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The Impact of Corporate ESG Performance on Supply Chain Resilience

Yuting Feng

Department of Business, Nanjing Normal University, Nanjing, China

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Abstract: Based on the resource-based view and dynamic capability theory, this paper uses the panel data of Chinese A-share manufacturing listed companies from 2011 to 2024 to empirically examine the impact of corporate ESG performance on supply chain resilience and its mechanism. The research finds that corporate ESG performance significantly enhances supply chain resilience. The mechanism test shows that ESG practices strengthen supply chain resilience through three paths: "resource renewal (green technology upgrade) - resource reconfiguration (resource allocation optimization) - resource acquisition (corporate reputation improvement)". The research conclusion reveals the core value of ESG as a non-market strategy in building an autonomous and controllable supply chain.

1. Introduction

Against the complex backdrop of intensifying global geopolitical conflicts, frequent public health emergencies, and the rising trend of de-globalization, supply chain disruption risks have become a critical bottleneck constraining the high-quality development of the manufacturing industry. The logic of supply chain management is transitioning from traditional "efficiency-driven" to "resilience-driven," making the construction of an autonomous and controllable supply chain system an urgent strategic task. Meanwhile, corporate ESG performance, as the core of non-market strategies, is playing an increasingly prominent role in risk aversion and value creation.

However, existing research largely focuses on tactical optimizations such as redundant inventory, lacking a systematic examination of the deep mechanisms through which ESG translates into supply chain resilience and the "technology-environment" contingency boundaries. Although existing literature has noted the role of ESG in alleviating financing constraints, few studies have opened the "black box" of the entire process of ESG empowering supply chain "ex-ante defense—in-process response—post-event recovery" from the dynamic perspective of resource evolution.

Based on this, the possible marginal contributions of this paper are as follows: First, it incorporates ESG performance into an integrated analytical framework of supply chain resilience, empirically establishing the strategic status of ESG as a key antecedent variable for enhancing supply chain resilience. Second, based on dynamic capabilities theory, it constructs a mechanism framework of "resource renewal—resource reconfiguration—resource acquisition," revealing the mediating paths of green technology, resource allocation, and reputational capital. Third, it incorporates supply chain digitalization and environmental uncertainty into the same framework,

constructing a "technology-environment" dual moderation model to clarify the boundary conditions under which ESG exerts its effects.

2. Theory and hypotheses

2.1 Corporate ESG Performance and Supply Chain Resilience

Drawing upon the Resource-Based View, this paper defines corporate ESG performance as strategic behavior across environmental, social, and governance dimensions that transcends traditional financial metrics to actively address climate change, fulfill social responsibilities, and perfect corporate governance structures. It is not only a commitment to sustainable operation but also a strategy for building long-term competitive advantage, representing an investment behavior that cultivates heterogeneous strategic resources.

As a deepening and extension of the RBV, Dynamic Capabilities Theory emphasizes that dynamic capability is essentially a comprehensive ability to adapt to environmental changes and drive sustainable development. This aligns highly with the needs of corporate supply chains in responding to external environmental changes and serves as a core element in shaping supply chain resilience and safeguarding supply chain stability and flexibility[1]. As a critical capability for firms to maintain stability and rapidly recover when facing external shocks, supply chain resilience is essentially the concrete projection of dynamic capabilities in the field of supply chain management. ESG fulfillment can bring critical strategic resources to the enterprise, and this resource advantage effect enhances the firm's dynamic capabilities. This reinforces the resistance and recovery capabilities exhibited by the corporate supply chain when facing shocks, as comprehensive dynamic capabilities strengthen supply chain resilience.

Actively fulfilling ESG responsibilities enhances this dynamic capability from multiple dimensions: in the environmental dimension, green investment can force technological upgrades and build defensive barriers; in the social dimension, responsibility fulfillment can accumulate social capital and enhance external adaptability; and in the governance dimension, optimizing governance structures can improve the agility of resource allocation. From the perspective of the "ex-ante—in-process—ex-post" process of supply chain risk response: ex-ante, ESG fulfillment promotes the establishment of risk prevention mechanisms and diversified resource reserves; in-process, efficient governance ensures the rapid scheduling of resources; and ex-post, good reputational capital facilitates the low-cost integration of resources to achieve rapid recovery.

