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Article

ESG-Oriented Collaborative Governance and Sustainable Supply Chain Performance: Supply Chain Resilience as a Mediator

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Abstract: In the highly volatile, uncertain, complex, and ambiguous (VUCA) era, global supply chains face escalating exposure to external shocks ranging from geopolitical disruptions to public health crises. This study investigates how environmental, social, and governance (ESG)-driven multi-stakeholder collaborative governance influences sustainable supply chain performance under conditions of severe macro-level disruption. Adopting a qualitative single-case study methodology, we conduct an in-depth longitudinal analysis of BYD Company Limited, examining its operational dynamics across the critical period from 2019 to 2023. The findings reveal that collaborative governance does not directly generate measurable performance dividends; rather, supply chain resilience functions as a crucial mediating mechanism that translates governance efforts into tangible outcomes. By organically integrating governments, suppliers, and non-governmental organizations, core enterprises cultivate profound relational capital and achieve extreme informational transparency across the network. These foundational elements systematically enhance the supply network's proactive readiness, concurrent resistance, and rapid recovery capabilities through agile resource bricolage. Ultimately, this enhanced resilience drives holistic sustainable performance across the Triple Bottom Line, encompassing economic, environmental, and social dimensions. Theoretically, this research unlocks the operational black box linking ESG initiatives to long-term performance, effectively bridging Stakeholder Theory with operations management scholarship. Practically, it provides actionable insights for managers seeking to transition from zero-sum bargaining paradigms to symbiotic ecosystems, leveraging ESG metrics not merely as compliance costs but as strategic instruments to construct resilient networks capable of navigating extreme global uncertainties.

Keywords: esg governance; supply chain resilience; sustainable performance; stakeholder collaboration; case study

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1. Introduction

In recent years, the global macroeconomic and business landscapes have entered a period characterized by volatility, uncertainty, complexity, and ambiguity. Geopolitical tensions, climate-related challenges, and public health events have highlighted the need for enhanced robustness in global supply chains. Under such dynamic conditions, enterprises relying solely on traditional, profit-focused operational models face increasing difficulty in maintaining stability amid external pressures. Concurrently, the Environmental, Social, and Governance (ESG) framework has become widely adopted as a guiding principle for responsible business practice. This ESG orientation requires core enterprises not only to advance internal sustainability efforts but also to extend

collaborative responsibility across upstream and downstream partners. The objective is to foster a supply chain ecosystem that supports balanced progress across economic performance, environmental protection, and social well-being.

As supply chain networks grow increasingly intricate, conventional hierarchical and directive management approaches have shown limited effectiveness [1, 2]. As a result, multi-stakeholder collaborative governance has emerged as a strategic priority. Under an ESG orientation, this approach goes beyond organizational boundaries, incorporating suppliers, regulatory authorities, civil society organizations, and end users into a coordinated governance structure. While the strategic importance of ESG-aligned collaborative governance is broadly recognized, a key theoretical question remains insufficiently addressed: what specific mechanisms enable this governance model to generate long-term sustainable outcomes? The underlying process linking collaborative ESG practices to measurable, enduring supply chain performance has not yet been fully clarified.

To address this gap, this study introduces 'supply chain resilience'—defined as a network's capacity to absorb challenges and adaptively recover—as a central mediating construct. The contributions of this research are twofold. Theoretically, it moves beyond direct associations between ESG initiatives and financial metrics. By establishing a logical sequence of 'collaborative governance → supply chain resilience → sustainable performance', this paper clarifies the pivotal role of resilience, thereby addressing a critical mechanistic gap in current supply chain scholarship. From a practical perspective, the study offers evidence-informed guidance for enterprises operating in highly dynamic environments. It demonstrates how firms can harness cross-sector collaboration to strengthen network robustness, supporting sustained advancement across economic, environmental, and social dimensions.

2. Literature Review and Theoretical Framework

2.1. Core Concepts and Literature Review

Traditional supply chain management, grounded in principal-agent dynamics, has historically prioritized cost reduction, risk allocation, and stringent delivery control by focal firms over suppliers and peripheral partners. While such efficiency-focused governance structures may enhance short-term operational performance, they often result in fragmented coordination and competitive, non-cooperative relationships among supply chain actors, thereby reducing the robustness of supply chain networks when confronted with external volatility and systemic stress.

