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Should the Chinese Government increase policy support and economic subsidies for the new energy transportation industry?

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Abstract:

This study examines the need for, and the impact of, increased policy support and economic subsidies from the Chinese government for the new energy transport industry. Among the implications are the current state of the new energy vehicle (NEV) market, current government policies, and their impact on market growth, technological advancement, and environmental sustainability. Through a comprehensive literature review and a preliminary study of 185 respondents, this study evaluates various hypotheses related to the potential pros and cons of increased government support. The results indicate that government subsidies have received substantial support and have played a positive role in promoting the popularity of new energy vehicles, facilitating the development of the industrial chain, improving energy security and technological competitiveness, and reducing environmental pollution. The study also identified possible adverse effects of reduced subsidies, such as slower infrastructure development and increased market segmentation. The findings emphasize the importance of continued government intervention in promoting sustainable growth of the new energy vehicle industry. The paper concludes with recommendations for policy adjustments to better align with dual-carbon goals and ensure the long-term viability of the industry.

Keywords: New Energy Vehicles (NEVs), Government Subsidies, Policy Support, Carbon Neutrality, Sustainable Development

1. Introduction

The transport sector is a major emitter of carbon emissions and is an important breakthrough direction for environmental and energy transformation. In the book “Carbon Neutral Economics”, global warming and other environmental problems have become increasingly serious in recent years, it has become an

international consensus to encourage the development of a new energy transport industry.

The Energy Saving and New Energy Industry Development Plan (2012-2020) was released in 2012. Electric vehicles, with their advantages of obtaining policy support and hundreds of billions of subsidies, stand out in the new energy vehicle industry and have a certain competitive advantage. At the same time, some "subsidy fraud" scandals have also broken out.

On 22 September 2020, Chinese President Xi Jinping proposed: "China will increase its nationally owned contribution, adopt more vigorous policies and measures, and strive for carbon dioxide emissions to peak by 2030 and work towards carbon neutrality by 2060."

Against this dual-carbon backdrop, new energy industries such as hydrogen and ethanol internal combustion engine vehicles are taking off. To achieve sustained breakthroughs in technology and commercialization in the future, policy, and capital will be needed to fuel these industries.

Based on my dual interest in economics and the new energy industry, I would like to explore the question, „Should the government increase policy support and financial subsidies for the new energy transport industry?" This topic is to understand and analyze the current situation of the new energy vehicle industry, to study the relationship between economy, energy, and sustainable development, and to put forward my own opinions and suggestions on the relevant policies of the new energy transport industry.

2. Literature Review

2.1 The New Energy Vehicle Market in 2024 and its Prospects

2.1.1 Markt Growth

The new energy vehicle market has experienced significant growth in recent years. According to the China Association of Automobile Manufacturers (CAAM), China's new energy vehicle sales will be 1.367 million in 2020, reach 3.521 million in 2021, grow to 6.887 million in 2022, and further grow to a value of 8.543 million in 2024. According to the first half of 2024 data, the annual sales volume of 2024 will be a breakthrough of more than 10 million units. In addition to technological progress, charging infrastructure construction, and other infrastructure upgrading factors.

2.1.2 Percentage of New Energy Vehicles in Total Vehicle Sales

The percentage of new energy vehicles in total automobile sales continues to climb, reaching 35.2% in the first half of 2024. (Source: China Association of Automobile Manufacturers). According to the data released by the Traffic Management Bureau of the Ministry of Public Security on 9 July, as of the end of June, the number of new energy vehicles in the country reached 24.72 million, accounting for 7.18% of the total number of cars.

Table 1 The Percentage of New Energy Vehicles

Year	New energy vehicle ownership (per 10,000)	Total number of vehicles (per 10,000)	Percentage	Data sources
2018	261	24028	1.09%	Traffic Management Bureau of the Ministry of Public Security
2019	381	26150	1.46%	Traffic Management Bureau of the Ministry of Public Security
2020	492	28087	1.75%	Traffic Management Bureau of the Ministry of Public Security
2021	784	30200	2.60%	Traffic Management Bureau of the Ministry of Public Security
2022	1310	31900	4.10%	Traffic Management Bureau of the Ministry of Public Security
2023	1620	33000	4.91%	Traffic Management Bureau of the Ministry of Public Security
2024 Q1&2	2472	34500	7.18	Traffic Management Bureau of the Ministry of Public Security

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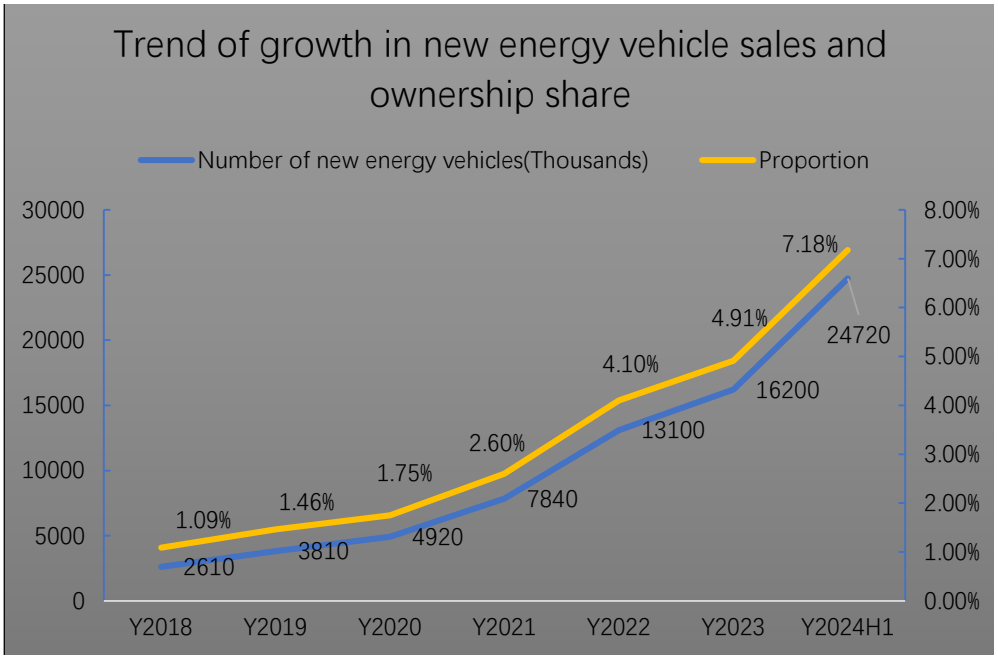
Table 2 Trend of growth in new energy vehicle sales and ownership share



