

The Analysis of China's New Energy Vehicle Policies

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Abstract. The electric vehicle industry has developed rapidly in the past ten years, under the support from the Chinese government policy, not only development of new energy technologies, the preferences of consumers and producers for the market are also increasing. The evaluates, article though different types of policies macro policies, subsidy policies, demonstration policies, tax policies, and facilitation policies, and made suggestion to the areas where the government could still improve in the future.

Keywords: Electric Vehicles, Policy analysis, Subsidy.

1. Introduction

In 2014, dubbed "the very first year of China's new energy vehicle," its state enacted a total of 16 new energy vehicle rules, laying the groundwork for the country's new energy vehicle market. However, at that time, urban logistics vehicles, such as sanitation vehicles, constituted the majority of the nation's new energy vehicle sales. The country accelerated the construction of public charging stations, which is indisputably supportive of the trend of the new energy vehicle industry. 2015 is the year for new energy vehicles to lay the groundwork and officially promote to regular consumers, so this year's sale prices did not increase significantly. Green license plates are also particularly conspicuous on the road this year. New energy vehicle adjustments will be made in 2016, including those to the low-speed electric vehicle technical requirements, the suspension of the ternary lithium battery order, the credits and carbon quota system, the battery catalog, production qualification, and subsidies. The policy disturbance has a minimal impact on annual sales growth, which ranges between 400,000 and 450,000 units. Some of the market demand will be compressed to 2017 as a result of the policy change at the end of the year [1]. 2017 is a year in which new energy vehicle sales have been steadily increasing. As a result of the national assessment of fuel consumption points, which found that the average fuel consumption in 2017 was 6.4, it is anticipated that many domestic brands will find it challenging to meet the fuel consumption standard. The number of new energy vehicle sales in 2017 was between 600,000 and 700,000. The production and sales of conventional fuel vehicles both experienced negative growth in 2018, but new energy vehicle sales continued to expand at a pace of over 20% [2]. New energy passenger vehicle sales are mostly driven by cities with rigorous buying regulations and high license plate costs. The theme of "Energy Conservation and New Energy Vehicles" was chosen in 2010 by the Chinese Ministries of Science and Information. The Chinese auto industry and government regulations now prioritize energy conservation and emission reduction, lowering reliance on foreign oil, and cutting carbon dioxide emissions. The maximum new energy vehicle subsidy that citizens can receive is 55,000 yuan and then will decrease year by year. The Notice states that pure electric passenger cars will get a subsidy of 25,000 yuan per vehicle for ranges between 100 and 150 kilometers; 45,000 yuan per vehicle for ranges between 150 and 250 kilometers; and 55,000 yuan per vehicle for ranges greater than 250 kilometers. In addition, the subsidies for pure electric buses range from 120,000 yuan per vehicle to 500,000 yuan per vehicle, while they are respectively 200,000 yuan per vehicle, 300,000 yuan per vehicle, and 500,000 yuan per vehicle for fuel cell passenger vehicles [1]. Pure electric passenger cars in the weekday rush hour area are not restricted to travel, in accordance with the "Beijing Municipal People's Government on the execution of weekday rush hour regional traffic management measures Notice" criteria. Without a question, this

is the most advantageous program for those who must commute daily by car. China has released pertinent laws and policies regarding expenses, subsidies, efficient environmental protection, and the benefits of carbon neutrality for new energy electric vehicles.

2. Policy evaluation

Since 2021, China's electric vehicle sales have occupied for half of the world's total, and its electric vehicle ownership and lithium battery production have ranked first in the world. These huge advantages were benefit from the full support from the government [3]. Expanded understanding can be employed to characterize the policies that the government has issued over the past ten years: macro policies, demonstration policies, subsidization policy proposals, preferential taxation policies, technical support policies, industry management policies, and infrastructure policies [4]. This article will review these policies individually and examine the effectiveness of mixed policies through to the study and research of relevant information under seven sorts of policies.

