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Corporate Digital Transformation and Green Governance: Empowerment or Enabling Harm? An Empirical Analysis Based on Corporate Greenwashing Behavior

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Abstract. Under the background of the joint development of digital and green economy, the digital change of enterprises is well seen as a key way to push forward the green management of companies. But scholars have not reached a common idea on whether digitalization can really hold back companies' greenwashing behavior. This study takes A-share companies from 2014 to 2023 as the research sample, and it analyzes how the digital change of enterprises acts on companies' greenwashing behavior and the specific ways that this influence works in practice. This study finds out several key results as follows: First, the digital change of enterprises greatly makes companies' greenwashing behavior more serious, and this shows that digitalization may bring a promotion effect in some specific situations. Second, total factor productivity (TFP) has a positive middle effect in this process, which means the digital change of enterprises can indirectly make greenwashing more serious by improving the efficiency of resource distribution and the overall level of production capacity of companies. Third, the outside management and control ways of enterprises cannot stop this bad influence in an effective way; on the contrary, the professional ability of auditors and the attention from analysts will strengthen the role of digitalization in promoting companies' greenwashing behavior, and this phenomenon is called the supervision reverse effect. Fourth, the analysis of different characteristics of enterprises shows that this promotion effect is more obvious in manufacturing industry, high-tech fields, capital-focused industries and private companies. The research results can provide new practical research evidence and policy suggestions for improving the green supervision systems in the digital age.

Keywords: digital transformation, greenwashing, total factor productivity

1. Introduction

Against the requirements of the dual carbon strategy and high-quality development, promoting the coordinated transformation of digitalization and greening (hereinafter referred to as "dual-coordination transformation") has become an important grasp of China's economic and social development. It has been incorporated into the top-level design of the 14th Five-Year Plan and continuously refined in departmental policies. In 2025, ten ministries jointly issued the 2025 Work

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Priorities for the Coordinated Development of Digital and Green Transformation, deploying 22 key tasks from four aspects: "green data center and base station operation and maintenance, digital technology empowering the green transformation of eight major industries, pilot demonstration construction, and coordination of laws, regulations and overall planning", further clarifying the roadmap and implementation plan for dual-coordination transformation. In the future, the development of dual-coordination transformation will continue to deepen. Some studies believe that digital technology can significantly improve environmental governance efficiency through data management, satellite remote sensing monitoring and industrial Internet applications, providing a theoretical basis for the development of dual-coordination transformation.

However, while digital technology injects strong impetus into green transformation, it may also create new space for corporate opportunistic behaviors due to its inherent characteristics. An intriguing phenomenon is that global "greenwashing" behaviors have not continued to decline with the strengthening of environmental governance. Instead, high-risk greenwashing with more organization and deception is on the rise, showing a structural characteristic of "decline in quantity – rise in risk". This contradictory phenomenon reveals a potential governance dilemma in the process of "dual-coordination transformation": does digital transformation bring "empowerment" or "enabling harm" to corporate environmental behaviors?

There have been some preliminary studies on whether digital transformation helps curb corporate greenwashing. Most literature shows that digital transformation tends to reduce corporate greenwashing behaviors, and the underlying mechanism can be explained from multiple perspectives. For example, digital transformation can alleviate corporate financing constraints, increase media and investor attention, promote green technological innovation [1], and improve the quality of internal control [2]. At the same time, some researchers give a warning that digital transformation may cause new problems in corporate governance, and this situation just creates a chance for companies to conduct greenwashing behaviors. The academic circle has talked about the influences that digital transformation has on corporate greenwashing, but the inner operating mechanism between these two things has not been made clear in a complete way. People have paid much attention to external pressure and corporate governance methods as mentioned above, yet the deeper economic influence brought by digital transformation – the basic change in the efficiency of resource allocation – has not got enough attention from the academic circle. This paper tries to make the inner mechanism between digital transformation and corporate greenwashing clear, and it carries out the relevant research from this specific perspective.