Of all the new energy vehicle categories, sales of electric vehicles are starting from a low base but are growing rapidly in many markets. According to www.ourworldindata.com, "By 2023, one in four new cars worldwide will be electric. In Norway, the proportion is over 90 percent, while in China it is close to 40 percent."

2.1.3 Major Brands and Manufacturers

BYD stands out in the market among numerous brands due to its leading battery technology and extensive product line. Tesla also holds a significant position with its cutting-edge self-driving technology and strong brand influence. Additionally, domestic new power brands like Azera, Ideal, and Xiaopeng, along with traditional automakers such as GAC EAN and Geely Geometry transforming, are all making an impact in the market. Meanwhile, advancements in hydrogen fuel cell research and the implementation of hydrogen energy industry policies have led to considerable progress by some companies in the hydrogen vehicle sector. (E-car, 2024)

2.1.4 Technology Development

Hydrogen vehicles, as an important branch of new energy vehicles, have developed significantly in recent years. According to incomplete statistics of public information, the bidding volume of hydrogen vehicles in the first three months of 2024 has soared to 2,744 vehicles, covering a wide range of models such as hydrogen fuel cell buses, heavy trucks, etc., and the bidding volume has surpassed the 2,040 vehicles in the whole year of 2023. 801 vehicles of domestic fuel cell vehicles were licensed for sale in the first quarter of 2024, representing a significant increase of 45.9% year-on-year. (GG Hydrogen Industry Research Institute, 2024)

2.1.5 Hydrogen Vehicle Development Data

According to the GGI Hydrogen and Electricity Industry Research Institute (GGII) "Fuel Cell Vehicle Database" (caliber of traffic insurance), in the first quarter of 2024, the installed capacity of licensed hydrogen vehicle systems reached 84MW, and the average installed power exceeded 100KW, reaching 105KW. Among the models put into use, the special-purpose vehicles represented by heavy trucks took up a majority of the share of the quarterly hydrogen vehicle installations, with the installed capacity of heavy trucks amounting to 359, up 181.3% year-on-year. The installed volume of heavy trucks reached 359 units, an increase of 181.3% over the previous year. (GG Hydrogen Industry Research Institute, 2022)

2.1.6 Forecast for Future Growth

With ongoing technological advancement, strong policy support, and consumers' growing awareness of environmental protection, the new energy vehicle market is anticipated to maintain rapid growth in the future. By 2025, sales of new energy vehicles are expected to surpass 50%. Notably, the cost-effectiveness of hydrogen fuel cell vehicles will improve further, paving the way for widespread application in transportation. With the introduction of detailed local policies and subsidies, production and sales are projected to continue growing at a high rate, and the hydrogen and fuel cell industry is set to enter a period of

accelerated growth in 2024. (Wu, 2023)
Overall, the new energy vehicle market will develop well in 2024, with a broad prospect. However, it also faces some challenges, such as the improvement of charging infrastructure, the reduction of battery cost, the safety issue of hydrogen storage and transport, and the popularity of hydrogen refueling facilities. Brands and manufacturers should continue to innovate to adapt to the changes and demands of the market.

2.2 Existing Chinese Government Policy Toward New Energy Vehicles

2.2.1 Overview of existing policies

With the improvement of environmental protection requirements and the adjustment of energy structure, and to ensure the realization of the 3060 dual-carbon policy, new energy vehicles and hydrogen fuel cell vehicles have been highly valued, and the government has introduced a series of relevant policies to continuously promote the development of the new energy industry. However, with the increase in policy support and the accumulation of subsidies, the competitive advantage of electric vehicles in the market has been inflated, as well as "subsidy fraud". To deal with the problem of "subsidy fraud", the Chinese government canceled the new energy vehicle purchase subsidy policy in 2023 but continued the policy of exempting new energy vehicles from vehicle purchase tax. (Cui, 2016)

2.2.2 Existing Policies for Hydrogen Fuel Cell Vehicles

In economics, policy support and financial subsidies are important tools used by governments to regulate the economy, promote the development of specific industries, and ensure social stability; they are two key tools for achieving macroeconomic and social goals.
1. Policies for Demonstration City Clusters
According to the Notice on Demonstration and Application of Fuel Cell Vehicles issued by the Ministry of Finance, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, the National Development and Reform Commission, and the National Energy Administration, several demonstration city clusters for hydrogen fuel cell vehicles will be supported to carry out the relevant work and to promote the technological research and development and industrial development.
2. Subsidy support
For example, the Ministry of Finance, Ministry of Industry and Information Technology, Ministry of Science and Technology, and Development and Reform Commission issued the Notice on Further Improving the Financial Subsidy Policy for the Promotion and Application of New Energy Vehicles, and some provinces and cities have issued separate policies to provide certain subsidies for the production and purchase of hydrogen fuel cell vehicles.
3. Support for hydrogen refueling station construction
According to the Guidance Opinions on Accelerating the Development of the Hydrogen Energy Industry issued by the National Energy Administration, the construction of hydrogen refueling stations is encouraged to improve the supply capacity of hydrogen energy.
4. High-speed free policy
Starting from 1 March 2024, Shandong Province will temporarily waive highway tolls for hydrogen-powered vehicles installed with ETC kits on highways in the province for a trial period of two years, with timely adjustments based on the implementation situation after the expiration of the policy.
Sichuan Province issued a notice on 17 April on the public solicitation of opinions and suggestions on the Action Plan to Further Promote the Development and Application of the Hydrogen Energy Industry Chain in Sichuan Province (2024-2027) (Draft for Opinion). It mentions relaxing urban access restrictions for hydrogen fuel cell vehicles across the province and exempting highway tolls in the province for hydrogen vehicles installed with ETC equipment.
Ordos City, Inner Mongolia Autonomous Region, since 1 June, for hydrogen vehicles traveling through toll stations in Ordos City, the amount of the charge will be collected and then all the tolls will be returned after the next month's audit. It provides that hydrogen fuel cell vehicles enjoy free passage on motorways in [specific road sections and time frames].

