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The Impact of the Expected Utility and Experienced Utility Gap on Electric Vehicle Repurchase Intention in Jiangsu, China

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Abstract

The global automotive industry' s rapid transformation has led to electric vehicles (EVs) capturing a significant market share as a sustainable transportation option. To sustain this growth, it is crucial to not only attract new users but also retain existing ones through repurchases. This decision is shaped by both vehicle attributes and users' prior experiences. This study examines the impact of five dimensions of expected utility and experienced utility gap (including cost utility, functional utility, emotional utility, environmental utility, and social utility) on the repurchase intentions of 863 Chinese EV users. Discrete choice experiments were used to analyze these factors, considering both vehicle and personal attributes. The results show that when emotional utility exceeds expectations, users are more likely to repurchase pure electric and plug-in hybrid electric vehicles. However, if environmental and social utilities fall short of expectations, users may be discouraged from choosing these two vehicle types. In contrast, decisions regarding gasoline vehicles are primarily driven by economic and habitual factors, with minimal influence from emotional, environmental, or social utilities. Additionally, EV users show a preference for medium-sized models that offer shorter charging times and longer driving ranges. These findings offer insights for enhancing consumer acceptance, accelerating EV market penetration, and supporting the automotive industry's sustainable development, thereby contributing to the achievement of environmental sustainability goals.

Keywords: electric vehicles; expected utility and experienced utility gap; choice experiment; repurchase intention

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1. Introduction

As global transport-related carbon emissions exceed 24% [1], China, as the largest automotive market, faces significant challenges. Road transport accounts for 84.1% of China's total transport emissions, with an annual growth rate of 4% [2,3]. In this context, electric vehicles (EVs) have become central to national carbon neutrality strategies due to their potential to reduce emissions across their entire life cycle [4]. In recent years, China's EV market has shown remarkable growth, with increasing market penetration year by year. According to the latest data from the China Association of Automobile Manufacturers, the penetration rate of EVs in China rose from 5.4% in 2020 to 31.6% in 2023, and reached 40.9% in 2024 [5]. However, this rapid growth is accompanied by a significant sustainability challenge. While the EV market continues to expand and the

number of first-time EV consumers rises, the repurchase rate remains lower than that of gasoline vehicles (GVs) [6–8]. This discrepancy warrants urgent attention, as empirical studies indicate that improving repurchase rates can generate positive externalities, further supporting the sustainable growth of the EV market [9,10].

Unlike first-time EV purchase behavior, repurchase behavior is more complex and multidimensional [11–13]. When repurchasing, consumers not only consider basic car attributes such as power, displacement, and functionality, but are also significantly influenced by the alignment between their post-purchase experience and pre-purchase expectations [14,15]. In the decision-making process, consumers often compare pre-purchase information (i.e., expected utility) with post-purchase updates (i.e., experienced utility), which directly impacts their repurchase decisions. For instance, consumers typically form expectations about an EV's performance, range, and charging time before purchase, but these expectations may not always align with their actual experience. Research has shown, for example, that the actual range of EVs is often 20% lower than the manufacturer's advertised figures [16], the actual charging time exceeds the expected duration [17], and charging time estimates can be off by as much as 60 min [18]. When there is a gap between post-purchase experience and pre-purchase expectations (i.e., a negative expected utility and experienced utility gap), consumers may be inclined to switch to other vehicle types when considering repurchases. On the other hand, consumers whose experiences exceed their expectations are more likely to choose an EV again for their next purchase.

In this study, expected utility and experienced utility gap (EEUG) refers to the discrepancy between consumers' expectations and their actual experiences with EVs, shaped by personal driving experience, media reports, and evaluations from others prior to purchase. This gap is particularly pronounced in high-value, high-investment products like EVs [19], as it directly influences user satisfaction, which in turn affects their repurchase intentions. If the actual cost of owning and operating an EV exceeds consumers' expectations, it can lower satisfaction and reduce the likelihood of repurchase [20–23]. Conversely, if an EV exceeds expectations—such as offering superior acceleration—it can enhance satisfaction and increase the likelihood of repurchase [24–26]. Given the growing competitiveness in the EV market, understanding EEUG is crucial for driving repurchase behavior and supporting long-term market growth.

While current literature has primarily focused on the factors influencing the initial purchase of EVs, such as policy, technology, and price [27–29], research on repurchase behavior remains limited. The few studies that have explored this area mostly focus on churn analysis [21]. For instance, Pan et al. [30] conducted a comprehensive analysis of the factors affecting EV repurchase, but the study is confined to a specific brand (BYD), limiting its generalizability. Therefore, there is a lack of a systematic framework to explain repurchase behavior of EV users.

To bridge this gap, this paper first constructs a model of EEUG and then applies the choice experiment method to simulate the real-world repurchase environment, examining the vehicle types chosen by EV users. Based on the collected data, a hybrid-logit model is developed to assess the impact of the utility gap on consumer behavior. The findings provide valuable theoretical insights for EV companies to develop targeted marketing strategies, optimize product design and service experiences, and promote the sustainable growth of China's EV market. Additionally, the results provide guidance for policymakers in optimizing incentives to promote the repurchase of EVs. Ultimately, this research provides a foundation for a greener, more sustainable transportation future.

The remainder of this paper is structured as follows: Section 2 outlines the theoretical background and model development, including the definition of EEUG, the choice experiment, and the data collection process employed in this study. Section 3 presents the results

of the hybrid logit discrete choice model, highlighting the influence of the five dimensions of EEUG and individual attributes on consumer repurchase behavior. Section 4 provides a comprehensive analysis of these findings. Finally, Section 5 provides a concise summary and concluding remarks.

