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# Consumer Purchase Intention and the Packaging Lifecycle: Evaluating End-of-Life Literacy for Bioplastics in Bangladesh

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## Abstract

Consumer awareness of bioplastic packaging is gaining significance in Bangladesh's journey towards a circular economy due to the rising amount of plastic waste generated by packaging and the scarcity of end-of-life infrastructure. This study explores the factors that influence willingness to pay a premium (WPP) for bioplastic packaging, and the intervening effect of green purchase intention (GPI) on this relationship. The study is based on cross-sectional survey data of 208 consumers in urban Bangladesh, and employs a hierarchical multiple regression analysis with heteroscedasticity-consistent robust standard errors. Bioplastic lifecycle literacy proved to be the most consistent and strongest predictor of WPP (Willingness to Pay Premium), whereas environmental concern was positively correlated with WPP (Willingness to Pay Premium) but the relationship was greatly reduced after the inclusion of GPI (Green Purchase Intention), suggesting partial mediation and an attitude–behaviour gap. GPI (Green Purchase Intention) was a significant predictor of WPP (Willingness to Pay Premium), while perceived consumer effectiveness and perceived greenwashing risk were not significant. The visual attractiveness of packaging was found to have a significant positive direct effect on WPP (Willingness to Pay Premium), but did not moderate the relationship between GPI (Green Purchase Intention) and WPP (Willingness to Pay Premium). The results highlight the need to provide clear and lifecycle-specific sustainability information and also to keep a credible and premium packaging proposition in Bangladesh.

**Keywords:** Bioplastic packaging; Lifecycle literacy; Green purchase intention; Willingness to pay a premium; Circular economy; Bangladesh; Sustainable consumer behaviour.

# 1. Introduction

With the increasing plastic waste in the world, plastic packaging waste has turned into a major problem in the environment. Consistent with a general pattern, production and disposal remains a strain on waste-management systems (Geyer, Jambeck, & Law, 2017). As a result, bioplastic packaging has become a prominent alternative to conventional plastic. Bioplastics, however, exhibit an environmental value, which relies not only on the material itself, but how consumers perceive the characteristics, claims and appropriate disposal.

Consumer knowledge and consumer decision-making is important because of this; representing one of the steps to more sustainable packaging. The problem is more relevant in Bangladesh where consumers are getting exposed. From identifying claims to green, biodegradable and compostable packaging, to the collection and recycling of such materials; infrastructure for treatment of such materials is still in its infancy (Zakir & Biswas, 2025). Consumers need to be more aware of the presence of sustainable packaging in the market; make choices despite knowledge and/or trust in sustainability claims varies among individuals, and subjective assessment of products worth. However, not everyone who cares about the environment will act. Research on there has long been an awareness that green consumption needs to find a different way to differentiate itself from its users' concern for the environment problems and preparedness to take economically costly decisions (Kollmuss & Agyeman, 2002). This is particularly important with regard to bioplastics packaging, where environmental benefits are not immediately apparent and consumers have to make decisions about whether, for a sustainable option, they rely on information, perceived effectiveness and trust that this option is the better one to be paying more for.

The study of sustainable packaging preferences and food-label information is underway in Bangladesh. The factors for the adoption of these technologies encompass knowledge, and green supply-chain perceptions (Mollah, 2024), (Abir, Islam, Munira, Probal, & Rahman, 2025). Nevertheless, these factors at the consumer level have not been combined in previous studies to explain how the willingness to pay a premium for knowledge and environmental perceptions may translate into a willingness to pay a premium for bioplastic packaging. In particular, there is not a lot of focus in the literature on the role of the perceived effectiveness of the information and concern about the environment are important prerequisites for bioplastic lifecycle literacy. Perceived effectiveness of information and environmental concern are important prerequisites for bioplastic lifecycle literacy. The perceived greenwashing risk and green purchase intention along with packaging related aspects were the three areas of interest. factors. This leaves a big window of ignorance regarding the pathway from environmental awareness to real purchase commitment in the Bangladeshi context.

To fill this void, the present study explores the factors related to consumers' willingness to pay premium price for bioplastic packaging in Bangladesh. Guided by and building on an extension of the Theory of Planned Behavior (Ajzen, 1991), this study positions consumers' bioplastic literacy, environment concern and greenwashing risk perception as antecedents, with green purchase intention serving as the central mechanism linking these factors to willingness to pay. Access to infrastructure, the packaging visual attractiveness is further investigated as potential factors influencing this relationship.

Overall, the study's purpose is to investigate the relationships of these constructs and how they all collectively influence consumers' willingness to pay a premium for bioplastic packaging. In particular, it

looks at the direct links between the proposed antecedents and willingness to pay, the intervening role of green purchase intention in that link, and potential links between infrastructure access and packaging visual attractiveness with the green purchase intention-willingness to pay link.

Academically, it builds upon existing literature by integrating consumer knowledge, information and preferences in packaging design. By incorporating such factors, it was possible to carry out the research on sustainable packaging in Bangladesh. Three factors which are: environmental perceptions, purchase intention and willingness to pay; could be combined into one framework.

The results are practically significant in that they may provide businesses and policy makers with insight into if consumers are more likely to support sustainable packaging when they have greater control over the choice of package, knowledge about the lifecycle, increased confidence in the environmental claims, and positive environmental outcomes. Perceptions of the product and the surrounding infrastructure. The study aims at finally to: explain the process that consumers go through from being aware and concerned to having the intent to shop for a purchase. Agency for greater premium on sustainable packaging.

# 2. Literature Review

## 2.1 Employing bioplastic packaging as a Lifecycle System

The scale of plastic production and waste, as documented by (Geyer, Jambeck, & Law, 2017), is the starting point for the environment case on alternatives to conventional plastic packaging. Substitution, however, is not a material only decision. Bioplastic is a broader term and is not a sign of environmental excellence. Bio-based does not mean biodegradable and biodegradation and compostability are based on specific biological and environmental conditions (Emadian & Onay, 2017); (Boz & Korhonen, 2020). To provide conceptual clarity, the term bioplastic packaging is used as the focal term in this review. Organic packaging is not synonymous, as it does not refer to specific feedstock, material characteristics and/or proven end-of-life path.

Environmental impacts of a bioplastic package rely on the entire forward and reverse supply chain. Upstream, package performance and material selection are important, downstream, label understanding, sorting, collection and treatment are important. An examination of biodegradation literature revealed that degradation is not a natural phenomenon that occurs solely due to the polymer properties and environmental conditions (Emadian & Onay, 2017). The behavioral problem identified by consumer studies. Although bio-based packaging received positive responses in some studies, results from a field experiment were not consistent with these findings (Taufik, Reinders, & Molenveld, 2020), and a large-scale survey in Australia revealed low levels of awareness and understanding of end-of-life management for bio-based packaging, although the perceptions were generally favorable (Dilkes-Hoffman, Ashworth, & Laycock, 2019). The consumer is not then seen as an end user in the supply chain. Operating conditions for circular material flows are consumer recognition and sorting.

More recently, synthesis confirms this systems perspective. The barriers were grouped into an umbrella review of bioplastics demand under the following categories: Awareness, Knowledge, Perceptions, Expectations, Social influence and Policy/Regulatory conditions (Domingos, Farias, & Possidónio, 2025). Such categories are inter-organizational. Information can diminish uncertainty but it cannot overcome a poorly designed collection system, unclear claims or a product that consumers don't value. The research

model is consequently strongest when read as a consumer-facing extension of a supply-chain problem rather than as a stand-alone attitude model.

## 2.2 Theoretical Framing and the Premium-Payment Outcome

The model starts from the theory of planned behavior. It assumes that intention is the most immediate psychological determinant of behavior and that intention is mediated by attitudes, perceived social pressure and perceived behavioral control (Ajzen, 1991). The present model is not a direct replication of that theory, but rather an extension. Perceived bioplastic lifecycle literacy, environmental concern, perceived consumer effectiveness and perceived greenwashing risk serve as informational and evaluative antecedents. The proposed proximal mechanism is green purchase intention, and willingness to pay a premium is a stated economic commitment. Proposed boundary conditions are the infrastructure access and the visual attractiveness of the packaging. The theory can provide support for the ordering of beliefs to intentions to actions, but it cannot guarantee the validity of all the direct, mediating and moderating paths used in this packaging context.

