

# ***Research on the Impact of New Energy Vehicles on China's Industrial Policy Innovation***

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**Abstract:** The subject of China's new energy vehicle policy implementation analysis was chosen due to the growing importance of switching to renewable energy due to resource depletion, price volatility, and the need to address pressing environmental issues. New energy vehicles are critical for controlling greenhouse gases and atmospheric pollutants, reducing the auto industry's dependence on oil which makes this subject matter crucial nowadays. Such methods as secondary literature analysis and case study are essential to analyze the processes behind China's new energy vehicle success. As a result, the current backdrop of environmental and political instability has stimulated the Chinese government to create a range of policymaking initiatives that rely on provincial and central collaboration, cutting switching costs, and socially normalizing new energy vehicle use. The value of this paper is in how it can be utilized as a fundament for other business branches and governments to construct effective initiatives to grow the renewable energy vehicle market.

**Keywords:** New energy vehicle, China, Policy, Market share growth.

## **1. Introduction**

### **1.1. Research Background**

The research topic has emerged from observing the rise of the new energy vehicles on the Chinese market in the past years and the governmental support of this trend. China's consumption and production patterns represent the massive switch to new energy vehicles. The penetration rate of the new energy vehicles on the Chinese market multiplies yearly, showcasing the all-time highest results nowadays [1]. In 2020 alone, new energy vehicles represented 6,2 percent of all cars bought by Chinese customers, but the number had outgrown 15,5 by the end of 2021 [1]. At the same time, the manufacturing of new energy vehicles has skyrocketed from 3,334 million in 2021 to almost 5 million in 2022, thus, representing a clear trend [1]. The Chinese government avidly supports such changes within the vehicle manufacturing industry. As early as 2019, the Chinese government has started introducing initiatives to subsidize the use of new energy vehicles by the citizens and oblige car producers to manufacture a fixed percent of new energy vehicles [2]. Consequently, the proportion of new energy vehicles on the market is steadily growing, drawing attention to the importance of this change.

The research on the ecological impact caused by China's new energy vehicle preference is important to constructing prospects for the whole car manufacturing industry's future and estimating

the extent of oil dependence in the future. After successfully reviving from the great decline caused by the uncertainty of the COVID-19 pandemic crisis, China is on the way to regaining its status as the highest-selling car market worldwide, with about 19,8 million automobiles sold in 2020 and about 80 million up until February 2021 [3]. Therefore, considering the mere importance of the Chinese vehicle market as the biggest one worldwide, it is essential to consider its massive changes to predict the new paradigm of international development for the car industry. This topic is valuable to the business since the case study of China can be used as a source of insights for manufacturers to prepare for market transformations. Governments should take notice of the effective Chinese strategies for tackling climate change and energy dependence issues through effective policymaking.

## 1.2. Literature Review

The expansion of the new energy vehicles within the Chinese car market has caught the attention of several scholars. Kimble & Wang draws attention to Chinese success in popularizing new energy vehicles as a component of an overarching national strategy that generates stability and success for the emerging Chinese economy. According to the researchers, the Chinese government wants to push vehicle manufacturers to generate new energy models that would match all the criteria of the average oil-based vehicles in such parameters as cruising distance and speed [4]. However, Kimble & Wang also draw attention to the challenges of the rapid switch to new energy cars, such as the need for novel powering networks, updated product architectures, charging facilities, and drive training [4]. Consequently, a massive scheme of transforming the energy consumption patterns of such a huge vehicle market requires complex logistical amendments emphasizing the government's role in creating conditions for mass new energy car consumption.

