The Impact of Corporate ESG Performance on Regional Employment Quality

Ailei Lang[1,*], Xincheng Zhu[1], Yu Wen[1], Jin Wu[1]
[1]School of Mathematics and Physics, Handan University, Hebei 056005, China
Corresponding author: Ailei Lang (e-mail: langailei@hdc.edu.cn)

ABSTRACT Against the background of the deepening global concept of sustainable development and the steady advancement of China's dual-carbon goals, corporate ESG performance has become an important criterion for evaluating comprehensive corporate value and long-term development capacity. From a regional macro perspective, this paper uses A-share listed companies and provincial employment panel data from 2012 to 2023 to examine the mechanism and regional differences through which corporate ESG performance affects regional employment quality. A two-way fixed-effects model and mediation-effect tests are used for empirical analysis. The results show that overall corporate ESG performance significantly promotes regional employment quality, and this conclusion remains valid after robustness tests and endogeneity treatment. Further mediation tests indicate that technological innovation, resource agglomeration, and the easing of financing constraints are three major mechanisms through which ESG improves regional employment quality by generating high-skilled jobs, promoting factor concentration, and securing employment supply. In addition, the effect of overall corporate ESG performance on regional employment quality shows clear regional heterogeneity: the employment-quality improvement effect is more pronounced in eastern regions with higher marketization, but relatively weaker in central and western regions. The conclusions provide a reference for governments and enterprises to realize a win-win outcome between economic benefits and social value through ESG practices and offer implications for advancing the employment-priority strategy.

INDEX TERMS ESG performance, Regional employment quality, Technological innovation, Resource agglomeration, Financing constraints

I. INTRODUCTION

A. RESEARCH BACKGROUND AND SIGNIFICANCE

Employment quality is an important indicator of economic and social development and the level of livelihood protection. The Twentieth National Congress of the Communist Party of China proposed strategic arrangements that emphasize the comprehensive implementation of the employment-priority strategy and the simultaneous improvement of both employment quantity and quality. The employment-promotion plan for the Fourteenth Five-Year Plan period also regards the improvement of employment quality as an important way to stabilize economic operation and promote common prosperity. China is currently in a transition stage in which industrial upgrading and the dual-carbon goals are being advanced in coordination. It is necessary to address the structural coexistence of employment difficulty and recruitment difficulty while improving the stability, income level, and developmental capacity of employment.

Enterprises are the main providers of jobs and important carriers of ESG practices. With the continuous standardization and diffusion of ESG-related concepts, enterprises exert an increasing influence on regional labor markets. ESG requires enterprises to pursue economic returns while also paying attention to environmental protection, employee rights, and internal governance optimization. This development model is consistent with China's high-quality development requirements and fits the core dimensions of regional employment quality, including employment stability, skill structure, labor remuneration, rights protection, and development opportunities.

The significance of this study lies in two aspects. Theoretically, the paper connects micro-level corporate ESG behavior with macro-level regional employment quality and constructs a multi-level analytical framework, thereby addressing the insufficient connection between micro behavior and macro outcomes in existing research and enriching studies on the social effects of ESG and the formation mechanism of employment quality. Practically, the study clarifies the specific paths and regional differences through which corporate ESG performance affects regional em-

ployment quality, which can provide evidence for governments to formulate differentiated ESG incentive policies and employment-promotion policies, and also help enterprises understand the social value of ESG practice.

B. LITERATURE REVIEW

Research on ESG and employment has produced relatively rich findings. Some scholars examine the effect of ESG performance on corporate employment from a micro-enterprise perspective. For example, Mao and Wang [1] confirm, through listed-company data, that ESG advantages can significantly improve corporate employment levels. Other studies focus on the role of financing constraints [2], production-scale expansion, and related channels in employment. The existing literature also discusses ESG performance from perspectives such as industrial agglomeration [3], green innovation, corporate governance, and social responsibility.

Existing research nevertheless has clear limitations. Most studies are confined to internal corporate employment at the micro level and lack systematic analysis of regional macro employment quality. Mechanism exploration remains insufficient, especially regarding mediating channels such as technological innovation and human-capital upgrading. In addition, the measurement dimensions of employment quality are relatively single, making it difficult to comprehensively reflect the integrated impact of ESG on employment quality.

On this basis, this paper selects Chinese A-share listed companies and provincial employment-related data from 2012 to 2023 as the research sample and systematically explores the effect and internal mechanism of provincial corporate ESG performance on regional employment quality. The entropy-weight method is used to quantify both provincial corporate ESG performance and regional employment quality. A two-way fixed-effects model, mediation-effect tests, robustness tests, and heterogeneity analysis are then constructed to identify the overall effect, transmission channels, and regional differences.

