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A Study on the Factors Influencing the Penetration of the New Energy Vehicle Market in the New Stage of Demand-Driven Development: Analysis Based on Consumer Surveys

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Abstract: With the increasingly serious issues of global warming and energy scarcity, the development of the new energy vehicle industry has become an important link in the development of industries in various countries. With the support of strong government subsidies and capital investment, China's new energy vehicle industry has become the world's largest market. But, in 2023, China's new energy vehicle market entered the knockout stage: subsidies declined. The development of new forces in car manufacturing faces severe challenges. The growth rate of sales of new energy vehicles has slowed down. After two rounds of rapid development driven by policies and supply, how to drive the next rapid development of the new energy vehicle industry through demand has become a valuable research topic. Therefore, this article first integrates literature and information presented in industrial reality to summarize the factors that affect the penetration of the new energy vehicle market. Then, starting from the consumer side, we collected data by questionnaire survey and analyzed the questionnaire data by variance analysis and multiple logistic model to explore their potential consumer characteristics, selection preferences, and factors affecting market penetration. Finally, based on the above research, conclusions are proposed to help new energy vehicles achieve performance and service upgrades around intelligence with a user-oriented approach and to propose countermeasures and suggestions for the future development of China's new energy vehicle industry.

Keywords: new energy vehicle industry, demand-driven, consumer, intelligence

1. Introduction

With the increasingly prominent issue of global climate change, more and more countries have adopted low-carbon policies to address environmental challenges. According to data, transportation is one of the important sources of global greenhouse gas emissions [1], and automobiles are the main contributors to the total pollutant emissions, emitting over 90% of CO, HC, NOx, and PM. The greenhouse gases such as carbon dioxide generated by traditional fuel vehicles are the main components [2]. According to the data of the International Energy Agency, if no measures are taken, the transportation sector will account for one-third of the global emissions by 2050 [3]. The Chinese government announced at the general debate of the United Nations General Assembly on September 22, 2020 that it will adopt stronger policies and measures to strive to achieve carbon peaking and achieve carbon neutrality goals as soon as possible. The specific time point is to achieve carbon peaking by 2030 and carbon neutrality by 2060. As an important part of the industrial ecology of low-carbon economy, the promotion of new energy vehicles can effectively reduce exhaust emissions and carbon emissions, which is of vital significance for preventing global warming and achieving the goal of low-carbon economy [4].

The development of new energy vehicles in China has officially launched the "Electric Vehicle Research Program" from the "Eighth Five Year Plan." Afterwards, a research and development layout of "three vertical and three horizontal" was gradually established. From 2008 to 2016, the country implemented a significant and low threshold subsidy policy for the new energy vehicle industry, which stimulated the first period of vigorous development of the new energy vehicle industry. In 2015, China's production and sales of new energy vehicles surpassed those of the United States, becoming the world's largest new energy vehicle market and has continued to hold on to this day. However, the outbreak of the subsidy fraud incident in 2016 cast a shadow over the development of the new energy vehicle industry, forcing the government to significantly adjust subsidy policies. The development of the industry shifted from government support to a two-way-driven development model driven by the market and

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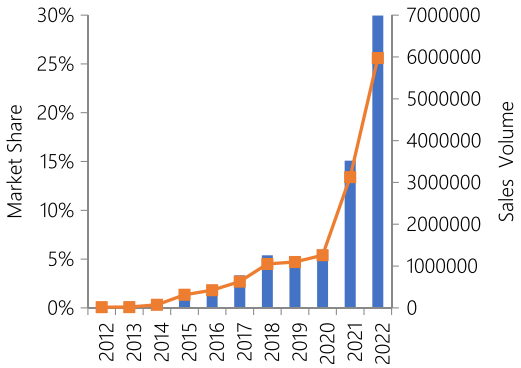
government. The wave of subsidy fraud did not stop the enthusiasm of capital to pursue profits. New forces of car building, Internet enterprises, and traditional car companies have poured into the new energy vehicle industry. The production, sales, and industry financing of new energy vehicles have made great achievements. Since 2012, the sales and market share of new energy vehicles in China have been increasing year by year, as shown in Figure 1. The annual sales of new energy vehicles in China have increased from 507000 in 2016 to 6887000 in 2022 [5]. Tesla's Ultimate Factories have also chosen to settle in Shanghai, which indicates that new energy vehicles have gone out of the wave of subsidy fraud, smooth entry into the second period of rapid development.

Figure 1
Sales volume and market share of China's new energy vehicle market over the years



From the perspective of market performance, between 2012 and 2022, the annual compound growth rate of new energy vehicle sales in China reached 87%, with a cumulative promotion of 15.96 million new energy vehicles. Especially in the second period of rapid development after the "fraudulent subsidy" scandal in 2016, the development momentum of China's new energy vehicle industry is even stronger. In 2022, the annual sales exceeded 6 million units, and by the end of 2022, the market share exceeded 25% [6]. However, we should also see some crises behind the brilliant market performance. On the one hand, with the withdrawal of government subsidies, individual new energy vehicle manufacturers represented by the new forces in car manufacturing have fallen into difficulties, facing pressure from various aspects such as funding and cost control, and facing severe challenges. The former new force in car manufacturing, the "Four Little Dragons," Byton, has been filed for bankruptcy, marking the entry of the new energy vehicle industry into the knockout stage. The industry generally believes that 2023 will be the first year for new energy vehicle companies to reshuffle [7]. On the other hand, the growth rate of sales has slowed down. Although China's new energy vehicle sales reached approximately $150 billion in 2022, market competition is fierce, and some brands are increasing their market share competition. For example, Tesla, while maintaining its top position in the pure electric vehicle category, its market share in a single quarter has dropped from 20.1% in the first quarter of 2022 to a new low of 15.9%, making the competition environment in the new energy vehicle market even more intense. The price war that started in early 2023 has already affected many car companies, including new energy brands [8].