2. Theoretical Background and Model Construction

2.1. Expected Utility and Experienced Utility Gap

In the field of consumer behavior, utility generally refers to the degree to which a consumer's desires are satisfied when they own or consume goods and services. Expected utility represents an individual's anticipation of future experienced utility [31], while experienced utility focuses on the subjective evaluation of actual experience [32]. However, a discrepancy often exists between expected and experienced utility due to the tendency for individuals to rely on intuition when forecasting future events, making their predictions prone to various biases [33]. For example, Frederic and Kahneman [34] found that participants tended to overestimate the impact of future changes on their well-being while underestimating the actual impact of similar changes in the past. This suggests a gap between expected and experienced utility. Scholars have further explained this gap through five key factors: projection bias [35,36], the illusion of focus [37], underestimating adaptation [38,39], the impact of scenario selection [40], and learning from past experience [41].

For instance, Kahneman and Krueger [33] proposed the concept of "rules of change," which suggests that people often assess the long-term effects of a new situation based on their initial reactions. However, these initial responses are influenced by various factors and may not accurately predict the long-term outcomes. This reliance on initial impressions can lead to "predictive utility bias", where predictions are overly optimistic or pessimistic and lack objective analysis. Another explanation for this bias lies in the difference between the information used to predict the future and the information available when reflecting on the past [42]. When forecasting the future, individuals rely on belief-based information, whereas recalling past experience involves contextual memories that are often influenced by subjective factors. This discrepancy can introduce bias into predictions. Predictions are generally more accurate when sufficient information is available, but when information is limited, subjective beliefs are more likely to shape predictions, leading to a gap.

In this paper, expected utility refers to the extent to which EV users subjectively anticipate their future needs and desires will be met through the use of EVs, based on their core values and personal preferences. The difference between expected and actual experienced utility is referred to as EEUG, as illustrated in Figure 1. The blue cylinder on the left represents the expected utility prior to purchase, while the pink and green cylinders represent the experienced utility after purchase. When there is a discrepancy in the height of these three cylinders, it reflects that there is a utility gap between expected and experienced utility. A positive deviation is indicated by the height difference between the blue and green cylinders, while a negative deviation is represented by the height difference between the blue and pink cylinders.

According to previous studies [43–47], both expected utility and experienced utility are linked to the anticipated emotions or actual experiences of EV users across five key areas: cost (including purchase cost, usage cost, and time and effort invested), vehicle performance, emotional state, environmental impact, and social value. Based on this, this paper categorizes EEUG into five dimensions: cost, function, emotion, environment, and society. The specific definitions of these utilities are detailed in Table 1.

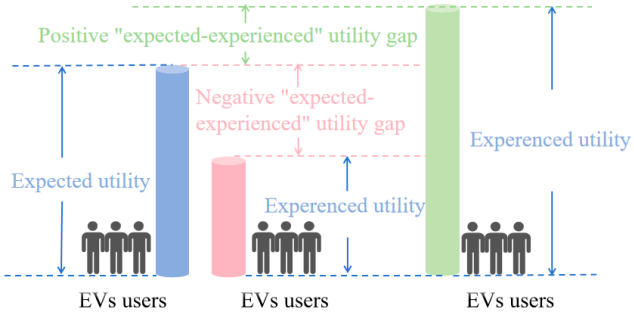

Figure 1. The concept of expected utility and experienced utility gap.

Table 1. Definitions of five utilities and EEUG.

Utility	Definition	Expected Utility and Experienced Utility Gap
Cost utility	Cost utility refers to how well EVs satisfy consumers' economic needs.	This section examines the gap between consumers' expectations and their actual experience with the cost-effectiveness of EVs. A positive discrepancy suggests that the actual cost-effectiveness of EVs exceeds consumers' expectations, potentially increasing their likelihood of repurchase. Conversely, a negative discrepancy may diminish their willingness to repurchase due to perceived cost inefficiencies.
Functional utility	Functional utility pertains to the extent to which EVs meet consumers' needs for knowledge acquisition and daily mobility.	This section explores the difference between consumers' expectations and actual experiences related to vehicle performance, reliability, and comfort. When actual experiences surpass expectations, consumers are likely to feel satisfied and loyal, which may encourage them to repurchase higher-performance EVs. On the other hand, if their expectations are unmet, consumers may experience disappointment, reduced trust in the brand or technology, and may opt for alternative vehicle types.
Emotional utility	Emotional utility refers to the pleasure and comfort consumers seek when purchasing and driving an EV.	This section discusses the emotional aspect of EVs, focusing on the discrepancy between consumers' expectations and actual emotional experience. A positive gap indicates that the emotional experience associated with EVs exceeds expectations, leading to higher driving satisfaction and greater interest in repurchase. However, a negative difference may stem from issues such as range anxiety, inconsistent vehicle performance, or low social acceptance, potentially deterring consumers from purchasing another EV and prompting them to revert to traditional GVs.
Environmental utility	Environmental utility relates to the ability of EVs to fulfill consumers' green travel and environmental protection needs.	This section evaluates consumers' expectations versus actual experience regarding the environmental impact of EVs. A positive difference suggests that the environmental benefits of EVs exceed expectations, encouraging consumers to repurchase. Conversely, a negative difference may discourage further EV purchases and lead consumers to choose GVs instead.
Social utility	Social utility concerns consumers' desire to enhance their personal image and gain recognition from others.	This section addresses the disparity between consumers' expectations and actual experience regarding the social aspects of EV ownership. A positive gap suggests that the social benefits, such as perceived status and social recognition, of owning an EV exceed expectations, potentially increasing the likelihood of repurchase. Conversely, a negative gap may prompt consumers to reassess the social value of EV ownership, potentially deterring future purchases and leading them to revert to GVs.