C. RESEARCH CONTRIBUTIONS AND ANALYTICAL FRAMEWORK

This study extends the existing literature by shifting the analytical unit from the individual enterprise to the province-year level. Previous research has mainly examined whether ESG performance changes a firm's own labor demand, employment scale, or employee stability. Such evidence is important, but it cannot fully explain how the ESG activities of multiple enterprises jointly reshape a regional labor market. By aggregating listed-company ESG information within each province and linking it to provincial employment-quality indicators, this paper constructs a cross-level analytical framework in which micro-level corporate behavior is connected with macro-level labor-market outcomes. This design makes it possible to evaluate not only whether ESG creates jobs inside a particular firm, but also whether it contributes to a more stable, better-paid, more skill-intensive, and better-protected regional employment structure.

A second contribution concerns the measurement of employment quality. Employment quantity alone cannot capture whether workers receive adequate remuneration, have access to training, enjoy social-security coverage, or face a sustainable labor-demand environment. The composite indicator developed in this paper therefore integrates employment environment, employability, remuneration, and protection. This multidimensional structure corresponds to the practical meaning of high-quality employment and reduces the risk that a single indicator, such as the unemployment rate or average wage, dominates the empirical conclusion. The entropy-weight method further allows the information contained in each indicator to determine its relative contribution, thereby improving comparability across provinces and years.

Third, the paper integrates three transmission mechanisms that are usually discussed separately. Technological innovation explains how ESG-related investment and governance can generate new production tasks and skill-intensive positions. Resource agglomeration captures how credible ESG practices attract capital, talent, and complementary enterprises to a region. Financing-constraint relief explains how improved information transparency and stakeholder trust can stabilize investment, production, and employment. Examining these channels within the same framework helps distinguish direct employment effects from indirect effects arising through innovation capacity, factor concentration, and financing availability.

Finally, the study treats regional marketization and geographical location as boundary conditions rather than assuming that ESG produces an identical effect everywhere. The same ESG signal may be converted into employment gains more efficiently where financial markets, industrial networks, human capital, and public services are more developed. The heterogeneity analysis therefore complements the average-effect estimation and provides a basis for differentiated policy design. Overall, the analytical framework follows the sequence of ESG input, mechanism activation, employment-quality improvement, and regional-condition adjustment, which is subsequently tested through fixed-effects estimation, mediation analysis, robustness checks, and subgroup comparisons.

II. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESES

Corporate ESG performance does not operate through a single dimension. Instead, environmental, social, and governance dimensions interact to exert a broad influence on regional employment quality. Stakeholder theory [4] and signaling theory [5] provide useful analytical frameworks for understanding this mechanism. Technological innovation and resource agglomeration constitute two major transmission paths, while financing-constraint relief further connects corporate ESG behavior with regional employment quality.

A. DEFINITION OF RELATED CONCEPTS

Employment quality is a comprehensive and systematic measure of workers' employment status. It includes employment stability, labor remuneration, skill development, rights protection, working conditions, and development space. Regional employment quality is not a simple aggregation of individual employment conditions; rather, it reflects the sustainability and inclusiveness of the regional labor market, industrial structure, and institutional environment. Provincial corporate ESG level refers to the annual provincial composite ESG score obtained by integrating the environmental, social, and governance scores of A-share listed companies with indicators such as firm size, return on assets, and leverage through the entropy-weight method.

B. RELATED THEORIES

Stakeholder theory argues that enterprises are contractual coalitions composed of shareholders, employees, governments, communities, and other stakeholders, and that business objectives should balance the interests of all parties rather than simply maximize shareholder value [4]. ESG performance is the fulfillment of stakeholder obligations. Signaling theory explains indirect market effects under information asymmetry [5]. In labor markets, ESG performance serves as a credible signal to workers, investors, and governments, indicating stable operation, standardized employment practices, and strong sustainable-development capacity.

C. RESEARCH HYPOTHESES

From the perspective of stakeholder theory, ESG practice is an effective response to the demands of employees, governments, communities, and other stakeholders. Employment stability, skill improvement, and rights protection are highly consistent with these demands. Signaling theory further explains the indirect path through which ESG performance conveys a positive signal of sustainable development, strengthens investor confidence and consumer recognition, expands production and operations, and provides support for technological innovation and resource agglomeration. Therefore, Hypothesis 1 is proposed: overall corporate ESG performance has a significant positive effect on regional employment quality.

Technological innovation is a core mechanism through which ESG affects regional employment quality. From the perspective of endogenous growth theory and innovation diffusion theory, ESG attention promotes resource integration and stakeholder collaboration, thereby stimulating innovation vitality [6]. Environmental responsibility encourages green technology R&D and cleaner production; social responsibility improves employee training and human-capital quality; governance quality reduces innovation decision risks and improves R&D resource allocation. Hypothesis 2 is therefore proposed: ESG advantages can optimize regional employment quality by promoting regional technological innovation input and capability improvement.

Resource agglomeration is another core mechanism. According to resource dependence theory and industrial agglomeration theory, enterprises with superior ESG performance are more likely to obtain government support, financial resources, and social resources [7]. In labor markets, ESG-oriented firms protect employee rights and provide development space, making them more attractive to high-quality labor [8]. This factor concentration improves production efficiency, promotes industrial upgrading, increases employment opportunities, and enhances regional employment quality. Hypothesis 3 is therefore proposed: overall corporate ESG performance can improve regional employment quality by attracting capital, labor, and other production factors and promoting industrial agglomeration.