In contrast, ESG orientation has evolved into a central governance logic within contemporary supply chain management. Research indicates that performance gaps related to environmental, social, and governance expectations significantly influence supply chain stability, reflecting the deep integration of ESG considerations into governance design and practice. ESG orientation denotes the systematic incorporation of environmental, social, and governance criteria into strategic decision-making and day-to-day operations across the entire supply chain. Diverging from conventional approaches centered on immediate financial returns, ESG-oriented supply chains prioritize long-term sustainability, ethical conduct, and inclusive stakeholder engagement. This shift has also propelled the advancement of sustainable supply chain management, which calls for the balanced pursuit of economic viability, environmental stewardship, and social well-being—not profitability alone. From this standpoint, firms must recognize their interdependence with the broader environmental and social ecosystems in which they operate. Pressing challenges—including climate adaptation, responsible sourcing, equitable employment practices, and efficient resource use—increasingly demand coordinated action across multiple tiers and entities within the supply chain network.

Within ESG-oriented supply chains, focal firms increasingly serve as integrative hubs, connecting suppliers, public authorities, civil society organizations, local stakeholders, and end users into cohesive governance arrangements. Capabilities rooted in mutual trust

and sustained collaboration can enhance organizational effectiveness by enabling strategic coherence and enduring cooperation among diverse participants. Compared with traditional governance models relying predominantly on formal contracts and oversight mechanisms, collaborative governance emphasizes open information sharing, relationship-based confidence, shared value creation, and joint capacity to manage uncertainty.

To address escalating uncertainty and network intricacy, firms are placing greater emphasis on adaptive and responsive organizational capabilities. Digital capabilities aligned with ESG objectives support governance evolution and strengthen firms' agility in volatile operating environments. Likewise, ESG considerations in cross-border trade necessitate governance frameworks that span organizational and geographic boundaries through multi-stakeholder engagement. Consequently, collaborative governance has become essential for harmonizing diverse interests and navigating complexity in global supply networks. Within this context, supply chain resilience has emerged as a vital organizational competency. Resilience refers to the capacity of a supply chain to anticipate potential disturbances, maintain functionality during unexpected events, and restore and reconfigure operations afterward while preserving continuity [3]. Distinct from conventional risk mitigation—which targets known threats—resilience centers on dynamic responsiveness under conditions of ambiguity. It typically encompasses three interrelated phases: anticipatory readiness prior to incidents, functional continuity during incidents, and post-incident recovery coupled with adaptive learning. The overarching aim is to sustain supply chain performance over time. Beyond conventional financial metrics, sustainable performance is increasingly assessed using a holistic framework that integrates economic vitality, environmental responsibility, and social contribution. In this study, economic performance reflects long-term operational reliability and market positioning; environmental performance covers greenhouse gas mitigation and circular resource management; and social performance includes fair employment standards, ethical commercial conduct, and constructive regional engagement. The multifaceted nature of supply chain risk may substantially influence both financial outcomes and ESG-related results.

Although prior scholarship has examined ESG governance, supply chain resilience, and sustainable supply chain performance individually, the literature remains largely siloed in several key respects. Few studies have clarified the mechanisms through which ESG-oriented collaborative governance fosters resilience development, or how resilience, in turn, enables improved sustainable performance. Accordingly, this study proposes an integrated theoretical framework that links ESG-oriented collaborative governance, supply chain resilience, and sustainable supply chain performance.

2.2. Theoretical Model Construction

Based on the preceding literature review, this study develops the conceptual framework illustrated in Figure 1. The proposed model posits that ESG-driven multi-stakeholder collaborative governance does not directly yield sustainable supply chain performance [4]. Instead, its influence is mediated by a critical bridging mechanism: the strategic enhancement of supply chain resilience through the reconfiguration of network characteristics and inter-organizational relationships.

