# Consumer Decision-Making in Outdoor Apparel Purchases: A Discrete Chioce Experiment on Hardshell Jackets

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**Abstract: This study adopts a discrete choice experiment and collects 406 valid responses through a questionnaire survey to explore consumers' preference characteristics and willingness to pay for outdoor jackets. Conditional Logit regression and latent class models are used for analysis. The study finds that price has an inverted U-shaped effect on the probability of choice, with the utility-maximizing price around 4,700 yuan; although fabric technology is the most influential factor in choice, there exists a negative cognitive bias of "the higher, the more rejecting"; consumers' willingness to pay for RECCO rescue devices is approximately three times that for reflective logos; sustainability shows an "attitude-behavior gap" with limited influence; consumers can be categorized into three types: environmentalists, cost-performance seekers, and professional performance-oriented individuals. The study recommends that outdoor brands price their main products below 4,700 yuan, communicate technology through simplified naming and reduced exposure, build a safety configuration pyramid, and implement differentiated strategies for different consumer segments.**

**Keywords: Outdoor Jackets; Discrete Choice Experiment; Consumer Preferences; Inverted U-shaped Price Curve; Latent Class Model**

## 1. Introduction

In recent years, China's outdoor sports market has been rapidly expanding. As the most representative core gear, outdoor jackets are no longer limited to professional mountain and wilderness expeditions; they are increasingly appearing in everyday urban commuting and have also become one of the fastest-growing segments within the outdoor category. Domestic brands such as Kailas and Toread compete alongside international brands like Arc'teryx and Mammut, forcing consumers to make trade-offs across multiple dimensions, including price, fabric technology, and fit. However, what exactly is the preference structure of consumers regarding outdoor jackets? Is price always perceived as "the cheaper, the better"? Does high-end fabric technology necessarily lead to higher purchase intention? Do sustainability claims genuinely influence actual choices? These questions still lack systematic empirical evidence [1,2].

Discrete Choice Experiments (DCEs) can simulate real purchasing scenarios, measuring consumers' preference weights for product attributes and their willingness to pay, effectively avoiding the discrepancy between "stated preferences" and "actual behavior"[3]. This method has been widely applied in fields such as smartphones, new energy vehicles, and sustainable clothing [4-6], yet DCE research focused on outdoor jackets remains lacking. More importantly, most DCE studies assume a linear effect of price on utility for model simplification, but in the consumption of functional products, excessively low prices raise quality concerns, while excessively high prices trigger rational resistance [7,8]; simultaneously, consumers tend to adopt heuristic decision-making strategies when confronted with complex technical terms [9,10]. Therefore, this study introduces a squared price term within the DCE framework to capture potential nonlinear effects, while employing a latent class model to analyze heterogeneity in consumer preferences, aiming to reveal the true preference characteristics of outdoor jacket consumers.

## 2. Data and Methods

### 2.1 Data Sources

A mixed online and offline sampling method was adopted. Participants were required to meet the following criteria: having engaged in outdoor activities at least twice in the past year and

 

having purchased or planned to purchase a softshell jacket. Questionnaires were distributed from December 2025 to February 2026. A total of 462 questionnaires were collected, and after quality control, 56 invalid questionnaires were excluded, resulting in 406 valid responses, with a validity rate of 87.9%.

## 2.2 Research Methods

Discrete Choice Experiments (DCE) are based on Random Utility Theory and are commonly used to analyze how product attributes influence people's decision-making. This method, by simulating relatively realistic and intuitive purchasing scenarios, can effectively reflect the trade-offs consumers make among multiple options. This study employs this method to explore consumers' preferences for outdoor jackets, with the specific steps outlined as follows.

2.2.1 Smaple size calculation

This study refers to the empirical guidelines proposed by scholars such as Johnson and Orme to calculate the minimum sample size required for discrete choice experiments. The calculation formula is: $N>(500\times c)/(t\times a)$, where $c$ represents the maximum number of levels among all attributes, $t$ is the number of choice tasks each respondent must complete, and $a$ is the number of options in each choice set. Based on this, the minimum sample size calculated is 111.