2.1 Macro policy

Macro-policy provide direction to businesses and citizens as a whole. For China, the promotion of electric vehicle-related policies is an important part of achieving carbon neutrality [4]. The world is concerned about the mitigation of global warming through the control of overall carbon emissions and China is committed to achieve carbon emissions peak by 2030 and become carbon neutral by 2060. With the economic incentives and policies, some regions are on track to be carbon neutral by 2060, but carbon neutrality for the entire country is unlikely to happen [5]. Some less developed provinces are unable to provide a large amount of subsidies compared to the rich province such as shanghai, and they are still in the early age of new energy facility [5, 6]. As a direction, the details of the macro policies still need to be perfected by the governments of each province and cities based on their situation and needs to be combined with other policies under a carbon neutral policy, such as using coal to generate electricity still cannot solve the reduction of carbon dioxide emissions.

2.2 Subsidization policies

Financial subsidies are seen as the most effective one among all policies to increase both consumer and business preference for electric vehicles. Financial subsidies are also the most direct government intervention to the market. The emergence of subsidies has accelerated society's transition from traditional fuel vehicles to new energy vehicles [7], especially in the early diffusion stage, it plays an irreplaceable role [8].

2.2.1 Consumer subsidy

Market demand is the most fundamental factor driving industrial development [9]. By promoting the preferences of consumers can promote the development of an industry which the increasing demand also promotes the willingness of enterprises to produce electric vehicles [10]. Subsidies to consumers can be multifaceted, the subsidy for the price of the cars, the subsidy for parking costs, or a subsidies for energy costs [7]. Subsidies are considered to be a necessary policy in the early stage of the development of the electric vehicle market, as batteries and other costs are expensive with the low economic of scope, that consumer could not attracted only by the saving in the cost of fuel [11]. And the penetration of the market in the early stage also largely relied on the subsidy policy [7] The impact of consumer subsidies increases gradually over time [9], a short subsidy cycle will lead to subsidy policies failing to achieve the expected goals. As the scale of subsidies continues to expand, the impact on consumers is gradually increasing [10]. However, due to the complex economic system, there is great uncertainty in consumer subsidies. The cycle and uncertainty of the transformation from subsidies to market preferences require the government to more rigorously adjudicate [9].

2.2.2 Supplier subsidy

There is a strong positive correlation between government subsidies and corporate innovation [12]. The reduction of financial subsidies will affect the investment of enterprises in innovation [13]. Compared with consumer subsidies, the efficiency of corporate subsidies in the early stage is more obvious, especially in the face of some mature companies with a large market share, subsidies can help them spend enough costs for R&D [10]. Innovation, as the core competitiveness of some new energy companies, continues and expands under the premise of sufficient funds, which is also very important for improving the overall development of the industry [14]. At the same time, government subsidies can also send a signal to enterprises to reduce the impact of information asymmetry [15]. The subsidy provided according to different types of products should be linear, change with the increase of mileage, and the subsidy should be increased [16]. Government should strictly control the effects of subsidies to prevent them from being used inefficiently or for other purposes, and should formulate appropriate plans to supervise them [10,16]. Consumption subsidies and production subsidies are mutually reinforcing, and the effectiveness of unidirectional subsidies is limited, but at the same scale, consumer subsidies are more effective [10].

2.3 Preferential tax policies

Tax policy and subsidy policy are similar, both promote industrial development by changing the government's revenue and expenditure. Tax relief can be multifaceted, excise tax, vehicle purchase tax and resources taxation were the pre-exist tax item, by increasing the consumption tax on petroleum-related products and subsidizing the purchase tax of new energy vehicles, the government has been able to support new energy vehicles to a certain extent [14].

2.3.1 Carbon tax

Carbon dioxide emissions are not recognized as pollution in the international sense, so different from traditional energy tax and pollution tax, the significance of carbon tax was issued to solve carbon dioxide emissions. Without disturbing the original tax system, and with the control of corporate carbon emissions through tax rebates, subsidies or penalties, the carbon tax can greatly help achieve carbon neutrality policies [14,17]. Low-carbon travel offers benefits that will make consumers a more environmentally friendly person, thereby changing their preferences [17]. However, in terms of the corporate, a high carbon tax may affect the profit of some automotive corporation, the impact of this policy can only be erased when there is a stable and large demand for electric vehicle products, which affects the proliferation rate of electric vehicles in the early stage [15].

