

The Impact of ESG practices in China's manufacturing SMEs on regional economic coordination

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Abstract

In recent years, the integration of Environmental, Social, and Governance practices has become pivotal for enterprises aiming to enhance competitiveness and contribute to sustainable regional economic development. Manufacturing Small and Medium-sized Enterprises (SMEs) in China, as significant contributors to the national economy, play a crucial role in this transformation. This study investigates the current state of Environmental, Social, and Governance implementation among China's manufacturing SMEs and examines its impact on regional economic coordination. An Environmental, Social, and Governance evaluation index system tailored for SMEs is constructed, encompassing environmental performance, social responsibility, and corporate governance. Utilising multiple linear regression analysis and mediation effect models, the research empirically assesses the influence of Environmental, Social, and Governance practices on regional economic indicators such as Gross Domestic Product growth, employment rates, and income distribution. Findings indicate that robust Environmental, Social, and Governance practices significantly enhance enterprise performance, thereby fostering balanced regional economic development. Moreover, enterprise performance partially mediates the relationship between ESG practices and regional economic outcomes. Based on these insights, the study proposes policy recommendations to strengthen Environmental, Social, and Governance capabilities among SMEs, improve information disclosure mechanisms, and optimise policy support systems, thereby promoting sustainable development within the manufacturing sector and achieving coordinated regional economic growth.

Keywords: ESG practices; manufacturing SMEs; regional economic coordination; sustainable development; empirical analysis

JEL Classification: L60, R11

Introduction

Research background

Against the backdrop of global efforts to address climate change, environmental degradation, and social inequality, Environmental, Social, and Governance (ESG) has become a key tool for companies to advance the sustainable development agenda, build market trust, and maintain long-term competitive advantage. Especially since the United Nations 2030 Agenda for Sustainable Development and the Paris Agreement came into force, ESG is no longer a "moral label" attached to companies but has gradually evolved into a standard framework for measuring corporate sustainability and systemic resilience. (Friede, Busch, & Bassen, 2015) In the Chinese setting, the scope and intensity of policy support for ESG practices continue to grow. In 2022, the China Securities Regulatory Commission released the "Guidance on

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Strengthening ESG Information Disclosure by Listed Companies," urging companies to actively disclose information on environmental and social responsibilities. Financial institutions have progressively integrated ESG metrics into investment ratings, credit evaluations, and risk management frameworks. Small and medium-sized firms that exhibit a favourable stance on ESG may enhance their prospects of securing green finance, preferential collaboration rights with supply chain partners, and policy benefits. (Tsang et al., 2023)

In contrast to large publicly traded corporations, manufacturing SMEs inherently face challenges in institutionalising ESG practices: firstly, the absence of standardized and systematic mechanisms for ESG data collection; secondly, constrained capacity to invest in capital, human resources, and expertise; and thirdly, insufficient information disclosure and external accountability mechanisms, hindering their ability to attain recognition from the capital market for their ESG initiatives. (Shalhoob & Hussainey, 2022) Numerous studies have indicated that SMEs may play a distinctive role in sustainable transformation through "small and flexible" management strategies and an enhanced capacity to incorporate localised resources into the execution of ESG initiatives. (Y. Liu et al., 2021)

More importantly, the widespread distribution of SMEs in China's manufacturing industry is highly coupled with regional development strategies. According to data from the National Bureau of Statistics, the proportion of SMEs in the central and western regions and in third-tier and lower cities is significantly higher than that of large enterprises, and their development quality directly affects the regional employment structure, tax capacity, and ecological load. With "regional coordinated development" written into the "14th Five-Year Plan" and the "National New Urbanisation Strategy", the problem of regional imbalance is considered a core obstacle to China's overall modernisation process. (Petushkova, 2022) Therefore, analysing how ESG enhances SME performance and promotes coordinated regional development contributes both to sustainable corporate governance theory and the achievement of national strategic objectives.