The main extra contributions of this study can be shown from the following two points: First of all, this research provides new practical evidence to help people understand the relationship between the digital development of organizations and the fulfillment of environmental responsibilities in the present period. Second, this paper introduces total factor productivity as a middle variable in an innovative way, and it makes the specific mechanism clear that digital transformation can indirectly push forward corporate greenwashing behaviors by raising production efficiency and the ability of resource allocation of enterprises.

2. Theoretical analysis and research hypotheses

2.1. The impact of corporate digital transformation on greenwashing behaviors

When enterprises carry out digital transformation, this transformation may bring two effects to greenwashing behaviors. On the one hand, digitalization has the potential to curb greenwashing. First, the integration of digital tools lowers the expense associated with eco-friendly innovation,

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stimulates the development and implementation of technologies with reduced carbon emissions, and boosts the efficiency of energy use. Consequently, this diminishes an organization's inclination to address external pressures through mere symbolic compliance. On the other hand, the adoption of digital transformation increases the clarity and openness in revealing environmental data. By utilizing technologies such as big data analytics, cloud-based computing, and the Internet of Things, organizations gain the capability to continuously track and report their ecological impact, which facilitates the detection of misleading claims [3]. Third, digitalization helps improve corporate internal governance. The R&D, production and financial links are timely and visualized, which helps restrain managers' myopic behaviors and prevent greenwashing. On the other hand, digitalization may provide a new space for greenwashing. Its own technology is complex and data is manipulable. Enterprises can carry out "digital whitewashing" to shape a false image by manipulating or selectively disclosing environmental information [4]. Moreover, the black box effect of information processing makes review more difficult and delays the emergence of negative information [5]. In this case, digitalization may not inhibit greenwashing, and even become a driving factor. Therefore, the overall impact of digital transformation on corporate greenwashing is uncertain and needs to be judged by empirical analysis. Based on this, this paper puts forward the following competing hypotheses:

H1a: Corporate digital transformation can curb corporate greenwashing.

H1b: Corporate digital transformation may exacerbate corporate greenwashing.

2.2. The mediating role of total factor productivity

The impact of corporate digital transformation on greenwashing behaviors may be transmitted through the main intermediate mechanism of total factor productivity. Current studies mostly focus on the fact that TFP optimization helps curb greenwashing, but in some specific environments, TFP may also aggravate greenwashing.

From the perspective of resource-based view, digital transformation will improve production processes, strengthen knowledge protection and optimize resource allocation, greatly enhancing corporate total factor productivity. The improvement of TFP enables enterprises to obtain more outputs with fewer inputs, thus freeing up more resources and operational space. These additional resources can support enterprises' actual green renewal and upgrading of pollution control equipment, thus reducing the pressure of greenwashing due to resource constraints.

On the other hand, higher TFP may have the opposite effect. After the improvement of enterprise efficiency, the amount of surplus resources increases, and enterprises have stronger information processing and data manipulation capabilities. When there are deviations in regulation and market rewards, this advantage may be used by enterprises to consolidate superficial compliance, that is, to create a "green" image with more complex disclosure methods instead of actually carrying out environmental protection measures. In other words, efficiency optimization may become a means relied on by greenwashing behaviors.

Based on this, this paper puts forward the following competing hypotheses:

H2a: Corporate digital transformation curbs greenwashing by improving total factor productivity.

H2b: Corporate digital transformation exacerbates greenwashing by improving total factor productivity.

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2.3. Analysis of the moderating effect of external supervision factors

Auditors with professional capabilities can effectively identify and verify environmental information, which will improve the authenticity and credibility of corporate disclosure information, and thus strengthen the inhibitory effect of digital transformation on greenwashing [5]. When digital transformation makes data transparent, industry expertise helps auditors more accurately identify the differences between corporate environmental performance and their reports [6], deepen the level of information verification and optimize its quality. However, the complex technology and data-dependent characteristics of digital disclosure may also bring new "legal excuses on the surface" to enterprises. With professional data presentation and algorithm narration, enterprises may more easily obtain "formal recognition" from auditors, thus weakening the intensity of substantive supervision. At this time, the professional expertise of auditors may inadvertently endorse corporate greenwashing behaviors and aggravate the "negative effect" of digital transformation.