Accepting a premium is less than overall product acceptance and less than actual purchasing. It questions the viability of the environmental proposition in the face of price trade-offs. Similarly, a cross-sectional packaging study found a positive relationship between pro-environmental package evaluations and willing to pay more, but that familiarity has the potential to change this relationship (De Canio, 2023). A hypothetical bottle-choice experiment also identified linkages between attitude and reported choice and willingness to pay for premiums (Zwicker & Brick, 2023). These studies confirm the relevance of premium payment as an outcome, but, neither observe repeated market behavior nor test the current Bangladesh model. Willingness to pay a premium in this study should therefore be taken at face value and not as realized revenue, confirmed adoption, or correct post-use behavior.

## 2.3 Perceived Bioplastic Lifecycle Literacy

The provided model classifies the focal knowledge construct as ‘organic or bioplastic lifecycle literacy’ (OLL). The survey questions give greater specificity to the construct: they include questions about whether or not participants can separate recyclable packaging from compostable packaging and, whether they know what happens when they mix compostable packaging with regular plastic packaging. OLL can thus be said to be perceived bioplastic lifecycle literacy. It is perceived because the items tap into self-assessed understanding instead of performance on an independent scored knowledge test. This separation allows confidence to be taught as validated technical expertise.

There is previous evidence to suggest that lifecycle literacy could be important, and there is also previous evidence to suggest that it would be unsafe to make a claim from knowledge to payment. (Dilkes-Hoffman, Ashworth, & Laycock, 2019) discovered that consumers had little knowledge of bioplastics and were unsure of their disposal. (Taufik, Reinders, & Molenveld, 2020) demonstrated that there is no conflict between environmental attractiveness of the pack and disposal mistakes. The participants also used graphical cues and lay beliefs that were not always congruent with the LCA results in packaging experiments (Steenis, van Herpen, & van der Lans, 2017). In the same vein, the latest umbrella review highlights several persistent challenges for the bioplastics market, including low awareness, lack of knowledge, and distorted perceptions, as well as misinformation about bioplastics (Domingos, Farias, & Possidónio, 2025).

The combination of these results suggests a “cautious mechanism.” An increase in perceived literacy can decrease uncertainty and make the actual benefits more easily judged, which can lead to a decrease in the need for verification and increase intention to green purchase and WPP. But overconfidence, inaccurate labels or a lack of disposal infrastructure can disrupt the process. The reviewed studies do not provide direct evidence of OLL-WPP effect in Bangladesh. It is therefore not just a conclusion to be drawn from the literature, but a testing of that relationship that is an honest empirical goal.

## 2.4 Environmental Concern and Perceived Consumer Effectiveness

Environmental concern is the consumer's concern about environmental issues. The belief that personal buying or disposal decisions can make a difference is more action-specific, and is perceived consumer effectiveness. The distinction is important because there's a sense of concern without agency; agency can be diffused across behaviors. In the early evidence, perceived consumer effectiveness was found to be a distinct, separable construct from general concern and its importance varied by environmental action (Ellen, The role of perceived consumer effectiveness in motivating environmentally conscious behaviors, 1991). In this model, concern provides the motivation to care about lower impact packaging, and perceived effectiveness provides a motivation to believe paying/switching will have an impact.

Both of these are not payment guarantees. Studies examining pro-environmental behavior have found that there is a longstanding mismatch between awareness, attitudes and behavior, since habits, costs, social context and external barriers come in the way (Kollmuss & Agyeman, 2002). Another study on green purchase behavior also revealed that environmental concern is also a factor which complements price, availability, product attributes, trust and other situational factors (Joshi, 2015). Packaging research similarly arrives at the same practical conclusion; when making a choice, there is competition between the perception of environmental benefits of packaging and cost and functionality (Boz & Korhonen, 2020). Based on this, environmental concern and perceived effectiveness might be directly related to, or indirectly related to, WPP, or both. It is not possible to simply add up their relative contributions to form one pro-environmental attitude.

## 2.5 Perceived Greenwashing Risk and Information Credibility

Perceived greenwashing risk refers to the perceived belief that there is a discrepancy between the environmental claims and the actual performance. This isn't the opposite of being “concerned” about the environment. Weak claims might be particularly alarming to a highly concerned consumer. When the context is not a package, perceived greenwashing led to confusion among consumers and to their perception of risk, thus leading to a decrease in green trust (Chen & Chang, 2013). Experimental studies also indicate that when green advertising messages are in conflict with poor environmental practices, negative responses can be heightened (Nyilasy & Gangadharbatla, 2014). Both of these studies support the credibility mechanism, yet neither account for premium payment for bioplastic packaging.

Packaging is especially vulnerable to this threat as consumers are able to see or hear that a product is sustainable before they consider the material or end-of-life conditions. Even if sustainability objective measures of environmental performance remain unchanged, graphics can alter the perception of sustainability (Steenis, van Herpen, & van der Lans, 2017). There should thus be a credible link between the package and the verified material properties and a realistic pathway for disposal. The proposed negative relationships between perceived greenwashing risk and green purchase intention and WPP are theoretically

sound, but the studies analyzed do not directly support the negative relationships in the specific context of Bangladesh. Their claims are still untested.

## 2.6 Green Purchase Intention as Mediating Mechanism

The intention to purchase a product with a greener packaging is an individual's expressed intention or willingness to select the more environmentally friendly packaging option. Based on the extended theory of planned behavior, this construct can be situated between upstream beliefs and a price-premium decision since the construct of intention is more proximal to the decision than general concern or knowledge (Ajzen, 1991). Adjacent support comes from packaging research, with pro-environmental evaluations of packages being linked to reported willingness to pay for products (De Canio, 2023) and attitudes towards bio-based products being linked to hypothetical choices of bottles and premium willingness (Zwicker & Brick, 2023).

The mediation offer should be made in a disciplined manner, however. In the cited studies, it is not shown that green purchase intention is a mediator of the effects of OLL, environmental concern, perceived consumer effectiveness, and perceived greenwashing risk on WPP in one model. The attitude-behavior gap research also indicates that the gap between attitudes and behaviors can be bridged by price, convenience, product performance, or market access (Joshi, 2015). In the present study mediation is thus an empirical extension. It involves the estimation of specific indirect effects and the effects of green purchase intention after controlling for those indirect effects would not be sufficiently weak to constitute proof of mediation. Cross sectional self-report would not offer a clear temporal relationship; it would only be associational.

## 2.7 The Infrastructure Access and Packaging Visual Attractiveness

Infrastructure access" here means the ease of access to facilities to collect or drop off recyclable or compostable packaging. It is a consumer level view on a supply-chain capability, not an audit of treatment capacity. Accessible infrastructure might render a "green" option more believable and practical, as the intended end-of-life path may seem feasible. (Zakir & Biswas, 2025) in a review of bioplastics in Bangladesh, have identified some factors that hinder the scale of production such as underdeveloped production systems, cost, technological maturity, policy support, and public awareness. Other studies on Bangladesh's circular supply chains also highlight economic, regulatory, awareness and collaboration challenges (Noha, Ali, & Shah, 2023). The sources do not examine if infrastructure perceived access impacts the relationship between the green purchase intention and the WPP, but make an argument for doing so. This is an exploratory moderation.

Another boundary condition is packaging visual attractiveness as consumers will first see the design, before checking on the claims made by the claim. Experiments reveal that visual appearance and verbal environmental claims influence the environmental concern and hence the brand response and purchase response (Magnier & Schoormans, 2015). However, other research shows that package material and graphics can affect perceptions of sustainability, product quality, and product evaluation, and that consumer opinions can differ from life-cycle assessment (Steenis, van Herpen, & van der Lans, 2017). The value of a current desirable ‘green' option may therefore be enhanced by visual appeal, but also be able to be used as a ‘nonspecific' cue to raise doubts. The model should reflect the direct relationship of the model with WPP and the interaction between attractive design and green purchase intention without making an assumption that attractive design is always good.

## 2.8 Evidence from Bangladesh and the Supply-Chain Context

There is some relevant evidence from Bangladesh, which is scattered. Among 384 self-selected samples of young consumers, sustainable food and beverage packaging corresponded with the stated preferences, whereas price and environmental impact were major factors (Mollah, 2024). Another cross-sectional study with 397 university students revealed higher knowledge about food labels than reading the food labels and lower understanding of some symbols on food labels (Imran, Md. Entaduzzaman Jony, & Emon, 2025). These studies show some local interest in packaging and information, but none of them capture bioplastic lifecycle literacy and/or a price premium for verified bioplastic packaging, or the entire pathway described here. They also have predominantly young, non-probability samples that warn against generalization to the nation.