To assess the influence of EEUG on EV repurchase behavior, we first develop a model of consumer EEUG and simulate the real-world repurchase context of EV users through discrete choice experiments. The measurement scales for expected utility and experienced utility are similar, both based on the research findings of scholars such as Cheng et al. [48,49], Herberz et al. [50], Li et al. [51], Babin et al. [52], and Holbrook [53]. Table 1 below presents

the scale content for both expected and experienced utility, with the specific measurements for each utility type provided in Appendix A.

2.2. Discrete Choice Experiments

2.2.1. Attribute Design

In addition to EEUG, several other factors can influence the repurchase intention of EV users. To accurately simulate the repurchase environment in real world, this study employs the choice experiment method. Choice experiments are a powerful tool for evaluating consumers' decision-making processes when confronted with different options and uncovering their true preferences for alternative products [54]. This method is grounded in stochastic utility theory, providing a strong micro-theoretical foundation that is widely applied in consumer choice behavior research [55]. In a choice experiment, a virtual scenario is created in which respondents are presented with a set of options, each defined by different attribute combinations. A "keep it as before" or "do nothing" option is often included as a baseline. Respondents are asked to select the option that best aligns with their needs, thereby maximizing their utility. This choice reflects their preferences for the various attributes under consideration [56]. By employing this approach, the study offers a more nuanced analysis of the factors influencing EV user's repurchase intentions, capturing a broader spectrum of influences than traditional methods.

Referring to previous studies [57–60], this paper selects several key attributes to simulate the real-world market environment: purchase price, fuel economy, range, charging/fueling time, availability of public charging stations, and vehicle size. These factors play a crucial role in shaping consumer decision-making. The purchase price is set at five levels—80,000, 150,000, 200,000, 300,000, and 400,000 RMB (converted amounts are approximately 11,136; 20,880; 27,840; 41,760; and 55,680 US dollars)—to reflect a range of consumer budgets, from economy to luxury vehicles. Fuel economy is defined at four levels for EVs: 0.05, 0.1, 0.2, and 0.3 RMB per kilometer (converted amounts are approximately 0.696, 1.392, 2.784 and 4.176 US cents per kilometer). For GVs, the fuel cost is set at 0.3, 0.6, and 0.9 RMB per kilometer (converted amounts are approximately 4.176, 8.352, 12.528 US cents per kilometer). Vehicle sizes are categorized into four types—small cars, compact cars, medium cars, and large cars—catering to diverse consumer needs regarding space and driving experience. Charging/fueling time is set at 360 min, 420 min, and 480 min for EVs, and 5 min for GVs. The availability of public charging stations is vital for the practicality of EVs, and the proportion of stations is varied from 80% to 160%. Finally, the driving range, which is a critical factor influencing the practicality and user satisfaction of EVs, is set at 400 km, 600 km, 800 km, and 1000 km. The specific ranges for each attribute are detailed in Table 2, allowing for a more accurate representation of the market selection environment.

Table 2. Selection of experiment attributes and attribute level.

Attribute	Attribute Levels
Purchase price (Unit: RMB)	80,000; 150,000; 200,000; 300,000; 400,000
Fuel economy (Unit: RMB/KM)	EVs: 0.05, 0.10, 0.20, 0.30; GVs: 0.30, 0.60, 0.90 (Unit: RMB/KM)
Vehicle size	Small, Compact, Medium, Large
Charging/fueling time (Unit: minutes)	GVs: 5; EVs: 360, 420, 480
Charging stations (Relative to gas stations)	80%, 100%, 120%, 140%, 160%
Driving range (Unit: km)	400, 600, 800, 1000

Note: The survey was conducted in China in September 2023. All monetary values converted from RMB to US Dollars and US cents were based on the average monthly exchange rate of 7.1839. Accordingly, the purchase prices were converted to the following amounts in US Dollars: 11,136; 20,880; 27,840; 41,760; and 55,680. Fuel economy for EVs is defined at four levels: 0.70, 1.39, 2.78, and 4.18 US cents per kilometer. For GVs, the fuel cost is set at 4.18, 8.35, and 12.53 US cents per kilometer.

2.2.2. Design of Experiments

Based on the product attributes and their specific levels outlined in Table 2, a total of 3500 potential product profiles were initially generated using a full-factorial design. However, it is impractical to expect respondents to complete such a large-scale choice task, as fatigue typically sets in after 15–20 scenarios [61]. To address this issue, Sawtooth Lighthouse software was used to optimize the experimental design and create a more manageable set of selection profiles. To ensure the quality of the selection set, a prior test was conducted to assess the D-efficiency of the design. D-efficiency, a widely recognized measure of experimental design quality, reflects the precision of parameter estimates [62]. As a result, 10 high-quality selection sets were generated, as shown in Figure 2.

Fuel type	PEVs	PHEVs	GVs	
Purchase price (Unit: RMB)	150,000	300,000	200,000	
Fuel economy (Unit: RMB/KM)	0.2	0.6	0.9	
Vehicle size	Compact	Medium	Small	Base alternative
Charging/fueling Time (Unit: minutes)	45	30	5	
Charging stations (Relative to gas stations)	20% less	60% less	same	
Driving range (Unit: km)	400	800	600	
	Choice 1	Choice 2	Choice 3	Choice 4

Figure 2. Selection of experimental samples. Note: The survey was conducted in China in September 2023. All monetary values converted from RMB to US Dollars and US cents were based on the average monthly exchange rate of 7.1839. Accordingly, the purchase prices were converted to the following amounts: 20,880 US Dollars and 2.78 US cents per kilometer for PEVs; 41,760 and 8.35 US cents per kilometer for PHEVs and 27,840 and 8.35 US cents per kilometer for GVs.

