Causes and Governance of Involutionary Competition in China's New Energy Vehicle Industry

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Abstract. Based on the Structure-Conduct-Performance paradigm, this paper explores the generative mechanism of the current involutionary competition within China's new energy vehicle industry. Findings reveal that technological homogeneity and product-service homogenization have normalized price competition, while disruptive technological innovations have reshaped the landscape between established and emerging automakers, leading to market supply-demand imbalances. Furthermore, local government investment priorities and industrial policies have fostered industrial isomorphism. However, in pursuit of economic growth and industrial performance, local governments generally adopt investment incentive policies such as land preferences and financial subsidies in the new energy vehicle sector. This leads to a high degree of overlap in industrial layouts across regions, further strengthening the phenomenon of industrial isomorphism and exacerbating the level of "involution".To overcome this involutionary competition, a coordinated governance system must be established, encompassing technological innovation, industrial ecosystem optimization, market order regulation, internationalization strategies, and consumer environment improvement. This paper aims to provide theoretical support and practical references for promoting high-quality industrial development, while contributing Chinese experience to the global transition toward new energy vehicles.

Keywords: New energy vehicle; involutionary competition; Structure-Conduct-Performance paradigm; industrial policy.

1. Introduction

Against the backdrop of the dual carbon goals becoming a national strategy, China's new energy vehicle industry has experienced explosive growth in recent years. Domestic sales surged from 20,000 units in the first half of 2014 to 12.866 million units in 2024, with market penetration reaching a historic peak of 40.9% [1]. Meanwhile, according to China's General Administration of Customs statistics, China's electric vehicle exports grew from 147,100 units in 2018 to 2.2388 million units in 2024. China has not only become the worlds largest new energy vehicle market but also leads the global automotive industry's electrification transformation.

However, behind the rapid growth lie structural concerns that have plunged China's new energy vehicle industry into involutionary competition. At the technological innovation level, the lack of breakthroughs in core technologies and product homogenization stemming from shared technological origins have intensified the normalization of price competition. At the market structure level, innovations in new energy vehicle technology have reshaped the competitive landscape between traditional and new energy automakers, highlighting structural imbalances on both the supply and demand sides [2,3]. At the policy level, similar investment preferences among local governments lead to overlapping high-tech industry layouts across regions, inducing overcapacity and market fragmentation.

Existing literature primarily explains the involution of new energy vehicles through three pathways. First, price wars triggered by technological homogenization following subsidy reductions [2]. Second, supply-demand mismatches between new and traditional automakers under disruptive technological shocks [3]. Third, amplified overcapacity due to local industrial homogeneity and administrative decentralization [4]. However, these studies either focus on isolated factors or remain at the macro level, failing to integrate technology-market-institutional dimensions into a unified analytical framework. They also lack systematic evaluation of the synergistic effects of governance tools, leaving room for these papers integrated research based on the Structure-Conduct-Performance (SCP) paradigm.

In light of this, this paper adopts the SCP paradigm from industrial organization theory as its analytical framework. It first describes the primary characteristics and manifestations of the low-price, low-value, high-conductivity, high-negative externalities pattern of involutionary competition within China's new energy vehicle industry. Next, it analyzes the generative mechanisms of this involutionary competition from three perspectives: technology, market, and policy. Finally, based on the above analysis, it proposes practical governance recommendations. The study follows a logical progression of theory—current state—mechanism—countermeasures, aiming to provide theoretical support and practical references for promoting high-quality industrial development, while contributing Chinese experience to the global transition toward new energy vehicle.

2. Key Characteristics and Manifestations of Involutionary Competition

This paper summarizes the primary characteristics and manifestations of the involutionary competition within China's new energy vehicle industry from the following perspectives.

2.1. Homogeneous Low-price Competition Leads to Low Profits

Amid intensifying price wars, the price-for-volume strategy has yielded significant sales elasticity on the demand curve but triggered a steep decline in profit margins. In 2024, the industry's revenue surpassed 3.5 trillion yuan for the first time, marking a 4.1% year-on-year increase. However, total net profit fell by 8% year-on-year, with the overall sales profit margin dropping below 3%.

