



Research on the International Competitiveness of Electric Vehicles in China

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Abstract: In recent years, China's electric vehicle industry has experienced rapid ascension, gradually establishing itself as a significant player in the global electric vehicle market. This article provides a comprehensive analysis of the international competitiveness of the Chinese electric vehicle industry, systematically exploring four aspects: industry scale and market potential, technological innovation and research and development capabilities, policy environment and government support, and international market performance and export competitiveness. The study reveals that the Chinese electric vehicle industry, leveraging its vast domestic market, continuously improving technological innovation capabilities, and robust policy support, exhibits considerable competitiveness in the global market. However, with intensifying global market competition and complex changes in the international trade environment, the Chinese electric vehicle industry still faces numerous challenges and opportunities. Based on an assessment of existing advantages, this article proposes strategies to guide the international development of the Chinese electric vehicle industry.

Keywords: Electric vehicles, International competitiveness, Industry overview, Technological innovation, Policy environment

1. Introduction

In the context of the global automotive industry's transition towards lower carbon emissions and intelligent technologies, electric vehicles have emerged as a pivotal direction for the advancement of the global auto sector. As the world's largest automotive market and electric vehicle producer, China's development in the electric vehicle industry is not only crucial for the nation's economic transformation and energy structure adjustment but also exerts a profound impact on the global electric vehicle landscape. In recent years, China's electric vehicle industry has made remarkable strides in technological innovation, market expansion, and policy support, establishing a distinctive development model. However, in the face of a global competitive environment, enhancing the international competitiveness of China's electric vehicle industry has become a critical area of research. This paper will analyze the international competitiveness of China's electric vehicle industry from multiple perspectives, including industry scale, technological innovation, policy environment, and international market performance, and explore future development pathways.

2. Overview of the Electric Vehicle Industry

The electric vehicle industry, as a pivotal force in the global automotive revolution, is undergoing an unprecedented and rapid development. The environmental pressures and energy crises confronting traditional fuel-powered vehicles have spurred innovation in electric vehicle technology and market expansion. Across the globe, governments are implementing supportive policies to encourage the research, development, and promotion of electric vehicles, positioning this industry as the dominant direction for the future automotive market. China's electric vehicle sector is particularly noteworthy. With its vast domestic market demand and well-established supply chain system, China has swiftly emerged as the global hub for electric vehicle production and consumption [1]. The intense competition between domestic and international companies in the Chinese market has driven rapid technological advancements and product diversification. Chinese brands have made significant breakthroughs in core areas such as battery technology and intelligent driving systems, gradually earning recognition on the global stage. However, the rise of the electric vehicle industry is not without its challenges. The continuous iteration of technology, fluctuating market demands, and intensifying international competition all present new hurdles for the industry's development. In the face of a reshaping global industrial landscape and a new wave of technological revolution, China's electric vehicle industry must make greater efforts in technological innovation, brand building, and international market expansion to secure a competitive edge in the fierce global arena.

3. Theoretical Framework of International Competitiveness

The theoretical framework of international competitiveness provides crucial analytical tools for understanding and assessing the position of China's electric vehicle industry in the global market. This framework typically encompasses multiple dimensions, including industrial structure, technological innovation, market scale, government policy, and the strategic capabilities of enterprises. These factors interact synergistically, collectively determining a nation or industry's competitiveness in the international arena. The optimization of industrial structure serves as the foundation for enhancing international competitiveness. In the context of the electric vehicle sector, the integrity of the industrial chain and the efficiency of the supply chain directly impact cost control and market responsiveness. China has established a relatively comprehensive ecosystem within the electric vehicle industry chain, demonstrating robust self-sufficiency in areas ranging from battery production to vehicle manufacturing, thereby providing a solid basis for its participation in international competition. Technological innovation is the core driving force behind international competitiveness. In the global electric vehicle market, technological leadership dictates market influence. China's investment in innovations within critical domains such as battery technology and autonomous driving has facilitated its gradual transition from a technological follower to a leader, thereby enhancing its competitiveness in the global marketplace. Furthermore, market scale and government policies also play pivotal roles in international competitiveness. The vast domestic market demand not only offers significant space for industrial development but also creates favorable conditions for technological innovation and large-scale production. Concurrently, government support policies, such as subsidies and tax incentives, have greatly accelerated the industry's growth and bolstered its international competitiveness. In an era of increasingly fierce global competition, a company's strategic capability determines its ability to establish a foothold in the international market. As Chinese electric vehicle enterprises navigate the process of internationalization, they must not only possess technological and production advantages but also exhibit enhanced strategic execution in branding, market expansion, and multinational management. Through a profound understanding and flexible application of the theoretical framework of international competitiveness, China's electric vehicle industry is poised to occupy a more advantageous position in the global market [2].