2.2.2 Attribute and level determination

The attributes and their levels were identified through a three-stage process: literature review, market investigation, and expert assessment. We first reviewed relevant studies and product materials to compile an initial attribute pool. We then conducted an in-depth content analysis of 113 products from five brands, followed by a broader validation using 37 products from ten additional brands, eliminating attributes with low occurrence frequencies. Finally, through expert consultation and market calibration, we settled on seven attributes and their corresponding levels, as shown in Table 1.

**Table 1. Attributes and Levels of Hardshell Jackets**

| Attribute | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|
| Fabric technology | Basic waterproof coating | Domestic brand membrane | GORE-TEX | GORE-TEX Pro |
| Price (yuan) | 899 | 1,899 | 3,499 | 5,800 |
| Fit | Slim / Athletic | Regular / Standard | Relaxed / Helmet-compatible | |
| Ventilation system | No pit zips | Pit zips | | |
| Safety feature | None | Reflective logos | RECCO | |
| Product type | Shell jacket | 3-in-1 jacket | | |
| Sustainability | None specified | Eco-friendly materials / certifications | | |

2.2.3. Choice set generation

**Table 2. Example Choice Set**

| Attribute | Hardshell jacket A | Hardshell jacket B |
|---|---|---|
| Fabric technology | GORE-TEX | Domestic brand membrane |
| Price | ¥3,499 | ¥1,899 |
| Fit | Slim | Regular |
| Ventilation system | Pit zips | Pit zips |
| Safety feature | None | Reflective logos |
| Product type | 3-in-1 jacket | Shell jacket |
| Sustainability | None specified | Eco-friendly materials / certifications |
| Your choice | □ | □ |
| □ None of the above, I like neither jacket. | | |

The choice sets were generated using Ngene 1.1 software with a D-efficient design. Each choice task consisted of two alternatives and a "none-of-the-above" option to avoid forcing respondents to choose. A total of 12 choice sets were generated and randomly divided into two blocks, with each respondent completing six tasks. Some attribute combinations in the initial design were unrealistic (for example, a basic coating paired with a high price), so we made minor adjustments accordingly. The D-error after adjustment was 0.048, indicating good design efficiency. An example choice set is presented in Table 2.

2.2.4 Quality control

We embedded several quality checks in the

 

questionnaire. First, we included a dominance test choice set in which alternative B was clearly superior to alternative A on multiple attributes; respondents who did not choose B were classified as invalid. Second, we added reverse-coded items in the psychological scale. Third, we excluded responses with completion times of less than 3 minutes or more than 30 minutes. Fourth, we removed respondents who consistently chose the same alternative across all choice tasks.

### 2.3 Statistical Analysis

We used conditional logit models to analyze the data, with the dependent variable being respondents' choices (alternative 1, alternative 2, or neither) and the independent variables being the attribute levels. The model is specified as follows:

$$U_{ij} = \beta_1 \cdot price_{ij} + \beta_2 \cdot price_{ij}^2 + \beta_3 \cdot fabric_{ij} + \beta_4 \cdot fit_{ij} + \beta_5 \cdot vent_{ij} + \beta_6 \cdot safety_{ij} + \beta_7 \cdot type_{ij} + \beta_8 \cdot sustain_{ij} + \varepsilon_{ij} \quad (1)$$

where *price* is entered as a continuous variable in thousands of yuan,and $price^2$ is its quadratic term. The remaining categorical attributes were dummy-coded, with the reference categories set as follows: slim for fit, no pit zips for ventilation, none for safety feature, shell jacket for product type, and none specified for sustainability.

Willingness to pay (WTP) for each attribute was derived by dividing the attribute coefficient by the marginal utility of price:

$$WTP = \frac{\beta_{attribute}}{\partial U / \partial price} \quad (2)$$

Because the price effect takes an inverted U-shape, the marginal utility of price varies with the price level. We therefore evaluated it at the sample mean price (2,682 yuan) to obtain WTP estimates.

To explore preference heterogeneity across respondents, we estimated a latent class model and determined the optimal number of classes using the Bayesian Information Criterion (BIC). All analyses were conducted in Stata 17.0, with statistical significance indicated by a *P*-value below 0.05.