Financing constraints are an important factor limiting firms' employment expansion and job-quality improvement. ESG disclosure reduces information asymmetry between firms and investors [9], sends sustainable-development signals to the market, lowers external financing costs, and expands financing channels. After financing constraints are eased, firms can expand production, increase jobs, improve employee training and welfare, and stabilize employment supply. Hypothesis 4 is therefore proposed: ESG advantages indirectly improve regional employment quality by easing financing constraints.

D. INTEGRATED MECHANISM FRAMEWORK AND BOUNDARY CONDITIONS

The four hypotheses can be organized into an integrated mechanism framework. Corporate ESG performance first changes the information and incentive environment faced by stakeholders. Better environmental management reduces regulatory and operational risks; stronger social responsibility improves employee relations and organizational legitimacy; and sound governance increases the credibility of corporate commitments. These changes improve the willingness of investors, employees, governments, and business partners to provide resources. The resulting resource response is then transmitted to regional employment quality through innovation, agglomeration, and financing channels.

The three mediating mechanisms are complementary rather than mutually exclusive. Innovation may create demand for researchers, engineers, technicians, and supporting service workers, but the scale and durability of these jobs depend on whether capital and talent can be attracted and retained. Resource agglomeration can enlarge local labor demand and strengthen knowledge spillovers, but it also requires stable financing and credible institutional signals. Financing-constraint relief enables firms to maintain R&D, production, training, and compensation expenditures during periods of uncertainty, thereby supporting both employment quantity and job quality. Consequently, the combined effect of the three mechanisms may be stronger than the isolated effect of any single channel.

The framework also implies a temporal sequence. ESG improvements may first affect disclosure quality, stakeholder

expectations, and financing conditions. Innovation output and industrial agglomeration generally require a longer adjustment period, while changes in wage levels, skill structure, and employment protection may emerge gradually as firms expand and regional production networks deepen. The use of annual panel data and province and year fixed effects helps capture this medium-term adjustment, although the empirical model estimates average relationships rather than a complete dynamic path.

Regional conditions determine how effectively ESG resources are transformed into employment outcomes. In provinces with developed markets, stronger financial intermediation and more efficient factor allocation can accelerate the conversion of ESG reputation into financing and investment. A dense industrial base can amplify knowledge spillovers and supplier linkages, while a larger pool of skilled labor can support the creation of high-quality positions. Conversely, in regions with weaker market institutions, limited infrastructure, or a narrow industrial structure, ESG improvements may not immediately generate comparable employment gains. These boundary conditions motivate the subsequent marketization and regional heterogeneity tests.

III. DATA SOURCES AND VARIABLE DESCRIPTION

A. DATA SOURCES AND SAMPLE SCREENING

The paper selects Chinese A-share listed companies and provincial employment data from 2012 to 2023 as the research object. Corporate ESG performance data are obtained from Huazheng ESG ratings through the Wind database. Regional employment-quality indicators are compiled from provincial statistical yearbooks and the China Labor Statistical Yearbook, covering employment stability, skill structure, rights protection, and other dimensions. Firm-level controls such as firm size and profitability are obtained from CSMAR and Wind, while provincial macro controls are compiled from the National Bureau of Statistics and provincial statistical yearbooks.

The sample screening follows four principles: listed companies in the financial industry are excluded because of their special asset-liability structure and regulatory policies; ST, *ST, and PT firms are excluded to avoid abnormal operating conditions; observations with missing or abnormal key variables are removed; and all continuous variables are winsorized at the 1% level to reduce the influence of extreme values.

B. VARIABLE DESCRIPTION

1) DEPENDENT VARIABLE

The dependent variable is regional employment quality (EQ), namely the macro-level employment quality of each province. Drawing on the research frameworks of Qi et al. [10] and Sun and Chai [11], and based on capability theory, this paper constructs an evaluation system with four primary dimensions: employment environment, employability, labor remuneration, and labor protection. Twenty core secondary indicators are selected and the entropy-weight method is used to calculate the composite score. The indicators are shown in Table I.

2) CORE EXPLANATORY VARIABLE

The core explanatory variable is the Huazheng ESG composite rating. The rating scores firms on environmental, social, and governance dimensions and then aggregates them into a score from 1 to 100, with higher values representing better ESG performance [12]. To integrate firm-level ESG scores into provincial corporate ESG levels, differentiated weighting is conducted according to the actual economic influence of enterprises in each province.

The first step is to calculate provincial indicator means by province and year:

$$X_{pyt} = \frac{1}{n}\sum X_{it} \tag{1}$$

where Xpyt denotes the mean of indicator y in province p and year t; Xit is the value of firm i in year t; and n denotes the number of firms in the corresponding province-year group.