Drawing from the preceding discussion, this study constructs and presents a set of opposing propositions:

H3a: Auditor expertise strengthens the inhibitory effect of digital transformation on greenwashing.

H3b: Auditor expertise strengthens the promoting effect of digital transformation on greenwashing.

Analysts act as intermediaries of external information. Their behavior of tracking and interpreting relevant information helps improve information asymmetry and prompts enterprises to show their environmental performance more truly and comprehensively [7]. Higher analyst attention indicates stricter market supervision, which helps restrict enterprises from using digital technology to carry out greenwashing behaviors, and thus enhance the "empowerment" effect of digital technology [8]. In the digital capital market with fierce information competition, analysts may prefer eye-catching green narratives. When enterprises shape a green image that meets market expectations through digital means, analysts may be misled by trusting the information disclosed by enterprises, over-affirm symbolic environmental protection measures, and even produce a "reputation amplification effect". In this case, analyst attention not only fails to curb greenwashing, but also promotes such behaviors.

Accordingly, this paper puts forward competing hypotheses:

H4a: Analyst attention strengthens the inhibitory effect of digital transformation on greenwashing.

H4b: Analyst attention strengthens the promoting effect of digital transformation on greenwashing.

3. Research design

3.1. Sample selection

The subjects of analysis for this investigation consist of firms listed as A-shares on the Shanghai and Shenzhen exchanges, covering the period from 2014 through 2023. The metrics pertaining to digital transformation are extracted from the disclosed corporate annual filings within the Wind financial database. Concurrently, the corporate greenwashing metrics originate from the Bloomberg platform and the Huazheng ESG evaluation system. All remaining pertinent financial variables and indicators are sourced directly from the CSMAR data repository. To avoid the interference of other factors, this paper screens and processes the samples with reference to existing research practices: 1) Eliminate

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ST, *ST and PT samples; 2) Eliminate financial industry data; 3) Delete samples with missing information of main variables; 4) Conduct 1% bilateral winsorization on all continuous variables. Finally, 24,176 annual observation data are obtained.

3.2. Model construction

3.2.1. Baseline regression

To test the effect of digital transformation on corporate greenwashing behaviors, this paper constructs the following model:

$$GW_{i,t} = \alpha + \beta DCG_{i,t} + \mu Controls_{i,t} + \gamma_i + \lambda_t + \epsilon_{i,t} \tag{1}$$

In the model setting, i and t represent the individual and annual time dimensions of listed companies respectively; $DCG_{i,t}$ represents the level of corporate digital transformation, $GW_{i,t}$ is the corporate greenwashing indicator, and $Controls_{i,t}$ covers a series of enterprise-level control variables such as corporate maturity and financial structure. This empirical analysis focuses on the statistical significance and direction characteristics of the coefficient β of $DCG_{i,t}$: if β passes the significance test and the sign is negative, it confirms that corporate digital transformation can effectively curb greenwashing; otherwise, it confirms that corporate digital transformation exacerbates its greenwashing behaviors.

3.2.2. Mediating effect test

To test the mediating role of total factor productivity, the following mediating effect test models are constructed:

$$TFP_{i,t} = \alpha_2 + \beta_2 DCG_{i,t} + Controls + \gamma_i + \lambda_t + \epsilon_{2,i,t} \tag{2}$$

$$GW_{i,t} = \alpha_3 + \beta_3 DCG_{i,t} + \beta_4 TFP_{i,t} + Controls + \gamma_i + \lambda_t + \epsilon_{3,i,t} \tag{3}$$

3.2.3. Moderating effect test

To test the impact of analyst attention and auditor expertise, the following models are constructed:

$$GW_{i,t} = \alpha_4 + \beta_4 + DCG_{i,t} + \beta_5 AC_{i,t} + \beta_6 \left(DCG_{i,t} \times AC_{i,t}\right) + \gamma_i + \lambda_t + \epsilon_{4,i,t} \tag{4}$$

$$GW_{i,t} = \alpha_5 + \beta_7 + DCG_{i,t} + \beta_8 ISPA_{i,t} + \beta_9 \left(DCG_{i,t} \times ISPA_{i,t}\right) + \gamma_i + \lambda_t + \epsilon_{5,i,t} \tag{5}$$