## 3. Resuits

### 3.1 Sample Characteristics

**Table 3. Sample Characteristics (n=406)**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male | 237 | 58.4 |
| | Female | 169 | 41.6 |
| Age | 18–25 years | 70 | 17.2 |
| | 26–35 years | 186 | 45.8 |
| | 36–45 years | 110 | 27.1 |
| | Above 46 years | 40 | 9.9 |
| Monthly income | Below 5,000 yuan | 73 | 18 |
| | 5,000–10,000 yuan | 151 | 37.2 |
| | 10,001–20,000 yuan | 120 | 29.6 |
| | Above 20,001 yuan | 62 | 15.2 |
| Education level | High school or below | 47 | 11.6 |
| | Junior college | 91 | 22.4 |
| | Bachelor's degree | 191 | 47 |
| | Master's degree or above | 77 | 19 |
| Outdoor experience | Beginner | 117 | 28.8 |
| | Some experience | 192 | 47.3 |
| | Experienced enthusiast | 83 | 20.5 |
| | Professional | 14 | 3.4 |

This study included a total of 406 valid samples. The sample was mainly composed of males (58.4%), individuals aged 26-35 (45.8%), those with a monthly income of 5,000-10,000 yuan (37.2%), individuals with a bachelor's degree (47.0%), and those with certain outdoor experience (47.3%), which basically corresponds to the overall characteristics of the population participating in outdoor sports in our country. See Table 3 for detailed sample characteristics.

### 3.2 Preference Analysis

We estimated a conditional logit model with consumers' choices (alternative 1 or alternative 2)

as the dependent variable and the attribute levels as the independent variables. The estimation results are presented in Table 4.

The coefficient on the linear price term is positive and significant (1.494, P < 0.001), while the coefficient on the squared price term is negative and significant (-0.159, P < 0.001), indicating an inverted U-shaped price effect. The utility-maximizing price, calculated using the vertex formula, is approximately 4,700 yuan (95% CI: 4,393 to 5,211 yuan).

The coefficient on fabric technology is negative and significant (-0.929, P < 0.001), implying that higher technical grades are associated with weaker preferences. Ventilation (0.378) and safety features (0.393) both have positive and significant coefficients. Sustainability (0.158) is also positive and significant, though the coefficient is relatively modest. The coefficient on product type (-0.115) suggests that shell jackets are preferred over 3-in-1 jackets.

**Table 4. Conditional Logit Regression Results for Consumer Preferences**

| Variable | β | SE | Wald $\chi^2$ | p-value | Exp(β) | 95%CI |
|---|---|---|---|---|---|---|
| Price (1,000 yuan) | 1.494*** | 0.065 | 532.42 | <0.001 | 4.454 | 3.923~5.057 |
| Price² (1,000 yuan²) | -0.159*** | 0.009 | 288.93 | <0.001 | 0.853 | 0.838~0.869 |
| Fabric technology (0–3) | -0.929*** | 0.056 | 272.19 | <0.001 | 0.395 | 0.354~0.441 |
| Fit (0–2) | -0.190*** | 0.042 | 20.78 | <0.001 | 0.827 | 0.762~0.897 |
| Ventilation (with = 1) | 0.378*** | 0.060 | 39.15 | <0.001 | 1.460 | 1.297~1.644 |
| Safety feature (0–2) | 0.393*** | 0.055 | 51.49 | <0.001 | 1.482 | 1.331~1.650 |
| Product type (3-in-1 = 1) | -0.115* | 0.054 | 4.46 | 0.035 | 0.892 | 0.802~0.992 |
| Sustainability (with = 1) | 0.158** | 0.054 | 8.55 | 0.003 | 1.172 | 1.054~1.303 |

*Note: ***p < 0.001, **p < 0.01, *p < 0.05. Fabric technology, fit, and safety feature are treated as ordinal variables (coded 0 to the number of levels minus one). The remaining variables are dummy-coded; see the main text for reference categories.*

### 3.3 Monetary Valuation of Attributes (Willingness to Pay)

To compare the monetary value of different safety configurations, we split the safety feature into two dummy variables—reflective logos and RECCO—and re-estimated the model. At the sample mean price of 2,682 yuan, the marginal utility of price was 0.665. The resulting WTP estimates are presented in Table 5. Willingness to pay for RECCO (1,385 yuan) was roughly three times that for reflective logos (467 yuan), and the difference was statistically significant (Wald $\chi^2 = 45.34$, P < 0.001).