The second step is Min-Max normalization. To eliminate dimensional differences, all indicators are positively standardized to the interval [0,1], and standardized zero values are replaced by 0.00001 to avoid invalid logarithmic operations:

$$Y_{pyt} = \frac{X_{yt} - \min(X_y)}{\max(X_y) - \min(X_y)} \tag{2}$$

The third step is to calculate the indicator proportion matrix:

$$P_{pyt} = \frac{Y_{pyt}}{\sum\sum Y_{pyt}} \tag{3}$$

The fourth step is to calculate information entropy and the difference coefficient:

$$e_y = -K\sum\sum P_{pyt}\ln(P_{pyt}) \tag{4}$$

$$K = \frac{1}{\ln(m \times k)} \tag{5}$$

$$d_y = 1 - e_y \tag{6}$$

The fifth step is to determine entropy weights and synthesize the composite score:

$$w_y = \frac{d_y}{\sum_{y=1}^{6} d_y} \tag{7}$$

$$\mathrm{ProvinceESG}_{pt} = \sum_{y=1}^{6}(w_y \times Y_{pyt}) \tag{8}$$

where d_y denotes the difference coefficient of indicator y; e_y denotes the information entropy value; w_y is the entropy-weight value assigned to indicator y; Y_pyt is the standardized value of indicator y in province p and year

TABLE I. Provincial Employment Quality Evaluation Indicator System in China

Primary Indicator	Secondary Indicator	Definition	Direction
Employment Environment	Economic Development Level	Per capita gross regional product	+
	Employment training institutions per capita	Number of private vocational training institutions / resident population	+
	Share of employment in the tertiary industry	Tertiary-industry employment / total employment	+
	Regional Employment Level	Urban unit employees / (urban unit employees + registered urban unemployed persons)	+
	Regional Unemployment Level	Registered urban unemployment rate	-
	Performances by art performance troupes	Direct data	+
Employment Remuneration	Average wage of urban unit employees	Direct data	+
	Average wage of urban manufacturing employees	Direct data	+
	Average wage of urban construction employees	Direct data	+
	Medical insurance coverage	Urban employee medical insurance participants / resident population	+
	Pension insurance coverage	Urban employee pension insurance participants / resident population	+
	Urban-rural income gap	Per capita disposable income of urban households / per capita disposable income of rural households	-
Employability	Share of employees with college degree or above	Share of employees with junior college, undergraduate, postgraduate, or higher education	+
	Education expenditure	Education expenditure / GDP	+
	Number of higher education institutions	Direct data	+
Employment Protection	Trade union mediation efficiency	Successfully mediated labor-dispute cases by trade unions / labor-dispute cases accepted by trade unions	+
	Labor dispute closure rate	Closed labor-dispute arbitration cases / accepted labor-dispute arbitration cases	+
	Labor demand-supply ratio	Registered recruits / registered job seekers	+

t; and ProvinceESG_pt represents the provincial corporate ESG composite score in province p and year t. The score is within [0,1], and a higher value indicates a better provincial corporate ESG level.

3) MEDIATING VARIABLES

Innovation level (Inov) is measured by the natural logarithm of the number of accepted invention patent applications in each province, with data from the National Bureau of Statistics. Resource agglomeration (RA) is measured by the location quotient, namely the ratio of a province's share of national industrial value added to its share of national GDP [13]. Financing-constraint relief (FC) is measured by the FC index; a lower index value indicates weaker financing constraints, lower external financing costs, and stronger financing availability.

4) CONTROL VARIABLES

Regional economic development (PC_GDP) is measured by the natural logarithm of provincial per capita GDP. Industrial structure (Indus) is measured by the share of tertiary-industry value added in regional GDP. Population density (Pop) is the ratio of year-end provincial population to regional area. Human capital level (Hum) is measured by the number of college students per 10,000 persons. Urbanization level (Urban) is measured by the share of urban population, and government intervention (Gov) is measured by the ratio of provincial fiscal expenditure to GDP. Variable Definitions are shown in Table II.

C. MODEL SPECIFICATION

1) FIXED-EFFECTS REGRESSION MODEL

To test the direct effect of ESG performance on regional employment quality, the following two-way fixed-effects model is constructed:

$$EQ_{it} = \alpha + \beta ESG_{it} + \gamma Controls_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (9)$$

where EQit represents regional employment quality in province i in year t; ESGit represents corporate ESG performance in province i in year t; Controls denotes the control variables; μ_i and λ_t represent province and year fixed effects; and ε_{it} is the random disturbance term.

2) MEDIATION-EFFECT MODEL

A stepwise regression method is used to test the mechanism effects of technological innovation, resource agglomeration, and financing-constraint relief:

$$EQ_{it} = \alpha + \beta ESG_{it} + \gamma Controls_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (10)$$

$$M_{it} = \alpha + \beta ESG_{it} + \gamma Controls_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (11)$$

$$EQ_{it} = \alpha + \beta ESG_{it} + \theta M_{it} + \gamma Controls_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (12)$$

Mit represents the three mediating variables: innovation level (Inov), resource agglomeration (RA), and financing-constraint relief (FC).

