Research on the Impact of Green Supply Chain Governance on Corporate Performance — A Case Study of CATL

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Abstract: Against the backdrop of the global "dual carbon" goal and sustainable development strategy, green supply chain governance has become a core capability that determines enterprises' access to international markets and long-term competitive advantages. This paper takes CATL as a case study, based on stakeholder theory, resource-based view and sustainable development theory. Using the company's operational data from 2020 to 2024, this study empirically examines how green supply chain governance affects corporate environmental, economic and social performance. Results show that green governance significantly reduces full-life-cycle carbon emissions, improves resource recycling efficiency, enhances supply chain resilience, boosts operating income and profitability, lowers financing costs, and increases brand value and social recognition. The coordinated improvement of environmental, economic and social benefits proves that green governance creates strong comprehensive value for leading enterprises. This research enriches empirical evidence on green supply chains and provides practical implications for Chinese new energy firms to advance low-carbon transformation.

***Keywords*:** green supply chain governance, corporate multi-dimensional performance, power battery industry, CATL, carbon emission reduction

1. Introduction

1.1 Research background and significance

In recent years, global climate governance has entered a stage of accelerated implementation. More and more countries have incorporated carbon neutrality into their long-term development strategies. New institutional constraints represented by the EU Carbon Border Adjustment Mechanism, green trade barriers and international ESG investment rules are reshaping the competition logic of the global industrial chain. For manufacturing enterprises, carbon emission intensity, environmental compliance and full-life-cycle sustainability have become basic conditions for entering the international market, obtaining capital support and maintaining stable customer cooperation. As a core component of new energy vehicles and energy storage systems, power batteries feature a long industrial chain, high resource dependence and multiple links including raw material mining, processing, large-scale manufacturing, logistics and recycling. Environmental risks or non-compliance in any link may threaten the stability and safety of the entire supply chain. Therefore, building a green supply chain and realizing full-chain low-carbon governance has become an inevitable choice for power battery enterprises to enhance core competitiveness.

With technological and scale advantages, CATL has become the world's largest power battery manufacturer, with a supply chain covering dozens of countries and hundreds of upstream and downstream enterprises. As an industry leader, CATL took an early lead in promoting green transformation and embedded carbon neutrality and sustainable development into its entire supply chain system. This paper studies its governance model and performance impact, which carries important theoretical and practical significance. Theoretically, this study expands the research boundary between green supply chain governance and corporate performance, clarifies the driving mechanism of chain-leading enterprises, and enriches the application of sustainable development theory and resource-based theory in emerging industries. Practically, it provides replicable experience for new energy and manufacturing enterprises to improve operational efficiency, reduce compliance risks and enhance international competitiveness under carbon constraints.

1.2 Review of domestic and foreign research

Foreign research on green supply chains started early. Early studies mainly focused on green procurement, cleaner production and reverse logistics. With the deepening of sustainable development, scholars gradually expanded their perspectives to full-chain collaborative governance. Bowen et al. (2001) pointed out that green supply chain management helps reduce environmental risks and improve brand reputation and market value [1]. Zhu et al. (2007) found that green practices increase short-term investment but improve financial performance through efficiency improvement, cost saving and green premium in the long run [2].

Domestic research is more in line with China's industrial development context, mostly focusing on policy-driven transformation, industrial upgrading and corporate strategic choices. Existing studies generally confirm that green supply chains can improve resource utilization efficiency, reduce environmental compliance costs and enhance adaptability to the international market. However, systematic case studies on how chain-leading enterprises drive upstream and downstream collaborative transformation through green governance to achieve multi-dimensional performance improvement are still insufficient [3][4]. Therefore, this paper takes CATL as the research object to supplement empirical evidence and make up for the deficiencies in existing research.

1.3 Research content and methods

This paper consists of five parts: introduction, core concepts and theoretical basis, green supply chain governance practices of CATL, impact of green governance on corporate performance, and conclusion and suggestions. This study adopts case study, literature research and data analysis. Supported by CATL's public data from 2020 to 2024, this paper combines quantitative and qualitative analysis to reveal the actual effects of green supply chain governance.

2. Core concepts and theoretical basis

2.1 Definition of core concepts

2.1.1 Green supply chain governance

Green supply chain governance refers to a comprehensive management mode that integrates ecological protection, efficient resource utilization, carbon emission reduction and circular economy into all links of the supply chain. Through standard formulation, supplier management, technological innovation, digital monitoring and industrial chain collaboration, it reduces environmental externalities and improves sustainable development capabilities [3].

