IMPACT MECHANISM OF GREEN MARKETING TOOLS ON BUYING BEHAVIOR

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Abstract. Although studies have increasingly focused on the impact of individual green marketing strategies on consumer behavior. There is a lack of knowledge on about how a combination of green marketing tools affects consumer behavior. Based on a sample of 599 consumers from the Pearl River Delta region in China, this study employs an SEM model to examine the impact of three green marketing tools—ecological labels, ecological branding, and environmental advertising—on consumer buying behavior. The findings indicate that green marketing tools positively impact consumer buying behavior, primarily due to perceptions of authenticity and green values. Furthermore, reputation value positively moderates the impact of ecological labels, ecological branding, and environmental advertising on buying behavior, and the impact of ecological labels and environmental advertising perceived green value. Our study clarifies the key role of combining green marketing tools in consumer buying behavior and offers useful information for corporate green marketing practices.
Keywords: *green purchase, perceived green value, perception of authenticity, reputation value, eco-labeling*

Introduction

Since the 1970s, with increasing awareness of environmental protection, consumers have redirected their purchasing behavior toward environmentally friendly products (Alghamdi and Agag, 2024). This change has facilitated the initiation of the Green Revolution to prevent further environmental damage. Green consumption has become a global trend, and marketing models have evolved from traditional marketing centered around the 3Cs (customer, company, and competitors) to green marketing focused on the 3Es (economy, ethics, and environment) (Zhang et al., 2024). Green marketing emphasizes that companies should minimize their environmental impact during production and sales, while also focusing on social responsibility and sustainable development. Green marketing can be defined as a modern marketing model guided by sustainable development, which integrates environmental protection concepts and green awareness throughout production and operational processes, forming a complete green supply chain (Shao et al., 2025). It considers economic benefits for companies while balancing social and ecological interests to achieve a win-win situation.

Green purchasing behavior refers to the purchase of "recyclable and environmentally beneficial" or sustainable products that avoid damaging the environment and society (Chan, 2004). Green consumer behavior is typically evaluated based on consumer

willingness or intention to purchase green products, and this awareness or intention eventually translates into purchasing decisions that promote environmental sustainability (Joshi and Rahman, 2019). Existing research has explored the impact of green marketing on consumer behavior from multiple dimensions, including environmental awareness, recycling willingness, media influence, and ecological concerns. Empirical methods, such as surveys and structural equation modeling (SEM), have been employed to study the specific effects of green marketing on consumer behavior. Although environmental awareness and the willingness to recycle significantly influence green purchasing behavior in emerging markets (Boztepe, 2012), price and product quality remain major factors affecting purchasing decisions. Green marketing must combine economic factors, and companies can successfully implement it by improving product performance and enhancing consumer loyalty. Additionally, the media plays an important role in shaping consumers' environmental attitudes and purchasing behavior. Companies should use media promotion to enhance consumers' ecological concerns and willingness to purchase green products (Delaine et al., 2018). Green marketing tools mainly include environmental advertising, eco-public relations activities, eco-packaging design, ecological labels and certifications, social media marketing, and ecological brand image building (Akram et al., 2024). These tools can deliver environmental protection messages and value, attract consumer attention, and increase purchase rates. Ecological labels, branding, environmental advertising, and other green marketing methods enable consumers to perceive and become aware of the attributes and characteristics of green products, thereby guiding them to purchase environmentally friendly products (Potter et al., 2021). The use of these policy tools plays a crucial role in transforming consumer purchasing behavior toward eco-friendly products, thus reducing the negative environmental impact of synthetic products. Some scholars have studied the impact of a single variable on consumer purchasing behavior, such as green branding (Kazmi et al., 2021), but research on the combination of green marketing tools remains relatively scarce.

Additionally, most existing studies on the impact of green marketing on consumer purchasing behavior focus on specific countries or regions, and due to sample bias, their findings may not be generalizable to other cultural contexts. Green consumption behavior is a dynamic process; however, existing studies are mostly cross-sectional and lack long-term tracking of behavioral changes. Green consumption behavior is a complex phenomenon that requires consideration of multiple factors. Based on this, this study explores the impact of green marketing tools on consumer purchasing behavior under the influence of green perceived value and the perception of authenticity. Furthermore, it investigates the antecedent factors of consumer purchasing behavior and the psychological decision-making process to enhance businesses and effectively discover new marketing strategies for green reform and marketing decisions. It examines the impact of green marketing tools (ecological labels, ecological branding, and environmental advertising) on consumer purchasing behavior, revealing that perceptions of authenticity and green value play partial mediating roles. Simultaneously, reputation value moderates the relationship between green marketing tools and green perceived value, as well as purchasing behavior.

The contributions of this study are as follows: First, it explores how green marketing tools affect consumer purchasing behavior, constructs green marketing tools that influence consumer behavior, provides theoretical guidance for green marketers, and contributes to environmental protection. Moreover, the research results will enable businesses understand consumer needs and psychology accurately, providing data support

and decision-making references for promoting the sale of eco-friendly products. Second, by revealing the mediating roles of perceived value and authenticity, this study reveals the transmission mechanisms of different green marketing tools on consumer purchasing behavior, providing guidance for corporate marketing strategies and product design. Finally, based on the reputation value as a moderating variable in the Pearl River Delta region, this study can better understand and predict consumers' environmental choices. Moreover, this study considers regional cultural characteristics, making it highly relevant to the development of green marketing and environmental protection in the Guangdong-Hong Kong-Macao Greater Bay Area.

Theoretical analysis and research hypotheses

Green marketing tools and consumer buying behavior

Accenture's "2022 China Consumer Insights" found that an increasing number of Chinese consumers are becoming aware of the importance of sustainable development and are willing to spend time and money on environmental protection. PwC's "June 2022 Global Consumer Insights Pulse Survey" revealed that more than half of the global consumers surveyed indicated that they would become more eco-friendly, especially millennials and Gen Z, who are more likely to consider environmental, social, and governance (ESG) factors when trusting, advocating, and purchasing from companies. Eras give birth to ideas, while ideas influence eras. Against this backdrop, the new generation of consumers (Gen Z) have gradually developed a pursuit of a green lifestyle, and green brands with the concept of "sustainable development" are increasingly being favored by global consumers. As digital natives, Generation Z possesses strong environmental awareness and prioritizes brand values alignment. Sustainable consumption—such as eco-designed, energy-efficient, and responsibly sourced tech products—has become central to their purchasing decisions (Theocharis and Tsekouropoulos, 2025). As the green economy grows rapidly and the Gen Z consumer group (currently accounting for more than a quarter of the total consumer base) expands, the profound recognition of environmental protection and ecological friendliness enhances the significance of "sustainable development" within major brand strategies; therefore, green marketing has gained widespread attention from corporate marketers.

In green consumer psychology research, attitude has always been regarded as an important antecedent of behavioral intentions and actual behavior (Halinen et al., 2022). Attitude can be classified as general or specific; general attitude refers to the broad tendency to engage in behaviors related to a class of objects, whereas specific attitude is a strong predictor of a single behavior related to a particular object (Shatnawi and Chin, 2019). In environmental consumer research, such specific attitudes are often related to green products or purchases, beliefs or feelings about purchasing eco-friendly products, and the impact of such behaviors on ecology (Riethmuller and Buttriss, 2008). However, in the context of green purchase decision making, people's attitudes toward green products differ from general environmental attitudes because these decisions benefit environmental sustainability.

However, from the perspective of consumer behavior, such concerns do not necessarily translate to actual purchases. Many factors, including market accessibility, self-efficacy perceptions, product quality perceptions, access to information about green products, and high prices, prevent the transformation of consumer attitudes and purchase intentions into actual consumption behavior (Zhang et al., 2024). Additionally, the

phenomenon of "greenwashing" by brands causes trust issues (Nguyen et al., 2019). Dangelico and Vocalelli (2017) indicated that careful definition of advertising content by companies is crucial and that product ecological labels are an important marketing tool. White et al. (2019) suggested that when information or contextual stimuli trigger psychological factors in consumers, they are more likely to engage in environment-friendly behaviors, such as social influence, habit formation, personal self, sensation and cognition, and tangibility. Casalegno et al. (2022) discovered that age plays a key role in choosing green and socially friendly products and that environmental concern and perceived effectiveness are important prerequisites for the green and sustainable purchasing behavior of the three groups. When companies adopt green marketing tools, they can create an image of environmental protection and sustainable development in line with ESG principles. The more consumers focus on a company's ESG performance, the more likely they are to be influenced by green marketing tools and choose to purchase products that align with their ESG values.

Existing research has examined green purchasing behavior from various perspectives; however, few studies have investigated how a combination of green marketing tools influences consumer buying behavior. Based on this, we propose Hypothesis 1:

H1: There is a significant positive correlation between green marketing tools and consumer buying behavior.

