

A Study of Consumer Brand Preferences and the Effect of Policy Instruments Based on New Energy Vehicle Markets

Pengfang Gao¹, Jingwen Gao², Wenjun Luo^{1,*}

¹ School of Science, Shandong Jianzhu University, Jinan, China, 250101

² College of Literature and History (College of Culture and Tourism), Weifang University, Weifang, China, 261061

* Corresponding Author Email: 13869333856@163.com

Abstract. In the context of global low-carbon transportation transformation, analyzing the correlation mechanism between new energy vehicle consumer brand preferences and policy tool effects is crucial for improving market penetration and optimizing industrial policies. This article focuses on residents of Jinan City and uses in-depth interviews based on grounded theory, association rules, and contingency analysis methods to study the correlation between consumer cognitive structure, brand preferences, and policy expectations. Shandong residents are highly concerned about new energy vehicles, Jinan is the capital of the province and a transportation hub, and its residents were chosen to be representative of the survey. The research innovation focuses on the association between brand preference and policy tools, integrating qualitative and quantitative methods to reveal group differences and brand differentiation characteristics, providing the basis for accurate policy making. The results showed that consumer purchasing status (not willing to purchase, willing to buy, already purchased) was significantly correlated with policy tool effects: government procurement demonstrations and license plate discounts were more likely to stimulate potential purchasing intentions, car purchase subsidies had a significant effect on attracting and increasing purchasing intentions among the already purchased group, while the effect of public awareness enhancement policies on reducing the proportion of unwilling groups was limited. Meanwhile, brand preferences exhibit differentiated characteristics. Based on this, the study proposes suggestions from the perspectives of government precision design policy tools and enterprise adaptation to consumer demand, providing decision-making references for the high-quality development of the new energy vehicle industry.

Keywords: Questionnaire survey, New energy vehicles, Brand preference, Behavior analysis.

1. Introduction

With the increasingly severe global climate change problem, governments around the world have successively introduced policies to accelerate the development of the New Energy Vehicles (NEV) industry. As the world's largest automobile market, China has listed new energy vehicles as a strategic emerging industry and actively guided consumers to purchase new energy vehicles through incentive policies such as fiscal subsidies and tax incentives. However, the actual implementation effect of policies largely depends on consumers' awareness and acceptance of new energy vehicles. In addition, the rapid iteration of new energy vehicle technology, such as the improvement of battery energy density and the popularization of intelligent driving functions, has further intensified the complexity of consumers' understanding of product characteristics, making the problem of information asymmetry increasingly prominent.

Wang Xuanwen et al. explored the relationship between technical innovation and market value in China's NEV industry chain using DEA and fixed effect models, finding positive effects on upstream and midstream but a negative impact on downstream [1]. Xianfang Su and Jian He use the extended joint connectivity and cross-sectional quantile methods to analyze the correlation between the crude oil market and new energy vehicle-related industries, and find that there is a strong risk spillover effect, with the energy system dominating and the Russian-Ukrainian conflict exacerbating the spillover effect in the vehicle and energy system markets [2]. Chen Long and other scholars proposed the FPCA-GRNN model combining functional principal component analysis and generalized

regression neural network for predicting the market trend of new energy vehicles, and its accuracy is better than that of traditional methods [3]. In addition, Xiong Yongqing and Shu Nanqian conducted experimental research to analyze the impact of negative word-of-mouth of new energy vehicles on consumer purchase intention and explored the mediating role of risk perception and the moderating effect of intervention measures [3]. From a broader industry perspective, Yang Shishan focuses on the intelligent development of new energy vehicles and analyzes the challenges they face in terms of technological security, privacy protection, infrastructure construction, and industrial chain collaboration [5]. Su Hui, Liu Yutong, and others studied the process of replacing traditional fuel vehicles with new energy vehicles, emphasizing the priority of promoting carbon reduction targets in high penetration areas [6]. Fan Zhiqing explores the evolution path of technological innovation, market demand, and service models from the perspective of the post-market ecology of new energy vehicles [7]. In addition, Du Tianyu et al. studied the collaborative development trend of autonomous driving technology and new energy vehicles [8], while Deng Wenjun analyzed the reshaping effect of new energy vehicles on the aftermarket from four dimensions: policy, technology, employment, and global competition [9]. Although existing literature has conducted in-depth discussions on the technological evolution, market diffusion, policy support, and consumer behavior of new energy vehicles, research on consumer cognitive structure, brand preferences, market demand characteristics, and policy tool effects is still relatively limited.

