

MECHANISM AND PATH OF CHAIN MASTER ENTERPRISES LEADING THE COLLABORATIVE DEVELOPMENT OF ZHAOQING NEW ENERGY VEHICLE INDUSTRY CHAIN FROM THE PERSPECTIVE OF HETEROGENEITY

YingLin Li, JiaXin Luo*, LianHua Liu, ZiLing Wang

School of Management, Guangzhou Huashang College, Guangzhou 510000, Guangdong, China.

**Corresponding Author: JiaXin Luo*

Abstract: Against the backdrop of intensifying competition within industrial chains, the industrial organizational capabilities of anchor enterprises have become pivotal in shaping regional industrial networks. Anchor enterprises positioned at different nodes of the value chain exhibit markedly distinct industrial driving logics. This study selects XPeng Motors' Zhaoqing production base and Ruiqing Times as comparative cases to analyze, from a heterogeneity perspective, the differentiated industrial driving logics—and their respective regional synergistic effects—of vehicle manufacturing anchor enterprises versus core-component anchor enterprises. The research finds that vehicle manufacturing anchor enterprises establish a "demand–order-driven" mechanism, leveraging vehicle production, market orders, and supplier networks to generate supporting demand upstream in the industrial chain; whereas core-component anchor enterprises establish a "technology–product-driven" mechanism, relying on core power battery technologies and scalable production capacities to catalyze industrial agglomeration across the battery supply chain. The mere establishment and clustering of anchor enterprises does not automatically yield industrial chain synergy; instead, the regional industrial environment, industrial park infrastructure, and industrial support services constitute critical supporting conditions for the regionalization of the anchor enterprise effect, thereby influencing the transformation of enterprise-level industrial driving effects into regional industrial organizational capabilities. Within a dual-chain parallel configuration, challenges such as insufficient capabilities among supporting enterprises, weak cross-chain linkages, limited shared services, and the absence of collaborative mechanisms constrain the upgrading of industrial networks. Accordingly, this study proposes actionable pathways—including enhancing the capabilities of anchor enterprises, fostering the competencies of supporting entities, constructing cross-chain network architectures, and refining collaborative mechanisms—to guide regional industrial networks from a dual-chain parallel state toward dual-chain coupling.

Keywords: Anchor enterprises; Heterogeneity perspective; Industrial chain collaboration; New energy vehicles

1 INTRODUCTION

The competitive landscape has been continuously evolving, with competitive entities gradually expanding from individual enterprises to the level of industrial chains. Within an industrial network, the leading enterprise serves as the core hub of the industrial chain; leveraging its technological accumulation, market position, and organizational capabilities to manage relationships with upstream and downstream industries, it facilitates collaboration among various entities within the chain, thereby driving capability upgrades among supporting entities along the chain. The value of such a leading enterprise is no longer confined to the expansion of its own operational scale; instead, it is increasingly manifested in the coordination, restructuring, and value creation of the entire industrial chain [1-2]. However, different leading enterprises occupy distinct positions within the industrial chain, which in turn leads to divergent characteristics in the key resources they control and the ways in which they exert influence over the chain. For vehicle manufacturing leading enterprises targeting the end-consumer market, their industrial influence stems from product market presence, brand strength, and an extensive upstream and downstream supporting ecosystem; whereas for leading enterprises in the field of critical intermediate components—such as power batteries—they rely more on core technological processes and large-scale production capabilities to achieve industrial leadership. The underlying mechanisms through which these two types of leading enterprises exert influence within the industrial chain differ significantly [3]. The role of chain leaders in driving industrial chain upgrading and enhancing industrial chain resilience has already been extensively discussed [3-4]. Most analyses treat chain leaders as homogeneous entities, with limited attention paid to the divergent industrial chain driving patterns arising from differences in their embedded positions within the value chain. Research on the heterogeneity of chain leaders has predominantly focused on the intrinsic attributes of individual enterprises, emphasizing the impact of such heterogeneity on corporate innovation performance [5]. However, given the practical scenario where two distinct types of chain leaders—those specializing in complete vehicle manufacturing and those specializing in core components—coexist within the same geographical region, there remains a scarcity of comparative case studies addressing how these different types of chain leaders can drive the extension of their respective industrial chains, and how the coexistence of diverse chain leaders can facilitate industrial chain synergy at the regional level. The

