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The Impact of China's Carbon Emissions Trading Market on Manufacturing Firms' ESG Performance

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Abstract. Being one of the most important environmental regulation tools designed to incentivize operations, the carbon emission trading policy is an essential tool toward corporate sustainable development. Realizing the research sample using Chinese A-share listed companies between 2009 and 2022, this paper uses a multi-period difference-in-differences (DID) model to examine the the effects and mechanism of the carbon emissions trading policy on the listed firms ESG performance in the context of the goal of the carbon emissions trading policy known as the Dual Carbon. The findings indicate that the involvement in the carbon emissions trading scheme generates a considerable enhancement in the ESG performance of firms, and digital transformation participates in this relationship partially. Analysis of heterogeneity demonstrates that state-owned businesses and non-heavy-polluting businesses benefit more from the policy's ESG performance. Moreover, firms in less marketized areas and eastern regions are more responsive to the policy. This study contributes to promoting listed firms to enhance their ESG performance and provides actionable references for further improving the creation of the national carbon emissions trading market.

Keywords: Carbon Emissions Trading Policy, ESG Performance, Digital Transformation, Multi-period Difference-in-Differences

1. Introduction

The 20th National Congress of the Communist Party of China identifies high-quality development as the primary task of Chinese-style modernization and proposes advancing the "Dual Carbon" strategy (carbon peaking and carbon neutrality). To implement carbon emission reduction, governments at all levels need to formulate differentiated environmental regulation policies, as traditional command-and-control regulation has encountered implementation bottlenecks. Ecological and environmental problems are essentially rooted in the economic development model, as corporate production and operation tend to generate negative environmental externalities. Market-incentivized environmental regulations, through the paid transfer of environmental rights and interests, can effectively enforce firms' primary responsibility for carbon emission reduction and break the constraints of traditional regulation. As the core of the environmental rights trading market and a vital market-incentivized environmental regulation tool in China, the carbon emissions trading policy is also a key mechanism to achieve the "Dual Carbon" goal and sustainable economic and

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social development [1]. The Interim Regulations on the Administration of Carbon Emissions Trading issued in 2024 clarifies that the policy covers eight energy-intensive industries including power generation and steel, whose carbon emissions account for more than 80% of the national total [2]. Including high-emission industries in the market as early as possible can achieve the optimal allocation of carbon reduction costs for the whole society, indicating the broad development prospects of this policy and the growing importance of carbon reduction for corporate development.

To analyze the impact on firms' long-term sustainable development, stakeholders such as governments and investors have significantly increased their attention to corporate ESG performance. ESG comprehensively evaluates corporate development from environment, society, and governance, and can fully measure a firm's operational development and performance of social responsibility [3]. As a comprehensive indicator of corporate sustainable development capability, ESG performance carries important research value and broad application prospects [4].

Digital transformation is a new strategy in the digital economy that firms can use to survive the needs of the carbon emissions trading policy, and enhance the performance of their personal ESG [5]. It is against this background that this paper investigates the effect of the carbon emissions trading policy on the ESG performance of listed firms and discusses the process of digital transformation and the channels through which the variables are transmitted. The research has valuable theoretical sources and practical recommendations in advancing the sustainable development of China and directing companies to carefully practice carbon reduction processes.

2. Theoretical analysis and research hypotheses

2.1. Carbon emissions trading policy and ESG performance

The implementation of the carbon emissions trading policy encourages firms to improve internal control and low-carbon development, optimize the allocation of internal resource factors, and strengthen carbon emission control, thereby affecting firms' environmental, social, and governance performance.

First, it helps improve and regulate firms' environmental performance and makes them accountable for the surrounding environment [6]. Proper environmental regulation can drive technological innovation, enhance market competitiveness and profitability, reduce the adverse impact of external factors on operational performance, and incentivize firms to allocate more resources to environmental governance, thereby improving their environmental governance capacity [7].

Second, it can significantly improve the social performance of regulated firms. With the implementation of the national carbon emissions trading market, the capital market and the public pay more attention to carbon trading policies, and regard firms' participation as a positive green signal. Therefore, firms tend to improve carbon transparency and carbon performance transparency through social responsibility reports to gain the confidence and favor of governments and investors [8].