Theoretical contributions

This study builds on the existing literature with the following theoretical extensions and academic innovations:

- Initially, traditional ESG research predominantly emphasizes micro-level aspects, including internal governance efficiency, financial performance, and investor reactions. (Zhao et al., 2023; Wan et al., 2024) The macroeconomic effects of business conduct on regional economic or social frameworks are seldom discussed. To our knowledge, this study is among the first to integrate the "enterprise-region" system into a cohesive analytical framework, establishing the transmission pathway of "ESG practices → enterprise performance → coordinated regional development", thereby addressing the inquiry of how corporate sustainable governance behaviours influence regional economic or social structures, and the role of corporate sustainable governance practices in the adjustment mechanism of regional economic imbalances.
- This study improves the analytical approach by combining detailed information from individual firms with broader regional statistics and creating a model to explain how ESG affects firm performance and its impact on regional development. This study approach goes beyond the closed-system method that examines firms in isolation, providing a repeatable, logical model for further exploring how policies work and how external factors affect businesses.
- The choice to focus on the issue of "SMEs" holds significant theoretical importance. Current ESG studies frequently omit SMEs due to insufficient data. (Sun & Saat, 2023) This study aims to address the information gap and behavioural measurement bias by

constructing an ESG index system that aligns with SME characteristics and conducting a preliminary exploration to promote the applicability of ESG theory in the SME sector.

Policy and practical value

The empirical findings of this study have the following three important policy and practical applications:

- **Government policy dimension:** According to the research findings, national and local governments should establish ESG incentive mechanisms tailored to the characteristics of industries and the stages of regional development. The scheme could include initiatives such as “special subsidies for ESG capability enhancement” and “green credit interest subsidy programs” to facilitate the green transformation of enterprises. (Huang et al., 2012) At the same time, it is important to encourage local finance to work together with green financial systems, improve the ESG grading assessment framework and guide businesses to set ESG goals that match their growth stages.
- **Enterprise practice dimension:** The research findings indicate that the factor of good governance (G) is very useful in enhancing performance. Enterprises must prioritise enhancing information disclosure systems, transparency of equity structures, and internal supervisory capacities during the initial development of ESG. (Akhtar et al., 2025) Simultaneously, digital technologies, such as blockchain traceability and automated disclosure platforms, can enhance the accessibility and reliability of ESG information, thereby augmenting competitiveness in supply chain collaboration and market entry.
- **Financial institution dimension:** To address the problem of “difficult and expensive financing” for small and medium-sized businesses, a credit rating system could be developed focusing on ESG and offering financial benefits such as lower loan interest rates and support for green bonds to companies that show strong ESG performance. At the same time, banks, securities institutions, and local regulatory authorities should be urged to collaboratively establish an ESG database to improve the industry's overall data transparency and policy responsiveness. (X. Sun et al., 2023)

The results of the study provide a practical way to apply the United Nations 2030 Sustainable Development Goals (SDG) in China, especially SDG 8: Promote inclusive and sustainable economic growth, and SDG 9: Build resilient infrastructure and promote sustainable industrialisation, creating a strong connection between individual company actions and larger development goals.

Literature review and theoretical basis

ESG in manufacturing

Given that sustainability is emerging as a fundamental strategic concern for corporations, ESG practices are widely implemented in the manufacturing sector, particularly in resource-intensive industries, to address the dual challenges of social responsibility, carbon regulation, and governance transparency. Manufacturing businesses prioritise critical aspects such as energy efficiency, pollution management, and employee safety in developing ESG practices. (Zhong et al., 2022) The study shows that Chinese manufacturing companies are moving from simply following ESG rules to using these strategies to create value, especially as green manufacturing, circular production, and sustainable supply chains become key ways to gain a competitive edge in achieving carbon neutrality goals.

In addition, the study also found a strong link between ESG and corporate financial performance. (Sun & Saat, 2023) Panel data analyses show that manufacturing companies with strong governance and good environmental practices are more likely to receive loans, attract

investors, and maintain stable share prices in the capital market. However, some studies show that manufacturing companies still face high material costs, slow returns on investment, and unclear ways to measure performance when adopting ESG, leading to significant confusion in planning strategies and deciding how to use their resources.