If the first wave of high-speed development period before 2016 benefited from the strong promotion of government policies, that is, policy driven, and the second wave of high-speed development period since 2016 benefited from the strong investment of vehicle enterprises, that is, mainly driven by the market of the supply side, then how to maintain the sustainable development of the new energy vehicle industry is a problem worth studying at the moment of the decline of subsidy policies in 2022 and the beginning of the reshuffle of alternative fuel vehicle enterprises [9]. After the two major economic entities, the government and enterprises, take turns and contribute their efforts, the development of the new energy vehicle industry requires the support of another economic entity – consumers, that is, to fully leverage the demand side power driven by the market. Whether it is government policies or the direction of investment by car companies, it is even more necessary to have a deep understanding of consumer needs [6]. This article proposes the view that the new energy vehicle industry has experienced three periods of rapid development, as shown in Figure 2. From 2008 to 2016, thanks to strong support and policy subsidies from the government for the development of new energy vehicles, the production and sales of new energy vehicles entered the first period of rapid development. The government has promoted the development of new energy vehicles by formulating a series of policies, such as car purchase subsidies and exemption from purchase taxes. The government's policies during this period provided a foundation for market access and development of new energy vehicles. In 2015, China's production and sales of new energy vehicles surpassed those of the United States. Since then, China has become the world's largest producer and seller of new energy vehicles. The fraudulent subsidy incident in 2016 became the first watershed for the development of the new energy vehicle

Figure 2
Schematic diagram of the main driving entities and driving forces in the development stages of China's new energy vehicle market

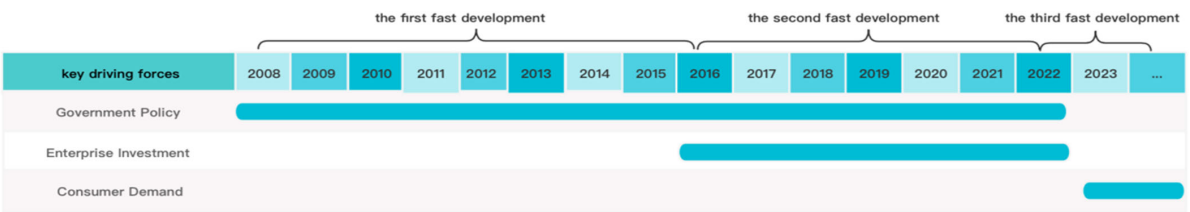


Table 1
Overview of factors influencing the new energy vehicle industry

Influence factor	Author (year)
Consumer characteristics	Xu Guo-hu [10], Song [27], Skippon [24], Xie Ruyu [23], Yang Kexin [18], Zhe Lv [28]
Perceived risk	Franke [29], Li Su-xiu [25], Zhou Yan [30], Zhang [31]
Choose preferences	Zubaryeva [19], Song [27], Li Su-xiu [25], CHEN Zhi-heng [20], Zhang [31]
Financial factors	MauEJC2008, Xu Guo-hu [10], Hidrue [12], Song [27], Axsen [11], Li Su-xiu [25], Zhou Yan [30], Zhang [31], Jiaxin He 2021, Wang Lu [17], Liu Cong [15], Holechek [13], Yang Kexin [18], Jing Shouwu [14]
Vehicle properties	MauEJC2008, Xu Guo-hu [10], Hidrue [12], Zubaryeva [19], Song [27], Li Su-xiu [25], Jianghui Yan [22], CHEN Zhi-heng [20], Zhang [31], Liu Cong [15]
Intelligent properties	Xu Guo-hu [10], Zubaryeva [19], Song [27], Li Su-xiu [25], Jianghui Yan [22], CHEN Zhi-heng [20], Jing Shouwu [14], Wang Zhen-po [26], Zhang [31], Liu Cong [15]
Personal consumption psychology	MauEJC2008, Xu Guo-hu [10], Song [27], Li Su-xiu [25], CHEN Zhi-heng [20], Yang Kexin [18], Jing Shouwu [14], Zhe Lv [28]

industry. In the first quarter of 2017, there was a negative growth trend. However, the government quickly adjusted the subsidy policy, raised the subsidy threshold, encouraged and supported enterprises with advanced core technologies to invest in building new energy vehicle production lines, and provided relevant technical support and financial subsidies[1]. From 2016 to 2022, the production and sales of new energy vehicles experienced a second rapid development. The characteristic of this period is that the industry has shifted from policy driven to a dual driven model of "policy+supply." After 2022, the 2017 subsidy policy has fully declined, and the competition in the new energy vehicle market is becoming increasingly fierce, gradually entering the elimination stage. How to grasp consumer demand and expand domestic demand is a major issue that the current development of new energy vehicles needs to face, and consumer demand has become a key driving force for the "third" high-speed development of new energy. In this stage and context of development, research is conducted from the perspective of consumers to propose countermeasures and suggestions for the promotion of new energy vehicles in China, the sustained and healthy development of the new energy vehicle industry, the enhancement of national competitiveness, and the seizing of a new round of strategic heights.

2. Literature Review

The development of new energy vehicles is an inevitable choice for Modern Motor Company industry. With the development and progress of technology, the demand for new energy vehicles has been expanding in recent years. In terms of academic attention, media attention, and academic dissemination, the popularity of new energy vehicles has always been high. Among them, the number of Chinese-related literature on new energy vehicles reached an astonishing 2806 in 2019. Although the number of related literature has decreased compared to 2022, it is still a major focus of attention. Especially in the past 2 years, the media attention of new energy vehicles has increased by 30% annually, becoming an important hot topic at present. Meanwhile, in terms of academic dissemination, the citation of new energy vehicle literature has been increasing year by year, with a growth rate of 18% in 2022. Many research institutions, universities, and enterprises are paying attention to various fields of new energy vehicles, such as technological innovation, policy research, and market analysis. This article reviews the factors that affect the development of the new energy vehicle industry in the literature, in preparation for designing a questionnaire and conducting in-depth research from the consumer side.

The factors influencing market penetration are important topics related to the research topic of the new energy vehicle industry and are also issues of concern to the industry. There are many factors that affect the penetration of the new energy vehicle market. Through literature review, it has been found that the relevant factors are mainly financial factors related to the purchase price of new energy vehicles [10] and usage cost [11–19], as well as factors related to vehicle driving performance such as acceleration and top speed [19]. Especially the unique factors such as range, charging time, and charging convenience of new energy vehicles [12, 20–22], which are related to handling and use, can be classified as vehicle properties. Variables such as environmentalism, herd mentality, psychological [23] also affect the willingness to purchase new energy vehicles. With the increase in market share of new energy vehicles, more and more consumers have become the experience and user group of new energy vehicles [24], and factors such as purchase and use experience and brand value [25] have gradually become factors that consumers consider when purchasing new energy vehicles. In addition, compared to traditional cars, new energy vehicles generally have a stronger sense of technology and fashion [26], which has also become the reason why many consumers, especially young consumers, choose new energy vehicles. When it comes to technology and fashion, we have to mention the inherent advantages of new energy vehicles in intelligence [20]. The electric drive system of vehicles facilitates the application of intelligent operating systems and components. Especially for vehicles with L3 and above auto drive system, new energy vehicles are the best natural carrier. In summary, the influencing factors that affect the penetration of the new energy vehicle market are summarized into four aspects: financial factors, vehicle properties, intelligent properties, and consumer psychology. The specific list of influencing factors is shown in Table 1.