implementation of chain leaders does not automatically translate into enhanced regional industrial chain synergy; rather, the regional industrial environment and industrial infrastructure constitute critical conditions for the localized realization of the driving effects of chain leaders [6]. Furthermore, how to achieve functional integration among multiple parallel industrial chains still requires further investigation. The theory of industrial chain governance, grounded in the source of actor power, distinguishes between two governance paradigms: market-oriented and technology-driven [7]. The former relies on order constraints to engage upstream suppliers, whereas the latter leverages process barriers in intermediate products to establish industrial dominance. Nevertheless, existing empirical studies predominantly focus on single industrial chains, with limited exploration of the coexistence of heterogeneous chain leaders and the concurrent evolution of multiple parallel chains within the same geographical region. Xpeng Motors' Zhaoqing production base and Ruiqing Times are both located within the Zhaoqing High-tech Industrial Development Zone; they represent two types of "chain leaders" —one in complete vehicle manufacturing and the other in core power battery components, respectively. Together, they provide a typical research context for studying the evolution of regional industrial chains driven by heterogeneous chain leaders. This paper employs a dual-case comparative analysis to examine differentiated driving mechanisms and practical constraints, explores pathways for synergistic collaboration between the two chains, and offers actionable case references for similar regions across China.

2 RESEARCH DESIGN

2.1 Case Selection

This study selects XPeng Motors' Zhaoqing production base and Ruiqing Times (CATL's Zhaoqing production base) as comparative cases, representing, respectively, a full-vehicle manufacturing leader and a core-component manufacturing leader within the industrial chain. Both enterprises are located in the Zhaoqing High-Tech Industrial Development Zone, where regional policies and industrial park infrastructure conditions are highly aligned; this setup allows for the mitigation of external environmental disturbances, enabling the attribution of differences in industrial organization to the inherent characteristics of each leading enterprise. The two enterprises occupy distinctly different key nodes within the new energy vehicle (NEV) industrial chain. XPeng Motors' Zhaoqing production base focuses on the full-vehicle manufacturing segment, establishing industrial linkages centered around final vehicle assembly. By leveraging the production and delivery demands of finished vehicles, it drives the clustering of upstream and downstream component suppliers, thereby extending its own industrial chain. In contrast, Ruiqing Times centers its operations on the production of power and energy storage batteries, using power batteries—a pivotal intermediate product—as its foundation to expand its industrial ecosystem. Its industrial driving effect stems primarily from its product technical standards and large-scale production capabilities.

Both enterprises exhibit a developmental trajectory characterized by a gradual evolution from project implementation and construction toward assuming roles as drivers within industrial value chains. XPeng Motors' Zhaoqing base completed its establishment in 2017, obtained production qualifications in 2020 and achieved scaled production in 2020, and initiated the construction of a supporting components industrial park in 2022; meanwhile, Ruiqing Times' Zhaoqing base commenced construction in 2021, achieved the commissioning of its first production facility in 2022, and subsequently progressively completed its business layout encompassing battery cells, electrical cabinets, electrical boxes, and passenger vehicle battery packs. This complete developmental sequence provides observable empirical evidence for tracking the transformation of "chain leaders" —from mere production entities to comprehensive organizational entities within industrial value chains. Furthermore, these two enterprises operate in the terminal manufacturing and core components segments, respectively, representing two representative types of "chain leaders" within the new energy vehicle (NEV) industrial value chain. While existing research has extensively discussed the industrial value chain driving effects of chain leaders, such studies have predominantly focused on a single chain leader or a group of similar chain leaders; attention has been relatively limited to how regional industrial value chains evolve and how synergy can be achieved under the coexistence of these two types of chain leaders within the same region [8-9]. Accordingly, this study establishes the XPeng Motors' Zhaoqing base and Ruiqing Times as analytical units—representing a vehicle manufacturing-type chain leader and a core components-type chain leader, respectively—to investigate the shaping processes of these two types of chain leaders within their respective linked industrial value chains, as well as the underlying logic by which the industrial driving effects of these different chain leaders can be effectively integrated within a regional industrial environment.

2.2 Case Study Methodology

This study employs an embedded dual-case comparative research design, adhering to an inductive theoretical construction framework. Through systematic cross-case comparisons, it identifies causal mechanisms, focusing on whether and how differences in the types of chain leaders lead to systematic divergences in industrial organizational structures. Within individual cases, causal process tracing is applied: by examining key events—project implementation, capacity deployment, entry of supporting enterprises, and industrial park development—the study reconstructs the evolutionary process along the sequence of time-actor-key behavior-target entity -industrial outcome, thereby delineating the causal chains linking the actions of chain leaders with the responses of supporting entities. Cross-case comparisons are conducted via differentiated alignment, employing systematic comparisons across seven dimensions: chain leader type, position within the industrial chain, core resource base, key behaviors, responses of affiliated

enterprises, directions of industrial extension, and modes of industrial traction. On this basis, the study delineates two distinct mechanisms—"demand-order-driven" and "technology-product-driven"—and compares their differentiated manifestations (Table 1).

