Green Packaging Material Preferences among Young Chinese Consumers: A Comparative Study of Recycled versus Virgin Papers and Bio-based versus Synthetic Materials

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Abstract

Increasing the use of recycled paper instead of virgin wood pulp paper and plastic in green packaging has the potential to alleviate the current pressure on wood supplies, reduce the carbon footprint of consumer goods, and improve the sustainable development of the forest industry. Exploring how consumers' environmental, carbon, and health concerns influence their preferences for different layers of green paper products can provide theoretical guidance for enhancing resource utilization and promoting sustainable development of the forest products market. This study aimed to identify consumer perceptions of green attributes, assess the impact of environmental and carbon concerns on green product preferences, and examine the significance of paper materials in various packaging layers. Utilizing conjoint, factor, and regression analyses, we investigated young Chinese consumers' green packaging preferences, focusing on their prioritization of packaging types and the choice between recycled and regular paper over fossil-based materials. The results indicate that consumers prefer green attributes in food packaging, such as recycled paper, paper-based substitutes for plastic, and corn fiber substitutes for nylon. However, recycled paper and virgin paper have no significant difference in consumer utility. For different layers, the preference for recycled paper was slightly higher for outer packaging than for inner packaging and packaging in direct contact with food. Cognitive and affective attitudes toward recycled paper material have a positive impact on both recycled paper and paper-based plastic substitutes, while environmental concern directly influences the choice of recycled paper, and carbon concern influences consumer preferences for paper-based plastic substitutes.

The production of paper and packaging materials has a long tradition of using wood (Liang et al. 2023). The pulp and paper industry is one of largest wood-consumption sectors worldwide (Jochem et al. 2021, Järvinen et al. 2022), requiring significant amounts of cellulose fiber. Approximately 196 million metric tons of virgin pulp were produced worldwide for paper production in 2018 (Jochem et al. 2021). However, forested lands have a finite capacity to provide these resources (Hubbe 2014). To address potential future pressure on forest resources, irrespective of whether they are viewed from technological or market perspectives, it is important to investigate methods for increasing the application of recycled paper products.

The paper industry is a carbon-intensive sector around the world (Johansson et al. 2021). Among all forestry products, if excluding recycling considerations, virgin pulp-based products are generally discarded and incinerated after one utilization. Under this assumption, when considering the product's life cycle, paper-based products have a significantly shorter

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carbon-sequestration duration compared to other timber products such as furniture or wooden architectural structures. For long-lifespan or recyclable paper products, carbon storage is an indispensable component of the carbon footprint of paper products (Liang et al. 2023). Therefore, extending the life cycle of paper-based products during production and consumption has significant implications for conserving forest resources and mitigating climate change.

Previously, the exploration of paper-based green packaging has often treated it as a holistic concept. However, upon deconstructing the notion of green packaging, it becomes evident that it encompasses distinct paper-based materials (virgin paper vs. recycled paper) and multiple packaging layers, which constitute a multifaceted construct. For instance, package attributes are distinguished by different layers: outer packaging (sales package), inner packaging (small packages assembled into sales units), and food-grade packaging (which does not release hazardous chemicals when in contact with food). The direct contact between food and packaging is an important factor that influences consumer behavior (Van Bossuyt et al. 2016).

Since consumer purchase choices always factor in multiple attributes, it is necessary for consumers to consider various product attributes (Rokka and Uusitalo 2008), such as environmental friendliness and health and safety, when evaluating green packaging. Consumers consider both the environmental and health/safety attributes of packaging when making consumption decisions (Alamri et al. 2021), as well as product purchase intentions (Xu et al. 2019). Several studies have investigated the migration of hazardous substances from food packaging to contents (Poças and Hogg 2006, Suciu et al. 2013, Alamri et al. 2021). However, research on consumer trade-offs between the environmentally friendly and health/safety attributes of recycled paper packaging is lacking.

To partially address the research gaps, this study aimed to explore several aspects of green packaging from a consumer multi-attribute trade-off perspective, using a micro-quantitative analysis approach. First, this study examined green packaging as a simplified and straightforward concept to distinguish consumers' preferences for renewable, low-carbon-footprint, and human health attributes. Second, this study investigated the importance of the green attributes of paper-based packaging alternatives for outer, inner, and food-grade packaging, as perceived by consumers. In particular, the non-food-contact properties of recycled paper were emphasized (since in some countries, recycled paper is still prohibited as a packaging material in direct contact with food). These properties have not been differentiated in previous investigations. Also, we aimed to investigate the personal internal factors and environmental and carbon concern factors that impact the trade-off between plastic and paper packaging. Additionally, we sought to determine if consumers were willing to pay a premium for ecologically friendly packaging when given the choice.

Literature Review

Green packaging

Previous nontechnical research on green packaging can be broadly categorized into three main categories (Figure 1). The microlevel studies mainly organized the principles of green packaging by regulating materials and design, thereby enhancing standards and production to achieve sustainable benefits (Siracusa et al. 2008, Svanes et al. 2010, Zhou 2014). The macrolevel perspective showed how the design of policies and regulations,

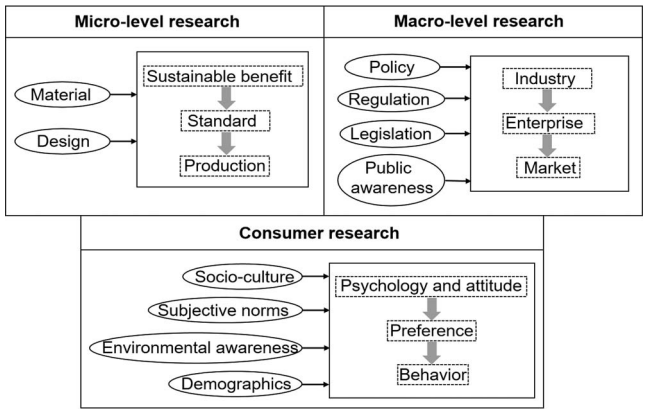

Figure 1.—Outlines of previous nontechnical research on green packaging.

legislation, and the promotion of public awareness can contribute to the development of the industry and the market (Yu 2011, Zhang and Zhao 2012, Molina-Besch and Pålsson 2015, Chen et al. 2017, Meherishi et al. 2019, Maziriri 2020, Sun and Li 2021, Lin et al. 2022). The consumer perspective in green packaging research elucidated how socio-cultural, subjective norms, environmental awareness, and demographic elements influence consumer psychology and attitudes, and thus preferences and behaviors (Chan 2001, Chan and Lau 2002, Qing and Li 2005, Young et al. 2010, Scott and Vigar-Ellis 2014, Martinho et al. 2015, Hao et al. 2019, Núñez-Cacho et al. 2020, Cammarelle et al. 2021, Herrmann et al. 2021).

Environmental concern and carbon concern

Environmental concern refers to the emotional response, or worry, associated with beliefs about environmental issues (Fransson and Gärling 1999, Schultz et al. 2004). It reflects the affective evaluation that a consumer assigns to environmental problems (Lee 2008). Schultz et al. (2004) identified three dimensions of environmental concern, namely, egoistic, altruistic, and biosphere concern. Research has shown a strong correlation between environmental concern and green consumption. Scholars in the environmental field have proposed that concern for the environment directly motivates environmental purchase intentions (Hedlund 2011, Hartmann and Apaolaza-Ibáñez 2012). Various moderating variables, such as environmental knowledge, green product scarcity, and collectivism, support the positive correlation between environmental concern and purchase intention (Arısal and Atalar 2016, Li et al. 2019, Marcelino and Widodo 2021). According to Roberts (1996), environmental concern is an attitude of worry that is directly related to environmentally conscious consumer behavior (ECCB). The theory of planned behavior posits that attitudes, subjective norms, and perceived behavioral control have a significant direct effect on behavior, with intention serving as a mediator in this relationship (Ajzen 1991, Bamberg 2003, Kim and Han 2010, Hidalgo-Crespo et al. 2022). Studies have shown that environmental concern is a strong predictor of green purchase behavior (Kautish et al. 2019, Yue et al. 2020). According to Heo and Muralidharan (2017) and Ghali-Zinoubi (2022), there is a positive correlation between consumer concern for environmental issues and the likelihood of exhibiting ECCB. Madushanka and Ragel (2016), in a Sri Lankan context, found that high levels of environmental

concern among consumers in Trincomalee District significantly influenced their attitude towards green packaging.

Previous studies have defined the concept of environmental concern. However, carbon concern is a more specific concept that falls within the realm of environmental concern but has been comparatively underexplored in research. The attention of the public towards climate change may result in the development of pro-environmental behaviors, shaping low-carbon actions and ultimately leading to a reduction in per capita carbon emissions (Wu et al. 2019, Liu et al. 2022, Shen and Wang 2023). Climate-friendly labeling in the food sector is still in its early stages. Although consumer understanding of carbon footprint labeling is limited (Rondoni and Grasso 2021), consumers still support and endorse the idea of carbon footprint-labeled products (Edenbrandt and Lagerkvist 2021, Denver et al. 2023). Based on past research in related fields, this study summarized consumers' carbon concern as the awareness, worry, or level of interest consumers have regarding the carbon emissions associated with products or services they purchase and their impact on the environment. However, most previous research on carbon concerns has primarily been rooted in environmental concerns, lacking distinction between the two concerns at different breadths in terms of the mechanisms that influence consumer behavior.

Human health concern

When exploring green purchasing mechanisms, the internalization of economic externalities of green products due to health considerations is another purchasing motive. Compared to conventional products, the friendliness of green products to human health is one of the main considerations, so consumers' health concerns may also be a factor influencing green purchasing behavior. Previous research has shown that consumers' high level of health concern has a significant impact on their green purchasing behavior (Irianto and Heru 2015, Qader and Zainuddin 2010, Yilmaz and Ilter 2017, Pham et al. 2019, Zidehsaraei et al. 2022). Lindh et al. 2016 (2016) found that consumers in Sweden are more likely to have green purchase intentions due to health, environmental, and ethical concerns. Similarly, Abdulsahib et al. (2019) identified health concerns as the primary driver for consumers choosing green products. Grewal et al. (2017) found that consumers are significantly influenced by health concerns when choosing to consume green products, as they are perceived to be free from harmful substances and chemicals. Previous research by Dewulf et al. (2015) indicated that health concerns are the most significant factor driving the consumption of green products. However, there has been limited research on the purchase behavior of consumers' related to green packaging in terms of undesirable environmental consequences and health concerns.