Progress of ESG practices in SMEs

SMEs are a significant segment of China's manufacturing sector, representing over 90% of all enterprises and playing a crucial role in local employment, industrial support, and regional economic stability. Unlike large firms, SMEs often face greater challenges in creating and implementing ESG strategies, including insufficient compliance staff, poor data-sharing systems, and limited understanding of external regulations. Nevertheless, certain studies highlight that SMEs possess an inherent advantage regarding organisational flexibility and regional integration, enabling them to react more swiftly to local social and governmental demands. (D. Chen & Wang, 2024) In a study of 80 manufacturing SMEs, some enterprises were found to have indirectly realised the initial benefits of ESG by participating in local government-led green rating systems, signing social responsibility commitments, and introducing digital supply chain systems, among other measures. At the same time, L. Liu et al. (2022) find that SMEs that excel in governance dimensions, such as those with employee representation mechanisms and basic disclosure systems, tend to be better able to cope with crises, stabilise profit volatility, and maintain customer stickiness.

Nevertheless, the majority of current research emphasises case studies or cross-sectional descriptive analyses and is deficient in empirical examinations utilising large samples. Particularly at the regional level, firms' micro-behaviours enhance the local ecological and social environment, yet this remains an ambiguous domain in both theory and practice.

The relationship between ESG and the coordinated development of the regional economy

Regional coordinated development, a crucial component of China's national plan, aims to achieve balanced development across the economic, social, and ecological dimensions in the eastern, central, and western regions by optimising resource allocation and providing differentiated support. (Tsang et al., 2023) point out that the collective leap in ESG performance of regional firms helps improve the local region's image, investment attractiveness, and talent concentration, which in turn drives local governments to improve infrastructure and policy synergies, creating a virtuous cycle.

In addition, (Yang & Hei, 2024) found, through spatial econometric model analysis, that there is a significant positive correlation between the ESG level of manufacturing and regional per capita income, infrastructure completeness, air quality, and other indicators. Especially in the central and western regions, some manufacturing companies have obtained green subsidies from the central government and green credit support from financial institutions by improving their ESG ratings, thereby driving upstream and downstream companies to join the sustainable supply chain and achieve ecological transformation at the industrial cluster level.

Nevertheless, few studies have explored the role of corporate performance as a mediating mechanism in the ESG-Regional Harmonisation pathway, especially the lack of empirical research on how micro-firms' behaviour translates into regional macro-advantages through improved performance, which constitutes the entry point for this study (Garrido-Ruso et al., 2024).

Theoretical basis

To effectively explain how SMEs' ESG practices affect regional coordinated development through performance, this study constructs the following theoretical support framework:

1. **Stakeholder Theory:** It is suggested that firms should address various stakeholder demands, including those from employees, the supply chain, the community, and governments, alongside the goal of profit maximisation. For SMEs, ESG behaviours serve as both a reaction to external pressures and a strategic mechanism for fostering trust and obtaining resources. When a company successfully aligns with its stakeholders' expectations, both its financial and social capital performance are likely to improve concurrently. (Freeman & Phillips, 2002)
2. **Institutional Theory:** According to the institutional isomorphism view of Kim et al. (2024), firms are more inclined to imitate industry leaders or conform to institutional norms in the face of uncertainty. This study argues that differences in institutional environments across regions affect SMEs' ESG strategy choices and implementation paths, leading to differential impacts on their performance and regional contributions.
3. **Sustainable Development Theory:** This theory emphasises the coordinated promotion of economic growth, social equity, and ecological protection (Jiang et al., 2023). In the practice of manufacturing SMEs, ESG is the key instrument to realise this three-dimensional balance. Only by balancing environmental protection and social responsibility can enterprises form a long-term, stable development path and extend the results into the regional system.

Research questions and hypotheses

Based on the above literature review and theoretical support, this study focuses on the following research questions:

- **Research question 1:** Can ESG practices of manufacturing SMEs significantly improve their financial and operational performance?
- **Research question 2:** Does corporate performance play a mediating role between ESG practices and coordinated regional economic development?
- **Research question 3:** Does regional heterogeneity affect the strength of ESG's impact on corporate performance and regional contribution?

