

Original Paper

A Study on the Impact of Corporate Governance Levels on Enterprises' Green Transformation

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Abstract

Corporate governance serves as a critical factor in incentivizing and ensuring enterprises proactively pursue green transformation. Against this backdrop, this study incorporates labor structure optimization into its research model using data from Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2012 to 2023. It systematically examines the causal mechanism linking corporate governance levels to enterprise green transformation. Findings indicate that corporate governance levels significantly promote green transformation, a conclusion that remains robust after a series of stability tests. Heterogeneity analysis reveals that the promotional effect of corporate governance on green development is more pronounced for state-owned enterprises, high-tech firms, and companies with low financing constraints. In terms of transmission mechanisms, corporate governance drives green transformation by optimizing both the quality and functional structure of the workforce. This study not only sheds light on the drivers of recent trends in corporate human capital levels but also holds significant implications for promoting the sustained and stable development of corporate green transformation.

Keywords

Corporate governance, Green transformation, Labor structure optimization

1. Introduction

Amidst the global wave of sustainable development and the deepening two-pronged advancement of China's "dual carbon" strategy, corporate green transformation has become a critical driver of high-quality economic growth. According to the Ministry of Ecology and Environment's 2023 Report on China's Policies and Actions on Climate Change, China accounts for over 30% of global carbon emissions. As the primary entities for emissions reduction, enterprises bear significant responsibility in their green transition. At the February 2025 symposium with private enterprises, General Secretary Xi Jinping emphasized the need to improve corporate governance structures in accordance with the

requirements of modern enterprise systems with Chinese characteristics, standardize shareholder behavior, strengthen internal oversight, and enhance risk prevention mechanisms. However, enterprises face profound contradictions such as long green investment cycles, high externalities, and short-term management orientation. According to statistics from the China Association of Listed Companies, only about 27% of A-share listed companies disclosed specific carbon reduction measures or targets in 2022, reflecting to some extent how agency conflicts substantially constrain green transformation. Against this backdrop, the refinement of corporate governance—as a core institutional arrangement for internal coordination of interests and mitigation of agency conflicts—holds significant theoretical value and practical relevance in determining how it influences corporate green transformation.

2. Literature Review

Corporate governance levels can enhance decision-making and operational efficiency, thereby driving green transformation and development. Existing literature has systematically explored this topic across three dimensions: structural aspects, operational mechanisms, and economic impacts. At the structural dimension level, current research tends to adopt a multi-dimensional indicator selection approach from a comprehensive perspective encompassing shareholders, directors, and executives, establishing a unified framework for comprehensively measuring corporate governance levels [1]. At the mechanism level, studies indicate that effective corporate governance not only enhances financial performance by alleviating financing constraints and mitigating agency conflicts [2], reduces capital costs, and optimizes the efficiency of factor allocation such as labor [3], but also plays a critical role at the strategic level. Regarding economic effects, high-quality governance structures directly drive strategic transformations like digital transformation by enhancing risk-bearing capacity and innovation capabilities [4]. Corporate governance mechanisms also improve through interactions with strategic actions such as digital transformation [5], with this bidirectional effect further reinforcing its foundational role in achieving sustainable development.

As a core pathway to sustainable development, corporate green transformation has been extensively studied in terms of its driving mechanisms and influencing factors. Existing literature indicates that corporate green transformation is influenced by both internal and external factors. Externally, green finance pilot policies [6] and smart manufacturing policies [7] promote transformation by optimizing financial resource allocation and enhancing technology absorption capacity; data elements facilitate transformation by mitigating information asymmetry and fostering green technological innovation [8]. Internally, proactive corporate strategies—such as forming strategic alliances and implementing green supply chain management—drive transformation by increasing technological diversification [9]. However, green transformation may exert short-term pressure on corporate growth, and innovation investment can effectively mitigate this negative impact [10]. Furthermore, corporate green transformation decisions exhibit pronounced herd effects [11]. Collectively, these studies indicate that

corporate green transformation is a complex strategic process driven by multiple factors and transmitted through diverse pathways.