D. IDENTIFICATION STRATEGY AND EMPIRICAL VALIDATION LOGIC

The empirical identification strategy is designed to separate the association between ESG performance and employment quality from persistent provincial characteristics and common macroeconomic shocks. Province fixed effects absorb time-invariant differences such as geographical conditions, long-standing industrial traditions, and institutional culture. Year fixed effects absorb nationwide changes in economic

TABLE II. Variable Definitions

Variable Type	Variable Name	Definition	Symbol
Dependent variable	Employment Quality	Measured by entropy-weight method	EQ
Explanatory variable	Provincial ESG	Measured by entropy-weight method	ESG
Control variables	Regional economic development	Natural logarithm of provincial per capita GDP	PC_GDP
	Industrial structure	Share of tertiary-industry value added in regional GDP	Indus
	Population density	Ratio of year-end provincial population to area	Pop
	Human capital level	College students per 10,000 persons	Hum
	Urbanization level	Share of urban population	Urban
	Government intervention	Fiscal expenditure / regional GDP	Gov
Mediator	Innovation level	Log of accepted invention patent applications	Inov
	Resource agglomeration	Measured by location quotient	RA
	Financing constraint	Direct data	FC

cycles, employment policy, and ESG regulation. The remaining ESG coefficient is therefore identified from within-province changes over time after observable provincial controls are considered.

Several procedures are used to assess whether the benchmark result is sensitive to data treatment or model specification. Winsorization limits the influence of extreme observations; excluding the pandemic period reduces the possibility that exceptional labor-market disruptions drive the result; province-clustered standard errors allow for serial correlation and heteroskedasticity within provinces; and lagged ESG reduces, although it cannot completely eliminate, contemporaneous reverse causality. Consistency across these tests is interpreted as evidence that the positive relationship is not dependent on a single estimation choice.

The mediation analysis is implemented as a mechanism-identification exercise. First, ESG must significantly affect the proposed mediator. Second, the mediator must be associated with the employment outcome after ESG and controls are included. Third, the indirect effect is evaluated through Bootstrap confidence intervals. Because the mediators are measured at different levels and scales, their coefficients should not be compared mechanically. The focus is instead on whether each channel is statistically supported and whether its direction is consistent with the theoretical mechanism.

The heterogeneity analysis provides an additional validation layer. If the ESG effect is transmitted through market signals, factor allocation, and innovation capacity, stronger effects should be observed where these supporting conditions are more developed. Dividing the sample by marketization and region allows this implication to be examined without changing the core model. The subgroup results are interpreted as differences in transmission efficiency rather than as evidence that ESG is irrelevant in less-developed regions.

IV. EMPIRICAL ANALYSIS OF THE EFFECT OF ESG PERFORMANCE ON REGIONAL EMPLOYMENT QUALITY

A. BENCHMARK REGRESSION

To identify the marginal effect of provincial corporate ESG performance on employment quality more clearly and avoid multicollinearity or coefficient distortion caused by adding too many controls at once, this paper uses groupwise stepwise regression for benchmark estimation. Different categories of control variables are added sequentially, and the sign, magnitude, and statistical significance of the ESG coefficient are observed to judge the reliability of the empirical results. Table III reports the benchmark regression results.

Column (1) shows that without control variables, the coefficient of ESG is 0.127 and significantly positive at the 5% level, preliminarily indicating that provincial corporate ESG performance promotes regional employment quality. In column (2), after adding controls related to economic development and industrial structure, the ESG coefficient increases to 0.152 and is significant at the 1% level. Column (3) further includes government intervention, population density, human capital, urbanization, and other provincial macro controls, and the ESG coefficient remains significant at 0.296. The result indicates that after controlling for provincial macro disturbances, a one-level improvement in corporate ESG performance significantly increases regional employment quality, supporting Hypothesis 1.

Among the control variables, the coefficient of per capita GDP is significantly positive, indicating that economically developed regions generally have higher employment quality. The coefficient of industrial structure is significantly positive, suggesting that a higher share of the service industry improves employment structure and employment quality. Human capital and urbanization are also significantly positive, reflecting the positive role of labor quality improvement and urbanization in employment quality. Government intervention is insignificant, possibly because policy support and market distortion effects offset each other.

Robust t-statistics are reported in parentheses: ***p<0.01, **p<0.05, *p<0.1.

B. ROBUSTNESS TESTS

To further verify the reliability of Hypothesis 1 and exclude interference from estimation methods, sample selection, extreme observations, and endogeneity, this paper conducts robustness tests from four aspects: variable treatment, sample screening, standard-error adjustment, and endogeneity treatment. The results are shown in Table IV.