Conceptual framework

Previous research has encompassed a wide range of studies focusing on different aspects of green packaging. These include material and technological innovations, market industry supply chain construction, government management system development, and consumer behavior and psychology related to green packaging, as well as the effects of environmental and human health concerns on green packaging. However, several important points have been overlooked in current research.

First, previous research has often examined green packaging as a unified concept, without distinguishing between its distinct attributes: for example, renewable, low carbon footprint, and human health attributes. This research gap raises an important question about potential disparities in consumer perceptions and the relative importance assigned to these specific green packaging attributes. Observed phenomena suggest a potential behavioral psychological mechanism where consumers show a willingness to select green packaging materials, whereas their willingness to make environmental sacrifices varies. For instance, consumers prefer paper packaging over plastic green packaging or recycled paper packaging materials due to their inherent distrust of the safety of recycled products.

Second, previous research has not comprehensively investigated the various effects of environmental and carbon concerns on the quality of green packaging (Wu et al. 2019, Alamri et al. 2021, Liu et al. 2022, Shen and Wang 2023). High levels of environmental concern do not necessarily equate to high levels of carbon concern. Both concepts have different priorities. Environmental concerns are more related to motivating consumers to choose recycled materials, whereas carbon concerns are probably more engaged with lowering usage of products derived from petroleum, such as plastic. It is important to consider how much the varied emphases will affect consumers' utilities on distinguished green packaging attributes.

Third, customers may place different levels of importance on the environmental performance of different packaging layers. However, past literature has not explored from this perspective. In terms of the importance attributed to various layers of packaging, consumers may consider packaging that occupies a larger volume to be more important while disregarding smaller packaging elements. For instance, consumers may value outer packaging more highly than inner packaging due to its higher quantity of materials. Also, it is reasonable to assume that consumers tend to prioritize materials that come into direct contact with food. To address these research gaps, a thorough examination of the relationship between these traits and their relative value to consumers is required. The research conceptual framework is outlined in Figure 2.

Data and Methodology

Data collection

As the world's second-largest economy, China boasts the second-largest consumer market and the greatest trade in goods. Therefore, it is important for academics to conduct an in-depth study on the green drivers of China's consumer market. Socio-demographic factors have been found to influence environmental consumption. Consumers with higher levels of education generally exhibit greater environmental concern and a stronger tendency to purchase eco-friendly products globally (Arısal and Atalar 2016, Herrmann et al. 2022). Meanwhile, younger consumers, in particular, are more inclined towards green consumption (Arısal and Atalar 2016, Núñez Cacho et al. 2020). This trend is also apparent among young Chinese consumers, the majority of whom have a positive attitude towards green and environmentally friendly consumption (Qing and Li 2005). According to Accenture, young Chinese consumers' knowledge of the environment is continuing to rise, and leading an environmentally conscious lifestyle is an increasingly common trend among them (Accenture, 2022 China Consumer Insights Report). This trend is reflected in their daily consumption preferences, such as

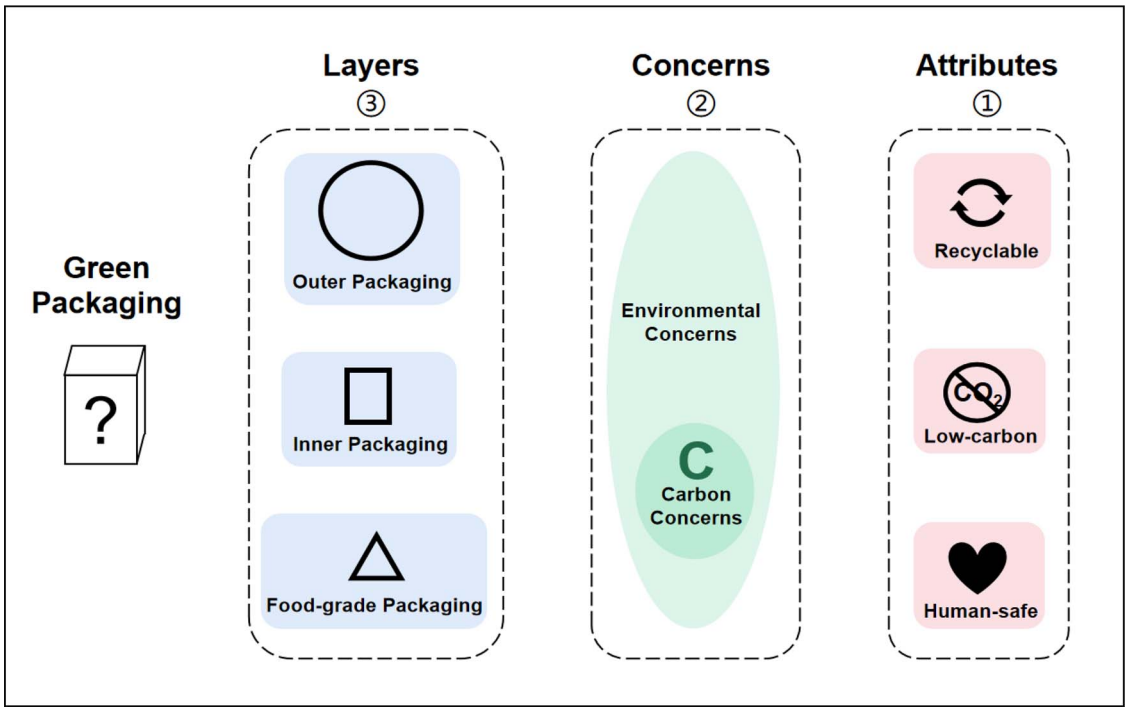

Figure 2.—Research conceptual framework.

purchasing vintage clothes, using reusable cups for coffee, and choosing environmentally friendly packaging products. Investigating the preferences of young Chinese customers for different green packaging may provide solutions for developing countries where environmental consciousness is increasing. Although many Chinese customers are ecologically sensitive, and some are eager to purchase green products and generally have a positive attitude toward green packaging, there is still a lack of awareness regarding green packaging (Hao et al. 2019). Therefore, this study focused on young consumers in China as the target population, given that they represent a key demographic engaged in green consumption practices in the country. This selection enhances the practical significance of the research findings and provides valuable insights for future green packaging market strategies in developing countries facing similar circumstances.

We administered a paper-based questionnaire by face-to-face survey to university students from Guangdong province, China, who had prior experience purchasing tea bag products. The university community from Guangdong province was selected for two primary reasons. First, China has a rich tradition of tea consumption, particularly in Guangdong province. While most middle-aged and elderly tea consumers primarily purchase whole-leaf tea in metal cans, tea bag products have become popular among young Chinese consumers in recent years, reflecting Western trends. According to the *Research Report on Industrial Operation and Big Data of Consumption Insight of Chinese Tea Bags Industry from to 2023–2024*, in the daily consumption of fresh-made beverages in the Chinese market, bagged tea (41.0%) stood out in daily life scenarios, beating traditional tea (whole-leaf tea) (33.0%), coffee (32.3%), milk tea (38.7%), and other beverages, and became the favorite choice of consumers. The online market size of China's bagged tea industry reached RMB 18.03 billion in 2022, and 88.2 percent of consumers are under the age of 40 (iiMedia Research Report, 2024). Second, our research focused on highly educated young individuals to ensure the validity of the data, as younger generations exhibit relatively higher levels of concern towards environmental and carbon-related issues, despite general awareness of environmental protection among Chinese consumers lagging behind that of developed nations. Before distributing the formal questionnaire, we conducted a pretest and collected 50 questionnaires. Based on the feedback from the pretest, we fine-tuned the questionnaire linguistically to ensure that the final form and content were unambiguous and easy to understand. The questionnaires were anonymized free of charge, and collected in the bagged tea sales area of the stores in places where public comprehensive universities are clustered during May to June 2023, and respondents were included only if they had purchased a tea bag product within the last 6 months. All questionnaires were collected by in-person, on-site completion and retrieval, with an average time of approximately 15 minutes per questionnaire. In total, 600 paper questionnaires were distributed, and 404 valid questionnaires were collected (with a response rate of 67%).

Questionnaire design

This study employed a structured questionnaire to investigate participants' preferences for green packaging and its effects. The questionnaire consisted of three sections. The first section collected demographic information, including variables such as gender, monthly household income per person, and family member career background (refer to Table 1 for detailed information).

The objective of the second section was to investigate the participants' preferences for different attributes of green packaging using conjoint analysis. An orthogonal design was utilized to generate product profile cards, resulting in the creation of eight potential green packaging profiles. To analyze consumer preferences for each attribute, we applied a rating-based conjoint analysis. The analysis focused on four primary attributes that

Table 1.—Demographic information about respondents (n = 404).

Variables	Frequency (%)
Gender	
Female	68.8
Male	31.1
Age	
18–20	76.5
21–23	23.5
Monthly household income/person (RMB)	
<1,000	6.6
1,000–3,000	13.6
3,000–5,000	29.7
5,000–10,000	29.4
10,000–20,000	13.1
20,000–35,000	2.9
>35,000	1.7
Family member career background	
Government agencies	4.3
Public institution	7.1
State-owned enterprise	4.3
Foreign enterprise	2.2
Private enterprise	14.2
Individually owned business	35.2
Nonprofit organizations	1.2
Freelance	30.3

simulate a bagged tea product: outer package, inner package, food-grade material, and price (Table 2; Figure 3). Many past consumer studies conducted in the packaging sector have primarily focused on fast-moving consumer goods, also referred to as consumer packaged goods due to their quick shelf turnover, affordability, and low cognitive, temporal, and financial demands (Rokka and Uusitalo 2008, Vyshak et al. 2022). Participants were asked to rank the eight profiles in order of preference (refer to the Appendix). It was designed to identify consumer preferences for green packaging attributes to help packaging manufacturers create green packaging to meet consumer needs.

The third section of the questionnaire was designed to measure the cognitive and psychological factors that influence consumers' perceptions of green packaging. This included their cognitive and affective perceptions, subjective norms, and environmental and carbon-related concerns (see the Appendix). To measure cognitive perceptions, a set of seven questions related to self-perceived knowledge of renewable paper packaging was developed. A set of questions was designed to investigate participants' emotional response to recycled paper packaging. Subjective norm-related questions mainly investigated the influence of other people upon the participants. Finally, the participants' environmental and carbon concerns (including self-perceived levels of concern and degrees of attentiveness to environmental problems and carbon issues) were measured using sets of questions respectively. All question items were scored using a five-level Likert scale for measurement (see the questionnaire).