In recent years, the intrinsic link between corporate governance levels and green transformation has also garnered significant attention. Research indicates that corporate governance not only directly influences green transformation but also plays a crucial moderating role in the relationship between other factors and green transformation. Regarding direct effects, robust corporate governance structures enhance decision-making efficiency and resource allocation capabilities, thereby directly promoting green innovation and transformative development. Notably, corporate governance demonstrates significant dual value in the relationship between digital transformation and green transformation[12]. In terms of moderating mechanisms, corporate governance exhibits multidimensional influence characteristics. Governance elements such as board internationalization promote green innovation by enhancing corporate ESG performance [13]. Furthermore, the moderating effect of corporate governance varies significantly in intensity across state-owned enterprises, firms with differing financing constraints, and companies with distinct industry characteristics [14]. These findings collectively reveal the indispensable role of corporate governance in corporate green transformation. However, existing research on how governance levels influence green transformation still has room for deepening in terms of pathway integration and mechanism analysis. This study serves as a crucial supplement to the existing literature, offering new perspectives on understanding the green efficacy of corporate governance.

The potential contributions of this paper are as follows: First, while prior research on the impact of corporate governance levels on green transformation has largely relied on empirical judgments, this study employs empirical analysis to examine the influence and underlying mechanisms of corporate governance on green transformation. Second, this study incorporates labor structure optimization as a key factor into the analytical framework, confirming its significant mediating effect. This breaks through the limitations of existing research and enriches our understanding of the driving mechanisms behind corporate green transformation. Third, it reveals the important conclusion that the green transformation effect of corporate governance varies depending on the attributes of the enterprise itself. This finding provides direct evidence for enterprises to implement differentiated governance optimization strategies.

3. Theoretical Analysis and Research Hypotheses

3.1 Direct Impact of Corporate Governance Levels on Enterprise Green Transformation

Corporate governance constitutes a vital component of internal institutional arrangements within enterprises, determining strategic orientation and resource allocation efficiency. Strong corporate governance provides institutional safeguards for green transformation by optimizing decision-making mechanisms, strengthening oversight and accountability, and enhancing information transparency. First, robust governance structures mitigate agency problems, aligning management objectives with the long-term interests of shareholders and society, and encouraging the integration of environmental responsibilities into strategic planning. Second, well-developed internal control mechanisms improve

decision-making rationality and risk management capabilities, thereby increasing corporate willingness to invest in green technology innovation and energy-saving initiatives. Finally, governance mechanisms for transparent information disclosure enhance corporate environmental responsibility and social reputation, attracting more green investments and policy resources to create a virtuous cycle. Thus, higher corporate governance levels help enterprises balance economic and ecological objectives, driving sustainable green transformation. Based on this, the following hypothesis is proposed:

H1: Corporate governance levels promote green transformation and development.

3.2 Indirect Impact of Corporate Governance Levels on Green Transformation via Labor Structure Optimization

Enhanced corporate governance promotes labor structure optimization by standardizing decision-making, refining incentive mechanisms, and strengthening oversight. On one hand, regarding workforce quality, governance encourages increased investment in human capital, intensified employee training, and technological upgrades, thereby elevating green innovation awareness and professional skills. Enterprises with higher governance levels prioritize fairness and performance-oriented hiring systems, attracting and retaining high-caliber talent to form a workforce structure centered on knowledge-based and innovative personnel. On the other hand, regarding functional labor structure, improved corporate governance facilitates organizational restructuring and functional realignment, driving the establishment and optimization of departments focused on green management and energy-efficient operations. Improvements in corporate governance guide human resources from low-value-added positions toward high-value-added domains like R&D, management, and green innovation, thereby achieving functional structure upgrades. Optimizing the labor structure is a key pathway for promoting corporate green transformation, with its mechanism operating on two dimensions. First, the quality structure optimization brought by corporate governance provides human support for green production and technological R&D. The concentration of high-caliber labor helps enhance the efficiency of green technology absorption and conversion within enterprises. Second, functional structure optimization improves resource allocation efficiency and decision-making execution by strengthening green functional departments and enhancing cross-departmental collaboration, thereby more effectively translating corporate governance strategies into operational practices. By promoting labor structure optimization, corporate governance reinforces green transformation momentum at the organizational capability and human capital levels, converting institutional advantages into developmental strengths. Based on this, the following hypothesis is proposed:

H2: Corporate governance levels can promote enterprise green transformation through labor structure optimization.

4. Research Design

4.1 Sample Selection and Data Sources

Given data availability and statistical consistency, this study selects Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2012 to 2023 as the initial research subjects. The initial sample underwent the following screening and processing: - Exclusion of firms with abnormal operational status during the sample period, such as ST and *ST-listed companies; - Exclusion of firms suspended or delisted from trading; - Exclusion of financial institutions; - Exclusion of firms with excessive missing key fundamental information and data. Following these data matching and processing steps, the study ultimately consolidated a sample of 915 firms, comprising 10,980 observations.

