A Comparative Analysis of Electric Vehicle Industries in China and the United States

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Abstract. In recent years, with the continuous advancement of technology and the growing attention of various countries to environmental issues, the electric vehicle industry has developed rapidly worldwide. China and the United States, as the two major economies in the world, have both shown strong growth momentum in the electric vehicle sector. Both countries have introduced a number of supportive policies, covering aspects such as purchase subsidies, tax exemptions, and charging infrastructure, to promote the standardized and market-oriented development of the electric vehicle industry. Under the dual influence of policy-driven and market-driven forces, the production and sales scale of electric vehicles has continued to expand, and the industrial ecosystem has gradually improved. This article will discuss the following aspects: Firstly, analyze the current development status of the electric vehicle industry in China and the United States; Secondly, compare the differences and similarities in policy guidance, market promotion, and technological research and development between the two countries; Finally, evaluate the competitiveness of both industries and their future development trends.

Keywords: Electric Vehicle Industry; Comparative Analysis; Policy and Infrastructure.

1. Introduction

The EV industry has had a significant impact on the economies of both China and the United States in recent years. The significance of developing the EV industry in these two countries is different. In terms of traditional fuel vehicles, the Chinese automotive industry lags far behind other countries. Therefore, the emergence of the EV sector provides an opportunity for China to reorganize itself and many first-tier cities in China are plagued by air pollution, such as smog. Traditional fuel vehicles are one of the main sources of mobile pollution. Promoting the EV industry is a key measure for addressing urban air pollution [1]. At the same time, in the current digital era, the perfect integration of EV with intelligent connectivity and autonomous driving technologies, China also hopes to seize this opportunity to build the core competitiveness of the next-generation automotive industry. Therefore, the development of the EV industry is of great importance to the country. The continuous expansion and development of the EV industry chain have created many high-value jobs. From battery research and development to intelligent software, it provides positions and space for more people dedicated to this field, forming a huge new economic ecosystem. In recent years, the development of the EV industry has enabled China to gain global industry leadership. China has become the world's largest EV market and producer, has nurtured many world-class EV enterprises, changed China's label of "following" in the automotive industry, and is also at the forefront of global innovation in battery technology, intelligent cabins, and vehicle networking, increasing overall technological strength and international competitiveness [2].

For the United States, over the past few decades, the decline of the American automotive industry has led to the loss of manufacturing jobs overseas. The EV industry is regarded as an important direction for regaining the leadership in manufacturing, and the United States has traditional advantages in technology and core technologies, such as in areas related to EV software like autonomous driving, artificial intelligence, and chip design. The EV industry is also considered a strategic competitive field with China. The United States cannot accept relying on other countries in such an important future industry, so developing the EV industry is related to economic security and national security. In the current development trend, whoever gains dominance in the EV industry will

have the right to lead the future automotive industry and even the mobile transportation ecosystem industry. Therefore, the United States needs to use policies to attract technology and the industrial chain back to its own country. The significance of the EV industry to the United States is also very significant. The policies of the United States have triggered a huge change in the global automotive industry landscape. His policies have forced European and South Korean sleep-walking automakers to make selective investments and accelerated the regionalization trend of the global EV industry. Moreover, EV has become a symbol of "cultural war" in the United States, with support and opposition behind it being collisions of energy interests, traditional automotive industry culture, environmental protection concepts, and political parties [3].

As a result, the core significance of studying this issue lies in conducting a comparative analysis of the different roles and efficiencies of the market in driving innovation and industrial upgrading at the industrial economic level. At the technological and energy level, it focuses on the intersection of the two global trends of intelligent transportation and low-carbon energy and speculates on the future direction [4].

2. Electric Vehicle Industry in China and the U.S.: Growth and Impact

In this section, the growth and current situation of the EV industries in China and the United States, as well as the impacts and reasons behind these situations, will be discussed.

2.1. Growth and Impact of Chinese EV Industry

China has become the world’s leading EV production and consumption country. From January to April 2025, 1.747 million units were exported, with a 18.7% share in the European market, making China the core engine of the global market. The penetration rate increased from 5.4% in 2020 to 48.7% in June 2025. In 2020, the sales of new energy vehicles in China were approximately 1.367 million units; in 2023, China sold approximately 9.5 million electric vehicles, accounting for about 32% of the total new vehicle sales, with a year-on-year growth rate of 38%; among them, 7.7 million were passenger vehicle electric vehicles, indicating a strong growth trend in the demand from the private sector (China Association of Automobile Manufacturers). However, by 2024, the sales reached 12.87 million units, and in the first half of 2025, the sales reached 6.94 million units (a year-on-year increase of 40%), with the penetration rate rising from 5.4% in 2020 to 48.7% in June 2025 and is expected to approach 50% for the entire year. In 2025, China will account for 68% of global sales of new energy vehicles, and its export volume will rank first in the world. The market share in the European market will reach as high as 18.7%, making it a core engine of the global market [5].