Third, it can significantly improve the governance performance of regulated firms. Participation in carbon trading effectively improves managers' access to market information, helps reduce information asymmetry between firms and external investors or financial institutions, and thus attracts external support and imposes favorable external constraints on corporate management [9].

The effectiveness of the carbon emissions trading policy has long been a focus of policymakers and academia. As a comprehensive indicator, ESG performance reflects information transparency and largely demonstrates firms' sustainable development under policy constraints.

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Accordingly, this paper proposes Hypothesis 1:

H1: The carbon emissions trading policy significantly improves firms' ESG performance.

2.2. Carbon emissions trading policy, digital transformation, and ESG performance

Current research on digital strategy and corporate sustainable development is divided into two streams. One stream examines the separate impacts of digital strategy on firms' environmental, social, and innovative performance, affirming the positive effect of digitalization in improving the environment, strengthening social responsibility, and driving technological innovation from the perspectives of digital-enabled production factor agglomeration and intelligent production [10]. The other stream explores potential pathways between digitalization and ESG performance through financial indicators such as financing constraints, internal information transparency, and perceptual capability, contributing to the literature from a multi-dimensional perspective.

The policy requires firms to accurately measure and report carbon emissions, forming a regulatory and legal constraint that pushes firms to adopt more efficient and eco-friendly production methods and more effective governance tools (e.g., ESG rating systems, risk management software) to comply with relevant standards [11]. In the digital economy, firms adopt digital technologies or digital production equipment to cut carbon emissions, improve production efficiency, and reduce costs to meet carbon emission targets. At present, the national carbon market only covers the power industry—the largest carbon-emitting sector. Regulated power firms can use digital transformation to provide data support for the evaluation, reserve, and operation of carbon assets, build analytical models, track emissions in real time, address the lag in traditional carbon data collection, identify carbon reduction opportunities, and support intelligent decision-making [12].

Digital transformation helps firms improve operational efficiency, optimize internal resource allocation, reduce production costs, and enhance green benefits in sustainable development, thereby lifting environmental performance [13]. It breaks internal and external information barriers in traditional business models, improves investor relations, reduces information asymmetry, and enhances transparency, attracting investment from external stakeholders and providing sufficient capital to strengthen sustainable development and social responsibility. Digital technologies effectively help build and improve internal management frameworks, boosting the efficiency and flow of internal resources and information [14].

Accordingly, this paper proposes Hypothesis 2:

H2: The carbon emissions trading policy promotes firms' digital transformation, which in turn improves their ESG performance.

3. Research design

3.1. Model specification

China's carbon emissions trading policy has been rolled out gradually across regions and periods. Pilot regions include firms in the trading scheme based on local economic development and industrial structure, and the policy has expanded from selected industries, providing an ideal exogenous shock and natural experiment for studying the policy's impact on ESG performance [15-16]. Following the method of Wang Feng et al. [17], this paper creates a multi-period difference-in-differences (DID) model as shown in Equation (1):

$$ESG_{it} = \theta_0 + \theta_1 DID_{it} + \theta_2 X_{it} + \delta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

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where i and t denote firm and year; ESG_{it} is the ESG performance index of firm i in year t; DID_{it} is the interaction term of the treatment variable ($Treat$) and time variable ($Time$) of the carbon trading policy; θ_1 captures the total effect of the policy on ESG performance, and a greatly positive value indicates a positive impact; θ_0 is the intercept; X_{it} is a vector of control variables; δ_i is firm fixed effects; λ_t is year fixed effects; and ε_{it} is the random error term.

To test the mediating role, this paper adopts the mediation effect model and specifies Equations (2) and (3) [18]:

$$M_{it} = \alpha_0 + \alpha_1 DID_{it} + \theta\alpha_2 X_{it} + \delta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

$$ESG_{it} = \beta_0 + \beta_1 DID_{it} + \beta_2 X_{it} + \beta_3 M_{it} + \delta_i + \lambda_t + \varepsilon_{it} \quad (3)$$

where M_{it} denotes the mediator (digital transformation). If α_1 in Equation (2) and β_3 in Equation (3) are both significant, the mediating effect is confirmed without Bootstrap testing. If β_1 is insignificant, M acts as a full mediator; otherwise, it is a partial mediator.