**Table 5. Marginal Willingness to Pay (MWTP) for Safety Features**

| Safety feature | β | Marginal utility of price | MWTP (yuan) | 95% CI (yuan) |
|---|---|---|---|---|
| Reflective logos | 0.311*** (0.062) | 0.665 | 467 | 272~663 |
| RECCO | 0.920*** (0.122) | 0.665 | 1,385 | 1,010~1,760 |

*Note: ***p < 0.001. Standard errors are shown in parentheses. Marginal utility of price is evaluated at the sample mean price of 2,682 yuan.*

### 3.4 Changes in Choice Probability by Attribute

Based on the coefficients from the main model, we calculated the relative changes in choice probability when shifting each attribute from its baseline level. The baseline scenario was set as follows: price at 899 yuan, basic coating, slim fit, no pit zips, no safety feature, shell jacket, and no sustainability claim. The results are presented in Figure 1.

Price and fabric technology were the two attributes that induced the largest changes in choice probability. When fabric technology was upgraded from basic coating to domestic brand membrane, GORE-TEX, and GORE-TEX Pro, choice probability dropped by 16.54%, 41.18%, and 66.34%, respectively—again confirming the negative perception bias whereby higher technical grades are associated with weaker consumer preferences.

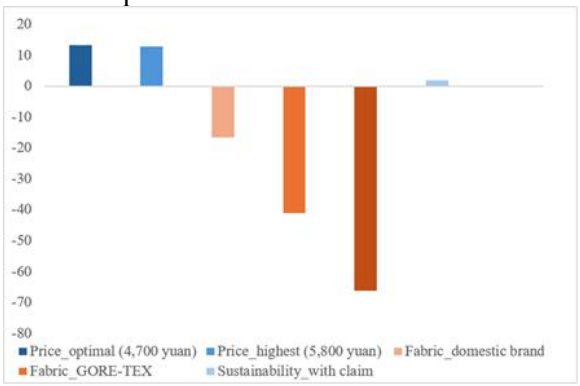


**Figure 1. Impact of Attribute Level Changes on Choice Probability (Relative to Baseline)**

 

Raising the price from 899 yuan to 4,700 yuan increased choice probability by 13.15%. At the 5,800 RMB price point, the choice probability dipped from 0.9853 to 0.9822, but remained well above the baseline. This indicates that within the experimental price range, high prices still convey a quality signal, but the attractiveness diminishes marginally once the optimal price is exceeded. Sustainability increases from non-existent to present, with the selection probability rising by only 1.93%, indicating a limited impact.

### 3.5 Changes in Choice Probability by Attribute

The Bayesian Information Criterion (BIC) favored a three-class model (Table 6).

**Table 6. Latent Class Model Estimation Results**

| Variable | Class 1 | Class 2 | Class 3 |
|---|---|---|---|
| Price (1,000 yuan) | 3.799 | 1.063 | 215.217 |
| Price² | -0.460 | -0.125 | -28.202 |
| Domestic brand membrane | -2.094 | -1.023 | -167.000 |
| GORE-TEX | -4.196 | -1.946 | -294.557 |
| GORE-TEX Pro | -4.186 | -1.820 | -246.069 |
| Fit | -0.791 | 0.095 | -34.066 |
| Ventilation | 1.158 | -0.333 | 30.831 |
| Safety feature | 0.263 | 0.468 | 54.841 |
| Product type | -0.402 | 0.081 | -36.546 |
| Sustainability | 0.245 | -0.423 | -29.637 |
| Class share | 47.3% | 38.4% | 14.4% |
| Covariates (Class 3 as reference) | | | |
| Covariate | Class 1 | Class 2 | Class 3 |
| Experienced outdoor enthusiast | -2.993 | -3.413 | 0.000 |
| High income | 0.144 | 0.522 | 0.000 |
| Environmental values | -0.024 | 0.022 | 0.000 |

The first category accounts for 47.3% and can be referred to as “Environmentalists”. This group of consumers is the only one showing a positive preference for sustainability (coefficient 0.245), while also placing relatively high importance on ventilation systems (1.158) and safety features (0.263), and generally has a higher income level. The second category accounts for 38.4% and is characterized as “Value Seekers”. They are less averse to domestically branded films (-1.023, lower than -1.506 in the baseline model), show a preference for looser fits (0.095) and three-in-one structures (0.081), but have negative attitudes toward ventilation systems (-0.333) and sustainability (-0.423). The third category accounts for 14.4% and can be called “Performance Purists”. This group exhibits extremely strong positive preferences for ventilation systems (30.831) and safety features (58.841), while showing strong negative cognitive biases toward high-end fabric technologies and sustainability. In terms of covariates, experienced outdoor enthusiasts are significantly more likely to belong to this category.