However, some studies focus on how China conducted new energy transformation in the vehicle sales business in different ways on a few levels to attain such an impressive result. As Zhang & Qin state, Chinese market evolution has occurred on three scopes: municipal, provincial, and national, to generate a long-lasting change in consumption patterns. As early as 2013, the local governments on the levels of provinces and municipalities have started to prompt new energy vehicle policies to align their legislation with the general national consensus on green energy consumption [5]. Each area is committed to the new regulations of varying depth and reaches, representing the diversity in new energy consumption within the Chinese car market [5]. Nonetheless, the main initiative in introducing the new energy policies comes from the national government. In contrast, the smaller-scale policies are majorly linked to updating the industrialization processes and research and development following the national plan [5]. Hence, some scholars have outlined how the varying levels of government support structural transformations in the Chinese car manufacturing industry to stimulate transformation.

Other scholars envision the Chinese new energy vehicle model from the environmental impact perspective. Ren points to the fact that the Chinese new energy vehicle industry is not yet sustainable as it faces the challenges of reconciling various factors to persist, including economic, technological, ecological, and sociopolitical ones [6]. At the same time, Zhang & Hanaoka underscore the successes of decarbonization through eclectic vehicle use, especially in highly developing Chinese provinces such as Guangdong, Jiangsu, and Shandong have undergone extensive transit in the type of vehicles used. Subsequently, Zhang & Hanaoka suspect that the Chinese government continues to be committed to the decarbonization agenda in the years to come in its policies. The country will manage to meet its 2060 carbon reduction target and vastly expand the share of the new energy vehicle market.

### 1.3. Research Gap

Therefore, many researchers delve into the environmental effects of Chinese new energy vehicle transformation. Moreover, nearly all researchers point to the role of government in stimulating market change. However, the research gap is in the lack of insight into how the Chinese experience may be valuable for other countries to forecast market changes and adapt.

### 1.4. Research Framework

The case study will serve as an overview of the Chinese experience and a source of ideas on the new energy vehicle transformation that policymakers may adopt worldwide. First, the research will overview the preconditions for new energy vehicle prioritization. The study will draw on the relation between energy demand challenges and China's new energy sector's rise. Second, the research will highlight the relationship between government support and the new vehicle industry's rapid growth. The study will point to international market implications and lessons from the case.

## 2. Methods

Considering the subject matter of the study is the evaluation of the attained new energy vehicle transformation scheme in China and the dissection of policymaking incentives behind it, it is appropriate to rely solely on secondary data research. It is essential to conduct literature research and analysis by collecting insight from varying credible sources on the statistics. Processes and tendencies in the Chinese new energy vehicle sector are then interpreted, compiled, and contrasted with one another to construct a multifaceted vision of the issue. The industrial data, combined with scholarly findings on the subject, will be essential for outlining implications on which policymakers could rely internationally when contemplating how to stimulate the transformation of in vehicle energy consumption patterns. Considering the limitations of the study as a relatively brief university-level assignment and restrictions of the COVID-19 pandemic, it would be relevant to find research articles in such Science Direct, Research Gate, Taylor & Francis, among others, that are available online. These sources can be supplemented by the data from credible online websites that cite industry data. Moreover, as the subject matter is relatively new and changes yearly, it would be relevant to cite some appropriate authoritative popular media sources that report the latest news in the industry.

Considering that this paper will focus on the success story of China as the country which excelled in the massive switch to new energy vehicles, the case study method will also be appropriate. The case study method requires delving into a specific case to explore its background information, different characteristics, processes, components, and implications in detail. Then, the pieces of evidence and the major conclusions collected through a case study can be applied to understand the mechanisms behind similar cases. Since the paper aims to evaluate correlations between the governmental incentive of new energy vehicle use and its aftermath, it is appropriate to conduct a case study solely on the Chinese green transformation experience in the vehicle segment. In this paper, we will find out how governmental policies boosted new energy car sales by using varying sources of information to conduct a case study on China's new energy vehicle use model. By speculating how other countries could emulate the same result to cut dependence on traditional energy, decrease environmental footprint and design effective policymaking solutions to stimulate new energy consumption.