2.3.2 Tax incentives

The government's tax incentive for high-tech enterprise are also an efficient policy. There's a positive relationship between the government incentive policies and innovation activities [15]. The tax exemption policy also encourages some companies to start the business of building charging stations [14]. In the aspect of the consumers, no auto purchased taxed was required, it attract consumers as another form of financial incentive. In addition to giving preferential treatment to new energy companies and consumers, the government can also increase the tax cost and use the cost of traditional fuel vehicles to promote the process of new energy transformation

2.4 Facilitation Policy

Infrastructure policy is part of facilitation policy, facilitation policies include the popularization of charging piles, exemptions from purchase restrictions or exemptions from travel restrictions, compared with users of traditional cars, users of electric vehicles enjoy privileges under the policy [18]. The popularity of infrastructure such as charging piles is an important factor in consumer acceptance of electric vehicles, also has the greatest impact on purchase intentions, even more, powerful than financial incentives [11, 19].

2.4.1 Purchase restrictions

In developed cities such as Beijing and Shanghai, due to the restrictions on vehicle quotas and carbon emissions, they all adopt the form of auction, queue or lottery to provide the right to purchase vehicles, under these conditions, The probability of obtaining the right to use is more valuable than the subsidy [17]. Even subsidies are important, but exemptions from purchase restrictions are more attractive especially to people travelling on public transport. Buying restrictions benefit to the social welfare but hurt the market, however the exempt that comes with buying an electric car reinforces the preference for electric vehicles, the top six cities in the top ten new energy vehicle sales are developed cities, which restrictive policy exist. The purchase restriction exemption is more effective than the subsidy policy, but it is also very narrow. It is effective only in developed cities. In some cities without purchase restrictions, the promotion of electric vehicles still needs the help of financial policies [20].

2.4.2 Charging pile

The popularity of charging piles is also crucial to the development of the electric vehicle industry [21]. The popularity of charging piles can improve the adoption rate of electric vehicles [11]. Travel anxiety caused by insufficient charging points [22] or occupancy of electric vehicle parking spaces are factors that hinder the development of electric vehicles. This depends more on the government's location selection and installation of public charging piles, as well as the management of parking spaces by the property [23].

2.5 Demonstration policies

Electric vehicles as the government proposes new goals, the government itself needs to make changes to demonstrate and guide the market. As early as the 2008 Beijing Olympics, the government had provided electric buses to serve the Olympic Games. This type of bus was charged by changing batteries, enabling 24-hour uninterrupted service. 14 years later, at the 2022 Beijing Winter Olympics, electric buses will appear in people's field of vision. At this time, they already have perfect intelligence and Internet technology, which can implement automatic driving and real-time information exchange and because it is winter, the cold protection of the battery has also been upgraded [8]. In terms of daily public transportation, China's E bus has exceeded 400,000 vehicles by the end of 2020. Other public transport such as taxis, can also be regarded as a demonstration policy for the government. When the government provides sufficient subsidies for purchase, operation, registration, and other expenses, taxi drivers are still willing to give up traditional fuel vehicles [24]. However, the problem of excessive charging time and the number of charging stations is still a dilemma. The effect of the demonstrative policy is unknown, but it increases the frequency of electric vehicles in the consumer's field of vision to achieve publicity.

2.6 Other policies

In addition to the above four policies, other policies can also provide different levels of support, such as the information policy. Information policy is to increase market demand by changing consumer preferences through the dissemination and promotion of new technologies, this policy will not sufficiently promote the industry in the short term, but in the long run, it can achieve the same effect as the subsidy policy [9,19]. Some other policies, such as enterprise technical support and enterprise management policies, affect the market from the enterprise side [4]. However, all policies are based on the public's preference for environmental protection, the effectiveness of the above policies will be improved with good environmental protection publicity [19].

2.7 Policy mixed

Compared with a single policy, the combination of policies is more effective in promoting new energy vehicles. By controlling multiple policies to different degrees, the government can achieve its goals. Of the single policies, financial policy is seen as the most effective, achieving maximum effect

by combining subsidies from both producers and consumers [25]. For example by giving both sides subsidies and tax breaks to change their preferences. Some other combinations are similar to financial subsidies and infrastructure is also more effective when they are in combination [11].