2.2.3 Policy Impact

From the data results, these policies have strongly promoted the market growth of new energy vehicles and hydrogen fuel cell vehicles. The sales volume of new energy vehicles has been climbing year by year, the technology has been advancing, and the cost has been gradually reduced. The R&D and application of hydrogen fuel cell vehicles are also accelerating.

2.3 Economic Principles surrounding the market for new energy vehicles

The rapid development of the new energy vehicle market reflects the combined effect of economic principles such as supply and demand, economies of scale, the principle of externalities, and industrial policy. In the future, with the continued influence of these factors, the new energy vehicle market is expected to continue to grow.

2.3.1 Principle of supply and demand relationship

According to the data of the China Association of Automobile Manufacturers (CAAM), the sales volume of new

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energy vehicles in China will be 1.367 million units in 2020, and the sales volume will reach 6.887 million units in 2023. The rapid growth of demand makes the demand curve shift sharply to the right.

On the supply side, with the maturity of production technology and the expansion of scale, the cost is lowered, more enterprises enter the market, and the supply curve also shifts significantly to the right. Taking the cost of batteries as an example, the average cost of batteries per kWh will be about RMB1,000 in 2020 and will drop to about RMB800 in 2023 (Bang, 2021), which makes the price of new energy vehicles more competitive and further stimulates demand.

2.3.2 Economy of scale

Taking a new energy vehicle manufacturer as an example, when its annual output is 50,000 units in 2020, the unit production cost is 150,000 yuan; when the annual output reaches 200,000 units in 2023, the unit production cost drops to 100,000 yuan. The increase in production enables the enterprise to share the R&D expenses and fixed costs and reduce the cost of raw materials through large-scale procurement, thus realizing economies of scale.

2.3.3 The principle of externality

According to calculations by environmental protection authorities, a conventional fuel vehicle emits an average of about 4.6 tons of carbon dioxide per year. In comparison, a new energy vehicle can reduce carbon dioxide emissions by about 3 tons per year. However, the producers and consumers of new energy vehicles do not get the full benefit of this environmental improvement, so there is a positive externality.

2.3.4 Principle of Industrial Policy

The government has introduced a series of industrial policies, such as purchase subsidies. In 2020, the purchase subsidy for some models can reach about 10% of the vehicle's selling price, which directly reduces the purchase cost of consumers and stimulates demand (Yang, 2020). At the same time, the government supports the R&D investment of new energy vehicle manufacturers, which promotes technological progress and industrial development.

2.4 A review of arguments concerning government support and subsidies

By reading the literature, it is not difficult to find that people have different opinions on the effectiveness of government policies to support and subsidize the new energy transport industry. The article "Analysis of the Effectiveness of Subsidy Policies for New Energy Vehicles" systematically elaborates on two views: on the one hand, subsidy policies have played a positive role in promoting industrial development, technological innovation, and market expansion; on the other hand, they may also lead to problems such as overcapacity, policy dependence, and diminishing incentive effects.

2.4.1 Positive Attitude

Supportive views of existing new energy vehicle policies usually focus on the following aspects:

1. Industrial incentive effect

The article "Research on the Effects of New Energy Vehicle Subsidy Policy in J District, Shanghai" summarizes two examples of subsidy policies that have achieved industrial incentives: "New energy vehicle ownership has surged, and the new energy vehicle industry chain has lengthened. "The new energy vehicle industry chain is lengthening. Consumers have increased their purchasing motivation by obtaining subsidies, and the new energy transport market has accelerated its expansion with the development of subsidy policies.

2. Promoting enterprise production and operation and independent innovation

The tax incentives provided by the subsidy policy for the industry can effectively reduce the tax burden pressure of new energy vehicle production companies, enabling enterprises to invest most of their funds into the research of new technologies and to promote production and operation. Take BYD company in the article "Research on the impact of new energy vehicle subsidy policy on BYD company performance" as an example, its "enterprise income tax payment enjoys 15% tax incentives.....greatly reducing the tax burden".

3. Enhancing market stability

By analyzing the model constructed in the article and the results shown in the model, it can be seen that the subsidies of the new energy automobile industry "are expanding the market and accelerating the progress of industrial development" and, to a certain extent, increase the stability of the market.

2.4.2 Reverse Attitude

The critical views of the existing new energy vehicle policy are mainly focused on the following aspects:

1. Lack of understanding of existing policies by the target group of policy implementation

The survey results in the article "Research on the Problems and Countermeasures of the Implementation of the New Energy Vehicle Promotion and Application Policy in Chengdu" show that Many customers will ask the sales staff about the preferential policies for new energy vehicles, which shows that "this part of potential consumers have no understanding of the new energy vehicle promo-

tion and application policy in Chengdu".
2. Insufficient policy iteration and flexibility
The article "Research on the Implementation of New Energy Vehicle Industry Policy in Province S" mentions examples of iterative and inflexible new energy vehicle policies: "There is a certain lag in the implementation of new energy vehicle policies. "Some regions entered the practical application and industrialization phase" as early as 2006, while Province S only introduced new energy companies in 2010) and "insufficient flexibility in the application of policy instruments" ("...the implementation of New Energy Vehicle Industry Policy in Province S"). ("...more attention has been paid to environmental policies and factors in the development of the new energy automobile industry, which to a certain extent standardizes the quality of management and taxation").
3. Fiscal and taxation policies have been exploited by problematic enterprises, resulting in discounts on the national subsidy policy.
According to the "Study on New Energy Vehicle Industry Policy", "due to the national encouragement of new energy vehicles fiscal policy adjustments, certain automobile manufacturers and even equipment manufacturers in the case of insufficient technical reserves, R & D capacity does not match the hasty launch of new energy projects, there are more some business sector policy 'east wind' to cheat the state subsidies."