### 3. Results

#### 3.1. Status Quo Analysis: Review of New Energy Investment

The Chinese government's investment in new energy sources has been a massive focus. The country is incentivized to establish itself as an international leader in green energy production and use, reflected in the governmental approach to its many industries, including vehicle manufacturing [7]. The aptitude for sustainable energy leadership has been reflected in the country's willingness to take accountability for Chinese production's massive contribution to the greenhouse gas emission problem via a gradual shift towards the preference for renewable electricity sources [7]. Furthermore, investment in green energy is a top priority for the Chinese government, partly because it helps the nation address issues with air and water pollution and reduce risks of socioeconomic turmoil [7]. It is economically feasible for the government to put great care into renewable energy systems. In 2012 the state lost 6,5 percent of its GDP solely due to the decrease in productivity caused by environmental pollution, and this issue becomes more acute yearly [7]. As a result, the government is ready to become a major investor in funding green energy programs. This year, just between January and April, the Chinese government has spent 4,3 billion dollars on solar energy alone [8]. The Chinese government is interested in boosting wind and solar energy investment by constructing massive power grids while aiming to eliminate all carbon pollution by 2060 [8]. Being a major sector involved in the Chinese renewable energy plan, vehicle manufacturing is also about to mark a turning point by finishing market education. New energy vehicle sales to the domestic market are likely to meet the 25-30 percent [9]. Consequently, the Chinese market of renewable energy vehicles is on the verge of maturity under the overarching scheme of Chinese green transformation. The government has expressed strong commitment for the nearest decades to come.

Another incentive behind the preference for new energy sources, especially in the car production and use sector, is the skepticism towards the future of non-renewable energy sources. Switching costs of reducing the reliance on non-renewable energy sources such as oil, natural gas, and coal are insurmountable for most developing countries. It is necessary to sustainably stimulate long-term financial development by preserving a clean environment [10]. In addition, the future of non-renewable energy sources raises questions due to the risk of resource depletion in fossil fuels and minerals caused by overconsumption [11]. According to the estimations of the MET group, the current fossil fuels are expected to be exhausted before the end of the twenty-first century. Coal is expected to last the longest with 114 estimated years, natural gas is expected to be available for 53 years, while oil resources may deplete within 50 years [12]. Another factor that stimulates investment in renewable energy sources for Chinese vehicles is the geopolitical turmoil of 2022. As the major natural resource's exporter Russia is now under sanctions due to the Russo-Ukrainian war, the energy market is volatile, with costs of gas and oil skyrocketing, which has already affected the short-term energy use plans of China [13]. In these conditions, new energy vehicle investment is necessary for China to secure its stable, long-lasting economic growth.

#### 3.2. Consumer Behavior Characteristics and Policy Initiatives

To encourage Chinese citizens to support the governmental investment in renewable energy, the government has been implementing a series of initiatives to manipulate consumer behavior in terms of new energy vehicle use. For example, the Chinese dual credit program enacted in 2018 disincentivizes car manufacturers whose cars fall short of fuel economy goals while allowing them to create their own or purchase new-energy credits to make up for wasteful energy use [9]. As Figure 1 demonstrates, this strategy is expected to expand the new energy vehicles' market share twice in three years [14]. As a result, customers will be motivated to choose within the wider scope of

renewable energy vehicles, thus, normalizing the idea of new energy cars as a default vehicle of choice for Chinese consumers.