In addition to the product attributes, demographic factors also influence the repurchase intentions of EV users [63–65]. For instance, Lee et al. [66] found that users living in single-family homes with access to secondary charging infrastructure are more likely to repurchase EVs. Similarly, Hasan [67] suggested that individuals with higher income and education (e.g., college or university degrees) are more inclined to purchase EVs. Figure 3 below illustrates the selection experiment process employed in this study. Respondents were asked to choose the EV option that best aligned with their needs, based on the provided product attributes.

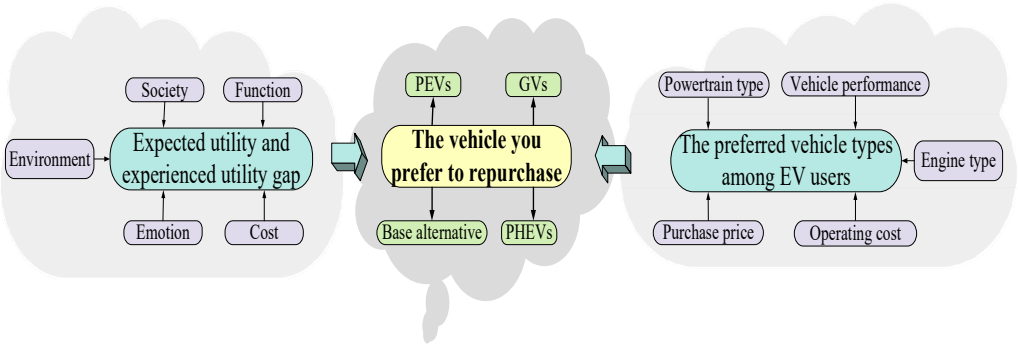

Figure 3. The process by which EV users select a vehicle for repurchase.

2.3. Survey Implementation and Data Description

The questionnaire used in this study is structured into four sections: (1) the Expected Utility Scale, (2) the Experienced Utility Scale, (3) a Choice Experiment, and (4) Respondent

Demographics. To ensure a representative sample, the survey includes questions regarding respondents' repurchase intentions and whether they have purchased a previous EV within the past year, thus enhancing the accuracy of expected utility measurements. Additionally, to further improve the reliability of expected utility data, a scenario was incorporated based on Elias [68] and Egbue and Long [69] to prompt respondents to recall their pre-purchase expectations. The scenario is as follows: "Imagine you are in the situation before your last car purchase. Please recall your feelings about the selected vehicle and choose the option that best represents your expectations of the car before purchasing it." Responses are rated on a 5-point scale, where 1 indicates strong disagreement and 5 indicates strong agreement. To minimize cognitive biases, all sections are presented on a single page, with an estimated completion time of approximately 10 min.

Data were collected through both online and offline channels, primarily in cities in Jiangsu Province where EV penetration is high and consumer awareness is relatively advanced, including Nanjing, Suzhou, and Xuzhou. The survey was distributed through EV sales outlets and social media channels. Prior to the main survey, a pretest was conducted with 150 respondents, and based on their feedback, the questionnaire and experimental design were refined. The formal survey took place from March to June 2024, yielding a total of 1256 responses. After excluding incomplete or invalid responses—such as those from individuals who had not yet purchased their first EV, lacked repurchase intent, exhibited inconsistent answering patterns, or completed the survey too quickly or slowly—a final sample of 863 valid responses was retained, yielding an effective response rate of 68.7%. Among the 863 respondents, 353 were first-time EV consumers, while 372 previously owned a GV, 95 owned a PEV, and 43 owned a HPEV.

3. Results

3.1. Data Description

The survey results reveal that the majority of respondents were male (87.64%) and aged between 18 and 40 years. Furthermore, 90.2% of respondents held a college degree or higher, reflecting a generally high level of education. The majority also reported a household disposable income between 100,000 and 400,000 RMB (converted amounts are approximately between 13,920 and 55,680 US Dollars), comprising 91.42% of the sample. In terms of household characteristics, the ratio of respondents with a home charging pile to those with elderly family members or children was close to 1:1. In comparison to national demographics, the respondents in this study were notably more likely to be male, younger, better educated, and possess higher disposable incomes, which aligns with typical characteristics of EV users [70,71].

3.2. Results of the Model

Based on the hybrid-logit discrete choice model, the repurchase preferences of EV users were analyzed. The model incorporated variables such as EEUG, vehicle attributes (e.g., purchase price, fuel economy, vehicle size, charging time, charging station coverage, and driving range), personal attributes (e.g., city level, education level, age, income), and family attributes (e.g., availability of fixed parking space). The base alternative served as the reference group in the model, with a small car specified as the reference vehicle size. The objective of this analysis was to understand the factors influencing repurchase intentions of EV users. Given the complexity of the results, this section focuses solely on the findings related to EEUG (see Table 3). Results for individual attributes can be found in Appendix B.

Table 3. Results of the hybrid-logit discrete selection model (EEUG).