H1a: There is a significant positive correlation between ecological labels and consumer buying behavior.

H1b: There is a significant positive correlation between ecological branding and consumer buying behavior.

H1c: There is a significant positive correlation between environmental advertising and consumer buying behavior.

Mediating role of green perceived value

Green perceived value is an extension of perceived value (Liu et al., 2025). The primary beneficiaries of green consumption are not always only its own consumers, but also other consumers or society as a whole (Wu and Yang, 2018). Moreover, the price of green products is often higher than that of traditional products, enhancing consumers' reluctance to purchase them (Borin et al., 2013). Even if consumers express a positive attitude toward green products and indicate a willingness to purchase them, few actually do so (Dinh et al., 2021). This finding highlights that consumers evaluate perceived gains and losses when purchasing green products. Many studies have focused on how self-interest influences consumers' green purchasing behavior, demonstrating that they are more likely to buy green products that serve their own interests (Harjadi and Gunardi, 2022). Some researchers argue that green consumption is most likely to occur when the benefits of green products are linked to those of other products. Webb et al. (2008) found that in addition to self-interest, socially responsible consumption is always social-oriented. Previous studies have shown that consumers focus more on environmental rather than personal benefits when purchasing eco-friendly products. If buying green products benefits society, consumers may even forgo personal benefits. Peattie and Crane (2005) noted that green consumption is considered more efficient when it benefits an entire future generation of consumers than just yielding current personal gains, thereby influencing consumers' green purchasing intentions. Studies abroad have shown that trusted ecological labels provide valuable product information to consumers, thereby promoting green consumption (Wang et al., 2022). Although green purchasing has

become a popular research field, past studies have mostly focused on the demographics of green consumers (Joshi and Rahman, 2019) and the relationship between their attitudes and actual behavior. Our research contributes to the literature by observing the impact of socio-psychological variables on green purchase intentions. Previous studies have shown that attitudes or motivations may not fully explain eco-friendly behaviors, leading to an attitude-behavior gap. Moreover, it has been proposed that socio-psychological factors can bridge this gap by encouraging consumers to accept green products to reduce negative environmental impacts. However, further research is required to better understand these mechanisms.

Social cognitive theory suggests that behavior is influenced by social environment and factors. Through the socialization process of social cognition, consumers accept and absorb knowledge of green products and eco-friendly behaviors. Green marketing tools can enhance consumer awareness of green products through socialization channels, such as advertising, social media, and word-of-mouth, encouraging them to purchase these products. In the context of green consumption, the existing literature does not include ecological labels, ecological branding, or environmental advertising in a single framework to explore the impact mechanisms of these marketing tools on green purchase behavior. In this context, this study comprehensively considers the mediating role of green perceived value in the impact of green marketing tools on green purchasing behavior. Based on this, we propose Hypothesis 2:

H2: Green perceived value mediates the impact of green marketing tools on consumer buying behavior.

H2a: Green perceived value mediates the impact of ecological labels on consumer buying behavior.

H2b: Green perceived value mediates the impact of ecological branding on consumer buying behavior.

H2c: Green perceived value mediates the impact of environmental advertising on consumer buying behavior.

Mediating role of perception of authenticity

Scholars have based their research on signal and trust transfer theories to define credibility as a trust dimension (Doney and Cannon, 1997), describing it as the recipient's evaluation of the credibility of information (Wathen and Burkell, 2002). Researchers have extended the concept of credibility to that of source (Filieri, 2016; Filieri et al., 2015) and message. Consumers can easily distinguish these two types of credibility through online reviews. For instance, in case of online consumer reviews, source credibility relates to the reviewer, whereas message credibility pertains to the content (Kim et al., 2023). However, for offline information, such as stickers on restaurant windows, consumers may assume that these stickers are produced by the restaurant itself, making them less likely to distinguish between source and message credibility. Therefore, this study combines source and message credibility to assess the credibility of authentic statements. Signal theory emphasizes the credibility of signals, indicating that effective signals work only when customers consider them trustworthy. In the field of green consumption, some scholars have proposed that brand authenticity influences customer brand loyalty and positive word-of-mouth (Safeer and Liu, 2023). Therefore, the credibility of authentic statements is a key concept in this study.

Therefore, this study hypothesizes that when consumers perceive green brands as authentic, they are more likely to exhibit green purchasing behavior. Recognizing a

brand's authenticity can increase trust and motivate consumers to purchase products or services that align with environmental values. Combined with self-consistency theory, we argue that perceived authenticity influences consumer buying behavior. Therefore, this study hypothesizes that the perception of authenticity mediates the impact of green marketing tools on consumer buying behavior, and proposes Hypothesis 3:

H3: Perception of authenticity mediates the impact of green marketing tools on consumer buying behavior.

H3a: Perception of authenticity mediates the impact of ecological labels on consumer buying behavior.

H3b: Perception of authenticity mediates the impact of ecological branding on consumer buying behavior.

H3c: Perception of authenticity mediates the impact of environmental advertising on consumer buying behavior.

Moderating role of reputation value

Before purchasing products or services, consumers seek reliable cues to determine quality. However, in a traditional society, production and consumption are strictly separated, and only manufacturers or marketers typically provide limited information related to product decisions. Consumers are passive recipients of information and often take decisions based on limited and biased information. With technological advancements and the advent of the digital age, consumers have access to more information and transparency, enabling them to make informed purchasing decisions. Consumers can easily obtain product prices, features, quality ratings, and feedback from other consumers through the Internet and mobile applications. Additionally, they can share their experiences and evaluations of companies through the Internet and social media, which directly impacts a company's reputation.

For companies, a good reputation helps attract more investors, consumers, and followers, and gain respect (Keh and Xie, 2009). It generates direct economic benefits, such as easy recall of and trust in the company's advertisements and its products being accepted and used. Consumers are willing to pay more for products from companies with a good reputation. Particularly, when companies enter new markets or industries, a good reputation helps them quickly capture customers' attention and promote purchases. Therefore, reputation is crucial in promoting green purchasing behavior, as it can build consumer trust and loyalty. Moreover, positive environmental actions and green products can enhance a company's reputation (Safavi and Bouzari, 2025). While international and domestic scholars have studied the role of reputation value in green consumption and purchasing behavior, research on the influence of reputation value through green marketing tools is limited. Based on this, Hypothesis 4 is proposed.

H4: Reputation value moderates the impact of green marketing tools on consumer buying behavior.

H4a: Reputation value moderates the impact of ecological labels on consumer buying behavior.

H4b: Reputation value moderates the impact of ecological branding on consumer buying behavior.

H4c: Reputation value moderates the impact of environmental advertising on consumer buying behavior.

Reputation value refers to the image, credibility, and social value of a company or individual in the market (Liu et al., 2024). It is an important manifestation of corporate

image and brand value and is closely related to the operation and development of the business. In corporate social responsibility, "greenwashing" is a pseudo-social responsibility behavior. Greenwashing companies exploit information asymmetry to selectively release environmentally beneficial information by intentionally concealing negative environmental data. In disclosing environmental behaviors, greenwashing companies often use symbolic descriptions and rarely address substantive environmental actions, leading to biased and incomplete reports. Greenwashing reduces the credibility of environmental information, undermines the quality of regular reports, and harms stakeholders' right to know, ultimately making it unhelpful for environmental protection and restoration (Keilmann and Koch, 2024).

Companies' reputations can be classified into two types based on their source: one, competence reputation, derived from the quality and performance of the company's products, and the other, quality reputation, which reflects judgments made based on the company's actions, reflecting the company's integrity and trustworthiness. Although both can buffer the negative impacts faced by companies, they differ in effectiveness and magnitude. In practice, reputation value is typically measured using customer satisfaction, trust, loyalty, and other indicators. Companies with good reputations or individuals are more likely to obtain trust and support, thereby gaining more opportunities and value in the market. Studies have shown that corporate reputation not only creates a "halo effect," whereby products from reputable companies are more likely to be chosen, but consumers are also less sensitive to the prices of products from reputable companies, and company reputation moderates the marginal utility of high-clarity product features (Burke et al., 2018). Reputation can positively influence consumer perceptions and behavioral intentions, and the significant correlation between reputation and cross-purchase intentions suggests that reputation reduces uncertainty in decision-making, thereby promoting consumer purchasing behavior (Keh and Xie, 2009). According to transfer value theory, the environmental value of green products and services creates stronger transfer value perceptions during the purchase process. In sum, the level of reputation value may influence consumers' buying behavior through green perceived value. Based on this, we propose Hypothesis 5:

H5: Reputation value influences the moderating effect of green marketing tools on green purchasing behavior through perceived green value.

H5a: Reputation value influences the moderation of ecological labels on green purchasing behavior through perceived green value.