In response to the research gap mentioned above, this study takes residents of Jinan City as the research object and uses methods such as in-depth interviews encoded by grounded theory, questionnaire surveys, Apriori association rules, and cross-tabulation analysis to systematically explore consumers' cognitive structure, brand preferences, market demand characteristics, and policy tool effects towards new energy vehicles. By constructing a theoretical model of consumer cognition and willingness to consume, this study aims to expand the research on consumer behavior in the field of new energy vehicles, provide empirical support for government policy-making and corporate market strategies, and provide new research perspectives and data support for subsequent academic research.

2. Research methodology

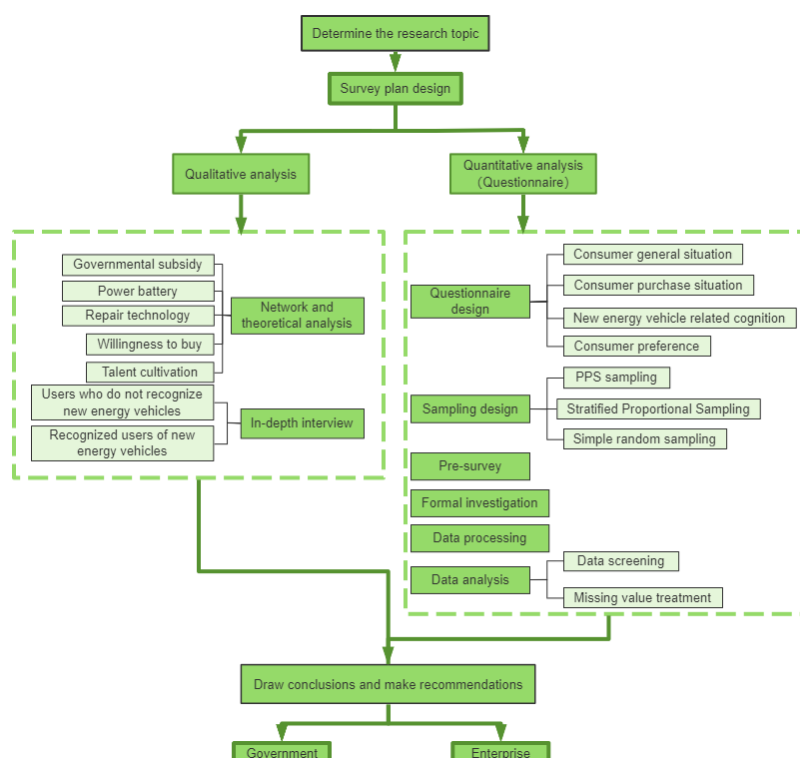


Figure 1. Technical Roadmap

This study utilizes a combination of in-depth interviews, questionnaires, columnar analysis, and association rules based on rooted theory coding. Rooted theory coding is a key method for systematically summarizing theories from raw data in qualitative research, and its core lies in transforming fragmented data into structured theoretical frameworks through layer-by-layer abstraction and conceptualization [10]; Questionnaire survey collects quantitative data through structured questions, and after standardized measurement and statistical analysis, it reveals the distribution pattern of group attitudes, behaviors, or characteristics to validate theories or describe characteristics. Association rule is a data mining technique that mines frequent item sets through layer-by-layer search and pruning strategies to generate association rules, assess reliability with support and confidence, and discover potential associations of data.

The technical roadmap of the entire study is shown in Figure 1.

3. Data analysis

The data used in this study comes from survey questionnaires and interview materials. In this study, a total of 723 questionnaires were collected, and the amount of valid questionnaires after screening reached 670, with a KMO value of 0.898, a p-value of 0.000 for the Bartlett's test of sphericity, and a Cronbach's alpha coefficient of 0.877, which indicates that the questionnaire is well-structured, and passes the test of reliability and validity [11].