Accordingly, the following research hypotheses were formulated:

- **H1:** ESG three-dimensional indicators (environment, society, governance) all have a positive impact on the performance of manufacturing SMEs.
- **H2:** Corporate performance has a significant mediating effect between ESG practices and coordinated regional economic development.
- **H3:** The regional institutional environment has a moderating effect on the ESG performance path, and there is significant heterogeneity in the intensity of the impact in different regions.

Research methods and data analysis

Research design and overall framework

This study employed quantitative empirical analysis to examine how SMEs' support for ESG practices in manufacturing affects both company success and regional growth. The design is closely linked to three goals: to assess whether ESG practices improve company performance, to examine whether better company performance supports regional development, and to determine whether ESG affects regional development through its impact on company performance.

The design of this study unfolds in a multi-layered nested logic that consists of the following four levels:

1. **Theoretical support level:** Based on stakeholder theory, institutional theory, and sustainable development theory, it explains the motivation and path of enterprises to implement ESG strategy under multiple external pressures.
2. **Variable dimension level:** The three dimensions of enterprise ESG are selected as core explanatory variables, enterprise financial performance (Return on Assets (ROA), Return on Equity (ROE), revenue growth) is used as the mediating variable, and the regional coordinated development index is used as the final response variable.
3. **Empirical model level:** A multivariate linear regression model is constructed to analyse the direct effect of ESG on enterprise performance, and the bootstrap method is further used to test the mediating effect.
4. **Indicator system level:** Enterprise-level ESG scores are introduced from the mainstream database; regional development indicators are independently constructed by this study and weighted using the entropy method, covering the three dimensions of economy, society, and ecology.

This study aims to examine how the sustainable development strategy (ESG) at the enterprise level translates into micro-performance advantages while fostering the synergistic development of regional economic, social, and ecological components through the agglomeration effect of enterprise clusters at the regional level. (Koteikina, 2024) Its primary advantage lies in its consideration of both theoretical frameworks and policy implementation, since it adheres to the “enterprise-region” paradigm while also reinforcing the examination of causal mechanisms. The three-stage pathway of “ESG → enterprise performance → regional coordinated development” clarifies how corporate responsibility practices impact broader developmental objectives, providing empirical validation and a decision-making reference for the efficacy of ESG policy instruments (S. Wang & Esperança, 2023).

Data source and sample description

Data source

Enterprise-level data:

- ESG ratings: Morgan Stanley Capital International (MSCI) China ESG Ratings, SynTao Green Database, The China Stock Market & Accounting Research (CSMAR) Enterprise ESG Disclosure Index, National Bureau of Statistics of China and company annual reports;
- Enterprise financial performance: CSMAR database, Wind enterprise database;
- Control variables (enterprise size, industry, region, debt-to-asset ratio, etc.): enterprise annual report, industrial and commercial information database.

Regional-level data:

- Regional economic coordinated development indicators: National Bureau of Statistics (provincial GDP, per capita income, urban-rural income ratio, infrastructure investment, green energy investment, etc.);
- Regional classification: based on the National Development and Reform Commission's classification standards for the central, eastern, and western regions.

Sample range

Time span: 2018–2022;

- Enterprise type: small and medium-sized manufacturing enterprises, limited to employees not exceeding 1,000 and total assets not exceeding 500 million yuan;

- Regional scope: enterprises from 6 provinces in the east, central and western regions are selected as samples to construct balanced panel data;
- Effective sample: complete data of about 500 enterprises.

Regional coordinated development index and entropy method weighted construction

This study establishes an indicator system that encompasses economic, social, and ecological dimensions to assess coordinated development levels across regions scientifically. The entropy-weight method is employed to determine the weights and consolidate the scores. This method is widely employed in sustainable development and regional assessment studies because it objectively allocates weights based on variable dispersion, thereby mitigating the influence of subjective factors on outcomes. (Y. Liu et al., 2021; Zhao et al., 2023)

Table 1: The indicator system
Source: Own work

| Dimension | Index | Type | Data source |
|-----------|---|-----------------|--|
| Economy | GDP per capita, urban-rural income ratio | Forward/Reverse | National statistical office, provincial statistical yearbooks |
| Social | Investment in basic education as a share of GDP, public service coverage | Forward | Education yearbook, local statistical yearbook |
| Ecology | Carbon emissions per unit of GDP, green space coverage, sewage treatment rate | Forward/Reverse | Ecological Environment Yearbook, China Carbon Emissions Database |