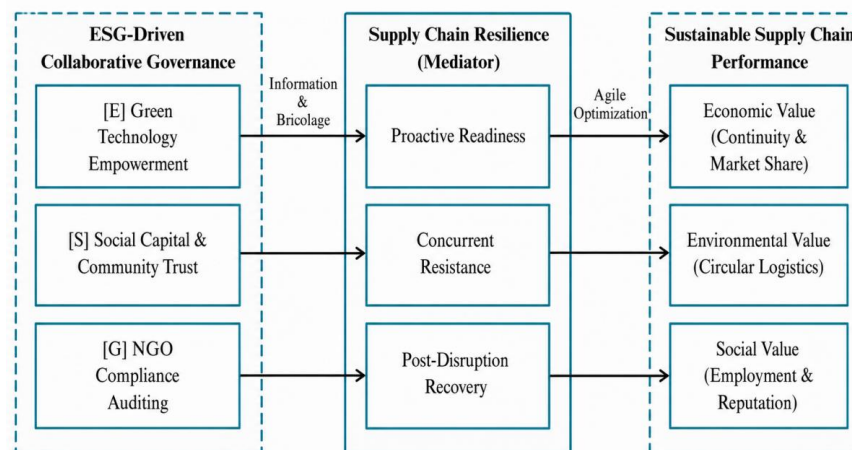


Figure 1. The Conceptual Model of ESG-Driven Collaborative Governance and Sustainable Supply Chain Performance

More specifically, ESG-oriented collaborative governance reshapes supply chain networks by strengthening stakeholder coordination, trust-based cooperation, information transparency, and shared risk management capabilities. These governance mechanisms improve the ability of supply chain actors to jointly anticipate, absorb, respond to, and recover from external uncertainties, thereby enhancing overall supply chain resilience. In turn, stronger resilience enables firms to maintain long-term operational continuity, adaptive capability, and sustainable value creation under volatile business environments. Accordingly, this study proposes a sequential relationship in which ESG-oriented collaborative governance enhances supply chain resilience, which subsequently contributes to sustainable supply chain performance.

2.2.1. Path a: Collaborative Governance Enhancing Supply Chain Resilience

ESG-oriented collaborative governance enhances supply chain resilience through several key theoretical mechanisms. From the perspective of Stakeholder Theory, firms are embedded within broader stakeholder networks that include suppliers, governments, non-governmental organizations, local communities, and customers [1, 5]. As a result, firms increasingly adopt collaborative governance approaches to align stakeholder interests and jointly address sustainability-related uncertainties.

Through ESG-driven collaboration, focal firms develop stronger relational ties, trust-based cooperation, and social capital across supply chain networks. For example, firms may support upstream suppliers by facilitating green technology adoption in environmental management or partner with international non-governmental organizations to strengthen compliance auditing and governance transparency. These collaborative relationships foster inter-organizational trust and long-term strategic alignment among stakeholders. During periods of significant macroeconomic volatility or unforeseen operational challenges, such trusted networks demonstrate greater capacity to operate beyond formal organizational boundaries, enabling more adaptive cross-network resource coordination and timely coordinated responses [6, 7].

Furthermore, collaborative governance promotes information transparency and facilitates digital information exchange among supply chain participants [8]. Consistent and comprehensive ESG disclosure reduces operational uncertainty and strengthens early risk detection capabilities within supply chain networks. Since effective multi-stakeholder collaboration relies on open communication and sustained ESG data sharing, this governance approach systematically enhances the ability of supply chains to anticipate, absorb, and recover from external challenges. Consequently, ESG-oriented collaborative governance not only advances sustainability coordination but also significantly strengthens supply chain resilience through improved trust, integrated resource utilization, and enhanced information-sharing infrastructure.

2.2.2. Path B: Resilience Driving Sustainable Performance

Supply chain resilience is not only a critical capability for enterprises to respond to emergencies but also a key mechanism for advancing sustainable supply chain performance [6]. Grounded in Dynamic Capabilities Theory, enterprises must continuously sense external environmental changes, respond promptly to emerging threats, and dynamically adjust and reconfigure resource allocation to sustain long-term competitive advantage. In this context, supply chain resilience manifests as dynamic adaptability—enabling enterprises to ensure operational continuity and pursue sustainable development amid uncertainty.

First, at the economic level, highly resilient supply chains mitigate adverse impacts of external shocks through flexible resource allocation, strategic redundancy, and rapid response mechanisms [9]. This reduces losses from operational disruptions, secures sustained delivery capacity, and preserves long-term market competitiveness.

Second, at the environmental level, resilience extends beyond restoration to post-crisis learning and adaptation [10]. Enterprises often enhance resource utilization efficiency via supply chain restructuring, material recycling, localized sourcing, and green logistics optimization—thereby driving continuous improvement in environmental performance.

Finally, on the social dimension, supply chain resilience safeguards the fundamental rights and interests of stakeholders—including employees, suppliers, and local communities—strengthening organizational credibility and stakeholder trust, and contributing to the long-term stability of the supply chain network [11]. Empirical evidence indicates that escalating supply chain risk complexity affects not only financial outcomes but also broader ESG-related performance. Consequently, the capacity to absorb and effectively manage risk shocks is essential for achieving balanced advancement across economic, environmental, and social dimensions.