H5b: Reputation value influences the moderating effect of ecological branding on green purchasing behavior through perceived green value.

H5c: Reputation value influences the moderating effect of environmental advertising on green purchasing behavior through perceived green value.

The theoretical model is shown in *Figure 1*.

In summary, the hypotheses of this study are as shown in the *Table 1*.

Methodology

Sample selection and data sources

The Pearl River Delta region, as one of China's most economically advanced areas, boasting a substantial consumers base with considerable purchasing power. Therefore, it has been selected as the research area for this study. Survey dimensions included sex, age, education level, monthly disposable income, and occupation. The questionnaire was

primarily administered online using platforms such as Wenjuanxing, Weibo, Xiaohongshu and WeChat Moments. The distribution and collection period of the survey was from June 10, 2023, to July 10, 2023, lasting one month. A total of 632 electronic questionnaires were collected. After screening, the following criteria were applied to exclude invalid responses: (1) very low or very high completion time, (2) same responses to all questions, (3) incomplete questionnaires (4) respondents located outside the Pearl River Delta region. Ultimately, 599 valid questionnaires were obtained, resulting in an effective response rate of 94.78%. Sample data are presented in *Table 2*. The sample comprised 56.9% female and 43.1% male respondents. The 56.5% of participants were aged between 30 and 44 years. In terms of educational background, the 81.8% held a bachelor's degree. Regarding monthly disposable income, the 37.5% within the 5000–7500 RMB bracket, 34.4% above 7500 RMB group. Occupationally, company employees represented the most frequent category, accounting for 73% of the sample.

Research tools

To help consumers understand the green marketing tools, specific shopping scenarios were created in this study. The products in each scenario were environmentally friendly, and different green marketing tools were applied to measure the variables. The questionnaire for this study incorporates seven variables based on existing literature in the field. It utilizes established measurement scales with demonstrated reliability and validity, thereby ensuring the research is theoretically well-supported. The study used a five-point Likert scale to assess the strength of the influence of green marketing tools on consumer buying behavior, where "1 = Strongly Disagree" and "5 = Strongly Agree." This study assessed scale reliability by calculating Cronbach's α coefficients using SPSS 26.0. A coefficient above 0.7 was interpreted as indicating satisfactory internal consistency for each variable. The complete questionnaire is shown in the *Appendix*.

(1) Ecological Labels: Measurement was mainly adapted from the scale of Husted et al. (2014), with appropriate modifications, based on the specific situation of green marketing tools. In this study, the Cronbach's α value for this scale was 0.799.

(2) Ecological Branding: The measurement was primarily based on the mature scale of Chen and Chang (2012), focusing on the consumer's understanding, acceptance, and trust in ecological brands. In this study, the Cronbach's α value for this scale was 0.812.

(3) Environmental Advertising: The measurement was based on the research of Davis (1994), Griffitt (1970), and Yoo et al. (2000), using their established scales and incorporating related studies. In this study, the Cronbach's α value for this scale was 0.736.

(4) Purchasing Behavior: This was measured using a scale developed by Zeithaml (1988), which included three items for purchasing behavior. In this study, the Cronbach's α value for this scale was 0.722.

(5) Perception of Authenticity: The measurement was based on the scale of Moulard et al. (2016), forming a four-item scale for perception of authenticity. In this study, the Cronbach's α value for this scale was 0.769.

(6) Green Perceived Value: The measurement was adapted from the scale of Sweeney and Soutar (2001), forming a four-item scale for green perceived value. In this study, the Cronbach's α value for this scale was 0.790.

(7) Reputation Value: The measurement was based on the scales of Chaudhuri and Holbrook (2001) and Tsai (2005), forming a five-item scale for reputation value. In this study, Cronbach's α value for this scale was 0.772.
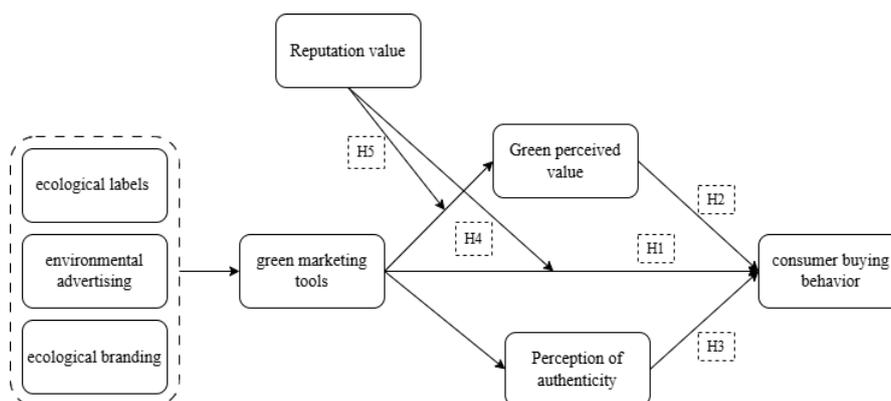
Figure 1. *Theoretical model*

Table 1. *Summary of hypotheses*

H1	There is a significant positive correlation between green marketing tools and consumer buying behavior
H1a	There is a significant positive correlation between ecological labels and consumer buying behavior
H1b	There is a significant positive correlation between ecological branding and consumer buying behavior
H1c	There is a significant positive correlation between environmental advertising and consumer buying behavior
H2	Green perceived value mediates the impact of green marketing tools on consumer buying behavior
H2a	Green perceived value mediates the impact of ecological labels on consumer buying behavior
H2b	Green perceived value mediates the impact of ecological branding on consumer buying behavior
H2c	Green perceived value mediates the impact of environmental advertising on consumer buying behavior
H3	Perception of authenticity mediates the impact of green marketing tools on consumer buying behavior
H3a	Perception of authenticity mediates the impact of ecological labels on consumer buying behavior
H3b	Perception of authenticity mediates the impact of ecological branding on consumer buying behavior
H3c	Perception of authenticity mediates the impact of environmental advertising on consumer buying behavior
H4	Reputation value moderates the impact of green marketing tools on consumer buying behavior
H4a	Reputation value moderates the impact of ecological labels on consumer buying behavior
H4b	Reputation value moderates the impact of ecological branding on consumer buying behavior
H4c	Reputation value moderates the impact of environmental advertising on consumer buying behavior
H5	Reputation value influences the moderating effect of green marketing tools on green purchasing behavior through perceived green value
H5a	Reputation value influences the moderation of ecological labels on green purchasing behavior through perceived green value
H5b	Reputation value influences the moderating effect of ecological branding on green purchasing behavior through perceived green value
H5c	Reputation value influences the moderating effect of environmental advertising on green purchasing behavior through perceived green value

Table 2. Descriptive statistics of demographic variables

Variable	Dimension	Frequency	Percentage	Mean	Standard deviation
Sex	Male	251	43.10%	1.57	0.5
	Female	331	56.90%		
Age	18–29 years	220	37.80%	1.68	0.58
	30–44 years	329	56.50%		
	45–59 years	33	5.70%		
Education level	High school/below	19	3%	2.89	0.52
	College degree	56	10%		
	Bachelor's degree	476	81.80%		
	Master's degree or above	33	5.30%		
Monthly disposable income	Below 2500 RMB	39	6.70%	2.99	0.91
	2500–5000 RMB	125	21.50%		
	5000–7500 RMB	218	37.50%		
	Above 7500 RMB	200	34.40%		
Occupation	Government employee	14	2.40%	3.05	0.83
	Public institution employee	73	12.50%		
	Company employee	425	73%		
	Individual business owner	18	3.10%		
	Student	42	7.20%		
	Other	10	1.70%		

Materials and methods

This study first employed confirmatory factor analysis to examine the construct validity and discriminant validity of each variable, utilizing SPSS software for descriptive statistics and correlation analysis. Subsequently, model fit analysis was conducted using AMOS software. Hierarchical regression analysis was employed to examine direct effects. To further validate the significance of mediating effects, the Bootstrap method proposed by Hayes (2009) was adopted to investigate the mediating role of perceived green value and perceived authenticity between green marketing tools and consumer purchasing behavior. Finally, assuming linear relationships between independent variables, dependent variables, and moderators, the moderation effect was tested using Ping's (1995) methodology. The moderation effect was calculated by multiplying the independent variable by the moderator variable (Busemeyer and Jones, 1983).

Results

Discriminant validity test

Discriminant validity is assessed by comparing the square root of the Average Variance Extracted (AVE) of each construct with the correlations within and between constructs. If the square root of the AVE of a construct is greater than the corresponding off-diagonal elements in the same row and column, then the correlation between these indicators and the construct is stronger than that with other indicators. In *Table 3*, the bold

numbers along the diagonal represent the square root of the AVE. Because all diagonal numbers are greater than the off-diagonal numbers, the discriminant validity of all constructs meets the requirements.