Variable	Coef.	S.E.	Z	$p > Z$	95% CI	
					LL	UP
Purchase price	2.49	0.48	5.16	0	1.55	3.44
Fuel economy	−0.48	0.18	−2.76	0.01	−0.83	−0.14
Compact vehicles	0.09	0.09	0.99	0.32	−0.09	0.28
Medium vehicles	0.17	0.09	1.9	0.05	−0.01	0.34
Large vehicles	−0.33	0.13	−2.47	0.01	−0.59	−0.06
Charging time	−0.004	0.002	−1.97	0.04	−0.01	−0.00
Proportion of charging stations	−0.19	0.21	−0.89	0.38	−0.60	0.23
Driving range	−0.0009	0.0002	−3.45	0.00	−0.00	−0.00
1. Pure electric vehicles						
Cost utility (+)	−0.002	0.21	−0.01	0.99	−0.41	0.41
Cost utility (−)	−0.11	0.19	−0.58	0.55	−0.48	0.260
Functional utility (+)	0.27	0.2	1.34	0.18	−0.12	0.66
Functional utility (−)	0.18	0.18	0.98	0.32	−0.18	0.54
Emotional utility (+)	0.19	0.09	2.11	0.04	−0.50	−0.29
Emotional utility (−)	0.13	0.19	0.67	0.50	−0.24	0.50
Environmental utility (+)	0.09	0.18	0.5	0.61	−0.26	0.45
Environmental utility (−)	−0.65	0.22	−2.98	0.00	−0.22	−0.08
Social utility (+)	0.32	0.21	1.56	0.11	−0.08	0.72
Social utility (−)	−0.46	0.19	−2.39	0.01	−0.85	−0.08
2. Plug−in hybrid electric vehicles						
Cost utility (+)	−0.05	0.22	−0.24	0.81	−0.48	0.38
Cost utility (−)	0.005	0.19	0.03	0.97	−0.37	0.38
Functional utility (+)	−0.09	0.21	−0.45	0.65	−0.50	0.31
Functional utility (−)	−0.05	0.19	−0.29	0.77	−0.42	0.31
Emotional utility (+)	0.4	0.21	1.91	0.05	−0.00	0.80
Emotional utility (−)	0.04	0.2	0.21	0.83	−0.34	0.43
Environmental utility (+)	0.001	0.19	0	0.99	−0.36	0.36
Environmental utility (−)	−0.43	0.23	1.86	0.06	−0.02	0.87
Social utility (+)	0.06	0.21	0.27	0.78	−0.35	0.47
Social utility (−)	−0.49	0.2	−2.46	0.01	−0.88	−0.09
3. Gasoline vehicles						
Cost utility (+)	0.08	0.24	0.32	0.746	−0.38	0.53
Cost utility (−)	−0.02	0.21	−0.08	0.934	−0.43	0.40
Functional utility(+)	−0.39	0.23	−1.74	0.082	−0.05	0.83
Functional utility(−)	0.51	0.21	2.45	0.014	0.10	0.92
Emotional utility (+)	0.17	0.23	0.77	0.439	−0.26	0.62
Emotional utility (−)	−0.07	0.22	−0.31	0.757	−0.49	0.36
Environmental utility (+)	0.12	0.21	0.58	0.564	−0.28	0.52
Environmental utility (−)	0.7	0.24	2.89	0.004	0.22	1.18
Social utility (+)	0.23	0.23	1.03	0.302	−0.20	0.67
Social utility (−)	0.81	0.22	3.6	0	−1.24	−0.36
4. Base alternative						

Note: A (+) indicates a positive difference value, while a (−) indicates a negative difference value.

The findings indicate that the cost utility does not significantly affect consumers' likelihood of repurchasing EVs. Similarly, the functional utility does not significantly impact the repurchase of PEVs or PHEVs, although it does influence GV repurchases. Emotional utility has a weak impact on the repurchase of GVs, but a positive value in emotional utility significantly increases the likelihood of repurchasing PEVs or PHEVs. Additionally, negative values in environmental and social utility significantly inhibit consumers' intention to repurchase EVs, but they positively influence repurchase decisions for GVs. On the other hand, when considering repurchase, EV users are significantly influenced by the purchase price (positively) and fuel economy (negatively). Compared to small vehicles, EV users are less likely to choose large vehicles, show no significant preference for compact

vehicles, and tend to favor medium vehicles. In terms of charging/fueling time, consumers are inclined to choose models with shorter charging times. The impact of public charging station availability was found to be non-significant in this study. However, an increase in driving range significantly increases the likelihood of consumers selecting EVs.

Furthermore, consumers in higher urban segments are more likely to choose PEVs and PHEVs. Consumers with higher education tend to favor PEVs or GVs. Compared to the base alternative, consumers who own private, fixed parking spaces show a positive and significant preference for all three types of vehicles, with those owning fixed parking spaces being more likely to purchase EVs.

4. Discussion

This paper explores the impact of EEUG on the repurchase behavior of EVs from five key perspectives: cost, function, environment, emotion, and society. The findings show that positive emotional experiences significantly increase the likelihood of consumers repurchasing both PEVs and PHEVs. This can be largely attributed to the driving pleasure, pride, and satisfaction associated with EVs. EVs, particularly, often feature cutting-edge technologies such as autonomous driving assistance and intelligent connectivity, which provide faster acceleration and smoother driving experiences that align with consumers' desire for innovation [72,73]. However, the emotional utility's impact on the repurchase of PHEVs is weaker. Despite being electrically driven, PHEVs are often viewed as transitional technologies due to their reliance on internal combustion engines [74,75], which limits their emotional appeal [76]. In contrast, the environmental benefits of PHEVs and the symbolism of new energy technologies tend to resonate more strongly with consumers, contributing to a more positive emotional experience.