3.1. Results of in-depth interviews encoded based on grounded theory

This study interviewed two different groups of people: 1) 14 consumers who do not approve of new energy vehicles, and 2) 15 consumers who approve of new energy vehicles. The interview was conducted from several aspects such as the comparative advantages, driving experience, decision-making influence, after-sales service, purchase reasons, and concerns about new energy vehicles. The obtained data was encoded and the following results were obtained:

Consumers who do not approve of new energy vehicles have multidimensional concerns about them, including low cost-effectiveness (high prices, expensive insurance costs, high battery replacement costs, and rapid depreciation of used cars), strong risk perception (concerns about battery self-ignition and immature technology), insufficient supporting facilities (few charging stations, time-consuming charging queues), and range anxiety (winter range attenuation, frequent charging affecting experience). They believe that traditional fuel vehicles are more reliable and economical, and lack confidence in the technological maturity and long-term value of new energy vehicles.

Consumers who recognize new energy vehicles highly appreciate their performance advantages (strong power, high comfort) and cost advantages (low charging costs, fuel savings), and benefit from policy support (car purchase subsidies, license plate discounts, battery replacement services) and brand after-sales services (such as lifetime battery warranty and exclusive community operations). In addition, they bind their purchasing behavior to social values, believing that new energy vehicles represent environmental protection concepts and technological images. Some consumers have explicitly expressed their support for domestic production in response to national strategies.

3.2. Analysis of General Consumer Situation Survey

The questionnaire for this study is shown in Table 1:

Table 1. Questionnaire content of the survey

(1) Basic information: age, sex, education, place of residence, occupation, marital status, annual income, channels of information	
(2) Consumers' views and suggestions on various aspects of new energy vehicles	
(3) Consumers' views and suggestions on various aspects of new energy vehicles	
(4) Consumer Preferences: Survey on consumer preferences for new energy vehicles from 5 aspects (after-sales service, policy support, brand preference, cost perception, and performance preference)	
Questionnaire 1: Consumers who have not purchased new energy vehicles	Questionnaire 2: Consumers who have purchased new energy vehicles
(5) Reasons for not purchasing new energy vehicles	(5) What problems do consumers encounter when driving new energy vehicles
(6) If considering a purchase, what is the consumer's budget for a new energy vehicle	(6) What is the price point of new energy vehicles for consumers to buy

Among the surveyed residents in Jinan, 40% are under 30 years old, 25% are 31-40 years old, 20% are 41-50 years old, 9% are 51-60 years old, and 6% are 61 years old or above; Gender is 50% male and 50% female, as shown in