3. Methodology

3.1 The Research Gap

Through extensive reading of the literature, it can be found that the most current articles that help to understand and analyze the policy subsidies for new energy vehicles are often published in 2020-2022. In such a rapidly changing market as new energy vehicles, tastes, opinions, technologies, etc., change so fast that even literature that is only half a year old now appears to have a mismatch between the status quo and the data, not to mention existing literature that is more than a year old. This information lag may lead to analytical errors.
In addition, the existing research hardly describes policies specifically within China and related to the Chinese market, preferring to describe the impacts of the world's new energy policies on China. Therefore, conducting primary research would ensure that the data is more market-specific.
Finally, the extant literature usually focuses on either one aspect of policy or consumer response and behavior, but few studies link these two aspects. This, in my view, is the biggest shortcoming of existing research in this area. Only by systematically analyzing the impact of policies on consumers can proposals for policy changes be better formulated.

3.2 Research Hypotheses

Assuming that the following effects will occur when the government increases policy subsidies for new energy vehicles:
1. Promote the popularity of new energy transport;
2. Drive the development of related industrial chains;
3. Enhance China's energy security and technological competitiveness;
4. Reduce environmental pollution and carbon emissions.
Assuming that the government does not increase policy subsidies for new energy policies, the following effects will occur:
1. slowdown in infrastructure development;
2. Short-term decline in market demand;
3. Increased costs for vehicle operators;
4. Increased market differentiation.

3.3 Research Methodology

To study this topic, I have used an electronic questionnaire format that is less costly and is not limited by geographic location. Questionnaires ensure that all participants answer the same questions, and the consistency and comparability of data make it easier to collect data for quantitative analysis.
I will use a single-sample t-test to get a p-value for data analysis. The neutral is represented by 5.5, so if $p<0.05$ and the mean value is greater than 5.5, I suppose the hypothesis is valid.

ISSN 2959-6149

4. Results

4.1 Sample Matrix

Table 3 Results of Chi-square Analysis

交叉(卡方)分析结果						
题目	名称	1、您的年龄段Your Ages(%)				总计
		18岁以下 Under 18 years old	19-30岁 19-30 years old	31-45岁 31-45 years old	45岁以上 Above 45 years old	
2、您对当前新能源交通（如电动汽车、氢能汽车、甲醇混合动力车等）的发展状况了解程度如何？To what extent are you aware of the current development of new energy transport (e.g. electric vehicles, hydrogen vehicles, methanol hybrids, etc.)?	一般了解 General	3(75.00)	14(73.68)	35(55.56)	64(64.65)	116(62.70)
	不了解 Not at all	1(25.00)	2(10.53)	6(9.52)	20(20.20)	29(15.68)
	很了解 Very well	0(0.00)	3(15.79)	22(34.92)	15(15.15)	40(21.62)
总计		4	19	63	99	185

Over the last two weeks, a total number of 185 responses were collected from the questionnaire. The survey dataset consists of responses analyzed from two dimensions: age group and level of awareness in the new energy transportation industry. The age groups range from young adults under 18 to older demographics above 45, providing a diverse perspective on the surveyed issues. The level of awareness concerning new energy transport, such as electric vehicles and hydrogen-powered vehicles, was also assessed.

4.2 Results by Question

See appendix [4]

4.3 Main differences in views by age

The comparison results for different age groups in terms of their views on the necessity of support and financial subsidies for the transport industry are shown in Table 4, and the p-value of the test results of one-way ANOVA is less than 0.05, indicating that there are significant differences between different age groups in terms of the necessity of support for the transport industry policy and the necessity of economic subsidies. From the mean results, the group between 31-45 years old has the most positive attitude.

Table 4 Question 3 and 4 Statistics

	Age	N	Mean	SD	F	p
3. Do you think there is a need for the government to increase policy support for the new energy transport industry?	Under 18 years old	4	5.50	3.79	5.175	0.002
	19-30 years old	19	7.63	2.97		
	31-45 years old	63	8.81	1.93		
	Above 45	99	7.24	3.08		
4. Do you think there is a need for the government to increase subsidies for the new energy transport industry?	Under 18 years old	4	5.50	2.52	3.937	0.009
	19-30 years old	19	7.79	2.97		
	31-45 years old	63	8.40	2.22		
	Above 45	99	6.96	3.20		

Table 5 shows a comparison of the evaluation of the effectiveness of each policy, and from the results, there is a significant difference in the efficacy of Charging/hydrogen refueling infrastructure development, financial support for research and development, Hydrogen highways free of charge, The access policy for new energy vehicles for zero-carbon ports, zero-carbon construction sites, and other vehicle scenarios. The p-value on the evaluation of the effectiveness of the above policies is less than 0.05, indicating that there is a significant difference in the evaluation of the effectiveness of these policies among different age groups and that the evaluation of the 31 - 45 age group is the most positive.