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3.3. Variable selection

3.3.1. Dependent variable

The dependent variable is corporate greenwashing (GW). Referring to the practice of scholars [9], this paper measures the degree of corporate greenwashing with the peer-relative greenwashing score (see Formula 6).

$$GW_{i,t} = \left(\frac{ESG_{dis\,i,t} - \overline{ESG_{dis}}}{\sigma_{dis}} \right) - \left(\frac{ESG_{per\,i,t} - \overline{ESG_{per}}}{\sigma_{per}} \right) \tag{6}$$

3.3.2. Independent variable

The methodological approach implemented in this study adopts the textual analysis technique referenced in prior academic work [10]. To elaborate, the procedure involves utilizing the Python programming language to compile the yearly disclosure documents from every A-share listed entity within the Shanghai and Shenzhen stock markets. Subsequently, the textual content of these compiled reports is scrutinized and processed employing the Java PDFbox software library. By constructing a digital feature word list, we identify, match and count the frequency of feature words in the text, and finally summarize the total word frequency at the enterprise level. Given that the index data is usually right-skewed, we conduct logarithmic processing on it in the analysis to construct the final digital transformation (DCG) index.

3.3.3. Mediating variable

This study utilizes a dataset consisting of enterprises listed on China's A-share market spanning the years 2014 to 2023, and its methodological framework predominantly applies the Generalized Method of Moments (GMM) for the purposes of estimation and analysis. This method can effectively solve the simultaneity bias (enterprises adjust factor inputs according to current observable productivity) and sample selection bias (non-random enterprise exit from the market) in traditional TFP estimation, which is suitable for the micro-enterprise data scenario of this paper and provides a reliable method support for TFP calculation.

3.3.4. Moderating variables

There are two moderating variables in this paper, namely auditor expertise and analyst attention. Auditor expertise is measured by referring to the proportion of the total client assets of auditors in a specific industry to the total client assets of the firm; analyst attention is mathematically represented by taking the natural logarithm of the total count of financial analysts who are covering that specific publicly traded corporation, with one added to this number.

3.3.5. Control variables

Referring to the method of scholars [11], this paper adopts the following control variables: asset-liability ratio (Lev), fixed asset ratio (Ppe), intangible asset ratio (Intang), return on assets (Roa), return on equity (Roe), book-to-market ratio (MtB), corporate maturity (Age), environmental

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regulation intensity (ERI), and duality of positions (PART). The variable definition table is as follows:

Table 1. Variable definition table

Variable Name	Abbreviation	Variable Connotation
Corporate Greenwashing	GW	Peer-relative greenwashing score
Corporate Digital Transformation	DCG	Log (word frequency of digital transformation feature words)
Asset-Liability Ratio	Lev	Total liabilities / Total assets
Fixed Asset Ratio	Ppe	Net fixed assets / Total assets
Intangible Asset Ratio	Intang	Net intangible assets / Total assets
Return on Equity	Roe	Net profit / Owner's equity
Return on Assets	Roa	Net profit / Total assets
Book-to-Market Ratio	MtB	Net assets per share / Market price per share
Corporate Maturity	Age	Establishment time of the enterprise
Environmental Regulation Intensity	ERI	Number of words in sentences with environmental protection words in the city / Total number of words in the city government work report
Duality of Positions	PART	Difference between the proportion of corporate ownership and control rights
Analyst Attention	AC	Natural logarithm of the number of securities analysts following the same listed company plus one
Total Factor Productivity	TFP	Total output / Total resource input
Auditor Expertise	IPSA	Proportion of total client assets of auditor i in specific industry K to total client assets of auditor i's firm

