

Business Structure and Environmental Sustainability Strategy in China's EV Battery Industry: A Comparative Case Study of CATL and BYD

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Abstract. This study examines how business structure shapes the design and implementation of environmental sustainability strategies in China's EV-battery industry by comparing CATL, a specialised battery supplier, with BYD, a vertically integrated battery-and-vehicle producer. Using a qualitative comparative case-study design, it analyses corporate ESG and annual reports, official policy documents, academic literature and market-share data from 2023 to mid-2025. Drawing on sustainable supply chain management, global value-chain governance and the natural-resource-based view, the analysis identifies two overlapping coordination pathways. CATL's model is associated with more formalised inter-organisational carbon governance, supplier coordination and product-footprint accounting. BYD's integration supports closer links among battery-vehicle design, manufacturing efficiency and internal energy management, while still requiring upstream supplier governance. Market leadership can amplify implementation capacity but does not measure sustainability. The study shows that organisational boundaries shape where sustainability decisions and capabilities are coordinated across the value chain.

Keywords: electric-vehicle batteries, sustainable supply chain management, organisational boundaries, environmental strategy, CATL and BYD

1. Introduction

The rapid expansion of electric mobility has made lithium-ion batteries strategically important to industrial decarbonisation while shifting environmental pressure toward battery production, electricity consumption, critical-mineral extraction and end-of-life management. Battery sustainability is therefore not a narrow manufacturing issue. Environmental outcomes depend on decisions made across sourcing, cell production, vehicle integration, use, recycling and material recovery [1-3]. For firms, these pressures increasingly intersect with competitiveness because access

to major customers and markets depends on credible carbon accounting, responsible sourcing, resource efficiency and evidence of lifecycle improvement [4, 5].

China is a particularly relevant setting because its battery producers operate at global scale while responding to both domestic low-carbon policy and international lifecycle requirements. China's carbon-peaking and carbon-neutrality standards framework increasingly addresses product carbon footprints for new energy vehicles and lithium batteries, while the EU Batteries Regulation establishes requirements concerning battery carbon footprints, raw-material due diligence and recycling [6, 7]. These developments increase the strategic value of environmental information, traceability and value-chain coordination for globally active battery firms.

Existing research has extensively examined the environmental and technical dimensions of EV batteries, including production emissions, electricity mix, mineral bottlenecks, recycling technologies and lifecycle trade-offs [8-10]. SSCM research further explains why environmental and economic objectives should be integrated across supply chains rather than treated as peripheral reporting concerns [4, 11]. Recent research has examined lithium-ion battery production as an organisational and geographical production network [12] and has compared the technological catch-up and organisational capabilities of BYD and CATL [13]. Yet less attention has been paid to how organisational boundaries shape the relative locus and mechanisms of environmental sustainability coordination within and across firms. This gap matters because firms exposed to similar environmental pressures may require different governance mechanisms when their organisational boundaries differ.

Business structure helps explain this difference. A specialised battery supplier works with several automakers and upstream suppliers, so it has stronger incentives to make environmental information consistent across organisational boundaries. A vertically integrated producer can coordinate a larger share of battery design, vehicle manufacturing, energy management and production planning within the same corporate system. CATL and BYD therefore offer a theoretically useful contrast. CATL is battery-centred and serves multiple automakers, while BYD combines battery production with new energy vehicles, energy storage and related technologies [14]. Both firms face many of the same industry-wide environmental pressures, but battery-related decisions are located differently within their organisational structures.

This study asks: how, and through what organisational mechanisms, does business structure influence the design and implementation of environmental sustainability strategies among leading EV battery firms? A secondary question concerns how market position conditions this relationship without being treated as a direct measure of environmental performance. The paper argues that business structure shapes the locus of sustainability coordination. CATL's supplier model is associated with stronger formalisation of inter-organisational carbon management, supplier governance, product carbon-footprint accounting and recycling coordination. BYD's vertically integrated model enables sustainability to be embedded more directly in intra-firm production efficiency, battery-vehicle coordination, product design and system-level optimisation. These are relative emphases rather than mutually exclusive categories: both firms use carbon management, supplier governance and recycling, but they organise and prioritise them differently.