Accordingly, this paper proposes:

Hypothesis 1: Superior corporate ESG performance can significantly enhance supply chain resilience

2.2 Corporate ESG Performance, Green Technology Upgrading, and Supply Chain Resilience

Corporate environmental performance refers to the extent of a company's emphasis on environmental protection and its actual achievements during production and operational processes. This dimension focuses on the impact of enterprises on the natural environment, specifically including the implementation of environmental protection policies, promotion of carbon emission reduction, development of environmental protection technologies[2], and fulfillment of their environmental responsibilities. Companies with strong ESG performance prioritize ecological resource management, achieving energy conservation and emission reduction during production to facilitate the transition to a green economy. They emphasize investment in and research on green technologies, effectively driving corporate green technology upgrades. Through green technology upgrades, companies achieve iterations of technological assets, enhancing the supply chain's

resilience to environmental regulations and resource fluctuations.

First, optimizing costs to counter external shocks. Enterprises with leading advantages in energy efficiency and green decarbonization directly reduce energy consumption and raw material waste. This efficiency in resource utilization and cost advantage enables companies to better handle external shocks such as resource price volatility and regulatory changes, strengthening preemptive defenses against environmental disruptions and reducing reliance on traditional scarce resources, thereby sustaining profitability and operational stability over the long term[3].

Second, achieving green competitive advantages. Green innovation drives the transformation of products and services toward sustainability. By developing green products and offering eco-friendly services, companies meet customer demand for environmentally responsible goods, expanding market boundaries. Additionally, green technologies precisely respond to stakeholders' sustainability preferences, generating "green premium" tolerance and lock-in effects on the demand side, securing differentiated advantages and reducing supply chain sensitivity to external market shocks.

Finally, building a green collaborative network to mitigate systemic risks. Through strategic partnerships, companies and supply chain stakeholders jointly engage in activities that promote environmental sustainability, forming green supply chain synergies[4]. Enterprises disseminate advanced green technology standards and management concepts to upstream suppliers and downstream distributors. This diffusion not only strengthens environmental consensus across the supply chain but also fosters green innovation throughout the network, establishing a robust green cooperation framework. This reduces the overall vulnerability of the supply chain to external shocks and has a direct positive impact on supply chain resilience[5].

Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 2: Corporate ESG performance enhances supply chain resilience through green technology upgrading.

2.3 Corporate ESG Performance, Resource Allocation Optimization, and Supply Chain Resilience

Corporate governance performance refers to a firm's performance in areas such as corporate governance structure, management transparency, board independence, and the protection of shareholder rights. As a crucial pillar of ESG strategy, this dimension emphasizes high-quality management and ethical business standards, ensuring that corporate decisions align with sustainable development goals[2]. According to principal-agent theory, superior ESG fulfillment signifies that a firm possesses sound internal governance mechanisms. This can lower the firm's own agency costs, alleviate agency problems, reduce the degree of information asymmetry during internal decision-making, improve management efficiency[6], and decrease inefficient corporate investment, thereby assisting management in making resource allocation decisions that are more conducive to corporate development.

Resource allocation optimization can drive firms to rationally allocate core resources such as capital, human resources, and production capacity, avoiding resource idleness and misallocation. This, in turn, allows for the establishment of targeted risk buffering reserves, enhancing capabilities for prediction and preparation prior to external shocks. Supply chain resilience often depends on whether a firm can rapidly adjust its resource structure and perform effective allocation and utilization during moments of crisis, while resource allocation optimization ensures that resources flow toward high-return or critical survival areas[7]. When external shocks occur, firms can more quickly transfer resources from obstructed links to critical links [8-9], rapidly mobilizing emergency funds, redeploying labor, and adjusting production plans. This improves resource utilization

efficiency and increases the firm's resource reconfiguration capability amidst risks, thereby strengthening resistance and recovery capabilities when facing risks and ultimately enhancing supply chain resilience.

Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 3: Corporate ESG performance enhances supply chain resilience through resource allocation optimization.