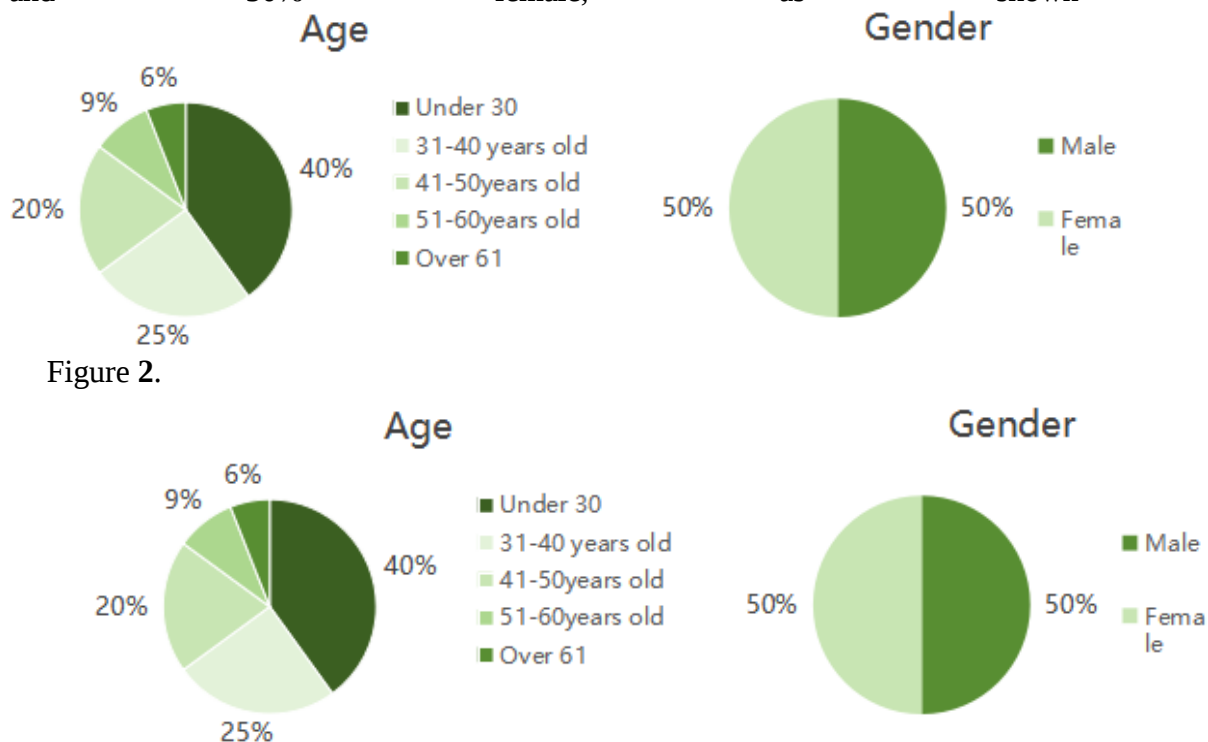


Figure 2.

Figure 2. Age and Gender Distribution of Respondents

In terms of education, 21% of residents in Jinan City have a high school, vocational school, or below education, 17% have a college diploma, 45% have a bachelor's degree, and 17% have a graduate degree or above; At the residential level, residents living in the new community account for 55%, while those living in the old community account for 45%, as shown in Figure 3.

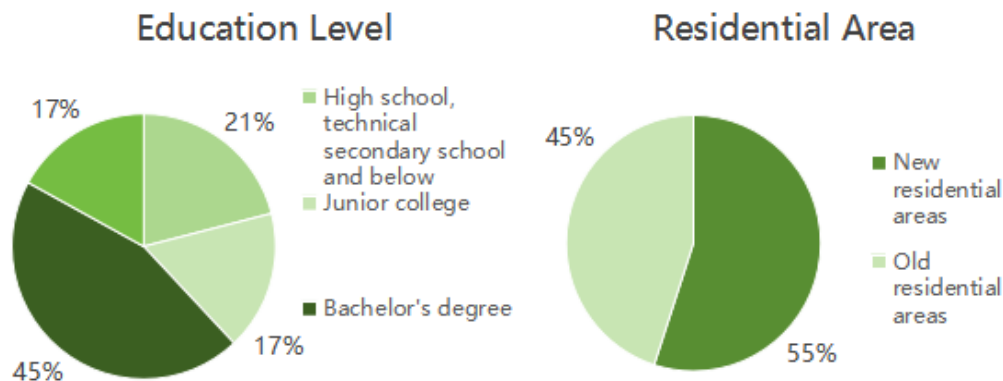


Figure 3. Educational background and place of residence

In terms of annual income, married residents under 80000 account for 19%, unmarried residents account for 72%, married residents between 80000 and 150000 account for 30%, unmarried residents account for 16%, married residents between 150000 and 300000 account for 31%, unmarried residents account for 6%, married residents between 300000 and 600000 account for 17%, unmarried residents account for 2%, married residents between 600000 and above account for 3%, and unmarried residents account for 2%, as shown in Figure 4.