Table 5 Question 5 Statistics

	Age	N	Mean	SD	F	p
5. Tax incentives and subsidies for the purchase of vehicles	Under 18 years old	4	6.25	2.87	1.228	0.301
	19-30 years old	19	7.84	2.89		
	31-45 years old	63	8.02	2.74		
	Above 45	99	7.26	2.94		
5.1 Charging/hydrogen refueling infrastructure development	Under 18 years old	4	6.00	1.63	3.232	0.024
	19-30 years old	19	7.74	2.90		
	31-45 years old	63	8.76	2.19		
	Above 45	99	7.59	2.97		
5.2 Financial support for research and development	Under 18 years old	4	5.50	4.20	3.367	0.02
	19-30 years old	19	7.16	3.01		
	31-45 years old	63	8.03	2.60		
	Above 45	99	6.64	3.04		
5.3 Hydrogen highways free of charge	Under 18 years old	4	4.50	1.92	5.104	0.002
	19-30 years old	19	7.84	2.85		
	31-45 years old	63	8.59	2.40		
	Above 45	99	7.17	3.00		
5.4 The access policy for new energy vehicles for zero-carbon ports, zero-carbon construction sites, and other vehicle scenarios	Under 18 years old	4	5.25	3.20	3.218	0.024
	19-30 years old	19	7.68	2.93		
	31-45 years old	63	8.44	2.43		
	Above 45	99	7.35	2.82		

The results of the comparison of the positive impact of policy support for different age groups are shown in Table 6. For promoting the development of related industrial chains and employment and reducing environmental pollution and carbon emissions, there are significant differences in the evaluation of different age groups. The highest ratings were found between the ages of 31 - 45.

Table 6 Question 6 Statistics

	Age	N	Mean	SD	F	p
6.1 Promoting the spread of new energy transport	Under 18 years old	4	8.75	1.50	1.363	0.256
	19-30 years old	19	7.63	3.04		
	31-45 years old	63	8.40	2.33		
	Above 45	99	7.62	2.71		
6.2 Promoting the development of related industrial chains and employment	Under 18 years old	4	6.75	3.40	3.28	0.022
	19-30 years old	19	7.68	2.93		
	31-45 years old	63	8.76	2.15		
	Above 45	99	7.42	3.05		
6.3 Enhancing China's energy security and scientific and technological competitiveness	Under 18 years old	4	8.25	2.06	2.01	0.114
	19-30 years old	19	7.16	3.29		
	31-45 years old	63	8.70	2.24		
	Above 45	99	7.88	2.88		

ISSN 2959-6149

6.4 Reducing environmental pollution and carbon emissions	Under 18 years old	4	8.75	1.89	2.668	0.049
	19-30 years old	19	7.47	3.06		
	31-45 years old	63	8.97	2.00		
	Above 45	99	7.99	2.74		

Table 7 shows the results of the comparison of different age groups on thoughts of the impacts of reducing support by the government, from the table, the p-value of the comparison results of each group is less than 0.05, the age groups are not the same, and there is a significant difference in the expectations on impact and outlook. From the mean scores of the comparison results, the group between 31-45 years of age gives the highest expectation on impact and outlook.

Table 7 Question 7 Statistics

	Age	N	Mean	SD	F	p
7.1The slowdown in infrastructure development	Under 18 years old	4	1.75	0.50	8.208	0.000
	19-30 years old	19	7.11	3.16		
	31-45 years old	63	8.22	2.35		
	Above 45	99	6.79	3.13		
7.2 Short-term decline in market demand	Under 18 years old	4	3.50	4.44	4.755	0.003
	19-30 years old	19	5.89	3.64		
	31-45 years old	63	7.89	2.62		
	Above 45	99	6.76	3.03		
7.3 Increased enterprise costs for vehicle operators	Under 18 years old	4	5.25	2.22	5.671	0.001
	19-30 years old	19	5.63	3.56		
	31-45 years old	63	8.27	2.55		
	Above 45	99	6.79	3.12		
7.4 Increased market fragmentation	Under 18 years old	4	3.75	1.71	5.963	0.001
	19-30 years old	19	5.95	3.42		
	31-45 years old	63	8.11	2.48		
	Above 45	99	6.87	2.88		

4.4 Main differences in views by the level of awareness

The results of the comparison of different transport cognitive groups in the attitude toward the necessity of policy support and financial subsidies are shown in Table 8, and the p-values of the test results are all greater than 0.05, and there is no significant difference between groups with different levels of transport cognition in the evaluation of the necessity of policy support and financial subsidies.

Table 8 Question 8 Statistics

	Level of understanding	N	Mean	SD	F	p
3, Do you think there is a need for the government to increase policy support for the new energy transport industry?	Very well understand	40	8.45	2.44	1.728	0.181
	Generally understand	116	7.68	2.83		
	Do not understand at all	29	7.24	3.26		
4, Do you think there is a need for the government to increase subsidies for the new energy transport industry?	Very well understand	40	8.10	2.71	1.353	0.261
	Generally understand	116	7.43	2.88		
	Do not understand at all	29	6.97	3.39		

Different traffic cognitive groups in the evaluation of the effectiveness of the policy comparison results in Table 9, test results p-value are greater than 0.05, traffic cognitive level of different groups in the evaluation of the effectiveness of the policy there is no significant difference.

Table 9 Question 5 Analysis

	Level of understanding	N	Mean	SD	F	p
5.1 Tax incentives and subsidies for the purchase of vehicles	Very well understand	40	7.98	2.76	0.699	0.499
	Generally understand	116	7.51	2.92		
	Do not understand at all	29	7.17	2.84		
5.2 Charging/hydrogen refueling infrastructure development	Very well understand	40	8.30	3.08	1.143	0.321
	Generally understand	116	8.02	2.50		
	Do not understand at all	29	7.31	3.19		
5.3 Financial support for research and development	Very well understand	40	7.05	3.27	0.485	0.616
	Generally understand	116	7.28	2.80		
	Do not understand at all	29	6.69	3.26		
5.4 Hydrogen highways free of charge	Very well understand	40	8.33	2.86	1.57	0.211
	Generally understand	116	7.41	2.85		
	Do not understand at all	29	7.79	2.92		
5.5 The access policy for new energy vehicles for zero-carbon ports, zero-carbon construction sites, and other vehicle scenarios	Very well understand	40	8.20	2.85	0.793	0.454
	Generally understand	116	7.58	2.66		
	Do not understand at all	29	7.59	3.03		

Table 10 is a comparison of the evaluation results of the positive impact of policy support by different groups of traffic cognition, and the p-values of the test results are all greater than 0.05, and there is no significant difference between groups with different levels of traffic cognition in the evaluation of the positive impact of policy support.