3.2. Sample selection and data sources

Chinese A-share listed firms from 2009 to 2022 are selected as the research sample. To ensure validity and robustness, this study excludes financial firms, ST/ST* firms, and firms with severe missing data on core variables; imputes minor missing data via linear interpolation; and winsorizes continuous variables at the 1st and 99th percentiles to reduce the impact of outliers. Firm-level data are obtained from the WIND Database, CSMAR Database, the National Bureau of Statistics, and the China Energy Statistical Yearbook.

3.3. Variable definition and measurement

The ESG performance of the sample businesses is the dependent variable. It is determined by the Huazheng ESG Rating's overall score, which assesses businesses in terms of governance, social, and environmental aspects. The Huazheng system is tailored to China's institutional context, adopts a quarterly updated four-tier indicator system (3 primary, 16 secondary, 44 tertiary, and nearly 80 quaternary indicators), and comprehensively reflects firm-level information.

Independent Variable is carbon emissions trading policy, which is measured by the interaction term DID_{it} ($Treat \times Time$) in the multi-period DID model. $Time$ is the year when the firm enters the carbon trading scheme; $Treat$ equals 1 if the firm is included in the policy, and 0 otherwise.

Mediator is digital transformation, which is evaluated as the ratio of digital intangible assets to total intangible assets disclosed in annual reports [19]. Digital assets include intangible items related to digital technologies and patents.

Control Variables include revenue growth rate ($Reve$), leverage ratio (Lev), Tobin's Q (TQ), firm age (Age), CEO duality ($Duality$), firm size ($Size$), and operating cash flow ($Cash$) [20-21].

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4. Empirical results and analysis

4.1. Descriptive statistics

Table 1 reports the descriptive statistics. The minimum, median, and maximum values of ESG are 55.920, 73.220, and 84.250, respectively, with a mean of 72.870, indicating left skewness and large cross-firm variation in ESG performance. The mean of DID is 0.026 with a standard deviation of 0.158, suggesting that few listed firms participate in the carbon trading scheme.

Table 1. Descriptive statistics of variables

Variable	Obs	Min	Median	Max	Mean	Std. Dev.
ESG	40239	55.920	73.220	84.250	72.870	5.471
DID	40239	0	0	1.000	0.026	0.158
DT	40239	0	0.012	1.000	0.110	0.244
Roa	40239	-0.315	0.034	0.206	0.033	0.071
Reve	40239	-0.746	0.125	8.182	0.398	1.136
Lev	40239	0.052	0.434	0.970	0.444	0.220
Tq	40239	0.106	0.616	1.179	0.619	0.253
Age	40239	0	9.000	28.000	10.560	7.607
Duality	40239	0	0	1.000	0.277	0.448
Size	40239	19.560	22.015	27.192	22.243	1.449
Cash	40239	-0.196	0.044	0.253	0.044	0.074

4.2. Correlation analysis

Table 2 presents the correlation matrix. Most pairwise correlations are significant at the 1% level, and coefficients are generally below 0.5. The variance inflation factor (VIF) of each variable ranges from 1.01 to 2.25, with a mean of 2.17, confirming no severe multicollinearity and valid model specification.

Table 2. Correlation analysis

	ESG	DID	Reve	Lev	Tq	Age	Duality	Size	Cash
ESG	1								
DID	0.043***	1							
Reve	-0.024***	-0.026***	1						
Lev	-0.098***	0.009*	0.075***	1					
Tq	0.159***	0.027***	-0.004	0.328***	1				
Age	-0.103***	0.006	0.076***	0.330***	0.173***	1			
Duality	-0.019***	-0.003	-0.023***	-0.139***	-0.112***	-0.219***	1		
Size	0.265***	0.069***	-0.022***	0.470***	0.583***	0.342***	-0.163***	1	
Cash	0.100***	0.041***	-0.096***	-0.170***	-0.085***	-0.025***	-0.010**	0.059***	1

Note: *** p<0.01, ** p<0.05, * p<0.1

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4.3. Baseline regression

Table 3 reports the baseline regression results of the carbon trading policy on ESG performance.