Table 3. *Discriminant validity test results*

Latent variable	1	2	3	4	5	6	7
Ecological labels	0.731						
Ecological branding	.439***	0.756					
Environmental advertising	.397***	.399***	0.742				
Green buying behavior	.543***	.528***	.569***	0.745			
Perception of authenticity	.499***	.413***	.609***	.567***	0.727		
Green perceived value	.479***	.520***	.321***	.587***	.270***	0.764	
Reputation value	.299***	.222***	.314***	.312***	.239***	.368***	0.775

The diagonal represents the square root of the corresponding AVE extracted from each construct

Correlation analysis of variables

To explore the relationships between the various dimensions, Pearson correlation analysis was conducted, and the results are shown in *Table 4*. Ecological labels, ecological branding, environmental advertising, green marketing tools, green buying behavior, green perceived value, perception of authenticity, and reputation value are positively correlated with each other in pairs.

Table 4. *Correlation analysis of variables*

Variable	Ecological labels	Ecological branding	Environmental advertising	Green marketing tools	Green buying behavior	Green perceived value	Perception of authenticity	Reputation value
Ecological labels	1							
Ecological branding	.382**	1						
Environmental advertising	.346**	.358**	1					
Green marketing tools	.744**	.779**	.750**	1				
Green buying behavior	.447**	.437**	.475**	.597**	1			
Green perceived value	.410**	.449**	.277**	.500**	.481**	1		
Perception of authenticity	.412**	.353**	.530**	.568**	.447**	.221**	1	
Reputation value	.249**	.192**	.268**	.310**	.257**	.311**	.215**	1

**Significance at the 0.01 level

Baseline regression

This study used multiple regression to test the main effects. This study employs multiple regression analysis to examine main effects. Data analysis was conducted using the regression analysis function within SPSS 26.0 software. The first stage assesses the influence of control variables on the dependent variable. The second stage introduces green marketing tools as additional predictor variables to evaluate their impact on the dependent variable. The third stage incorporates eco-labels, eco-brands, and environmental advertising to form the regression model. The analysis results shown in *Table 5* reveal that, after controlling for demographic variables, green marketing tools, ecological labels, ecological branding, and environmental advertising have a significant positive impact on buying behavior. Thus, H1, H1a, H1b, and H1c are confirmed.

Table 5. *Baseline regression*

Dependent variable: green buying behavior	Stage 1	Stage 2	Stage 3
Sex	0.024	0.036	0.031
Age	0.062	0.018	0.016
Education level	.106*	.074*	.074*
Monthly income	.107*	0.064	0.062
Occupation	0.04	0.015	0.013
Green marketing tools		.587***	
Ecological labels			.252***
Ecological branding			.233***
Environmental advertising			.291***
R²	0.029	0.362	0.37
△R²	0.029	0.339	0.361
F	3.442	55.914	42.086

***p < 0.001, **p < 0.01, *p < 0.05

Mediating effects test

Based on the previous hypotheses and structural models, this study proposes that both, green perceived value and perception of authenticity, mediate the effect of green marketing tools on consumer buying behavior. To test the mediating effects of green perceived value and authenticity, we used the bootstrap method supported by Hayes (2009), setting the number of bootstrap samples to 5000 and the confidence interval to 95%. If the 95% confidence interval of the indirect effect does not contain zero, it indicates the existence of a mediating effect.

(1) Independent Variable: Green Marketing Tools. *Table 6* demonstrates that as all confidence intervals do not contain zero, a mediating effect exists, and both, perception of authenticity and green perceived value, play partial mediating roles in the effect of green marketing tools on consumer green buying behavior. Therefore, H2 and H3 are supported.

(2) Independent Variable: Ecological Labels. *Table 6* reveals that as all confidence intervals do not contain zero, a mediating effect exists, and both, the perception of authenticity and green perceived value, play partial mediating roles in the effect of ecological labels on consumer green buying behavior. Thus, H2a and H3a are supported.

(3) Independent Variable: Environmental Advertising. *Table 6* also shows that as all confidence intervals do not contain zero, a mediating effect exists, and both, the perception of authenticity and green perceived value mediate the effect of environmental advertising on green buying behavior.

Table 6. *Mediating effect: green perceived value and perception of authenticity*

Effect type	Effect value	Standard error	Bootstrap 95% CI lower	Bootstrap 95% CI upper
(1) Independent variable: green marketing tools				
Total effect	0.767	0.044	0.681	0.853
Direct effect	0.466	0.083	0.309	0.632
Total indirect effect	0.301	0.047	0.21	0.394
Indirect effect 1 (mediator: green perceived value)	0.166	0.03	0.108	0.227
Indirect effect 2 (mediator: perception of authenticity)	0.135	0.04	0.062	0.22
(2) Independent variable: ecological labels	0.466	0.039	0.389	0.542
Total effect	0.199	0.055	0.092	0.31
Direct effect	0.267	0.035	0.201	0.34
Total indirect effect	0.142	0.025	0.094	0.197
Indirect effect 1 (mediator: green perceived value)	0.125	0.026	0.077	0.18
Indirect effect 2 (mediator: perception of authenticity)	0.466	0.039	0.389	0.542
(3) Independent variable: environmental advertising				
Total effect	0.46	0.037	0.389	0.532
Direct effect	0.238	0.053	0.134	0.34
Total indirect effect	0.222	0.033	0.16	0.29
Indirect effect 1 (mediator: green perceived value)		0.097	0.02	0.062
Indirect effect 2 (mediator: perception of authenticity)		0.125	0.029	0.07

Moderating effect test

(1) Moderating role of reputation value in the relationship between green marketing tools and green buying behavior

The moderating effect test was primarily conducted using hierarchical regression. First, we tested the moderating role of reputation value in the relationship between green marketing tools and green buying behavior. *Table 7* shows that, when the interaction term between green marketing tools and reputation value is included, the adjusted R^2 change is 0.018, which represents a relatively significant change. The coefficient of the interaction term between green marketing tools and reputational value is positive, indicating that reputational value plays a positive moderating role.

Figure 2 presents a moderating effect chart to further demonstrate the moderating role of reputation value. Marketing tools and Consumer buying behavior serve as independent and dependent variables, respectively, as they are measured using a 5-point Likert scale where "1 = Strongly Disagree" and "5 = Strongly Agree." Therefore, their levels are measured based on the scores on the Likert scale. Reputation value serves as the moderator variable. Following the methodology of Aiken et al. (1991), reputation value

is measured by dividing respondents into low-reputation-value (27%) and high-reputation-value (73%) groups. The simple slope test reflects the magnitude of the independent variable's impact on the dependent variable when the moderating variable takes low or high values. The simple slope analysis shows that with low reputation value, the positive impact of green marketing tools on green buying behavior is significant (β = 0.661, 95% CI = [0.566, 0.757]); with high reputation value, the positive impact of green marketing tools on green buying behavior is also significant (β = 0.922, 95% CI = [0.796, 1.048]). A comparison of these effects reveals that as the reputation value increases, the positive impact of green marketing tools on green buying behavior strengthens. Therefore, H4 is supported.

Table 7. *Moderating role of reputation value in the relationship between green marketing tools and green buying behavior*

Dependent variable: green buying behavior	Model 1	Model 2	Model 3
Sex	0.024	0.036	0.026
Age	0.062	0.015	0.017
Education level	.106*	.077*	.068*
Monthly income	.107*	0.061	0.058
Occupation	0.04	0.012	0.006
Green marketing tools		.563***	.606***
Reputation value		.079*	.107**
Green marketing x reputation			.145***
R²	0.029	0.374	0.392
△R²	0.029	0.345	0.018
F	3.442	49.016	46.117

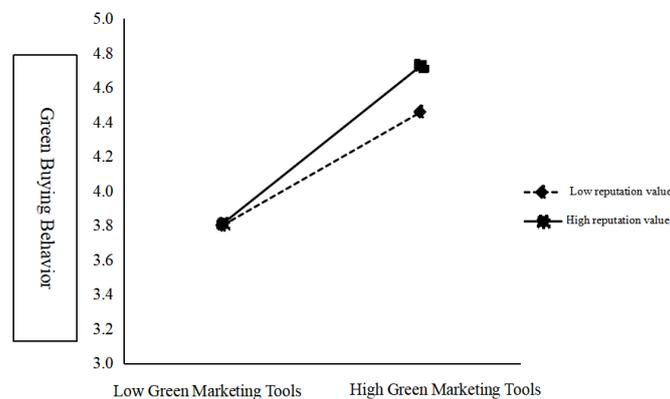***p < 0.001, **p < 0.01, *p < 0.05

Figure 2. *Moderating role of reputation value in the relationship between green marketing tools and green buying behavior*

First, moderating role of reputation value in the relationship between ecological labels and green buying behavior. When the interaction term between ecological labels and reputation value is added, the results in *Table 8* show that the adjusted R² change is 0.010,

indicating a relatively significant change. The coefficient of the interaction term between ecological labels and reputation value is positive, indicating that the moderating variable of reputation value plays a positive moderating role.