### 3.6 Relative Importance of Attributes

Based on the coefficients from the main model, we calculated the maximum absolute effect of each attribute on utility within its respective range and normalized these values to obtain relative importance weights (Table 7). Fabric technology and price contributed the most, at 40.40% and 33.26%, respectively, together accounting for over 70% of the total. Sustainability (2.29%) and product type (1.66%) had much smaller impacts.

**Table 7. Relative Importance of Attributes**

| Attribute | Relative importance (%) |
|---|---|
| Fabric technology | 40.4 |
| Price | 33.26 |
| Safety feature | 11.4 |
| Fit | 5.5 |
| Ventilation | 5.48 |
| Sustainability | 2.29 |
| Product type | 1.66 |
| Total | 100 |

### 3.7 Supplementary Analysis and Robustness Checks

We included interaction terms in the model to examine possible moderating effects of outdoor experience on ventilation preference and of environmental values on sustainability

 

preference. Neither interaction coefficient reached statistical significance (ventilation × outdoor experience: $\beta = -0.106$, $p = 0.099$; sustainability × environmental values: $\beta = -0.034$, $p = 0.276$). These results suggest that preferences for ventilation do not vary with the level of outdoor experience, and that the influence of sustainability is not moderated by environmental values.

For robustness, we conducted three additional analyses. First, we replaced the squared price term with piecewise dummy variables for each price level. The coefficients for each price segment first increase and then decrease (¥1,899: 1.262, ¥3,499: 2.713, ¥5,800: 2.426), which is consistent with the inverted U-shaped conclusion. Second, when the fabric technology is changed from a continuous variable to a categorical variable, the absolute values of the coefficients for the three dummy variables increase with higher technology levels (Domestic brand film: -1.506, GORE-TEX: -2.662, GORE-TEX Pro: -2.988), confirming the robustness of the negative cognitive bias. Third, introducing the interaction term between brand sensitivity and price yields insignificant results, indicating that the inverted U-shaped effect of price is general and not driven by a specific group.

## 4. Discussion and Implications

### 4.1 Pricing Strategy: The 4,700 Yuan Price Threshold and Product Line Design

This study found that price has an inverted U-shaped effect on consumer choice, with the utility-maximizing price at approximately 4,700 yuan. This result delineates the boundaries of the Veblen effect in functional products: when the price is below the threshold, an increase conveys a quality signal; once the threshold is exceeded, consumers switch to rational evaluation. These findings are consistent with the price psychophysics argument advanced by Kamen and Toman (1970), but add a category-specific threshold for functional apparel—a contribution we believe has not been quantified previously. Unlike earlier DCE applications that imposed a linear price-utility specification, our work shows the empirical benefit of allowing for nonlinearity via a squared term. The nonsignificant interaction between brand sensitivity and price further suggests that this inverted-U pattern holds broadly across the sample, rather than being driven by any particular subgroup.

For core product lines, pricing in the 3,500–4,700 yuan range should capitalize on the positive quality signal without overshooting the utility peak. For ultra-premium offerings above 5,000 yuan, brands should embed highly visible added features—such as RECCO—that justify the price premium, rather than relying on brand equity alone.

### 4.2 Technical Communication: Differentiated Strategies Based on Cognitive Biases

Despite the high relative importance of fabric technology (40.40%), consumers show an aversion to higher technical grades—a pattern consistent with the idea that consumers rely on simple mental shortcuts when evaluating technical attributes. In practice, brands often adopt scenario-based experiences (such as rain simulation videos) in an attempt to address this issue. However, this study suggests that lowering the cognitive threshold is more critical than scenario-based experiences. Recommendations: First, simplify technical nomenclature by using scenario labels such as “mountain-level” or “expedition-level” instead of professional terms like “GORE-TEX Pro”, allowing consumers to understand technological differences without specialized knowledge. Second, for value-conscious consumers, high-end technology exposure should be deliberately minimized to avoid triggering negative associations of “over-specification”. Third, environmental narratives should only target environmentally conscious groups; for the other two consumer groups, not only are such narratives ineffective, but they may also distract from the focus on core performance.