According to the "2015 Annual Report on Motor Vehicle Emission Control in China", vehicle pollution has become the main source of air pollution in China. Therefore, the Chinese government decided to start developing the EV industry and issued a number of policies. Through these policies, the market of China's EV industry has seen steady growth every year. In the "Research on Carbon Emissions of China's New Energy Vehicles throughout Their Lifecycles", it was indicated that in recent years, the popularization of China's EVs has led to a 40%-50% lower carbon emission throughout the life cycle of pure electric vehicles compared to fuel vehicles. EVs have many advantages over fuel vehicles, such as rapid acceleration, low noise, and higher energy efficiency. The International Energy Agency (IEA) report states that the widespread popularity of China's new energy vehicles has reduced carbon emissions in the transportation sector by 120 million tons in 2022 [6].

2.2. Growth and Impact of U.S EV Industry

The U.S. electric vehicle (EV) industry underwent a complex transformation from policy-driven development to market volatility between 2020 and 2025. The development trajectory of the EV industry was influenced by multiple factors, including policy shifts, technological bottlenecks, and the restructuring of the competitive landscape. As shown fig 1, according to the latest data from the

Argonne National Laboratory, the sales volume of new energy vehicles in the United States reached 74,200 units in June, with 59,090 units being pure electric vehicles and 15,121 units being hybrid electric vehicles. In the first half of 2022, the cumulative sales of new energy vehicles in the United States had reached 419,000 units, and the market penetration rate increased to 6.59%. However, the overall U.S. market is currently showing a trend of high opening and low closing, with intensified structural differentiation. Tesla's sales in California decreased by 21%. As California accounts for one-third of the total U.S. EV sales and is the largest EV market in the country, this decline in sales also led to a downturn in the entire U.S. EV market. Recently, the California New Car Dealers Association (CNCDA) released its report for the second quarter of 2025, confirming that Tesla's sales volume in this quarter decreased by 21%. According to Fig.1, in the second quarter of 2025, Tesla delivered 41,138 vehicles, a year-on-year decrease of 21%, and its global delivery volume declined by 13.5% to 384,000 units. As of now, this indicator has shown a quarter-on-quarter decline for four consecutive quarters [7].

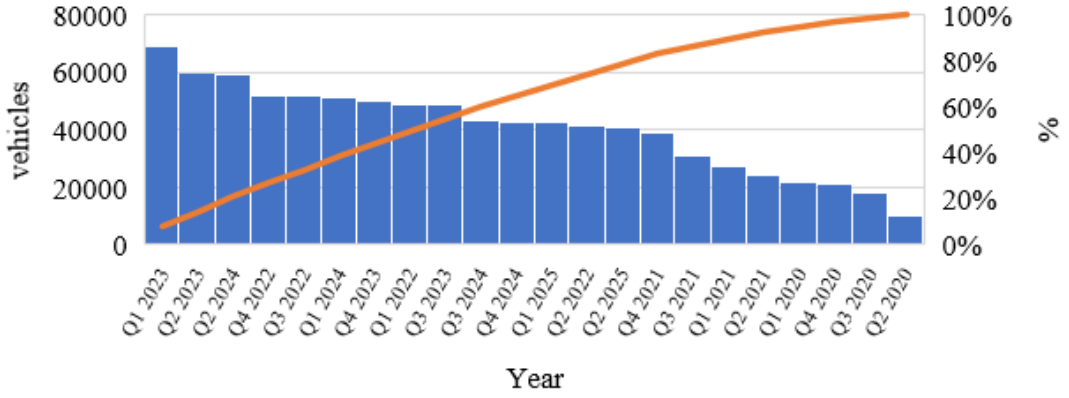

Fig 1. Tesla New Vehicle Registrations in California by Quarter.