3. Methods and Data

3.1. Questionnaire design

Summarizing the literature read, identifying the potential influencing factors, and designing the questionnaire (questionnaire

[1]China News. (2022). Are you ready to withdraw from China's new energy vehicles? Retrieved from: https://www.chinanews.com.cn/cj/2022/12-07/9910212.shtml

Table 2
Distribution of consumer characteristics and choice preference variables

Variable	Variable definition	Frequency	Proportion	Variable	Variable definition	Frequency	Proportion
Gender	Male	177	55.14%	Knowledge lever of new energy vehicles	Very familiar	56	17.45%
	Female	144	44.86%		Familiar	157	48.91%
Age	18–25	61	19%		Only know	89	27.73%
	26–30	84	26.17%		No	19	5.92%
	31–45	98	30.53%	Driving experience of new energy vehicles	Yes	130	40.5%
	46–60	54	16.82%		No	191	59.5%
	Above 61	24	7.48%	Familiarity with nearby charging facilities	Very familiar	61	19%
Education background	Junior high school and below	30	9.35%		Familiar	119	37.07%
	High school	81	25.23%		Only know	92	28.66%
	Undergraduate course	172	53.58%		No	49	15.26%
	Master degree or above	38	11.84%	Willingness to purchase new energy vehicles	Very unwilling	62	19.31%
Career	Professional work (teachers, doctors, lawyers, etc.)	30	9.35%		Relatively unwilling	149	46.42%
	Service industry personnel	31	9.66%		Average	67	20.87%
	Freelance	27	8.41%		Relatively willing	24	7.48%
	Public institutions/ civil servants/ government staff	28	8.72%		Very willing	19	5.92%
	Official of the company	83	25.86%	Choose type preferences	Hybrid electric vehicle	178	55.45%
	Students	62	19.31%		Pure electric vehicle	119	37.07%
	Housewife	13	4.05%		Fuel cell vehicle	24	7.48%
	Industrial workers	20	6.23%	Choose brand preferences	Tesla	83	25.86%
	Others	27	8.41%		BYD	97	30.22%
Monthly income (yuan)	Below 5000	125	38.94%		Traditional brands such as Volkswagen, SAIC, and Volvo	96	29.91%
	5000–9999 yuan	118	36.76%		New power brands such as Xiaopeng, NIO, Ideal, Weima, and Xiaomi	45	14.02%
	10000–19999 yuan	58	18.07%	Choose model preferences	Mini sedan	95	29.6%
	Above 20000	20	6.23%		Medium to large sedans	67	20.87%
Residence	Rural area	68	21.18%		MPV	51	15.89%
	City	212	66.04%		SUV	108	33.64%
	Suburb	41	12.77%	Choose marketing model preference	Vehicle sales + self-charging mode	187	58.26%
					Vehicle rental + self-charging mode	75	23.36%
					Bare car sales, battery leasing, and charging/swapping compatibility modes	59	18.38%

attached) in two parts, according to the research needs and data analysis requirements. The first part includes 15 questions such as individual characteristics and selection preferences. The second part is the five-point Likert scale of factors influencing the penetration of the new energy vehicle market, including 19 factors in four aspects, including financial factors, vehicle properties, intelligent properties, and consumer psychology. Consumers are asked to score according to the degree of care, from 1–5 to very indifferent–very concerned.

In April 2023, the project distributed 321 questionnaires on consumers' willingness to purchase new energy vehicles through the Questionnaire Star platform and collected 323 valid questionnaires, with an effective rate of 99.38%. The statistical results are shown in Table 2. The Cronbach's α coefficient is 0.809, indicating a high reliability of the questionnaire response results. The Kaiser-meyer-Olkin KMO value is 0.861, and the *P*-value of Bartlett's sphericity test is 0.000, indicating a high validity of the questionnaire content. The gender ratio of

Table 3
Impact factors of new energy vehicle market penetration and average consumer evaluation

Category of influencing factors	List of influencing factors	Average value
Financial factors	Purchase price of new energy vehicles	3.9
	Government-related subsidies for new energy vehicles	3.96
	The cost of using new energy vehicles (charging)	3.9
	Rising insurance prices for new energy vehicles	3.88
	Maintenance costs of new energy vehicles	3.97
	Value preservation rate of new energy vehicles	3.84
Vehicle properties	Range	4.06
	Charging time	4.01
	Charging convenience (deployment of charging infrastructure)	4.01
	Other vehicle properties (acceleration performance, top speed, etc.)	3.81
Intelligent properties	Auxiliary driving function (primary autonomous driving)	3.8
	Human–machine co-driving function (intermediate autonomous driving)	3.74
	Unmanned driving function (advanced autonomous driving)	3.58
	Functions in mobile office, consumption, entertainment, etc.	3.66
Consumer psychology	Environmentalism	3.63
	Herd mentality	3.47
	Trendy pursuit psychology	3.5
	Purchase and usage experience (full lifecycle services such as sales, maintenance, and recycling)	3.93
	Brand value	3.84

Note: The influencing factors are summarized and organized based on literature and industry reality in this article, with the average calculated based on 319 valid questionnaires

respondents to this questionnaire is 1.22:1, with 56.7% aged 26–45. The majority of respondents have a high school or above education level, accounting for 90.65%, and mostly reside in cities. The descriptive statistics of the questionnaire on consumers' individual characteristics, perceived risks, and selection preferences are detailed in the questionnaires.

The second part of the questionnaire is a five-point Likert scale for the influencing factors of new energy vehicle market penetration. According to the filling of 319 valid questionnaires, the average scores of 19 influencing factors in the four dimensions listed are all above 3.4 points, indicating that the influencing factors listed in this article will affect consumers' willingness to purchase new energy vehicles. The two factors with the lowest scores belong to the dimension of consumer psychology, with an average of 3.47 for herd mentality and 3.5 for trendy pursuit psychology. The average of environmentalism in the dimension of consumer psychology is also not high, with a value of 3.63, indicating that in terms of consumer psychology, consumers are more concerned with the purchase and use experience closely related to driving and use experience (sales, maintenance, recycling, and other full life cycle services) (with an average of 3.93) and brand value (with an average of 3.84). In addition, there are two factors with lower scores in terms of intelligent attributes, namely unmanned driving function (advanced autonomous driving) (average of 3.58), and functions in mobile office, consumption, entertainment, etc. (average of 3.66). The former has a low score because advanced autonomous driving cars have not been commercialized, so it has little impact on consumers' purchasing intention. The latter because these intelligent attributes can be purchased through mobile phones. The implementation of other more convenient intelligent devices such as tablets is not the core competitiveness of new energy vehicles, so the impact on consumers' willingness to adopt is relatively small. The average score of each influencing factor is shown in Table 3.