Research added by Supply Chain Insider proves useful at the consumer/supply-chain interface. (Abir, Islam, Munira, Probal, & Rahman, 2025) used 269 online responses to show that perceived green value and perceived green supply-chain compliance are associated with the purchase intention, whereas none of the green trust and the environmental attitude variables were statistically significant in their model. The pattern is significant because it demonstrates that a positive environmental orientation does not necessarily win out in value judgements. (Chowdhury & Mohammad, 2023) used perceived product quality and trustworthiness as the link between transparency in the supply chain and sustainable consumption in a convenience sample of 182 respondents, primarily young students. This discovery is in line with transparency of information as a mechanism of credibility, but it does not create a bioplastic WPP effect because the sample and the general sustainable-consumption result.

In addition to compliance in the supply chain, empirical consumer research in Bangladesh shows that there is an emerging market for green products. However, (Uddin Chowdhury & Alamgir, 2021) found that subjective norms and environmental concern are important determinants in predicting the green purchasing intention among young Bangladeshi consumers. In an extended TPB model, (Niloy & Sultana, 2023) created and validated the model, which highlighted the importance of perceived consumer effectiveness and environmental concern in influencing purchase intentions among urban consumers in Bangladesh, while financial and situational factors are often barriers to immediate economic action. This local finding is consistent with the international literature on consumer literature that indicates that environmental concern needs to be guided by proximal cognitive and intentional mechanisms to break the green price barrier (Barber, 2014); (Aqmar, 2026)

The other piece of the argument is provided by firm-level evidence. Following 196 responses and 25 invalid ones, (Helal, Uzzal, & Probal, 2024) analyzed responses from 171 manufacturing professionals and found that green purchasing and green manufacturing practices were linked to their self-reported environmental performances in Bangladesh. The outcome warrants the focus on operational practices but does not directly translate to intentions or premium payments in households. The bioplastics sector review by (Zakir & Biswas, 2025) and the circular supply-chain assessment by (Noha, Ali, & Shah, 2023) also identify constraints of production, policy, collection, and collaboration as a location of consumer awareness. These five journal articles offer real-life context of the Bangladesh supply chain, but not a replacement for consumer evidence in the construction.

## 2.9 Research Gap and Intended Contribution

However, the extensive statement that the research on sustainable packaging is lacking in Bangladesh is not supported by the literature reviewed. Local studies highlight preferences of youth consumers, food labelling, perceptions of green supply chains, transparency, circularity, firm-level environmental practices, and challenges in the bioplastics supply. Defensible space is reduced. The relationship between perceived bioplastic lifecycle literacy, environmental concern, perceived consumer effectiveness, and perceived greenwashing risk to WPP through green purchase intention is tested in a single study for the first time for Bangladesh. For the first time, the relationship between perceived bioplastic lifecycle literacy, environmental concern, perceived consumer effectiveness, and perceived greenwashing risk to WPP through green purchase intention is tested in a single study in Bangladesh.

A proposed contribution is thus integrative and conditional. It links consumers' thinking and doubts with the back-channel logistics environment required for bioplastic packaging to provide value. It also makes a distinction between a general desire to use green packaging and acceptance of a premium price. The study can estimate the associations in the sample surveyed and which paths are supported based on the provided cross-sectional survey data for 208 respondents. It cannot demonstrate the effects on the temporal causality, actual payment patterns, proper disposal, lifecycle performance, or national representative effects without further design evidence. The defining of these boundaries maintains the value of the model and helps to avoid overstating the literature review.

# 3. Research Objectives

## 3.1 Overall Objective

The purpose of the study was to understand the mediating role of green purchase intention and boundary conditions (infra-structural support and packaging visual attractiveness) of the relationship between bioplastic lifecycle literacy, environmental concern, perceived consumer effectiveness and willingness to pay a price premium for sustainable packaging among consumers in Bangladesh.

## 3.2 Specific Objectives

1. To assess the psychometric reliability, multicollinearity and distribution of the study constructs in an urban Bangladeshi consumer sample (N=208).
2. To examine the direct linkages between bioplastic lifecycle literacy (OLL), environmental concern (EC), perceived consumer effectiveness (PCE), perceived greenwashing risk (PGR) and willingness to pay a premium (WPP).
3. To assess the mediating effect of green purchase intention (GPI) between the preceding constructs and the acceptance of premium using hierarchical regression coefficient attenuation.
4. To determine the relationship between the packaging visual attractiveness (PVA) and willingness to pay a premium.
5. To examine if the relationship between green purchase intention and willingness to pay a premium is moderated by the perceived infrastructure access (IA) and the packaging visual attractiveness (PVA) by using the mean-centered interaction terms between green purchase intention and perceived

infrastructure access (IA) as well as between the green purchase intention and perceived packaging visual attractiveness (PVA).

# 4. Research Methodology

## 4.1 Research Philosophy

The current study follows a positive philosophy of research as it views consumer attitudes towards bioplastic food packaging as measurable constructs as opposed to individual, personal interpretations of these experiences (Saunders & Lewis, 2019). This selection pursues straight from the research goal. The objective and quantifiable attitude was the obvious choice because the intent was to determine if there were any specific factors like literacy, concern, perceived effectiveness that actually predicted willingness to pay. A deductive method was also used where the research model and its seven hypotheses were first developed, based on the literature review of consumer-behavior and circular-economy (Geissdoerfer, Savaget, & Bocken, 2017), and a survey was conducted to test their pre-defined relationships in a Bangladeshi context.

## 4.2 Research Design

A quantitative, cross sectional survey design was used (Saunders & Lewis, 2019) which was appropriate for the study's timeframe and underlying question. It addresses the relationship between these variables at one time in the study instead of how these variables change. The design is explanatory and not just descriptive. It does not just say how consumers think; it shows how literacy, concern and perceived effectiveness of actions, and greenwashing skepticism influence the link between purchase intention and willingness to pay whether infrastructure access or appearance of packages influences that link any further. The main tool used was a structured, self-administered online questionnaire, appropriate for a deductive study and for the results to be directly converted into numerical data for statistical analysis.

## 4.3 Measurement of Variables

**Table 1: Measurable Items**

| Variables | Construct | Item | Item Operationalization | Citation |
|---|---|---|---|---|
| **Control Variable** | **Age** | Age | Age band of the respondent | (Hair & Black, 2019) |
| | **Gender** | Gender | Gender identity of the respondent | |
| | **Monthly Income** | Income | Monthly Personal Income/Allowance | |
| | | OLL1 | Knowledge of composting vs. | (Taufique, Siwar, & Chamhuri, 2016) |
| | | OLL2 | | |

| | | | | |
|---|---|---|---|---|
| **Independent Variable** | **Bioplastic/Organic Lifecycle Literacy (OLL)** | | mechanical recycling pathways | |
| | **Environment Concern (EC)** | EC1 | Concern about plastic waste and related behavioral scenarios | (Dunlap & Van Liere, 1978) |
| | | EC2 | | (Laroche & Bergeron, 2001) |
| | **Perceived Consumer Effectiveness (PCE)** | PCE1 | Belief that individual disposal choices make a difference | (Ellen, Wiener, & Cobb-Walgren, The role of perceived consumer effectiveness in motivating environmentally conscious behaviors, 1991) |
| | | PCE2 | | |
| | **Perceived Greenwashing Risk (PGR)** | PGR1 | Skepticism toward unsubstantiated "eco-friendly" claims | (Chen & Chang, 2013) |
| | | PGR2 | | |
| | | PGR3 | | |
| **Mediator** | **Green Purchase Intention (GPI)** | GPI1 | Intention to choose or switch to eco-friendly packaging | (Chan, 2001) |
| | | GPI2 | | |
| | | GPI3 | | (Laroche & Bergeron, 2001) |
| **Moderator** | **Infrastructure Access (IA)** | IA1 | Perceived accessibility of proper disposal points | (Barr, 2007) |
| | **Packaging Visual Attractiveness (PVA)** | PVA1 | Perceived visual appeal of eco-friendly packaging | (Ketelsen & Janssen, 2020) |
| **Dependent Variable** | **Willingness to Pay Premium (WPP)** | WPP1 | Acceptance of a price premium for sustainable packaging | (Laroche & Bergeron, 2001) |
| | | WPP2 | | |

All substantive constructs were measured on a five-point Likert scale from Strongly Disagree (1) to Strongly Agree (5) (Likert, 1932). To assure that the measurement approach has some existing empirical basis although adapted to the packaging context in Bangladesh, each construct was measured with 2–3 items taken from the previously validated scales from literature on sustainability and green-marketing. Demographic and control variables, such as age, gender, and monthly income, were also gathered and then transformed into numeric bands to serve as control variables in the statistics as previous literature indicated that these variables have a significant influence on environmental attitude and price sensitivity separately (Hair & Black, 2019)

## 4.4 Population and Sampling

This study was conducted among the target population of urban Bangladeshis who often buy packaged consumer goods from retail shops, e-commerce websites and food delivery platforms, and thus have the opportunity of getting both conventional and eco-packaged products. Considering the limited time and resources of a study at this scale, a non-probability sampling technique, namely a snowball sampling method, was employed (Etikan & Musa, 2016) and the survey was circulated mainly through social media and personal contacts across Dhaka. There were 208 valid responses that were used in the final sample which is sufficient for the regression analysis performed, as there are 9 substantive and demographic predictors in the baseline analysis (Hair & Black, 2019). A first point to note is that the sample is biased in favor of younger people, about three-quarters of respondents being 18-24 years old. This is discussed further in the limitations of this study.