4.2 Variable Selection and Explanation

4.2.1 Dependent Variable

Corporate Green Transformation (GT). First, drawing on LOUGHRAN T[15]'s research, this study measures corporate green transformation using textual information disclosed in listed companies' annual reports. Second, following Zhou Kuo et al. (2022) [16], 113 keywords related to green transformation were selected across five dimensions: advocacy initiatives, strategic concepts, technological innovation, pollution control, and monitoring management. The frequency of each keyword's occurrence in listed companies' annual report texts was counted to generate green transformation keyword frequencies. Finally, the green transformation keyword frequency was incremented by 1 and subjected to natural logarithmic transformation to form the green transformation measurement indicator.

4.2.2 Explanatory Variables

Corporate Governance Level (CorpGov). Following Zhou Hong et al. (2018) [17], this study constructs a corporate governance level indicator system encompassing: separation of chairman and CEO roles, proportion of independent directors, board ownership ratio, largest shareholder ownership ratio, board and supervisory board size, and total compensation of the top three executives. Principal component analysis is employed to derive a comprehensive corporate governance evaluation index. Higher values indicate superior corporate governance.

4.2.3 Mediating Variable

Labor Structure Optimization (LSU). Based on the preceding theoretical analysis, this study selects labor structure optimization as the mediating variable. The key to optimizing a firm's labor structure lies in the elevation of educational attainment distribution and the specialization of skill composition. Accordingly, drawing on the research of Qi Ke et al. (2024) [18], this study measures the quality of the labor structure (LSU_edu) using the proportion of employees holding master's degrees or higher relative to the total workforce. Second, employees are categorized into four major occupational groups: technical and R&D personnel; sales and marketing personnel; finance personnel; and other personnel. Technical and R&D personnel primarily include engineers and R&D staff; sales and marketing personnel are mainly responsible for product sales and marketing functions; finance personnel primarily engage in accounting and financial management tasks. Technical, sales/marketing, and finance personnel are classified as non-

routine high-skilled labor. The proportion of non-routine high-skilled labor relative to total employees measures the labor functional structure (LSU_job). An increase in both LSU_edu and LSU_job indicates optimization of both the labor quality structure and functional structure.

4.2.4 Control Variables

Based on existing literature, control variables comprise two components: at the company level: Firm size (SIZE), measured by the natural logarithm of annual total assets; Debt-to-asset ratio (LEV), measured by the ratio of year-end total liabilities to year-end total assets; Equity multiplier (EM), measured by the ratio of year-end total assets to year-end owners' equity; Return on equity (ROE), measured by the ratio of net profit to total assets. At the city level: Population Density (PEO), measured as the ratio of registered population to administrative land area; Financial Development (FIN), measured as the ratio of year-end deposits and loans from financial institutions to regional GDP; Government Intervention (GOV), measured as the ratio of local government general budget expenditures to regional GDP. Descriptive statistics for these variables are presented in Table 1.

Table 1. Descriptive Statistics of Key Variables

Variable Name (Variable Symbol)	mean	sd	min	max
Corporate Green Transformation (GT)	1.895	0.864	0	3.970
Corporate Governance Level (CorpGov)	-0.166	0.873	-2.791	3.580
Enterprise Scale (SIZE)	22.62	1.352	19.52	26.45
Debt-to-Asset Ratio (LEV)	0.435	0.198	0.0381	0.908
Equity Multiplier (EM)	2.115	1.177	1.040	10.83
Return on Equity (ROE)	0.0535	0.133	-2.438	0.352
Population Density Level (PEO)	6.668	0.789	0.440	8.176
Financial Development Level (FIN)	4.332	1.718	0.779	12.51
Government Intervention Level (GOV)	0.161	0.0597	0.0595	1.106
Labor Force Quality Structure (LSU_edu)	0.0518	0.0600	0.000105	0.519
Labor Force Functional Structure (LSU_job)	0.414	0.237	0.00244	3.760

4.3 Model Construction

First, to analyze the impact of corporate governance levels on green transformation, a two-way fixed effects model is constructed as follows:

$$GT_{it} = \alpha_0 + \alpha_1 CorpGov_{it} + \alpha_2 Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

In Equation (1), GT_{it} denotes corporate green transformation, $CorpGov_{it}$ represents corporate governance level, $Controls_{it}$ is the control variable, μ_i and λ_t denote individual and time fixed effects, respectively, while ε_{it} is the random error term.