Analysis method

Conjoint analysis was used to estimate the relative importance of selected attributes based on the joint effect of consumer choices. The average importance of each product attribute was calculated by examining individuals' part-worth utility functions. Conjoint analysis is a widely utilized methodology for measuring consumers' preferences by analyzing their utility trade-offs among competing products (Green and Srinivasan 1978, Green et al. 2001). Conjoint analysis is often used to examine the impact of multiple product attributes on consumer preferences and purchasing decisions. It can also simulate how consumers may respond to changes from conventional products to new ones (Luo et al. 2017). Orthogonal arrays (Addelman 1962) and other fractional factorial designs are used to construct characterizations of a limited number of alternative products that are arranged according to sectional experimental designs (Green et al. 2001). Respondents are informed of the definition of each product attribute and are then asked to rank or rate a set of cards that are derived from the orthogonal design, each representing different attribute combinations. Statistical methods are then used to assess separate attributes and utilities, providing insight into how consumers prioritize and trade-off different attributes when making purchasing decisions. The basic model of conjoint analysis can be expressed by the following equation:

$$U(X) = \sum_{i=1}^{m} \sum_{j=1}^{n} a_{ij} X_{ij}$$

The equation shows that there are $i = 1, 2, \ldots m$ product attributes in the conjoint analysis; there are $j = 1, 2, \ldots n$ levels in each i attribute. $U(X)$ is the overall utility of each product profile, a_{ij} is the part-worth utility on the jth level of the ith factor, and X_{ij} is a dummy variable for the presence of the jth level of the ith factor in the product ($X_{ij} = 0$ or $X_{ij} = 1$).

Since consumers are partly influenced by green marketing, it is therefore necessary to identify and concentrate promotions on those market targets that are environmentally concerned (Lampe and Gazda 1995). Market segmentation has traditionally been accomplished through the application of conjoint analysis combined with cluster analysis, which is designed to categorize groups of entities that possess shared, distinct characteristics. This approach has emerged as a crucial and fundamental tool in academic consumer studies, as well as in the realm of applied marketing (Punj and Stewart 1983, Djokic et al. 2013). However, this study cannot apply the traditional research paradigm of conducting a socio-demographic factors-based market segmentation analysis using conjoint analysis in combination with cluster analysis due to the concentration of age and education background. Therefore, we applied cognitive and psychological data to describe each segment and applied a linear regression in additional to the traditional post-hoc segmentation, which is not commonly used in marketing studies but has been applied in previous medical research (Bhargava et al. 2006).

The SPSS software (SPSS, Inc., Chicago, Illinois) was employed to assess the importance of each attribute and the utilities of attribute levels, utilizing a rate-based conjoint model (results see Table 3). Conjoint analysis remains a common and important research method and has been widely applied in those studies focusing on products and consumers (e.g., Bech-Larsen and Grunert 2003, Scholz and Decker 2007, Rokka and Uusitalo 2008, Cai and Aguilar 2013, Zimmermann et al. 2013, Acosta et al. 2014, Almli et al. 2015, Arenoe et al. 2015, Lima Filho et al. 2015, Osburg et al. 2016, Luo et al. 2017). Subsequently, a K-means (nonhierarchical algorithm) approach was used to conduct a cluster analysis and categorize respondents into distinct market segments based on their product preferences (Ketchen and Shook 1996). Third, a reliability and validity

Table 2.—Description of selected attributes.

Specific attribute	Attribute levels	Description
Outer package material	Recycled paper  vs. Plain paper 	Recycled paper: The outer packaging paper material under consideration is explicitly indicated by the manufacturer to have been processed using recycled or reprocessed paper materials. This practice contributes to resource conservation and waste reduction, as it involves reutilizing paper fibers and minimizing the demand for virgin pulp. Plain paper: The outer packaging of this product is virgin paper material made from original wood fiber, which is a common type on the market.
Inner package material	Plain paper  vs. plastic 	Plain paper: The inner packaging of this product is virgin paper material made from original wood fiber. Although not as good as recycled paper, virgin paper packaging is still more environmentally friendly than plastic packaging. It possesses advantages such as biodegradability, low carbon emissions, and human health friendliness. Plastic: The inner packaging of this product is plastic. The advantages of plastic food packaging compared to paper packaging lie in its ability to be sealed and have good air-tightness, excellent waterproof properties, and greater strength.
Tea bag material	Corn fiber  vs. nylon 	Corn fiber: The tea bag is made from corn fiber material. Corn fiber is extracted from various parts of the corn plant such as stalks, husks, and cobs. Corn fiber material is a premium alternative material to the commonly used nylon tea bag material on the market. Corn fiber tea bags possess advantages such as being environmentally friendly, biodegradable, relatively low-carbon, and human health friendly. Nylon: Tea bags are made from nylon material. Nylon tea bags are widely used in the market for bagged tea products. Nylon made tea bags are usually more durable and less prone to breaking compared to plant fiber tea bags. However, nylon tea bags might release microplastic particles, posing potential risks to health and the environment.
Price	20 RMB vs. 25 RMB vs. 30 RMB	Due to the significant impact of tea variety, quality, and brand on the price, we deliberately avoided including the aforementioned factors in our research. In the questionnaire, we refrained from using images of any existing tea products available in the market. Instead, we created virtual packaging images of tea products to eliminate the influence of other factors on price. For the pricing selection, we referenced the price benchmarks of the most common types of packaging from well-known brands in the market (outer packaging box with individually packaged tea bags), which generally range from around 20 to 30 RMB. As a result, we established three pricing levels for the virtual products: 20, 25, and 30 RMB.

test was conducted on the measurement of cognitive and psychological factors (cognitive and affective attitudes, subjective norms, environmental- and carbon-related concerns) by constructing five variable components using exploratory factor analysis (EFA). The application of EFA identifies underlying latent factors or constructs within a set of observed variables, reveals their interrelationships, and allows data reduction without loss of essential information, thereby enhancing understanding and parsimony in many psychological, social, and health research areas (Maciel et al. 2013, Hadi et al. 2016, Victor and Hoole 2018, Susilo 2020). Following the outcomes of the cluster analysis, the demographic traits of respondents within each segment were examined through analysis of variance (ANOVA) testing. ANOVA in consumer research is used to statistically assess the significance of mean differences between multiple groups (e.g., product variants, consumer segments, or treatment conditions) to determine whether they differ in their responses to variables of interest (such as preferences, satisfaction, or purchase behavior), providing valuable insights into market segmentation and informing marketing strategies (Bindah and Othman 2012, Todua and Dotchviri 2015, Singh and Rana 2017, Trivedi et al. 2023). Additionally, multilinear regressions were constructed to explore the cognitive and psychological factors that influence the utilities of both outer and inner green packaging for each participant (Table 4). The dependent variables were estimated utilities for green outer and inner

Figure 3.—Product profiles from the orthogonal design.

packaging from the conjoint analysis of each participant, respectively, while the independent cognitive and psychological variables are selected items from the EFA (where C represents cognitive attitude, A represents affective attitude, SN represents subjective norm, EC represents environmental concern, and CC represents carbon concern; see Table 5).

Results

Table 3 displays the overall average utilities and the relative importance of different product attribute levels obtained from the conjoint analysis. The results indicate that the average relative importance of more than four attributes investigated exhibited slight disparity. Among the attributes, the outer package was found to be the most influential factor in consumer choices, with a relative importance of 26.106 percent. The results reveal a favorable preference towards recycled paper, while plain paper outer packaging material demonstrated a negative inclination. The subsequent attribute in terms of importance was price (25.155%), which was marginally lower by less than 1 percent compared to the outer package material. The average utility of price demonstrates that respondents, on the whole, exhibited a preference for the lowest price point. The relative importance of the inner package and food-grade material was almost equal, standing at 24.308 percent and 24.431 percent, respectively. Concerning the inner package material, respondents displayed a preference for plain paper rather than plastic material. Corn fiber was the favored material for the tea bag, with a positive average utility value compared to nylon.

Table 4 shows the results of the cluster analysis, EFA, and ANOVA. The participants were divided into four groups based on the utility values assigned to the attribute levels. According to the different preferences of segments, we defined them as: health-minded (cluster 1), recycled paper enthusiasts (cluster 2), price-sensitive (cluster 3), and plastic skeptics (cluster 4). Respondents from the health-minded (cluster 1) group care about the greenness level of food-contact material over non-food-contact material and price. It is suspected that this is due to their heightened concern for the green level of the food-contact materials they consume, which may have an effect on their health. Approximately 27 percent of the study's respondents belonged to cluster 4, indicating a preference for paper over plastic. They believe that refusing the use of plastic and substituting it with paper is more meaningful than opting for packaging made from recycled paper (although recycled paper is also favored by them). Cluster 2, the recycled paper enthusiasts, accounted for 21 percent of all respondents and showed a strong preference for outer packaging made from recycled paper. In cluster 3, respondents were sensitive to price (with 57.990% importance level), which indicates that, for these consumers, in the process of product acquisition, the foremost determinant is the price, with the significance of the packaging's environmental sustainability being considerably overshadowed by the allure of lower cost.

Table 3.—Overall average utility values and relative importance of each attribute.

Specific attribute	Attribute levels	Average utility	Relative importance (%)
Outer package material	Recycled paper	0.698	26.106
	Plain paper	−0.698	
Inner package material	Plain paper	0.676	24.308
	Plastic	−0.676	
Tea bag material	Corn fiber	0.679	24.431
	Nylon	−0.679	
Price	20 RMB	−4.262	25.155
	25 RMB	−5.114	
	30 RMB	−5.541	

Based on the results of EFA, we removed 17 items from the original question list and evaluated the fit of the measurement model (all remaining items are illustrated in Table 4). The factor loading values indicated a relatively acceptable significance level of internal validity. According to the results of the ANOVA, only the factor of cluster 3 from subjective norms (SN1) was significantly different from the other three values in this row, which indicates that the SN1 level (SN from families) was significantly lower than other segments.