Table 10 Question 6 Analysis

	Level of understanding	N	Mean	SD	F	p
6.1 Promoting the spread of new energy transport	Very well understand	40	8.28	2.72	1.07	0.345
	Generally understand	116	7.92	2.52		
	Do not understand at all	29	7.34	2.84		
6.2 Promoting the development of related industrial chains and employment	Very well understand	40	8.03	3.13	0.147	0.864
	Generally understand	116	7.91	2.71		
	Do not understand at all	29	7.66	2.87		
6.3 Enhancing China's energy security and scientific and technological competitiveness	Very well understand	40	8.50	2.63	0.65	0.523
	Generally understand	116	8.03	2.71		
	Do not understand at all	29	7.79	2.98		
6.4 Reducing environmental pollution and carbon emissions	Very well understand	40	8.68	2.50	0.581	0.56
	Generally understand	116	8.18	2.56		
	Do not understand at all	29	8.17	2.74		

Table 11 shows the comparison of results on thoughts of the impacts of reducing support by the government for different traffic awareness groups, where the p-value of the impact outlook test for Increased market fragmentation is less than 0.05, and there is a significant difference between groups with different levels of traffic awareness

ISSN 2959-6149

on this impact outlook. The group with the highest level of traffic awareness has the highest expectations. In other impacts and outlooks, there is no significant difference between different traffic awareness groups.

Table 11 Question 7 Analysis

	Level of understanding	N	Mean	SD	F	p
7.1 The slowdown in infrastructure development	Very well understand	40	7.68	3.16	0.863	0.423
	Generally understand	116	6.98	2.97		
	Do not understand at all	29	7.41	3.07		
7.2 Short-term decline in market demand	Very well understand	40	7.60	3.22	1.182	0.309
	Generally understand	116	6.74	2.98		
	Do not understand at all	29	7.10	3.28		
7.3 Increased enterprise costs for vehicle operators	Very well understand	40	8.05	2.95	2.331	0.1
	Generally understand	116	6.94	3.02		
	Do not understand at all	29	6.69	3.36		
7.4 Increased market fragmentation	Very well understand	40	8.08	2.84	4.297	0.015
	Generally understand	116	6.66	2.88		
	Do not understand at all	29	7.69	2.78		

5. Discussion

According to the questionnaire results, all eight hypotheses are supported, albeit to varying degrees, with respondents most strongly agreeing that government subsidies would reduce environmental pollution and carbon emissions and enhance China's energy security and technological competitiveness. Respondents' agreement with the possible negative impacts of the absence of subsidies is relatively low, but still higher than the neutral value.

5.1 Hypothesis 1 – If the government increases policy support and financial subsidies, it will promote the popularity of new energy transportation

Table 12 Hypothesis 1 Support

Name	N	Mean	SD	t	p
Promoting the spread of new energy transport	185	7.91	2.61	23.2603	0.000**

As can be seen from the table, the test using the one-sample t-test is whether 6 is significantly unequal to the number 5.0. This statement presents a significant difference at 5 ($p=0.000<0.05$). It has a mean of 7.91, which implies that it is recognized that an increase in government subsidies will promote the popularity of new energy transport. In 2.4 we can easily find out that the literatures also agree with this hypothesis by saying "Under the joint effect of national policy propaganda, policy orientation, and consumption promotion, many urban residents consciously approach the consumption of new energy vehicles, and are willing to choose new energy vehicles for consumption in the foreseeable policy expectations, promoting the popularity of new energy transport." (Li, 2020)

5.2 Hypothesis 2 – If the government increases policy support and financial subsidies, it will drive the development of a related industrial chain

Table 13 Hypothesis 2 Support

Name	N	Mean	SD	t	p
Promoting the development of related industrial chains and employment	185	7.892	2.819	25.5368	0.000**

The mean value is around 7.9, indicating that respondents believe that government subsidies can boost the development of related industries. Still, the effect is not as obvious as that of popularization. The t-statistic of industry chain development is 25.5368, with a P-value of 0.0000, indicating a highly significant effect. This supports the hypothesis that government support promotes the development and growth of new energy transport-related industries. In the literature mentioned in 2.4, we can find out that it also gave support to this hypothesis by saying "(New energy) automotive industry chain involves iron and steel, machinery, rubber, electronics, energy, textiles and other industries, can drive the development of more than 100 related sub-industries, the automotive industry is a veritable pillar industry, for which supporting industrial policies must be developed." (Han, 2023)

5.3 Hypothesis 3 – If the government increases policy support and financial subsidies, it will enhance China's energy security and technological competitiveness

Table 14 Hypothesis 3 Support

Name	N	Mean	SD	t	p
Enhancing China's energy security and scientific and technological competitiveness	185	8.092	2.734	23.6060	0.000**

The mean value ranged from 7.7 to 8.1, the highest of all hypotheses, indicating that respondents strongly agreed with this view. The t-statistic is 23.6060 with a p-value of 0.0000, a result that strongly supports the hypothesis that 'greater government support will enhance energy security and technological competitiveness'. This suggests that strategic government intervention can make China more self-reliant and competitive in the global energy sector. However, literature from 2.4 puts forward a conflicting opinion which is "Due to the new energy vehicle industry ecology is not sound enough, the core technology research and development and reserves need to be strengthened, the industry chaos disrupts the development of the industry. All these need to be adjusted, transformed, or strengthened from the government regulatory level, industry guidance level, the enterprise itself." (Li, Huang, 2020)

5.4 Hypothesis 4 – If the government increases policy support and financial subsidies, it will reduce environmental pollution and carbon emission

Table 15 Hypothesis 4 Support

Name	N	Mean	SD	t	p
Reducing environmental pollution and carbon emissions	185	8.286	2.568	25.3311	0.000**

The mean value of 8.29 was the highest of all the questions, indicating that the respondents strongly shared this view. The t-statistic for environmental impact is 25.3311 with a p-value of 0.0000, indicating a significant positive effect. This supports the hypothesis that government support plays a key role in reducing environmental pollution and carbon emissions, further emphasizing the ecological benefits of supporting new energy transport. In the literature mentioned in 2.4, an author wrote, "...implementation in the public domain through relevant policies is a fundamental means of achieving emission reductions" (Han, 2022), which agrees with this hypothesis.