Table 8. *Moderating role of reputation value in the relationship between ecological labels and green buying behavior*

Dependent variable: green buying behavior	Model 1	Model 2	Model 3
Sex	0.024	0.053	0.049
Age	0.062	0.057	0.054
Education level	.106*	0.103	0.098
Monthly income	.107*	0.064	0.058
Occupation	0.04	0.037	0.032
Ecological labels		.406***	.435***
Reputation value		.150***	.176***
Labels x reputation			.108**
R²	0.029	0.244	0.253
△R²	0.029	0.215	0.01
F	3.442	26.399	24.28

***p < 0.001, **p < 0.01, *p < 0.05

To further illustrate the moderating effect of reputation value on the relationship between ecological labels and green buying behavior, a moderating effect chart is shown in *Figure 3*. The simple slope test shows the magnitude of the independent variable's impact on the dependent variable when the moderating variable takes low or high values. The simple slope analysis indicates that with low reputation value, the positive impact of ecological labels on green buying behavior is significant ($\beta = 0.386$, 95% CI = [0.303, 0.469]); with high reputation value, the positive impact of ecological labels on green buying behavior is also significant ($\beta = 0.531$, 95% CI = [0.423, 0.638]). A comparison of these effects reveals that as the reputation value increases, the positive impact of ecological labels on green buying behavior strengthens. Therefore, H4a is supported.
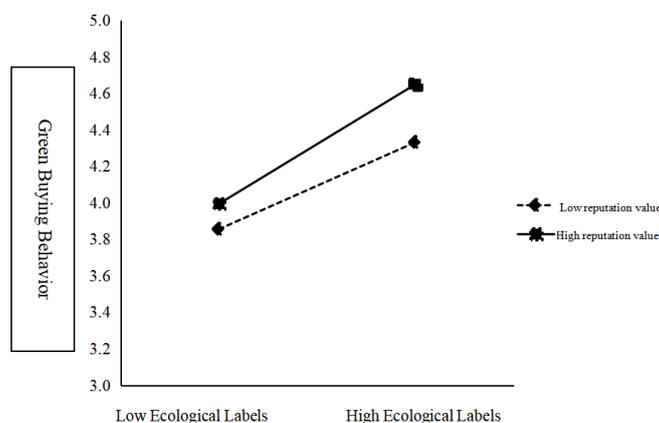

Figure 3. *Moderating role of reputation value in the relationship between ecological labels and green buying behavior*

Second, moderating role of reputation value in the relationship between ecological branding and green buying behavior. *Table 9* shows that when the interaction term between ecological branding and reputation value is added, the adjusted R^2 change is 0.008, indicating a relatively significant change. The coefficient for the interaction term between ecological branding and reputation value is positive, indicating that the moderating variable, reputation value, plays a positive moderating role.

***Table 9.** Moderating role of reputation value in the relationship between ecological branding and green buying behavior*

Dependent variable: green buying behavior	Model 1	Model 2	Model 3
Sex	0.024	0.052	0.046
Age	0.062	0.036	0.04
Education level	.106*	.094*	.089*
Monthly income	.107*	.084*	.083*
Occupation	0.04	0.022	0.023
Ecological branding		.399***	.427***
Reputation value		.175***	.188***
Brand x reputation			.098*
R^2	0.029	0.243	0.252
$\triangle R^2$	0.029	0.214	0.008
F	3.442	26.34	24.074

***p < 0.001, **p < 0.01, *p < 0.05

To further illustrate the moderating effect of reputation value on the relationship between ecological branding and green buying behavior, a moderating effect chart is presented in *Figure 4*. The simple slope analysis shows that with low reputation value, the positive impact of ecological branding on green buying behavior is significant ($\beta = 0.334$, 95% CI = [0.259, 0.409]); with high reputation value, the positive impact of ecological branding on green buying behavior is also significant ($\beta = 0.468$, 95% CI = [0.369, 0.567]). A comparison of these effects reveals that as the reputation value increases, the positive impact of ecological branding on green buying behavior strengthens. Therefore, H4b is supported.
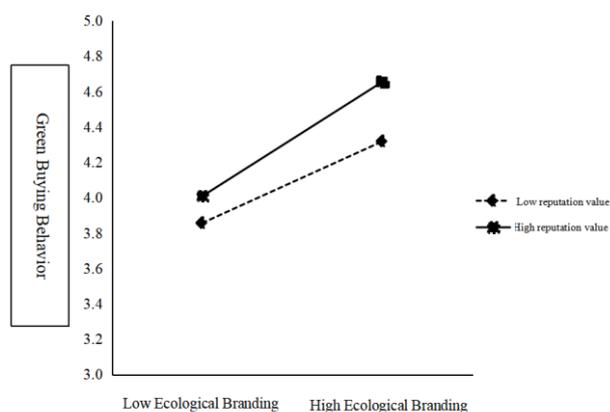

***Figure 4.** Moderating role of reputation value in the relationship between ecological branding and green buying behavior*

Third, moderating role of reputation value in the relationship between environmental advertising and green buying behavior. *Table 10* shows that when the interaction term between environmental advertising and reputation value is added, the adjusted R^2 change is 0.012, representing a relatively significant change. The coefficient of the interaction term between environmental advertising and reputation value is positive, indicating that the moderating variable of reputation value plays a positive moderating role.

Table 10. *Moderating role of reputation value in the relationship between environmental advertising and green buying behavior*

Dependent variable: green buying behavior	Model 1	Model 2	Model 3
Sex	0.024	-0.012	-0.02
Age	0.062	-0.007	-0.005
Education level	.106*	.079*	0.072
Monthly income	.107*	0.071	0.076
Occupation	0.04	0	-0.007
Environmental advertising		.429***	.470***
Reputation value		.139***	.148***
Advertising x reputation			.119**
R^2	0.029	0.257	0.269
$\triangle R^2$	0.029	0.228	0.012
F	3.442	28.383	26.386

***p < 0.001, **p < 0.01, *p < 0.05

To further illustrate the moderating effect of reputation value on the relationship between environmental advertising and green buying behavior, a moderating effect chart is presented in *Figure 5*. The simple slope analysis shows that with low reputation value, environmental advertising exerts a significant positive impact on green buying behavior ($\beta = 0.373$, 95% CI = [0.293, 0.453]); with high reputation value, the positive impact of environmental advertising on green buying behavior is also significant ($\beta = 0.555$, 95% CI = [0.444, 0.666]). A comparison of these effects reveals that increasing reputation value strengthens the positive impact of environmental advertising on green buying behavior. Therefore, H4c is supported.
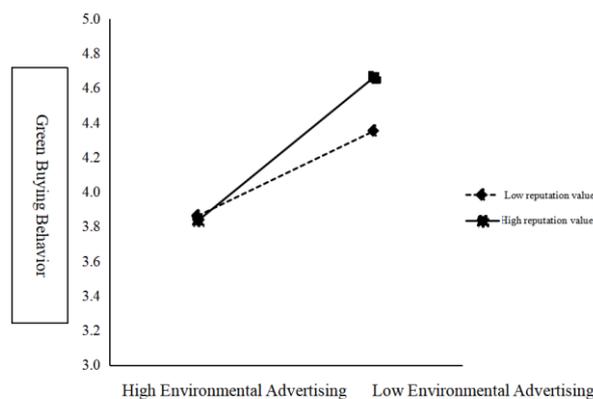

Figure 5. *Moderating role of reputation value in the relationship between environmental advertising and green buying behavior*

(2) The moderating role of reputation value in the relationship between green marketing tools and perceived green value.

The moderating effect test is primarily conducted using hierarchical regression. First, we test the moderating role of reputation value in the relationship between green marketing tools and green perceived value, as shown in *Table 11*. When the interaction term between green marketing tools and reputation value is added, the adjusted R^2 change is 0.034, and the coefficient for the interaction term is significant. Additionally, the direction of the interaction term and main effect are positive, indicating that reputation value has a positive moderating effect on the relationship between green marketing tools and perceived green value.