3.2. Research methods

Based on the feedback data from the survey questionnaire, further difference analysis and regression analysis will be conducted. Firstly, the multifactor analysis of variance method will be used to analyze the characteristics of potential buyers of new energy vehicles based on individual consumer characteristics. Next, the one-way ANOVA method is used to determine the differences in market penetration factors that consumers with different selection preferences care about, based on the different types, brands, models, and marketing modes involved in the selection preferences. To examine the contribution of ANOVA methods on different consumers to determine the influence of controllable factors on the outcome of the study - purchase intention. Compared to other methods, ANOVA can analyze the independent effects of multiple factors at once, analyzing the consumer characteristics that affect purchasing and the differences in different choice preferences. Finally, based on the average consumer rating of the penetration factors in the new energy vehicle market in the second part of the questionnaire, a multivariate ordered logistic model is used to analyze the impact of the penetration factors in the new energy vehicle market on consumer purchase intention.

Analysis of variance is a statistical method used to analyze research results and test whether the means of multiple normal populations with equal variances are equal, in order to determine whether the influencing factors are significant for the dependent variable. Multivariate analysis of variance can simultaneously study the differences in the influence of two or more factors on

the dependent variable. This article uses multiple factor analysis of variance to study the individual characteristics of consumers in the first part of the questionnaire. Single factor analysis of variance is a method used to test whether there is a significant difference in the distribution of population variables between different groups and can be used to test the differences between the means of two or more sample sizes. In this article, when studying consumer selection preferences, we choose one-way ANOVA to analyze whether the influence of new energy car types, brands, models, and marketing modes with different selection preferences on market penetration factors is statistically significant.

Multiple ordered logistic regression can be used to explore the impact of multiple influencing factors on the dependent variable. It is suitable for cases where the dependent variable Y is categorical ordered data, and there are no special requirements for the data type of X. X can be categorical data or quantitative data. This feature is suitable for use in this study on the impact of multiple market penetration factors on consumer purchase intention. Consumer purchase intention is divided into five levels, which meets the requirement that the dependent variable is classified and ordered data.

4. Application

4.1. Analysis of individual differences in characteristics

A multiple factor analysis of variance was conducted on the individual characteristics section of the first part of the questionnaire. As there were as many as 9 items considered in this study, the analysis of the impact on the interaction items was not selected. The results are shown in Table 4. Age, occupation, and understanding of new energy vehicles have a significant impact on the willingness to purchase new energy vehicles. Among them, age and occupation have a negative coefficient of willingness to purchase, while understanding of new energy vehicles has a positive correlation with willingness to purchase. All three items have a main effect. The age is significantly negatively correlated at the 1% level, indicating that the older the age, the lower the willingness to purchase new energy vehicles. Occupations are negatively correlated at the level of 5%, and different occupations have a significant impact on purchase intention. According to the order of multiple occupations in this study, the purchase intention of new energy vehicles is ranked from service industry workers, professional workers, students, staff of public institutions, industrial workers, freelancer, others, company employees, and housewives from top to bottom. The level of understanding of new energy vehicles is positively correlated at the 5% level, indicating that the deeper the consumers' understanding of new energy vehicles, the stronger their willingness to purchase them.

Table 4
Multivariate ANOVA of consumer individual characteristics and perceived risk on purchase intention

Items	Square sum	Free degree	Mean square	F	P
Sexual	1.669	1	1.669	1.311	0.253
Age	21.789	4	5.447	4.279	0.002***
Qualification	4.906	3	1.635	1.285	0.280
Job	20.226	8	2.528	1.986	0.048**
Income	4.204	3	1.401	1.101	0.349
Place of residence	0.498	2	0.249	0.196	0.822
Knowledge level of new energy vehicles	10.432	3	3.477	2.732	0.044**
Driving experience of new energy vehicles	0.099	1	0.099	0.077	0.781
Understanding of charging facilities for new energy vehicles	3.527	3	1.176	0.923	0.430
Error	369.156	290	1.273		

Note: *** and ** represent significant at the 1% and 5% levels, respectively.

4.2. Analysis of differences in choice preferences

In order to analyze how consumers who prefer different types of new energy car types, brands, models, and marketing modes care about the factors that affect the market penetration of new energy vehicles, a one-way ANOVA was conducted and tables were made using the form of mean plus minus standard deviation. Due to the limited sample size, consumers with different selection preferences did not show significant differences in the degree of concern for most factors affecting the penetration of the new energy vehicle market. Based on the grouping of various selection preferences, the main differences are concentrated in government subsidies, intelligent properties in vehicle mobile office, consumption, entertainment, etc., herd mentality, trendy pursuit psychology, purchase and use experience (full lifecycle services such as sales, maintenance, and recycling), value preservation rate, usage cost (charging), and repair cost, as shown in Table 4.

The preferences for different types of new energy vehicles: Vehicles that use unconventional fuels as their power source can all become new energy vehicles. From the current market situation, they mainly include pure electric vehicles, hybrid electric vehicles, and fuel cell electric vehicles. Consumers with different preferences for new energy vehicle types have certain differences in the degree of concern about the factors influencing the penetration of the new energy vehicle market. As shown in Table 5, the influencing factors with significant differences are as follows: the degree of concern about government subsidies for new energy vehicles, the degree of concern about functions such as mobile office, consumption, and entertainment, the degree of attention to herd mentality, and the degree of concern about trendy pursuit psychology, Pay attention to the purchase and usage experience (sales, maintenance, recycling, and other full lifecycle services).

Consumers who prefer pure electric new energy vehicles are the most concerned about government subsidies, while those who prefer fuel cell vehicles are the least concerned about government subsidies. In terms of functions such as mobile office, consumption, and entertainment, there is a significant difference in preference for pure electric consumers, with the highest level of concern. The difference between fuel cell and hybrid models is not significant. In terms of herd mentality, pure electric, hybrid, and fuel cell models are ranked in descending order of concern. In terms of pursuing trendiness, the preference for pure electric models has the highest score, followed by fuel cell models, and the preference for hybrid models has the lowest level of concern for pursuing trendiness. The degree of concern for purchasing and using experiences (sales, maintenance, recycling, and other full life cycle services), with a preference for fuel cell models, is significantly different from the other two, and the degree of concern for them is much lower than

the other two. However, there is not a significant difference in scores between hybrid and pure electric models.

The preferences for different brands of new energy vehicles: From the perspective of new energy vehicle brands, BYD and Tesla stand out, as well as new car making forces represented by NIO, Ideal, and Xiaopeng, as well as traditional brands represented by Volkswagen, Toyota, BMW, and others. Analyzing the degree of concern among consumers who prefer different brands toward the factors influencing the penetration of the new energy vehicle market, as shown in Table 5, except for significant differences in the preservation rate of new energy vehicles, the differences in other dimensions are not significant. Among consumers who prefer different new energy vehicle brands, those who prefer traditional brands have the highest level of concern for the preservation rate of new energy vehicles, followed by those who prefer new forces in car manufacturing. However, there is no significant difference between BYD and Tesla preferences.