The study makes two related contributions. First, it extends SSCM by treating organisational boundaries as a condition that influences how sustainability is operationalised rather than assuming a uniform supply-chain response. Second, it connects global value-chain governance with the NRBV to distinguish inter-organisational environmental capabilities from intra-organisational integration capabilities. The objective is not to rank CATL and BYD as more or less sustainable, but

to explain why their business structures are associated with different implementation pathways and what this reveals about sustainability governance in the EV-battery sector.

2. Literature review and theoretical framework

2.1. Sustainable supply chain management and battery lifecycle challenges

The main theoretical basis of this study is SSCM. According to the definition of Carter and Rogers [4], sustainable supply chain management is the strategic and transparent integration of environmental, social and economic goals into inter-organisational business processes. In this way, environmental measures are more likely to be sustained if they are connected with risk management, efficiency and continuity of operations, and long-term competitiveness. Similarly, Pagell and Wu [11] argue that the transition toward a more sustainable supply chain will require changes in supplier relationships, traceability, innovation and operating practices, and not just an increase in reporting activities.

This is particularly important for the lithium-ion battery, where impacts occur at various stages of its lifecycle. Energy used to manufacture batteries, the mix of electricity used, battery chemistry, battery lifetime, and battery recycling affect batteries' environmental impacts, and electrification can shift part of the environmental burden from consumer use of vehicles to battery production and electricity generation processes [1, 8]. A second governance challenge concerns critical minerals. Some materials, such as lithium, nickel, cobalt, manganese, graphite and others, are geographically concentrated, are volatile in price and are exposed to environmental risks; companies must consider supply security, traceability and responsible sourcing [3, 9].

Recycling and circularity also make the coordination challenge extend beyond production. Large-scale recycling can reduce reliance on virgin materials and help deal with future waste, but effective recovery depends on appropriate technologies, collection networks, reliable end-of-life flows and the economic viability of putting recovered materials back into production [2, 10, 15]. Battery sustainability therefore cannot be represented by a single factory-level intervention. It requires coordination of environmental information and material flows among actors that may sit on different sides of firm boundaries.

2.2. Strategic motivations and the natural-resource-based view

Environmental strategy can create strategic value when it reduces regulatory exposure, improves resource productivity, protects market access or strengthens relationships with customers and regulators. Hart's [16] NRBV extends resource-based reasoning to the natural environment by identifying pollution prevention, product stewardship and sustainable development as potential sources of competitive capability. Hart and Dowell [17] emphasise that such capabilities evolve as firms adapt technologies, routines and stakeholder relationships to changing environmental demands.

For EV-battery manufacturers, sustainability therefore has environmental and competitive dimensions. Automakers increasingly request carbon and sourcing information from battery suppliers, regulators are developing product carbon-footprint rules, and end markets are moving toward lifecycle-based standards. Carbon accounting, renewable electricity, recycling and supplier governance can reduce impacts while improving regulatory readiness, customer confidence, supply security and market access [5]. This does not imply that sustainability and growth are automatically aligned. Rapid capacity expansion can create tension between cost control and long-term investment

in carbon reduction, recycling and supply-chain governance. The relevant analytical question is consequently how environmental objectives are integrated with the organisational structures through which firms compete.

2.3. Business structure as a governance architecture

Business structure determines which activities are coordinated within the firm and which depend on inter-organisational exchange. Global value-chain research demonstrates that governance varies with transaction complexity, codifiability and supplier capability, generating different degrees of coordination and power asymmetry [18]. Organisational boundaries are not neutral but can influence the flow of information, monitoring arrangements, power and the realisation of strategic goals.

A specialised battery supplier functions through a network of outside relationships. It must serve several automaker customers, coordinate upstream suppliers and show comparable environmental performance across products and markets. Environmental governance is likely to rely more heavily on codified carbon accounting, supplier requirements, traceability, product-level footprint information and cross-firm recycling arrangements. These capabilities can turn into strategic assets as they make coordination less costly and enable a supplier to meet a variety of customer and regulatory requirements at scale.