All continuous variables are winsorized at the 1% level and the regression is re-estimated. The coefficient of ESG remains significantly positive, and its sign, economic mean-

TABLE III. Benchmark Regression Results

Variable	(1) EQ	(2) EQ	(3) EQ	(4) EQ
ESG	0.127**	0.152***	0.296**	0.295**
	(2.08)	(2.59)	(2.54)	(2.86)
lnPc_GDP		0.037*	0.039*	0.036*
		(1.08)	(1.87)	(1.72)
Indus		3.441***	3.486***	2.814***
		(5.37)	(5.33)	(4.32)
Gov			-0.010	-0.019
			(-0.65)	(-1.20)
Pop			0.126	0.137*
			(1.35)	(1.68)
Hum				0.281***
				(3.92)
Urban				0.261***
				(2.60)
Constant	-0.112***	-0.089***	-0.073***	-0.076***
	(3.566)	(3.021)	(2.844)	(2.894)
Observations	372	372	372	372
R-squared	0.631	0.827	0.917	0.944
Time fixed effects	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes

ing, and statistical significance are highly consistent with the benchmark regression. The sample for 2020-2021 is then excluded because the COVID-19 pandemic may have caused exogenous disturbances to regional labor markets and corporate operations. The ESG coefficient remains stable. The original robust standard errors are also replaced by province-clustered standard errors, and the core coefficient remains largely unchanged. Finally, lagged ESG is used as the explanatory variable to mitigate endogeneity, and the result remains consistent with the original model.

Robust t-statistics are reported in parentheses: ***p<0.01, **p<0.05, *p<0.1.

C. MEDIATION-EFFECT TESTS

To examine the internal transmission mechanism through which corporate ESG performance affects regional employment quality [14], this paper conducts mediation-effect tests for technological innovation, resource agglomeration, and financing-constraint relief [15]. All regressions control for province fixed effects, year fixed effects, and provincial macro control variables [16]. The results are reported in Table V.

For the path of ESG performance, innovation level, and employment quality, column (1) shows that the coefficient of ESG on regional innovation is 0.322 and significantly positive at the 5% level. After innovation level is introduced into the benchmark regression, the ESG coefficient remains significantly positive and innovation is also significantly positive, indicating a partial mediation effect. Technological innovation improves employment quality directly by expanding production [17] and creating high-skilled jobs [18] and indirectly by generating spillovers along the industrial chain [19].

For the path of ESG, resource agglomeration, and employment optimization, the coefficient of ESG on resource agglomeration is 0.556 and significantly positive at the 5% level. After resource agglomeration is included in the benchmark regression, both ESG and resource agglomeration are significant, indicating a partial mediation effect. Resource agglomeration expands employment scale, promotes knowledge spillover and wage growth, and improves employee-rights protection through talent competition.

For the mechanism of financing-constraint relief, firm-level samples are used because financing constraints are micro-level characteristics. The results show that ESG significantly relieves financing constraints, and the easing of financing constraints significantly expands firm employment scale. Good ESG performance improves the financing environment through the signaling effect, lowers financing pressure, and enables firms to invest more in production expansion, employee compensation, welfare, and training. Hypothesis 4 is therefore supported. Mediation-Effect Tests are shown in Table V.

To further verify the robustness of the stepwise regression results, the Bootstrap method is used to retest the three mediation paths. Bootstrap repeated sampling estimates the empirical distribution of indirect effects and constructs 95% confidence intervals. If the interval does not contain zero, the mediation effect is significant. The results are shown in Table VI.

The Bootstrap results are consistent with the benchmark and stepwise regressions. At the provincial level, the total effect of corporate ESG performance on regional employment quality is 0.295 (Z=2.54, P=0.011), significant at the 5% level. The 95% confidence intervals of the indirect effects of all three mediation paths exclude zero, and the corresponding Z and P values pass significance tests. Hypotheses 2, 3, and 4 are therefore effectively verified.

Robust t-statistics are reported in parentheses: ***p<0.01, **p<0.05, *p<0.1.

D. HETEROGENEITY ANALYSIS

To explore whether the effect of corporate ESG performance on employment quality differs across groups, the sample is classified by market resource allocation and region. The results are shown in Table VII.

According to differences in provincial economic development levels [20], the sample is divided into

TABLE IV. Robustness Tests

Variable	(1) EQ	(2) EQ	(3) EQ	(4) EQ
ESG	0.443***	0.415**	0.150**	
	(2.85)	(2.35)	(2.46)	
L.ESG				0.135**
				(2.10)
Cons	-0.063***	-0.067***	-0.093***	-0.098***
	(3.34)	(3.98)	(5.34)	(7.53)
Observations	372	372	372	372
R-squared	0.955	0.952	0.954	0.953
Control variables	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes

TABLE V. Mediation-Effect Tests

Variable	(1) Inov	(2) EQ	(3) RA	(4) EQ	(5) FC	(6) lnemploy
ESG	0.322**	0.171***	0.556**	0.136**	0.009***	0.131***
	(2.01)	(2.74)	(1.98)	(2.39)	(2.87)	(4.15)
Inov		0.176**				
		(2.22)				
RA				0.036*		
				(1.85)		
FC						0.644***
						(9.02)
Observations	372	372	372	372	19196	19196
R-squared	0.502	0.647	0.628	0.932	0.907	0.932
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