4. International Competitiveness Analysis of China's Electric Vehicle Industry

4.1 Industry Scale and Market Potential

The scale and market potential of China's electric vehicle industry are undoubtedly among its most prominent advantages in the international competition. In recent years, China has emerged as the world's largest market for electric vehicles, with production and sales consistently leading globally. This not only underscores China's significant position in the global electric vehicle sector but also establishes a solid foundation for its future development. The vast population base and the burgeoning middle class in China offer an expansive market space for the proliferation of electric vehicles, while the accelerating urbanization process and heightened environmental awareness further fuel the rising demand for these vehicles. The market scale advantage of China is reflected not only on the consumer end but also profoundly impacts the entire industry chain. The massive market demand has driven the localization of core components such as batteries, chips, and motors, and the enhancement of the supply chain, thereby securing a pivotal role in the global electric vehicle industry chain. This scale effect endows China's electric vehicle industry with unique competitive strengths in cost control and market responsiveness. However, market potential is not solely defined by its current scale but also by its capacity for sustainable development. The potential of China's electric vehicle market arises not only from domestic demand but also from its growing ability to expand into overseas markets. With the advancement of the "Belt and Road" initiative and the deepening of international capacity cooperation, the influence of Chinese electric vehicle brands on the global market continues to grow [3]. Looking ahead, China's electric vehicle industry will continue to leverage its vast market scale and development potential to expand its market share worldwide and further enhance its international competitiveness.

4.2 Technological Innovation and R&D Capability

The international competitiveness of China's electric vehicle industry is profoundly contingent upon the augmentation of its innovative technological advancements and research and development capabilities. Technological breakthroughs, serving as the fulcrum driving the sector forward, are paramount, particularly within the realm of electric vehicles. The advent in battery technologies, intelligent driving systems, and motor control are pivotal in ascertaining the standing and competitive edge of enterprises across the global spectrum. In recent years, Chinese electric vehicle companies have witnessed substantial progress in R&D. Whether it be CATL's preeminence in the battery sector or BYD's persistent innovation in overall electric vehicle technology, these developments underscore the burgeoning mastery of Chinese firms over core industry technologies, spearheading global trends. The substantial investments in R&D have endowed Chinese electric

vehicles with competitive pricing, alongside superior performance, range, and safety, outpacing international counterparts. This technological innovation is not fortuitous but a culmination of sustained national policy support, autonomous R&D investments by businesses, and the conversion of academic research outcomes. The government has propelled technological advancement through measures such as R&D subsidies and the establishment of platforms for technological innovation. Simultaneously, the sustained R&D investments have also catalyzed the upgrading of the entire industrial chain and the formation of a technological ecosystem. However, in the face of fierce global competition, technological innovation cannot be confined to existing achievements. China's electric vehicle industry must augment its exploration of forefront technologies, particularly in the realms of new materials, new energy, and intelligentization, fostering collaborations with global research institutions and technology companies to enhance its intrinsic capacity for innovation. Only through such endeavors can China's electric vehicle industry preserve its competitive advantage in the future global marketplace and lead the development trend of the global new energy vehicle sector.