Table 5 shows the results of the regression models. From the figures in regression model 1, illustrated in A1, A4 and EC7 have positive effects on consumers' preference on choosing recycled paper outer package at the $p < 0.05$ significance level, which indicates that affective attitude and environmental concern variables have a strong positive effect on green packaging preferences. C3 and SN3 are positively significant at the $p < 0.1$ level, which also shows that cognitive and subjective norm variables have slight positive influences on green packaging preferences. However, unlike the other two affective factors, A2 is negatively significant at the $p < 0.05$ level with a beta coefficient of −0.188.

Regression model 2 shows that A4 has the strongest positive effect of attitude on the preference for choosing paper inner packaging ($p < 0.000$) based on affective attitude. Meanwhile, A5 has a slight positive influence on green packaging preference

Table 4.—Results of cluster analysis, exploratory factor analysis (EFA), and analysis of variance (ANOVA).

Respondents		Total	Cluster 1 (health-minded)	Cluster 2 (recycled paper enthusiasts)	Cluster 3 (price-sensitive)	Cluster 4 (plastic skeptics)
Number of respondents		404	97	85	114	108
Frequency (%)		100	24	21	28	27
Average importance						
Outer package material		26.106	18.419	49.653	14.182	23.238
Inner package material		24.308	21.970	18.565	14.054	40.130
Tea bag material		24.431	49.557	20.767	13.774	18.404
Price		25.155	10.053	11.015	57.990	18.228
Average utility values for attribute levels						
Outer package material						
Recycled paper		0.698	0.624	1.256	0.238	0.725
Plain paper		−0.698	−0.624	−1.256	−0.238	−0.725
Inner package material						
Plain paper		0.676	0.704	0.566	0.337	1.063
Plastic		−0.676	−0.704	−0.566	−0.337	−1.063
Tea bag material						
Corn fiber		0.679	10.454	0.566	0.367	0.486
Nylon		−0.679	−1.454	−0.566	−0.367	−0.486
Price						
20		−40.262	−0.454	−0.685	−11.652	−3.101
25		−5.114	−0.545	−0.822	−13.982	−3.721
30		−5.541	−0.591	−0.891	−15.148	−4.031
Cognitive and psychological factors	EFA Factor *l*oading					
Cognitive attitude						
C1	0.830	2.96	2.96	2.92	2.95	3.02
C2	0.870	3.21	3.24	3.09	3.25	3.22
C3	0.793	3.03	3.14	2.95	3.00	3.03
Affective attitude						
A1	0.631	3.79	3.87	3.85	3.67	3.82
A2	0.753	4.08	4.12	4.12	3.96	4.14
A3	0.714	4.19	4.21	4.22	4.09	4.24
A4	0.707	4.05	3.99	4.14	3.94	4.14
A5	0.701	4.02	4.04	4.04	3.89	4.13
A6	0.591	4.00	4.05	3.96	3.97	4.03
Subjective norm						
SN1	0.640	3.69	3.76	3.74	3.51**[a]	3.77
SN2	0.795	3.38	3.34	3.39	3.27	3.52
SN3	0.757	3.39	3.33	3.42	3.25	3.56
SN4	0.575	3.67	3.68	3.68	3.62	3.71
Environmental concern						
EC1	0.659	3.99	4.05	4.04	3.94	3.95
EC4	0.755	4.25	4.31	4.26	4.20	4.25
EC5	0.693	4.48	4.53	4.53	4.41	4.46
EC7	0.647	4.38	4.34	4.45	4.37	4.36
Carbon concern						
CC2	0.819	4.08	4.08	4.00	4.08	4.16
CC3	0.879	3.96	3.91	3.87	4.04	3.97
CC4	0.804	3.90	3.81	3.86	3.94	3.98
CC1	0.456	3.88	3.87	3.82	3.85	3.95
CC7	0.505	3.79	4.08	3.73	3.73	3.98
CC8	0.653	4.26	4.24	4.26	4.25	4.30
	KMO = 0.870***[a]					

[a] **$p < 0.05$; ***$p < 0.01$.

with a significant beta coefficient of 0.116 at the $p < 0.1$ level. CC7 also has a positive beta coefficient and is significant at the $p < 0.05$ level, indicating that carbon concern positively influences green packaging preference. The beta coefficient for the subjective norm variable (SN4: −0.148) is significant at $p < 0.05$, indicating an inverse correlation between special situations in social networks and the preference for green packaging.

Discussion

Green packaging preference

The analysis shows that young consumers can clearly distinguish the advanced properties of green packaging materials, and the importance of those green attributes is almost as unanimous as the importance of price. Compared to the inner

Table 5.—Linear regression results.

	Regression model 1 (outer package)			Regression model 2 (inner package)		
	B[a]	Std. error	*p* value	B[a]	Std. error	*p* value
Cognitive attitude						
C1	0.006	0.079	0.935	−0.040	0.070	0.568
C2	−0.034	0.076	0.659	0.072	0.068	0.288
C3	0.130*	0.068	0.058	−0.010	0.061	0.876
Affective attitude						
A1	0.152**	0.069	0.029	−0.061	0.062	0.324
A2	−0.188**	0.093	0.045	−0.064	0.084	0.444
A3	0.028	0.084	0.734	0.070	0.075	0.349
A4	0.190**	0.076	0.013	0.200***	0.068	0.004
A5	−0.066	0.068	0.328	0.116*	0.060	0.056
A6	−0.063	0.076	0.404	−0.097	0.068	0.153
Subjective norm						
SN1	0.111	0.078	0.156	0.034	0.070	0.621
SN2	−0.089	0.071	0.209	0.021	0.063	0.741
SN3	0.116*	0.063	0.067	0.079	0.056	0.158
SN4	0.009	0.073	0.905	−0.148**	0.065	0.024
Environmental concern						
EC1	−0.112	0.086	0.194	−0.098	0.077	0.205
EC4	−0.007	0.085	0.934	0.051	0.076	0.501
EC5	0.115	0.094	0.221	0.106	0.084	0.209
EC7	0.160**	0.076	0.035	−0.011	0.068	0.875
Carbon concern						
CC2	−0.124	0.093	0.185	−0.080	0.083	0.337
CC3	−0.030	0.094	0.745	0.100	0.084	0.233
CC4	0.003	0.086	0.972	−0.010	0.076	0.899
CC1	0.078	0.078	0.319	0.019	0.069	0.783
CC7	0.001	0.069	0.99	0.124**	0.062	0.045
CC8	−0.007	0.089	0.935	−0.033	0.079	0.674
Constant	−0.712	0.456	0.119	−0.698	0.406	0.084
R2	0.128			0.108		
F	2.435			1.993		
p	0.000			0.005		

[a] $*p < 0.10$; $**p < 0.05$; $***p < 0.01$.

packaging and tea bag materials, the environmental performance of the outer packaging is slightly more important. In terms of food-contact packaging materials preference, no matter the environmental protection (paper vs. plastic) or health safety (corn fiber vs. nylon) aspects, the importance to the consumers was almost identical. This suggests that there is almost no significant difference between consumers' preference for distinct layers of green packaging. However, consumers still perceive the outer packaging as slightly more important than the other two layers. This may be due to the larger physical size of the outer packaging and the perception among consumers that it is the only option that uses recycled paper, making it more environmentally friendly. The level of importance attributed to both the inner packaging and the green materials of tea bags was nearly equal, indicating that consumers weighed environmental concerns and human health considerations to be of similar importance when selecting small-sized green packaging materials. This finding suggests that consumers do not give priority to one aspect over the other, demonstrating a balanced approach to their choices.

Recycled paper versus plain paper

The study examined both cognitive and affective aspects of consumer attitudes towards recycled paper. According to our results, consumers' cognitive attitude towards green packaging safety issues has a positive impact on their preference for recycled paper packaging, which is consistent with prior research (Van Dam 1996, Thøgersen 1999, Anstine 2000, Micklethwaite 2004, Young 2008, Young et al. 2010, Lindh et al. 2016, Calvo-Porral and Lévy-Mangin 2020). In line with previous studies, we confirmed that the affective aspect of consumers' attitudes has a positive impact on their preference for recycled paper packaging, since "recycle" and "green" are usually associated with "positive emotions–self-identification–and acceptance" (Mobley et al. 1995, Martinho et al. 2015, Lindh et al. 2016, Stranieri et al. 2017, Kamleitner et al. 2019, Calvo-Porral and Lévy-Mangin 2020, Tezer and Bodur 2020, Adigüzel and Donato 2021, Queiroz et al. 2021, Polyportis et al. 2022). Although previous research has indicated that consumers' safety concerns may lead to nonadoption of recycled paper-based products, especially for direct food contact (Akkucuk 2011, Fernqvist et al. 2015, Martinho et al. 2015, Lindh et al. 2016, Magnier et al. 2019, Calvo-Porral and Lévy-Mangin 2020, Herbes et al. 2020, Meng and Leary 2021, Oloyede and Lignou 2021, Queiroz et al. 2021), our study design specifically targeted recycled paper as the outermost layer of packaging that does not come into contact with food, and it confirmed that consumer cognitions of safety (C3) issues related to recycled paper were positively correlated with their preference for recycled paper outer packaging. We compared the affective and cognitive attitudinal findings of this study with those of past studies, as summarized in Table 6.

Our results also confirmed that positive subjective norms, especially perceptions from family members, have a positive

Table 6.—Comparison of research findings on attitudes with past related research.