Table 1 Cross-Case Comparison Dimensions

Serial Number	Comparison Dimension	Xpeng Motors Zhaoqing Base	Ruixing Times
1	Chain Leader Type	Complete Vehicle Manufacturing Type	Core Component Type
2	Position in the Industrial Chain	New Energy Vehicle Manufacturing	Power and Energy Storage Batteries
3	Core Resource Foundation	Market Demand, Vehicle Orders, Supplier System	Core Technologies, Power Battery Products, Scalable Production Capacity
4	Key Actions	Supplier Access, Supporting Industrial Park Development, Joint Investment Promotion	Production Capacity Allocation, Product Portfolio Expansion, Specialized Support Services
5	Associated Enterprise Response	Component Supplier Entry, Contract Signing for Supporting Projects	Agglomeration of Material, Equipment, and Specialized Service Enterprises
6	Industrial Extension Directions	Automotive Components, Electric Motors and Controls, Automotive Electronics, Lightweighting	Battery Materials, Equipment, Pack, Energy Storage Applications
7	Industrial Driving Mechanisms	Order-Driven by Demand	Product-Driven by Technology

3 DEVELOPMENT FOUNDATION OF NEW ENERGY VEHICLE INDUSTRY IN ZHAOQING AND CHARACTERISTICS OF HETEROGENEOUS CHAIN OWNERS

3.1 Development Foundation of New Energy Vehicle Industry in Zhaoqing

New energy vehicles constitute a key priority cluster for Zhaoqing's industrial development strategy, with focused efforts on complete vehicle manufacturing, the "three-electric" systems, and vehicle lightweighting. The industrial infrastructure for this sector is primarily concentrated within the Zhaoqing High-tech Industrial Development Zone, and the industrial development paradigm has evolved from the introduction of individual projects to a chain-based industrial layout. In May 2022, the groundbreaking ceremony for the XPeng Intelligent Vehicle Supporting Components Industrial Park was held concurrently with the commissioning of the first power battery factory of Ruixing Times. The XPeng Supporting Components Industrial Park aims to enhance its industrial supporting capabilities across key segments, including complete vehicles, batteries, motors, electronic control systems, vehicle lightweighting, and the automotive aftermarket. The first phase of Ruixing Times' Zhaoqing base, with a total investment of 12 billion yuan, includes the planned construction of power and energy storage battery production lines. The concentrated establishment of these two strategic hubs—complete vehicle manufacturing and power battery production—within the High-tech Industrial Development Zone has fostered a dual-pillar industrial structure.

From the perspective of industrial organizational structures, Zhaoqing's new energy vehicle (NEV) industry is gradually evolving toward an industrial framework centered on complete vehicle manufacturing and power battery production as its key pillars. On one hand, complete vehicle production generates demand for components, logistics, and related production services; on the other hand, power battery projects create industrial demands for materials, equipment, and specialized related services. These two types of "chain leaders" extend their industrial linkages around distinct core segments, thereby laying the foundation for further industrial agglomeration and supply chain extension within Zhaoqing's NEV and related industries. These chain leaders serve as the core drivers behind the evolution of this chain-based industrial layout. They play a pivotal role in fostering innovative industrial development, facilitating the integration of industrial chain resources, and promoting synergistic growth among enterprises within the industrial chain. Their ecosystem leadership encompasses multiple dimensions, including technological innovation leadership, industrial collaboration and integration capabilities, and overall industrial development leadership [5].

3.2 XPeng Motors' Zhaoqing Base: Full-Vehicle Manufacturing Leader

The industrial integration of XPeng Motors' Zhaoqing production base has evolved from vehicle manufacturing to industrial ecosystem support. In 2017, XPeng Motors established its first production base in the Zhaoqing High-Tech Industrial Development Zone, thereby integrating the critical segment of new energy vehicle (NEV) manufacturing into Zhaoqing's industrial framework. By 2020, the Zhaoqing plant had obtained full vehicle production qualifications and commenced production of the XPeng P7, establishing a complete manufacturing chain encompassing stamping, welding, painting, final assembly, and PACK assembly. The leading enterprise in this industrial chain thus transitioned from project construction to large-scale production operations. The vehicle manufacturer, positioned at the demand integration stage, transmits requirements—pertaining to quality, delivery, and technical standards—along with model iterations and production schedules to its suppliers. In turn, this leading enterprise establishes unified production specifications to regulate upstream suppliers, thereby ensuring the quality of the end products.