Table 3. Baseline regression results

Variable	(1) ESG	(2) ESG	(3) ESG	(4) ESG
DID	1.5061***	1.5122***	0.5712***	0.7206***
	(0.1727)	(0.1850)	(0.1589)	(0.1731)
Reve			0.0982***	0.1027***
			(0.0222)	(0.0246)
Lev			-6.0836***	-6.3925***
			(0.1353)	(0.1445)
Tq			0.5803***	0.0063
			(0.1232)	(0.1359)
Age			-0.1256***	-0.1198***
			(0.0036)	(0.0037)
Duality			-0.2455***	-0.1648***
			(0.0575)	(0.0577)
Size			1.5779***	1.6960***
			(0.0239)	(0.0258)
Cash			2.4363***	2.1609***
			(0.3539)	(0.3742)
Constant	72.8302***	72.8985***	41.3508***	40.3137***
	(0.0276)	(0.1097)	(0.4703)	(0.4990)
Firm FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes
Obs	40239	40239	40239	40239
R^2	0.0020	0.0060	0.1610	0.1690

Note: *** p<0.01, ** p<0.05, * p<0.1

Without controls or fixed effects, column (1) demonstrates that the coefficient of DID is 1.5061 and significant at the 1% level, demonstrating that carbon trading enhances ESG performance. The coefficient is still 1.5122 and highly significant when firm and year fixed effects are taken into consideration in Column (2). Control variables and fixed effects are added one after the other in columns (3) and (4). The coefficient of DID stabilizes at 0.7206 (1% significance), and R^2 rises gradually, indicating improved model fit. The baseline results strongly support H1.

4.4. Parallel trend test

To guarantee the reliability of the DID estimates, two parallel trend tests are conducted (Figure 1). After the launch of carbon trading pilots in 2013, the ESG performance of treated firms rose significantly and outperformed that of control firms.

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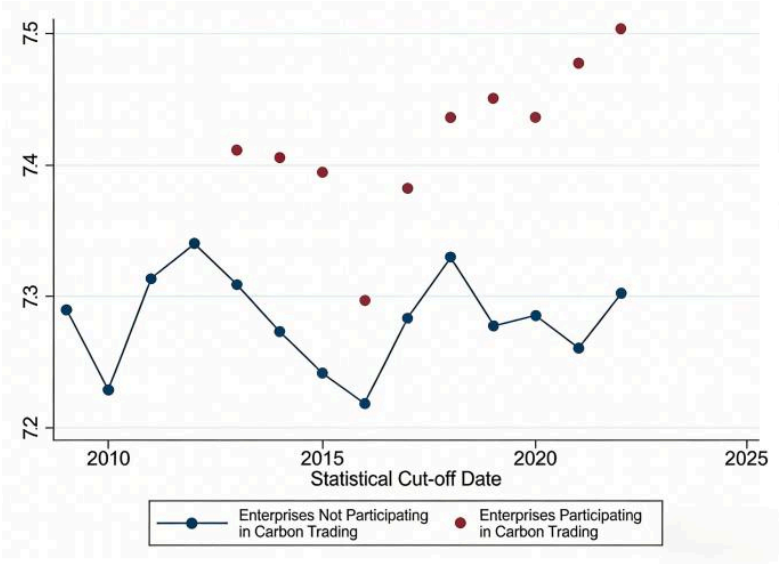

Figure 1. Parallel trend test for ESG performance

To rule out pre-existing trends, a confidence-interval-based test is performed (Figure 2). The coefficients are insignificant before policy implementation, confirming parallel pre-trends. Significance weakens temporarily in 2020 due to external shocks but remains robust in other years. The parallel trend assumption is satisfied, validating the causal identification.

