

Green Development Governance and Corporate Value

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Abstract: *This study examines the impact of green development governance on corporate value using a panel dataset of Chinese listed companies from 2009 to 2023. Grounded in resource dependence and stakeholder theories, ESG scores are employed to measure green development governance, and return on assets (ROA) serves as the proxy for corporate value. A two-way fixed effects model and a mediation model are applied to explore both direct and indirect effects. The findings reveal that: (1) stronger green development governance significantly enhances corporate value, particularly among large and non-state-owned firms; and (2) corporate efficiency, measured by total asset turnover, partially mediates this relationship, supporting the mechanism that governance improvements drive efficiency and, in turn, value creation. These results provide theoretical and practical implications for firms, policymakers, and investors seeking to foster green transformation and sustainable growth in emerging markets.*

Keywords: *Green Development Governance, Corporate Efficiency, Corporate Value*

1. Introduction

As environmental concerns intensify, green development has emerged as a strategic priority for Chinese enterprises. Decades of rapid industrialization have placed significant pressure on ecological systems, triggering regulatory reforms and heightened expectations from stakeholders regarding sustainability performance. In this context, green development governance—reflecting firms' environmental responsibility and ESG practices—has gained growing prominence in both policy agendas and capital markets. Despite increasing attention, the relationship between green development governance and firm value remains insufficiently explored, particularly in emerging markets like China. Existing literature presents mixed findings and often lacks empirical analysis of the internal mechanisms through which green governance influences firm performance. Moreover, the extent to which these effects differ across firm characteristics, such as ownership structure and size, remains unclear.

This study examines the impact of green development governance on firm value using panel data from Chinese listed companies between 2009 and 2023. ESG ratings are employed as the primary explanatory variable, while return on assets (ROA) serves as the proxy for firm value. A two-way fixed effects model is used to estimate the relationship, and we further assess whether corporate efficiency mediates this link. In addition, heterogeneity analyses are conducted to explore how ESG effectiveness varies across ownership types and firm sizes.

This study offers several significant theoretical and practical contributions. Theoretically, while prior research has largely focused on macro-level policy discussions surrounding green governance, few studies have systematically examined the micro-level relationship between corporate green governance and firm value. By analyzing the pathways and mechanisms through which green governance influences value creation, our study helps to bridge this research gap and enrich the theoretical discourse on green development governance in the Chinese context. Practically, the results have direct implications for multiple stakeholders. For corporate managers, our findings offer guidance on how to balance economic objectives with environmental responsibility in the pursuit of sustainable transformation. For investors, the study highlights ESG performance as a key metric for evaluating long-term firm value and investment risk. For policymakers, this research provides empirical evidence to support the formulation of green governance regulations that promote both ecological sustainability and economic progress.

Moreover, this study adopts a multidimensional analytical framework, moving beyond traditional single-variable approaches. We also examine the mediating role of corporate efficiency in the green

governance–firm value relationship. The results indicate that firms with strong green governance (e.g., high ESG ratings) can enhance corporate value through improved operational efficiency. This transmission mechanism deepens the understanding of the dynamic processes underlying green governance and offers a valuable reference for future research. Finally, our heterogeneity analysis reveals that the value-enhancing effects of green governance are more pronounced in non-state-owned enterprises and larger firms. These findings suggest that differentiated governance strategies may be necessary to accommodate varying institutional contexts, providing a theoretical rationale for the targeted implementation of green policies.

2. Literature Review and Hypothesis Development

2.1. Literature Review

2.1.1. Research on Green Development Governance

The concept of green development governance originates from interdisciplinary insights in environmental economics, sociology, and public policy. Classical theories by Pigou and Coase laid the foundation, with Pigou advocating for government intervention to address externalities through taxes and subsidies^[1], while Coase emphasized efficient market-based solutions^[2]. Subsequent scholars expanded the framework, incorporating institutional adaptability^[3] and the role of public leadership in long-term ecological planning^[4]. In China, research on green development governance has accelerated in response to national policy priorities. Yuan and Cui^[5] highlighted the collaborative nature of green development governance involving state, market, and civil society actors. Shi and Liu^{[6][7]} proposed a co-governance model integrating environmental, economic, and cultural dimensions. Drawing from traditional Chinese philosophy, Li^[8] emphasized innovation and ecological harmony, while Liu and Zhuang^[9] conceptualized green development governance as a systemic mechanism for managing the human-nature relationship toward long-term sustainability. Despite varying definitions, both domestic and international scholars agree that green development governance plays a critical role in aligning economic development with environmental protection through coordinated institutional arrangements.