With the ramp-up of vehicle production capacity, the demand for automotive component supply has continued to grow. In 2022, XPeng launched the construction of its Intelligent Vehicle Component Industrial Park, with the first phase covering 1,048 mu of land, and set a goal to attract 80–100 upstream and downstream supply chain enterprises within the next 2–3 years. Simultaneously, six supporting projects were signed and implemented, with planned investments totaling 1.26 billion yuan. The park emphasizes "localized supply and timely responsiveness," demonstrating that vehicle production demands have been transformed into an industrial phenomenon characterized by supplier clustering through the development of this industrial park. This process follows a clear causal chain: the expansion of vehicle production scale generates demand for component supply; this demand is then translated into targeted investment strategies via the construction of industrial parks; suppliers strategically locate their operations based on order forecasts and industrial clustering conditions; and ultimately, a industrial landscape emerges in which enterprises specializing in components, motors and electronic controls, automotive electronics, and lightweight materials converge around vehicle manufacturing hubs. Vehicle manufacturing leaders leverage their resource integration capabilities and market influence to play a pivotal role in fostering collaborative development across the industrial chain [3]. Accordingly, XPeng's Zhaoqing production base exhibits distinct characteristics of demand-driven dynamics and supplier organization. Its leadership role is primarily driven by the diffusion of end-user demand and vehicle production systems across related industries; its industrial organizational activities revolve around final vehicle assembly; its upstream and downstream component enterprises are attracted by integrated vehicle production requirements; and its industrial chain expansion strategy is fundamentally rooted in the production and delivery of finished vehicle products.

3.3 Ruiqing Times: Core-Component Leader

The chain leader position of Ruiqing Times is established in the key industry link of power and energy storage batteries. The first phase of the Ningde Times Zhaoqing Base project has a total investment of 12 billion yuan and started construction in March 2021. The first factory will be put into operation in May 2022, with plans to build power and energy storage battery production lines. Afterwards, the Zhaoqing base further formed business layouts such as battery cells, cabinets, boxes, and passenger car packs, and highlighted the production function of energy storage batteries. The power battery industry chain connects materials and specialized equipment upwards, and covers the entire vehicle and energy storage scenarios downwards. The chain owner relies on products, processes, and large-scale production capacity to achieve industrial driving. In the practice of Ningde Times, by sorting out the gaps in the industrial chain and relying on technical standards to promote specialized support in the upstream and downstream.

With the establishment of production capacity for power batteries, the demand for related materials, equipment, and specialized services has continued to grow. Power battery production involves a lengthy technological and supply chain; the successful implementation of its core projects can generate sustained demand for relevant production factors and specialized enterprises, thereby strengthening the foundation for the clustering of various industrial segments within the same geographical region. The packaging, energy storage applications, and related technical service segments have also progressively extended around these core components. This process follows a causal chain distinct from that of XPeng Motors: the establishment of technical standards for core products creates demand for specialized supporting components; the deployment of large-scale production capacity generates ongoing demand for materials and equipment; relevant enterprises then provide specialized supporting services centered on power batteries—a pivotal intermediate product—ultimately forming an industrial landscape in which material suppliers, equipment providers, and specialized service firms converge around the core component node. Leading enterprises occupying critical links in this industrial chain, leveraging their technological leadership and advantages in core products, can steer the formulation of industry technical standards and guide upstream and downstream enterprises in collaborative upgrading [1]. Consequently, Ruiqing Times has exhibited distinct characteristics of technology-driven product development and specialized supporting capabilities. Its industrial growth is primarily driven by the achievement of component technical standards and large-scale production capacity, with its industrial expansion extending outward from power batteries—this pivotal intermediate product—as the foundation, focusing mainly on related segments such as materials, equipment, and energy storage.