2.1.2 Corporate multi-dimensional performance

This paper adopts a comprehensive performance system including environmental performance, economic performance and social performance to fully reflect the sustainable development level of enterprises.

2.2 Theoretical basis

2.2.1 Stakeholder theory

The operation and development of enterprises are affected by the government, customers, investors, suppliers and consumers. Green supply chain governance can meet the low-carbon and environmental protection needs of multiple parties, so as to obtain more resources and policy support to promote performance improvement.

2.2.2 Resource-based view

Green supply chain governance capability is a scarce and difficult-to-imitate heterogeneous resource of enterprises, which can form a sustainable competitive advantage and help enterprises achieve long-term performance growth [4].

2.2.3 Sustainable development theory

Sustainable development emphasizes the unification of economic, environmental and social benefits. Green supply chain is an important tool for enterprises to balance economic benefits and environmental responsibilities and promote high-quality development [4].

3. Green supply chain governance practices of CATL

CATL is a global leading provider of power batteries and energy storage batteries, with a huge and complex supply chain system. To cope with global low-carbon rules and sustainable development requirements, CATL has built a full-chain green supply chain governance system covering upstream, midstream and downstream.

At the source, CATL has established a strict green supplier management system, incorporating environmental compliance, carbon emissions and social responsibility into access and assessment. In the production link, CATL promotes zero-carbon factories, energy-saving technological transformation and renewable energy substitution. At the end, CATL has built a global battery recycling system to realize efficient recycling of key materials. Meanwhile, digital technology is used to build a carbon management platform to realize real-time monitoring of carbon footprint, environmental data and supply chain risks. These measures together constitute the core framework of CATL's green supply chain.

4. The impact of green supply chain governance on corporate performance

4.1 Impact on environmental performance

The most direct effect of green supply chain governance is the improvement of environmental performance. Through

full-chain carbon reduction, resource recycling and environmental risk control, CATL has significantly improved carbon emission intensity, resource utilization efficiency and compliance level.

Table 1. Core indicators of CATL's environmental performance from 2020 to 2024

Indicators	2020	2021	2022	2023	2024
Supply chain carbon emission intensity (Base value = 100)	100	88.5	76.2	65.3	57.7
Battery recycling rate (%)	82.5	85.1	87.2	91.3	95.0

Data source: CATL ESG Reports, Public Carbon Accounting Data and Sustainable Development Reports from 2020 to 2024.

First, carbon emission intensity continues to drop significantly. Driven by green supply chain governance, CATL has achieved full-chain carbon reduction from upstream materials to production and logistics, with the overall carbon emission intensity of the supply chain dropping by more than 40% in five years. The continuous carbon emission reduction has gradually realized carbon neutrality in the core business, significantly reduced the cost pressure brought by the EU Carbon Border Adjustment Mechanism, and improved international market access capacity [5].

Second, the level of resource recycling has been continuously improved. Power battery production relies on scarce metals such as lithium, cobalt and nickel, and the traditional model is highly dependent on mineral mining. By building a closed-loop recycling system, CATL's battery recycling rate has increased year by year, and a large number of recycled materials have re-entered the production link, which not only reduces the dependence on primary minerals but also reduces the environmental impact caused by resource mining [6].

Finally, environmental compliance and risk prevention capabilities have been significantly enhanced. Green supply chain governance runs environmental protection requirements through the whole process of supplier selection, production and logistics, maintaining a high level of environmental compliance and effectively avoiding production suspension, penalties and supply chain interruption risks caused by environmental problems.

4.2 Impact on economic performance

While improving environmental performance, green governance transforms into economic benefits through cost reduction and efficiency improvement, financing optimization, market expansion and efficiency improvement, becoming an important driving force for the sustained growth of economic performance.

Table 2. Core indicators of CATL's economic performance from 2020 to 2024

Indicators	2020	2021	2022	2023	2024
Operating income (100 million yuan)	503.19	1303.12	3285.94	3882.13	4237.01
Net profit (100 million yuan)	55.83	159.31	578.15	646.53	721.88
Weighted average financing cost (%)	4.5	4.2	3.9	3.5	3.1

Data source: CATL Annual Reports, Bond Issuance Announcements and Public Financial Data from 2020 to 2024.