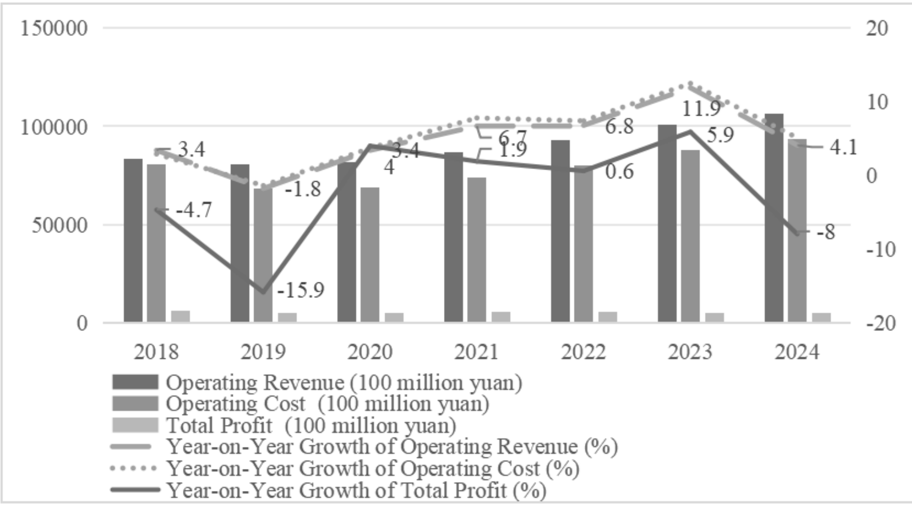

Fig 1. Key financial indicators of the automotive manufacturing industry, 2018–2024 (Picture credit: Original).

Data from China Association of Automobile Manufacturers.

Leading companies like Build Your Dream (BYD) maintain gross margins around 18% through vertical integration, yet this struggles to offset rising financial expenses and Research and Development amortization. NIO and XPeng, meanwhile, face per-vehicle losses expanding to the 100,000-yuan range, exhibiting a classic vicious cycle of scale expansion—cash flow deterioration. Consequently, revenue growth without profit growth is no longer a short-term financial disturbance but an inevitable outcome for the industry's profit structure undergoing systemic reassessment amid the price war as shown in Figure 1.

2.2. High Conductivity

Cutthroat competition exhibits high transmissibility. Wang Yu posits that this transmission mechanism can be categorized into two types: vertical transmission within industrial chains and horizontal transmission across industries [5].

Vertical transmission within industrial chains, or chain-wide competition, intensifies disorderly competition within industries. In 2022, Tesla initiated a price war in the new energy vehicle sector, prompting immediate follow-through from automakers like BYD and XPeng. Repeated price cuts by multiple players triggered a prisoners dilemma. Under Nash equilibrium, the optimal reaction function dictates that any party halting price reductions faces a sharp market share decline, locking the industry into a low-profit or even negative-profit equilibrium. Simultaneously, under pressure from automakers to reduce costs, upstream raw material and component suppliers face shrinking profit margins, extended payment terms, and heightened risks of capital chain disruptions. Excessive competition among upstream enterprises propagates through the supply chain to midstream and downstream players. In the downstream sales market, dealers grapple with severely squeezed profits, with approximately half operating at a loss.

Horizontal transmission between industries primarily occurs through competition and substitution effects. Specifically, the emergence of the new new energy vehicle sector has altered the industrial structure of the traditional fuel vehicle industry, eroding its market share. Simultaneously, the new energy vehicle industry's price wars and other forms of cutthroat competition exert downward pressure on prices, compressing profit margins and intensifying the challenges of transformation for traditional automakers.

2.3. Low Capacity Utilization and Excess Production Capacity

As the industry rapidly expands in scale, issues of low capacity utilization and overcapacity have gradually come to the fore. Overcapacity is propagating vertically along the supply chain: upstream battery inventories remain high, midstream equipment operating rates are below 50%, and downstream distributors face severe inventory pressure, with the risk of capital chain disruptions sharply rising. Data from the fourth quarter of 2023 indicates that 36 automakers nationwide operated their new energy vehicle production lines at capacity utilization rates below 30%, with some falling below 20%.

3. The Mechanism of Involutionary Competition

The market structure-competitive behavior-firm performance analytical framework within industrial organization theory provides a systematic theoretical foundation for understanding the phenomenon of involutionary competition in manufacturing and its underlying causes. The following analysis examines the generative mechanisms of involutionary competition within China's new energy vehicle industry from a macro perspective, encompassing technological homogeneity, the restructuring of the landscape between established and emerging automakers, local government investment priorities, and industrial policy frameworks.