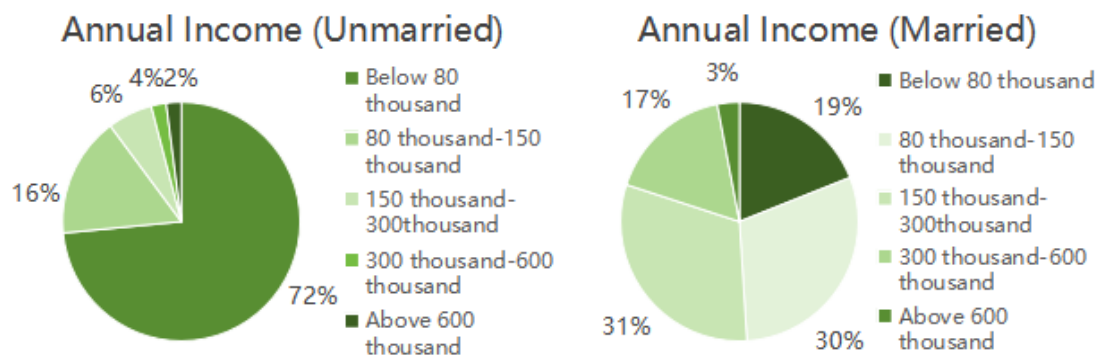


Figure 4. Annual Income Situation

At the occupational level, residents of government and public institutions account for 27%, residents of state-owned enterprises account for 13%, residents of private enterprises account for 14%, residents of individuals and freelancers account for 19%, residents of foreign-funded joint ventures account for 5%, and residents of other occupations account for 22%, as shown in Figure 5.

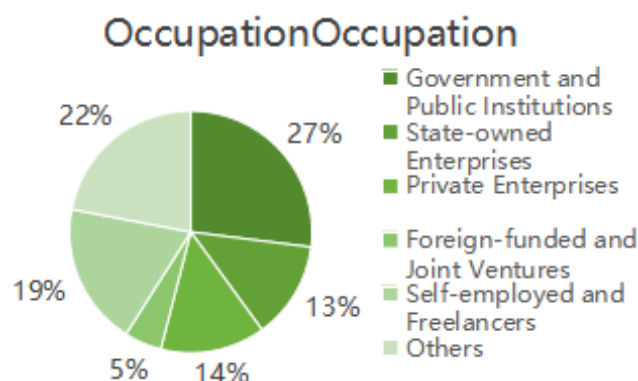


Figure 5. Occupational situation

Overall, the distribution of consumer data at all levels is relatively uniform, indicating that the sample collection is reasonable and representative, providing a foundation for further analysis and research.

3.3. Brand Preference Analysis

The choice of Tesla and BYD as the antecedent of the correlation rule stems from their stand for position in the field of new energy vehicles and the significant differentiation of user preferences:

In terms of market influence, Tesla occupies the global high-end market with its high-end intelligent positioning (e.g. Autopilot technology, supercharging network), representing technology-driven consumer groups; BYD covers the mainstream household market with its whole industrial chain layout (blade battery, DM-i hybrid technology) and affordable product line, which is a typical choice for cost-performance-oriented users. Together, they account for 43% of the purchased brands in the Jinan sample, which is representative of the data. By using them as the antecedent items, the key influencing factors of different market segments can be identified accurately, which will provide data support for the enterprises' product adaptation (e.g., Tesla strengthens its safety policy propaganda, BYD optimizes its battery after-sales service) and the government's differentiated policy design. Therefore, this study conducted an association rule analysis on the brand preferences and other preferences of various consumers using BYD and Tesla as representative brands.

The survey results are shown in the Table 2. Consumers who prefer BYD pay more attention to car maintenance costs in terms of cost preference, driving experience, and intelligent driving assistance systems in terms of performance preference, component replacement, battery health management, and car fault repair in terms of after-sales service. They are more interested in performance research and development information and after-sales service. Consumers who prefer Tesla pay more attention to car maintenance and insurance costs in terms of cost preference, driving experience in terms of performance preference, evaluation and replacement of used cars in terms of after-sales service, and repair of car malfunctions. They are also interested in government policy information.

Table 2. Brand preference analysis based on association rules

consequent	preceding paragraph	Support percentage (%)	Confidence percentage
tesla	Car maintenance&evaluation and replacement of used cars&fault repair&insurance costs&policy information	10.597	84.507
tesla	Car maintenance&evaluation and replacement of used cars&fault repair&driving experience&insurance costs	11.343	80.263
BYD	Car maintenance&intelligent driving assistance system&fault repair&after-sales service&performance research and development information	11.194	85.333
BYD	Component replacement&driving experience&after-sales service&battery health management&performance research and development information	12.09	85.185

3.4. Policy shock analysis based on contingency analysis

Based on the research purpose of this article, the following hypotheses are proposed:

H_0 : The respondents' purchasing situation of new energy vehicles is independent of policy expectations.