TABLE VI. Bootstrap Test Results

Mediator	Effect Type	Coefficient	Standard Error	Z	P	95% Confidence Interval	Significance
Inov	Total effect	0.295	0.116	2.54	0.011	[0.068,0.522]	**
Inov	Direct effect	0.171	0.063	2.71	0.007	[0.047,0.295]	***
Inov	Indirect effect	0.057	0.028	2.04	0.041	[0.011,0.112]	**
RA	Total effect	0.295	0.116	2.54	0.011	[0.068,0.522]	**
RA	Direct effect	0.136	0.057	2.39	0.017	[0.024,0.248]	**
RA	Indirect effect	0.020	0.012	1.67	0.095	[0.002,0.045]	*
FC	Total effect	0.131	0.032	4.09	0.000	[0.068,0.194]	***
FC	Direct effect	0.125	0.031	4.03	0.000	[0.064,0.186]	***
FC	Indirect effect	0.006	0.002	3.02	0.003	[0.002,0.011]	**

TABLE VII. Heterogeneity Analysis

Variable	(1) High marketization	(2) General level	(3) Low marketization	(4) Eastern region	(5) Central/western regions
ESG	0.287***	0.314**	0.128**	0.233***	0.151**
	(7.32)	(2.42)	(2.31)	(7.21)	(2.36)
Observations	60	216	96	120	252
R-squared	0.974	0.903	0.769	0.942	0.862
Time fixed effects	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes

high-marketization, low-marketization, and general-level provinces. In high-marketization provinces, the ESG coefficient is 0.287 and significant at the 1% level; in low-marketization provinces, the coefficient is 0.128 and significant but notably smaller. This indicates that higher marketization strengthens the positive effect of ESG advantages on regional employment quality. A possible explanation is that marketized environments have higher resource-allocation efficiency, making the signaling and resource-agglomeration effects of ESG easier to realize.

The sample is also divided into eastern and central-western regions [21]. In the eastern region, the ESG coefficient is 0.233 and significant at the 1% level; in the central and western regions, the coefficient is 0.151 and significant but smaller. This suggests that the employment-quality-promoting effect of ESG is more pronounced in the eastern region, where the macro environment, industrial agglomeration, and labor quality better match the high-quality employment demand generated by ESG practices.

E. DISCUSSION OF EMPIRICAL FINDINGS

The benchmark regressions show that the positive ESG coefficient remains stable as provincial economic, industrial, demographic, and institutional controls are introduced. The increase in the coefficient after additional controls suggests that omitted regional conditions may initially mask part of the ESG effect rather than create a spurious positive relationship. More importantly, the sign and significance remain consistent across the fully specified model and the robustness tests. This pattern supports an interpretation in which provincial corporate ESG improvement contributes to employment quality beyond the influence of general

economic development and industrial upgrading.

The mechanism results indicate that ESG affects employment quality through more than one pathway. Technological innovation is associated with the creation of skill-intensive tasks and the upgrading of production processes. Resource agglomeration strengthens local employment demand by attracting capital, labor, and related enterprises. Financing-constraint relief supports employment stability by improving firms' ability to sustain production, compensation, training, and welfare expenditure. The three indirect effects are measured on different scales, so their numerical coefficients are not directly comparable; nevertheless, the consistent Bootstrap evidence shows that each mechanism contributes to the broader transmission process.

The heterogeneity findings further clarify why ESG policy cannot rely on a uniform implementation approach. Higher marketization improves the credibility of ESG signals and facilitates the allocation of capital and labor to firms with stronger sustainability performance. Eastern provinces also possess denser industrial networks, stronger innovation systems, and larger pools of skilled workers, allowing ESG-related investment to generate employment-quality gains more rapidly. The smaller coefficients in central and western regions should therefore be understood as evidence of weaker supporting conditions rather than as a reason to reduce ESG efforts.

These findings are consistent with the broader literature showing that responsible corporate behavior can lower financing costs, strengthen resource acquisition, and influence labor demand [22]–[24]. They also complement recent evidence that digital transformation and human-capital upgrading can improve employment outcomes [25], [26], as well as firm-level studies linking ESG performance with employment expansion [27], [28]. The contribution of the present analysis is to show that these effects can accumulate at the regional level and become visible in a multidimensional employment-quality index.

From a practical perspective, statistical significance should be distinguished from implementation effectiveness. A positive average coefficient does not imply that every ESG activity immediately creates high-quality jobs. Employment gains depend on whether ESG investment is substantive, whether disclosure is credible, and whether local institutions can convert corporate initiatives into innovation, financing, and factor-agglomeration outcomes. Policy evaluation should therefore focus on the quality and continuity of ESG practices rather than on formal disclosure alone.

V. CONCLUSIONS AND RECOMMENDATIONS

A. RESEARCH CONCLUSIONS

Based on Chinese A-share listed companies and provincial employment data from 2012 to 2023, this paper systematically analyzes the path and regional differences through which corporate ESG performance affects regional employment quality. The main findings are as follows.