A vertically integrated EV-and-battery producer has more of the adjacent production steps in-house. Common ownership allows for the alignment of battery design, vehicle architecture, production scheduling, energy management and cost reduction. Sustainability can thus be integrated more directly into the manufacturing processes and the design of the product-systems. Vertical integration does not remove the dependence on the suppliers of minerals, materials and components. The theoretical difference is not whether or not there is supply-chain governance, but the relative locus of coordination.

This distinction also helps to explain market position. The large size and customer base of a dominant firm can facilitate its ability to invest in environmental systems and spread the requirements out along the value chain. However, market share is not an environmental outcome and cannot indicate carbon intensity, recycling effectiveness or sourcing quality. It is better thought of as a contextual indicator of strategic influence and capacity for implementation. The relationship examined in this paper is thus conditional; business structure influences where and how sustainability is coordinated, and market position can enhance the reach of these mechanisms.

2.4. Analytical expectations and expected contribution

Three analytical expectations guide the comparison. First, a specialised battery-supplier structure should be associated with greater formalisation of external sustainability governance, including supplier carbon management, product carbon-footprint accounting, traceability and recycling coordination. Second, a vertically integrated EV-and-battery structure should be associated with stronger coupling of sustainability with internal production efficiency, battery-vehicle integration, product design and system-level optimisation. Third, market position should amplify the ability to implement and diffuse sustainability practices without constituting a direct measure of environmental performance. The expected contribution is mechanism-based: organisational boundaries condition whether environmental capabilities are built primarily as inter-organisational governance capabilities or as intra-firm integration capabilities.

3. Methodology

3.1. Research design and case selection

The study uses a qualitative comparative case-study design. Case-study research is appropriate when a contemporary phenomenon is closely connected to its organisational and institutional context and when the objective is to examine mechanisms rather than estimate population-level effects [19]. Comparative cases are also useful for theory development because patterns of similarity and difference can be used to assess whether an explanatory mechanism is consistently supported [20].

CATL and BYD are theoretically selected contrasting cases within a common national-industry setting. Both are China's leading EV-battery companies facing similar market, technology and regulatory challenges, but with significantly different business models. CATL is a battery-centred company, supplying batteries to several external automakers; BYD makes batteries and vehicles, and undertakes related activities. The comparison therefore holds the broad national and industry context relatively constant while examining how organisational boundaries correspond with different environmental coordination mechanisms. It does not claim to isolate business structure from every firm-level difference.

3.2. Data sources, temporal scope and coding

The primary analytical window is 2023 to the first half of 2025. Corporate evidence includes CATL's 2023 carbon-neutrality announcement and 2024 ESG Report and BYD's 2024 Annual Report and 2024 Sustainability Report. These sources are supplemented with Chinese policy documents, the EU Batteries Regulation, industry market-share data based on SNE Research and reported by CnEVPost, and peer-reviewed academic literature. Corporate reports are used to identify stated strategies and reported implementation; policy documents establish regulatory context; industry data indicate relative market position. Earlier information is used only to establish company background and structural development.

The documents are examined through structured document analysis and thematic comparison [21, 22]. As shown in Table 1, evidence is coded into six dimensions derived from the theoretical framework: organisational structure and value-chain position; carbon-management architecture; manufacturing energy and efficiency; supplier and critical-mineral governance; recycling and circularity; and product-system integration. Within-case analysis first reconstructs each firm's strategy, after which the same dimensions are compared across cases. The analysis also considers rival explanations including market position, disclosure practices, product mix, technology strategy and regulatory exposure.

Table 1. Comparative coding framework

Dimension	Illustrative evidence	Interpretive question
Business structure	Supplier vs. integrated model; revenue and customer structure	Where key battery decisions are located
Carbon management	Targets; data systems; product footprinting; standards participation	External standardisation or internal integration?
Operations	Zero-carbon factories; renewable electricity; efficiency projects	How is decarbonisation linked to production control?

Table 1. (continued)

Supplier governance	Carbon requirements; training; traceability; due diligence	How strongly does the firm rely on external coordination?
Circularity	Collection; second life; recycling; material recovery	How are end-of-life flows linked back to production?
Product integration	Battery-vehicle design; architecture; system efficiency	Internal co-design or cross-customer standardisation?