Table 11. *Moderating role of reputation value in the relationship between green marketing tools and green perceived value*

Dependent variable: green perceived value	Model 1	Model 2	Model 3
Sex	-0.058	-0.047	-0.061
Age	0.022	-0.021	-0.018
Education level	0.015	-0.006	-0.019
Monthly income	.124**	.080*	.077*
Occupation	0.077	0.05	0.041
Green marketing tools		.441***	.501***
Reputation value		.169***	.208***
Green Marketing x reputation			.202***
R^2	0.02	0.285	0.319
$\triangle R^2$	0.02	0.265	0.034
F	2.309	32.704	33.559

***p < 0.001, **p < 0.01, *p < 0.05

The simple slope analysis demonstrates the magnitude of the independent variable's impact on the dependent variable when the moderating variable takes low and high values. *Figure 6* shows that with low reputation value, the positive impact of green marketing tools on green perceived value is significant ($\beta = 0.575$, 95% CI = [0.453, 0.698]); with high reputation value, the positive impact of green marketing tools on green perceived value is also significant ($\beta = 1.015$, 95% CI = [0.853, 1.178]). A comparison of these effects reveals that as reputation value increases, the positive impact of green marketing tools on green perceived value strengthens.

Table 12 indicates that reputation value significantly moderates the mediating effect of green perceived value. When the reputation value is low, the mediating effect of green marketing tools on green buying behavior through green perceived value is significant; when the reputation value is high, the mediating effect is also significant. A comparison of these effects shows that as reputation value increases, the mediating effect of green marketing tools on green buying behavior through green perceived value strengthens. Therefore, H5 is supported.

Table 13 shows that when the interaction term between ecological labels and reputation value is added, the adjusted R^2 change is 0.016, and the coefficient for the interaction term is significant. Additionally, the direction of the interaction term and the main effect is both positive, indicating that reputation value positively moderates the relationship between ecological labels and green perceived value.
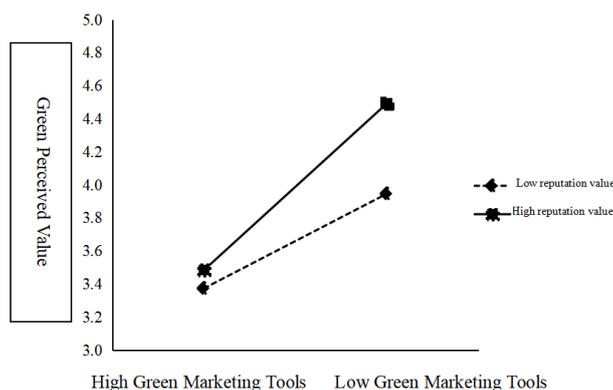
Figure 6. *Moderating role of reputation value in the relationship between green marketing tools and perceived green value*

Table 12. *Moderated mediation effect low and high group 1*

Group	Effect value	Standard error	95%CI	
			Lower	Upper
M-SD	0.122	0.028	0.075	0.181
M	0.169	0.031	0.112	0.232
M + SD	0.215	0.04	0.14	0.297
Moderated mediation index	Index	Standard error	Lower	Upper
	0.068	0.023	0.024	0.113

Table 13. *Moderating role of reputation value in the relationship between ecological labels and green perceived value*

Dependent variable: green perceived value	Model 1	Model 2	Model 3
Sex	-0.058	-0.032	-0.036
Age	0.022	0.013	0.009
Education level	0.015	0.013	0.007
Monthly income	.124**	.081*	0.073
Occupation	0.077	0.071	0.063
Ecological labels		.349***	.388***
Reputation value		.218***	.251***
Labels x reputation			.139**
R²	0.02	0.224	0.24
△R²	0.02	0.204	0.016
F	2.309	23.647	22.61

***p < 0.001, **p < 0.01, *p < 0.05

Figure 7 illustrates this moderating effect. The simple slope analysis shows that with low reputation value, the positive impact of ecological labels on green perceived value is significant ($\beta = 0.382$, 95% CI = [-0.280, 0.483]); with high reputation value, the positive

impact is also significant ($\beta = 0.609$, 95% CI = [0.477, 0.741]). A comparison of these effects shows that as reputation value increases, the moderating effect of ecological labels on green perceived value and their subsequent influence on green buying behavior strengthens.
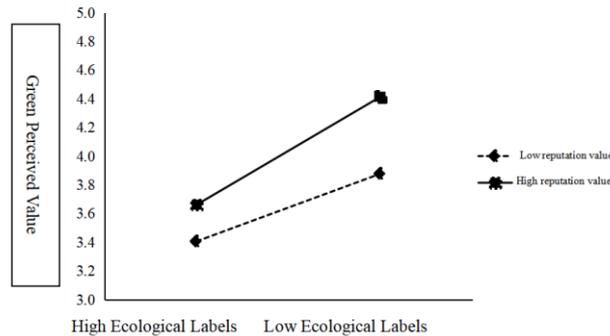

Figure 7. Moderating role of reputation value in the relationship between ecological labels and perceived green value

Table 14 indicates that reputation value significantly moderates the mediating effect on green perceived value. When the reputation value is low, the mediating effect of ecological labels on green buying behavior through green perceived value is significant; when the reputation value is high, the mediating effect is also significant. A comparison of these effects shows that as reputation value increases, the mediating effect of ecological labels on green buying behavior through green perceived value strengthens. Therefore, H5a is supported.

Table 14. Moderated mediation effect low and high group 2

Group	Effect value	Standard error	95%CI	
			Lower	Upper
M-SD	.105	.025	.062	.160
M	.136	.025	.091	.188
M + SD	.168	.032	.108	.233
Moderated mediation index	Index	Standard error	Lower	Upper
	.046	.021	.001	.083

Table 15 shows that reputation value does not significantly moderate the relationship between ecological branding and green perceived value. Thus, H5b is not supported.

Table 16 shows that when the interaction term between environmental advertising and reputation value is added, the adjusted R^2 change is 0.080, and the coefficient for the interaction term is significant. Additionally, the direction of the interaction term and the main effect is both positive, indicating that reputation value positively moderates the relationship between environmental advertising and green perceived value.

Figure 8 illustrates this effect. The simple slope analysis shows that with low reputation value, the positive impact of environmental advertising on green perceived value is not significant ($\beta = 0.092$, 95% CI = [-0.008, 0.192]); with high reputation value, the positive impact of environmental advertising on green perceived value is significant ($\beta = 0.660$,

95% CI = [0.522, 0.798]). A comparison of these effects shows that as reputation value increases, the effect of environmental advertising on green perceived value changes from non-significant to significantly positive, and the impact value increases.

Table 17 indicates that reputation value significantly moderates the mediating effect on green perceived value. With low reputation value, the mediating effect of environmental advertising on green buying behavior through green perceived value is not significant; when reputation value is high, the mediating effect is significant. Additionally, a comparison of these effects reveals that as reputation value increases, the mediating effect of environmental advertising on green buying behavior through green perceived value changes from non-significant to significant, and the effect size increases. Therefore, H5c is supported.

Table 15. *Moderating role of reputation value in the relationship between ecological branding and green perceived value*

Model	Dependent variable: green perceived value		
	Model 1	Model 2	Model 3
Sex	-0.058	-0.029	-0.031
Age	0.022	-0.007	-0.006
Education level	0.015	0.003	0.002
Monthly income	.124**	.097*	.097*
Occupation	0.077	0.056	0.057
Ecological branding		.400***	.408***
Reputation value		.228***	.232***
Brand x reputation			0.027
R^2	0.02	0.264	0.264
$\triangle R^2$	0.02	0.244	0.001
F	2.309	29.391	25.757

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Table 16. *Moderating role of reputation value in the relationship between environmental advertising and green perceived value*

Model	Dependent variable: green perceived value		
	Model 1	Model 2	Model 3
Sex	-.058	-.073	-.095*
Age	.022	-.022	-.018
Education level	.015	.004	-.011
Monthly income	.124**	.094*	.107**
Occupation	.077	.049	.030
Environmental advertising		.210***	.313***
Reputation value		.249***	.272***
Advertising x reputation			.306***
R^2	.020	.151	.230
$\triangle R^2$	.020	.131	.080
F	2.309	14.544	21.441

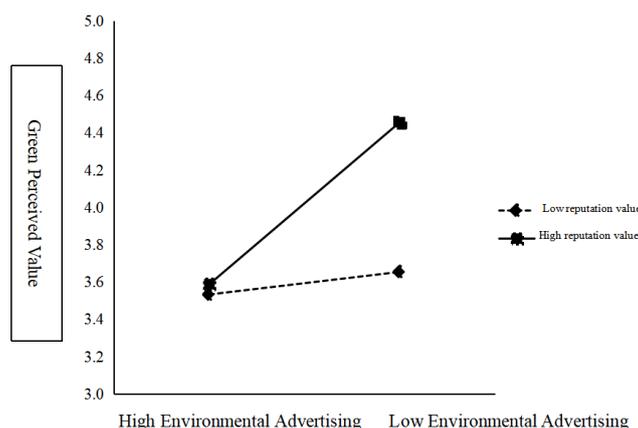***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Figure 8. *Moderating role of reputation value in the relationship between environmental advertising and perceived green value*

Table 17. *Moderated mediation effect low and high group 4*

Group	Effect value	Standard error	95%CI	
			Lower	Upper
M-SD	.027	.016	-.005	.060
M	.111	.021	.070	.154
M + SD	.194	.034	.129	.262
Moderated mediation index	Index	Standard error	Lower	Upper
	.121	.023	.078	.168

Discussion

Main findings

This study examines the influence of green marketing tools (eco-labels, eco-brands, and eco-advertising) on consumer purchasing behavior. It reveals that perceived authenticity and perceived green value partially mediate this relationship, while reputation value moderates the association between green marketing tools and perceived green value, as well as the relationship between green marketing tools and purchasing behavior. The consumers primarily involved are those in the Pearl River Delta region. The study concludes with the following findings:

First, green marketing tools exert a significant positive influence on consumer purchasing behavior. Research indicates that eco-labels, eco-brands, and eco-advertising all positively impact purchasing behavior, with eco-advertising demonstrating a more pronounced effect than eco-labels and eco-brands. This conclusion is supported by the findings of the study by Chen and Chang (2012), which was based on a sample of Taiwanese consumers, found that eco-brands, environmental advertisements, and eco-labels all exert a significant positive influence on green purchase intention, confirming the effectiveness of these three tools.