Our research findings	Consistency with previous studies	Influence factors	Research perspectives from the references	References
Recycled paper vs. plain paper				
Consumers affective attitude has a positive impact on their preference for recycled over plain paper-based packaging.	Consistent	Positive emotions	"Green" and "recyclable" are associated with positive emotions that promote the purchase of recycled paper packaging.	Calvo-Porral and Lévy-Mangin (2020); Queiroz et al. (2021); Tezer and Bodur (2020); Mobley et al. (1995); Adıgüzel and Donato (2021); Kamleitner et al. (2019); Polyportis et al. (2022); Lindh et al. (2016); Martinho et al. (2015); Stranieri et al. (2017)
	Inconsistent	Safety concerns	Safety concerns about the recycled paper-based products may decrease the consumer acceptance.	Rokka and Uusitalo (2008); Akkucuk (2011); Calvo-Porral and Lévy-Mangin (2020); Magnier et al. (2019); Queiroz et al. (2021); Sun et al. (2018); Fernqvist et al. (2015); Martinho et al. (2015); Lindh et al. (2016); Herbes et al. (2020); Oloyede and Lignou (2021); Kuah and Wang (2020); Magnier et al. (2019); Meng and Leary (2021)
Consumers' cognitive attitude towards green packaging safety issues has a positive impact on their preference for recycled paper packaging over plain paper packaging.	Consistent	Knowledge	Ways in which packaging waste was disposed affect the consumer acceptance.	Van Dam (1996); Young (2008)
	Consistent	Environmental awareness and knowledge	Guidance on packaging labels and advertising messages minimize the psychological risks related to recycled papers.	Anstine (2000); Micklethwaite (2004); Calvo-Porral and Lévy-Mangin (2020)
	Consistent	Eco-concerns	Readability, reusability, and material efficiency increase the consumer acceptance of green packaging.	Young et al. (2010); Thøgersen (1999); Lindh et al. (2016); Young et al. (2010)
	Consistent	Environmental awareness	Environmental awareness can minimize the nonacceptance caused by safety concerns of recycled paper-based products.	Hamzaoui-Essoussi and Linton (2010)
Paper vs. plastic				
Consumers' affective attitude towards recycled paper positively influences their preference for paper over plastic material.	Consistent	Safety concerns	Consumers generally prefer to purchase edible products in traditional packaging materials.	Lindh et al. (2016); Young (2008); Fernqvist et al. (2015)
	Consistent	Positive emotions	Paper is also associated with a variety of pleasant feelings and qualities, including a sense of health, freshness, and homeliness, whereas plastic is viewed as a low-quality product that evokes negative perceptions and emotions.	Fernqvist et al. (2015); Lindh et al. (2016); Steenis et al. (2017); Gelici-Zeko et al. (2013)
	Consistent	Positive emotions	Consumers view excessive packaging as an unfavorable manifestation of unsustainable packaging, rejecting excessive plastic packaging and instead regarding paper-based packaging as a more sustainable alternative.	Oloyede and Lignou (2021)
	Consistent	Positive emotions	Paper/cardboard is often preferred over plastic, which is associated with emotions and attitudes such as unnecessary, strange, expensive, or environmentally unfriendly.	Fernqvist et al. (2015)

impact on the acceptance of recycled paper products. Conversely, negative family-originated subjective norms make consumers price-sensitive. Núñez-Cacho et al. (2020) suggested that consumers are influenced by the beliefs and social pressure of others and are more likely to recycle when surrounded by individuals who prioritize green consumption. Family members, work colleagues, and other social contacts play a role in shaping consumer behavior towards environmental friendly products (Núñez-Cacho et al. 2020). Moreover, ethical expectations from different aspects of society may predispose consumers to accept recycled paper products (Tezer and Bodur 2020). The influence of social and environmental values on consumer attitudes is significant and has been highlighted in previous studies (Bulut and Nazli 2020, Polyportis et al. 2022). Our research further confirms that when it comes to recycled green packaging, the promotion factor from the family members is particularly important.

Environmental consciousness has a positive effect on the preference for recycled paper products, which is consistent with previous research findings (Rucker 2009, Tobler et al. 2011, Venter et al. 2011, Testa et al., 2021). Studies have indicated that environmentally conscious consumers are more likely to pay for recycled paper products due to their environmental benefits (Rucker 2009, Testa et al. 2021). Most consumers perceive the packaging and the product as one entity before consuming the product (Venter et al. 2011). This group of consumers places more importance on the potential environmental impact of packaging rather than on the actual impact on the food and its production when evaluating the environmental impact of the product (Tobler et al. 2011).

An unexpected finding was item A2. Purchasing recycled paper packaging was not perceived as a "smart" decision, but it did have a positive impact on consumer preferences. Although this result may seem counterintuitive, it is important to discuss the underlying consumer psychology. Previous research provides some clues. For instance, Kamleitner et al. (2019) suggested that consumers' green consumption satisfies their need for self-expression and the desire to feel special. Griskevicius et al. (2010) argued that consumers engage in green consumption behavior due to the influence of altruism, the desire to express self-sacrifice and self-contribution, and to achieve status and prestige in their collective. Since environmental consumerism is not widespread in China, young people are more likely to purchase products with green packaging due to their "rebellion against popular perception" and "spirit of self-sacrifice."

Paper versus plastic

In addition to exploring the use of recycled paper for outer packaging, our study further analyzed whether the attitudes and subjective norms towards recycled paper and environmental and carbon concerns affected consumers' choices of paper versus plastic packaging materials. Our findings suggest that consumers' affective attitudes towards recycled paper positively influence their preference for paper over plastic material. Consistent with the findings (see Table 6) of many past studies, consumers will choose paper over plastic packaging for environmental and safety reasons (Young 2008, Fernqvist et al. 2015, Lindh et al. 2016, Magnier and Schoormans 2015, Popovic et al. 2019). Compared to plastic, paper is more able to bring consumers a healthy, natural, and familiar feeling, thus obtaining a more pleasant psychological feeling. This is also one of the reasons for choosing paper instead of plastic packaging materials (Gelici-Zeko et al. 2013, Fernqvist et al. 2015, Lindh et al. 2016, Steenis et al. 2017, Oloyede and Lignou 2021).

The results of the subjective norm factor show that negative attitudes towards recycled paper packaging in the consumers' social environment unexpectedly acted as a greater motivator to choose paper packaging over plastic. This result contradicts intuition and several previous research findings (Griskevicius et al. 2010, Yokoyama et al. 2014, Kamleitner et al. 2019, Herrmann et al. 2022). Yokoyama et al. (2014) investigated the social risk perceptions of green consumption behavior from a neuroscientific perspective and found a significant positive correlation between social risk assessment and activity, indicating that consumers experience higher purchase apprehension when they anticipate disapproval from others. However, this finding supports some earlier research suggesting that, in some circumstances, consumers may utilize environmental behavior as a symbol of individuality and egoism in opposition to the wishes of those around them. As Griskevicius et al. (2010) argued, green consumption behavior involves prosocial behavior, where individuals engage in green consumption in order to gain a prosocial reputation and status, even in the face of expected disapproval from those around them. Kamleitner et al. (2019) further asserted that consumers' green consumption behavior is driven by a maverick, self-claiming mentality. Furthermore, Herrmann et al. (2022) identified the use of paper-based packaging as a symbolic characteristic of young people who express their environmental attitudes by choosing paper-based packaging.

Our research also supports the idea that customers favor paper packaging material over plastic because of concerns about carbon issues. As noted by Otto et al. (2021), consumers are increasingly prioritizing the environmental impact of traditional packaging materials, particularly their carbon footprint. Consumers are critical of excessive packaging, particularly in fruit and vegetable packaging, and are demanding the packaging industry to reduce carbon emissions by using environmentally friendly packaging materials or by eliminating unnecessary packaging altogether (Fernqvist et al. 2015, Magnier and Schoormans 2015, Popovic et al. 2019).

Conclusion

Our study breaks down green packaging into distinct levels and compares consumer preferences for conventional paper, recycled paper, plastic, and two types of food-contact materials. We analyzed whether consumers prioritize the green attributes or the health attributes of green packaging and identified the factors that influence consumers' preferences for green packaging attributes. Green packaging attributes such as being recyclable, low-carbon, health-conscious, and price all garnered greater recognition and value by consumers compared to conventional packaging. In addition, consumers tended to assign similar levels of importance to different aspects of green packaging. Therefore, it is crucial for enterprises to ensure a balanced consideration of the materials, levels, and volumes used in packaging when designing green solutions. However, it is important to note that this aforementioned balance is contingent upon consumers' unwillingness to pay a premium price per unit. The price premium associated with green packaging is no longer justifiable.

While previous studies have raised concerns about consumer reluctance to purchase recycled paper for food packaging due to safety concerns (Poças and Hogg 2006, Rokka and Uusitalo

2008, Bossuyt et al. 2016, Sun et al. 2018, Alamri et al. 2021), our research clearly demonstrates that consumer acceptance is unaffected when recycled paper is used exclusively as an outer packaging material, thereby avoiding direct contact with food. Therefore, tactical adjustments can be made for companies concerned about the use of recycled paper packaging by selecting specific areas where this material is used.

Our study confirms that consumers' perceived and affective attitudes towards recycled paper not only have a positive influence on their preference for recycled paper-based packaging, but they also contribute to a similar inclination towards paper-based packaging (nonrecycled) as a preferred alternative to plastic. Consequently, in order to gain greater consumer acceptance or to create a more emotional connection, it is better for companies to prioritize the use of paper packaging, including recycled paper, over plastic packaging when it comes to product packaging.

Interestingly, young Chinese consumers exhibit a rebellious attitude towards the green behaviors. While purchasing environmentally friendly packaging is not widely supported by their peers, they deliberately choose products packaged in green materials as an act of rebellion. They perceive green consumption as a bold defiance of the prevailing culture of nonenvironmental mass consumption, and they see it as a form of self-sacrifice. This may reflect the unique psychological characteristics of young individuals in developing countries during a transformative period of environmental consciousness. Consequently, companies developing green marketing strategies in developing countries should therefore recognize and capitalize on the rebellious environmentalism of young people. For example, companies can target potential green consumers with marketing messages that promote a maverick lifestyle or emphasize the uniqueness of the individual, or they can seek out unique or pioneering individuals or media when choosing sources and channels of communication for marketing green products.

Consistent with our hypotheses, environmental concern positively influences consumers' preference for recycled paper products, whereas carbon concern further motivates individuals to choose paper over plastic in trade-offs. Because paper packaging does have certain drawbacks compared to plastic, such as lower strength, toughness, and water resistance, these limitations may discourage environmental purchasing. However, our research suggests that individuals who prioritize environmental issues, particularly carbon emissions and climate change, may increase their adoption of paper packaging beyond the current levels, alongside the use of recycled materials. Companies can adopt a more targeted positioning in their promotional strategies for green packaging, focusing specifically on the target consumer segments interested in paper-based alternatives to plastic or packaging materials made from recycled paper products.

Limitation

This study explored young Chinese consumers' views on green packaging attributes using a virtual tea bag product as a case study. However, as the data for the study were collected from university students in Guangdong Province, South China, there are some limitations in terms of geography and educational level. It is suggested that future research should be conducted in different regions, with different age groups, and for different educational levels to explore more mass market perspectives in this area.