2.1.2. Green Development Governance and Corporate Value

Extant literature presents mixed findings on the relationship between green development governance and firm value. Some studies suggest that strong green development governance practices improve internal efficiency and brand reputation, thus enhancing financial performance^[10]. Conversely, others find that environmental initiatives may lead to short-term financial burdens and reduced shareholder returns^[11]. These inconsistencies are often attributed to differing contexts. In developed economies, stringent regulations and investor expectations make green development governance efforts more impactful. In contrast, developing economies like China face trade-offs between ecological goals and growth imperatives, and much of the current research remains conceptual rather than empirical.

2.2. Hypothesis Development

2.2.1. Direct Impact of Green Development Governance on Corporate Value

According to resource dependence theory, green development governance enables firms to reduce environmental risks and improve resource efficiency through practices such as circular economy models^[12]. Stakeholder theory suggests that green development governance meets regulatory and investor expectations, securing benefits like tax incentives and green financing. Therefore, we propose the following hypothesis:

H1: A firm's level of green development governance (measured by ESG performance) is positively associated with its corporate value.

2.2.2. The Mechanism Linking Green Development Governance and Corporate Value

Green development governance may influence firm value not only directly but also indirectly by improving internal operations. Companies with strong green performance typically exhibit better governance structures, stronger environmental and social responsibility, and more efficient use of resources. These qualities can reduce operational costs, enhance asset efficiency, and ultimately drive firm value. Based on this rationale, we propose the second hypothesis:

H2: Corporate efficiency mediates the relationship between green development governance and

corporate value ; that is, stronger green development governance performance improves efficiency, which in turn enhances corporate value.

3. Research Design

3.1. Sample and Data Sources

Our initial sample is obtained from China Stock Market & Accounting Research (CSMAR), using Chinese listed companies varying from 2009 to 2023. ESG data is obtained from Huazheng ESG ratings. We then exclude financial distress companies (Special Treatment (ST) companies). To mitigate the concern about outliers, we winsorize continuous variables at 1%. Finally, the research sample covers major non-financial listed companies in China from 2009 to 2023, forming a high-quality panel dataset suitable for empirical analysis.

3.2. Variable Definition

3.2.1. Green Development Governance

The Huazheng ESG rating classifies listed companies into 9 levels (C, CC, CCC, B, BB, BBB, A, AA, AAA) according to their ESG performance. In this study, the ESG levels are assigned values from 1 to 9 from lowest to highest, and the annual average of the ESG score is used as the core variable to measure green development governance.

3.2.2. Corporate Value

Corporate value is measured using the following two indicators. Return on Assets (ROA). Measures a company's profitability. The formula is:

$$ROA = \frac{Net\ Profit}{Total\ Assets} \quad (1)$$

ROA2. Alternative measures a company's profitability. The formula is:

$$ROA2 = \frac{Net\ Profit}{Average\ Total\ Assets} \quad (2)$$

Where Average Total Assets is calculated as:

$$Average\ Total\ Assets = \frac{Beginning\ Total\ Assets + Ending\ Total\ Assets}{2} \quad (3)$$

This alternative indicator is used to check if the findings are consistent even with a different way of calculating ROA, reducing the impact of fluctuations in the financial data.

3.2.3. Mediating Variable and Control Variables

This study selects Total Asset Turnover (TAT) as the mediating variable to measure the impact of green development governance on corporate value. The formula is:

$$TAT = \frac{Operating\ Revenue}{Average\ Total\ Assets} \quad (4)$$

This indicator reflects how efficiently a company uses its assets to generate sales revenue. A higher TAT may indicate the positive impact of green development governance practices (such as green supply chain optimization and improved operating efficiency) on company performance. Our paper also include some firm-level characteristics, including Company Size (Size), Debt-to-Asset Ratio (Lev), Operating Revenue Growth Rate (Growth), Tobin's Q (TobinQ), Proportion of Independent Directors (Indep), Ownership Nature (SOE), Ownership Concentration (Top1) and Company Age (Age).