## 4.5 Data Collection Method

The collection of primary information was done by using a self-administered online questionnaire which was created and sent using Google Forms, as it was low cost, easily accessible and would be sent to city's digitally active consumers, who are also most likely to encounter eco-friendly packaging first. Because some of the items required comprehension, the survey was designed to be relatively brief with the aim of increasing the number of respondents who completed the entire survey and to limit respondent fatigue. The first few pages of the questionnaire included a short statement about the purpose of the study and that participation was voluntary and anonymous. Data was gathered over several weeks, followed by exporting, cleaning, and recoding of responses from Likert labels from the text to numeric for statistical software.

## 4.6 Research Model

The conceptual model tested in this study assumes that four variables; Organic Lifecycle Literacy, Environmental Concern, Perceived Consumer Effectiveness, and Perceived Greenwashing Risk which are independent predictors of Green Purchase Intention and is hypothesized to predict Willingness to Pay a Premium. Infrastructure Access and Packaging Visual Attractiveness are seen as moderators of the relationship between purchase intention and willingness to pay. This is based on the basic idea that people can't be expected to buy if they don't want to, unless the context of the buying process encourages them to do so (Carrington, Neville, & Whitwell, 2010). The structure was based on a framework of the Circular Economy (Geissdoerfer, Savaget, & Bocken, 2017) and Signaling Theory (Connelly & Certo, 2011), which enabled the study to extend beyond a correlational, causal model of green consumer behavior and to test a more complete behavioral pathway, from awareness and attitude through intention, to a more economically meaningful outcome.

The model was estimated empirically as a hierarchical multiple regression in which the predictors were added in four successive blocks nested within each. The control variables, the four independent variables, the mediator and the two moderating interaction terms are regressed on Willingness to Pay a Premium (WPP) for respondent i. These are the four guessed equations:

1. $WPP_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 INCOME_i + \varepsilon_i$

Equation (1) is the baseline control model, capturing the portion of willingness to pay explained by demographic factors alone, before any of the study's substantive predictors are introduced.

$$2.\quad WPP_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 INCOME_i + \beta_4 OLL_i + \beta_5 EC_i + \beta_6 PCE_i + \beta_7 PGR_i + \varepsilon_i$$

Equation (2) adds the four independent variables, namely Organic Lifecycle Literacy (OLL), Environmental Concern (EC), Perceived Consumer Effectiveness (PCE), and Perceived Greenwashing Risk (PGR), and tests H1 through H4.

$$3.\quad WPP_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 INCOME_i + \beta_4 OLL_i + \beta_5 EC_i + \beta_6 PCE_i + \beta_7 PGR_i + \beta_8 GPI_i + \varepsilon_i$$

Equation (3) introduces Green Purchase Intention (GPI) as the mediating variable, testing H5 and allowing any resulting change in the coefficients of the four independent variables to be observed.

$$4.\quad WPP_i = \beta_0 + \beta_1 AGE_i + \beta_2 GENDER_i + \beta_3 INCOME_i + \beta_4 OLL_i + \beta_5 EC_i + \beta_6 PCE_i + \beta_7 PGR_i + \beta_8 GPI_i + \beta_9 IA_i + \beta_{10} PVA_i + \beta_{11}(GPI_i \times IA_i) + \beta_{12}(GPI_i \times PVA_i) + \varepsilon_i$$

The full and final specification is equation (4) which includes the addition of Infrastructure Access (IA) and Packaging Visual Attractiveness (PVA) along with the interaction terms with GPI, thus testing H6 and H7. As is customary with moderated regression analyses, the product terms were computed after the three main effect terms were mean centered, with the aim of reducing the possibility of the main effect and its moderation being highly correlated (Cohen, Cohen, & West, 2003). The intercept term, $\beta_0$, is the same in each of the four equations, while $\beta_1$, ..., $\beta_{12}$ are the estimated coefficients in each equation; the residual term, $\varepsilon_i$, is the robust-standard-error residual associated with respondent i.

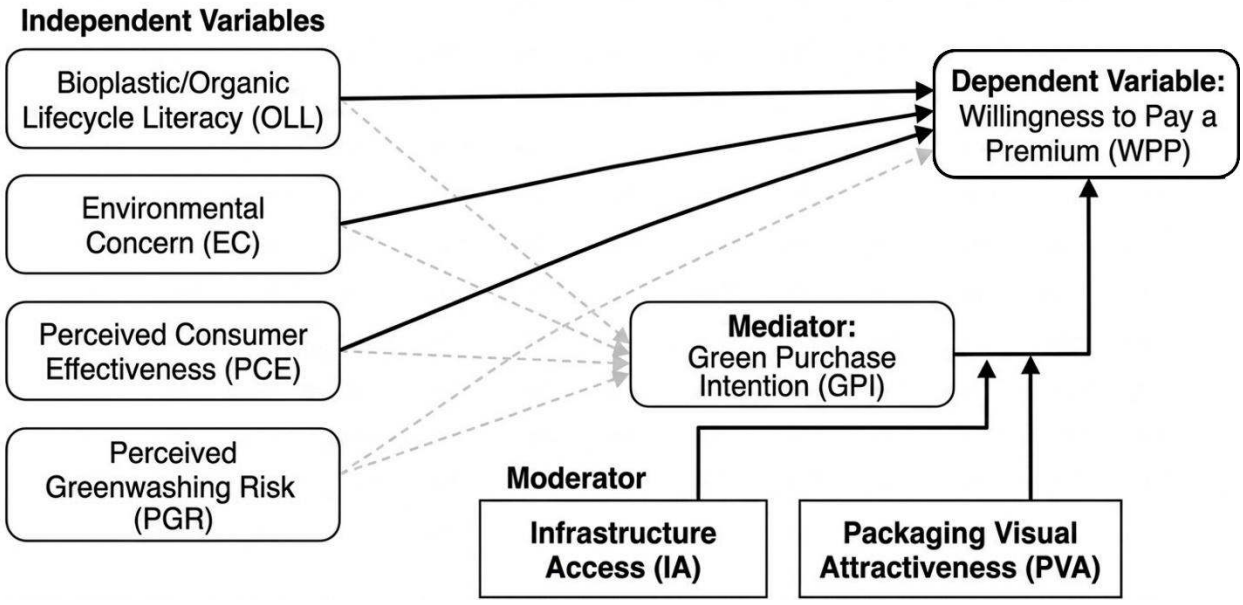



*Figure 4.1: Research Model*

## 4.7 Data Analysis Techniques

STATA 17 was used for data analysis. Prior to the computation of composite scale scores for each multi-item construct, descriptive statistics and data-quality screening were done, with composite reliability testing

for each multi-item construct to verify internal consistency of each construct (Fornell & Larcker, 1981). A Breusch-Pagan test was employed to test for heteroscedasticity (Breusch & Pagan, 1979). This assumption was not satisfied and subsequently 3 additional regression models were estimated with heteroscedasticity-consistent robust standard errors (White, 1980). Variance inflation factor (VIF) diagnostics were also conducted to ensure that the predictors were not highly correlated with each other and were used in the main analysis (Hair & Black, 2019), with the conventional cut-off being < 5. The core hypotheses were examined with a hierarchical multiple regression analysis technique (Cohen, Cohen, & West, 2003), where the control variables were entered first, followed by the four independent variables, the mediating variable, and the interaction terms of the two moderators. This staged approach allowed for the examination of not only whether each variable significantly predicted willingness to pay, but also how the apparent influence of the variables changed with the introduction of purchase intention and the conditions that moderated the relationship between the variables and willingness to pay.