In summary, supply chain resilience simultaneously enhances the triple bottom line—economic, environmental, and social performance—serving as a pivotal bridge linking ESG-oriented collaborative governance with sustainable supply chain outcomes.

3. Research Design and Case Introduction

3.1. Research Methodology

This study employs a qualitative single-case study methodology. Case studies are particularly well-suited for addressing "how" and "why" research questions, and are especially effective for exploring organizational phenomena embedded in complex real-world contexts.

Given that the underlying mechanisms through which ESG-oriented collaborative governance influences sustainable supply chain performance via supply chain resilience remain insufficiently understood, a single-case study design enables deep exploration of this causal process. Compared to large-scale quantitative research, case studies allow closer tracking of dynamic multi-stakeholder interactions, the evolution of governance models, and the development of resilience capabilities [9].

Analytically, the study adopts a mechanism-based explanatory approach, focusing on the causal pathway linking ESG collaborative governance, supply chain resilience, and sustainable supply chain performance. Thematic analysis is applied to encode and synthesize case data, enabling identification of key themes and their interrelationships [12].

3.2. Case Selection

Following the principle of theoretical sampling, this study selects BYD Co., Ltd. (BYD) as the research object. As a leading enterprise in the global new energy vehicle industry, BYD demonstrates high representativeness and research value in ESG practice and supply chain management.

First, BYD actively implements initiatives including zero-carbon industrial park development, supplier responsibility management, and power battery recycling,

integrating environmental, social, and governance considerations deeply into its supply chain ecosystem. This reflects the characteristics of multi-stakeholder collaborative governance, making BYD a suitable case for examining ESG-oriented collaborative governance.

Second, BYD constitutes an information-rich case [13]. From 2019 to 2023, global supply chains faced persistent disruptions from factors such as the pandemic, semiconductor shortages, and logistics constraints. Amid this complex external environment, BYD maintained strong operational stability and market growth, demonstrating notable supply chain resilience. Thus, this case effectively illustrates how ESG-oriented collaborative governance contributes to enhancing supply chain resilience and advancing sustainable supply chain performance.

3.3. Data Sources and Triangulation

To ensure the credibility and construct validity of the research results, this study applies data triangulation to cross-analyze secondary data from multiple sources. Data collection spans the period from 2019 to 2023, enabling observation of BYD’s dynamic evolution before, during, and following global supply chain adjustments.

The data are drawn from three complementary sources. First, publicly available corporate disclosures—including BYD’s annual reports, sustainability reports, and official announcements—provide foundational financial and operational insights [2]. In 2023, BYD reported operating income of 602.3 billion yuan and net profit attributable to parent company shareholders of 30 billion yuan, reflecting substantial scale and a high degree of transparency. Second, corporate governance practices, supply chain strategies, and sustainability initiatives are examined through sustainability reporting; BYD has received recognition for excellence in environmental, social, and governance (ESG) communication and implementation, underscoring its sustained commitment to responsible development. Third, industry analyses, authoritative media coverage, and peer-reviewed academic literature are integrated to corroborate enterprise-disclosed information, thereby strengthening evidentiary coherence and enhancing the robustness of research conclusions.

4. Case Analysis: The Evolution and Role of the Mediating Mechanism

This chapter systematically aligns the theoretical framework with the operational practices of BYD Company Limited [14]. Through a detailed examination of BYD’s development trajectory—especially during the period 2021–2022—it demonstrates how ESG-integrated collaborative governance contributes to sustainable performance, mediated critically by supply chain resilience.

4.1. Antecedents: ESG-Driven Multi-Stakeholder Collaborative Governance Practices

Traditionally, interactions between anchor enterprises and stakeholders have followed transactional, zero-sum patterns. However, BYD has proactively established an ESG-oriented governance ecosystem that integrates government bodies, suppliers, and nongovernmental organizations into a unified value-creation network. Specific collaborative initiatives are summarized in Table 1 and detailed below.