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Literature Cited

Abdulsahib, J. S., B. Eneizan, and A. S. Alabboodi. 2019. Environmental concern, health consciousness and purchase intention of green products: An application of extended theory of planned behavior. *J. Soc. Sci. Res*. 5(4):868–880.

Acosta, L. A., E. A. Eugenio, N. H. Enano Jr, D. B. Magcale-Macandog, B. A. Vega, P. B. M. Macandog … W. Lucht. 2014. Sustainability trade-offs in bioenergy development in the Philippines: An application of conjoint analysis. *Biomass and Bioenergy*. 64:20–41.

Accenture, 2022. China Consumer Insights Report. https://www.accenture.com/cn-zh/insights/consulting/2022-china-consumer-insight-overarching (in Chieses, accessed 16.04.2024).

Addelman, S. 1962. Orthogonal main-effect plans for asymmetrical factorial experiments. *Technometrics* 4:21–46.

Adıgüzel, F., and C. Donato. 2021. Proud to be sustainable: Upcycled versus recycled luxury products. *J. Bus. Res*., 130(10):137–146.

Ajzen, I. 1991. The theory of planned behavior. *Organ.i Behav. Hum. Decis. Process*. 50:179–211.

Akkucuk, U. 2011. Combining purchase probabilities and willingness to pay measures: A case on recycled products. *Eur. J. Soc. Sci*. 23(3):353–361.

Alamri, M. S., A. A. A. Qasem, A. A. Mohamed, S. Hussain, M. A. Ibraheem, G. Shamlan, H. A. Alqah, and A. S. Qasha. 2021. Food packaging's materials: A food safety perspective. *Saudi J. Biol. Sci*. 28(8):4490–4499.

Almli, V. L., A. Øvrum, M. Hersleth, T. Almøy, and T. Næs. 2015. Investigating individual preferences in rating and ranking conjoint experiments. A case study on semi-hard cheese. *Food Quality and Preference*. 39: 28–39.

Anstine, J. 2000. Consumers' willingness to pay for recycled content in plastic kitchen garbage bags: A hedonic price approach. *Appl. Econ. Lett*. 7(1):35–39.

Arısal, I., and T. Atalar. 2016. Exploring relationships between environmental concern, collectivism and ecological purchase intention. *Procedia Soc. Behav. Sci*. 235:514–521.

Arenoe, B., J. P. I. van der Rest, and P. Kattuman. 2015. Game theoretic pricing models in hotel revenue management: An equilibrium choice-based conjoint analysis approach. *Tourism Management*. 51:96–102.

Bamberg, S. 2003. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *J. Environ. Psychol*. 23:21–32.

Bech-Larsen, T. and K. G. Grunert. 2003. The perceived healthiness of functional foods: A conjoint study of Danish, Finnish and American consumers' perception of functional foods. *Appetite*. 40:9–14.

Bindah, E. V., and M. N. Othman, 2012. Age and gender differences associated with family communication and materialism among young urban adult consumers in Malaysia: A one-way analysis of variance (ANOVA). *International Journal of Academic Research in Business and Social Sciences*. 2(11):228.

Bhargava, J. S., B. Patel, A. J. E. Foss, A. J. Avery, and A. J. King. 2006. Views of glaucoma patients on aspects of their treatment: An assessment of patient preference by conjoint analysis. *Invest. Ophthalmol. Vis. Sci*. 47(7):2885–2888.

Bulut, C., and M. Nazli. 2020. Environmentalist predispositions and recycled product preferences. *Int. J. Contemp. Econ. Admin. Sci*. 10(1): 173–196.

Calvo-Porral, C., and J. P. Lévy-Mangin. 2020. The circular economy business model: Examining consumers' acceptance of recycled goods. *Admin. Sci*. 10(2):1–13.

Cammarelle, A., R. Viscecchia, and F. Bimbo. 2021. Intention to purchase milk packaged in biodegradable packaging: Evidence from Italian consumers. *Foods* 10:20–68.

Cai, Z., and F. X. Aguilar. 2013. Meta-analysis of consumer's willingness-to-pay premiums for certified wood products. *Journal of Forest Economics*. 19:15–31.

Chan, R. Y. K. 2001. Determinants of Chinese consumers' green purchase behavior. *Psychol. Mark*. 18(4):389–413.

Chan, R. Y. K., and L. B. Y. Lau. 2002. Explaining green purchasing behavior. *J. Int. Consum. Mark*. 14(2–3):9–40.

Chen, Z., L. Wei, and L. Ye. 2017. Study on legislation of green packaging in China. *Adv. Soc. Sci. Educ. Human. Res*. 87:1087–1090.

Denver, S., T. Christensen, T. B. Lund, J. V. Olsen, and P. Sandøe. 2023. Willingness-to-pay for reduced carbon footprint and other sustainability concerns relating to pork production—A comparison of consumers in China, Denmark, Germany and the UK. *Livestock Sci*. 276:105337.

Dewulf, J., L. Benini, L. Mancini, S. Sala, G. A. Blengini, F. Ardente, M. Recchioni, J. Maes, R. Pant, and D. Pennington. 2015. Rethinking the area of protection "natural resources" in life cycle assessment. *Environ. Sci. Technol*. 49:5310–5317.

Djokic, N., S. Salai, R., Kovac-Znidersic, I., Djokic, and G., Tomic. 2013. The use of conjoint and cluster analysis for preference-based market segmentation. *Engineering Economics*. 24:343–355.

Edenbrandt, A. K., and C. J. Lagerkvist. 2021. Is food labelling effective in reducing climate impact by encouraging the substitution of protein sources?. *Food Policy* 101:102097.

Fernqvist, F., A. Olsson, and S. Spendrup. 2015. What's in it for me? Food packaging and consumer responses, a focus group study. *Br. Food J*. 117(3):1122–1135.

Fransson, N., and T. Gärling. 1999. Environmental concern: Conceptual definitions, measurement methods and research findings. *J. Environ. Psychol*. 19:369–382.

Gelici-Zeko, M. M., D. Lutters, R. T. Klooster, and P. L. G. Weijzen. 2013. Studying the influence of packaging design on consumer perceptions (of dairy products) using categorizing and perceptual mapping. *Packag. Technol. and Sci*. 26(4):215–228.

Ghali-Zinoubi, Z. 2022. Examining drivers of environmentally conscious consumer behavior: Theory of planned behavior extended with cultural factors. *Sustainability* 14:8072.

Green, P. E., A. M. Krieger, and Y. Wind. 2001. Thirty years of conjoint analysis: Reflections and prospects. *Interfaces* 31:56–73.

Green, P. E., and V. Srinivasan. 1978. Conjoint analysis in consumer research: Issues and outlook. *J. Consum. Res*. 5(2):103–123.

Grewal, A. S., A. Singla, P. Kamboj, and J. S. Dua. 2017. Pesticide residues in food grains, vegetables and fruits: A hazard to human health. *J. Med. Chem. Toxicol*. 2(1):40–46.

Griskevicius, V., J. M. Tybur, and B. V. den Bergh. 2010. Going green to be seen: Status, reputation, and conspicuous conservation. *J. Pers. Soc. Psychol*. 98(3):392–404.

Hadi, N. U., N., Abdullah, and I., Sentosa. 2016. An easy approach to exploratory factor analysis: Marketing perspective. *Journal of Educational and Social Research*. 6(1):215–223.

Hamzaoui-Essoussi, L., and J. D. Linton. 2010. New or recycled products: How much are consumers willing to pay? *J. Consum. Mark*. 27(5):458–468.

Hao, Y., H. Liu, H. Chen, Y. Sha, H. Ji, and J. Fan. 2019. What affects consumers' willingness to pay for green packaging? Evidence from China. *Resour. Conserv. Recycl*. 141:21–29.

Hartmann, P., and V. Apaolaza-Ibáñez. 2012. Consumer attitude and purchase intention toward green energy brands: The roles of psychological benefits and environmental concern. *J. Bus. Res*. 65:1254–1263.

Hedlund, T. 2011. The impact of values, environmental concern, and willingness to accept economic sacrifices to protect the environment on tourists' intentions to buy ecologically sustainable tourism alternatives. *Tour. Hosp. Res*. 11:278.

Heo, J., and S. Muralidharan. 2017. What triggers young Millennials to purchase eco-friendly products? The interrelationships among knowledge, perceived consumer effectiveness, and environmental concern. *J. Mark. Commun*. 25(4):421–437.

Herbes, C., C. Beuthner, and I. Ramme. 2020. How green is your packaging—A comparative international study of cues consumers use to recognize environmentally friendly packaging. *Int. J. Consum. Stud*. 44:258–271.

Herrmann, C., S. Rhein, and K. F. Sträter. 2022. Consumers' sustainability-related perception of and willingness-to-pay for food packaging alternatives. *Resour. Conserv. Recycl*. 181:106219.

Hidalgo-Crespo, J., S. Coello-Pisco, H. Reyes-Venegas, M. Bermeo-Garay, J. L. Amaya, M. Soto, and A. Hidalgo-Crespo. 2022. Understanding citizens' environmental concern and their pro-environmental behaviours and attitudes and their influence on energy use. *Energy Rep*. 8:103–109.

Hubbe, M. A. 2014. Prospects for maintaining strength of paper and paperboard products while using less forest resources: A review. *BioResources* 9(1):1634–1763.

Irianto, H. 2015. Consumers' attitude and intention towards organic food purchase: An extension of theory of planned behavior in gender perspective. *Int. J. Manag. Econ. Soc. Sci*. 4(1):17–31.

iiMedia Research Report, 2024. Research Report on Industrial Operation and Big Data of Consumption Insight of Chinese Tea Bags Industry from to 2023–2024. https://www.iimedia.cn/c400/94285.html (in Chieses, accessed 16.07.2024).

Järvinen, J., H. E. Ilgın, and M. Karjalainen. 2022. Wood preservation practices and future outlook: Perspectives of experts from Finland. *Forests* 13(7):1044.

Jochem, D., M. Bösch, H. Weimar, and M. Dieter. 2021. National wood fiber balances for the pulp and paper sector: An approach to supplement international forest products statistics. *Forest Policy Econ*. 131:102540.

Johansson, M. T., S. Broberg, and M. Ottosson. 2021. Energy strategies in the pulp and paper industry in Sweden: Interactions between efficient resource utilisation and increased product diversification. *J. Clean. Prod*. 311:127681.