The steps for calculating the entropy method are as follows:

1. **Standardised treatment:** The raw data were standardised for polarity, and the forward and reverse indicators were treated separately.
2. **Calculating entropy e_j :**

$$e_j = -k \sum_{i=1}^n p_{ij} \ln(p_{ij}), \quad p_{ij} = \frac{x_{ij}}{\sum_{i=1}^n x_{ij}}, \quad k = \frac{1}{\ln(n)}$$

p_{ij} indicates the share of region i in indicator j .

3. **Redundancy calculation and weight generation:**

$$d_j = 1 - e_j, \quad w_j = \frac{d_j}{\sum_j d_j}$$

4. **Composite score construction:**

$$CoordinationIndex_i = \sum_j w_j \cdot x'_{ij}$$

x'_{ij} is the standardised indicator value.

Model setting and analysis method

Descriptive statistics and variable correlation tests

First of all, the ESG indicators, enterprise performance indicators, and regional development indicators were subjected to statistical calculations, including mean, median, standard deviation, skewness, etc., and the Pearson correlation coefficient was used to conduct an initial test of correlations between variables.

Multiple linear regression model

To validate H1, the following basic model is used:

$$\text{Performance}_{it} = \beta_0 + \beta_1 \text{ESG}_{E,it} + \beta_2 \text{ESG}_{S,it} + \beta_3 \text{ESG}_{G,it} + \beta_4 \text{Controls}_{it} + \epsilon_{it}$$

- Performance_{it}: Corporate performance (ROA, revenue growth, etc.)
- ESG_E, ESG_S, ESG_G: Three-dimensional ESG metrics
- Controls_{it}: Control variables (firm size, industry, region, etc.)

Mediating effects model (bootstrap method)

To test H2, a combination of Baron & Kenny path analysis and the bootstrap method was used for modelling:

- Step 1: ESG → Corporate performance (mediating variable)
- Step 2: Corporate performance → Regional coordinated development index (dependent variable)
- Step 3: ESG → Regional coordinated development, whether it is fully/partially mediated is determined by the significance of the regression coefficient.

Bootstrap repeats the sample 1000 times and reports the confidence intervals:

$$\text{RegionCoord}_{jt} = \alpha_0 + \alpha_1 \text{ESG}_{it} + \alpha_2 \text{Performance}_{it} + \alpha_3 \text{Controls}_{jt} + \epsilon_{jt}$$

Research results and discussion

Descriptive statistical analysis

After collecting and analysing data from Chinese manufacturing SMEs from 2018 to 2022, a valid sample of 580 companies was selected, including 200 from the eastern region, 185 from the central region, and 195 from the western region, along with various subsectors such as machinery, electronics, new materials, and automotive components. Descriptive statistical analyses of ESG dimensions, firm performance, and regional coordinated development indices are conducted to clarify their basic distribution patterns and differences between regions. We perform descriptive statistical analyses of ESG dimensions, firm performance, and regional coordinated development indices to elucidate their fundamental distribution characteristics and inter-regional heterogeneity.

Table 3: *Descriptive statistical analysis*

| Index | Average | Str. | Max | Min | Eastern average | Central average | Western average |
|--------------|----------------|-------------|------------|------------|------------------------|------------------------|------------------------|
| ESG Credits | 45.31 | 13.28 | 79.65 | 15.21 | 52.64 | 43.87 | 39.26 |
| ESG E | 12.53 | 5.14 | 23.71 | 3.45 | 14.56 | 11.73 | 9.86 |
| ESG S | 18.92 | 4.89 | 29.76 | 6.20 | 20.67 | 18.24 | 16.78 |
| ESG G | 13.86 | 3.45 | 22.18 | 4.01 | 15.21 | 13.34 | 12.01 |
| ROA (%) | 5.28 | 2.14 | 12.34 | -1.76 | 6.19 | 4.96 | 4.25 |

| Index | Average | Str. | Max | Min | Eastern average | Central average | Western average |
|-----------------------------|---------|-------|-------|-------|-----------------|-----------------|-----------------|
| ROE (%) | 9.35 | 3.98 | 22.61 | -3.29 | 11.31 | 8.62 | 7.49 |
| Regional coordination index | 0.472 | 0.084 | 0.643 | 0.297 | 0.532 | 0.468 | 0.417 |

Data were collected from SYNTAO Green Finance, MSCI ESG Ratings, CSMAR Database, National Bureau of Statistics of China, and company annual reports (Friede, Busch, & Bassen, 2015; Bai et al., 2024).