First, green governance promotes the simultaneous growth of business scale and profitability. Supported by the green supply chain, the company's low-carbon products have prominent advantages, international customer recognition has improved, order scale has continued to expand, and operating income has grown rapidly. At the same time, efficiency improvement, energy consumption reduction and raw material cost optimization brought by the green supply chain further improve corporate profit margins [2][4].

Second, excellent green performance significantly reduces financing costs. As international capital pays more and more attention to ESG and low-carbon performance, CATL has obtained higher credit ratings and more favorable financing conditions with good environmental performance and sustainable governance system. The weighted average financing cost has decreased year by year, effectively reducing the financial burden [5].

Third, the green supply chain enhances market competitiveness and customer stickiness. Under the background that global automakers have put forward carbon neutrality goals, suppliers with complete green supply chains and transparent carbon footprint products have more advantages. Through green governance, CATL can provide customers with low-carbon battery products and full-life-cycle emission reduction solutions to consolidate its global market position [6].

Fourth, the green supply chain promotes the continuous improvement of internal operational efficiency. The application of zero-carbon transformation, digital management and energy-saving technologies has continuously reduced the energy and material consumption per unit product, optimized logistics and inventory costs, providing long-term support for the growth of economic performance.

4.3 Impact on social performance

Green supply chain governance not only improves environmental and economic performance but also significantly enhances corporate brand value, industry influence and social recognition, driving the continuous improvement of social performance.

Table 3. Core indicators of CATL's social performance from 2020 to 2024

Indicators	2020	2021	2022	2023	2024
Brand value (100 million yuan)	680	870	1097	1450	1860
Consumer satisfaction (%)	88.3	90.2	91.7	94.1	96.5
Number of upstream and downstream enterprises driven to green transformation	45	62	80	145	200+

Data source: Public Data from Brand Laboratory, Third-party Market Research Data and CATL Sustainable Development Reports.

First, green transformation significantly enhances brand value. The company has transformed from a traditional battery manufacturer to a zero-carbon technology enterprise, with a more high-end, sustainable and international brand image. Its brand value has increased significantly for five consecutive years, forming a distinct competitive advantage in the global new energy industry pattern [5][6].

Second, the company's industry leadership and discourse power have been continuously improved. As a leading enterprise, CATL drives hundreds of upstream and downstream enterprises to promote green transformation through green standard output, technical empowerment and collaborative management, promoting the low-carbon upgrading of the entire power battery industry chain. The company actively participates in the formulation of domestic and international green standards, significantly enhancing the global discourse power of China's new energy industry.

Finally, social recognition and stakeholder satisfaction continue to improve. The government, investors, consumers and partners highly recognize the company's green practices, creating a stable external development environment for the enterprise and further supporting its long-term sustainable development.

5. Conclusion

5.1 Research conclusions

CATL's green supply chain governance is a full-chain systematic system covering source control, production manufacturing, closed-loop recycling and digital collaboration. It is implemented through supplier collaboration, zero-carbon manufacturing, closed-loop recycling and carbon data management, with strong demonstration effects. Green supply chain governance has a significant and sustained positive impact on corporate environmental, economic and social performance. Carbon emission reduction, revenue growth and brand improvement are realized simultaneously, showing obvious synergistic efficiency characteristics [3][4]. Leading enterprises can play a role in driving the industrial chain through green supply chain governance, promote upstream and downstream collaborative carbon reduction, enhance supply chain resilience and international competitiveness, and form a virtuous cycle of "green governance – performance improvement – continuous investment" [5][6]. Under the background of increasingly stringent global low-carbon rules, green supply chain has become a core capability that determines the long-term competitiveness, market access and sustainable development of enterprises.

5.2 Limitations and prospects

This paper takes CATL as a single case, and the conclusions may have certain limitations. In the future, multi-enterprise and multi-industry comparative studies can be carried out to enhance the universality of conclusions. In addition, with the development of digital technology and carbon trading policies, the long-term dynamic mechanism of green governance can be further explored.

5.3 Suggestions

For enterprises, green supply chain governance should be elevated to a core strategy, strengthen supplier green management, increase investment in zero-carbon technology and digital control, and balance short-term investment and long-term benefits. For the industry and the government, the green supply chain standard system should be improved as soon as possible, green finance and policy support should be increased, and collaborative green transformation of the industrial chain should be promoted.

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