H_1 : The respondents' purchasing situation of new energy vehicles is not independent of policy expectations.

Table 3. Chi-square test of purchasing situation and policy expectations of new energy vehicles

Chi-square test			
	price	freedom	Gradual significance (bilateral)
Pearson chi-square	120.949 ^a	12	.000
likelihood ratio	130.037	12	.000
Number of effective cases	473		

a. The expected count of 0 cells (0.0%) is less than 5. The minimum expected count is 6.26.

The chi-square test results are show in Table3 that the asymptotic significance value (two-sided) is 0.000, which is less than the significance level of 0.05, rejecting the null hypothesis. The purchase of new energy vehicles is not independent of policy expectations, and there is a significant correlation between the two.

The Figure 3 stacked graph further supports the above conclusion:

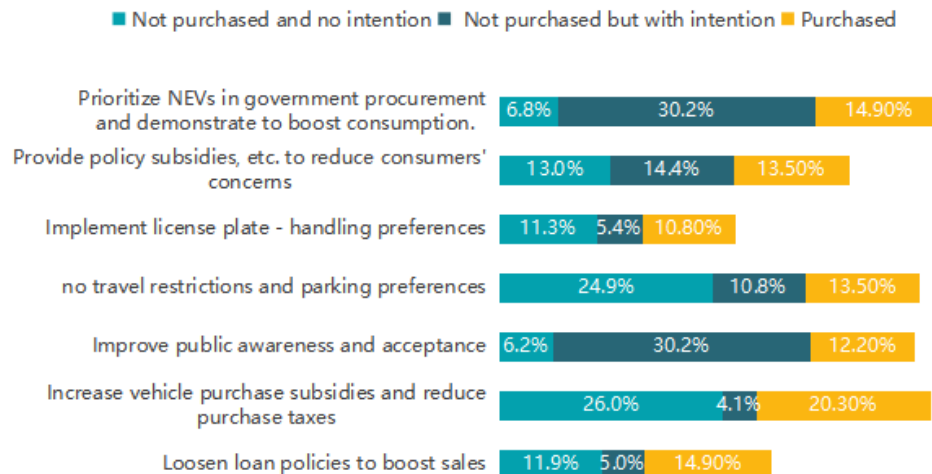


Figure 3. Stacked chart of new energy vehicle purchase situation and policy expectations

This clustered plot displays the distribution of the proportion of new energy vehicle purchases under different policy expectations (no intention to purchase, no intention to purchase, and already purchased). From the results of the graph, it can be seen that 30.2% of consumers who support "government procurement priority for new energy vehicles and demonstration-driven consumption" have no intention to purchase, which is significantly higher than the other two categories, indicating that this policy has a certain effect on stimulating potential purchase intention; 24.9% of consumers who support the implementation of differentiated traffic management have no intention of purchasing, which is significantly higher than the other two categories, indicating that this policy has a great help in changing the purchasing intention of the unwilling group. Only 6.2% of consumers who support the improvement of public awareness and acceptance have no intention of purchasing, indicating that the policy has not been effective in enhancing acceptance and purchasing intention. Among the consumer group that supports the policy of increasing car purchase subsidies and reducing purchase taxes, 20.6% of consumers have no intention of purchasing, but 20.6% have already purchased, indicating that this policy is attractive to the already purchased group and has significant effects on increasing purchase intention.

4. Conclusion and Suggestions

In order to explore the mechanism of consumer brand preferences and policy tool effects in the new energy vehicle market, this article takes Jinan residents as the research object and comprehensively uses grounded theory in-depth interviews, questionnaire surveys, Apriori association rules, and contingency analysis methods to systematically analyze the impact of consumer cognitive structure, brand preference characteristics, and policy expectations on purchasing behavior. The results indicate that there is a significant correlation between consumer purchasing behavior and policy expectations, manifested in the prominent effects of government procurement demonstrations and license discounts in stimulating potential purchasing intentions (among those who have not purchased); Increasing car purchase subsidies has a strong appeal to the already purchased group, but its effect on the unwilling group is limited. The implementation of public awareness policies has achieved significant results in reducing the proportion of unwilling groups, while differentiated traffic management policies have a weaker impact on unwilling groups. Consumers who prefer BYD pay attention to maintenance costs,

intelligent driving assistance, and battery health management; Consumers who prefer Tesla pay attention to insurance costs, used car swaps, and policy information, reflecting the differences in cost, performance, and service needs among users of different brands.