4. Empirical analysis

4.1. Baseline regression results and analysis

Table 2 displays the estimated results of corporate digital transformation on corporate greenwashing. Column (1) controls industry and time effects, and adds three control variables: asset-liability ratio (Lev), corporate maturity (Age), and fixed asset ratio (Ppe); Column (2) adds three control variables: intangible asset ratio (Intang), return on assets (Roa) and return on equity (Roe); Similarly, Column (3) adds three variables: book-to-market ratio (MtB), duality of positions (PART), and environmental regulation intensity (ERI); Column (4) is the regression result with all control variables added. The empirical findings demonstrate that the coefficient for organizational digital transformation (DCG) is statistically and meaningfully positive throughout every specified model, attaining significance at the 1 percent threshold of statistical significance. Within the fourth specified model, which incorporates the complete set of controlled variables, the estimated regression coefficient for DCG registers at 0.003, thereby providing confirmation for the competing proposition H1b advanced in this research.

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Table 2. Regression results of two-way fixed effects model of corporate digital transformation and corporate greenwashing

Variable	（1）	（2）	（3）
DCG	0.0032***	0.0031***	0.0030***
	(4.7035)	(4.5732)	(4.5444)
Lev	-0.0465***	-0.0401***	-0.0403***
	(-8.6926)	(-7.3616)	(-7.4164)
Age	0.0001	0.0001	0.0002
	(0.1384)	(0.1266)	(0.1583)
Ppe	-0.0311***	-0.0269***	-0.0262***
	(-3.9002)	(-3.3539)	(-3.2734)
Intang		-0.0323	-0.0327
		(-1.4439)	(-1.4604)
Roa		-0.0001	-0.0000
		(-0.4654)	(-0.1461)
Roe		0.0002***	0.0002***
		(2.8677)	(2.6406)
MtB			0.0079**
			(2.2415)
PART			-0.0000
			(-0.1705)
ERI			0.0030
			(0.1389)
Constant	4.3089***	4.3065***	4.2984***
	(201.3514)	(197.8447)	(149.6961)
Observations	23,691	23691.00	23691.00
R-squared	0.575	0.576	0.576
Individual/Time Effects	YES	YES	YES

4.2. Robustness tests

4.2.1. Replacement model

In the baseline regression analysis, this study improves the deviation caused by potential omitted variables by controlling time and individual fixed effects. To further explore the impact of possible industry heterogeneity, this paper adds two-way fixed effects of time and industry to the baseline model for robustness verification. The empirical results show that digital transformation still significantly aggravates corporate greenwashing.

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4.2.2. Replacement of independent variable

Macroeconomic control variables are further adopted to improve the credibility of the model. Macroeconomic fluctuations may affect corporate decision-making through market demand, financing environment and other factors. Therefore, this paper takes the annual GDP growth rate of Chinese mainland (to measure economic growth) and annual Consumer Price Index (CPI) (to reflect inflation level) from 2014 to 2023 as macro control variables. After eliminating macroeconomic fluctuations, the baseline results are still stable.

4.2.3. Sub-sample test

Given that 2014-2019 is a period of gradual development of corporate digital transformation and continuous deepening of public attention to CSR and greenwashing behaviors. Accordingly, this section of the study utilizes firms traded on the A-share markets of both the Shanghai and Shenzhen stock exchanges, spanning the period from 2019 to 2023, to constitute a secondary sample set. The total number of observations within this derived sample group reaches 3,253. The robustness test finds that the promoting effect of corporate digital transformation on greenwashing is still significant, and the hypothesis is still valid.

Table 3. Robustness tests

VARIABLES	（1）	（2）	（3）
DCG	0.0030***	0.4442***	0.0027***
	（-4.44）	（-3.98）	（-3.12）
Constant	4.2984***	30.5840***	4.2617***
	（-135.54）	（-9.69）	（-106.82）
Controls	YES	YES	YES
Observations	23,691	7,917	13,832
R-squared	0.576	0.833	0.686
Individual Effects	YES	YES	YES
Time Effects	YES	YES	YES

4.2.4. Endogeneity analysis

Within the framework of the initial regression analysis, despite the implementation of controls for both temporal and entity-specific fixed influences, concerns regarding endogeneity—primarily stemming from variables that were omitted and inaccuracies in measurement—could still persist and potentially bias the results. To address and mitigate these endogeneity issues in causal inference, this research adopts an approach referenced from prior academic work [12]. It selects the digital transformation indicator from the preceding time period (L.DT) to serve as an instrumental variable. The analysis then employs the 2-Stage Least Squares estimation method (using an Instrumental Variable approach, IV-2SLS) to facilitate more robust causal interpretation. The instrumental variable test shows that the research conclusion remains robust.