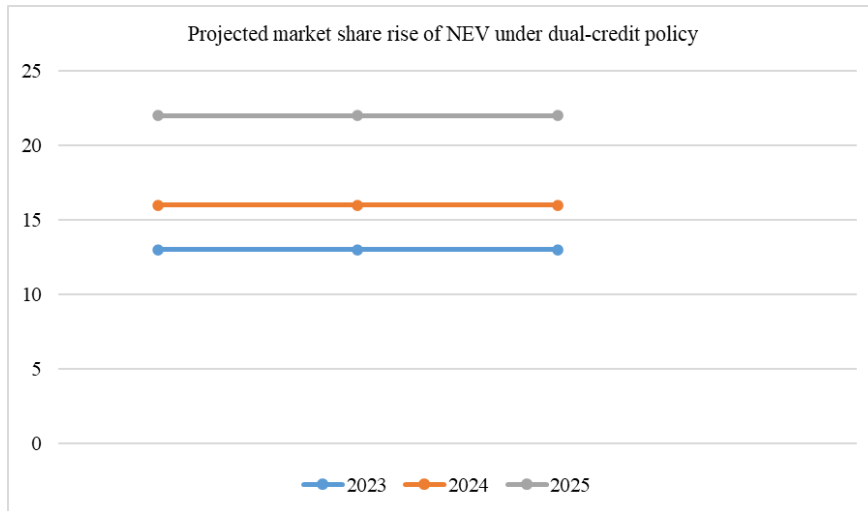


Figure 1: The future of the new energy vehicle sector's market share in China.

(Note. Projected market share rises of NEV under the dual credit policy. Adapted from How will the dual credit policy help China boost new energy growth? by Z. Chen, 2022, ICCT).

Rather than just affecting consumer choices through changing market propositions, the Chinese government has installed policies to motivate higher consumption rates for the new energy vehicles. Subsidizing the purchase of new energy vehicles has been a backbone of the Chinese model of switching to renewable energy at the highest rate worldwide [15]. The subsidizing of the new energy vehicles has been enacted three-fold: by establishing a preferential taxation method for the new energy vehicle owners, governmental procurement of the sector, and special fiscal policies [15]. Such subsidies, especially governmental procurement and taxation-related changes have had an overwhelmingly positive impact on the stock prices within the new energy vehicle sector [15]. Concerning private consumers, the governmental subsidies introduced in 2009 aimed to cut the price of renewable energy vehicles since the electric vehicle models tend to cost more than the vehicles that use natural resources as a fuel [16]. As an outcome, the national government has invested more than 200 billion yuan in cost-cutting strategies. In comparison, provincial governments have added more than 100 billion yuan to subsidize new energy vehicles on the regional scale [16]. Even though such price reduction strategies were aimed to last until 2015, the central government is negotiating to support further the industry that is now struggling to recover from the COVID-19 pandemic until the end of 2023 [16]. Combined with all these measures, China created conditions in which using new energy vehicles is convenient, thus, eliminating doubt on whether driving such cars will be advantageous. The Ministry of Finance had allocated 100 billion yuan for creating charging stations around the country [17]. Local initiatives also supported this spending; for example, the authorities of Beijing alone have introduced a 30 percent subsidy for creating infrastructure for serving electric vehicles [17]. In conclusion, different tiers of government have created opportunities for consumers to save money on new energy vehicle use, thus, demonstrating that renewable energy can be a cheaper option that is equally convenient to the standard non-renewable vehicles.

### **3.3. The Problem of Outlining Implications**

However, the persisting issue is outlining the global implications of the Chinese experience and elaborating major premises of strategic success that allowed the model to flourish. Hence, rather than just treating the Chinese case as exceptional, it is essential to derive lessons and recommendations from it. The above case study can help other governments craft similar strategies to stimulate the preference for new energy vehicles.

## **4. Discussion**

### **4.1. Cooperation of Government on Different Levels**

One central implication derived from the case study of the Chinese new energy vehicle sector's success is the role of multidimensional governmental involvement. Rather than representing the switch to renewable energy only as an ideological governmental paradigm for the country, it is central to support regional solutions that would help penetrate the model into the mundane lives of citizens. In the Chinese governmental system, provincial and municipal authorities are designated first-hand guides to coordinate and execute greater governmental schemes [18]. Since each province of China is very different from the others on the level of political agenda, social composition, and cultural background. Hence, the central government adopts an approach of providing subjective agency to local powers that have a deeper understanding of what type of project implementation suits the region [18]. However, even though China is deeply decentralized, governors of the provinces are obliged to interchange insight into their administrative tactics to foster better communication and cooperation [18]. Moreover, vast differences in administration of the regions stimulate local experimentation and implementation of strategies that attract overseas investments to the province with its approach to industrial transformation, industrialization, and even policymaking [19]. As a result, governments that aspire to pursue a similar strategy to the one implemented in China when it comes to new energy vehicle reform implementation may adopt the strategy of decentralized project support that gives more leeway to regional authorities on how to popularize NEV.