In recent years, the development of the electric vehicle (EV) industry in the United States has had an impact on both the country's economy and environment. Firstly, the impact of the U.S. EV industry on the economy is also quite significant [8]. Firstly, it has created many new jobs. In 2023, the number of direct employees in the EV industry reached 280,000, with an hourly wage of $26, higher than the $22 in traditional manufacturing. This has also indirectly led to the loss of traditional jobs, with 120,000 people losing their jobs due to the closure of engine and transmission factories (data from the United Auto Workers (UAW)). Although the carbon - reduction benefits are significant, they are constrained by the power grid. Research by the U.S. Department of Energy (DOE) indicates that under a clean power grid, the carbon emissions of pure electric vehicles over their entire life cycle are 60% - 70% lower than those of fuel - powered vehicles. However, in states with a relatively high proportion of coal - generated electricity, the reduction is only 20% - 30% (2023). Moreover, the EV industry in the United States is also facing challenges in terms of resources and the environment. The battery demand of U.S. EVs is highly dependent on lithium imports, reaching up to 80%. The lithium mine in Thacker Pass, Nevada, can only meet one - third of the domestic demand. During the lithium mining process, each ton of lithium requires 2 million liters of water, resulting in substantial water consumption. Similar to China, the United States also faces the problem of a low recycling rate (less than 15%) for retired EV batteries [9]. The large - scale landfill of used batteries has led to soil heavy - metal pollution (as reported by the Natural Resources Defense Council (NRDC) in 2024).

The development of the EV industry has introduced new environmental challenges, particularly concerning battery pollution. The global recycling rate for EV batteries remains under 5%, far below that of lead-acid batteries, due to low automation and high costs-recycling one ton of batteries may cost RMB10,000 while yielding only RMB6,000-8,000 in materials. Inadequate disposal risks heavy metal leakage and soil or water contamination, while battery production generates significant carbon emissions, often unaccounted for. Weak regulations and a lack of mandatory recycling policies exacerbate the issue. Moreover, EV prices do not incorporate future recycling and pollution costs, which may later fall on governments [10].

3. Comparative Insights of Electric Vehicle Industries in China and the United States

3.1. Policy Comparison

In recent years, China has regarded the electric vehicle industry as an important part of its economic transformation and pollution control strategy. Its policies mainly focus on technological innovation, market expansion, infrastructure construction, and industrial chain optimization. However, the electric vehicle policies of the United States are greatly influenced by political changes among governments. By contrast, U.S. policies emphasize market mechanisms, relying on fiscal incentives and legislation to encourage EV adoption. In recent years, the EV industry in China has witnessed significant growth due to the substantial support provided by various policies. In Table 1, from 2020 to 2025, the country focused on maintaining and gradually reducing fiscal subsidies as the core to guide the industry from policy-driven to market-driven [11]. From 2023 to 2025, the country shifted its focus to technical standardization, such as the national standard for battery swapping, and the support for new business models, while strengthening the supervision of vehicle safety. In 2025, there were new regulatory priorities, including targeted crackdowns on frequent OTA upgrades and false advertising. At the same time, 15 provinces introduced V2G subsidies, promoting electric vehicles to become "mobile energy storage units" for the power grid [12].

Table 1. Chinese Policies in EV industry.

Year	Policy	Content
2020	Notice on Improving the Fiscal Subsidy Policy for the Promotion and Application of New Energy Vehicles	Extend the subsidy until the end of 2022. The reduction pace: 10% reduction in 2020, 20% reduction in 2021, and 30% reduction in 2022. You can choose a different car model without being restricted by the 300,000-yuan price limit. In areas such as public transportation, there will be no reduction in support in 2020.
2020	New Energy Vehicle Industry Development Plan (2021 - 2035)	Set the goal of achieving a 20% penetration rate of new energy vehicles by 2025 and making them the mainstream by 2035. Promote the integration of electrification, connectivity and intelligence. Support the vehicle-electricity separation mode
2024	Four national standards for electric vehicle battery swapping	Including "Electric Vehicle Quick Battery Box Frame", "Communication Protocol", "Connector", "General Requirements for Battery Replacement", unify the standard for heavy truck battery replacement interfaces, and solve the compatibility issues across brands.
2025	Notice on Strengthening the Supervision of Product Recall and Production Consistency for Intelligent Connected New Energy Vehicles	Three key regulatory directions: 1. OTA upgrade control: Unauthorized push is prohibited; covering up hardware defects is also prohibited. 2. Production consistency: All key parameters must be registered throughout the process; enterprises that violate the regulations will have their production and sales suspended. 3. Advertising norms: The use of "autonomous driving" dance promotions is prohibited; mandatory safety warnings must be provided.
2025	Notice on Announcing the First Batch of Pilot Projects for Large-Scale Application of Vehicle-to-Infrastructure Interaction	Nine cities including Shanghai and 30 projects have been selected as pilot projects; promoting the commercialization of V2G technology and encouraging electric vehicles to participate in grid peak-load regulation.