4. Model Design

1) General Form of the Model (Two-Way Fixed Effects Model)

$$Y_{it} = \beta_0 + \beta_1 ESG_{it} + \sum \beta_k X_{it} + \alpha_i + \gamma_t + \epsilon_{it} \quad (5)$$

dependent variable Y_{it} represents the explained variable (e.g., ROA, ROA2). This is the outcome that the model aims to explain and predict. Core Explanatory Variable ESG_{it} represents the ESG score

of the i -th entity at time t . Other Control Variables $\sum \beta_k X_{k,it}$, each variable has a corresponding coefficient β_k . These variables are used to further control for other factors that may influence ROA. X_{it} includes firm size($Size_{it}$), leverage(Lev_{it}), growth($Growth_{it}$), Tobin's Q($TobinQ_{it}$), independent director ratio($Indep_{it}$), ownership nature(SOE_{it}), ownership concentration($Top1_{it}$), and firm age(Age_{it}). Individual Fixed Effect α_i , this term represents the unique, time-invariant characteristics of each individual entity, such as corporate culture, governance structure, and geographical location. Time Fixed Effect γ_i , controls for macroeconomic or policy time trends. Error Term ϵ_{it} represents other random factors or noise that are not explained by the model. It is the residual part of the model. It includes all factors not included in the model that may affect the dependent variable, as well as random errors.

2) Mediating Effect Model (Corporate Efficiency Channel)

First Stage (Total Effect of ESG on ROA):

$$ROA_{it} = \beta_0 + \beta_1 ESG_{it} + \sum \beta_k X_{k,it} + \alpha_i + \gamma_i + \epsilon_{it} \quad (6)$$

Second Stage (Effect of ESG on the Mediating Variable TAT):

$$TAT_{it} = \beta_0 + \beta_1 ESG_{it} + \sum \beta_k X_{k,it} + \alpha_i + \gamma_i + \epsilon_{it} \quad (7)$$

Third Stage (Testing for Partial Mediating Effect by Including Both ESG and TAT):

$$ROA_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 TAT_{it} + \sum \beta_k X_{k,it} + \alpha_i + \gamma_i + \epsilon_{it} \quad (8)$$

5. Empirical Results and Analysis

5.1. Descriptive Statistics and Correlation Analysis of Key Variables

5.1.1. Descriptive Statistics

Table 1 presents the descriptive statistics of key variables. The average Return on Assets (ROA) is 3.4% with a standard deviation of 7.4%, indicating substantial variation in profitability across listed firms in China. The ESG score has a mean of 4.116 and a standard deviation of 0.973, suggesting a left-skewed distribution and room for improvement in green governance practices. The mean Total Asset Turnover (TAT) is 0.603, reflecting varying levels of operational efficiency.

Table 1: Descriptive Statistic.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	52,790	0.034	0.074	-0.339	0.218
ESG	47,519	4.116	0.973	1.000	8.000
TAT	51,798	0.603	0.421	0.046	2.522
Size	53,286	22.103	1.516	18.754	27.096
Lev	53,286	0.434	0.222	0.050	0.982
Growth	47,890	0.161	0.464	-0.648	3.039
Tobinq	48,834	2.043	1.380	0.840	9.226
Indep	50,388	0.377	0.053	0.333	0.571
SOE	50,392	0.335	0.472	0.000	1.000
Top1	50,389	33.891	15.107	8.220	74.960
Age	49,700	18.546	6.162	5.000	34.000

5.1.2. Correlation Analysis of Key Variables

Correlation analysis among major variables reveals several noteworthy relationships that support the theoretical framework of this study. First, Return on Assets (ROA) is positively associated with ESG scores, suggesting that firms with stronger green governance tend to exhibit better financial performance. Second, Total Asset Turnover (TAT) is also positively correlated with ROA, indicating that higher operational efficiency is linked to greater firm value. Additionally, firm size shows a positive relationship with ESG performance, implying that larger firms are more likely to implement green governance practices, possibly due to greater resources and increased scrutiny from regulators and investors. These correlations provide preliminary support for the proposed hypotheses and justify the inclusion of relevant variables in the subsequent regression models.