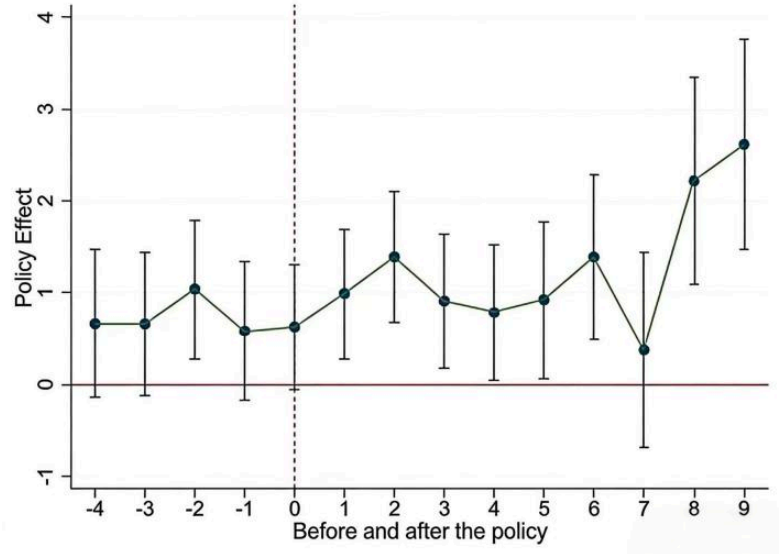

Figure 2. Parallel trend test for policy validity

4.5. Mediation effect test

Table 4 reports the mediation effect results for digital transformation.

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Table 4. Mediation effect test results

Variable	(1) DT	(2) ESG
DID	-0.0392***	0.7530***
	(0.0053)	(0.1730)
DT		0.8360***
		(0.1060)
Controls	Yes	Yes
Constant	-0.0734***	40.3800***
	(0.0256)	(0.4990)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Obs	40239	40239
R^2	0.036	0.017

Note: *** p<0.01, ** p<0.05, * p<0.1

Column (1) shows that DID significantly and negatively predicts digital transformation (DT), likely because compliance with carbon reduction requires upgrading low-carbon equipment and technologies, expanding total intangible assets and diluting the share of digital assets. Column (2) shows that both DID and DT are significantly positive, confirming that digital transformation plays a partial mediating role in the policy-ESG relationship. H2 is supported.

4.6. Robustness tests

A placebo test is conducted by randomly assigning 1,000 pseudo-treatment groups. The estimated coefficients center near zero and follow a normal distribution (Figure 3), confirming that the baseline results are not driven by unobserved confounders.

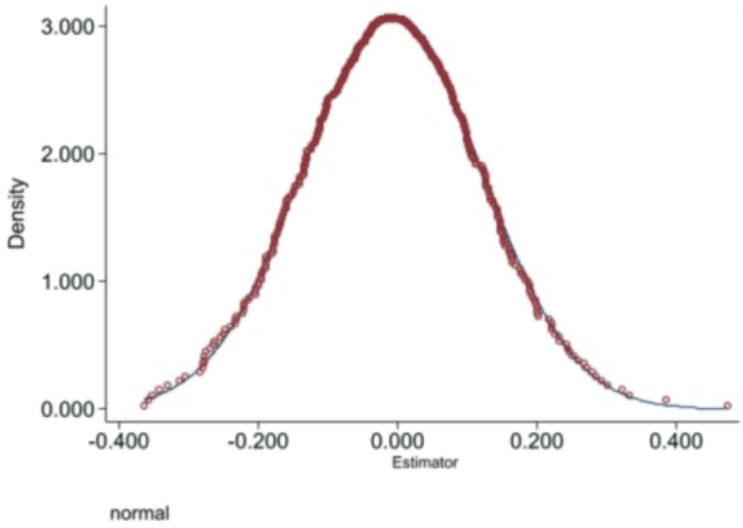

Figure 3. Placebo test

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Propensity Score Matching (PSM) is used to cope with sample selection bias, as regulated firms are not randomly selected. Table 5 shows that after matching, all standardized biases are below 10%, and t-tests confirm no distinct differences between treated and control groups. Regression on the matched sample yields a DID coefficient of 0.7206 (1% significance), aligning with the baseline (Column 4, Table 3).