Kamleitner, B., C. Thürridl, and B. A. Martin. 2019. A Cinderella story: How past identity salience boosts demand for repurposed products. *J. Mark*. 83(6):76–92.

Kautish, P., J. Paul, and R. Sharma. 2019. The moderating influence of environmental consciousness and recycling intentions on green purchase behavior. *J. Clean. Prod*. 228:1425–1436.

Ketchen, D. J., and C. L. Shook. 1996. The application of cluster analysis in strategic management research: an analysis and critique. *Strategic management journal*. 17(6):441–458.

Kim, Y., and H. Han. 2010. Intention to pay conventional-hotel prices at a green hotel—A modification of the theory of planned behavior. *J. Sustain. Tour*. 18(8):997–1014.

Kuah, A. T., and P. Wang. 2020. Circular economy and consumer acceptance: An exploratory study in East and Southeast Asia. *J. Clean. Prod*. 247:119097.

Lampe, M., and G. M. Gazda. 1995. Green marketing in Europe and the United States: An evolving business and society interface. *Int. Bus. Rev*. 4(3):295–312.

Lee, K. 2008. Opportunities for green marketing: Young consumers. *Mark. Intell. Plan*. 26(6):573–586.

Li, G., W. Li, Z. Jin, and Z. Wang. 2019. Influence of environmental concern and knowledge on households' willingness to purchase energy-efficient appliances: A case study in Shanxi, China. *Sustainability* 11:1073.

Liang, Z., H. Deng, H. Xie, B. Chen, M. Sun, and Y. Wang. 2023. Rethinking the paper product carbon footprint accounting standard from a life-cycle perspective. *J. Clean. Prod*. 393:136352.

Lima Filho, T., S. M. Della Lucia, R. M. Lima, and V. P. R.Minim. 2015. Conjoint analysis as a tool to identify improvements in the packaging for irradiated strawberries. *Food Research International*. 72:126–132.

Lin, Y., J. Li, and L. Xiang. 2022. Exploring the role of green government publicity influencing people's pro-environmental behaviors. *Front. Psychol*. 13:973160.

Lindh, H., A. Olsson, and H. Williams. 2016. Consumer perceptions of food packaging: Contributing to or counteracting environmentally sustainable development? *Packag. Technol. Sci*. 29(1):3–23.

Liu, P., M. Segovia, E. C. Y. Tse, and R. M. Nayga. 2022. Become an environmentally responsible customer by choosing low-carbon footprint products at restaurants: Integrating the elaboration likelihood model (ELM) and the theory of planned behavior (TPB). *J. Hosp. Tour. Manag*. 52:346–355.

Luo, W., M. Kanzaki, and K. Matsushita. 2017. Promoting green buildings: Do Chinese consumers care about green building enhancements? *Int. J. Consum. Stud*. 41(5):545–557.

Maciel, E. D. S., L. K. Savay-da-Silva, J. S. Vasconcelos, J. A. Galvão, J. G. Sonati, D. D. Silva, and M. Oetterer. 2013. Application of

exploratory factor analysis to assess fish consumption in a university community. *Food Science and Technology*. 33:99–106.
Madushanka, G., and V. R. Ragel. 2016. Consumer's attitude towards green packaging: A study on Trincomalee District. *J. Mark.* 1(2):18–27.
Magnier, L., and J. Schoormans. 2015. Consumer reactions to sustainable packaging: The interplay of visual appearance, verbal claim and environmental concern. *J. Environ.* Psychol. 44:53–62.
Magnier, L., R. Mugge, and J. Schoormans. 2019. Turning ocean garbage into products—Consumers' evaluations of products made of recycled ocean plastic. *J. Clean. Prod*. 215:84–98.
Marcelino, D., and T. Widodo. 2021. Consumer environment responsibility and concern on green consumption: Unavailability of eco-product moderation. *Trikonomika* 20(2):71–81.
Martinho, G., A. Pires, C. Portela, and M. Fonseca. 2015. Factors affecting consumers' choices concerning sustainable packaging during product purchase and recycling. *Resour. Conserv. Recycl*. 103:58–68.
Maziriri, E. T. 2020. Green packaging and green advertising as precursors of competitive advantage and business performance among manufacturing small and medium enterprises in South Africa. *Cogent Bus. Manag*. 7:719586.
Meherishi, L., S. A. Narayana, and K. S. Ranjani. 2019. Sustainable packaging for supply chain management in the circular economy: A review. *J. Clean. Prod*. 237:117582.
Meng, M. D., and R. B. Leary. 2021. It might be ethical, but I won't buy it: Perceived contamination of, and disgust towards, clothing made from recycled plastic bottles. *Psychol. Mark*. 38(2):298–312.
Micklethwaite, P. 2004. The "recycled consumer"—Evidence and design implications. *In:* Design and Manufacture for Sustainable Development. B. Hon (Ed.). John Wiley and Sons, New York. pp. 77–89.
Mobley, A. S., T. S. Painter, E. M. Untch, and H. R. Unnava. 1995. Consumer evaluation of recycled products. *Psychol. Mark.* 12(3):165–176.
Molina-Besch, K., and H. Pålsson. 2015. A supply chain perspective on green packaging development theory versus practice. *Packag. Technol. Sci.* 29:45–63.
Núñez-Cacho, P., J. C. Leyva-Díaz, J. Sánchez-Molina, and R. Van der Gun. 2020. Plastics and sustainable purchase decisions in a circular economy: The case of Dutch food industry. *PLoS ONE* 15(9):e0239949.
Oloyede, O. O., and S. Lignou. 2021. Sustainable paper-based packaging: A consumer's perspective. *Foods* 10:1035.
Otto, S., M. Strenger, A. Maier-Nöth, and M. Schmid. 2021. Food packaging and sustainability—Consumer perception vs. correlated scientific facts: A review. *J. Clean. Prod*. 298:126733.
Osburg, V. S., M. Strack, and W. Toporowski. 2016. Consumer acceptance of Wood-Polymer Composites: a conjoint analytical approach with a focus on innovative and environmentally concerned consumers. *Journal of Cleaner Production*. 110:180–190.
Pham, T. H., T. N. Nguyen, T. T. H. Phan, and T. H. Nguyen. 2019. Evaluating the purchase behavior of organic food by young consumers in an emerging market economy. *J. Strat. Mark.* 27(6):540–556.
Poças, F. M., and T. Hogg. 2006. Exposure assessment of chemicals from packaging materials in foods: A review. *Trends Food Sci. Technol*. 18:219–230.
Popovic, I., B. A. Bossink, & P. C. van Der Sijde. 2019. Factors influencing consumers' decision to purchase food in environmentally friendly packaging: What do we know and where do we go from here? *Sustainability*. 11(24):7197.
Polyportis, A., R. Mugge, and L. Magnier. 2022. Consumer acceptance of products made from recycled materials: A scoping review. *Resour. Conserv. Recycl*. 186:106533.
Qader, I. K. A., and Y. Zainuddin. 2010. Intention to purchase green electronic products: The consequences of perceived government legislation, media exposure and safety and health concern and the role of attitude as mediator. *Int. J. Innov. Manag. Technol*. 1(4):432–440.
Qing, P., and C. Li. 2005. An empirical study of college students' environmentally friendly consumption behavior. Ecol. Econ. 6:63–66, 77.
Queiroz, F. C. B. P., N. C. Lima, C. L. da Silva, J. V. Queiroz, and G. H. S. de Souza. 2021. Purchase intentions for Brazilian recycled PET products—Circular economy opportunities. *Recycling* 6(4):75.
Punj, G., and D. W. Stewart. 1983. Cluster analysis in marketing research: Review and suggestions for application. J. *Mark. Res*. 20(2):134–148.
Roberts, J. A. 1996. Will the real socially responsible consumer please step forward? *Bus. Horiz*. 39(1):79–83.
Rokka, J., and L. Uusitalo. 2008. Preference for green packaging in consumer product choices-do consumers care? *Int. J. Consum. Stud*. 32:516–525.
Rondoni, A., and S. Grasso. 2021. Consumers behaviour towards carbon footprint labels on food: A review of the literature and discussion of industry implications. *J. Clean. Prod*. 301:127031.
Rucker, M. 2009. Consumer perceptions of recycled textile fibers. In: Sustainable Textiles: Life Cycle and Environmental Impact. R. S. Blackburn (Ed.). Elsevier, Amsterdam. pp. 203–213.
Scholz, S. W., and R. Decker. 2007. Measuring the impact of wood species on consumer preferences for wooden furniture by means of the Analytic Hierarchy Process. *Forest products journal*. 57(3): 23.
Schultz, P. W., C. Shriver, J. J. Tabanico, and A. M. Khazian. 2004. Implicit connections with nature. *J. Environ. Psychol*. 24:31–42.
Scott, L., and D. Vigar-Ellis. 2014. Consumer understanding, perceptions and behaviours with regard to environmentally friendly packaging in a developing nation. *Int. J. Consum. Stud*. 38(6):642–649.
Shen, C., and Y. Wang. 2023. How does public concern about climate change affect carbon emissions? Evidence from large-scale online content and provincial-level data in China. *J. Clean. Prod*. 426:139137.
Siracusa, V., P. Rocculi, S. Romani, and M. D. Rosa. 2008. Biodegradable polymers for food packaging: A review. *Trends Food Sci. Technol*. 19:634–643.
Singh, S., and R. Rana. 2017. Study of consumer perception of digital payment mode. *Journal of internet banking and commerce*. 22(3):1–14.
Steenis, N. D., E. van Herpen, I. A. van der Lans, T. N. Ligthart, and H. C. M. van Trijp. 2017. Consumer response to packaging design: The role of packaging materials and graphics in sustainability perceptions and product evaluations. *J. Clean. Prod*. 162:286–298.
Stranieri, S., E. C. Ricci, and A. Banterle. 2017. Convenience food with environmentally-sustainable attributes: A consumer perspective. *Appetite* 116:11–20.
Suciu, N., F. Tiberto, S. Vasileiadis, L. Lamastra, and M. Trevisan. 2013. Recycled paper-paperboard for food contact materials: Contaminants suspected and migration into foods and food simulant. *Food Chem*. 141(4):4146–4151.
Sun, H., and J. Li. 2021. Behavioural choice of governments, enterprises and consumers on recyclable green logistics packaging. *Sustain. Prod. Consum*. 28:459–471.
Sun, H., P. L. Teh, and J. D. Linton. 2018. Impact of environmental knowledge and product quality on student attitude toward products with recycled/remanufactured content: Implications for environmental education and green manufacturing. *Bus. Strat. Environ*. 27(7):935–945.
Susilo, A. 2020. Identifying factors that affect consumer satisfaction of Parklatz cafe in Ponorogo city, East Java, Indonesia: An application of exploratory factor analysis. *Falah: Jurnal Ekonomi Syariah*. 5(1):1–14.
Svanes, E., M. Vold, H. Møller, M. K. Pettersen, H. Larsen, and O. J. Hanssen. 2010. Sustainable packaging design: A holistic methodology for packaging design. *Packag. Technol. Sci*. 23:161–175.
Testa, F., V. Di Iorio, J. Cerri, and G. Pretner. 2021. Five shades of plastic in food: Which potentially circular packaging solutions are Italian consumers more sensitive to. *Resour. Conserv. Recycl*. 173:105726.
Tezer, A., and H. O. Bodur. 2020. The greenconsumption effect: How using green products improves consumption experience. *J. Consum. Res*. 47(1):25–39.
Thøgersen, J. 1999. The ethical consumer. Moral norms and packaging choice. *J. Consum. Policy* 22:439–460.
Tobler, C., V. H. M. Visschers, and M. Siegrist. 2011. Eating green, consumers' willingness to adopt ecological food consumption behaviors. *Appetite* 57:674–682.
Todua, N. U. G. Z. A. R., and T. Dotchviri. 2015. ANOVA in marketing research of consumer behavior of different categories in georgian market. *Annals of the "Constantin Brâncusi" University of Târgu Jiu, Economy Series*. (1):183–190.
Trivedi, V., P. Joshi, K. N. Chatterjee, and G. Pal Singh. 2023. Effect of demographic factors and apparel product categories on online impulse buying behaviour of apparel consumers. *Textile and Leather Review*. 6, 57–77.
Van Bossuyt, M., E. Van Hoeck, T. Vanhaecke, V. Rogiers, and B. Merten. 2016. Printed paper and board food contact materials as a potential source of food contamination. *Regul. Toxicol. Pharmacol*. 81:10–19.
Van Dam, Y. K. 1996. Environmental assessment of packaging: The consumer point of view. *Environ. Manag*. 20(5):607–614.