The preferences for different new energy vehicles models: Similar to traditional fuel vehicles, new energy vehicle models can be divided into micro sedans, medium to large sedans, MPVs, SUVs, etc. The degree of concern of consumers who prefer different vehicle models on the factors that affect the penetration of the new energy vehicle market is analyzed, as shown in Table 5. Consumers of new energy vehicles who prefer different car models have significant differences in the degree of concern for value preservation rate and the pursuit of trendiness, while there is no difference in other dimensions. In terms of the degree of concern for the value preservation rate of new energy vehicles, consumers who prefer medium to large vehicles and MPV models have a higher degree of concern for the preservation rate, while consumers who prefer micro sedans and SUV models have a lower degree of concern. In terms of pursuing trendy trends, the preference for micro sedans, SUV models, mid to large sedans, and MPV models ranked from low to high.

The preferences for different new energy vehicles marketing modes: The common marketing mode for new energy vehicles is vehicle sales and self-charging, in which consumers have private ownership of the vehicles. At present, consumers who choose the vehicle rental and self-charging marketing model mainly do not have their own vehicles or need to use vehicles in different places. Setting aside the two special situations mentioned above, if consumers focus on the practicality of the vehicle rather than ownership, the vehicle rental and self-charging mode is also a good choice. In addition, batteries account for a high proportion of the total vehicle cost and are considered consumables, which hinders many consumers from choosing new energy vehicles. With the improvement of battery standardization, the mode of bare car sales combined with battery leasing and compatible charging and swapping is also a future marketing choice. The degree of concern among consumers who prefer different marketing modes regarding the factors that affect the penetration of the new energy vehicle market is analyzed, as shown in Table 5. There are significant differences in the level of concern among consumers with different preferences in terms of charging costs, maintenance costs, and herd mentality, while the differences in other influencing factors are not

Table 5
Single factor ANOVA results of various preferences for new energy vehicles

Dimension	Fuel cell type	Hybrid version	Pure electric type	F value	Significance
The concern level of government-related subsidies for new energy vehicles	3.50±1.45	3.96±0.93	4.07±1.03	3.137	0.045
The concern level of functions in mobile office, consumption, entertainment, etc.	3.54±1.179	3.54±0.986	3.85±1.002	3.624	0.028
The concern level of herd mentality	3.17±1.579	3.32±1.07	3.75±1.066	6.253	0.002
The concern level of trendy pursuit psychology	3.5±1.022	3.34±1.1	3.73±0.979	4.703	0.01
The concern level of purchase and usage experience (full lifecycle services such as sales, maintenance, and recycling)	3.21±1.474	3.95±1.004	4.03±0.999	6.344	0.002
The concern level of brand value	3.46±1.141	3.93±0.945	3.77±0.968	2.884	0.057

Dimension	New forces	Traditional brands	BYD	Tesla	F value	Significance
The concern level of value preservation rate of new energy vehicles	3.91±1.074	4.07±1.039	3.7±1.058	3.69±1.07	2.773	0.042
The concern level of trendy pursuit psychology	3.28±0.988	3.63±0.951	3.84±0.946	3.4±1.199	3.674	0.013

Dimension	Compact car	Medium to large sedan	MPV	SUV	F value	Significance
The concern level of value preservation rate of new energy vehicles	3.69±1.117	4.03±1.015	4.12±1.125	3.71±0.991	3.054	0.029

Dimension	Bare car sales	Vehicle rental+self-charging	Vehicle sales+self-charging	F value	Significance
The concern level of charging usage cost of new energy vehicles	3.69±1.163	3.73±0.947	4.03±0.938	4.095	0.018
The concern level of maintenance costs	3.71±1.068	3.9±1.002	4.07±0.928	3.225	0.041
The concern level of herd mentality	3.36±1.297	3.9±0.836	3.33±1.139	7.349	0.001

Note: This article only summarizes the differences in significant influencing factors.

Table 6
Multiple ordered logistic regression results

List of influencing factors	Regression coefficient	standard error	z	P	OR
The concern level of purchase price of new energy vehicles	0.062	0.14	0.441	0.660	1.064
The concern level of government-related subsidies for new energy vehicles	−0.197	0.147	1.345	0.179	0.821
The concern level of charging usage cost of new energy vehicles	0.38	0.137	2.771	0.006***	1.462
The concern level of the increase in insurance prices of new energy vehicles	0.183	0.139	1.321	0.186	1.201
The concern level of maintenance costs	0.086	0.144	0.599	0.549	1.09
The concern level of value preservation rate of new energy vehicles	−0.01	0.125	0.078	0.938	0.99
The concern level of rage	0.84	0.173	4.842	0.000***	2.316
The concern level of charging time	0.212	0.143	1.48	0.139	1.236
The concern level of the convenience of charging (layout of charging infrastructure)	−0.415	0.155	−2.68	0.007***	0.661
The concern level of degree of other vehicle properties (acceleration performance, top speed, etc.)	0.162	0.148	1.089	0.276	1.175
The concern level of auxiliary driving function (primary autonomous driving)	−0.05	0.131	0.379	0.071*	0.952
The concern level of human–machine co-driving function (intermediate autonomous driving)	−0.253	0.136	1.858	0.063*	0.777
The concern level of autonomous driving function (advanced autonomous driving)	0.101	0.13	0.776	0.438	1.106
The concern level of functions in mobile office, consumption, entertainment, etc.	−0.045	0.138	0.325	0.745	0.956
The concern level of environmentalism	0.056	0.133	0.419	0.675	1.058
The concern level of herd mentality	0.123	0.119	1.034	0.301	1.13
The concern level of trendy pursuit psychology	−0.049	0.121	0.408	0.683	0.952
The concern level of purchase and usage experience (full lifecycle services such as sales, maintenance, and recycling)	−0.245	0.134	1.829	0.067*	0.783
The concern level of brand value	−0.268	0.159	−1.689	0.091*	0.765

Note: ***, **, and * represent significant levels at 1% and 10%, respectively

significant. In terms of charging cost and maintenance cost dimensions, the preference for vehicle sales+self-charging marketing mode, vehicle leasing+self-charging marketing mode, and bare car sales+battery leasing+swapping compatible marketing mode is all ranked from high to low. In terms of herd mentality, those who prefer car rental and self-charging have the highest level of concern, and there is a significant difference compared to the other two marketing modes.

4.3. Multivariate ordered logistic regression analysis of factors influencing market penetration

4.3.1. Variable description

The second part of the questionnaire is a Liszt 5-level rating scale that measures consumers' awareness of factors that affect the penetration of the new energy vehicle market. Based on literature research and industry status, this study divides the factors that affect the penetration of the new energy vehicle market into 19 factors, including financial factors, vehicle properties, intelligent properties, and consumer psychology.