3.3. Analytical credibility and limitations

Several procedures are used to improve analytical credibility. The same coding dimensions are applied to both firms, market-share evidence is separated from environmental-performance evidence, and reported corporate actions are distinguished from verified environmental outcomes. Policy timing and market data are used for contextual triangulation rather than as proof of causality. Contradictory or incomplete evidence is retained rather than resolved through assumption, and no aggregate sustainability score is constructed because the firms disclose different units of information.

The evidence base nevertheless imposes constraints. ESG reports are self-disclosures and may emphasise favourable initiatives. Battery-specific indicators are less visible for BYD because battery production is embedded in a wider vehicle business. A two-case design cannot fully separate organisational structure from differences in scale, customer composition, technology strategy or international exposure. The findings should therefore be read as structured associations and plausible mechanisms, not universal causal estimates.

4. Findings and comparative analysis

4.1. Business structure, revenue and market position

CATL and BYD occupy leading positions in the global EV-battery market through different organisational models. CATL's activities remain concentrated in power batteries, energy-storage batteries, battery materials and recycling. This battery-centred structure requires the firm to serve multiple external automakers and coordinate environmental information across a broad supplier-customer network. BYD embeds battery production within a larger EV and energy system in which batteries support substantial internal vehicle demand while the company also operates in energy storage and related technologies [14].

Revenue reporting reinforces the structural difference. In 2024, CATL's overall revenue amounted to around RMB 362.0 billion, comprising RMB 253.041 billion from Power Battery Systems, RMB 57.290 billion from Energy-Storage Battery Systems, and RMB 28.7 billion from Battery Materials & Recycling [23, 24]. In 2024, BYD reported operating revenue of RMB 777.102 billion and sales of 4.272 million new energy vehicles, though it did not provide a directly comparable standalone EV-battery revenue figure as battery production is integrated with vehicle production and other activities [14]. This is not an issue of data alone; it reflects how the two companies organise battery activities within their broader businesses.

As shown in Table 2, market-share data show the strategic scale of both firms without measuring sustainability. CATL's global EV-battery share was 36.8% in 2023, increased to 37.9% in 2024 and

remained at 37.9% in the first half of 2025. BYD's share rose from 15.8% to 17.2% and then 17.8% over the same periods [25-27]. CATL therefore remained the dominant specialised supplier, whereas BYD continued to expand its battery position alongside rapid growth in its own vehicle business. Scale can strengthen both firms' implementation capacity, but it interacts with different coordination architectures.

Table 2. Global EV battery market share, 2023-H1 2025

Period	CATL	BYD	Interpretation
2023	36.8%	15.8%	CATL clear leader; BYD second
2024	37.9%	17.2%	Both strengthened their positions
H1 2025	37.9%	17.8%	CATL remained dominant; BYD gained share

Source: Kang [25-27], based on SNE Research data.

4.2. Carbon-management architecture and operational decarbonisation

CATL formalised its carbon-management strategy in April 2023 by announcing targets for carbon neutrality in core operations by 2025 and across the battery value chain by 2035 [28]. Its 2024 ESG Report describes a wider architecture involving zero-carbon factories, product carbon-footprint assessment, a Carbon Chain Management System, supplier carbon training, renewable electricity, lifecycle assessment and participation in carbon-footprint standard development [29]. These practices are consistent with a supplier model that must produce environmental information that is credible and transferable across multiple customers and markets.

CATL also reports substantial operational indicators. By the end of 2024 it had nine zero-carbon factories, while zero-carbon electricity accounted for 74.51% of total electricity consumption at battery bases. The company reported 285 energy-saving projects and a 14.63% reduction in energy consumption per production unit at battery factories. It also reported nearly 200 carbon-reduction technologies, lifecycle assessment practices and Environmental Product Declarations for selected cell products [29]. These measures indicate that the carbon strategy goes beyond target setting to manufacturing processes and product-level accounting.