5.5 Hypothesis 5 – If the government does not increase policy support and financial subsidies, infrastructure development might slow down

Table 16 Hypothesis 5 Support

Name	N	Mean	SD	t	p
The slowdown in infrastructure development	185	7.2	3.025	27.9953	0.000**

The mean value of 7.20 indicates that respondents believe that without government subsidies, infrastructure development may slow down. The t-statistic of 27.9953 with a p-value of 0.0000 strongly suggests that infrastructure

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development will slow down significantly if the government does not increase its support. This highlights the importance of government intervention in maintaining the momentum of infrastructure development required for new energy transport. However, there is literature that states "…They believe that the subsidy policy is essentially a means of enterprise support, for the key technological innovation, the existing universal subsidy policy cannot effectively incentivize the technological progress of new energy vehicles" (Chen, 2021) which is an opposite opinion with the hypothesis.

5.6 Hypothesis 6 – If the government does not increase policy support and financial subsidies, there will be a short-term decline in market demand

Table 17 Hypothesis 6 Support

Name	N	Mean	SD	t	p
Short-term decline in market demand	185	6.984	3.083	18.8853	0.000**

The mean value of 6.98 is the lowest of all the questions, but is still above the neutral value of 5, indicating that respondents believe that the absence of subsidies may lead to a decline in demand, but the impact is relatively small. The t-statistic is 18.8853 with a p-value of 0.0000, indicating that if the government does not increase its support, there is a high likelihood that market demand will decline in the short term. This finding emphasizes the role of government policies in maintaining market demand for new energy vehicles. From some of the literature mentioned in Section 2, we can find similar ideas that the market demand for new energy transportation now results in policy support.

5.7 Hypothesis 7 – If the government does not increase policy support and financial subsidies, there will be an increased cost for vehicle operators

Table 18 Hypothesis 7 Support

Name	N	Mean	SD	t	p
Increased enterprise costs for vehicle operators	185	7.141	3.083	17.5753	0.000**

The mean value of 7.14 indicates that respondents believe that the absence of subsidies will increase the cost of doing business. The t-statistic is 17.5753 with a p-value of 0.0000 indicating that without government support, vehicle operators may face higher costs. This suggests that subsidies and other forms of financial support play a crucial role in managing operating costs. Descriptions such as "Without increasing policy subsidies, manufacturers need to keep investing money into R&D, resulting in higher vehicle operating costs." (Chen, 2021) are always seen in different literature in Section 2 that will certainly support the hypothesis.

5.8 Hypothesis 8 – If the government does not increase policy support and financial subsidies, market differentiation will increase

Table 19 Hypothesis 8 Support

Name	N	Mean	SD	t	p
Increased market fragmentation	185	7.13	2.905	18.2700	0.000**

The mean value of 7.13 indicates that respondents believe that the absence of subsidies may lead to market fragmentation. The t-statistic is 18.2700 with a p-value of 0.0000, indicating that without government support, the market would become more fragmented. This may lead to uneven growth in different sectors and regions and exacerbate differences in market development. Further related studies such as "...have some products to supply the market, but without the support of corresponding policies may lead to increased market fragmentation" (Li, Huang, 2020) strongly support this hypothesis.

6. Conclusion

The very low p-values for all hypotheses suggest that the impact of government support (or lack thereof) on all as-

pects of new energy transport is highly significant.
Consistently high t-statistics indicate a strong opinion or a clear trend in the data, meaning that respondents perceive a large gap between programs with increased government support and those with decreased support.
In conclusion, all the research points to a shared result: the government should increase or at least retain the policy support and economic subsidies for the new energy transportation industry. Among all the reasons, the most important factor valued through the t-tests and mean calculation is the reduction of environmental pollution and carbon emission. Other positive reasons such as promoting the popularity of new energy transport, driving the development of related industrial chains, and enhancing China's energy security and technological competitiveness have a higher average support rate than negative reasons like slowing down in infrastructure development, short-term decline in market demand, increasing costs for vehicle operators, and increasing market differentiation.
High-quality economic development, efficient energy use, and high environmental protection are three interdependent elements for achieving sustainable development. Through the research and analysis of this project, it is recommended that the Government promote technological innovation and international cooperation through policy guidance and economic support to accelerate the promotion and realization of green and low-carbon economic and social development.

7. Evaluation

To consolidate my research, firstly, I could expand the sample size by obtaining more specific responses to the questionnaire to increase the reliability of the statistical results and the study. I can also observe the dynamic change of opinions over time by enlarging the sample size to better understand the development process of new energy transport policies.
In addition, ensuring a more stable data structure is also a strategic approach to ensure the comprehensiveness of the data collected. I can make the distribution of the number of respondents in the four age groups not too different, which will make the results of the questionnaire survey more objective and credible.
Finally, since new energy transport is a rapidly changing field, information discrepancies in the study are inevitable. The secondary sources I have used were written between 2021 and 2024, and some of the literature may have appeared outdated due to its early date. This study could have been more rigorous if all of the newly published literature from the last two months had been utilized.