The dependent variable Y is the consumer's willingness to purchase new energy vehicles, divided into 5 levels, which are very unwilling, relatively unwilling, average, relatively willing, and very willing. The independent variable Xi is the average score of the degree of concern of various factors that affect the penetration of the new energy vehicle market, including 19 factors including financial factors, vehicle properties, intelligent properties, and consumer psychology. The results are shown *in* Table 2.

4.3.2. Regression results and analysis

The results of multiple ordered logistic regression are shown in Table 6. The factors that have a significant impact on consumers' willingness to purchase the new energy market are the cost of use (charging), range, convenience of charging (deployment of charging infrastructure), auxiliary driving function (primary autonomous driving), human–machine co-driving function (intermediate autonomous driving), and purchase and use experience (full lifecycle services such as sales, maintenance, and recycling) of new energy vehicles. The impact of 7 factors such as brand value is not significant among the other 12 factors.

The analysis of multiple ordered logistic regression results is as follows:

In terms of financial factors, the concern level of the cost of using new energy vehicles (charging) is significant at the 1% level, and the regression coefficient is positive, indicating that the cost of using new energy vehicles (charging) has a significant positive impact on consumers' willingness to purchase new energy vehicles. Combined with an OR value of 1.462, it indicates that the degree of concern about the cost of using new energy vehicles (charging) increases by one unit. The probability of consumers' willingness to purchase new energy vehicles increasing by one or more levels has increased by 46.209%. From the perspective of charging costs alone, new energy vehicles have obvious advantages. Taking the pure tram Tesla Model 3 as an example, its power consumption per 100 km is about 12 kWh/100 km, the cost of using a household charging station is about 6.24 yuan (calculated by 0.52 yuan/kWh), and the cost of a public charging station is about twice that of a household charging station. The Volvo S60, which has the same performance as the Model 3, has a comprehensive fuel consumption of 5.9–7.9 L/100 km per 100 km by the Ministry of Industry and Information Technology. Based on recent oil prices, the cost per 100 km is at least around 50 yuan. Therefore, the low cost of charging is the core competitiveness of new energy vehicles, which has a significant positive impact on the penetration of the new energy vehicle market.

In terms of vehicle properties, the concern level of range and charging convenience (deployment of charging infrastructure) is significant at the 1% level, indicating that the range and charging convenience of new energy vehicles have a significant impact on consumers' willingness to purchase new energy vehicles. The OR value of range is 2.316, indicating that for every unit of concern for range, consumers' willingness to purchase new energy vehicles increases by 1.316 times. The OR value of the degree of concern for charging convenience (the layout of charging infrastructure) is 0.661, indicating that consumers are more concerned about the convenience of charging new energy vehicles by a level, and their willingness to purchase new energy vehicles is reduced by 33%. This conclusion is consistent with the main path analysis results. With the development of battery technology, the range of new energy vehicles has increased significantly. At present, many brands in the market have launched new energy vehicles with a range of more than 500 km, such as Model 3, Model Y, BYD Tang, BYD Han, and Roewe Ei5. The range of new energy vehicles can meet the needs of consumers, not only a factor that prevents consumers from choosing new energy vehicles, on the contrary, it will have a positive driving effect on the market penetration of new energy vehicles. The lack of charging convenience caused by imperfect charging infrastructure remains a key factor restricting the penetration of the new energy vehicle market, which has a significant negative impact on consumers' willingness to purchase new energy vehicles.

In terms of intelligent properties, both the attention level of auxiliary driving function (primary autonomous driving) and human–machine co-driving function (intermediate autonomous driving) are significant at the 10% level, and the regression coefficients are both negative. The more consumers care about autonomous driving function, the lower their willingness to purchase. The OR value of the concern level of auxiliary driving function is 0.952, indicating that for every unit of concern for auxiliary driving function, the willingness to purchase new energy vehicles decreases by 5.8%. The OR value of the degree of concern for human–machine co-driving function is 0.777, indicating that for every unit of concern for human–machine co-driving function, the willingness to purchase new energy vehicles decreases by 22.3%. In comparison, the negative impact of auxiliary driving function on consumers' willingness to purchase new energy vehicles is relatively small. Due to the influence of technological development, the current autonomous driving functions have not reached the level of satisfaction for consumers. Various auxiliary driving functions have problems such as low accuracy and insufficient reliability, and the frequent news of system malfunctions during human–machine co-driving has made consumers feel intimidated. In this situation, the intelligent properties that should be the core competitive advantage of new energy vehicles have not played a positive role in promoting the market penetration of new energy vehicles but have instead become a significant negative factor affecting consumers' choice of new energy vehicles.

In terms of consumer psychology, the concern level of purchasing and using experiences (sales, maintenance, recycling, and other full life cycle services) and brand value is significant at the 10% level, and the regression coefficients are all negative. The OR value of concern for purchasing and using experiences (sales, maintenance, recycling, and other full life cycle services) is 0.783, indicating that an increase of one unit of concern will reduce purchasing intention by 21.7%. The OR value of brand value awareness is 0.765, indicating that an increase in awareness by one unit results in a 23.5% decrease in purchase intention. Automobiles are durable consumer goods, and the level of service throughout their entire lifecycle has a significant impact on consumers' willingness to purchase. When purchasing new energy vehicles, consumers pay high attention and expectations to various services, guarantees, maintenance, and upgrades related to the vehicle throughout the entire process from purchase to scrapping. However, new energy vehicle companies generally lack a strong service system and improved service processes that have been accumulated by traditional vehicle companies for decades or even centuries, becoming a significant negative factor affecting the penetration of the new energy vehicle market. Similarly, brand value requires more time to accumulate. Compared to traditional fuel vehicles, new energy vehicles have a relatively short development time and have not yet formed a strong brand effect. Consumers have insufficient information on brand selection and product quality, which suppresses their willingness to purchase.

5. Results and Discussion

The potential audience for new energy vehicles is still mainly young and middle-aged people, who have the highest willingness to purchase. New energy vehicles should grasp the post-90s user base and maintain their trendiness, as this consumer group places greater emphasis on intelligent factors such as technology. In addition, there is indeed a significant difference in the factors that potential consumers of new energy vehicles who prefer different types, brands, models, and marketing modes care about when purchasing. This requires new energy vehicle manufacturers to respond to symptoms and prescribe drugs, providing different products to meet diverse needs and services according to the different factors that consumers with different preferences care about. Increasing the level of perception can increase the willingness to purchase new energy vehicles. Manufacturers and brands should expand their promotion and offline experience to meet personalized needs such as preservation rates and performance for different consumers. The different needs of consumers with different choice preferences should also be met. New energy vehicle manufacturers should grasp the purchasing factors of different choice preferences and strive to close value-oriented customers. Consumers who prefer pure electric vehicles have the strongest purchasing intention, and manufacturers and new energy vehicle brands pay attention to the needs of pure electric vehicle consumers and their purchasing concerns, which can effectively promote the growth of new energy vehicle sales.