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Table 4. Instrumental variable test

	First Stage	Second Stage
Variable	DCG	Greenwash
LDCG	0.8784***	
	(267.00)	
DCG		0.0068***
		(15.34)
Constant	0.4667***	4.2729***
	(13.44)	(1,168.98)
Observations	15,908	15,908
R-squared		0.0884
Control Variables	YES	YES
Individual/Time Effects	YES	YES

4.3. Mechanism analysis

Table 5 presents the estimation outcomes derived from the mediating effect model. The results displayed in the first column indicate that the direct influence exerted by firm-level digital transformation (DCG) upon corporate environmental misrepresentation (GW) is statistically significant and positive. The second column assesses the effect of digitalization on total factor productivity (TFP), revealing a significantly positive coefficient, which suggests that the adoption of digital tools meaningfully enhances the productive efficiency of an enterprise. In the third column, both the DCG and TFP variables are included simultaneously in the regression model. The outcomes demonstrate that the coefficients for both factors remain significantly positive, with the magnitude of the digital transformation coefficient being reduced compared to its value in the first column. This pattern of results signifies that total factor productivity performs a partial intermediary function in the relationship connecting digital transformation and corporate greenwashing behavior.

Table 5. Mediating effect test

	(1)	(2)	(3)
VARIABLES	Greenwash	TFP	Greenwash
DCG	0.0030***	0.0402***	0.0028***
	(0.001)	(0.006)	(0.001)
TFP			0.0068***
			(0.002)
Constant	4.2984***	5.1955***	4.2630***
	(0.029)	(0.229)	(0.030)
Observations	23,691	23,691	23,691
R-squared	0.576	0.896	0.577
Controls	YES	YES	YES
Individual/Time Effects	YES	YES	YES

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4.4. Moderating effect analysis

The moderating effect analysis for auditor specialization (IPSA) is presented in the first column. It reveals that the influence of auditor specialization on corporate misleading environmental disclosures is statistically significant and positive. Furthermore, the coefficient for the interaction term is likewise significantly positive, demonstrating that auditor specialization exerts a positive moderating influence within the process whereby digital transformation affects such disclosure behaviors. The findings in the second column, concerning the moderating effect of scrutiny from financial analysts, indicate that the impact of analyst attention on corporate greenwashing behaviors is significantly positive. Additionally, the coefficient for the interaction term combining digital transformation and analyst attention is also significantly positive. That is to say, similar to auditor expertise, a high level of analyst attention does not strengthen the governance effect of digital transformation, but amplifies its "harm-enabling effect".

Table 6. Moderating effect test

	(1)	(2)
DCG	0.00239***	0.00157**
	(0.000649)	(0.000678)
IPSA	0.00165	
	(0.014)	
DCG×IPSA	0.0117*	
	(0.00627)	
AC		0.00658***
		(0.000746)
DCG×AC		0.000691**
		(0.000292)
Control Variables	YES	YES
Individual/Time Effects	YES	YES

4.5. Heterogeneity analysis

4.5.1. Industry-level differences: the promoting effect is more significant in manufacturing and high-tech industries

As shown in Figure 2, the exacerbating effect of digital transformation on greenwashing is more significant in the samples of manufacturing enterprises and high-tech industries. Compared with other industries, these two types of enterprises have a higher degree of digitalization in the production chain, a more complex information disclosure system, and greater green performance pressure from policies, investors and the public.

4.5.2. Production factor-level differences: capital-intensive enterprises are more prone to greenwashing

Compared with labor-intensive enterprises, capital-intensive enterprises often have stronger resource endowments and financial strength in technology investment, automated production and information

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system construction, which enables them to promote the digital transformation process earlier and more deeply. However, this high-investment and high-complexity digital system also provides enterprises with stronger information control and data manipulation capabilities.