3.4 Comparative Analysis of Structural Characteristics of Two Types of Chain Leading Enterprises

XPeng Motors and Ruiqing Times both operate within the Zhaoqing industrial ecosystem; however, they occupy distinct nodes of the industrial value chain, exhibiting systematic differences in their resource foundations and organizational logics. Regarding their modes of industrial leverage, XPeng Motors' Zhaoqing production base operates under a "demand–order-driven" paradigm, which is driven by end-market demand, vehicle production plans, and its supplier network; its industrial influence stems from the delivery requirements of its complete vehicles in the consumer market, and this influence is transmitted upstream through supplier qualification processes and quality standards. In contrast, Ruiqing Times employs a "technology–product-driven" paradigm, leveraging its core power battery products, technological capabilities, and large-scale production capacity; its industrial driving force derives from the technical standards and supply capabilities of its core components within the new energy vehicle and energy storage markets. The industrial driving effects of chain leading enterprises rely on two mechanisms: the enhancement of the industrial ecosystem and the spillover effects of supply chain collaboration; the modes of capability transmission vary significantly across different types of chain leading enterprises [10]. At the enterprise response level: for XPeng, this

manifests as securing partnerships with component suppliers to facilitate their settlement in the region, with suppliers adjusting their production capacity and processes to align with the vehicle production rhythm; for Ruiqing Times, this manifests as the clustering of material and equipment service providers to develop supporting capabilities around its battery products. A vehicle chain leading enterprise establishes a supplier organization center based on end-market demand, whereas a core-component chain leading enterprise establishes a specialized supporting center grounded in technical standards. In terms of industrial chain extension, XPeng expands its operations across the complete vehicle component chain, whereas Ruiqing Times strengthens its operations within the power battery-related chain, thereby forming a regionally differentiated division-of-labor network—a clear illustration of how a firm's position within the value chain shapes its strategic behavior (Table 2).

Table 2 Comparison of the Key Characteristics of XPeng Motors' Zhaoqing Base and Ruiqing Times

Serial Number	Comparison Dimension	Xpeng Motors Zhaoqing Base	Ruixing Times
1	Chain Leader Type	Complete Vehicle Manufacturing Type	Core Component Type
2	Position in the Industrial Chain	New Energy Vehicle Manufacturing	Power and Energy Storage Batteries
3	Core Resource Foundation	Market Demand, Vehicle Orders, Supplier System	Core Technologies, Power Battery Products, Scalable Production Capacity
4	Key Actions	Supplier Access, Supporting Industrial Park Development, Joint Investment Promotion	Production Capacity Allocation, Product Portfolio Expansion, Specialized Support Services
5	Associated Enterprise Response	Component Supplier Entry, Contract Signing for Supporting Projects	Agglomeration of Material, Equipment, and Specialized Service Enterprises
6	Industrial Extension Directions	Automotive Components, Electric Motors and Controls, Automotive Electronics, Lightweighting	Battery Materials, Equipment, Pack, Energy Storage Applications
7	Industrial Driving Mechanisms	Order-Driven by Demand	Product-Driven by Technology
8	Primary target beneficiaries	Component suppliers, logistics providers, and industrial service providers	Materials, equipment, and specialized supporting enterprises

4 MECHANISMS BY WHICH CHAIN LEADER ENTERPRISES DRIVE THE COLLABORATIVE DEVELOPMENT OF ZHAOQING'S NEW ENERGY VEHICLE INDUSTRY CHAIN FROM A HETEROGENEITY PERSPECTIVE

4.1 Heterogeneity of Chain Leader Enterprises Drives Differentiated Industrial Guidance

Although XPeng Motors' Zhaoqing production base and Ruiqing Times operate within the same new energy vehicle (NEV) industry chain, they occupy distinct segments—complete vehicle manufacturing and power battery production—resulting in fundamentally different industrial driving mechanisms. The industrial driver of XPeng Motors' Zhaoqing base primarily relies on end-market demand, complete vehicle production plans, and its supplier ecosystem. Complete vehicle production imposes stringent requirements on component quality, delivery lead times, technical interfaces, and supply stability; consequently, production requirements can be cascaded upstream through order allocation and supplier qualification processes. As the Zhaoqing base achieves scalable production capacity and advances the development of a supporting component industrial park, the market demand from complete vehicle manufacturers is increasingly transformed into a pivotal driver for supplier onboarding and supporting capacity development. In contrast, XPeng Motors' Zhaoqing base organizes its industrial activities around complete vehicle final assembly, leveraging vehicle integration demands to attract upstream and downstream component manufacturers; its industrial expansion strategy is fundamentally rooted in the production and delivery of finished vehicle products. Conversely, Ruiqing Times' industrial strategy is more technology-and core-product oriented. Its power battery production connects upstream materials, specialized equipment, and energy management systems with downstream vehicle and energy storage applications. Once scalable production capacity is established, this model generates sustained demand for specialized materials, equipment, and professional services, while technical standards and product ecosystems further incentivize related enterprises to provide specialized supporting capabilities for core components. Ruiqing Times thus expands its industrial ecosystem around power batteries—a critical intermediate product—where its industrial driving effect stems primarily from product technical standards and scalable production capabilities. The two entities thus follow two distinct organizational pathways: demand-order driven versus technology-product driven, respectively. However, as the supply chain leader operates a nationwide supply network, local enterprises seeking to enter this core supply chain must overcome barriers such as quality control, process consistency, and batch supply capabilities—thereby limiting the potential for the supply chain leader effect to be fully unleashed locally.