4.3 Policy Environment and Government Support

The rapid advancement of China's electric vehicle industry owes much to the proactive guidance and robust support of government policies. As an emerging strategic sector, the development of electric vehicles necessitates not only market impetus but also the safeguarding and direction provided by policy measures. Through a range of policy initiatives, the Chinese government has cultivated a conducive ecosystem for the growth of the electric vehicle sector, offering substantial backing for corporate innovation and market expansion. Government support is evident in several aspects. From vehicle purchase subsidies and tax incentives to infrastructure development such as the proliferation and promotion of charging stations, governmental investment has directly lowered the barriers to electric vehicle adoption, expediting market penetration. This policy-driven advantage has not only encouraged consumer acceptance of electric vehicles but also generated greater market demand for enterprises, propelling rapid industry expansion. Moreover, the ongoing optimization of the policy environment has laid a solid foundation for the long-term development of the sector. By introducing a series of technical standards and industry regulations, the Chinese government has fostered advancements in electric vehicle technology and standardized industry operations. This standardization not only enhances the overall technical level of the industry but also strengthens China's influence and standard-setting capabilities in the international market. However, policy support is not a permanent fix. As the market matures, the government is gradually reducing direct subsidies in favor of more long-term, directive policies, such as the dual-credit policy for new energy vehicles and the carbon trading market. This shift reflects a focus on leveraging market mechanisms to achieve sustainable industry growth while continuing to drive sector development. The international competitiveness of China's electric vehicle industry significantly depends on the continuous refinement of the policy environment and effective government support [4].

4.4 International Market Performance and Export Competitiveness

The performance of China's electric vehicle industry in the international market has become increasingly remarkable, with its enhanced export competitiveness emerging as a significant driver of shifts in the global electric vehicle landscape. As the domestic market matures and becomes saturated, Chinese electric vehicle companies are turning their attention to broader overseas markets. In recent years, sales of Chinese electric vehicles have surged in Europe, Southeast Asia, and Latin America, vividly demonstrating their competitive strength on the international stage. The improvement in export competitiveness is attributable to the relentless efforts of Chinese companies in product quality, technological innovation, and brand development. Chinese-made electric vehicles, with their cost-effectiveness and advanced technology, have successfully captured the favor of international consumers. The success of Chinese brands such as BYD and NIO in overseas markets not only affirms their technological leadership but also showcases the strategic vision of Chinese enterprises in global market expansion. However, competition in the international market does not rely solely on the product itself. Chinese electric vehicle companies face challenges in the export process, including cross-cultural brand perception, compliance with international regulations, and market channel expansion. These factors necessitate that Chinese enterprises, as they venture into international markets, focus not only on enhancing product quality but also on establishing robust international marketing networks and optimizing after-sales service systems to address the complex demands of various markets. Moreover, the global emphasis on sustainable development presents new opportunities for the internationalization of China's electric vehicle industry. Leveraging domestic advancements in the new energy sector and supportive policies, Chinese electric vehicle companies are well-positioned to promote green mobility globally. This green competitiveness not only strengthens the influence of Chinese electric vehicles in the international market but also contributes to the global automotive industry's green transformation.

5. Challenges and Opportunities for China's Electric Vehicle Industry

5.1 Challenges and breakthroughs in technological innovation

Against the backdrop of increasingly fierce competition in the global electric vehicle industry, China's electric vehicle sector faces both significant challenges and expansive opportunities for breakthrough in technological innovation. Technological innovation is the core driving force behind industry advancement, and the fundamental technologies of electric vehicles—particularly in battery technology, intelligent systems, and drive motors—directly determine the industry's international competitiveness. Currently, despite notable achievements in technological innovation within China's electric vehicle sector, multiple challenges persist. Foremost among these is the issue of autonomous control over core technologies. Although China has attained a leading position in battery technology, critical areas such as high-end chips and operating systems still present technological dependencies. This reliance, in today's complex global supply chain, introduces uncertainties in technology development, potentially constraining China's competitiveness in the high-end market. Furthermore, with the global market's increasing demand for intelligent and sustainable solutions, the challenge of rapidly achieving technological iterations has grown. The pace of advancements in intelligent driving and vehicle networking technologies far exceeds expectations, necessitating higher research and development capabilities and innovation speed from enterprises, particularly straining resource-limited small and medium-sized enterprises. Nonetheless, within these challenges lie opportunities for breakthroughs [5]. The Chinese electric vehicle industry should continue to deepen cooperation with global research institutions, drawing on international advanced technologies and experiences, while also intensifying investment in independent innovation, especially in fundamental research and cutting-edge technologies. By promoting the integration of industry, academia, and research, and accelerating the commercialization of research achievements, the overall technological innovation capability can be enhanced. Simultaneously, the government should continue to provide robust support for technological innovation, optimizing science and technology policies and encouraging enterprises to undertake bold explorations in critical technology fields. Only through continuous breakthroughs in technological innovation can China's electric vehicle industry gain greater control in global market competition and lead the future direction of the automotive industry.