Table 5. PSM balancing test

Variables	(U) Unmatched	Mean		Standard Deviation(%)	Reduction Magnitude of Standard Deviation(%)	t-test	
	(M) Matched	Treatment Group	Control Group			t-value	P>|t|
Reve	U	0.2151	0.4029	-18.5	85.0	-5.230	0.000
	M	0.2151	0.2432	-2.8		-0.720	0.473
Lev	U	0.4566	0.4439	5.9	40.7	1.830	0.068
	M	0.4566	0.4642	-3.5		-0.810	0.420
Tq	U	0.6611	0.6179	16.7	97.4	5.400	0.000
	M	0.6611	0.6600	0.4		0.090	0.925
Age	U	10.8410	10.5460	3.9	-19.6	1.230	0.219
	M	10.8410	11.1950	-4.6		-1.040	0.297
Duality	U	0.2677	0.2776	-2.2	20.9	-0.700	0.487
	M	0.2677	0.2599	1.7		0.400	0.689
Size	U	22.8560	22.2270	43.3	96.5	13.780	0.000
	M	22.8560	22.8790	-1.5		-0.330	0.744
Cash	U	0.0628	0.0437	26.3	82.8	8.240	0.000
	M	0.0628	0.0661	-4.5		-1.060	0.291

Note: *** p<0.01, ** p<0.05, * p<0.1

5. Heterogeneity analysis

5.1. Firm ownership and pollution intensity

Table 6 splits the sample by ownership and pollution status. The DID coefficient is 0.7430 (1% significance) for SOEs and 0.5260 (5% significance) for non-SOEs, suggesting a stronger effect for SOEs. For pollution intensity, the coefficient is 0.6420 (10% significance) for heavily polluting firms and 0.7760 (1% significance) for non-heavily polluting firms, meaning the policy boosts ESG more strongly for non-heavily polluting firms.

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Table 6. Heterogeneity by firm ownership and pollution type

Variable	SOEs	Non-SOEs	Heavily Polluting	Non-Heavily Polluting
DID	0.7430***	0.5260**	0.6420*	0.7760***
	(0.2860)	(0.2160)	(0.3340)	(0.2010)
Controls	Yes	Yes	Yes	Yes
Constant	40.2800***	39.1800***	43.0100***	39.6900***
	(0.7380)	(0.6910)	(1.0110)	(0.5770)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	14746	25493	11394	28845
R^2	0.1740	0.1890	0.1660	0.1750

Note: *** p<0.01, ** p<0.05, * p<0.1

5.2. Regional environment

Table 7 reports regional heterogeneity. The DID coefficient is 0.7790 (1% significance) for eastern firms and insignificant for central-western firms. By marketization, the coefficient is 0.5030 (5% significance) for high-marketization areas and 0.9540 (1% significance) for low-marketization areas, showing stronger policy effects in less marketized regions.

Table 7. Heterogeneity by region and marketization

Variable	Eastern	Central-Western	High Marketization	Low Marketization
DID	0.7790***	-0.3600	0.5030**	0.9540***
	(0.1820)	(0.5170)	(0.2310)	(0.2510)
Controls	Yes	Yes	Yes	Yes
Constant	40.7700***	40.4900***	40.5100***	39.9000***
	(0.5910)	(0.9560)	(0.7810)	(0.6500)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	28095	12147	18290	21949
R^2	0.1620	0.1730	0.1520	0.1840

Note: *** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

This study systematically explores the effect, mechanism, and heterogeneity of China's carbon emissions trading policy on corporate ESG performance using the Huazheng ESG score and a multi-period DID model. The results reveal that the carbon trading policy significantly boosts firms' ESG performance, with a highly significant coefficient of 0.7206; the conclusion holds after addressing endogeneity. Digital transformation acts as a partial mediator: the policy induces digital upgrading, which further lifts ESG (coefficient = 0.8360, 1% significance). Heterogeneity analyses reveal

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stronger positive effects for SOEs, non-heavily polluting firms, eastern-region firms, and firms in less marketized areas.

This study verifies the causal link and transmission mechanism between carbon trading and ESG performance. Limitations include the lack of analysis on differential effects across policy phases and intensities, and the absence of moderators such as industry competition and managerial characteristics. Future research can extend the analysis along these dimensions.

References

[1] Yang, S. L., Lü, Z. W., & Liu, T. L. (2023). Can carbon trading promote the green transformation of industrial firms? Industrial Economics Research, (3), 44-56.