BYD's 2024 Sustainability Report features a different, yet progressively more structured framework. BYD has set an interim target of a 50% reduction in the carbon intensity of its own operations by 2030 from a 2023 baseline and is committed to achieving carbon neutrality throughout the value chain by 2045 [30]. The report links these targets to technological innovation, energy-saving renovation, renewable-energy measures, waste management, manufacturing efficiency and value-chain cooperation. Vertical integration therefore does not imply informal environmental governance. The distinction lies in organisational use: CATL's architecture is strongly oriented toward comparability across external relationships, whereas BYD can connect carbon objectives more directly with internal decisions involving vehicles, batteries, manufacturing and energy management. Table 3 summarises these selected carbon-management and operational indicators.

Table 3. Selected carbon-management and operational evidence

Dimension	CATL	BYD
Carbon target	Core operations carbon neutral by 2025; battery value chain by 2035	50% reduction in operational carbon intensity by 2030 from 2023 baseline; whole value-chain carbon neutrality by 2045
Governance architecture	Zero-carbon strategy; Carbon Chain Management System; product footprinting; LCA; standards participation	Corporate targets integrated with ESG governance, manufacturing, energy management and value-chain cooperation
Operational evidence	9 zero-carbon factories; 74.51% zero-carbon electricity at battery bases; 285 energy-saving projects; 14.63% lower energy use per production unit	Energy-saving renovation, renewable-energy measures, waste management and production-efficiency initiatives across the integrated system

Source: CATL [29] and BYD [30].

4.3. Supplier governance and critical-mineral risk

Supplier governance is central to CATL's sustainability model because a specialised battery producer depends on upstream material suppliers while simultaneously facing environmental requirements from downstream automaker customers. CATL's disclosures describe supplier carbon training, green-electricity requirements, carbon-data management and broader supply-chain coordination through its carbon-management systems [29]. Such practices may reduce information asymmetry and translate customer and regulatory expectations into requirements for upstream firms. Their strategic value is heightened by CATL's multi-customer position: standardised supplier information can be reused across products and jurisdictions.

BYD also maintains supplier governance and should not be interpreted as self-sufficient. It remains exposed to critical minerals, materials and external components. Its sustainability reporting describes green supply-chain initiatives, supplier standards, due diligence and environmental requirements [30]. The difference is that some coordination problems encountered by a specialised supplier across downstream customer boundaries can be addressed within BYD's own battery-vehicle system. Upstream sourcing risk remains external, but downstream coordination is more extensively internalised. Vertical integration thus shifts the boundary of supply-chain governance rather than removing the supply chain itself.

4.4. Recycling, circularity and product-system integration

The recycling of batteries is a key strategy for both companies as it can cut down on waste, recover valuable materials and minimise reliance on virgin resources in the future. CATL states that it has developed a closed-loop system linking battery use, echelon utilisation, recycling and resource regeneration, aided by a growing recycling network and resource recovery capacity [29]. For a specialised supplier, such a network can be used by more than one customer and can provide control over secondary-material flows between organisations. This network-oriented pathway is in line with

the literature's emphasis on linking recycling with collection and the reintegration of information and materials, rather than treating recycling as an end-of-pipe activity [2, 10].

BYD also reports that battery recycling and second-life use are part of its wider EV and energy business [30]. Vertical integration may offer benefits in identifying batteries from the company's own vehicles, linking battery design and development to end-of-life considerations, and synchronising recovered materials with production requirements. But achieving circularity on a larger scale still requires external collection networks, legislation and recycling partners. System-level constraints cannot be removed by integration; however, integration can reinforce closed-loop coordination within the system.

The most pronounced structural difference is seen in product-system integration. BYD produces both batteries and vehicles, so battery chemistry, pack architecture, vehicle design, manufacturing cost and performance can all be aligned within the same corporate group. The Blade Battery exemplifies this logic: its analytical value is not that it proves superior sustainability, but that battery and vehicle decisions can be coordinated under common ownership [14, 30]. CATL, instead, has to make batteries compatible with the different requirements of automakers. This increases the incentive for modularity, standardisation of product information, coordination interfaces and lifecycle documentation that can be used across customer relationships. Product carbon-footprint accounting thus has strategic importance for a multi-customer supplier as it can help decrease coordination costs and facilitate external comparability.