## 4.8 Ethical Considerations

As is customary in survey-based research (Bryman, 2016), participation in the survey was voluntary and participants were informed about the academic purpose of the study before they were asked to complete it. No personal details were gathered at any point. Names, phone numbers, e-mail addresses etc. everything was anonymous and for academic research. The respondents could leave the survey at any time without any consequence and no incentive was given or compensation was offered that could have forced respondents to participate or answered the questions in a particular way. Data collected has been stored securely and was used only in statistical form, summarized and anonymized in this research. No person can be identified in the reporting of results, or will be identified.

## 4.9 Limitations

A few points should be noted. First, snowball sampling using social networks does not allow the sample to be representative of the overall Bangladeshi population (Etikan & Musa, 2016). It is more representative of younger, lower income, urban respondents and conclusions should not be drawn nationally. Secondly, the cross-sectional design provides a snapshot of attitudes and intentions and cannot establish causality (Bryman, 2016) so that the relationships found should be interpreted as predictive association, but not as cause and effect. Third, two of the moderating constructs (Infrastructure Access and Packaging Visual Attractiveness) were measured with only one item, which is limiting the degree to which the internal reliability of these constructs could be assessed and may underestimate the true explanatory power of the constructs (Fornell & Larcker, 1981). Lastly, and like all survey data that is gathered from respondents, there could be social desirability bias, meaning that people report their concern on the items when they have higher levels than they actually have. This is also in line with the results' gap between concern scores and willingness-to-pay, as has been found in the literature of ethical and green consumption (Carrington, Neville, & Whitwell, 2010).

# 5. Hypothesis Development

## 5.1 Organic Lifecycle Literacy and Willingness to Pay a Premium

Bioplastic or organic lifecycle literacy refers to a consumer's understanding of how packaging is meant to be disposed of at the end of its use, and specifically their ability to distinguish between two separate end-of-life pathways; mechanical recycling, in which durable plastics are reprocessed into new material, and organic recycling, in which compostable packaging is broken down through industrial composting (Geissdoerfer, Savaget, & Bocken, 2017). A consumer may be generally aware that a product is "eco-friendly" without understanding which of these two pathways applies, or what happens if the two are mixed. Consumers cannot meaningfully value what they do not understand, and (Taufique, Siwar, & Chamhuri, 2016) show that eco-label knowledge, which is distinct from general environmental awareness, is a meaningful predictor of ecologically conscious consumer behavior. Consumers who can correctly interpret a label are better positioned to act on it. Applied to this study, a consumer who understands the specific disposal pathway for bioplastic packaging should place greater trust in the product's environmental claim, and should therefore see more genuine value in paying extra for it. Where this understanding is absent, the price premium risks being seen as an unverifiable cost rather than a meaningful purchase. On this basis, the following is hypothesized:

***H1: Bioplastic Lifecycle Literacy (OLL) has a significant positive association with consumers' Willingness to Pay a Premium (WPP).***

## 5.2 Environmental Concern and Willingness to Pay a Premium

Environmental concern refers to the degree to which an individual is troubled by environmental degradation and perceives it as a serious problem requiring action (Dunlap & Van Liere, 1978). It is a general attitudinal orientation rather than a judgment about any single product, reflecting how a person feels about environmental issues broadly, prior to encountering any specific packaging or purchase decision. Environmental concern has long been treated as a foundational driver of green consumption, and (Laroche & Bergeron, 2001) find that consumers who express greater environmental concern are more likely to report a willingness to pay more for environmentally responsible products, even though that willingness does not always convert cleanly into actual purchase behavior. The underlying logic is straightforward: concern creates a personal stake in the outcome, and a price premium becomes easier to justify when it is seen as addressing a problem the consumer already cares about. A consumer who is genuinely troubled by plastic waste in Bangladesh's waterways and public spaces should, by this logic, be more willing to accept a higher price for packaging that claims to reduce that harm. Accordingly:

***H2: Environmental Concern (EC) has a significant positive association with consumers' Willingness to Pay a Premium (WPP).***

## 5.3 Perceived Consumer Effectiveness and Willingness to Pay a Premium

Perceived consumer effectiveness is a consumer's confidence that his or her individual efforts can have a significant positive environmental impact, or that their efforts are not inconsequential compared to the overall problem (Ellen, Wiener, and Cobb-Walgren (1991). Perceived consumer effectiveness is

conceptually distinct from concern for the environment; a consumer can be very concerned about the environment even if he or she does not think that the purchases he or she makes actually help. That this sense of personal efficacy is frequently more predictive of environmentally conscious behavior than the environmental concern itself is demonstrated in Ellen, Wiener and Cobb-Walgren (1991), as environmental concern that is not coupled to a belief in personal efficacy can be just as likely to engender resignation as action. If a consumer thinks that it is a good thing to clean up a package properly, or to use a more sustainable package, then they have a solid psychological reason to pay more for a package that they believe will make the world a better place; otherwise, it is just an extra dollar that they don't think is doing anything useful. This provides the following hypothesis:

***H3: Perceived Consumer Effectiveness (PCE) has a significant positive association with consumers' Willingness to Pay a Premium (WPP).***

## 5.4 Perceived Greenwashing Risk and Willingness to Pay a Premium

Greenwashing is the strategy of making a product, brand or organization appear to be environmentally responsible when it is not (de Freitas Netto & Sobral, 2020). Consumer-side perceptions of greenwashing risk, then, are the consumer perception that an environmental claim may be misleading, unverifiable, or simply a marketing tactic, not a true indicator of sustainability. The first three hypotheses are all about factors that are anticipated to boost willingness to pay, whereas greenwashing skepticism is anticipated to have an opposite impact. If green claims are perceived to be exaggerated or misleading, consumers' green trust decreases, leading to a decrease of green purchase behavior, and (Zhang & Li, 2018) corroborate this result by demonstrating that greenwashing perception negatively affects green purchasing intentions even when controlling for consumer's environmental concerns. This effect is especially important in Bangladesh, where there is no strict regulation on the use of eco-labels and consumers do not have much information to verify a brand's claims. If the consumer's primary concern is environmental, he or she has little motivation to pay more for packaging he or she believes is 'eco-friendly' when in reality it is little more than marketing. This suggests:

***H4: Perceived Greenwashing Risk (PGR) has a significant negative association with consumers' Willingness to Pay a Premium (WPP).***

## 5.5 Green Purchase Intention as a Mediating Pathway

Green purchase intention is defined as consumer's intention to purchase an eco-friendly product or packaging over the traditional one (Chan, 2001). It is between attitude and behavior: it's more tangible than a general disposition like concern or effectiveness beliefs, but it's not the purchase itself. Although the relationships described above outline what influences a consumer's disposition towards sustainable packaging, attitudes, concerns, and beliefs are not the same as behavior; in fact, the Theory of Planned Behavior sees attitude as being the most immediate and most proximal influencer of actual behavior (Ajzen, 1991). (Chan, 2001) directly uses this logic for green consumption, demonstrating that purchase intention is a stable and robust predictor of green purchasing outcomes, and (Zhang & Li, 2018) use the same logic for the connection between beliefs and purchase intention and its downstream impact on consumer response to green purchase. This study's model places green purchase intention as the most proximal to the actual

outcome variable, representing whatever predictive value literacy, concern, effectiveness, and greenwashing skepticism may have once translated to an actual purchase intention. For this reason, it is hypothesized that:

***H5: Green Purchase Intention (GPI) has a significant positive association with Willingness to Pay a Premium (WPP) and mediates the relationship between environmental antecedents and WPP.***

## 5.6 Infrastructure Access as a Moderator

Infrastructure access relates to a consumer's ease of putting a sustainable intention into action, in this case, how easy it is to find a suitable disposal site in the consumer's daily life, e.g., composting or recycling drop-off locations (Barr, 2007). It is an external attitude, not an internal attitude. When one has a strong intention to buy sustainably, it doesn't automatically translate to action when the situation does not make it convenient, that is when the external factors do not support pro-environmental behavior (ölander & ThØgersen, 1995). The same is true for packaging disposal; if a consumer wants compostable packaging but the only place he or she can drop it off is one that's not available, they shouldn't pay extra to get it because the benefit the package provides (the environment) can't be delivered. If the infrastructure is more accessible, the same will manifest itself more directly as a willingness to pay, because the consumer is confident that the extra cost will be spent as desired. This results in the following hypothesis:

***H6: Infrastructure Access (IA) positively moderates the relationship between Green Purchase Intention (GPI) and Willingness to Pay a Premium (WPP).***

## 5.7 Packaging Visual Attractiveness as a Moderator

Packaging visual attractiveness is the consumer's perception of the overall visual design of a package (color, shape, texture and overall impression) as being appealing (Orth & Malkewitz, 2008). It's a feeling impression regarding the packaging rather than any confidence in the packaging's products' environmental claims. Packaging serves as a product carrier but also serves as a signal to the consumer that influences consumer confidence during the point of sale. In relation to the product, the holistic visual design of packaging positively influences the brand image and consumer attitudes, as revealed by (Orth & Malkewitz, 2008) and (Ketelsen & Janssen, 2020) in relation to environmental-friendly packaging. However, if the consumer is already interested in purchasing a green product, he or she is likely to be more likely to act if the packaging's appealing because the consumer is reassured that the premium is being paid for a well-made and credible product, not just a prospective environmental benefit. But where packaging is inconvincing or plain, the same kind of message may not necessarily lead to the same kind of willingness to pay. Accordingly:

***H7: Packaging Visual Attractiveness (PVA) positively moderates the relationship between Green Purchase Intention (GPI) and Willingness to Pay a Premium (WPP).***

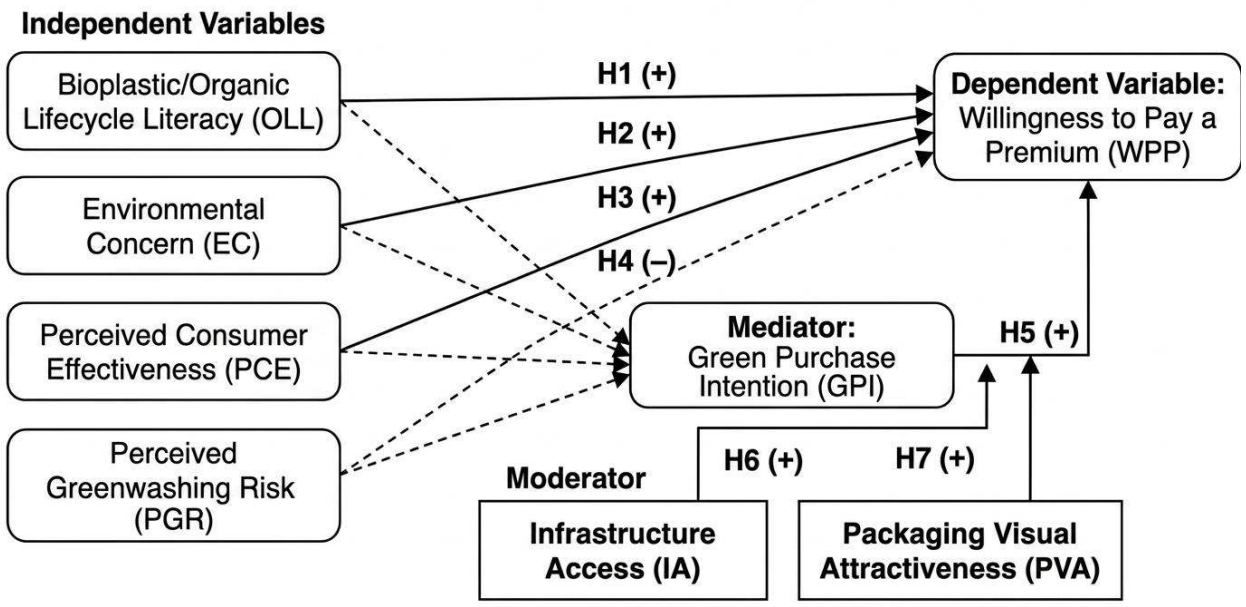



*Figure 5.1 Theoretical Framework*

# 6. Data Analysis and Interpretation

## 6.1 Demographic Profile

**Table 2: Frequency (Age)**

| | Age | Freq. | Percent | Cum. |
|---|---|---|---|---|
| **Valid** | 18-24 | 157 | 75.48 | 75.48 |
| | 25-34 | 45 | 21.63 | 97.12 |
| | 35-44 | 1 | 0.48 | 97.60 |
| | Under 18 | 5 | 2.40 | 100.00 |
| | Total | 208 | 100.00 | |

*Source: Author's Estimation*

The age distribution of respondents is heavily concentrated in the youngest bracket. From 208 valid responses, 157 (75.48%) were between 18 to 24 years, followed by 45 respondents (21.63%) aged 25 to 34. The other two groups are very small, with only 5 (2.40%) under 18 and only 1 (0.48%) between 35 and 44. Combined, the younger age group (34 years and under) account for 97.12% of respondents. The distribution reflects a strong youth sample, which is probably more made up of students than of a representative sample of adult consumers, than it reflects a broad cross section of the adult population.

**Table 3: Frequency (Age by Gender)**

| | Age | Gender | | |
|---|---|---|---|---|
| | | Female | Male | Total |
| Valid | 18-24 | 73 | 84 | 157 |
| | 25-34 | 21 | 24 | 45 |
| | 35-44 | 0 | 1 | 1 |
| | Under 18 | 5 | 0 | 5 |
| | Total | 99 | 109 | 208 |

*Source: Author's Estimation*

The age distribution is fairly even for the two major age groups, with gender across the groups being fairly even. Among the group between 18–24 years-old, 84 respondents (53.5%) are male and 73 (46.5%) are female out of 157 total. The 25–34 group shows a nearly identical split, with 24 males (53.3%) and 21 females (46.7%) out of 45. The two smallest brackets have little variation, with all five of those under 18 years old being female, and the one respondent aged 35 to 44 being male, but these counts are too small to draw any meaningful conclusions from. Generally, age is not significantly correlated with gender in this sample and the very close match between males and females in both age groups indicates that gender does not seem to influence the patterns observed for age.

**Table 4: Frequency (Income by Gender)**

| | Income | Gender | | |
|---|---|---|---|---|
| | | Female | Male | Total |
| Valid | BDT 10,000 -BDT 25,000 | 27 | 34 | 61 |
| | BDT 25,001 -BDT 45,000 | 3 | 11 | 14 |
| | BDT 45,001 -BDT 70,000 | 1 | 5 | 6 |
| | BDT 70,000+ | 2 | 4 | 6 |
| | Below BDT 10,000 | 66 | 55 | 121 |
| | Total | 99 | 109 | 208 |

*Source: Author's Estimation*

There is a more pronounced gender difference in income than in age. Female respondents were more likely to be concentrated in the lowest income group with 66 of 99 female respondents (66.7%) earning less than BDT 10,000, than 55 of 109 male respondents (50.5%) earning less than BDT 10,000. This divergence widens at higher income levels: male respondents account for the clear majority in every income bracket above BDT 10,000, including 34 of 61 (55.7%) in the BDT 10,000–25,000 range, 11 of 14 (78.6%) in the BDT 25,001–45,000 range, and 5 of 6 (83.3%) in the BDT 45,001–70,000 range. The sample size for the higher income groups is too small to provide definitive statistical conclusions, but there is a general trend indicating that men in this sample report slightly higher personal income than the women, which should be

considered when interpreting the regression analysis results because of personal income's importance as a control variable.

**Table 5: Frequency (Income by Age)**

| | Income | Age | | | | |
|---|---|---|---|---|---|---|
| | | 18-24 | 25-34 | 35-44 | Under 18 | Total |
| Valid | BDT 10,000 -BDT 25,000 | 47 | 12 | 0 | 2 | 61 |
| | BDT 25,001 -BDT 45,000 | 6 | 7 | 1 | 0 | 14 |
| | BDT 45,001 -BDT 70,000 | 3 | 3 | 0 | 0 | 6 |
| | BDT 70,000+ | 4 | 1 | 0 | 1 | 6 |
| | Below BDT 10,000 | 97 | 22 | 0 | 2 | 121 |
| | Total | 157 | 45 | 1 | 5 | 208 |

*Source: Author's Estimation*

Income also rises and falls by age in the same direction that would be expected based on the life cycle of earning. In the age group 18 to 24 people, income distribution is skewed towards lower income levels with 97 out of 157 respondents (61.8%) earning income below BDT 10,000 while 47 (29.9%) make between BDT 10,000 and 25,000 which together make up more than 90% of the sample for this age group. It shows that the income range of BDT 25,001-45,000 has about 2 times greater number of respondents than the 18-24 age group, and the range of BDT 45,001-70,000 is about 3 times more than the age group of 18-24 age group, suggesting a wider gap in income in these ranges compared to the 18-24 age group. This is consistent with older respondents having progressed further into paid employment and its further evidence of income being linked to age, as opposed to being an entirely separate demographic variable.