3.1. Technical Competition Remains Deadlocked, with Homogeneous Competition Becoming Increasingly Prominent.

In the new energy vehicle industry, technological homogeneity and product/service homogenization are the fundamental causes of normalized price competition. During the first half of 2024, the 200,000-300,000 yuan pure-electric SUV market witnessed spec sheet replication—the battery, motor, and lidar models of the Leapmotor C10, Neta L, and Deep Blue S7 were nearly identical, forcing retailers to rely on limited-time official price cuts to secure orders. Technological homogeneity has progressively narrowed differences between brands in battery performance and range, resulting in minimal distinctions in powertrains, battery technology, and charging efficiency. This makes it difficult for manufacturers to establish unique technological barriers or competitive advantages [2].

Product and service homogenization further exacerbates this trend. Products increasingly converge in design, functionality, and service offerings. Homogeneous product and service experiences make it difficult for consumers to differentiate new energy vehicles based on product characteristics, leading them to rely more heavily on price as a decision factor. When product features and service quality are indistinguishable, companies often resort to price-cutting strategies to attract consumers and gain market share through price advantages. This price competition not only compresses corporate profit margins but also triggers vicious market competition, undermining the industry's healthy development. Therefore, breaking free from technological homogeneity and product/service homogeneity to achieve product differentiation and innovation is crucial for the new energy vehicle industry to escape the cycle of price competition and achieve sustainable development.

3.2. Automotive Industry Landscape Reshaping, Market Supply-Demand Imbalance

As new energy vehicle technologies continue to emerge and mature, emerging new energy automakers leverage their agile operations and strong innovation capabilities to swiftly translate the latest technological advancements into products that deliver higher performance, lower costs, and better alignment with consumer demands. This enables them to respond more rapidly to policy shifts and market fluctuations. Traditional automakers, however, face challenges in adapting to sudden shifts in technological paradigms. Their historical advantages are difficult to transfer, and they often miss the window for adopting new technologies, entering the market late. Compounding this, their established technological chains, supply chains, and channel advantages are being eroded. The displacement of gasoline vehicles by electric vehicles further slows and weakens their transition to new energy.

This restructuring of the landscape between new and traditional automakers has led to an imbalance in market supply and demand. In the early competitive phase, both new and traditional automakers expanded production simultaneously, causing supply to outpace demand and resulting in low-capacity utilization. Simultaneously, the rapid pace of new energy technology updates led to an initial overall market surplus followed by localized shortages. For example: 2024–2025: High inventory levels for low-end pure electric and A00-class models, creating an overall surplus. Starting in 2026, as new technologies like 800V high-voltage systems, semi-solid-state batteries, and urban NOA (Navigation on Autopilot) become mainstream, supply may lag behind demand, shifting the market from comprehensive surplus to structural shortages.

3.3. Local Governments Investment Priorities and Industrial Policies Lead to Industrial Homogeneity

In the development of China's new energy vehicle industry, local governments investment priorities and industrial policies have played a pivotal role in shaping industrial homogeneity. First, fiscal arrangements—specifically administrative decentralization and fiscal autonomy systems—influence local governments selection of industrial investment directions. Second, local governments formulate corresponding industrial policies based on central government directives [3]. These two policy-making characteristics have led local governments to favor investments in high-value, high-profit industries. Local governments with similar resource endowments tend to converge on the same industrial sectors and supply chain segments for investment attraction [6]. This has resulted in excessively low geographical concentration of China's industries and severe industrial homogeneity across regions, potentially leading to a lack of regional distinctiveness and competitive advantages in products [7].

From a corporate perspective, the design and implementation of industrial systems also exacerbate industrial homogeneity. In China, the development of the new energy vehicle industry is heavily influenced by government policies, including fiscal subsidies, tax incentives, and market access regulations. While these policies drive industrial growth, they may also foster homogenized corporate behavior. For instance, to qualify for government subsidies, many enterprises may prioritize producing models that meet subsidy criteria rather than developing differentiated products based on market demand and their own competitive strengths.