### 4.3 Sustainability: Limited Investment and Precise Targeting

Sustainability has a positive impact on choice, but its relative importance is only 2.29%, and environmental values do not significantly moderate this effect. This corroborates the common “attitude-behavior gap” in the field of sustainable consumption, where consumers verbally endorse environmental concepts but rarely prioritize them in actual purchases. Therefore, brands should treat sustainability as a basic threshold rather than a core selling point. Given that third-party certification has become widespread, a more pragmatic approach is to avoid setting a significant environmental premium (as consumers have low willingness to

 

pay) and to direct limited marketing resources solely toward the group of environmentalists (47.3%), without emphasizing this attribute to the other two groups.

### 4.4 Function Configuration: Safety Pyramid and Ventilation System Positioning

Consumers' willingness to pay for RECCO (1,385 yuan) is approximately three times that for reflective markers (467 yuan). This substantial gap provides a quantitative basis for tiered safety configurations. We propose a "safety pyramid": at the entry level (below 1,000 yuan), reflective logos should be standard; at the mid-tier (1,000–2,500 yuan), reflective logos remain standard without RECCO; at the mid-to-high tier (2,500–5,000 yuan), reflective logos are standard with RECCO as an option; and at the flagship tier (above 5,000 yuan), both features are standard. Safety features should be marketed primarily to performance-oriented professionals (14.4%) and environmentalists (47.3%).

Regarding product type, consumers overall prefer shell jackets, though value seekers show a positive preference for 3-in-1 designs. Thus, professional and high-end lines should focus on shell jackets with an emphasis on lightweight construction and breathability, while mass-market and entry-level lines may retain 3-in-1 jackets with improvements in weight and ventilation. The positive effect of ventilation is not moderated by outdoor experience, suggesting that it should be standard in mid-to-high-end products, while entry-level products may omit it given value seekers' mild aversion to this feature.

### 4.5 Limitations and Future Directions

Several limitations of this study should be acknowledged and addressed in future research. First, only four price points were used, so the estimated optimal price of 4,700 yuan is an interpolated value. Future studies could increase the density of price points or apply semiparametric methods to verify the precise shape of the inverted U-shaped curve. Second, the negative effects of fabric technology may be influenced by the static presentation of text and images. In the future, information manipulation experiments (such as dynamic video comparisons) could be used to examine the mitigating effects of technology communication methods on cognitive biases. Third, the proportion of professional samples is only 3.4%. Although a latent class model identified a group of "professionals who prioritize performance", caution is still needed when extrapolating conclusions to deep users. Future studies could supplement the sample with professional outdoor groups. Fourth, brand variables were not included. Although robustness tests indicate that brand sensitivity does not moderate the price effect, the brand name itself may influence preferences. Future studies could use label designs to directly test brand effects. Fifth, there may be a gap between stated preferences and actual behavior. Future research could collaborate with e-commerce platforms to cross-validate real purchase data, thereby enhancing external validity.

## 5. Conclusions

This study, based on a discrete choice experiment (N=406), analyzed the preference characteristics of consumers of outdoor jackets and drew the following main conclusions: First, price exhibits an inverted U-shaped effect, with the utility-maximizing price around 4,700 CNY, revealing the boundaries of the Veblen effect in functional products. Second, while fabric technology is the primary factor influencing choice, there exists a significant negative cognitive bias: the higher the technology level, the weaker the preference, which aligns with consumers' heuristic decision-making characteristics when faced with complex technical terms. Third, there is a substantial difference in willingness to pay for safety features; consumers' willingness to pay for RECCO (1,385 CNY) is approximately three times that for reflective markings (467 CNY). Fourth, sustainability is more praised than practiced, with a relative importance of only 2.29%; environmental values do not significantly moderate this effect, indicating a clear attitude–behavior gap. Fifth, consumers overall prefer single-layer hard shells, but cost-performance seekers show a positive preference for 3-in-1 structures. Sixth, consumers can be categorized into three heterogeneous groups: environmentalists (47.3%), cost-performance seekers (38.4%), and performance-oriented professionals (14.4%).

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