4.2 Response of Associated Enterprises and Differentiated Industrial Chain Extension

The industrial impact of a chain leader enterprise is not merely reflected in the increase in the number of associated projects; more importantly, it lies in whether the chain leader's capabilities can be extended outward along the industrial chain relationships. The two types of chain leaders give rise to distinct types of industrial demands, which in turn lead to systematic differences in the entry modes of associated enterprises and the directions of their industrial chain extensions. Regarding XPeng Motors' Zhaoqing production base, the response of associated enterprises has primarily manifested as the entry of component suppliers and the signing and implementation of supporting projects. Complete vehicle production imposes stringent requirements on component quality, delivery reliability, and technical interfaces; consequently, suppliers must allocate production capacity and adapt their processes in alignment with the production rhythm of the complete vehicles. At Zhaoqing, XPeng Motors has established a supporting component industrial park and conducted supply chain investment promotion initiatives, facilitating the gradual clustering of enterprises across various segments—including components, motors and electronic controls, automotive electronics, and lightweight materials—around the complete vehicle manufacturing node. Through sustained participation in this complete vehicle production ecosystem, these suppliers have continuously accumulated capabilities in quality control, rapid delivery, and technical responsiveness. In contrast, the response of associated enterprises in Ruiqing Times has primarily manifested as the clustering of material suppliers, equipment providers, and specialized service enterprises. Power battery production involves a relatively long technical and supply chain; the implementation of core projects in this sector generates sustained demand for relevant production factors and specialized enterprises. The segments of battery packs, energy storage applications, and related technical services also progressively extend around these core components. Material, equipment, and specialized service enterprises provide specialized supporting services centered on power batteries—a critical intermediate product—thereby forming an industrial agglomeration pattern distinct from that of the complete vehicle supply chain. In Zhaoqing's new energy vehicle industry, the dual-chain development framework has only achieved geographical spatial agglomeration; each sector relies on external supplier networks for operation, and this spatial overlap has not led to substantial business interactions, while cross-chain regional collaboration remains relatively underdeveloped.

4.3 The Regionalized Chain-Leader Effect of Industrial Park Platforms and Industrial Service Support Chains

The formation of industrial traction by chain owners does not necessarily mean that this ability will automatically accumulate into local industrial advantages. The supplier system, technical cooperation, and production network have cross regional attributes, and whether the chain master effect can form sustained industrial connections locally depends on whether the regional industrial environment has the ability to undertake enterprise demand, allocate industrial elements, and organize related entities. Zhaoqing is promoting the construction of industrial parks, supply chain investment attraction, and the introduction of supporting projects around chain leading enterprises, so that the industrial demand at the enterprise level can further enter the process of local industrial layout and resource allocation. For the main chain of vehicle manufacturing, the park platform focuses more on supporting and supporting the components and supplier system; For core component chain owners, they focus more on improving industrial conditions around materials, equipment, and related specialized links. Zhaoqing High tech Zone and Xiaopeng Motors have established a joint construction supporting industrial park, joint investment attraction, and industrial interaction mechanism, enabling the procurement needs, supplier resources, and industrial chain gaps mastered by the chain owner enterprises to enter local investment decision-making, forming a chain investment logic of chain owner identification needs, park allocation resources, and supplier follow-up entry. The value of park carriers is to reduce collaboration costs and transform the advantages of enterprise level chain owners into regional industrial organization capabilities. However, the current shared service resources such as testing and pilot testing are scattered, and there is a mismatch between talent supply and job demand, which weakens the efficiency of the park's undertaking.