3. Suggestions

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In the market environment of the epidemic, the market trend of China's new energy vehicles will not be suppressed, on the contrary, sales and usage are gradually increasing. According to China's Ministry of Finance, Ministry of Science and Technology, and national reform and development commission released on December 31, 2021, "about 2022 new energy vehicles to apply for financial subsidies policy notice, to be sure, keep the battery capacity in 2022, some technical indexes such as energy consumption under the condition of invariable threshold, new energy vehicles subsidies has a 30% overall decline. It also helps stabilize corporate goals and push the fresh hybrid vehicle market to prominent examples. After the subsidy reduction, the burden on enterprises will be significantly reduced, and the profitability problem will be obvious difficulties. These three minerals outperform lithium iron phosphate in terms of cost, and demand will continue to rise. Therefore, in such an environment, new energy enterprises will focus on the application of iron phosphate batteries. Some businesses may also provide insurance plans to keep costs, whereas others might release new models to raise costs by upgrading cognitive performance. In order to establish the next phase of development objectives and important innovation tasks, the Department of Science and Technology issued the national key plan of the new energy car key specialized implementation plan in February 2015. It also proposed new energy cars and trucks pilot specialized management team and the implementation of project m. Ultimately, the aims and duties stipulated in the strategy are onerous and call for the profession as a whole to work collaboratively. Officials were also vigorously currently investigating this same practicability of incorporating California's negligible automobiles indispensable governance regulations and policy again for renewable electricity autos, vehicle manufacturers, the introduction of products fuel vehicles and petroleum fuel cars straightforwardly contacted only with the assessor, and adoption similar to California's negligible vehicles integral management policy and regulations for the new energy cars. The industrialization of new energy cars will go along much more quickly as a result of the policy's implementation, and businesses will be more motivated to make new energy vehicles [25]. Law enforcement agencies were indeed vigorously observing this same practicability of incorporating California's negligible automobiles indispensable governance regulations and policy again for renewable electricity autos, vehicle manufacturers, the introduction of products fuel vehicles and petroleum fuel cars straightforwardly contacted only with the assessor, and adoption similar to California's negligible vehicles integral management policy and regulations for the new energy cars. The industrialization of new energy cars will go along much more quickly as a result of the policy's implementation, and businesses will be more motivated to make new energy vehicles. A technological policy regarding recycling electrical vehicles' power packs is anticipated. The problem of battery system recycling has received a great deal of attention as even the number of innovative hybrid cars keeps growing. The state has suggested developing a technology system for power battery recycling in a number of documents. In order to promote waste rechargeable battery pack recycling via funds, deposits, mandatory recycling, and others tends to mean, as well as to establish and improve the waste battery system recycling system, the National Development and Reform Commission is currently investigating and continuing to develop electric vehicle influence battery material recovery and utilization technology policy. Somehow doesn't deal with catastrophes, etc., as required by the law.

Breakdown of industrialized economies' experiences. The "law of unintended consequences principle" was recognized and upheld by European union member states as early as 1972, and pollution prevention and management were included in their plans for economic development. Carbon taxes were enacted in a number of nations as transportation, energy, and vehicle purchase fees. The first, the use because purchase taxes on motor vehicles, is specific to the following points. Nine OECD members impose a one-time tax on car purchases, while the remaining nine impose annual taxes. second energy tax on transportation. OECD nations impose motor fuel taxes in addition to vehicle purchase and use taxes to discourage the use of high-energy vehicles and so lower16bon emissions [25].

4. Conclusion

New energy vehicles are gradually becoming popular in China. With the strong call for the slogan of carbon neutrality in recent years, the sales volume and usage of new energy vehicles in China have reached a peak. Through consumer subsidy policy, enterprise policy, carbon and water policy, tax subsidy policy, charging station setting policy, green license purchase limit policy, public transport policy, information policy, and industrial policy, China's new energy vehicle policy has gradually taken shape. The development of new energy vehicles is beneficial to alleviate the energy problem in China, reduce carbon dioxide emissions, protect the environment, reduce pollutant emissions and thus help to improve the haze weather. However, with the rapid development of new energy vehicles and the increase in the total number of new energy vehicles, the product safety risk of the new energy vehicle industry has gradually become prominent, and the scattered development trend of the industry is also increasing. As a result, from the end of 2016 to early 2017's new energy automobile policy's main measure is to raise barriers to entry, efforts to reduce subsidies, forcing companies such as strengthening technology research and development, to the road of independent innovation and development, make old technology is difficult to meet the need of the market the enterprise cannot rely on subsidies, go-to healthy development of new energy automotive industry.

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