To examine the mediating role of labor structure optimization in enhancing corporate governance levels

during green transformation, this study adopts the mediation effect testing method proposed by Jiang Ting (2022) [19]. According to theory, an effective mechanism path must satisfy two verification criteria: First, a robust causal relationship exists between the explanatory variable and the dependent variable. Second, the direct effect of the mechanism variable on the dependent variable has sufficient theoretical justification, and the mechanism through which the explanatory variable influences the mechanism variable holds. Only when both conditions are met can it be confirmed that the explanatory variable affects the dependent variable via the mechanism variable. Given that the causal relationship between corporate governance levels and corporate green transformation has been validated in the baseline regression, and the influence of the mediating variable on corporate green transformation is supported by relevant literature in the theoretical analysis, this study only needs to verify the impact of corporate governance levels on optimizing the quality structure and functional structure of the workforce. To this end, the following two-way fixed-effects model is constructed:

$$LSU_{it} = \beta_0 + \beta_1 CorpGov_{it} + \beta_2 Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

In equation (2), LSU_{it} represents the mediator variable LSU_edu and LSU_job , and the interpretations of other variables remain consistent with those in equation (1).

5. Empirical Results Analysis

5.1 Benchmark Regression Analysis

First, the Hausman test results indicate that the fixed-effects model is appropriate. Second, the benchmark regression results are presented in Table 2. Column (1) indicates that the regression coefficient for corporate governance level is significantly positive at the 10% level without additional control variables, preliminarily suggesting that corporate governance level can drive the enhancement of corporate green transformation. To eliminate interference from other factors, this study introduced relevant control variables and progressively controlled for individual fixed effects and time fixed effects for further testing, with results shown in Columns (2) to (4). The regression analysis indicates that even after controlling for variables, corporate governance levels still significantly enhance the degree of corporate green transformation. After fully controlling for relevant variables and fixed effects in the model, the estimated coefficient for *CorpGov* is 0.348, confirming that corporate governance levels significantly promote the development of corporate green transformation. Thus, research hypothesis H1 holds.

Table 2. Benchmark Regression Results

Variable	(1)	(2)	(3)	(4)
CorpGov	0.255* (1.764)	0.424*** (2.772)	0.223** (2.263)	0.348** (2.425)
Controls	No	Yes	Yes	Yes
Constant	8.657***	-78.373***	-19.852***	-31.653***

	(152.014)	(-16.241)	(-10.440)	(-6.347)
Individual Fixed	Yes	Yes	No	Yes
Time Fixed	Yes	No	Yes	Yes
Observations	10980	10980	10980	10980
R ²	0.6988	0.6783	0.1741	0.7036

Note. *, **, and *** denote significance at the 10%, 5%, and 1% significance levels, respectively. The values in parentheses represent t-values; the same applies below.

5.2 Robustness Tests

To validate the robustness of the empirical findings, three primary methods were employed. First, the sample period was adjusted. Re-estimating the two-way fixed effects model using the 2013–2023 timeframe, results in Column (1) of Table 3 indicate that corporate governance levels still exert a positive influence on green transformation at the 1% significance level. Second, we applied two-tailed trimming to the sample data at the upper and lower 1% thresholds before re-estimating. The regression results in Column (2) further confirm the robustness of our conclusion that corporate governance levels promote green transformation. Third, we re-estimated the model using robust standard errors based on firm-level and time-level bidirectional clustering. The results in Column (3) show that the direction and significance of the regression coefficient for corporate governance levels remain consistent with the benchmark regression results.

Table 3. Robustness Test Results

Variable	(1) GT	(2) GT	(3) GT
CorpGov	0.420*** (2.669)	0.341** (2.327)	0.341** (2.300)
Controls	Yes	Yes	Yes
Constant	-36.402*** (-6.497)	-32.374*** (-6.451)	-32.374*** (-7.103)
Individual Fixed	Yes	Yes	Yes
Time Fixed	Yes	Yes	Yes
Observations	10065	10980	10980
R ²	0.7180	0.7037	0.7037

5.3 Heterogeneity Analysis

5.3.1 Test for Heterogeneity in Ownership Attributes

As a vital pillar of China's economic development, state-owned enterprises (SOEs) shoulder greater political missions and social responsibilities. Simultaneously, they enjoy certain advantages in financing channels, resource allocation, and policy support, making it easier to translate governance structure optimization into concrete action measures. Furthermore, the more robust oversight and incentive systems within SOE governance mechanisms can constrain management's short-term behavior. Therefore, this study anticipates that enhanced governance levels in SOEs can effectively improve resource utilization efficiency and promote corporate green transformation. Based on this, the sample is divided into two groups by ownership type. The regression results are shown in Column (1) and Column (2) of Table 4. In SOEs, the coefficient for corporate governance level is significantly positive, while in non-state-owned enterprises, the coefficient is not significant, consistent with expectations.