4.4 From Dual Chain Parallel to Regional Industrial Chain Collaboration

Regional industrial chain collaboration is the process of industrial linkage evolving from individual driving and chain extension to resource sharing, functional connectivity, and industrial ecological integration. For the new energy vehicle industry in Zhaoqing, the first manifestation of the two types of chain owners is the extension of the chain and differentiated industries respectively. Further regional collaboration relies on the connection of public services, industrial platforms, innovative resources, and industrial coordination mechanisms. The whole vehicle chain and the power battery chain have sharing needs in the fields of testing and certification, intelligent manufacturing services, industrial Internet, logistics and warehousing, talent training, green energy and public technology platforms. The collaboration of these public links can reduce the duplication of investment and collaboration costs between the two industrial chains, and further transform the diversified industrial organization pivot formed by heterogeneous chain owners into regional industrial synergy advantages. For highly market-oriented matters such as technology routes, supplier selection, and product procurement, enterprises should maintain independent decision-making. The ecological leadership of the chain owner enterprise enhances the resilience of the industrial chain by promoting breakthroughs in key core technologies, collaborative support, and digital transformation of the industrial chain. This means that the whole vehicle manufacturing chain owner promotes the improvement of the parts industry chain through collaborative supporting paths, while the core component chain owner drives the upgrading of battery materials and equipment links

through key technological breakthroughs. Both paths have their own strengths, but collaboration within their respective chains is not enough, and functional connections need to be formed at the cross chain level.

Accordingly, from a heterogeneity perspective, the mechanism by which anchor enterprises drive the synergistic development of the new energy vehicle (NEV) industrial chain in Zhaoqing can be summarized as follows: the distinct types of anchor enterprises determine the modes of industrial traction and the response patterns of associated enterprises; these two types of anchor enterprises, respectively, establish two industrial organization pathways—demand-and order-driven pathways, and technology-and product-driven pathways. The regional industrial environment then leverages industrial park platforms and industrial service facilities to transform this anchor enterprise effect into regional industrial organizational capabilities. Ultimately, functional integration and resource sharing across different industrial chains must be achieved through cross-chain collaborative mechanisms. Such cross-chain integration and resource sharing, in turn, require the establishment of routine information exchange channels and demand-response mechanisms at the industrial chain level as foundational prerequisites. Currently, however, well-established routine information exchange channels between anchor enterprises and supporting enterprises, as well as between the two industrial chains, have not yet been fully developed. Consequently, the identification and alignment of the supply gaps identified by anchor enterprises with the development needs of supporting enterprises remain challenging, which constitutes an additional practical constraint on the coupling of these dual industrial chains.

5 IMPLEMENTATION PATHWAYS FOR LEADING ENTERPRISES TO DRIVE COLLABORATIVE DEVELOPMENT OF ZHAOQING'S NEW ENERGY VEHICLE INDUSTRY CHAIN FROM A HETEROGENEITY PERSPECTIVE

5.1 Cultivation of Differentiated Leading Enterprise Capabilities and Reinforcement of Core Strategic Pillars within Industrial Chains

The activation of chain owner capabilities should not adopt a homogeneous support logic for the two different types of industrial organizational paths of Xiaopeng Motors' Zhaoqing base and Ruiqing era. For vehicle manufacturing chain owners such as Xiaopeng Motors' Zhaoqing base, they should base themselves on their advantages in the end market and vehicle production system, stabilize the scale of vehicle production, enrich the product spectrum, continuously strengthen the internal supplier collaboration system, and further release the supporting traction efficiency of the vehicle end to the upstream and downstream. For core component chain owners like Ruiqing Era, we should continue to strengthen the iteration and large-scale production capacity of power battery technology, enhance the output of technical standards, and connect the industries of battery materials, equipment manufacturing, and energy storage applications. The focus of cultivating chain owners has shifted from supporting production to activating the organizational functions of the industrial chain. Promote the joint efforts of chain owners and industrial parks to identify supporting gaps, transform chain owner procurement and technical standards into regional cooperation basis, and drive supporting enterprises to improve their quality, delivery, and technical response capabilities.

5.2 Enhancement of Local Supporting Capability and Regional Embedding of Chain Owner Enterprises

Whether the industrial drive of the chain owner can be transformed into local industrial advantages depends on whether the local supporting entities and the chain owner's industrial chain system can establish stable business connections. The supplier networks of the two major chain owners have national layout characteristics, so high localization rate of the industrial chain cannot be simply pursued as a goal. It is necessary to comprehensively consider transportation costs, delivery time, technological interaction, and supply security, and select suitable sub links for local cultivation. Targeting Xiaopeng Motors' Zhaoqing base, we will focus on cultivating productive service industries such as automotive electronics, lightweight components, intelligent driving related components, and logistics; Facing the Ruiqing era, we focus on improving related industrial links such as battery auxiliary materials, testing services, and energy storage applications. Support local enterprises in technological transformation and quality system construction, rely on chain owners to build docking channels, open up opportunities for sample testing and small batch trial supply, and help enterprises to meet standards. The local supporting goal is to enhance Zhaoqing's position in the industrial division of labor in the Greater Bay Area and expand market opportunities for the bay area.