Second, perceived green value positively influences consumers' green purchasing behavior. Simultaneously, in the relationship between green marketing tools (independent variable) and consumer purchasing behavior (dependent variable), perceived green value

plays a partial mediating role. That is, green purchasing behavior can be achieved by reinforcing the perceived value of green products. Taking eco-friendly advertising as an example, Shieh et al. (2018) demonstrated that advertisements can effectively highlight product attributes, attract consumer interest, and foster consumer agreement with the benefits presented in the ad. Eco-friendly advertisements emphasize the green characteristics of products, enabling consumers to effectively identify with the advertising claims and achieve marketing objectives. This study also provides strong confirmation of these findings. Similarly, eco-labels and eco-brands produce the same effects.

Third, perceived authenticity positively influences consumers' green purchasing behavior. Simultaneously, within the relationship between green marketing tools and consumer purchasing behavior, perceived authenticity plays a partial mediating role. Perceived authenticity is intrinsically linked to consumers' actual purchasing behavior, particularly in a social environment saturated with environmental messages and rampant greenwashing. Driven by the rapid dissemination of information through the internet and big data, higher standards for the green authenticity of products are now demanded by consumers than ever before. Product eco-labels, eco-brands, and eco-advertising campaigns enable consumers to intuitively perceive a product's green value, which in turn enhances their perceived authenticity. Consumers with higher authenticity perceptions develop greater purchasing confidence and more determined purchasing behavior once they confirm a green product aligns with their values and consumption needs. Consequently, green messages about the product are more readily accepted, which in turn results in more positive evaluations of the green product.

Fourth, reputation value moderates the relationship between green marketing tools and purchasing behavior. Specifically, for enterprises or brands with higher reputation value, green marketing tools positively influence consumer purchasing behavior. Moreover, as reputation value increases, the positive impact of green marketing tools on purchasing behavior also intensifies. Observing the moderation effect diagrams for eco-labels, eco-brands, and eco-advertising reveals that eco-advertising exhibits the most pronounced statistically significant moderating effect, followed by eco-labels and eco-brands, which also demonstrate significant moderation. Consumers typically consider a company's reputation before making purchasing decisions, particularly in the realm of green consumption. Companies with strong reputations are perceived as more trustworthy, making consumers more likely to choose their products or services.

Fifth, reputation value moderates the relationship between green marketing tools and perceived green value. Specifically, for enterprises or brands with high reputation value, green marketing tools have a stronger positive impact on green perceived value. Comparative influence values reveal that as reputation value increases, the positive impact of green marketing tools on green perception intensifies. Eco-labels and eco-advertising align with these findings throughout the study. However, empirical research on eco-brands indicates that reputation value does not significantly moderate the relationship between eco-brands and perceived green value. This discrepancy may stem from limitations in research methodologies or analytical techniques—limitations that may fail to fully capture the true moderating effects. Overall, for companies with high reputational value, green marketing tools like eco-labels enable consumers to perceive that the company is practicing eco-friendly principles—whether in green product manufacturing or market communications—and genuinely contributing to environmental protection. Consumers believe that purchasing these products also plays a role in improving environmental quality.

Theoretical contributions

The theoretical contributions of this study are as follows. The main contribution of this study is the integration of ecological labels, branding, and environmental advertising as independent variables into green marketing tools, a rare perspective in domestic and international research. By studying the impact of green marketing tools on consumer buying behavior, this study helps us understand consumer attitudes and behaviors toward sustainable development and green products. It also helps businesses assess the effectiveness of green marketing tools in influencing consumers' buying behavior. This study reveals the differences in consumer attitudes and behaviors toward green marketing. By studying the relationship between various demographic and psychological factors and consumers' willingness to buy green products, it helps businesses better understand their target consumer groups and develop more precise green marketing strategies. This study provides a deeper understanding of environmentally friendly consumption behaviors in academic circles and lays the foundation for research in related fields. These findings provide new insights and theoretical support for areas, such as sustainable development, marketing, and consumer behavior.

Managerial implications

First, enterprises are advised to enhance the authenticity of their promotional materials and strengthen consumer trust. Companies should adhere to and comply with international environmental standards and regulations. They must ensure products meet eco-friendly criteria throughout their entire lifecycle without causing negative environmental impacts, ultimately creating genuinely green products. Building on this foundation, enterprises should actively promote the advantages and value of green products. Given that eco-advertising exerts a more pronounced impact on purchasing behavior than eco-labels and eco-brands, enterprises should prioritize eco-advertising in their marketing campaigns. Specifically, ads should highlight product green attributes (e.g., energy efficiency, recycled materials) to enhance consumers' perceived green value and authenticity. Enterprises should consistently maintain honesty and transparency, refraining from exaggerating or misleading consumers about the environmental properties of their products or services. They must ensure advertised green claims are truthful and credible, backed by appropriate supporting evidence. If a company discovers issues or errors related to its green products, it should promptly implement corrective measures and publicly apologize and explain to consumers. Timely responses and resolutions prevent trust erosion while demonstrating the company's genuine commitment to green values, thereby strengthening consumer confidence.

Second, companies should establish a strong green brand image and reputation to pursue green marketing. To avoid greenwashing, businesses must maintain honesty and transparency in green marketing practices; conduct comprehensive environmental assessments; obtain independent third-party certification and verification; implement transparent supply chain management; continuously improve environmental performance; and promptly address environmental-related issues. These measures help build credible environmental credentials and meet consumers' demand for sustainable products. Notably, research indicates that reputation value effectively moderates the relationship between green marketing tools and consumer purchasing behavior. Thus, proactive management of brand reputation—including social media monitoring, responding to consumer reviews, and engaging in green discourse—strengthens corporate

green credentials, thereby enhancing the moderating effect of reputation on green purchasing decisions. Prior to launching marketing initiatives, thorough research is essential to gauge existing consumer awareness of green marketing tools and their level of environmental concern. In addition, given that green products often carry a premium price compared to conventional alternatives, persuading consumers to opt for them requires careful deliberation by businesses. During green marketing initiatives, companies should position the environmental attributes of their products or services as key selling points, clearly communicating their positive environmental impact. Companies should highlight eco-friendly features such as energy efficiency, waste reduction, and use of recycled materials to capture consumer attention and interest. Through this cyclical process, companies can shape their brand image and enhance their reputation.

Furthermore, governments should establish authoritative and credible certification authorities, while consumers should actively engage in environmental protection initiatives. By establishing and managing eco-labeling systems, governments can encourage businesses to adopt more environmentally sustainable production practices. Simultaneously, such eco-labeling systems assist consumers in making more sustainable purchasing decisions. Consumers can more easily identify products with the minimal environmental impact, enabling them to practice responsible consumption. Many countries worldwide have already developed comprehensive eco-labeling and eco-brand certification systems. China is actively aligning with these global efforts and committed to establishing a green labeling system tailored to its national context. To effectively guide green consumption, two key measures merit attention. First, environmental education and public awareness campaigns are essential to enhance consumers' understanding of environmental concepts, thereby enabling them to recognize the positive role of green marketing tools and the green messages they convey, guiding consumers to pay attention to relevant labels and make better purchasing decisions, thereby embedding green consumption awareness. Second, incentives such as carbon benefits and carbon credits should be introduced to promote and advocate for environmental protection concepts, enabling a more low-carbon and green lifestyle. These efforts will contribute to the advancement of sustainable development and environmental protection.