The negative value in environmental utility significantly deters the repurchase of EVs while encouraging the repurchase of GVs. This may be because consumers in Jiangsu Province who purchase EVs are typically motivated by the environmental benefits. If these expectations are not met in practice, it can lead to disappointment, causing them to revert to GVs. GVs are especially appealing to consumers in regions with long-distance driving needs or insufficient charging infrastructure, as they offer the convenience of fueling while meeting some environmental concerns [77]. Similarly, a negative value in social utility significantly inhibits the repurchase of both PEVs and PHEVs, while promoting the repurchase of GVs in Jiangsu Province. Schuitema et al. [78] suggested that some consumers buy EVs to enhance their social image. If these expectations are not fulfilled or if social recognition is lacking, it can lead to dissatisfaction and impact their repurchase intentions. Additionally, some consumers purchase EVs as a demonstration of social responsibility [79], anticipating recognition from others. When these expectations are unmet or questioned, it may undermine their satisfaction and influence their future decisions.

Contrary to previous studies [80], the value in cost utility did not significantly affect repurchase behavior. Several factors could explain this result. First, consumers who are considering repurchase are generally more financially secure and less sensitive to price. Second, cost utility encompasses multiple aspects such as purchase price, operating costs, and maintenance [81]. The importance of different aspects for consumers is not the same. Moreover, consumers' values and priorities may shift over time, particularly in an area where environmental sustainability and technological innovation are gaining increasing attention. As a result, environmental utility may take precedence over cost utility, thereby weakening the influence of cost on repurchase decisions. Additionally, government policies such as subsidies, tax incentives, and the development of charging infrastructure have lowered the economic barrier for purchasing EVs, further diminishing the role of cost in influencing repurchase decisions [82].

Similarly, the value between functional utility and consumer expectations had a relatively minor impact on the repurchase intention for PEVs and PHEVs in Jiangsu Province. This may be attributed to consumers' rational expectations regarding the functionality of EVs [83,84]. As EV technology continues to advance, any gap between expected and actual functional performance is generally insufficient to discourage repurchasing another EV. In such contexts, functional utility is often regarded as a baseline requirement rather than a key differentiating factor in the decision to repurchase an EV. In contrast, functional utility plays a far more critical role when consumers decide to switch to GVs. If a consumer's current EV fails to meet functional expectations—for example, in terms of driving range, charging convenience, or cargo space—they are more likely to opt for a GV for their next vehicle. This distinction helps clarify that failing to repurchase an EV does not necessarily imply a switch to a GV—it might involve delaying purchase or choosing other alternatives. However, switching to a GV represents a conscious shift propelled by perceived functional shortcomings of EVs relative to conventional options. Thus, while functional utility may not be the primary driver in repeat EV purchases, it becomes a decisive factor in reverting to GVs.

Moreover, consumers in Jiangsu Province are more inclined to choose medium vehicles with higher prices, better fuel efficiency, and shorter charging time when making repurchases. Several factors contribute to this trend. Higher prices are often associated with superior quality, advanced technology, and better performance [85], which include improvements in fuel efficiency and charging time. High prices may be a signal for consumers to judge product quality and innovative technologies, especially in high-tech products such as EVs. After a period of use, EV users may seek to enhance their quality of life by selecting higher-performance models. Higher fuel efficiency not only reduces operating costs but also helps mitigate environmental impact [86,87], aligning with the growing preference for sustainability. A shorter charging time further improves the convenience and efficiency of EVs [88].

For most families or individual users, medium vehicles offer a balanced solution for repurchases, meeting the needs of daily commuting, family travel, and leisure activities, while excelling in energy efficiency and driving experience [89]. In contrast, while compact vehicles are more agile and cost-effective for urban driving, they may not fulfill the space and comfort requirements of some consumers. Large vehicles, while offering more space and luxury features [90], are often avoided by environmentally conscious consumers due to their higher acquisition and operating costs, as well as potential environmental impact. Additionally, consumers residing in higher-tier cities (e.g., first- or new first-tier cities), as well as those with higher levels of education, are more likely to repurchase EVs. Urban dwellers are typically more attuned to environmental concerns, while individuals with higher education are often more aware of environmental protection, making them more inclined to view the purchase of an EV as part of a sustainable lifestyle. These findings align with previous research [91–93], and as such, further analysis of these variables is not pursued here.

The results of this study indicate that consumers tend to prefer vehicles with shorter ranges when making repurchases, a finding consistent with previous research [94,95]. To further elucidate this, we examined the range of respondents' current vehicles and found that most already own EVs with relatively high ranges. As a result, a shorter range is often sufficient to meet their daily mobility needs. The survey also reveals that the majority of respondents primarily use their EVs for daily commuting or transporting children—activities that generally do not require long driving distances, making shorter ranges more than adequate. While respondents' current vehicles offer relatively high ranges, the continuous improvement of EV technology has led many consumers to become accustomed to longer

ranges, diminishing the marginal benefit of further range enhancements. Additionally, EVs with shorter ranges are typically more competitively priced, making them an appealing option for budget-conscious consumers. Thus, the influence of range on purchase decisions is multifaceted, shaped not only by range but also by factors such as price, usage scenarios, and personal preferences. This suggests that, although long range is a key feature of EVs, in certain markets or consumer segments, EVs with shorter ranges may still possess substantial appeal. From a consumer profile perspective, factors such as age and access to private, fixed parking spaces are positively associated with the likelihood of choosing any of the three vehicle types.

5. Conclusions, Implications and Limitations

5.1. Conclusions

As an environmentally sustainable transportation alternative, EVs have the potential to significantly reduce greenhouse gas emissions and contribute to the attainment of "dual carbon" goals. Despite these clear advantages, the repurchase rate of EVs continues to lag behind that of conventional fuel vehicles. This discrepancy is often attributed to high consumer expectations, particularly regarding performance, range, and charging convenience. In practice, limitations such as restricted battery lifespan, insufficient charging infrastructure, and prolonged charging time contribute to a disconnect between consumer expectations and actual experiences. These issues not only undermine consumer satisfaction but also erode trust in EVs, ultimately decreasing the likelihood of repurchase.