## 6.2 Descriptive Statistics

**Table 6: Descriptive Statistics**

| | Mean | Median | min | max | Std. Dev. | cv | N |
|---|---|---|---|---|---|---|---|
| **WPP1** | 2.4904 | 2 | 1.0000 | 5 | 1.0989 | .4413 | 208 |
| **WPP2** | 2.6154 | 2 | 1.0000 | 5 | 1.0197 | .3899 | 208 |
| **GPI1** | 2.5769 | 2 | 1.0000 | 5 | .97 | .3764 | 208 |
| **GPI2** | 2.9856 | 2 | 1.0000 | 5 | 1.3351 | .4472 | 208 |
| **GPI3** | 2.5048 | 2 | 1.0000 | 5 | .9428 | .3764 | 208 |
| **OLL1** | 2.625 | 2 | 1.0000 | 5 | 1.118 | .4259 | 208 |
| **OLL2** | 2.8462 | 2 | 1.0000 | 5 | 1.2219 | .4293 | 208 |
| **EC1** | 3.6058 | 5 | 1.0000 | 5 | 1.4673 | .4069 | 208 |
| **EC2** | 3.7548 | 5 | 1.0000 | 5 | 1.4654 | .3903 | 208 |
| **PCE1** | 3.399 | 3 | 1.0000 | 5 | 1.4938 | .4395 | 208 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PCE2** | 3.1442 | 2 | 1.0000 | 5 | 1.4205 | .4518 | 208 |
| **PGR1** | 2.9183 | 2 | 1.0000 | 5 | 1.2269 | .4204 | 208 |
| **PGR2** | 3.2115 | 2 | 1.0000 | 5 | 1.4017 | .4365 | 208 |
| **PGR3** | 2.9279 | 2 | 2.0000 | 5 | 1.2196 | .4166 | 208 |
| **IA** | 2.4279 | 2 | 1.0000 | 5 | 1.0189 | .4197 | 208 |
| **PVA** | 2.8558 | 2 | 1.0000 | 5 | 1.1911 | .4171 | 208 |
| **Age** | 2.2019 | 2 | 1.0000 | 4 | .4689 | .213 | 208 |
| **Income** | 1.6298 | 1 | 1.0000 | 5 | .9441 | .5793 | 208 |
| **Gender** | .476 | 0 | 0.0000 | 1 | .5006 | 1.0518 | 208 |

*Source: Author's Estimation*

Descriptive statistics of items used in the study that are measured on a Likert scale indicate that there is a consistent pattern and a pattern that is substantively important. The highest mean scores in the data set are for Environmental Concern (EC1 = 3.61, EC2 = 3.75), suggesting that, overall, respondents are inclined to agree with the questions regarding their concern about plastic pollution. Willingness to Pay a Premium, on the other hand, has the lowest mean scores, WPP1 = 2.49 and WPP2 = 2.62, both of which are less than the midpoint of the scale (3). This gap between relatively high stated concern and relatively low willingness to pay is an early descriptive-level indicator of the attitude-behavior gap that the hypotheses in this study are designed to explore, and anticipates the partial mediation result that will be reported later in this chapter. This is in the middle between the two extremes (M = 2.50 – 2.99), and Infrastructure Access has the lowest mean of any construct (M = 2.43), which indicates that the average respondent does not feel that there are convenient ways to dispose of their trash properly, which is consistent with the infrastructure limitations discussed in the introduction to the study. Perceived Consumer Effectiveness (M = 3.14–3.40) and Perceived Greenwashing Risk (M = 2.92–3.21) are more mixed or neutral in terms of perceived sentiment and can be seen to be closer to the middle of the scale. Standard deviations for all items are relatively small (between about 0.94 and 1.49), with no evidence of floor or ceiling clustering that would make the regression analysis that follows unreliable.

## 6.3 Reliability of Variables:

Because several constructs in this study are measured with only two or three indicators, composite reliability (CR) was used as the reliability criterion of each variable. Composite reliability estimates how consistently a set of items measures its intended latent construct, with values above the conventional 0.70 threshold considered acceptable for confirmatory research (Table 7). All six multi-item constructs clear this threshold, indicating that the survey items reliably capture their intended constructs and that subsequent analyses are not being materially distorted by measurement error at the construct level. Perceived Consumer Effectiveness (PCE) shows the strongest internal consistency (CR = 0.829), followed by Willingness to Pay a Premium (WPP, CR = 0.817), Organic Lifecycle Literacy (OLL, CR = 0.800) and Environmental Concern (EC, CR = 0.791). Green Purchase Intention (GPI, CR = 0.766) is also comfortably reliable. Perceived Greenwashing Risk (PGR) records the lowest though still acceptable reliability (CR = 0.756), which may reflect the fact that its three items span somewhat distinct facets of greenwashing skepticism (general claim skepticism, awareness of marketing tactics, and label-level skepticism) rather than a single narrow behavior.

**Table 7: Composite Reliability**

| Construct | Composite Reliability (CR) | Assessment |
|---|---|---|
| PCE - Perceived Consumer Effectiveness | 0.829 | Good |
| WPP - Willingness to Pay a Premium | 0.817 | Good |
| OLL - Organic Lifecycle Literacy | 0.800 | Good |
| EC - Environmental Concern | 0.791 | Acceptable |
| PGR - Perceived Greenwashing Risk | 0.756 | Acceptable |
| GPI – Green Purchase Intention | 0.766 | Acceptable |

*Source: Author's Estimation*

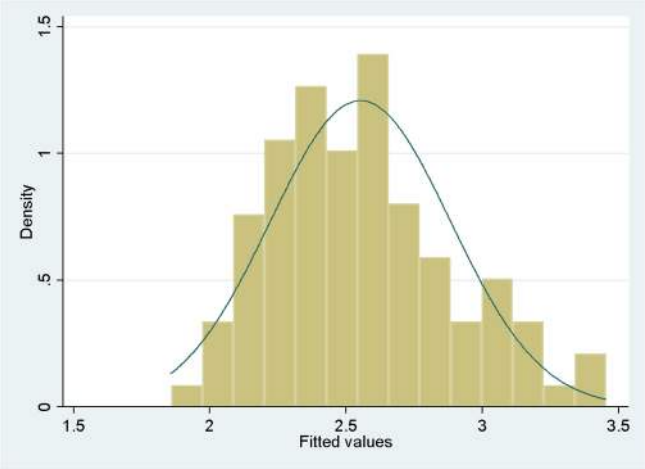
**Diagnostic Tests**

Before running the regression, this study has incorporated three tests: Normal distribution test, Multicollinearity test and heteroscedasticity test (inconsistent variance) to test for the standard OLS assumptions.

**Normality of residuals:**

The study has applied graphical method to test the OLS assumptions that residuals should be normally distributed. In order to do that the study has predicted the residuals and plotted the distribution of it in histogram.

Figure 6.1. Distribution of Fitted Values of WPP with Normal Curve Overlay




*Source: Authors Estimation*

The empirical distribution is showing close to a bell-shaped symmetrical curve around the sample mean (approximately 2.5-2.6 on the 1-5 scale), and tracks the theoretical normal curve reasonably closely, with only a mild positive skew and a slightly heavier upper tail than the normal curve would predict. Because OLS is relatively robust to modest departures from normality particularly at a sample size of 208, where the Central Limit Theorem supports the approximate normality of the sampling distribution of the coefficients

regardless of the shape of the residual distribution no transformation of the dependent variable was applied, and the standard OLS framework was retained.