Limitations and future research

This study has some limitations. First, it used a questionnaire survey that typically relied on voluntary responses from participants, which may not represent the entire target population. Second, it used a standardized online questionnaire, which made it difficult to obtain detailed views, attitudes, and motivations from the participants. This limits a deeper understanding of the issues at hand. Third, the sample size of the study was relatively small and only covered a short period, which may limit the full understanding of the events or phenomena. Moreover, some moderating variables may not have been accounted for, which could have masked potential moderating effects. Further, the methods or techniques used in this study may not be capable of fully capturing the true moderating effects of the variables. In studying how green marketing tools affect consumer buying behavior, the choice of variables is crucial. The variables that can be considered include consumers' environmental awareness, knowledge level, personal values, social influences, and product characteristics. These variables can help researchers understand consumers' motivations, perceptions, and behaviors regarding the purchase of green products. Future studies could enhance the depth and breadth of this

research by incorporating more relevant variables, providing a more comprehensive understanding of how green marketing tools influence consumer buying behavior.

Conclusion

The main conclusions of this study are as follows. Green marketing tools have a significant positive impact on consumer buying behavior. Ecological labels, branding, and environmental advertising help consumers easily perceive and become aware of the attributes and characteristics of green products, thereby guiding them to purchase environmentally friendly products.

The perception of authenticity positively influences consumers' green buying behavior and plays a partial mediating role in the relationship between the independent (green marketing tools) and dependent (consumer buying behavior) variable. Green perceived value positively influences consumer green buying behavior and plays a partial mediating role in the relationship between the independent (green marketing tools) and dependent (consumer buying behavior) variable. In sum, green buying behavior can be achieved by enhancing the perceived value of green products. Reputation value moderates the relationship between green marketing tools and buying behavior. For companies or brands with higher reputation value, green marketing tools positively influence consumer buying behavior; as reputation value increases, the positive influence of green marketing tools on buying behavior strengthens. Reputation value moderates the relationship between green marketing tools and green perceived value. Green marketing tools enhance the perception of authenticity among companies or brands with high reputation values. For companies or brands with lower reputation values, green marketing tools positively influence the perception of authenticity. A comparison of these effects shows that as reputation value increases, the positive influence of green marketing tools on green perceived value strengthens. Both, ecological labels and environmental advertising, align with these findings. However, reputation value does not significantly moderate the relationship between ecological branding and green perceived value.

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APPENDIX

Questionnaire on the impact mechanism of green marketing tools on buying behavior

Dear Sir/Madam,

This is a questionnaire about the impact of green marketing tools on consumers' purchasing behavior. Please select the appropriate options according to the questions and your actual situation. There are no right or wrong answers, and your first judgment on each question is the best answer. Thank you very much for participating in this survey in your busy schedule. We guarantee that the data collected through this questionnaire will only be used for academic research. Thank you for your kind help, and we sincerely wish you health and happiness!

### Part one: Introduction to relevant terms

(1) Ecolabel: An ecolabel indicates that a green product has undergone strict inspection by relevant authorities and meets national environmental standards; it is not arbitrarily fabricated by enterprises. Products with ecolabels are healthier and safer.

(2) Ecological Brand: A general term for brands established by faithfully practicing, advocating, and promoting the green concept of "health and peace". It refers to green and sustainable development brands.

(3) Environmental Advertising: Advertising with environmental protection as the theme, which conveys information through various media forms or methods to promote the improvement of environmental awareness and changes in environmental behavior.
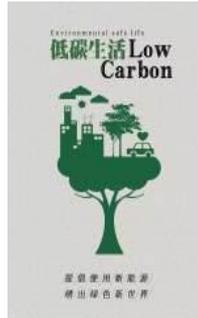
Part two: Measurement of relevant research variables

Survey Scenario 1: Suppose you are going to buy dish soap in a supermarket. It is food-grade dish soap certified with China's Green Product Certification Label. This label indicates that the product not only meets quality standards but also complies with specific environmental protection requirements during production, use, and disposal. Compared with similar products, it has environmental advantages such as low toxicity, low harm, and resource conservation.

1. Under the above shopping scenario and based on your actual feelings, please answer the following questions. [Matrix Scale Question] *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. I am familiar with the label of the product in the above example	1	2	3	4	5
2. The label certification of the above product is authoritative and credible	1	2	3	4	5
3. Products with green product certification must be green products	1	2	3	4	5
4. When buying green products in the future, I will carefully check whether the product packaging has the above-mentioned ecolabel	1	2	3	4	5
5. If a third-party organization can provide the above-mentioned ecolabel for green products, I will feel assured to buy them	1	2	3	4	5

Survey Scenario 2: Suppose you are going to buy rice in a supermarket or mall, and there is a green brand - Beidahuang rice on the shelf. When you are buying the product, you see that it is marked as "China's No.1 Organic Brand".

2. Under the above shopping scenario and based on your actual feelings, please answer the following questions. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6. I understand that this brand is an ecological brand in the above example	1	2	3	4	5
7. Ecological brands can give me good guidance to help me better choose green products	1	2	3	4	5
8. I think the brand commitment of ecological brands is worthy of customers' trust	1	2	3	4	5
9. The information presented by ecological brands is reliable	1	2	3	4	5
10. The credibility of ecological brand certification is very high	1	2	3	4	5

Survey Scenario 3: Suppose you are choosing laundry detergent in a supermarket. Near this phosphorus-free laundry detergent, there is a string of environmental advertising slogans: If you buy this phosphorus-free laundry detergent, it will reduce the discharge of phosphorus-containing sewage, not pollute the environment, and be beneficial to water body protection. In addition, your purchase behavior of this phosphorus-free laundry detergent will also encourage more producers to produce more green products for consumers to choose from. Finally, a green consumption model will be formed: producers carry out green production, and consumers conduct green consumption to jointly create a harmonious living environment.

3. Under the above shopping scenario and based on your actual feelings, please answer the following questions. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
11. This environmental advertisement can attract my attention	1	2	3	4	5
12. This environmental advertisement can convey environmental protection information	1	2	3	4	5
13. Enterprises doing environmental advertising means they are willing to make efforts for environmental protection	1	2	3	4	5
14. Compared with phosphorus-containing laundry detergent, I am more willing to buy phosphorus-free laundry detergent at this moment	1	2	3	4	5
15. The environmental protection work done by enterprises for their products is trustworthy	1	2	3	4	5

4. After reading the above shopping scenarios, please choose according to your actual situation. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16. I will consider buying this green product	1	2	3	4	5
17. I am willing to buy green products	1	2	3	4	5
18. I will recommend others to buy this green product	1	2	3	4	5

5. After reading the above shopping scenarios, please choose according to your actual situation. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
19. I feel that enterprises are sincere when conducting green marketing	1	2	3	4	5
20. I feel that enterprises are passionate about shaping green products	1	2	3	4	5
21. I feel that enterprises are making every effort to carry out green marketing	1	2	3	4	5
22. I feel that enterprises are sincerely contributing to the environment through green marketing tools	1	2	3	4	5

6.   Please choose according to your own situation. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
23. Using green products helps improve the ecological environment	1	2	3	4	5
24. Using green products will reduce environmental pollution	1	2	3	4	5
25. Using green products is beneficial to the sustainable development of society	1	2	3	4	5
26. Using green products helps improve environmental awareness	1	2	3	4	5

7.   Please choose according to your own situation. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
27. Buying and using green products can create a good impression on others	1	2	3	4	5
28. Buying and using green products can make others have a new understanding of oneself	1	2	3	4	5
29. Buying and using green products helps improve one's favorable image in society	1	2	3	4	5
30. Buying and using green products helps establish good social relationships with others	1	2	3	4	5

8.   Please choose according to your own situation. [Matrix Scale Question] *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
31. I am satisfied with the quality of green products	1	2	3	4	5
32. I think the price of green products is reasonable	1	2	3	4	5
33. I am satisfied with the image and reputation of the enterprise	1	2	3	4	5

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
34. My repurchase rate of this green brand is relatively high	1	2	3	4	5
35. I am willing to try new products launched by this green brand	1	2	3	4	5

Part three: Basic information survey

9. Your gender: [Single-choice Question] *

☐Male ☐Female

10. Your age group: [Single-choice Question] *

☐18~29 years old
☐30~44 years old
☐45~59 years old
☐60 years old and above

11. Your educational background: [Single-choice Question] *

☐High school/vocational or below
☐College degree
☐Bachelor's degree
☐Master's degree or above

12. Your monthly disposable income: [Single-choice Question] *

☐Below 2500 yuan
☐2500~5000 yuan
☐5000~7500 yuan
☐Above 7500 yuan

13. Your occupation type: [Single-choice Question] *

☐Government agency staff
☐Institution staff
☐Enterprise employee
☐Individual business owner
☐Student
☐Others

Finally, thank you again for your participation. Wish you good health and all the best!