5.3.2 Testing Industry Attribute Heterogeneity

High-tech enterprises typically possess strong technological innovation capabilities and a solid foundation of R&D investment. Advantages in capital, talent, and other resources help improve corporate innovation decision-making mechanisms and optimize incentive structures, thereby enhancing green transition efficiency. The green transition of high-tech enterprises is closely linked to their core competitiveness, and improved governance structures can promote the coordinated development of green technological innovation and clean production. Based on this, this paper argues that the promotional effect of corporate governance capabilities on green transition is more pronounced in high-tech enterprises. The sample was divided into high-tech and non-high-tech enterprises according to the "Guidelines for the Classification of Listed Companies by Industry (2012 Revision)." The regression results are shown in Column (3) and Column (4) of Table 4. The coefficient is significantly positive in high-tech enterprises but not significant in non-high-tech enterprises, indicating that the positive impact of corporate governance levels on green transformation is greater in high-tech enterprises, consistent with expectations.

5.3.3 Testing Heterogeneity in Corporate Financing Constraints

Financing constraints, as a key factor influencing corporate investment, exert a restraining effect on advancing green transformation. On one hand, firms with higher financing constraints, when facing limited capital sources, tend to prioritize short-term profitability and liquidity security, reducing investment in high-risk, long-cycle green innovation projects. On the other hand, firms operating in a relaxed financing environment can allocate resources more flexibly, converting governance improvements into capital investment for green technology R&D. Given this, this study predicts that firms with lower financing constraints are better positioned to leverage their governance capabilities to enhance green transformation. This study employs the SA index to measure firms' financing constraints, where a smaller SA index indicates stronger constraints. Subsequently, the sample's time-series mean and the median of the SA index are calculated. Firms with a mean above the median are classified as the low-constraint group, while those below the median form the high-constraint group. Separate regressions are conducted for both groups, with results presented in Column (5) and Column (6) of Table 4. The

coefficient is significantly positive at the 1% level for firms with low financing constraints, while it is insignificant for those with high financing constraints. This indicates that governance improvements enhance green transformation performance more markedly in firms with lower financing constraints.

Table 4. Regression Results for Heterogeneity Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	Ownership Type		Industry Type		Financing Constraint Type	
Variable	State-Owned	Non-State-Owned	High-Tech	Non-High-Tech	High Constraint	Low Constraint
	GT	GT	GT	GT	GT	GT
CorpGov	0.907*** (2.929)	0.001 (0.004)	0.340** (2.154)	0.191 (0.630)	-0.212 (-0.866)	0.660*** (3.775)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-40.883*** (-4.977)	-32.233*** (-4.722)	-22.859*** (-3.627)	-49.080*** (-5.691)	-28.864*** (-3.934)	-30.088*** (-4.501)
Individual Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4974	6006	6549	4431	5119	5861
R ²	0.7010	0.7272	0.6700	0.7437	0.6906	0.7163

5.4 Testing the Influence Mechanism

The preceding section theoretically analyzed the influence mechanism of corporate governance levels on enterprise green transformation from the perspective of labor structure optimization. Subsequently, drawing on Jiang Ting's (2022) mediation effect model, we tested whether the two aforementioned transmission pathways exist. The regression results are presented in Table 5. Column (1) presents the results for testing the mechanism of labor force quality structure optimization. The regression coefficient for corporate governance capacity shows a significant positive correlation at the 1% level, indicating that corporate governance levels can enhance green transformation by promoting labor force quality structure optimization. Existing literature generally holds that employees' accumulation of environmental knowledge, experience, and skills helps stimulate corporate green innovation behavior. This knowledge can be transformed into a driving force for corporate green innovation, bringing sustained competitive advantages and thereby promoting corporate green transformation [20]. Column (2) presents the results of the mechanism test for optimizing the functional structure of the workforce. The observed data reveal that at the 1% significance level, corporate governance is positively correlated with optimizing the functional structure of the workforce. This indicates that optimizing the functional structure of the

workforce is an effective pathway through which corporate governance promotes green development. Furthermore, existing literature demonstrates that in the presence of advanced technologies and equipment such as automation and industrial robots, only highly skilled labor performing technically demanding tasks can fully leverage their capabilities. By continuously synthesizing experience and generating innovative outcomes, this workforce indirectly facilitates corporate green transformation [21]. Thus, labor structure optimization mediates the influence of corporate governance levels on green transformation development, validating research hypothesis H2.