According to Table 2, the policies of the United States have also had an impact on the EV industry. The NEVI plan was frozen by the Trump administration in February 2025 and was forcibly restarted in June after a court ruling that it was unconstitutional. The revised version removed requirements such as "labour standards" and "investment in disadvantaged communities", granting greater

flexibility to state governments. OBBBA prematurely terminated the vehicle purchase credit, forcing consumers to purchase vehicles by the end of September 2025. Only the credit for charging facilities was granted a temporary extension. Therefore, these policies had a significant impact on the sales volume of EVs in the United States. The global sales volume of EVs increased by 27% in 2025, but in the United States, it only increased by 10%, mainly due to the gradual decline in subsidies and policy uncertainty [13].

Table 2. U.S. Policies in EV Industry.

Year	Policy	Content
2021	The Bipartisan Infrastructure Law National Electric Vehicle Infrastructure (NEVI) Program	Allocate 5 billion US dollars to build a charging network along highways, covering all 50 states in the United States; the federal government will bear 80% of the cost. In August 2025, revise the guidelines: remove the priority condition for disadvantaged communities, simplify the state-level approval process, and allow flexible planning of the spacing of charging stations.
2022	The Clean Vehicle Tax Credit under the Inflation Reduction Act (IRA)	New vehicle credit: Up to $7,500 (subject to the local production ratio of the battery); Used vehicle credit: Up to $4,000; Commercial vehicle credit: Up to $40,00
2025	"Amendment to the Large and Beautiful Act (OBBBA) for Clean Energy Credits"	Early termination time: The deadline for the tax credit for new/used vehicles has been moved forward from 2032 to September 30, 2025.
2025	The Environmental Protection Agency has revoked the "hazard discovery" regulations and relaxed the emission rules.	Abolish the scientific theory established in 2009 that greenhouse gases pose a threat to public health, weaken the legal basis for restricting vehicle exhaust emissions; cancel the fines imposed on car manufacturers that fail to meet fuel economy standards
2025	HOV Lane Exemption Reauthorization Bill	Allow each state to continue the policy of using dedicated lanes for single EVs until 2031 (originally set to expire in September 2025) to alleviate congestion and encourage clean transportation.

3.2. Infrastructure Comparison

In terms of infrastructure, there are significant differences between the United States and China. In terms of the number of charging stations, there is a clear disparity between the two countries. The total number of public charging stations in China is as high as 3.83 million (accounting for 65% of the global total), with a 100% coverage on highways. However, in the United States, there are only 186,000 charging stations (accounting for 3.2% of the global total), with a 35% coverage on interstate highways. Nevertheless, the charging technology in the United States is superior to that in China. In China, charging stations operate in parallel for fast charging and battery swapping, with the Nide Times EVOGO charging station (3 minutes) covering 40 cities, and vehicle-grid interaction (V2G) being piloted in 15 provinces with subsidy for discharge, such as 0.6 yuan/kWh in Shanghai. By 2025, the target for V2G charging stations is to reach 15% of the total. In the United States, charging stations are dominated by fast charging, with approximately 19,000 Tesla fast charging stations, accounting for 53% of all public fast charging stations in the country. However, there are less than 50 battery swapping stations for passenger vehicles [14].

Under the policy-driven approach of the two countries, these two models have also changed. The Chinese government's approach is "infrastructure first", so the "14th Five-Year Plan" goal is to include 1.2 million charging units among the 3.83 million, achieving the installation of charging stations in rural areas. Subsidy mechanisms have also been provided, with the highest subsidy for DC charging stations being 800 yuan/kW, and a 20% increase for rural areas. V2G projects receive a 30% subsidy for equipment investment [15]. In the United States, the focus is on market-driven and policy fluctuations. In the NEVI plan, it is stated that 5 billion US dollars will be invested in building a high-speed charging network, but it was frozen in February 2025. Additionally, tax credits (the OBBBA bill) have limited the development of electric vehicle industries in the United States [16].

4. Conclusion

Regarding the development of the EV industry, both countries have adopted different measures, but both aim for a promising future for the EV sector. China has established the world's most complete EV industry chain and market. The next step should be to focus more on "from large to strong", overcoming challenges such as high local costs of supply chains, poor policy continuity, and lagging infrastructure, and promoting fair market competition, preventing price wars with internal competition, protecting intellectual property rights, and encouraging automakers to compete through technological innovation rather than marketing gimmicks. The core challenge for the US EV industry lies in high local costs of supply chains, poor policy continuity, and lagging infrastructure. It is necessary to lay a solid foundation to improve the current situation of the EV industry. Ultimately, the success of both countries does not lie in competition; rather, it should be more about whether they can find limited cooperative space in responding to the common challenge of climate change, conduct coordination in other fields, and avoid the fragmentation of the global market, jointly promoting the green revolution in global transportation.

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