Provincial corporate ESG performance has a significant positive effect on local employment quality, and this relationship remains valid after robustness tests and endogeneity treatment, indicating that the core hypothesis is supported by the data. Technological innovation, resource agglomeration, and financing-constraint relief are three major transmission mechanisms. ESG performance promotes employment quality by stimulating regional innovation vitality, attracting capital and labor factors, and reducing external financing costs. These channels expand employment scale, optimize skill structure, and strengthen rights protection.

The effect exhibits clear regional differences. In high-marketization provinces and eastern regions, ESG has a more prominent effect on employment quality. In low-marketization provinces and central-western regions, the transmission effect is relatively weaker because of differences in resource-allocation efficiency and industrial foundations. The three ESG sub-dimensions also play distinct roles: the environmental dimension promotes green manufacturing transformation and creates environment-related jobs; the social dimension strengthens employee training and rights protection; and the governance dimension optimizes decision-making mechanisms and stabilizes employment supply.

B. RESEARCH RECOMMENDATIONS

From the government perspective, a differentiated and precise ESG incentive and regulatory system should be established so that policy supply matches regional development characteristics. In high-marketization and eastern provinces, mature market mechanisms and industrial foundations can be used to strengthen mandatory and refined ESG disclosure, link ESG performance with innovation subsidies and tax incentives, and encourage firms to increase green technology R&D. In central-western and low-marketization regions, policy should focus on insufficient resource agglomeration and tight financing constraints by establishing green industry funds, expanding green loan coverage, and granting tax relief for ESG-related projects.

From the enterprise perspective, listed companies should integrate ESG concepts into strategic planning and daily operations to achieve coordinated economic and social benefits. In the environmental dimension, enterprises should focus on green technology R&D and clean production transformation. In the social dimension, they should strengthen employee rights protection, improve compensation and welfare systems, and increase skill-training investment. In the governance dimension, enterprises should optimize governance structures, improve ESG decision-making and supervision mechanisms, and enhance risk control to ensure stable job supply.

From the market perspective, an ESG ecosystem should be accelerated and improved so that market mechanisms can play a leading role in resource allocation. A unified and authoritative ESG rating standard and information-disclosure framework should be established to reduce infor-

mation asymmetry. Long-term capital such as social security funds and insurance funds should be guided toward high-ESG firms. Industry associations and third-party institutions can build communication platforms for ESG employment effects, promote successful models such as ESG-oriented school-enterprise training, and form a virtuous cycle of ESG improvement, employment-quality enhancement, and corporate competitiveness.

C. RESEARCH LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, the sample is based on A-share listed companies, which have relatively standardized disclosure systems and stronger financing capacity than many unlisted, small, and medium-sized enterprises. Provincial ESG scores derived from listed firms may therefore represent the behavior of economically influential enterprises more accurately than the ESG conditions of all local businesses. Future research can incorporate unlisted firms, specialized and innovative small enterprises, and private-company survey data to improve the representativeness of regional ESG measurement.

Second, the Huazheng rating provides a consistent ESG measure, but rating results may still be affected by disclosure availability, industry characteristics, and differences in evaluation methodology. Aggregating firm scores to the provincial level may also conceal within-province dispersion. A province can have the same average ESG score under very different distributions of leading and lagging firms. Subsequent studies can compare multiple rating systems, construct sub-dimension indicators for environmental, social, and governance performance, and examine whether the concentration or dispersion of ESG performance has an independent employment effect.

Third, the empirical strategy reduces endogeneity through fixed effects, control variables, robustness tests, and lagged ESG, but it cannot completely rule out reverse causality or omitted time-varying factors. Regions with improving employment quality may attract better-governed firms or encourage stronger ESG disclosure. Future work can use quasi-natural experiments based on staggered ESG disclosure rules, green-finance pilot policies, environmental regulation, or local governance reforms. Difference-in-differences, instrumental-variable, and dynamic-panel methods may provide stronger causal identification.

Fourth, the three mediators are measured at different analytical levels. Innovation and resource agglomeration are provincial variables, whereas financing constraints are primarily firm-level characteristics. Although the current design reflects the available data and the theoretical mechanism, cross-level aggregation may weaken the precision of the mediation interpretation. Matched firm-city-worker data would allow researchers to trace how ESG affects financing, investment, recruitment, wages, training, social insurance, and job stability within a unified multilevel framework.

Future research can also extend the analysis in three directions. Spatial econometric models can test whether ESG practices in one province generate employment spillovers through interregional supply chains and labor mobility. Dynamic models can identify the time lag between ESG improvement, innovation output, industrial agglomeration, and employment-quality change. Distributional analysis can examine whether the benefits differ across gender, age, education, occupation, and income groups, thereby evaluating whether ESG promotes not only higher average employment quality but also more inclusive employment opportunities.

Finally, the interaction among ESG dimensions deserves further attention. Environmental investment may create green jobs but can also displace employment in pollution-intensive activities during the transition period. Social responsibility may directly improve worker welfare, while governance quality may determine whether environmental and social commitments are implemented effectively. Future studies can estimate the separate, complementary, and potentially nonlinear effects of the E, S, and G dimensions and identify the combinations most conducive to stable, skilled, and well-protected employment.

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