5.3 Transition Path from Dual-Chain Parallel Development to Dual-Chain Coupling

The essence of dual-chain coupling lies in identifying the common needs of the two industrial chains, addressing shared industrial prerequisites, and facilitating the alignment of industrial functions with resource systems. In public sectors where economies of scale are achievable—such as testing and certification, intelligent manufacturing services, industrial internet, logistics and warehousing, talent training, green energy, and public technical platforms—existing fragmented resources should be strategically integrated to establish cross-chain service ecosystems open to both industrial chains, thereby reducing redundant infrastructure development and collaborative costs. The selection of technical roadmaps, supplier procurement, and product acquisition constitute market-driven operational decisions for enterprises; in such cases, the autonomous choices of market entities should be fully respected. This approach distinguishes between public collaborative mechanisms at the platform level and market-oriented partnerships at the enterprise level, thereby enhancing the precision of industrial chain synergy. Concurrently, enterprises should explore cross-sector business

scenarios between the complete vehicle and power battery chains, investigating synergistic opportunities in areas such as energy storage applications and integrated vehicle energy management, thereby creating a practical foundation for inter-chain business interactions. In industrial investment promotion efforts, the focus should shift from relying solely on project portfolios led by a single chain leader to identifying shared capability gaps and common service deficiencies across both industrial chains. Through chain supplementation, chain extension, and chain integration, the industrial organizational model can evolve from separate development of individual chains toward a multi-node ecosystem supported by collaborative efforts.

5.4 Improvement of Collaborative Mechanism Involving Chain Owner Enterprises

Build a collaborative mechanism based on identifying the needs of chain owners and diagnosing gaps in the industrial chain, to gather the capability demands and shortcomings of the entire vehicle chain, power battery chain, and common service areas. Carry out differentiated chain repair for the exclusive shortcomings of the segmented chain; Promote cross chain resource sharing in response to common demands such as logistics, testing, talent, and innovative services; For local industrial connections lacking cost and efficiency foundations, do not deliberately pursue local supporting facilities, and respect the objective laws of cross regional division of labor in the industrial chain. Establish a normalized coordination channel involving chain owners, key supporting enterprises, park operators, and industrial service institutions to dynamically track changes in production capacity, supporting demands, and technological upgrading directions. In response to the supporting gaps raised by the chain owner, we will coordinate with investment promotion, public platforms, and policy resources to provide targeted responses; Targeting the common challenges faced by supporting enterprises in financing, technological transformation, talent, and market expansion, we will concentrate on matching public service resources. Establish dynamic monitoring of the industrial chain, promote the shift of industrial governance from project services to industrial ecological governance, and provide institutional guarantees for dual chain coupling.

6 CONCLUSION

This study finds through a comparison of two cases that the differences in value chain positions have given rise to two types of chain leader organizational models: demand order driven and technology product driven, forming a dual chain parallel pattern in Zhaoqing. The agglomeration of chain owners does not equal the synergy of industrial chains. The localization and release of the main effect of the chain through the regulation of parks and industrial services, as well as the lack of supporting thresholds, cross chain interaction, and shared carriers and information channels, constrain the level of synergy. To achieve dual chain coupling, it is necessary to cultivate differentiated chain owners, enhance local supporting facilities, build cross chain public platforms, and improve diverse collaboration mechanisms. The regional industrial environment, park platforms, and industrial services further transform the chain master effect at the enterprise level into regional industrial organizational capabilities through industrial carrying, resource allocation, and public services. Under the dual chain parallel pattern, constraints such as insufficient local supporting capabilities, weak cross chain interaction, limited shared services, and lack of information exchange channels still exist. The focus of the next stage of the new energy vehicle industry in Zhaoqing should shift from the aggregation of chain main projects to the improvement of industrial chain organizational capabilities. Through differentiated cultivation of chain main capabilities, enhancement of local supporting capabilities, promotion of dual chain coupling, and improvement of collaborative mechanisms, the industry should be promoted from dual chain parallel to dual chain coupling.

COMPETING INTERESTS

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