2.4 Corporate ESG Performance, Corporate Reputation Enhancement, and Supply Chain Resilience

Corporate social performance refers to a firm's performance in fulfilling social responsibilities, including employee welfare, community relations, consumer rights protection, and supply chain management. This dimension focuses on the firm's role and impact on social systems, covering interactions between the firm and stakeholders such as communities, employees, and consumers, as well as how these interactions shape corporate reputation and innovation capabilities[10]. By fulfilling ESG responsibilities, firms send a strong signal to the outside world regarding their long-term value and reliability. This builds valuable reputational capital[11], establishes a positive social image, and constructs trust and symbiotic relationships with external stakeholders. From the perspective of dynamic capabilities, this reflects the firm's ability to acquire external resources—specifically, utilizing social relationship capital to gain external support and form a benign interaction mechanism with the external environment. This mechanism endows the firm with strong external adaptability, which plays an irreplaceable role in enhancing supply chain resilience.

First, in risk-free scenarios, with reputation serving as a special form of social capital, firms can reduce their dependence on specific suppliers and customers. It also facilitates the attraction of high-quality partners and suppliers, thereby establishing more stable cooperative relationships. This builds a stable foundation for resource supply and demand within the supply chain, ultimately enhancing supply chain resilience.Second, superior ESG performance enhances the firm's credibility within the supply chain. In times of crisis, it helps the firm prioritize obtaining resources from suppliers or gaining trust from customers, enabling faster operational recovery when facing risks and enhancing overall supply chain resilience.Finally, this "reputation insurance" can mitigate the damage to the corporate image caused by negative shocks and reduce the risk of supply chain partnership ruptures. Relying on accumulated trust relationships, the firm can rapidly integrate upstream and downstream resources to complete supply chain reconstruction, reducing recovery costs and time.

Based on the above analysis, this paper proposes the following hypotheses:

Hypothesis 4: Corporate ESG performance enhances supply chain resilience through enhancement of corporate reputation.

3. Data and methodology

3.1 Sample

This study selects A-share manufacturing listed companies from 2011 to 2024 as the research sample. Although Huazheng ESG ratings have been disclosed since January 2009, the starting year of the research data was adjusted to 2011 due to severe data unavailability in 2009 and 2010. Data on ESG performance were obtained from the Huazheng ESG rating database within the Wind database, while all other variables were sourced from the China Stock Market & Accounting Research (CSMAR) database. Industry classification follows the guidelines of the China Securities

Regulatory Commission (CSRC).

During the sample selection and screening process, the following criteria were applied:(1) Excluding samples with abnormal operations, specifically those designated as ST (Special Treatment) and *ST; (2) Excluding samples with missing data for key variables, such as R&D investment amounts and firm size; and (3) Excluding samples containing anomalous values, such as a liability-to-asset ratio greater than 1 or less than 0. Ultimately, a total of 19,404 firm-year observations were retained. Furthermore, to mitigate the influence of extreme values on the regression results, all continuous variables were winsorized at the 1% and 99% levels.

3.2 Variable Definition

3.2.1 Dependent Variable: Supply Chain Resilience (Resil)

This paper deconstructs supply chain resilience into two core dimensions[12]: resistance and recovery. Four core indicators are selected, and a comprehensive index is constructed using the Entropy Weight Method.

(1)Supply Chain Resistance (Resis): This reflects the stability of the supply chain in maintaining smooth circulation.

Degree of Capital Occupation: This is measured using the "natural logarithm of the ratio of accounts receivable to operating income." A smaller value indicates smoother capital flow and stronger financial stability.

Proportion of Stable Customers: This is measured by the "proportion of stable cooperative customers among the top five customers over consecutive years." A larger value indicates more sustainable supply-demand relationships and a stronger ability to withstand shocks.

(2)Supply Chain Recovery (Recov): This reflects the rebound capability of the supply chain after sustaining a shock.

Supply-Demand Deviation: This is measured by the ratio of the variance of production fluctuations to the variance of demand fluctuations. A ratio closer to equilibrium indicates better supply-demand adaptability.

Performance Deviation: This is measured by the absolute value of the regression residuals from a performance prediction model (controlling for variables such as size and leverage). A larger absolute residual value indicates greater repair potential and rebound magnitude after a shock.

(3)Comprehensive Index Construction: The four indicators mentioned above are subjected to positive normalization and standardization. The Entropy Weight Method is used to objectively assign weights based on data dispersion. Finally, the comprehensive supply chain resilience index is obtained through weighted summation, where a larger value represents stronger resilience.