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9. References

Chinese Government (no date) *Sichuan Province Further Promoting the Development and*
Application of Hydrogen Energy Industry Chain Action Programme (2024-2027) (Draft), Notice on the Issuance of Sichuan Hydrogen Energy Industry Development Plan (2021-2025) - Chengdu Green Intelligent Networked Vehicle Industry Eco-system Alliance. Available at:
https://www.cdqc.org.cn/4/10253/452864 (Accessed: 03 September 2024).
Caam.org.cn. (2024). Announcement on the Continuation and Optimisation of the Vehicle
Acquisition Tax Reduction and Exemption Policy for New Energy Vehicles. [online] Available
at: http://www.caam.org.cn/policySearch/con_5235992.html [Accessed 10 Sep. 2024].
Chen (2021). Analysis of the effectiveness of new energy vehicle subsidy policy_E-Car. [online]
Yiche.com. Available at: https://news.yiche.com/hao/wenzhang/60897978/ [Accessed 10 Sep.
2024].
Chinese, G. (2021). National Development and Reform Commission (NDRC) and National Energy
Administration (NEA) jointly issued the Medium- and Long-Term Plan for the Development of
Hydrogen Energy Industry (2021-2035) - National Energy Administration . [online] Nea.gov.cn. Available at: https://www.nea.gov.cn/2022-03/23/c_1310525755.htm [Accessed 10 Sep. 2024].
Cui, W. (2016). New energy vehicle subsidies 'sword' _ Scrolling News_China.gov.cn. [online]
www.gov.cn. Available at: https://www.gov.cn/xinwen/2016-09/09/content_5106700.htm.
Dong, F. and Liu, Y. (2020). Policy evolution and effect evaluation of new-energy vehicle industry
in China. Resources Policy, 67(101655), p.101655. doi:https://doi.org/10.1016/j.resourpol.2020.101655.
Gong, J. and Yan, J. (2021). Carbon Neutral Economics: Macro and Sectoral Trends under the
New Constraints CITIC Press, Beijing.
Han, L. (2023). Study on the Implementation of New Energy Vehicle Industry Policies in Province
S. [online] Soolun.com. Available at: https://www.soolun.com/degree/20b44bbe829ad56d456c993dbf93467d.html [Accessed 10 Sep. 2024].
Li, B. (2024). 2024 Hydrogen Fuel Cell Industry Development

ISSN 2959-6149

Depth Research and Future Trend

Forecast Fuel Cell Heavy Duty Truck Licensing in the First Half of the Year Increased by 38%

Year-on-Year_ChinaResearch_ChinaResearch. [online] Chinairn.com. Available at: https://www.chinairn.com/hyzx/20240719/174946859.shtml [Accessed 10 Sep. 2024].

Li, X. (2020). Notice on the Demonstration and Application of Fuel Cell Vehicles_State Department

Documents. Chinese Government. [online] www.gov.cn. Available at: https://www.gov.cn/zhengce/zhengceku/2020-10/22/content_5553246.htm.

Li, Y. and Huang, T. (2020). Study on New Energy Vehicle Industry Policy. [online] Soolun.com.

Available at: https://www.soolun.com/periodical/0c9b795d101975507f3778c1eef53170.html

[Accessed 10 Sep. 2024].

Lin, L. and Fang, J. (2020). The Impact of New Energy Vehicle Subsidy Policy on BYD's Financial

Performance. [online] Soolun.com. Available at: https://www.soolun.com/periodical/cb9e05cfb9877cf76839b9f75998429b.html [Accessed 10 Sep. 2024].

Liu, C. (2021). The General Office of the State Council issued the 'New Energy Automobile

Industry Development Plan (2021-2035)' _Scrolling News_China.gov.cn. [online] Www.gov.cn. Available at: https://www.gov.cn/xinwen/2020-11/02/content_5556762.htm?eqid=c1714e800005961900000006646f64a8 [Accessed 10 Sep. 2024].

Ou, J. (2017). Economic Knowledge. Jiangxi Fine Arts Publishing House.Shanghai.gov.cn. (2022).

Implementation Measures for Encouraging the Purchase and Use of New Energy Vehicles in Shanghai, Flowchart of the Operation of Special Funds for the Promotion and Application of New Energy Vehicles, and Allocation Results for 2022 and 2023. [online] Available at: https://www.shanghai.gov.cn/hqcyfz2/20240626/17998eafc0a847a481c0fffb9259b2c2.html [Accessed 10 Sep. 2024].

Wang, Y. (2020). Notice on Further Improving the Financial Subsidy Policy for the Promotion and

Application of New Energy Vehicles. State Department Documents_China.gov.cn. [online]

www.gov.cn. Available at: https://www.gov.cn/zhengce/zhengceku/2020-12/31/content_5575906.htm.

Wu, Y. (2024). Observation | The Hydrogen fuel cell vehicle industry is expected to be truly

commercialized in 2030, and we need to grasp the advantages of the scene_10% Company_Pharma News -The Paper. [online] Thepaper.cn. Available at: https://www.thepaper.cn/newsDetail_forward_27647300 [Accessed 10 Sep. 2024].

Yang, F. (2020). 10 percent rebate, 2020 new energy vehicle subsidy policy announced. [online]

Guancha. cn. Available at: https://www.guancha.cn/qiche/2020_04_24_548103.shtml [Accessed 10 Sep. 2024].

Yang, N. (2012). State Council on the issuance of energy-saving and new energy vehicle industry

development plan (2012-2020) notice_State Council Documents_Chinese government website. [online] www.gov.cn. Available at: https://www.gov.cn/zhengce/zhengceku/2012-07/09/content_3635.htm.

Yang, X., Lin, W., Gong, R., Zhu, M. and Springer, C. (2021). Transport decarbonization in big

cities: An integrated environmental co-benefit analysis of vehicles purchases quota-limit and new energy vehicles promotion policy in Beijing. Sustainable Cities and Society, 71, p.102976. doi:https://doi.org/10.1016/j.scs.2021.102976.