Venter, K., D. Van Der Merwe, H. De Beer, E. Kempen, and M. Bosman. 2011. Consumers' perceptions of food packaging: An exploratory investigation in Potchefstroom, South Africa. *Int. J. Consum. Stud.* 35:273–281.

Vyshak, P. K., T. K. Jayarajan, and P. K. Vishnu. 2022. Why do consumers make purchase decisions? Exploring fast moving consumer goods as an emerging market. *Asian J. Manag*. 13(4):351–357.

Wu, J., H. Liao, J. W. Wang, and T. Chen. 2019. The role of environmental concern in the public acceptance of autonomous electric vehicles: A survey from China. *Transp. Res. F: Traffic Psychol. Behav*. 60:37–46.

Xu, X., S. Wang, and Y. Yu. 2019. Consumer's intention to purchase green furniture: Do health consciousness and environmental awareness matter? *Sci. Total Environ*. 704:135–275.

Yilmaz, B. S., and B. Ilter. 2017. Motives underlying organic food consumption in Turkey: Impact of health, environment, and consumer values on purchase intentions. *Econ. World* 5(4):333–345.

Yokoyama, R., T. Nozawa, M. Sugiura, Y. Yomogida, H. Takeuchi, Y. Akimoto, S. Shibuya, and R. Kawashima. 2014. The neural bases underlying social risk perception in purchase decisions. *NeuroImage* 91:120–128.

Young, S. 2008. Packaging and the environment: A cross-cultural perspective. *Des. Manage. Rev*. 19(4):42–48.

Young, W., K. Hwang, S. McDonald, and C. J. Oates. 2010. Sustainable consumption: Green consumer behaviour when purchasing products. *Sustain. Dev*. 18:20–31.

Yu, D. 2011. Exploration of the road of green packaging development in the context of low carbon economy. *Jiangxi Soc. Sci*. 31(12): 225–229.

Yue, B., G. Sheng, S. She, and J. Xu. 2020. Impact of consumer environmental responsibility on green consumption behavior in China: The role of environmental concern and price sensitivity. *Sustainability* 12:2074.

Zhang, G., and Z. Zhao. 2012. Green packaging management of logistics enterprises. *Phys. Procedia* 24:900–905.

Zhou, F. 2014. The theory of green packaging design and its application. *Appl. Mech. Mater*. 635–637:248–252.

Zimmermann, T. M., J. Clouth, M. Elosge, M. Heurich, E. Schneider, S. Wilhelm, and A. Wolfrath. 2013. Patient preferences for outcomes of depression treatment in Germany: a choice-based conjoint analysis study. *Journal of affective disorders*. 148:210–219.

Zidehsaraei, M., M. H. Javadi, and I. Shakerinia. 2022. The role of psychological factors in customers' purchase intention and willingness to pay for home energy management system. *Q. J. Advert. Sales Manag*. 3(3):118–136.

Appendix

Questionnaire

Dear Sir/Madam:

Hello! This questionnaire aims to understand consumers' environmentally friendly consumption preferences regarding green packaging. The survey results will be used for academic research purposes and will be completely anonymous. We anticipate that it will take approximately 5–10 minutes of your time. Thank you for your cooperation and contribution to environmental protection!

Background Introduction:

Recycled paper is a type of paper produced through a series of processes such as sorting, purification, pulping, and papermaking, using waste paper as raw material. It is regarded as an environmentally friendly paper with low energy consumption, minimal pollution, and the ability to conserve forests. Currently, recycled paper products have wide applications, including newspapers, paper egg cartons, and more. They are globally recognized as pollution-free, technologically advanced, and environmentally friendly packaging products.

Have you read the paragraph on recycled paper carefully [Single-choice question]*

○ Yes
○ No

I. Here are 8 simulated tea bag products. Please rank them based on your personal preferences (1–8, with 1 being the most preferred and 8 being the least preferred).

Notes:

1. The **green fonts** indicate that the mentioned packaging is green packaging.

2. Corn fiber is a material made from fermented starches such as corn and wheat. It is biodegradable and nontoxic to human.

[Ranking question, please fill in the numbers within the brackets in order.]

Products	Sorting
 ¥25 Plain Paper Plain Paper Nylon	
 ¥30 Plain Paper Plastic Corn Fiber	
 ¥20 Plain Paper Plastic Nylon	
 ¥25 Recycled Paper Plastic Corn Fiber	
 ¥20 Recycled Paper Plain Paper Corn Fiber	
 ¥30 Recycled Paper Plain Paper Nylon	
 ¥20 Recycled Paper Plastic Nylon	
 ¥20 Plain Paper Plain Paper Corn Fiber	

II. Please select the option from the following descriptions that best matches your situation. (Attitude)

Affective attitude	Very unhappy	Somewhat unhappy	Neutral	Somewhat happy	Very happy
A1.When purchasing products with recycled paper packaging, I feel	○	○	○	○	○
	Very unwise	Somewhat unwise	Neutral	Somewhat wise	Very wise
A2. I feel purchasing products with recycled paper packaging is	○	○	○	○	○
	Very harmful	Somewhat harmful	Neutral	Somewhat beneficial	Very beneficial
A3. I feel recycled paper packaging products in general are	○	○	○	○	○
	Very unimportant	Somewhat unimportant	Neutral	Somewhat important	Very important
A4. I feel purchasing recycled paper packaging products is	○	○	○	○	○
	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
A5. Purchasing products packaged with recycled paper makes me feel like I have done something meaningful.	○	○	○	○	○
	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
A6. I would have a positive impression of brands that use recycled paper packaging.	○	○	○	○	○
Cognitive attitude	Very unclear	Somewhat unclear	Neutral	Somewhat clear	Very clear
C1. My level of understanding regarding recycled paper packaging is	□	□	□	□	□
C2. My level of understanding regarding the environmental friendliness of recycled paper packaging is	□	□	□	□	□
C3. My level of understanding regarding the safety of recycled paper packaging is	□	□	□	□	□

III. Please select the option from the following descriptions that best matches your situation. (Subjective norm)

Subjective norm	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
SN1. My family is supportive of my purchasing products with renewable paper packaging.	○	○	○	○	○
SN2. Most of my friends around me would purchase products with renewable paper packaging.	○	○	○	○	○
SN3. My family members actively purchase products with renewable paper packaging.	○	○	○	○	○
SN4. My colleagues and classmates have a positive attitude towards my purchase of products with renewable paper packaging.	○	○	○	○	○

IV. Please select the option below that best matches your situation. (Environmental concern)

Environmental concern	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
EC1. I care about the environment.	○	○	○	○	○
EC2. I believe that every household should take responsibility for their impact on the environment.	○	○	○	○	○
EC3. I believe that the responsibility to protect the environment is a moral obligation.	○	○	○	○	○
EC4. Our society should make more efforts to protect the environment.	○	○	○	○	○

V. Please select the option below that best matches your situation. (Carbon concern)

Carbon concern	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
CC2. I understand what greenhouse gas is.	○	○	○	○	○
CC3. I understand what carbon emissions are.	○	○	○	○	○
CC4. I know about efforts to decrease carbon emissions.	○	○	○	○	○
CC1. I care about the issue of global warming.	○	○	○	○	○
CC7. I prioritize low-carbon behavior in my daily life.	○	○	○	○	○
CC8. I am willing to do my part to reduce carbon emission.	○	○	○	○	○

Your gender: [Single-choice question] A. Male B. Female
Your age is _____ [fill in the blank]
What is the average monthly income per person in your household?
[Single-choice question]
○ Less than 1,000 RMB ○ 1–3,000 RMB ○ 3–5,000 RMB ○ 5–10,000 RMB
○ 10–20,000 RMB ○ 20–35,000 RMB ○ Above 35,000 RMB
Your household size is _____ [fill in the blank]
Your hometown is _____ province _____ city _____ county _____ town _____
commune _____ village [fill in the blank]
Your family member's work background is [Single-choice question]
○ Government agencies ○ Institutions ○ State enterprises ○ Foreign enterprises
○ Private enterprises ○ Nonprofit organizations ○ Freelance