4.5.3. Property right nature-level differences: private enterprises are more prone to greenwashing

The test results show that compared with state-owned enterprises, the positive relationship between digital transformation and greenwashing behaviors is more significant in the sample of private enterprises. This result indicates that private enterprises are more likely to have a "harm-enabling effect" in the process of promoting digital transformation.

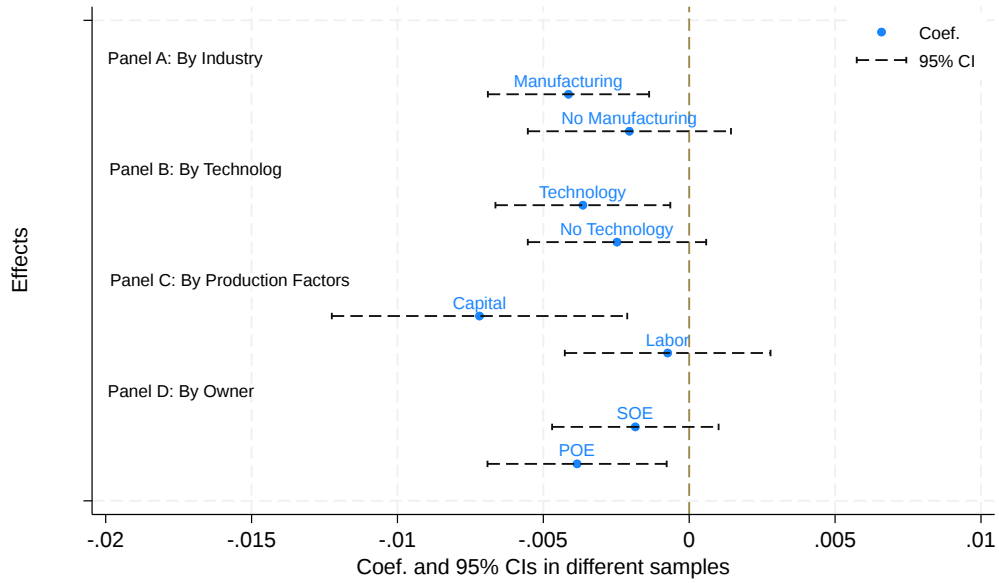

Figure 1. Confidence interval plot of heterogeneity test

5. Conclusion and implications

Against the background of the dual carbon strategy and high-quality development, corporate digital transformation is often regarded as a key measure to promote green governance. Nevertheless, following a process of empirical investigation grounded in the pertinent dataset encompassing China's A-share market-listed corporations covering the years 2014 through 2023, it is found that digital transformation is not a one-dimensional "empowerment" for the environment, and its impact on corporate greenwashing behaviors shows a significant "deterioration effect". The main understandings are as follows: First, according to the regression results, corporate digital transformation significantly aggravates the occurrence of greenwashing, indicating that digital transformation does not automatically help enterprises achieve real green transformation, but may become a technical means for enterprises to achieve "superficial compliance"; Second, the mechanism investigation shows that total factor productivity (TFP) plays a prominent intermediate regulatory role between digital transformation and greenwashing behaviors. Digital transformation indirectly expands corporate greenwashing behaviors by optimizing production efficiency and improving resource allocation capacity; Third, external governance factors will strengthen this "deterioration effect". Both the specialized knowledge of auditors and the focus from financial

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analysts serve to reinforce the intermediary influence within the mechanism through which digital transformation impacts misleading environmental disclosures. Specifically, each factor amplifies the facilitative effect that digitalization has on such behavior. Furthermore, an analysis of variations across different groups indicates that the effect of digital transformation in enabling negative outcomes is particularly more observable and marked within production sectors and technology-intensive fields. and capital-intensive enterprises and private enterprises also show a stronger tendency of greenwashing. In summary, the research findings of this paper provide a useful supplement and reflection to the existing mainstream view that "digitalization promotes green transformation", and reveal the complexity and duality of digital transformation in corporate environmental behaviors.

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