3.2.2 Independent Variable: Corporate ESG Performance (ESG)

This paper adopts the Huazheng ESG rating system to measure ESG performance. The Huazheng system is selected because it integrates China's national conditions with the characteristics of its capital market, employing a combination of regular quarterly evaluations and dynamic tracking to comprehensively, scientifically, and timely assess the ESG levels of all A-share listed companies. Specifically, the ESG ratings are classified into nine levels from low to high (C to AAA) and are assigned ordinal values ranging from 1 to 9. Furthermore, we select the specific numerical ESG scores as an alternative measure for robustness checks.

3.2.3 Mediating Variables

(1) Green Innovation (Gin)

This study measures green innovation using the natural logarithm of the number of green patent applications plus one[15].

(2) Resource Allocation Efficiency (Overinvest)

Adopting the measurement framework of Ni Tingting and Wang Yuetang[13], this study measures capital allocation efficiency by estimating the firm's normal investment level and calculating the deviation between actual investment and expected investment. Specifically, the following regression model is constructed:

$$Invest_{it}=\beta_0+\beta_1 Growth_{it-1}+\beta_2 Lev_{it-1}+\beta_3 Roa_{it-1}+\beta_4 Age_{it-1}+\beta_5 Size_{it-1}+\beta_6 Invest_{it-1} + \sum Industry+\sum Year+\varepsilon_{it}$$

Where Invest represents the ratio of the original value of fixed assets to total assets at the beginning of the period; Growth denotes the growth rate of main business revenue; Lev is the asset-liability ratio; Roa is the return on total assets; Age represents firm age; and Size is the natural logarithm of total assets. The portion of the model residuals greater than 0 represents over-investment (Overinvest); a larger value indicates lower resource allocation efficiency.

(3) Corporate Reputation (Rep)

This paper measures corporate reputation using the natural logarithm of the sum of the number of positive reports in online media and newspapers plus one each year.

3.2.4. Control Variables

Drawing on relevant scholarly research, the following indicators are selected as control variables in this paper: Firm Size (Size), measured as the natural logarithm of total assets at year-end; Listing Age (ListAge), calculated as the natural logarithm of the difference between the current year and the listing year plus one; Leverage (Lev), defined as the ratio of total liabilities to total assets at year-end; Return on Assets (ROA), calculated as net profit divided by total assets; Revenue Growth (Growth), representing the growth rate of operating income; Board Size (Board), measured as the natural logarithm of the total number of board members; Independent Director Ratio (Indep), calculated as the ratio of the number of independent directors to the total number of board members ; and Ownership Concentration (Top1), measured by the shareholding percentage of the largest shareholder. Furthermore, to mitigate the potential interference of industry characteristics and time factors on the estimation results, this paper includes firm (Firm), industry (Industry), and year (Year) dummy variables in the model.

3.3 Model

To test Hypothesis H1, this paper constructs the following baseline regression model:

$$Resil_{it}=\beta_0+\beta_1 ESG_{it}+\beta_2 Controls_{it}+Year\_FE+Firm\_FE+\varepsilon_{it} \quad (1)$$

Among them, *i* represents the individual enterprise, and *t* represents the year. The explained variable $Resil_{it}$ denotes the supply chain resilience of enterprise *i*'s supply chain in year *t*; ESG_{it} represents the ESG rating of the enterprise, with its coefficient βindicating the impact of the enterprise's ESG performance on supply chain resilience; $Controls_{it}$ refers to other control variables related to the individual enterprise; Year_FE is the year fixed effect, used to control the impact of shocks in different years on supply chain resilience; Firm_FE is the individual enterprise fixed effect, employed to control the impact of time-invariant shocks on the individual enterprise on supply chain resilience; and ε is the random disturbance term.