To address this challenge, the present study employs a discrete choice model to examine the influence of EEUG on repurchase intentions, taking into account vehicle, personal, and family attributes. Specifically, the study focuses on analyzing how differences in consumer utility across five dimensions—cost, function, environment, emotion, and society—affect repurchase decisions. The results indicate that the difference in cost utility has minimal impact on the repurchase of EVs. However, in the case of GVs, significant improvements in functional utility can attract consumers to repurchase. Emotional satisfaction also plays a crucial role in EV repurchases; if the environmental or social utility of EVs fails to meet expectations, consumers are more likely to switch to GVs. Overall, consumers prioritize emotional experiences and the environmental and social benefits of EVs when making repurchase decisions, rather than focusing solely on price or functional improvements. This study highlights the need for EV manufacturers and market strategists to not only meet, but exceed, consumer expectations—particularly in terms of environmental and social utility—in order to drive higher repurchase rates.

5.2. Implications

Drawing upon the findings from this study, it is essential to establish the correct expected utility for consumers regarding EVs and effectively enhance their experienced utility to improve the EV repurchase rate. To achieve this, the following policy recommendations are proposed:

First, automobile manufacturers should increase investment in technological research and development, particularly in areas such as battery life, range, and charging convenience. These technological advancements will effectively address the performance bottlenecks currently faced by EVs and bridge the functional utility gap, thereby improving the overall consumer experience. Notably, the advancements would also make EVs more budget-friendly, thus expanding accessibility for cost-conscious buyers. This aligns with the findings on cost utility, which, though having a relatively minor impact on repurchase decisions, still plays a role. Additionally, EV manufacturers should adjust their marketing strategies to avoid overstating the advantages of EVs, especially by refraining from unreal-

istic claims, and should not ignore consumers' concerns about infrastructure development and repair networks. Accurately conveying the practical use scenarios and long-term operating costs of EVs will help consumers establish rational expectations. Furthermore, independent third-party assessments of the environmental impact of EVs should be encouraged and publicly disclosed to enhance perceived environmental utility and strengthen consumer trust.

Second, accurately shaping consumer expectations should be a primary objective for automobile dealers. Initiatives such as organizing additional test-driving events and establishing dedicated experience centers enable consumers to directly evaluate EV functionality and performance, helping to form realistic pre-purchase expectations. As noted in the study, many consumers revert to GVs due to unmet expectations, particularly regarding range and charging times. Providing more first-hand experiences can better align consumer perceptions with actual vehicle capabilities, thereby reducing dissatisfaction and uncertainty arising from expected-experienced gap. Furthermore, a robust after-sales service system is essential for sustaining consumer confidence. Manufacturers should offer comprehensive warranty policies, streamline repair processes, and strengthen communication channels. As EV technology continues to evolve, enhancing Over-the-Air (OTA) update services is critical to ensure continuous product optimization and feature upgrades, thereby maintaining and adjusting consumer expectations over the product lifecycle.

Third, government intervention is essential to facilitate EV adoption. Policy-led financial incentives can significantly enhance the attractiveness of EVs and provide additional emotional value to consumers. The sustainability and transparency of such policies are particularly important; consumers must be able to anticipate long-term policy directions to avoid uncertainty and negative sentiment caused by abrupt changes. Beyond economic incentives, public education campaigns are needed to correct misconceptions about EV performance, range, and charging requirements, while highlighting their long-term environmental and economic benefits. Establishing EV user communities—such as online forums, local clubs, and advocacy groups—can strengthen group identity and collective support, thereby enhancing social utility. Furthermore, fostering collaboration among local governments, businesses, and research institutions to build a comprehensive EV ecosystem—including user co-creation mechanisms such as trial feedback and participatory design—can increase consumer engagement and satisfaction.

Lastly, further development of charging infrastructure is widely recognized as a critical factor in increasing EV repurchase intentions [96]. The coverage, density, and accessibility of charging facilities directly affect user convenience and overall experience, particularly in key areas such as urban centers, transportation hubs, major highways, and older residential neighborhoods. Such improvements can significantly reduce range anxiety and time-related charging costs [97]. In addition, the integration of intelligent scheduling systems and digital platforms can optimize charging pile utilization and improve user experience transparency. Together, these measures will enhance the perceived convenience and reliability of EVs, thereby strengthening consumer satisfaction and repurchase intention.

5.3. Limitations

Although this study utilized a choice experiment to simulate real-world vehicle repurchase scenarios, it possesses inherent limitations in capturing the dynamic evolution of users' experienced utility regarding EVs. Future research could adopt more dynamic and granular observational approaches to better reflect the authentic experiences of EV users over time. Additionally, while the questionnaire survey effectively collected first-hand experiential data and quantified subjective perceptions, it may not fully elucidate the nuanced and multifaceted nature of user experience. Factors such as temporal changes,

usage contexts, personal preferences, situational pressures, prior experiences, and risk tolerance all contribute to shaping perceived utility. Thus, subsequent studies should employ more holistic methodologies to gain deeper insights into the underlying perceptions and motivations of EV users. Furthermore, the generalizability of our findings may be limited by the regional and cultural specificity of the study sample, which was conducted exclusively in Jiangsu Province, China. To enhance the external validity of the results, future studies should seek to conduct larger-scale surveys across multiple regions, facilitating comparative analyses and improving the transferability of insights to diverse contexts.