Based on the above conclusions, this study proposes the following suggestions: the government should implement targeted measures: targeting the group of "unwilling to purchase", strengthen policies such as "government procurement demonstration" and "license processing discounts", and lower the purchase threshold; Priority should be given to promoting "public awareness enhancement" and infrastructure (such as charging stations) construction for the "unwilling to purchase" group, in order to alleviate range anxiety and technology trust issues. At the same time, the government should dynamically adjust its policy mix and gradually shift towards "user side discounts" (such as parking and charging discounts) and "technology empowerment" (such as promoting intelligent driving), in line with the trend of subsidy reduction, balancing short-term stimulus and long-term market cultivation. For enterprises, BYD should focus on "high cost-effectiveness+practical technology", strengthen battery life cycle management (such as lifetime warranty) and intelligent driving assistance system research and development, and meet the needs of users who value cost and technical reliability. Tesla should rely on its "high-end technology image+policy sensitivity" to optimize its used car evaluation and replacement services, strengthen policy information outreach (such as subsidy application guidelines), and consolidate its attractiveness to users with low price elasticity and a focus on policy and service added value.

References

- [1] Wang X, Zhu L, Zheng H. The relationship between technical innovation and market value: Evidence from the China's new energy vehicles industry [J]. *Energy Policy*, 2025, 202114606-114606.
- [2] Su X, He J. Does the crude oil return matter for the new energy vehicle-related industry markets? —A comparison of complete vehicles, energy systems, and raw materials [J]. *Energy Economics*, 2025, 144108339-108339.
- [3] Long C, Yong W, Qianhao C, et al. Integrating Functional Principal Component Analysis with Generalized Regression Neural Networks for Enhanced Forecasting of New Energy Vehicle Market Trends [J]. *Scientific and Social Research*, 2025, 7 (2): 104-114.
- [4] Xiong Yongqing, Shu Nanqian Negative reputation of new energy vehicles, intervention measures, and consumer purchase intention [J]. *China Management Science*, 2022: 00.
- [5] Yang Shishan Analysis of the Trend of Intelligent New Energy Vehicles under the Background of Digital Transformation [J]. *Automotive Knowledge*, 2025, 25 (01): 2527.
- [6] Suhui, Liu Yutong Research on the Process of Replacing Traditional Fuel Vehicles with New Energy Vehicles Considering Automotive Attributes [J]. *China Automotive*, 2024, (12): 2024+33.
- [7] Fan Zhiqing Exploration into the Development and Challenges of the Aftermarket for New Energy Vehicles [J]. *Special Purpose Vehicles*, 2024, (11): 106108. DOI: 10.19999/j.cnki.10040226.2024.11.030.
- [8] Du Tianyu, Wang Xinyang, Liu Xu, etc Intelligent Driving the Future: Market Demand Analysis of the Integration of Autonomous Driving Technology and New Energy Vehicles [J]. *Times Automotive*, 2024, (24): 158160.
- [9] Deng Wenjun The Rise of New Energy Vehicles and the Reshaping of the Future of the Automotive Aftermarket [J]. *Automotive Maintenance and Repair*, 2024, (23): 17. DOI: 10.16613/j.cnki.10066489.2024.23.007.
- [10] Wu Yi, Wu Gang, Ma Xiangsong A review of the origin, schools, and application methods of grounded theory: a case study based on workplace learning [J]. *Journal of Distance Education*, 2016, 35 (03): 3241.
- [11] Matsumura M, Fujita K, Myoji M Y, et al. Reliability and Validity of the Japanese Version of the Exercise Self-Efficacy Scale in Older People Undergoing Lower Extremity Arthroplasty [J]. *Nursing & health sciences*, 2025, 27 (2): e70111.