To further analyze the mechanism through which ESG affects supply chain resilience and test hypotheses H2-H4, this paper draws on Jiang Ting's[14] methodological discussion on mechanism testing in causal inference. By observing the impact of the core explanatory variable ESG performance on mechanism variables, the study conducts mechanism testing to avoid potential endogeneity issues associated with traditional stepwise regression methods. Models (2a)-(2c) are constructed to examine the impact of ESG performance on the three major mechanism variables, respectively.

$$Gin_{it}=\beta_0+\beta_1 ESG_{it}+\beta_2 Controls_{it}+Year\_FE+Firm\_FE+\varepsilon_{it} \quad (2a)$$

$$Overinvest_{it}=\beta_0+\beta_1 ESG_{it}+\beta_2 Controls_{it}+Year\_FE+Firm\_FE+\varepsilon_{it} \quad (2b)$$

$$Rep_{it}=\beta_0+\beta_1 ESG_{it}+\beta_2 Controls_{it}+Year\_FE+Firm\_FE+\varepsilon_{it} \quad (2c)$$

4. Result

4.1 Descriptive Statistical Analysis

Table 1. Descriptive Statistics of Main Variables

Variable	Mean	Median	SD	Min	Max
Resil	0.708	0.109	0.506	0.813	0.708
ESG	4.031	1.080	1.000	7.000	4.031
Gin	1.479	4.706	0.000	33.000	1.479
Overinvest	0.052	0.091	0.000	0.427	0.052
Rep	4.324	0.957	2.197	7.109	4.324
Size	22.077	1.116	19.906	25.416	22.077
ListAge	2.192	0.676	0.693	3.367	2.192
Lev	0.405	0.197	0.057	0.933	0.405
ROA	0.035	0.071	-0.253	0.221	0.035
Growth	0.129	0.319	-0.514	1.683	0.129
Board	2.095	0.190	1.609	2.565	2.095
Indep	37.852	5.427	33.330	57.140	37.852
Top1	0.315	0.138	0.079	0.704	0.315

As shown in Table 1, the mean value of the dependent variable, Supply Chain Resilience (Resil), is 0.708, with a standard deviation of 0.109. The minimum and maximum values are 0.506 and 0.813, respectively, indicating that while the overall level of supply chain resilience among the sample firms is relatively high, there exists a certain degree of variation. The mean value of the core independent variable, ESG comprehensive score (ESG), is 4.031, with a standard deviation of 1.080, ranging from 1 to 7. This suggests significant individual differences in the ESG performance of the sample firms. The mean value of Green Innovation (Gin) is 1.479 with a standard deviation of 4.706, showing a relatively dispersed distribution. The mean value of Over-investment (Overinvest) is 0.052, indicating a generally low level of over-investment across the sample firms. The mean value of Corporate Reputation (Rep) is 4.324. Additionally, state-owned enterprises (SOEs) account for 27.2% of the sample, and firms in heavy pollution industries account for 26.7%.

4.2 Main Hypothesis Testing

Table 2 reports the baseline regression results regarding the impact of ESG performance on

supply chain resilience. Column (1) controls only for firm and year fixed effects; the regression coefficient of the ESG comprehensive score is 0.0056, which is significant at the 1% level (coefficient = 0.0056, $P < 0.01$). This indicates that a one-unit increase in ESG performance is associated with an average increase of 0.56 percentage points in supply chain resilience. After introducing control variables in Column (2), the coefficient of the ESG comprehensive score decreases slightly to 0.0050 but remains significantly positive at the 1% level (coefficient = 0.0050, $P < 0.01$). This suggests that the positive impact of ESG performance on supply chain resilience remains robust after controlling for factors such as firm size, listing age, financial leverage, profitability, growth, board characteristics, and ownership structure. In terms of economic significance, a one-standard-deviation increase in the ESG score (1.080) leads to an increase in supply chain resilience of approximately 0.54 percentage points (0.0050×1.080), which is equivalent to 0.76% of the mean supply chain resilience. Thus, Hypothesis 1 is supported.

Table 2. Baseline Regression Results

Variable	(1)	(2)
	Resil	Resil
ESG	0.0056***	0.0050***
	(6.67)	(5.79)
Size		0.0124***
		(5.06)
ListAge		0.0232***
		(4.31)
Lev		-0.0026
		(-0.29)
ROA		0.0296**
		(1.99)
Growth		-0.0189***
		(-7.67)
Board		-0.0101
		(-1.09)
Indep		-0.0002
		(-0.71)
Top1		-0.0126
		(-0.83)
_cons	0.6855***	0.3998***
	(201.23)	(6.87)
Firm	Yes	Yes
Year	Yes	Yes
Within-R^2	0.0031	0.0134
Adj-R^2	0.4025	0.4084
N	19,404	19,404