Table 1. Summary of BYD’s Multi-Stakeholder Collaborative Governance Initiatives

Stakeholder Category	Primary ESG Focus	Specific Collaborative Actions & Mechanisms
Government Authorities	E & G	Co-creating the Pingshan Zero-Carbon Industrial Campus; integrating municipal smart grids; aligning enterprise operations with national "Dual Carbon" policies.
Upstream suppliers	E & S	Enforcing the Supplier Code of Conduct; providing continuous ESG capacity-building training; assisting

NGOs & communities	S & G	Tier-1/Tier-2 suppliers in optimizing energy consumption and green manufacturing.
		Partnering with institutions like the Responsible Minerals Initiative (RMI) for conflict-free mineral audits; co-developing battery recycling ecosystems; ensuring transparent community reporting.

In alignment with China’s dual carbon strategic goals – peaking carbon emissions by 2030 and achieving carbon neutrality by 2060 –BYD has advanced beyond regulatory compliance to engage in policy co-creation. A representative initiative is the Shenzhen Pingshan Zero-Carbon Industrial Park, developed jointly with local government authorities. Through this public-private partnership, BYD has integrated smart grid technology, green infrastructure, and a renewable energy ecosystem. Such collaboration facilitates localized implementation of carbon reduction policies while securing institutional support and subsidies, thereby strengthening macro-level governance foundations.

4.2. The Mediating Process: Shaping Supply Chain Resilience through Collaborative Governance

As shown in Figure 2, the multi-stakeholder governance model does not immediately generate visible financial returns. Instead, its main contribution lies in transforming collaborative governance into supply chain resilience through two mechanisms. First, digital SRM integration strengthens information sharing between BYD and its upstream suppliers. By improving the visibility of supplier performance, inventory changes, key component availability, and sustainability-related indicators, BYD is better able to identify potential operational interruptions before they fully materialise. This enhanced information transparency supports earlier risk sensing, production adjustment, and strategic preparation, thereby improving the firm's proactive readiness before external shocks occur [15, 16].

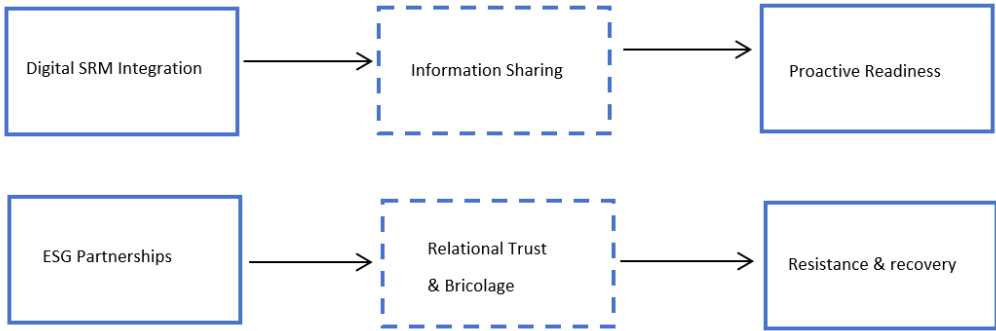


Figure 2. The Transformation Mechanism from Collaboration Governance to Supply Chain Resilience

Second, ESG partnerships foster relational trust and adaptive resource utilisation, which further strengthen continuity and recovery capacity during operational interruptions. Compared with short-term contractual relationships, ESG-oriented partnerships emphasise long-term cooperation, supplier empowerment, and mutual trust. Such relationships can reduce transaction friction and coordination costs when supply chains face uncertainty. During periods of logistics bottlenecks, raw material volatility, and semiconductor shortages, trust-based collaboration enables firms and suppliers to reconfigure available resources more efficiently and sustain critical operations [5]. In addition, adaptive resource utilisation allows the firm to integrate existing capabilities, alternative solutions, and supplier expertise to respond flexibly to operational limitations. Therefore, collaborative governance enhances supply chain resilience not through a single direct effect but through the two pathways of "digital SRM integration–information

sharing–proactive readiness" and "ESG partnerships–relational trust and adaptive resource utilisation–continuity and recovery capacity".

4.3. Outcome Transformation: The Leap from Resilience to Sustainable Performance

As a key intermediary mechanism, enhanced supply chain resilience contributes directly to BYD's outstanding triple bottom line (TBL) sustainable performance. During periods of industry-wide disruption, BYD demonstrated robust operational continuity, reflecting tangible financial benefits derived from supply chain resilience. In 2021 and 2022, global automakers faced production halts and substantial financial losses—measured in billions of dollars—due to critical component shortages. By contrast, BYD's resilient supply network ensured uninterrupted material flow, enabling sustained manufacturing operations. Rather than merely weathering the crisis, BYD proactively captured market share vacated by competitors' production suspensions. In 2022, the company delivered over 1.86 million new energy vehicles, representing a year-on-year increase exceeding 200%. This milestone in revenue and volume underscores that resilience, cultivated through collaborative governance, serves as a primary driver of long-term economic and competitive advantage.