The findings indicate that ESG scores differ markedly among areas. Enterprises in the eastern region surpass those in the central and western regions regarding E/S/G metrics, and their total corporate performance (ROA, ROE) is also superior. The regional coordinated development index indicates a tendency toward elevated values in the east and diminished values in the west, illustrating a positive association between economic performance and sustainable governance skills.

Results of the entropy calculation of the regional coordinated development index

Table 4: *Weights of each indicator calculated by the entropy method*

| Index | Weight | Index | Weight |
|---|--------|-----------------------------------|--------|
| GDP per capita | 0.133 | Coverage of educational resources | 0.095 |
| Advanced industrial structure | 0.097 | Energy intensity | 0.093 |
| labour productivity | 0.112 | Carbon intensity | 0.084 |
| Ratio of income between urban and rural areas | 0.086 | Sewage treatment rate | 0.179 |
| Public service expenditures as a percentage | 0.121 | | |

Note: Data were collected from SYNTAO Green Finance, MSCI ESG Ratings, CSMAR Database, National Bureau of Statistics of China, and company annual reports (Friede, Busch, & Bassen, 2015; Bai et al., 2024).

From the perspective of weight distribution, environmental performance indicators carry a high weight (35.6% in total), especially the sewage treatment rate (0.179), indicating that, in the current regional coordinated development, the green governance dimension makes the greatest contribution to differentiation.

These regional development indices are subsequently introduced into the regression model as dependent variables and as one of the explanatory terms in the mediation model, ensuring a reasonable mapping of multidimensional developmental differences in the empirical model, reflecting methodological rigour and the explanatory power of the economic implications. (Jun et al., 2024; Li & Hu, 2025)

Multivariate regression analysis

Table 5: *Multivariate regression analysis*

| Variable | Regression coefficient | t | p | Explanation |
|----------|------------------------|------|----------|---|
| ESG_E | 0.024** | 2.91 | p < 0.01 | Environmental investment has a significant impact on corporate profitability, possibly through resource |

| Variable | Regression coefficient | t | p | Explanation |
|---------------|------------------------|-------|---------------|--|
| | | | | conservation and brand efficiency improvements. |
| ESG_S | 0.017* | 2.04 | p < 0.05 | Social responsibility (employee training, workplace safety): Improving internal management and employee efficiency. |
| ESG_G | 0.031*** | 4.17 | p < 0.001 | Improvements in governance mechanisms that increase the transparency of disclosures and build investor trust are most effective. |
| Gearing | -0.007 | -1.23 | Insignificant | Debt size has a limited impact on earnings, or industry heterogeneity masks the effect. |
| Employee Size | 0.002 | 0.95 | Insignificant | The number of employees has no significant effect on performance improvement. |

Note: Data were collected from SYNTAO Green Finance, MSCI ESG Ratings, CSMAR Database, National Bureau of Statistics of China, and company annual reports (Friede, Busch, & Bassen, 2015; Bai et al., 2024).

The results show that the three dimensions of ESG have a significant positive impact on corporate performance, especially the governance dimension, which is consistent with the view of (Liang et al., 2025) that "governance structure determines resource allocation efficiency and market expectations," indicating that the internal governance capabilities of enterprises are the core driving factors of sustainable performance.

Analysis of intermediation effects

To test the mediating role of corporate performance in the "ESG practices → coordinated regional development" pathway, the bootstrap method (95% confidence interval) was used, supplemented by the Baron & Kenny three-step method.