Finally, regarding the issue of penetration factors in the new energy vehicle market, it is not difficult to see that improving the negative influencing factors that affect consumer purchasing willingness has a significant impact on expanding the future new energy vehicle market. Charging convenience and intelligent attributes play an important role in enhancing the willingness to purchase new energy vehicles. From the multiple logistic regression results, it can be seen that the current charging cost, the distribution of charging station, and the range can meet the daily use needs of consumers and are no longer important factors restricting the expansion of the new energy vehicle market. At the same time, consumers' level of concern for the purchase and use experience of new energy vehicles, as well as brand value, can be improved through the improvement of manufacturer service quality and accumulated reputation. The demand of consumers for charging convenience needs the coordination and interaction of the government, society, and other aspects to improve the construction of intelligent transportation infrastructure arranged by the charging station of new energy vehicles and improve user satisfaction. The current enhancement and improvement of intelligent properties are

mainly reflected in the auxiliary driving function and human–machine co-driving function. According to the results, the improvement of charging convenience and intelligent properties can promote the improvement of the two negative influencing factors of charging convenience and brand value. In summary, improving negative influencing factors, especially charging convenience and intelligent properties, plays an important positive role in promoting the penetration of the new energy vehicle market.

This article can help enterprises conduct market analysis and demand forecasting by understanding the characteristics and selection preferences of new energy vehicle consumers. Currently, the potential consumer group of new energy vehicles is still mainly young people, and consumers still tend to choose industry leaders such as BYD and Tesla in terms of brand preferences. At the same time, manufacturers should pay attention to the preservation rate and novelty level when producing different models of new energy vehicles. We plan to help different new energy vehicles accurately understand their user groups through the analysis of potential consumer profiles and in-depth interpretation of market penetration factors. New energy vehicles of different types, brands, and models can more accurately identify the factors that concern their target groups and carry out more targeted marketing and sales activities. Based on the needs and preferences of different users, car companies can adjust product functions, pricing strategies, promotion channels, etc., to meet the personalized needs of users, enhance user satisfaction and loyalty, and thereby enhance the competitiveness and market share of products.

However, there are still some shortcomings in this article. In the setting of independent and dependent variables, due to the excessive selection of variables and insufficient consideration of interference factors, it is easy to be ignored or misjudged, which may have a certain impact on the results.

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Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Data Availability Statement

Data available on request from the corresponding author upon reasonable request.

Author Contribution Statement

Yu Tian: Conceptualization, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Jianghui Yan:** Methodology, Formal analysis, Data curation, Supervision, Project administration, Funding acquisition.

References

[1] Ministry of Ecology and Environment of the People's Republic of China. (2022). *China mobile source environmental management annual report*. Retrieved from: https://www.mee.gov.cn/hjzl/sthjzk/ydyhjgl/202212/t20221207_1007111.shtml

[2] Li, Q. (2021). qiǎn tán xīn néng yuán qì chē dòng lì hé huán jìng fēn xī [On the power and environmental analysis of new energy vehicles]. *Environmental Engineering*, *39*(12), 313. https://doi.org/CNKI:SUN:SWYJ.0.2021-06-007

[3] Chen, S., & Li, M. (2023). cái zhèng zhèng cè zhī chí néng yuán lǜ sè dī tàn zhuǎn xíng: tiāo zhàn hé yìng du [Fiscal policies for Green and Low carbon transition of energy system: Challenges and countermeasures]. *Fiscal Science*, *85*(01), 110–117. https://doi.org/10.19477/j.cnki.10-1368/f.2023.01.005

[4] Hu, Z., & Zhu, Y. (2022). kě chí xù fā zhǎn bèi jǐng xià xīn néng yuán qì chē fā zhǎn cè luè de yǎn huà bó yì fēn xī [Evolutionary game analysis of new energy vehicle development strategy under the background of sustainable development]. *Journal of Industrial Technological Economics*, *41*(09), 11–17. https://doi.org/10.3969/j.issn.1004-910X.2022.09.002

[5] China Association of Automobile Manufacturers. (2022). *2022 nián 3 yuè xīn néng yuán qì chē chǎn xiāo qíng kuàng jiǎn xī [Analysis of the production and sales situation of new energy vehicles]*. Retrieved from: http://www.caam.org.cn/chn/4/cate_30/con_5235704.html

[6] Ministry of Industry and Information Technology of the People's Republic of China. (2022). *2022 nián 12 yuè qì chē gōng yè jīng jì yùn xíng qíng kuàng [Economic operation of the automotive industry in December 2022]*. Retrieved from: https://www.miit.gov.cn/gxsj/tjfx/zbgy/qc/art/2023/art_610c626d34b8424c9c1077ac5e5a40fe.html

[7] China Economic Times. (2023). *gè dì jìng sù xīn néng yuán sài dào xū jiān gù cuò wèi fā zhǎn [Local racing new energy track must take into account the development of dislocation]*. Retrieved from: https://lib.cet.com.cn/paper/szb_con/529389.html

[8] Trend Force. (2023). *Global EV sales and brand ranking*. Retrieved from: https://www.trendforce.com/research/download/RP230531BG

[9] Xiong Y. & Liu H. (2022). xīn néng yuán qì chē tuī guǎng yìng yòng de "fēi bǔ tiē xíng" zhèng cè zuò yòng jí qí chā yì [The influence and difference of "non-subsidized" policy in new energy vehicles promotion and application]. *Science Research Management*, *43*(09), 83–90. https://doi.org/10.19571/j.cnki.1000-2995.2022.09.010

[10] Xu, G. H., & Xu, F. (2010). xīn néng yuán qì chē gòu mǎi jué cè de yǐng xiǎng yīn sù yán jiū [Impact factors of purchase decision of new energy automobile]. *China Population Resources and Environment*, *20*(11), 91–95. https://doi.org/10.3969/j.issn.1002-2104.2010.11.016

[11] Axsen, J., Bailey, J., & Castro, M. A. (2015). Preference and lifestyle heterogeneity among potential plug-in electric vehicle buyers. *Energy Economics*, *50*, 190–201. https://doi.org/10.1016/j.eneco.2015.05.003

[12] Hidrue, M. K., Parsons, G. R., Kempton, W., & Gardner, M. P. (2011). Willingness to pay for electric vehicles and their attributes. *Resource and Energy Economics*, *33*(3), 686–705. https://doi.org/10.1016/j.reseneeco.2011.02.002

[13] Holechek, J. L., Geli, H. M., Sawalhah, M. N., & Valdez, R. (2022). A global assessment: Can renewable energy replace fossil fuels by 2050? *Sustainability*, *14*(8), 4792. https://doi.org/10.3390/su14084792