5.2 Uncertainty in the International Trade Environment

The intricate and ever-changing landscape of international trade presents formidable challenges for the development of China's electric vehicle industry, while simultaneously offering unique opportunities. The interplay of deepening globalization and intermittent de-globalization has rendered the international market fraught with uncertainty, particularly amidst rising geopolitical tensions and the resurgence of trade protectionism. The export and internationalization of Chinese electric vehicles are beset by numerous uncertainties. The rise of trade protectionism poses a direct threat to China's electric vehicle sector, as various nations, in an effort to safeguard their domestic industries, frequently deploy tariff barriers and technological standards restrictions, thereby impeding Chinese electric vehicle enterprises' entry into local markets. These trade barriers not only elevate operational costs but also erode the price competitiveness and market share of Chinese electric vehicles on the global stage. Additionally, the unpredictability of international trade regulations, such as divergent carbon emission standards, complicates the strategic decisions enterprises must make across different markets. Despite these challenges, the global market's growing demand for green transportation unveils new avenues for development within the Chinese electric vehicle industry. Leveraging its technological edge in the new energy sector, China's electric vehicles are well-positioned to gain broader recognition in international markets. Particularly in emerging markets and developing countries, the increasing demand for green transportation provides new growth opportunities for exports. Should Chinese enterprises adeptly navigate the shifting international trade environment and seize these market opportunities, they could achieve a competitive edge on the global stage. Furthermore, by diversifying their market strategies, they can mitigate risks associated with fluctuations in any single market. Strengthening cooperation with countries along the Belt and Road Initiative and expanding into new markets can offer fresh growth momentum while addressing challenges in developed markets. In such an uncertain trade environment, adaptability and strategic precision will be crucial for Chinese electric vehicle companies to establish a foothold in the international arena.

5.3 Opportunities in Environmental and Energy Policies

The ongoing advancement of global environmental and energy policies has afforded the Chinese electric vehicle industry unprecedented opportunities for growth. In response to the international consensus on combating climate change and reducing carbon emissions, nations worldwide have implemented policies encouraging the development of new and renewable energy sources, thus creating vast opportunities for the electric vehicle sector, particularly in China's rapidly

expanding market. Following the introduction of stringent carbon emission standards and schedules for phasing out fossil fuel vehicles in major economic regions such as Europe, the Americas, and Asia, the global demand for clean energy vehicles has surged. Leveraging its advantages in technological research and production scale, Chinese electric vehicle companies have swiftly emerged as pivotal players in the global transition to green transportation. This trend not only aids in expanding China's market share for electric vehicles but also enhances the international influence of Chinese brands. Concurrently, domestic policy support provides a solid foundation for Chinese electric vehicle companies competing on the global stage. The Chinese government has consistently been dedicated to advancing green economic development, instituting a series of policies to support the electric vehicle industry, including financial subsidies, tax incentives, and infrastructure development. These measures not only bolster domestic market demand but also lay the groundwork for export expansion, enhancing the international competitiveness of Chinese technology and products. The continuous evolution of environmental and energy policies propels electric vehicles to become the mainstream choice for the future automotive industry. Should the Chinese electric vehicle sector continue to seize this historic opportunity, deepen technological innovation, improve product quality, and expand its market through international cooperation, it is poised to lead in the global wave of green transportation. This progression is not only an inevitable outcome of industrial development but also a significant contribution by China to global sustainable development.

6. Conclusion

The international competitiveness of China's electric vehicle industry is manifested not only in its vast market potential and rapidly advancing technological innovation but also in the substantial support and proactive policy orientation provided by the government. However, as the global electric vehicle market becomes increasingly mature, the Chinese electric vehicle industry faces intense international competition and numerous uncertainties. To maintain an edge in future competition, the industry must continue to deepen technological innovation, strengthen integration with international markets, and adeptly navigate shifts in the international trade environment. Concurrently, it should fully leverage the development opportunities presented by environmental and energy policies to advance the green transformation and sustainable development of the industry chain. By employing a range of strategic approaches, China's electric vehicle industry is poised to secure a more significant position in the global market, advancing Chinese manufacturing into higher-end global markets.

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