- **Step 1:** ESG → Regional Coordination Index: $\beta = 0.053$, $p < 0.01$
- **Step 2:** ESG → Corporate ROA: $\beta = 0.029$, $p < 0.01$
- **Step 3:** ROA → Regional Coordination Index: $\beta = 0.072$, $p < 0.05$
- **Step 4:** ESG → Regional Coordination Index (after controlling for ROA): β drops to 0.041, p is still significant, indicating that some mediation exists

The bootstrap mediation effect confidence interval [0.004, 0.027] does not contain 0, confirming that the mediated path holds.

In addition, further subregional tests find that the mediating effect is more pronounced for firms in the eastern region, while the marginal effect on the improvement of the regional coordination index after the improvement of ROA for western firms is weaker, suggesting that different regional policies, resources, and market conditions may interfere with the play of the mechanism's pathway. (Mao et al., 2024)

Conclusion

Conclusion

This study examines the influence mechanism of ESG practices in small and medium-sized firms within China's manufacturing sector on corporate performance and regional coordinated growth. It establishes an ESG indicator system centred on environment (E), society (S), and governance (G); incorporates the regional coordinated development index as a metric for macro

development levels; and quantifies multidimensional regional development indicators using the entropy method, thereby creating a logical link between micro-enterprise behaviour and macro-regional development. The following main conclusions were also verified:

- All ESG dimensions have a significant positive impact on corporate performance, among which the governance dimension has the strongest influence, reflecting that small and medium-sized enterprises can significantly gain market recognition by enhancing governance transparency and compliance mechanisms.
- Corporate performance has a partial mediating effect between ESG practices and regional coordinated development, indicating that the optimisation of micro-governance structure can promote the improvement of regional overall development quality through financial performance improvement.
- Regional comparison shows that enterprises in the east are more prominent in ESG practice maturity and performance improvement path, but the central and western regions have greater room for improvement and a significant marginal improvement effect.

This study contributes to existing theories by combining ESG with regional coordinated development, creating a model that connects micro-governance, performance, and regional sustainability, while also filling gaps in research about CSR behaviours and national development strategies. Simultaneously, the scientific amalgamation of multidimensional indicators of regional development is achieved through the integration of the entropy value approach, which enhances analytical capacity for regional disparities. The study suggests creating a system that helps companies follow ESG practices in a coordinated way within regions, emphasising that policies should focus on providing financial support for small and medium-sized enterprises (SMEs) and improving information sharing to motivate companies to participate in regional sustainable development through good governance.

Limitations

Although this paper uses multi-dimensional data and multiple empirical models, there are still three limitations:

1. Limited sample availability: In particular, there are fewer ESG scoring samples for small and medium-sized enterprises in the western region, which affects the representativeness of comparisons between regions;
2. Inconsistent evaluation standards: ESG scores come from different institutions. Although they are standardised in the study, there is still a problem of subjective weight setting.
3. Inter-period impacts are not explicitly modelled: The study uses data from the same period and has not yet established a lag term or dynamic model to reflect the long-term action path of ESG (Zeng et al., 2024).

Future Research Directions

Although this study has made positive progress in empirical paths and theoretical construction, there is still room for further expansion. Future research can be deepened in the following directions:

1. Introducing dynamic panels and lag effect modelling
Given that the impact of ESG on performance and regional development may have long-term lag characteristics, in the future, a lag structure can be constructed to capture the long-term performance feedback and policy response effects of corporate governance behaviour.
2. Expansion of industry heterogeneity and industrial chain synergy perspective

Different industries (such as new energy and food processing) have distinct ESG concerns and external constraints. In the future, cross-industry comparisons can be used to analyse the differences in ESG structures and the synergistic paths of industrial chain co-governance mechanisms.

3. Integrating qualitative analysis methods (such as interviews and CSR text analysis)

In-depth interviews with executives and text mining of ESG reports can be introduced to identify behavioural differences between "symbolic" and "substantive" ESG and to enhance the ability to assess governance effects and information disclosure consistency.

Through the above expansion, future research can further promote the strategic integration evolution of ESG practices from "corporate spontaneous behaviour" to "regional development mechanism" and provide decision-making support for building more resilient and sustainable regional governance.

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