[14] Jing, S., Yang, L., & Zhao, Y. (2023). bǔ tiē jī zhì tuì chū duì zhōng guó xīn néng yuán qì chē chū kǒu de yǐng xiǎng yán jiū [Research on the impact of the withdrawal of subsidy mechanism on China's new energy vehicle export]. *Journal of Industrial Technological*

Economics, *42*(6), 134–141. https://doi.org/10.3969/j.issn.1004-910X.2023.06.015

[15] Liu, C., Liu, J., Shao, L. L., & Zhen, Y. F. (2022). "shuāng jī fēn" zhèng cè xià xīn néng yuán qì chē zhì zào shāng jī lì gōng yīng shāng chuàng xīn de qì yuē xuǎn zé yán jiū [Contract design to incentive supplier innovation under dual-credit policy]. *Chinese Journal of Management*, *19*(6), 928–937. https://doi.org/10.3969/j.issn.1672-884x.2022.06.015

[16] Mau, P., Eyzaguirre, J., Jaccard, M., Collins-Dodd, C., & Tiedemann, K. (2008). The 'neighbor effect': Simulating dynamics in consumer preferences for new vehicle technologies. *Ecological Economics*, *68*(1–2), 504–516. https://doi.org/10.1016/j.ecolecon.2008.05.007

[17] Wang, L., & Zheng J. (2022). shuāng jī fēn zhèng cè xià yì zhì qì chē zhì zào shāng de chǎn liàng bó yì jūn héng [Production game equilibrium of heterogeneous automobile manufacturers under dual-credit policy]. *China Population, Resources and Environment*, *32*(01), 67–76. https://doi.org/10.12062/cpre.20210401

[18] Yang, K. X., Zhang, Q., Yu, L., & Pan, X. Z. (2023). jī yú xiāo fèi zhě jià zhí guān hé yǒu xiàn lǐ xìng de xīn néng yuán qì chē gòu mǎi yì yuàn yǔ zhù tuī zhèng cè yán jiū [Study on new energy vehicle purchase intention and nudge policy based on consumer values and bounded rationality]. *Management Review*, *35*(1), 146–158. https://doi.org/10.14120/j.cnki.cn11-5057/f.2023.01.008

[19] Zubaryeva, A., Thiel, C., Barbone, E., & Mercier, A. (2012). Assessing factors for the identification of potential lead markets for electrified vehicles in Europe: Expert opinion elicitation. *Technological Forecasting and Social Change*, *79*(9), 1622–1637. https://doi.org/10.1016/j.techfore.2012.06.004

[20] Chen, Z., Ding, X., & Jin, J. (2018). zhōng guó xīn néng yuán qì chē shāng yè mó shì de shí jiàn yǔ chuàng xīn fēn xī [Analysis of the practice and innovation of China's new energy vehicle business model]. *Taxation and Economy*, *221*(06), 45–51. htttps://doi.org/CNKI:SUN:SWYJ.0.2018-06-007

[21] He, J., Li, J., Zhao, D., & Chen, X. (2022). Does oil price affect corporate innovation? Evidence from new energy vehicle enterprises in China. *Renewable and Sustainable Energy Reviews*, *156*, 111964. https://doi.org/10.1016/j.rser.2021.111964

[22] Yan, J., Tseng, F. M., & Lu, L. Y. (2018). Developmental trajectories of new energy vehicle research in economic management: Main path analysis. *Technological Forecasting and Social Change*, *137*, 168–181. https://doi.org/10.1016/j.techfore.2018.07.040

[23] Xie, R. Y., & An, L. R. (2020). The influence mechanism of innovation characteristics on new energy vehicle consumer's adoption intention: The moderating role of individual innovation. *Modern Economic Science*, *42*(5), 113–121.

[24] Skippon, S. M., Kinnear, N., Lloyd, L., & Stannard, J. (2016). How experience of use influences mass-market drivers' willingness to consider a battery electric vehicle: A randomised controlled trial. *Transportation Research Part A: Policy and Practice*, *92*, 26–42. https://doi.org/10.1016/j.tra.2016.06.034

[25] Li, S., Liu, Y., Wang, J., & Zhang, L. (2016). jī yú shì chǎng biāo xiàn de zhōng guó xīn néng yuán qì chē chǎn yè fā zhǎn zhèng cè pōu xī [China's new energy vehicle industry development policy: Based on the market performance]. *China Population, Resources and Environment*, *26*(9), 158–166. https://doi.org/10.3969/j.issn.1002-2104.201609.019

[26] Wang, Z. P., Li, X. H., & Sun, F. C. (2020). chǎn yè róng hé bèi jǐng xià de xīn néng yuán qì chē jì shù fā zhǎn qū shì [Development trends of new energy vehicle technology under industrial integration]. *Transactions of Beijing Institute of Technology*, *40*(1), 1–10. https://doi.org/10.15918/j.tbit1001-0645.2019.309

[27] Song, R. (2014). jī yú AHP qún jué cè fǎ de shì chǎng shí yàn jì shù yán jiū yǔ yìng yòng — — yǐ jiā yòng xīn néng yuán qì chē xiāo fèi zhě jué cè mó xíng wéi lì [An experimental market research and application on group decision-making method based on AHP: Taking new energy household automotive consumers' decision making model as an example]. *Experimental Technology and Management*, *31*(06), 63–66. https://doi.org/10.3969/j.issn.1002-4956.2014.06.018

[28] Lv, Z., Zhao, W., Liu, Y., Wu, J., & Hou, M. (2023). Impact of perceived value, positive emotion, product coolness and Mianzi on new energy vehicle purchase intention. *Journal of Retailing and Consumer Services*, *76*, 103564. https://doi.org/10.1016/j.jretconser.2023.103564

[29] Franke, T., & Krems, J. F. (2013). What drives range preferences in electric vehicle users? *Transport Policy*, *30*, 56–62. https://doi.org/10.1016/j.tranpol.2013.07.005

[30] Zhou Y., & Pan Y. (2019). cái zhèng bǔ tiē yǔ shuì shōu jiǎn miǎn — — jiāo yì fèi yòng shì jiǎo xià de xīn néng yuán qì chē chǎn yè zhèng cè fēn xī [Financial subsidies and tax exemptions – Policy analysis of the new energy vehicle industry under transaction costs]. *Management World*, *35*(10), 133–149. https://doi.org/CNKI:SUN:GLSJ.0.2019-10-013

[31] Zhang H. (2021). wǒ guó xīn néng yuán qì chē shì chǎng fù sū tài shì jí tuī jìn cè luè [Recovery situation and promotion strategy of China's new energy vehicle market]. *Economic Review Journal*, *35*(10), 133–149. https://doi.org/10.16528/j.cnki.22-1054/f.202110070

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