The process of strengthening supply chain resilience also yields significant environmental benefits. To mitigate logistics-related disruptions, BYD has advanced localized procurement and circular supply chain practices. Through the development of integrated industrial parks co-located with core suppliers, transportation distances have been substantially reduced, thereby lowering associated Scope 3 carbon emissions. Furthermore, structured collaboration with non-governmental organizations and suppliers has facilitated the implementation of closed-loop recycling systems for end-of-life batteries, enhancing environmental sustainability across the full product life cycle.

A highly adaptive supply chain delivers exceptional socio-economic stability. When confronted with severe external shocks, BYD's capacity to sustain uninterrupted operations prevents the widespread workforce disruptions—such as mass layoffs and unpaid leave—that affected much of the manufacturing sector. By maintaining steady order volumes, BYD safeguards employment and income security for tens of thousands of workers across its upstream supplier network. This continuity not only bolstered local economic resilience during turbulent periods but also reinforced public confidence [14]. Consequently, BYD's international ESG ratings have shown consistent improvement, strengthening its standing as a globally recognized responsible corporate entity.

5. Conclusions and Managerial Implications

Through in-depth single-case analysis of BYD, this study systematically explores how ESG-driven multi-stakeholder collaborative governance affects sustainable supply chain performance. Three core conclusions were drawn from the study. First, the ESG-oriented governance model has shifted the traditional supply chain paradigm—moving beyond transactional exchanges and cost control—to foster deeper structural integration and coordinated relationships among core enterprises, governments, suppliers, and non-governmental organizations. Second, supply chain resilience serves as a key intermediary mechanism in this process. Collaborative governance does not directly translate into financial or social benefits; rather, it strengthens enterprises' capacity for proactive preparation, coordinated response, and rapid recovery through mechanisms such as information sharing, relationship trust, and resource integration. Third, enhanced supply chain resilience further advances sustainable supply chain performance across the triple bottom line (TBL) dimensions—enabling enterprises to sustain operational continuity and market competitiveness amid macro-environmental volatility while simultaneously supporting environmental stewardship and socio-economic stability.

This research contributes to the existing literature in two principal ways. First, it clarifies the mechanism linking ESG practice to long-term enterprise performance, unpacking the operational pathway between the two. Prior work has largely emphasized direct associations between ESG inputs and financial outcomes; this study introduces

supply chain resilience as an explanatory intermediary, demonstrating how ethical and collaborative governance translates into durable competitive advantage via strengthened operational capabilities. Second, it extends the theoretical scope of supply chain resilience. By integrating stakeholder theory with operational management perspectives, the study reframes resilience not merely as a structural capability for reactive risk mitigation, but as a strategic asset embedded in social relationships, environmental accountability, and multi-party collaboration.

From a practical standpoint, the findings offer actionable guidance for enhancing supply chain stability in highly dynamic and uncertain environments. First, core enterprises should move beyond zero-sum logic and short-term cost reduction toward cultivating a symbiotic supply chain ecosystem. Managers are encouraged to engage suppliers, governments, and civil society organizations as strategic partners in value creation, building long-term cooperative networks anchored in shared ESG objectives. Second, enterprises should embed ESG criteria systematically into supplier evaluation and management frameworks. Environmental compliance and supplier capability development should be viewed not as compliance overhead, but as strategic levers for strengthening relational capital and reinforcing supply chain adaptability. Third, enterprises should accelerate deployment of digital supply chain platforms to enhance transparency and responsiveness—leveraging real-time data sharing, ESG performance monitoring, and predictive risk analytics.

Although this study offers theoretical insight and practical relevance, several limitations warrant acknowledgment. First, the single-case design—centered on BYD, a leading firm in the new energy sector—constrains generalizability and external validity. Second, the pathways linking collaborative governance to supply chain resilience may differ across industries, enterprise scales, supply chain configurations, and institutional contexts. Future research could employ large-sample empirical approaches—such as structured surveys or secondary panel data analysis—to validate the mediating role of resilience and assess its conditional strength. Cross-industry comparative studies would also deepen understanding of how varied ESG governance models influence enterprise capacity to navigate global supply chain challenges.

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