[2] Wang, F. (2023). Corporate ESG performance and low-carbon green transition: Effect evaluation based on financial policy instruments. Contemporary Finance & Economics, (1), 1-14.

[3] Huang, J., Wang, Y. H., Han, F. F., et al. (2023). ESG information disclosure: Connotation, evaluation methods and mechanism. Foreign Economics & Management, 45(6), 3-18.

[4] Ni, K. J., & Liu, X. Y. (2021). Digital transformation and firm growth: Theoretical logic and Chinese practice. Economic Management Journal, 43(12), 79-97.

[5] Zhao, C. Y., Wang, W. C., & Li, X. S. (2021). How does digital transformation affect corporate total factor productivity? Finance & Trade Economics, 42(7), 114-129.

[6] Chen, Q. J., Wang, Y. M., & Wan, M. F. (2021). Peer effects of corporate digital transformation and its determinants. Chinese Journal of Management, 18(5), 653-663.

[7] Zhu, H. L., & Wang, C. J. (2021). Industrial digital transformation under the "dual circulation" new development pattern: Theory and countermeasures. Finance & Trade Economics, 42(3), 14-27.

[8] Zhou, X. F., Han, L., & Xiao, X. (2022). Digital economy and sustainable green innovation of firms under the "Dual Carbon" goal: The mediating role of digital transformation. Securities Market Herald, (11), 2-12.

[9] Song, P., Chen, G. M., Yin, M. L., et al. (2023). Synergistic emission reduction effect of renewable energy subsidies and the national carbon market in the power industry. China Population, Resources and Environment, 33(7), 81-93.

[10] Han, Z. X., & Zhang, Y. (2023). Digital transformation and ESG performance: Mediating mechanisms based on information transparency and total factor productivity. Modern Management Science, (3), 141-150.

[11] Hao, Y. T., & Zhang, Y. H. (2022). Digital transformation and ESG performance of firms under the "Dual Carbon" goal. Science Technology and Management, 24(4), 80-91.

[12] Wu, F., Hu, H. Z., Lin, H. Y., et al. (2021). Corporate digital transformation and capital market performance: Evidence from stock liquidity. Journal of Management World, 37(7), 130-144+10.

[13] Maji, S. G., & Lohia, P. (2023). Environmental, social and governance (ESG) performance and firm performance in India. Society and Business Review, 18(1), 175-194.

[14] Lin, B. Q., Wang, X. Z., & Du, Z. L. (2021). The impact of environmental regulation on energy efficiency of China's industry: Empirical research based on micro-firm data. Journal of Xiamen University (Arts & Social Sciences), (4), 30-42.

[15] Zhu, J. H., & Wang, Y. L. (2018). Innovation compensation or compliance cost? Pollution halo or pollution haven? Threshold effect and spatial spillover test of dual hypotheses from the perspective of green total factor productivity. Science & Technology Progress and Policy, 35(20), 46-54.

[16] Han, C., Zhang, W. G., & Feng, Z. B. (2017). How can environmental regulation correct resource misallocation: Analysis based on China's first mandatory pollution control. China Industrial Economics, (4), 115-134.

[17] Wang, F., & Ge, X. (2022). Does low-carbon transformation shock employment? Evidence from low-carbon city pilots. China Industrial Economics, (5), 81-99.

[18] Wen, Z. L., & Ye, B. J. (2014). Analyzing mediation effects: Progress and development. Advances in Psychological Science, 22(5), 731-745.

[19] Zhang, Y. S., Li, X. B., & Xing, M. Q. (2021). Corporate digital transformation and audit pricing. Auditing Research, (3), 62-71.

DOI: 10.54254/2754-1169/2026.GT33008

[20] Zhou, C., Cai, H. J., & Liu, M. J. (2020). Micro-enterprise financial effects of carbon emissions trading: PSM-DID test based on the "Porter Hypothesis". Collected Essays on Finance and Economics, (3), 68-77.

[21] Zhang, Y. J., Zhai, J. Q., Zhu, Y. X., et al. (2023). How does digital transformation affect corporate ESG performance? Journal of China University of Geosciences (Social Sciences Edition), 23(6), 126-141.