4.3 Mediation Effect Test

Table 3. Regression Results of ESG on Mediating Variables

Variable	(1) Gin	(2) Overinvest	(3) Rep
ESG	0.0981***	-0.0020***	0.0159***
	(3.23)	(-3.24)	(3.07)
Size	0.4505***	0.0143***	0.2240***
	(3.49)	(5.69)	(12.70)
ListAge	-0.5506**	0.0067	0.0246
	(-2.54)	(1.45)	(0.67)
Lev	0.3647	0.0364***	0.1589***
	(1.24)	(4.82)	(2.63)
ROA	1.0779**	-0.0244*	1.3973***
	(2.28)	(-1.93)	(13.36)
Growth	-0.1772***	0.0411***	0.1605***
	(-2.76)	(13.59)	(10.93)
Board	0.1769	-0.0052	0.0031
	(0.47)	(-0.76)	(0.05)
Indep	0.0227*	0.0001	0.0024
	(1.77)	(0.25)	(1.35)
Top1	-0.0320	0.0093	-0.5226***
	(-0.06)	(0.50)	(-4.64)
_cons	-9.0398***	-0.2826***	-0.8052**
	(-3.08)	(-5.02)	(-2.05)
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
Within-R^2	0.0077	0.0688	0.0773
Adj-R^2	0.6876	0.6299	0.7328
N	19,404	19,404	19,404

Results in Column (1) show that ESG significantly promotes Green Innovation (Gin) (coefficient=0.0981, p<0.01$), suggesting that better ESG performance fosters green R&D and enhances risk resistance. Column (2) indicates that ESG significantly inhibits Over-investment (Overinvest) (coefficient=-0.0020, p<0.01$), implying that ESG practices improve governance efficiency and mitigate resource misallocation. Finally, Column (3) reveals a significant positive impact of ESG on Corporate Reputation (Rep) (coefficient=0.0159, p<0.01$), demonstrating that ESG enhances market recognition, attracts high-quality partners, and strengthens supply chain cohesion.

4.4 Endogeneity Tests

Table 4. Endogeneity Test Results

Variable	(1)	(2)
	ESG_num	Resil
ESG_num		0.0108***
		(3.54)
ESG_IVmean	0.8603***	
	(30.06)	
Size	0.3908***	0.0099***
	(14.59)	(3.69)
ListAge	-0.3140***	0.0251***
	(-6.07)	(4.57)
Lev	-0.8698***	0.0031
	(-9.23)	(0.33)
ROA	0.1684	0.0284*
	(1.14)	(1.91)
Growth	-0.0853***	-0.0184***
	(-3.88)	(-7.43)
Board	0.0464	-0.0103
	(0.49)	(-1.12)
Indep	0.0088***	-0.0003
	(3.07)	(-0.90)
Top1	0.4398**	-0.0148
	(2.56)	(-0.98)
_cons	-7.5885***	
	(-11.97)	
Firm	Yes	Yes
Year	Yes	Yes
Within-R^2	0.1269	
Adj-R^2	0.4904	0.0091
N	19,404	19,404
Kleibergen-Paap F		903.88

To address endogeneity, we employ the 2SLS method using the industry-province-year mean ESG score as the instrumental variable (IV), which satisfies both relevance (shared institutional environment) and exogeneity criteria.Table 4 reports the results. The first-stage regression confirms the IV's strength ($F=903.88, p<0.01$), ruling out weak instrument concerns. Crucially, the second-stage results demonstrate that ESG retains a significant positive impact on supply chain resilience ($\beta=0.0108, p<0.01$) after controlling for endogeneity. The increased coefficient compared to the baseline suggests the initial model may have underestimated the true effect, further reinforcing the causal conclusion.