### **4.2. Matching the Qualities of Standard Vehicle Use**

Another essential implication for the new energy vehicle market and the foreign governments is the focus on matching the experience with renewable energy cars to those of non-renewable energy ones. One central leverage of influence enacted by the Chinese government to popularize NEV was minimizing the switching expenses for citizens. The government and businesses should consider how to mitigate the impact of immediate switching costs to driving a new energy vehicle and the long-lasting need for maintenance associated with technology [20]. For instance, the government and new energy car manufacturers should regard the economic risk of losing money and accept the new technology's volatility [20]. The customers might face risks related to convenience, finance, and product performance when they agree to switch from the traditional type of product to a non-traditional one [20]. The Chinese government has created conditions in which consumer switching costs have been relatively low. Such policies and tax exemptions and subsidizing new energy car costs have allowed mitigating the financial risks for the buyers. The constant emphasis on optimizing the technical criteria of new energy cars to meet the standards of the traditional non-renewable energy fuel cars undermined the performance risks. Finally, creating complex national and municipal plans for new energy vehicle maintenance infrastructural systems decreased the convenience costs. Consequently, it is possible to extract lessons on how to compel citizens on the benefits of buying a new energy car from the Chinese policy strategy of matching the conditions of non-renewable energy vehicles.

### 4.3. Normalizing the Use of New Energy Vehicles

The psychological factor of associating new energy vehicle purchases and use with the need to serve the national mission might also increase the NEV market share successfully. According to the Theory of Reasoned Action, three central cognitive elements can be used to forecast and interpret human behavior. Such as the impact of social norms, the influence of social attitudes expressed in how the behavior is meant to be favorable for a person, and the value of human intentions [21-22]. By framing the switch to renewable energy in vehicles as the novel national agenda aimed at battling environmental problems and attaining green energy leadership worldwide, the Chinese government molds social norms and attitudes to align with its incentives. As an outcome, if a person supports a governmental plan, they serve the interests of the country and its far-reaching goals of developing this branch and surpassing other states in this realm. Moreover, the utilization of governmental subsidiary policies might further reinforce the use of new energy vehicles as a favorable behavior, thus, aligning citizens' intentions with governmental priorities.

## 5. Conclusion

### 5.1. Findings

The following paper is a case study secondary research analysis on how China has designed and implemented an effective policy strategy for developing its new energy vehicles domestically. Such pressing issues as the negative effects of pollution on worker productivity, depletion of resources, and natural resource market volatility have stimulated the Chinese government to continuously invest in renewable industries, including new energy vehicle manufacturing. To ignite interest in its new energy vehicles and stimulate market growth, central and regional authorities adopted efficient policymaking measures that allowed China to win over international leadership in the field. Taxation and fiscal policies, new energy car subsidies, and government procurement of the domain have turned out to be effective measures for boosting consumer preference toward renewable energy vehicles. This success story of China can be thus, utilized by governments worldwide to adopt new energy vehicle stimulation strategies based on the active cooperation of central government and municipalities, measures aimed at decreasing switching costs, and the presentation of new energy vehicle use as a socially preferable demeanor.

### 5.2. Limitations and Future studies

This study can be later used to compare the Chinese experience of new energy policy implementation with the similar strategies of other countries. Moreover, it can provide insight into the design of the new energy vehicle use popularization strategy. However, the research has a few limitations. For instance, it lacks incorporation of primary sources such as the comments from Chinese governmental officials on the construction of the Chinese new energy vehicle agenda. Moreover, the paper does not allocate deficiencies in the Chinese new energy vehicle systems and possible improvement points for the government and businesses to adopt. In future research, we plan to obtain primary research data using the interview method to supplement secondary research data with new unique pieces of information.

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