences, fiscal subsidies, green credit support, and R&D incentives can be linked to verifiable environmental and governance outcomes rather than to general ESG statements. At the same time, ESG disclosure standards for listed companies should place greater emphasis on dual-carbon indicators such as emission reduction, energy efficiency, and green investment. Third-party verification and penalties for misleading disclosure are also necessary to prevent ESG work from becoming symbolic reporting rather than substantive transformation.

Second, enterprises should match ESG investment with their resource base and development stage. Large firms can use their financing capacity, governance systems, and visibility to embed ESG targets into long-term strategy and supply-chain management. Small and medium-sized firms should avoid copying high-cost ESG models; instead, they can begin with compliance, energy-saving projects, employee protection, and transparent governance practices that fit their cash-flow conditions. Firms with shorter listing histories can use ESG construction to strengthen credibility, while firms with longer listing histories should review whether established routines have reduced the incentive to invest in long-term sustainability.

Third, regional ESG policy should be differentiated. Eastern regions can use mature capital markets to promote advanced ESG disclosure, green-finance products, and cross-firm ESG innovation. Central regions should strengthen policy guidance and compliance supervision so that firms move from passive reporting toward active ESG management. Western regions may need stronger fiscal support, green-credit access, training services, and demonstration projects to build ESG awareness and investment capacity. Cross-regional mechanisms for technology transfer, management learning, and green-finance cooperation would help reduce ESG development gaps and support more balanced progress toward the dual carbon goals.

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