4.5 Robustness Tests

Table 5. Robustness Test Results

Variable	(1)	(2)	(3)	(4)
	Resil	Resil	Resil	Resil
ESG	0.0010***			0.00355*
	(5.89)			(2.40)
L_ESG_num		0.0031***	0.0028***	
		(2.97)	(2.74)	
Size	0.0122***	0.0134***	0.0160***	0.0145***
	(5.00)	(4.93)	(5.67)	(3.53)
ListAge	0.0231***	0.0222***	0.0198***	0.0624***
	(4.30)	(2.86)	(3.23)	(6.75)
Lev	-0.0016	-0.0059	-0.0194*	-0.0110
	(-0.18)	(-0.61)	(-1.85)	(-0.80)
ROA	0.0297**	0.0296*	0.0068	0.0407
	(2.00)	(1.85)	(0.42)	(1.84)
Growth	-0.0189***	-0.0204***	-0.0010	-0.0203***
	(-7.67)	(-7.15)	(-0.39)	(-5.81)
Board	-0.0101	-0.0069	-0.0023	0.00774
	(-1.10)	(-0.69)	(-0.24)	(0.53)
Indep	-0.0002	0.0003	0.0004	0.000224
	(-0.72)	(0.90)	(1.30)	(0.52)
Top1	-0.0124	0.0012	0.0059	-0.0116
	(-0.82)	(0.07)	(0.32)	(-0.47)
_cons	0.3478***	0.3634***	0.3050***	0.196*
	(5.98)	(5.54)	(4.65)	(2.02)
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Within-R^2	0.0135	0.0110	0.0084	0.0190
Adj-R^2	0.4085	0.3968	0.3952	0.3874
N	19,404	15,791	15,791	9884

To test the robustness of the conclusions, the model is re-estimated using the numerical conversion of ESG ratings as an alternative indicator. As shown in Column (1) of Table 5, after replacing the ESG measurement, its impact on supply chain resilience remains significantly positive, which is consistent with the baseline regression results.

To further mitigate potential reverse causality issues, regressions are conducted using the ESG variable lagged by one period. Column (2) of Table 5 presents the results using the one-period lagged ESG variable with current control variables, while Column (3) employs both the ESG variable and all control variables lagged by one period. The results indicate that the one-period lagged ESG performance has a significantly positive impact on current supply chain resilience in both specifications, thereby verifying the robustness of the causal relationship between ESG performance and supply chain resilience.

Considering that the shock of the COVID-19 pandemic may have caused anomalous supply chain disruptions, samples from 2020 onwards are excluded (i.e., retaining only pre-2020 data) to re-examine the impact of ESG performance on supply chain resilience. The regression results, as

reported in Column (4) of Table 5, show that the research hypotheses of this paper remain valid.

5. Conclusion

Based on panel data of A-share manufacturing listed companies on the Shanghai and Shenzhen stock exchanges from 2011 to 2024, and drawing on the Resource-Based View and Dynamic Capabilities Theory, this paper examines the impact of corporate ESG performance on supply chain resilience. It provides an in-depth analysis of the mediating mechanisms involved, as well as the moderating roles of supply chain digitalization and environmental uncertainty. Considering differences in internal firm characteristics, this paper further conducts heterogeneity analysis from aspects such as firm size and the nature of ownership. The main findings are as follows:

First, corporate ESG performance has a significant positive impact on supply chain resilience. Empirical results indicate that, after controlling for a series of variables such as firm size, leverage, and profitability, firms with higher ESG ratings exhibit stronger supply chain resilience. This implies that ESG practice is not a mere cost burden but a strategic investment capable of translating into risk resistance capabilities. Superior ESG performance assists the corporate supply chain in maintaining the continuity of core functions when facing external shocks. This conclusion remains robust after a series of robustness tests, including the substitution of the core independent variable, lagged variable analysis, Instrumental Variable (IV) estimation, and Propensity Score Matching (PSM).

Second, green technology innovation, resource allocation efficiency, and corporate reputation serve as key mediating mechanisms through which ESG enhances supply chain resilience.ESG practices drive firms to increase investment in green R&D. Through technological upgrades, firms reduce energy consumption and pollution emissions, overcoming resource and environmental constraints, thereby enhancing the supply chain's resistance to environmental regulations and resource price fluctuations;Superior ESG performance effectively alleviates agency conflicts and information asymmetry, inhibits managerial opportunistic behavior and inefficient investments, and optimizes the allocation efficiency of internal capital and physical resources. This capability for efficient resource scheduling enables firms to rapidly reconfigure resources during crises, shortening the recovery cycle and enhancing supply chain resilience;As a high-credibility signal, ESG performance helps firms convey a long-term value orientation to stakeholders, accumulating a positive social reputation. Within the supply chain network, this reputational capital translates into partner trust and cohesion, functioning as an "insurance-like" mechanism that effectively maintains the stability of supply-demand relationships and prevents supply chain ruptures under external shocks.

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