5.2. Multicollinearity Test

To assess the multicollinearity issue in the regression model, this study calculated the Variance

Inflation Factor (VIF). The results show that all variables have VIF values less than 2, far below the empirical threshold of 10, indicating that there is no serious collinearity problem among the independent variables. The 1/VIF values for all variables are greater than 0.5, further supporting the conclusion that the risk of multicollinearity is low.

5.3. Model Testing

5.3.1. F Test

To assess the appropriateness of the fixed effects model compared to the pooled OLS model, this study employs the F-test. The results indicate an F-statistic of 3.98 with degrees of freedom F(5078, 38398), and a corresponding p-value of 0.0000. This allows us to reject the null hypothesis at the 1% significance level, suggesting that the fixed effects model is more suitable for the panel data structure used in this study.

5.3.2. Hausman Test

The Hausman test is conducted to determine whether the fixed effects (FE) model or the random effects (RE) model is more appropriate. The null hypothesis (H_0) assumes that the random effects model is preferred. The test yields a chi-square statistic of $\chi^2(9) = 1345.59$ with a p-value of 0.0000. This result strongly rejects the null hypothesis at the 1% significance level, confirming that the fixed effects model provides a more consistent and efficient estimation for the data in this research.

5.4. Multiple Regression Analysis

5.4.1. Relationship between Green Development Governance and Company Value

To assess the effect of green development governance on firm value, a series of two-way fixed effects regressions are conducted. As shown in Table 2, in the baseline model without controls, ESG scores are positively and significantly associated with ROA. After including control variables such as firm size, leverage, growth, and governance indicators, the outcome remains positive and statistically significant, supporting the argument that green development governance performance enhances firm profitability.

Table 2: Table of Regression Results for Hypothesis H1.

	(1)	(2)
	ROA	ROA
ESG	0.008*** (18.720)	0.002*** (4.145)
Size		0.022*** (34.246)
Lev		-0.192*** (-79.385)
Growth		0.031*** (50.207)
Tobinq		0.008*** (25.149)
Indep		-0.019** (-2.418)
SOE		-0.005*** (-2.883)
Top1		0.001*** (14.934)
Age		0.002* (1.696)
cons	0.011*** (4.879)	-0.402*** (-23.571)
Time effect	Yes	Yes
Individual effect	Yes	Yes
N	47455	43486
R2	0.057	0.247
F	169.233	548.193
***p<0.01, **p<0.05, *p<0.10		

5.4.2. Mechanism Analysis

To examine the mediating role of corporate operational efficiency, measured by Total Asset Turnover (TAT), in the relationship between green development governance, assessed via ESG scores, and firm value, evaluated through Return on Assets (ROA), this study employs the three-step mediation analysis

framework proposed by Wen Zhonglin^[13]. The regression results are presented in Table 3. Specifically, Model (1) reveals a highly significant positive direct effect of green governance on firm value. Model (2) demonstrates a statistically significant positive impact of ESG scores on TAT. In Model (3), where both ESG and TAT are included, both variables exhibit strong statistical significance. These findings indicate that operational efficiency partially mediates the relationship between green governance and firm value. In conclusion, firms can enhance their value directly through effective green development governance while also achieving indirect value creation by improving operational efficiency.

Table 3: Table of Regression Results for Hypothesis H2.