4.5. Regulatory timing and comparative synthesis

Regulatory timing provides additional context. CATL announced its carbon-neutrality plan in April 2023. The EU Batteries Regulation was adopted later in 2023, establishing a lifecycle-oriented framework covering carbon footprints, due diligence, raw materials and recycling, while China accelerated product carbon-footprint and carbon-accounting standardisation in 2024, including work relevant to lithium batteries and new energy vehicles [6, 7]. CATL's 2023 plan therefore did not precede the broader global movement toward battery carbon regulation, but it did precede several later Chinese product-level standardisation measures. Its carbon systems can be interpreted as partly anticipatory capability building within an already visible regulatory direction. BYD faces similar pressures as its battery and vehicle businesses internationalise, so both firms combine environmental commitments with market-access and regulatory-readiness considerations.

Taken together, the cases support the analytical expectations with important qualifications. CATL exhibits the characteristics expected of a specialised supplier: formalised supplier coordination, product-level carbon information, lifecycle governance and recycling systems that operate across multiple customer relationships. BYD demonstrates the coordination possibilities associated with vertical integration: sustainability can be connected directly with battery-vehicle design, manufacturing efficiency, energy management and internal production planning. Neither model is pure. CATL increasingly participates in broader system-level innovation, while BYD continues to rely on external supplier governance. Business structure is best understood as shifting the relative locus of coordination rather than determining a fixed list of practices. Table 4 summarises the relative coordination patterns across the two cases.

Table 4. Cross-case synthesis: business structure and sustainability coordination

Dimension	CATL: specialised supplier	BYD: vertically integrated producer
Primary coordination locus	Across external suppliers and automaker customers	Within an integrated battery-vehicle-manufacturing system, alongside external upstream suppliers
Carbon-management emphasis	Standardised product carbon information, supplier carbon systems and value-chain accounting	Corporate carbon targets linked with internal production, energy management and product systems
Supplier governance	High strategic importance across a multi-customer supply platform	Important upstream; downstream battery-vehicle coordination is more internalised
Circularity pathway	Network-oriented recycling and material recovery across battery value chains	Potentially tighter linkage among own-vehicle batteries, second life, recycling and internal production
Product integration	Must accommodate heterogeneous automaker requirements and interfaces	Can coordinate battery and vehicle design under common ownership
Role of market position	Can amplify external platform power and ability to diffuse standards	Can amplify internal deployment across the integrated ecosystem

5. Discussion

5.1. Business structure and the locus of sustainability coordination

The central finding is that business structure matters because it changes where environmental coordination must occur. Both CATL and BYD face carbon, mineral, recycling and market-access pressures, yet they organise responses through different governance architectures. CATL's reliance on external automakers and suppliers creates a stronger need for codified and transferable environmental information. BYD internalises a larger share of downstream coordination, allowing sustainability to be connected more directly with production planning and product-system design. The explanatory mechanism is therefore the location of coordination rather than a simple distinction between a 'supply-chain-focused' and an 'integrated' company.

This finding extends SSCM in two ways. First, it suggests that sustainability practices should not be analysed independently of organisational boundaries. Supplier monitoring, carbon accounting, recycling and eco-design can perform different strategic functions depending on whether relevant transactions are external or internal. Second, it highlights a distinction between inter-organisational and intra-organisational environmental capabilities. CATL's capacity to standardise carbon information across firms is an inter-organisational capability; BYD's capacity to align battery and vehicle decisions is an intra-organisational integration capability. Both can contribute to sustainability, but they solve different coordination problems.

5.2. Theoretical contribution: linking SSCM, value-chain governance and the NRBV

The theoretical contribution follows from integrating perspectives that are often treated separately. SSCM explains why environmental and economic objectives must be coordinated across supply

chains [4, 11]. Global value-chain governance explains how coordination and power vary according to inter-firm relationships [18]. The NRBV explains why environmental capabilities can become strategically valuable resources [16, 17]. The CATL-BYD comparison links these arguments by showing that business structure shapes the organisational arena in which sustainability capabilities are developed and exercised.