4. Policy Recommendations for Addressing Involutionary Competition

4.1. Corporate Strategy Level: Strengthen Core Technologies and Uphold Win-win Cooperation

In terms of technological innovation, enterprises must anchor their long-term strategy on tackling core technological challenges, focusing on Research and Development (R&D) investments in key areas such as the three-electric system (battery, motor, and electronic control), high-computing-power autonomous driving chips, solid-state batteries, and other critical domains. They should establish technological barriers through strategic patent layouts—for instance, in batteries, iterative development should center on high energy density, fast charging capabilities, and safety performance, while simultaneously exploring diverse technical pathways like sodium batteries and hydrogen fuel cells to avoid reliance on a single technology route.

At the corporate competition level, Zou Xiaoman et al. argue that enterprises should embrace a win-win cooperation philosophy. This involves fostering deep collaboration among upstream and downstream players in the industrial chain to share resources, enhance capacity utilization, and achieve coordinated development. Simultaneously, companies should band together to expand into overseas markets, attract more high-quality customers, reduce reliance on any single market, strengthen industrial resilience, and prevent overcapacity [8].

4.2. Policy and Institutional Level: Enhance Policy Coordination to Unleash Market Vitality

For governments, the first priority is to enhance policy coordination, break down policy barriers between industrial segments, and seamlessly integrate subsidy policies, technical access standards, and infrastructure development plans to prevent resource misallocation caused by fragmented policies. Secondly, antitrust rules in the new energy vehicle sector should be refined, relevant laws revised, and market oversight strengthened. Key focus should be placed on regulating data monopolies by platform-based enterprises and the abuse of market dominance by leading companies. Local protectionist policies must be eliminated to dismantle regional market barriers and ensure equal competitive participation for all enterprises [9].

4.3. Market Level

Build a business ethics system grounded in integrity, connected through cooperation, and aimed at mutual benefit. Strictly prohibit defamation and zero-sum games among enterprises, jointly curb irrational price wars across both horizontal and vertical supply chains, and foster a healthy competitive ecosystem featuring tiered collaboration and symbiotic evolution among large, medium, and small enterprises [10]. Deepening engagement in global markets to create a new development paradigm where domestic and international markets reinforce each other is both a key strategy for seizing the window of opportunity presented by the globalization of new energy and low-carbon industries, and an essential path for mitigating risks associated with reliance on any single market. By leveraging established competitive advantages, enterprises can integrate the unique strengths of different countries to meet local demands while circumventing trade barriers and driving exports of raw materials, components, and production line equipment.

5. Conclusion

This paper applies the SCP paradigm to embed the structure-behavior-performance framework within China's new energy vehicle involutionary competition. It systematically analyzes the two lows and two highs phenomenon, identifying three primary generative mechanisms: technological homogeneity, restructuring of old and new power dynamics, and local industrial isomorphism. Empirical evidence and case studies reveal that price wars are merely superficial manifestations, with root causes lying in market structural imbalances and misaligned policy incentives: when technological pathways converge, production capacity expands faster than demand upgrades, and local governments compete through homogeneous investment attraction, enterprises resort to price cuts to secure market share. This traps the entire industry in a low-level equilibrium characterized by revenue growth without profit growth. To break this vicious cycle, this paper proposes a four-dimensional collaborative governance framework integrating technological innovation + industrial ecosystem + market order + internationalization. It emphasizes breaking homogeneity through patent barriers and diversified technology routes; curbing excess capacity via regional division of labor and shared production; regulating competition through antitrust measures and self-discipline mechanisms; and dispersing risks through a dual circulation market approach. This offers an actionable policy combination to overcome industry stagnation.

Looking ahead, as next-generation technologies like solid-state batteries and urban NOA (Navigation on Autopilot) materialize, the mismatch between technology and demand may shift from overall surplus to structural shortage, requiring dynamic policy adjustments to new scenarios. Concurrently, geopolitical policy variables such as the EU carbon border adjustment mechanism and North Americas Inflation Reduction Act (IRA) will reshape global competitive boundaries. Future research should incorporate cross-border policy impacts into scenario simulations. This study's limitations include case studies and data primarily draw from domestic samples between 2018 and 2024, failing to fully capture overseas capacity deployment and consumer micro-level behaviors. While the SCP framework reveals causal chains, it remains coarse-grained regarding corporate heterogeneity and institutional details. Future work could integrate enterprise-level micro data and cross-national comparisons to refine the scenario applicability and policy flexibility of governance tools.

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