	(1)	(2)	(3)
	ROA	TAT	ROA
ESG	0.002*** (4.145)	0.003** (1.986)	0.002*** (3.898)
Size	0.022*** (34.246)	-0.049*** (-19.857)	0.024*** (37.325)
Lev	-0.192*** (-79.385)	0.079*** (8.351)	-0.195*** (-81.377)
Growth	0.031*** (50.207)	0.098*** (40.875)	0.027*** (43.816)
Tobinq	0.008*** (25.149)	0.018*** (14.502)	0.007*** (23.231)
Indep	-0.019** (-2.418)	0.002 (0.051)	-0.019** (-2.451)
SOE	-0.005*** (-2.883)	0.007 (1.052)	-0.005*** (-3.068)
Top1	0.001*** (14.934)	-0.000* (-1.853)	0.001*** (15.364)
Age	0.002* (1.696)	0.010*** (2.579)	0.001 (1.337)
Tat			0.037*** (28.670)
_cons	-0.402*** (-23.571)	1.492*** (22.518)	-0.458*** (-26.939)
Time effect	Yes	Yes	Yes
Individual effect	Yes	Yes	Yes
N	43486	43486	43486
R ²	0.247	0.090	0.263
F	548.193	166.053	570.835

***p<0.01, **p<0.05, *p<0.10

5.5. Robustness Test

Table 4: Robustness Test Results.

	(1)	(2)
	ROA	ROA2
ESG	0.002*** (4.145)	0.001*** (3.875)
Size	0.022*** (34.246)	0.019*** (30.704)
Lev	-0.192*** (-79.385)	-0.176*** (-74.356)
Growth	0.031*** (50.207)	0.033*** (54.855)
Tobinq	0.008*** (25.149)	0.009*** (29.182)
Indep	-0.019** (-2.418)	-0.020*** (-2.745)
SOE	-0.005*** (-2.883)	-0.006*** (-3.634)
Top1	0.001*** (14.934)	0.001*** (14.134)
Age	0.002* (1.696)	0.001 (1.580)
_cons	-0.402*** (-23.571)	-0.344*** (-20.842)
Time effect	Yes	Yes
Individual effect	Yes	Yes
N	43486	40929
R ²	0.247	0.252
F	548.193	528.637

***p<0.01, **p<0.05, *p<0.10

To evaluate the robustness of the regression results, we utilize an alternative measure of firm value, ROA2, defined as net profit divided by average total assets. As presented in Table 4, the ESG coefficient remains significantly positive across both model specifications. These results confirm that the positive relationship between green development governance and firm value holds under different performance metrics. This robustness check enhances the credibility of the study's core conclusions.

5.6. Heterogeneity Analysis

5.6.1. Heterogeneity of Company Size

To examine the moderating effect of firm size on the relationship between green development governance (ESG scores) and firm value (ROA), we split the sample into large (Size $\geq$ median) and small firms (Size $<$ median) and conducted two-way fixed effects regressions (Table 5). ESG scores significantly enhance ROA in large firms but show no significant effect in small firms, reflecting resource disparities. Large firms leverage capital and technology for sustainable practices, gaining cost savings and value premiums, while SMEs, limited by resources, struggle with green investments, yielding insufficient returns. Firm size mediates resource integration and efficiency.

Table 5: Heterogeneity Analysis of Firm Size.

	(1) ROA (large companies)	(2) ROA (small companies)
ESG	0.004*** (8.031)	0.001 (1.375)
Lev	-0.188*** (-58.717)	-0.181*** (-43.302)
Growth	0.025*** (36.839)	0.040*** (36.207)
Tobinq	0.013*** (26.764)	0.002*** (3.895)
Indep	0.007 (0.780)	-0.061*** (-4.187)
SOE	-0.007*** (-3.304)	-0.001 (-0.342)
Top1	0.000*** (7.862)	0.001*** (11.855)
Age	0.002** (1.961)	0.002 (0.963)
_cons	0.060*** (4.875)	0.057*** (2.958)
Time effect	Yes	Yes
Individual effect	Yes	Yes
N	23,188	20,298
R ²	0.259	0.227
F	322.518	220.537
***p<0.01, **p<0.05, *p<0.10		

5.6.2. Heterogeneity of Ownership Nature

To investigate the moderating effect of ownership structure on the relationship between green development governance (ESG scores) and firm value (ROA), we conducted two-way fixed effects regressions for state-owned enterprises (SOEs, SOE = 1) and non-state-owned enterprises (non-SOEs, SOE = 0), with results reported in Table 6. The ESG coefficient for SOEs is statistically insignificant, indicating ineffective policy-driven green investments, while for non-SOEs, it is highly significant and positive, reflecting market-oriented strategies that enhance value through brand development and capital attraction. This divergence underscores ownership structure's critical role in translating green governance into financial performance, necessitating tailored policy guidance.