For specialised suppliers, environmental capability includes the ability to collect, codify, verify and transmit information across organisational boundaries. Product carbon footprints, supplier carbon systems and lifecycle documentation are not merely reporting tools; they can reduce coordination costs and increase legitimacy across a diverse customer base. Environmental capability also involves the ability to coordinate the different stages of production and product decisions internally for vertically integrated producers. Although not as visible as standalone battery indicators, manufacturing efficiency, battery-vehicle integration and system-level optimisation can become important sustainability mechanisms. The NRBV can thus be refined by recognising that some environmental capabilities can be found in inter-firm governance systems, in addition to internal technologies and routines.

5.3. Market position, rival explanations and implications

The analysis also helps to explain the role of market position. Market share shows scale and the extent of customer reach and potential influence, but not carbon intensity, the effectiveness of recycling or responsible sourcing. Market position still plays a role as it can amplify the reach of sustainability practices. A large specialised supplier can spread product-footprint standards and supplier requirements throughout its extensive external network; a large integrated producer can implement energy-management and product design throughout a significant internal manufacturing base. Therefore, the importance of scale differs according to business structure.

The differences observed are not explained solely by business structure. Additionally, the customer mix, product mix, international presence, disclosure policy and technology policy also differ, while company size itself can increase resources available for environmental investments. There could also be differences regarding regulatory exposure, as CATL has external automaker customers that may convey requirements that are not exactly the same as the ones encountered by BYD's vehicle business. Thus, the study makes the bounded claim that business structure is an important organisational mechanism for sustainability implementation but does not determine strategy independently of these factors.

The results also have implications for management and policy. Interoperable carbon data and supplier engagement are needed, together with product-level footprint methodologies and recycling schemes that work across customers and jurisdictions for specialised suppliers. While integrated producers have internal control to harmonise product architecture, energy management, production processes and planning for end-of-life, integration does not replace upstream due diligence. Comparable rules for lifecycle disclosure can decrease the fragmentation of information available on multi-customer supply platforms, and facilitate external assessment of the battery-specific environmental information when that information is sufficiently transparent, especially for vertically integrated companies.

5.4. Limitations and future research

The results have four limitations. First, the study relies heavily on corporate disclosures, which can be selective and cannot independently verify environmental outcomes. Second, there are different

units of information disclosed, which makes it harder to compare absolute battery-level environmental performance. Third, the two-case design does not lend itself to statistical generalisation and it is not possible to identify a single causal effect of business structure. Fourth, the 2023-mid-2025 period captures rapid institutional change but is too short to evaluate long-term target achievement. Future research should combine corporate reporting with plant-level emissions, supplier databases, recycling volumes, product carbon-footprint records and interviews, and should compare additional specialised suppliers and integrated automakers across countries and over time.

6. Conclusion

This study examined how business structure is associated with environmental sustainability strategy in China's EV-battery industry through a comparative analysis of CATL and BYD. Rather than asking which company is more sustainable, it focused on the organisational mechanisms through which sustainability is implemented. Firms facing similar environmental pressures can develop different governance pathways because key production and coordination activities lie on different sides of the firm boundary.

CATL's specialised supplier structure is associated with a more externally oriented sustainability architecture. Product carbon-footprint accounting, supplier carbon management, traceability and recycling networks are strategically important because the firm must coordinate across multiple upstream suppliers and downstream automakers. BYD's vertical integration creates different possibilities for coordination: batteries, vehicles, energy-related technologies and production processes can be coordinated within a single corporate system and sustainability can be embedded more directly in terms of production efficiency, battery-vehicle design, energy management and system-level optimisation. This does not eliminate the upstream supply-chain risk; instead, it shifts the location where many downstream coordination problems are solved.

The broader implication is that corporate environmental strategy is in part a matter of organisational design. In addition to asking which SSCM practices firms adopt, the question of where coordination takes place, who controls relevant information, and how environmental capabilities operate across organisational boundaries can strengthen SSCM research. Their reach can be amplified by market position but market position is not evidence of environmental performance. The sustainability outcomes are not a mechanical consequence of the business structure, but business structure helps explain how leading businesses translate similar environmental pressures into different strategic and operational responses.

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