Table 5. Results of Mediating Effect Analysis

Variable	(1) LSU_edu	(2) LSU_job
CorpGov	0.004*** (5.585)	0.016*** (5.020)
Controls	Yes	Yes
Constant	-0.063*** (-2.776)	0.297** (2.251)
Individual Fests	Yes	Yes
Time Fests	Yes	Yes
Observations	10980	10980
R ²	0.8685	0.8443

6. Research Findings and Policy Recommendations

Faced with the dual objectives of economic development and resource conservation, corporate governance serves as a critical safeguard for incentivizing and ensuring enterprises proactively pursue green transformation. Against this backdrop, this study examines Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2012 to 2023. It employs principal component analysis to construct a comprehensive evaluation index for corporate governance levels and utilizes text analysis to obtain enterprise green transformation data. The research delves into the influence mechanisms among corporate governance levels, labor force structure optimization, and enterprise green transformation. The study reveals that, first, corporate governance levels significantly promote green development, a conclusion that remains robust after a series of stability tests. Second, the analysis of the mechanism of action indicates that labor structure optimization plays a mediating effect in the promotion of green transformation by corporate governance levels. Specifically, corporate governance drives green transformation through two pathways: optimizing the quality structure of the workforce and optimizing the functional structure of the workforce. Finally, heterogeneity analysis reveals that the promotional effect of corporate governance on green development is more pronounced for state-owned enterprises,

high-tech firms, and companies with low financing constraints compared to non-state-owned enterprises, non-high-tech firms, and those with high financing constraints.

Based on these findings, the following policy recommendations are proposed: (1) Upgrade internal governance frameworks to facilitate green transformation. Recognizing that enhanced corporate governance is a critical pathway for achieving green transformation, enterprises should embed green development principles throughout strategic planning and operational decision-making by restructuring internal governance. First, companies should refine board structures and decision-making mechanisms, integrating environmental risks and opportunities into long-term planning and risk management systems starting from the highest decision-making level. Second, align compensation incentives with green performance metrics to motivate management to proactively advance green transformation as a shared core objective for both individuals and the company. Finally, enterprises should voluntarily benchmark against high standards, enhancing market trust through internal transparency to attract greater green capital investment. (2) Comprehensively optimize the labor structure to build a green talent advantage. Labor structure optimization is a vital pathway for corporate governance to drive green transformation. Enterprises should enhance green human capital levels by focusing on both the quality structure and functional structure of their workforce. On one hand, intensify recruitment and cultivation of green talent, prioritizing multidisciplinary professionals, while enhancing existing employees' green skills and environmental awareness through university-industry collaborations and vocational training. On the other hand, drive organizational restructuring to clarify the functions of sustainability or green innovation departments across R&D, production, and supply chain operations, ensuring internal coordination between green decision-making and execution. Through continuous workforce optimization, enterprises can build intrinsic capabilities for green development atop enhanced governance. (3) Implement differentiated strategies to enhance the precision and effectiveness of green transformation. Enterprises should adopt tailored approaches based on their ownership structure, industry characteristics, and financing constraints to improve governance efficiency. State-owned enterprises should strengthen leadership and social responsibility fulfillment, integrating green performance into state capital operations to demonstrate exemplary roles. Non-state-owned enterprises should leverage flexible governance structures for swift decision-making and investment in green technologies or products with long-term competitive advantages. Across industries, high-tech enterprises should leverage their R&D strengths to deeply integrate governance improvements with green innovation, driving green patent and product development. Non-high-tech enterprises should focus on energy-saving and consumption-reducing upgrades to production processes and equipment, reducing environmental impact through lean management. Furthermore, enterprises with low financing constraints should fully leverage their financial strengths to convert governance advantages into forward-looking long-term investments, thereby building enduring competitive barriers. For enterprises with high financing constraints, elevating standardized corporate governance is paramount. Establishing green credit systems and expanding green

financing channels can alleviate capital pressures, ensuring governance enhancements effectively drive corporate green transformation.

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