Table 6: Heterogeneity Analysis of Firm Nature.

	(1) ROA (State-owned enterprises)	(2) ROA (Non-state-owned enterprises)
ESG	-0.001 (-1.481)	0.002*** (3.696)
Size	0.018*** (19.634)	0.026*** (28.727)
Lev	-0.188*** (-51.319)	-0.188*** (-57.145)

Growth	0.022*** (25.976)	0.035*** (41.762)
Tobinq	0.008*** (15.283)	0.008*** (20.289)
Indep	-0.022** (-2.234)	-0.019* (-1.743)
Top1	0.000*** (2.757)	0.001*** (13.239)
Age	0.002** (1.981)	0.002 (1.477)
_cons	-0.323*** (-13.021)	-0.475*** (-20.051)
Time effect	Yes	Yes
Individual effect	Yes	Yes
N	15,303	28,183
R ²	0.221	0.260
F	177.491	386.606
***p<0.01, **p<0.05, *p<0.10		

6. Conclusions and Future Directions

6.1. Research Conclusions

Based on data from Chinese listed companies between 2009 and 2023, this study systematically examines the mechanisms and effects of green development governance on firm value. The key findings are as follows: First, green development governance, measured by ESG scores, significantly enhances firm value, proxied by return on assets (ROA). Corporate efficiency, measured by total asset turnover (TAT), plays a partial mediating role in this relationship. This indicates that green governance can improve firm performance by optimizing operational efficiency, thereby validating the hypotheses of this study. Robustness tests further confirm that the positive effect of green development governance on firm value remains consistent when using alternative performance indicators such as ROA2, underscoring the generalizability of the results. The value-enhancing effect of green governance is more pronounced in large and non-state-owned enterprises, while it is weaker or statistically insignificant in small and state-owned enterprises.

6.2. Policy and Managerial Implications

Large and non-state-owned enterprises should accelerate green R&D initiatives and integrate green governance with digital transformation across supply chains to maximize resource efficiency. Small and medium-sized enterprises (SMEs) can alleviate transformation costs through industrial clustering or targeted financing strategies. State-owned enterprises (SOEs), meanwhile, should reform performance evaluation and incentive mechanisms to enhance market-oriented operations. At the policy level, the government should strengthen environmental information disclosure standards to mitigate “greenwashing” behaviors and offer tax incentives and green credit support specifically targeted at SMEs. For SOEs, a differentiated assessment framework is needed to distinguish policy-driven mandates from commercial objectives, enabling more efficient resource allocation. From the investment perspective, investors should incorporate firm size and ownership structure into their valuation models, prioritizing the sustainable value of large and non-state-owned firms. Additionally, developing performance-based index funds targeting SMEs could channel capital toward their green innovation efforts.

6.3. Limitations and Future Research

Despite the rigorous approach in variable construction and methodology, this study has several limitations. First, there may exist bidirectional causality between green development governance and firm value. Future research should consider leveraging exogenous policy shocks or quasi-natural experiments to strengthen causal inference. Second, although the sample spans multiple industries, it lacks a comparative mechanism analysis between high-pollution and high-tech sectors, which may limit the sectoral applicability of the findings. Third, the impact of green governance may extend beyond financial performance to areas such as technological innovation and employee satisfaction, which contribute to organizational resilience. Future studies could adopt a multi-dimensional performance evaluation framework and conduct international comparisons to explore the deeper effects of green governance under varying institutional contexts. In sum, this study uncovers the complex mechanisms through which green development governance enhances firm value via efficiency improvements, while

also delineating its boundary conditions. The findings offer both theoretical and empirical support for firms optimizing green practices, policymakers designing differentiated policies, and investors refining decision models. Going forward, research employing dynamic analyses, industry segmentation, and interdisciplinary approaches may provide richer empirical insights into the value creation logic of sustainable corporate governance.

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