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Abbreviations

The following abbreviations are used in this manuscript:

EVs	Electric vehicles
GVs	Gasoline vehicles
EEUG	Expected utility and experienced utility gap
PEVs	Pure electric vehicles
PHEVs	Plug-in hybrid electric vehicles

Appendix A

Table A1. Measurements of the five types of expected utility.

Expected Utility	Source	Measurements
Cost utility	Cheng et al. [48]; Herberz et al. [50]; Li et al. [51]	I expect the selected vehicle to be less expensive to purchase than other vehicles.
		I expect the selected vehicle to be less expensive to repair and maintain than other vehicles.

Table A1. *Cont.*

Expected Utility	Source	Measurements
Functional utility	Cheng et al. [49] Self-developed and designed	I expect that the effort to fully understand the performance of the selected vehicle is acceptable.
		Overall, I expected the selected vehicle to be good value for money.
		I expect the selected vehicle to meet the needs of my daily life.
		I expect the selected vehicle to operate reliably.
		I expect that the selected vehicle would allow me to meet my needs for personalized consumption.
Emotional utility	Babin and Daeden [52]; Holbrook [53]	I expect that driving the selected vehicle would be a pleasure for me.
		I expect that driving the selected vehicle would make me feel relaxed.
		I expect that driving the selected vehicle would be fun for me.
		I expect that driving the selected vehicle would give me a good mental pleasure.
Environmental utility	Cheng et al. [49] Self-developed and designed	I expect that driving the selected vehicle will help improve the environment.
		I expect that driving the selected vehicle will bring significant environmental value to the community.
		I expect that driving the selected vehicle will have benefits for mitigating climate change.
Social utility	Sweeney and Soutar [98]; Rintamäki et al. [99]	I expect that driving the selected vehicle will improve the perception of me.
		I expect that driving the selected vehicle would allow me to gain approval from others.
		I expect that driving the selected vehicle will earn me more thumbs up.

Table A2. Measurements of the five types of experienced utility.

Experienced Utility	Source	Measurements
Cost utility	Cheng et al. [48]; Herberz et al. [50]; Li et al. [51]	I think the purchase cost of the selected vehicle is lower than other vehicles.
		I think the maintenance cost of the selected vehicle is lower than other vehicles.
Functional utility	Cheng et al. [49] Self-developed and designed	I think the effort that goes into fully understanding the performance of the selected vehicle is acceptable.
		I think the selected vehicle will meet the needs of my daily life.
		I think the operational performance of the selected vehicle to be stable.
		I think the selected vehicle will allow me to meet the needs of personalized consumption.

Table A2. *Cont.*

Experienced Utility	Source	Measurements
Emotional utility	Babin and Daeden [52]; Holbrook [53]	I think driving the selected vehicle will give me a pleasure.
		I think driving the selected vehicle will make me feel relaxed.
		I think driving the selected vehicle will immerse me in it.
		I think driving the selected vehicle will give me a good mental pleasure.
Environmental utility	Cheng et al. [49] Self-developed and designed	I believe that driving the selected vehicle will help improve the environment.
		I think driving the selected vehicle is good for mitigating climate change.
		I think driving the selected vehicle will reduce the pollution to the environment.
Social utility	Sweeney and Soutar [98]; Rintamäki et al. [99]	I think driving the selected vehicle can elevate how others perceive me.
		I think driving the selected vehicle will allow me to gain the approval of others.
		I think driving the selected vehicle will earn me more thumbs up.

Appendix B

Table A3. Results of the hybrid logit discrete selection model (individual attributes).

Variables	Coef.	S.E.	Z	$p > Z$	95% CI	
					LL	UP
1. Pure electric vehicles						
City level	0.41	0.11	3.75	0	0.19	0.62
Education	0.41	0.11	3.86	0	0.20	0.61
Age	0.46	0.1	4.61	0	0.26	0.65
Income level	−0.36	0.08	−0.45	0.65	−0.19	0.12
Fixed parking space	1.56	0.24	6.56	0	1.09	2.02
Elderly	−0.22	0.23	−0.97	0.33	−0.67	0.22
Children	−0.35	0.18	−1.95	0.05	−0.69	0.00
_cons	−5.17	0.67	−7.71	0	−6.48	−3.85
2. Plug-in hybrid electric vehicles						
City level	0.46	0.11	4.09	0	0.24	0.68
Education	0.33	0.11	3	0.00	0.11	0.54
Age	0.18	0.11	1.71	0.08	−0.02	0.38
Income level	0.09	0.08	1.12	0.26	−0.07	0.25
Fixed parking space	1.36	0.25	5.48	0	0.87	1.84
Elderly	−0.54	0.24	−2.22	0.02	−1.01	−0.06
Children	−0.53	0.19	−2.88	0.00	−0.90	−0.17
_cons	−3.67	0.7	−5.23	0	−5.05	−2.29
3. Gasoline vehicles						
City level	0.43	0.12	3.59	0	0.19	0.66
Education	0.53	0.12	4.52	0	0.30	0.76
Age	0.34	0.11	3.03	0.002	0.12	0.56

Table A3. *Cont.*

Variables	Coef.	S.E.	Z	$p > Z$	95% CI	
					LL	UP
Income level	−0.08	0.09	−0.88	0.378	−0.25	0.09
Fixed parking space	1.89	0.25	7.41	0	1.39	2.39
Elderly	−0.35	0.24	−1.42	0.155	−0.84	0.13
Children	0.21	0.2	1.03	0.302	−0.18	0.59
_cons	−6.14	0.76	−8.11	0	−7.62	−4.65
4. Base alternative						

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