**Multicollinearity Tests**

**VIF Test:** Variance Inflation Factors (VIF) were computed for all nine predictors entered in the baseline model (Table 11) to test whether the independent variables are too highly intercorrelated to yield stable, individually interpretable coefficient estimates. As a rule of thumb, VIF values below 5 (and certainly below the more permissive threshold of 10) indicate that multicollinearity is not a material concern. In this study, PCE records the highest VIF (1.445) and IA the lowest (1.027); the mean VIF across all nine predictors is a very low 1.149. All values fall well within acceptable limits, confirming that there is no multicollinearity issue, holding the OLS assumption true. This tells that the predictors are sufficiently distinct and the regression coefficients can be interpreted individually.

**Table 8: Variance Inflation Factors**

| Variable | VIF | Tolerance (1/VIF) |
|---|---|---|
| PCE | 1.445 | .692 |
| EC | 1.275 | .784 |
| OLL | 1.211 | .826 |
| PGR | 1.115 | .897 |
| PVA | 1.102 | .908 |
| Gender | 1.070 | .935 |
| Income | 1.063 | .941 |
| Age | 1.031 | .970 |
| IA | 1.027 | .974 |
| Mean VIF | 1.149 | |

*Source: Author's Estimation*

**Pearson Correlation Matrix**

Pairwise (Pearson) correlations among the continuous study constructs were examined prior to multivariate regression, to check against multicollinearity (formally tested via VIF in VIF Test). Using Cohen's conventional benchmarks for the social sciences (r ≈ .10 = small, r ≈ .30 = medium, r ≈ .50 = large), the correlations in Table 9 are best characterized as small to medium in magnitude, with no pair approaching the large-effect range.

- PCE and EC show the strongest bivariate association (r = .429, medium), suggesting that respondents who feel more strongly that individual action matters also tend to report greater environmental concern a face-valid pairing, as both constructs relate to a broadly pro-environmental orientation.
- GPI correlates positively with every independent and moderator variable, most notably with EC (r = .378) and PVA (r = .350), and more modestly with PCE (r = .291), OLL (r = .163), IA (r = .123), and PGR (r = .077). This pattern GPI positively associated with the very variables hypothesized to influence WPP is consistent with, and lends preliminary support to, GPI's hypothesized role as an intervening (mediating) mechanism between these predictors and the final purchase-premium outcome, a relationship formally tested in Section 7.3.
- OLL correlates most strongly with PCE (r = .346) and, more modestly, with PGR (r = .223) and EC (r = .100), indicating that lifecycle literacy is a related but empirically distinct construct from general environmental concern consistent with OLL capturing specific, learnable knowledge rather than a general attitudinal disposition.
- PVA essentially has a weak correlation with PGR (r = -.048) and PCE (r = .197), suggesting that the visual appeal of eco-packaging is judged largely independently of respondents' skepticism toward green marketing claims i.e., attractive packaging does not appear to simply be a proxy for, or a driver of, greenwashing suspicion in this sample.

Because all coefficients remain well below the .70–.80 range conventionally treated as a warning sign for multicollinearity, and given the VIF results reported above, the correlation matrix does not raise concerns for the regression analysis that follows.

**Table 9. Pairwise Correlation Matrix**

| Variable | OLL | EC | PCE | PGR | IA | PVA | GPI |
|---|---|---|---|---|---|---|---|
| OLL | 1.000 | | | | | | |
| EC | 0.100 | 1.000 | | | | | |
| PCE | 0.346 | 0.429 | 1.000 | | | | |
| PGR | 0.223 | 0.143 | 0.217 | 1.000 | | | |
| IA | 0.112 | 0.044 | -0.010 | 0.039 | 1.000 | | |
| PVA | 0.123 | 0.220 | 0.197 | -0.048 | 0.091 | 1.000 | |
| GPI | 0.163 | 0.378 | 0.291 | 0.077 | 0.123 | 0.350 | 1.000 |

*Source: Author's Estimation*

**Heteroskedasticity Test**

The Cook-Weisberg test was used to test the OLS assumption of constant variances (homoscedasticity). The probability value is less than the natural significance level 0.05 ($p<0.05$), which means we reject the null hypothesis of constant variances, so there is heteroscedasticity in the baseline OLS model.

Substantively, this means that the dispersion of unexplained variation in WPP is not constant across the range of fitted values which if left uncorrected would produce standard errors, t-statistics, and p-values that are biased and therefore unreliable for hypothesis testing, but the point estimates of the coefficients

themselves remain unbiased. For all regression models, we have used the vce(robust) command to account the effect of heteroscedasticity issue.

**Table 10: Test for Constant Variances**

| |
|---|
| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity |
| Ho: Constant variance |
| Variables: fitted values of WPP |
| chi2(1) = 29.24 |
| Prob > chi2 = 0.0000 |

*Source: Author's Estimation*

## 6.4 Regression Analysis

**Baseline Regression Model**

The baseline model regresses WPP on the four independent variables (OLL, EC, PCE, PGR), the two theorized moderator variables entered here as direct predictors (IA, PVA), and the demographic controls (Age, Gender, Income), using heteroscedasticity-robust standard errors:

$$\mathbf{WPP = \alpha + \beta_1 OLL + \beta_2 EC + \beta_3 PCE + \beta_4 PGR + \beta_5 IA + \beta_6 PVA + \beta_7 Age + \beta_8 Gender + \beta_9 Income + e_i}$$

**Table 11: Baseline Linear Regression**

| WPP | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| OLL | .2068 | .0668 | 3.10 | .0022 | .0751 | .3385 | *** |
| EC | .1197 | .0552 | 2.17 | .0314 | .0108 | .2286 | ** |
| PCE | -.027 | .0569 | -0.47 | .6359 | -.1392 | .0852 | |
| PGR | .0295 | .0668 | 0.44 | .6589 | -.1022 | .1613 | |
| IA | .0535 | .0577 | 0.93 | .3551 | -.0603 | .1672 | |
| PVA | .11 | .0511 | 2.15 | .0325 | .0092 | .2108 | ** |
| Age | -.0392 | .1256 | -0.31 | .7553 | -.2868 | .2084 | |
| Gender | .1083 | .1198 | 0.90 | .3669 | -.1279 | .3446 | |
| Income | .1081 | .0633 | 1.71 | .0895 | -.0168 | .233 | * |
| Constant | .9602 | .4345 | 2.21 | .0283 | .1034 | 1.817 | ** |

| | | | |
|---|---|---|---|
| Mean dependent var | 2.5529 | SD dependent var | 0.8803 |
| R-squared | 0.1407 | Number of obs | 208 |
| F-test | 3.6032 | Prob > F | 0.0004 |
| Akaike crit. (AIC) | 524.7011 | Bayesian crit. (BIC) | 558.0764 |

*** *p<.01, ** p<.05, * p<.1*

*Source: Author's Estimation*

**Interpretation of Coefficients**

Four predictors emerge as statistically significant direct drivers of WPP net of all other variables in the model:

- Organic Lifecycle Literacy (OLL), with a coefficient 0.207 & p value: 0.002, is the strongest and most significant predictor in the baseline regression model. Holding all other variables constant, a one-unit increase in the OLL variable is associated with a .207 unit increase in WPP. Given the outcome's standard deviation is under 1 scale point, the effect is not small. This practically indicates that consumers who can more confidently distinguish 'recyclable' from 'compostable' packaging, and who understand the practical consequences of mixing waste streams, are significantly more willing to pay a price premium for bioplastic packaging.
- Environmental Concern (EC), also being a significant positive predictor with a coefficient of .1197 & p value: 0.0314, indicating that respondents who report greater personal concern about plastic pollution are also more willing to pay more for eco-friendly packaging, consistent with the theorized role of EC as a direct driver of pro-environmental purchase behavior.
- Packaging Visual Attractiveness (PVA) shows a significant positive direct effect with a coefficient of .110 & p value .033, indicating that the aesthetic appeal of eco-friendly packaging exerts an influence on WPP independent of literacy, concern, or the other predictors. Packaging that simply looks appealing commands a premium in its own right, over and above its communicated environmental credentials.
- Income as a control variable reported statistically significant relationship at 10% level, with a coefficient of 0.1081 and p value 0.085, meaning there is at least some association of high-income people with Willingness to Pay a Premium (WPP) for Green Products.

Other variable which are not statistically significant at the 10% level includes: Perceived Consumer Effectiveness (PCE, $\beta$ = -.027, p = .636), Perceived Greenwashing Risk (PGR, $\beta$ = .030, p = .659), and Infrastructure Access (IA, $\beta$ = .054, p = .355). These are not significant direct predictors of WPP in this model.

Though the control variable income reported statistically significant relationship, other two control variables: Age, Gender reported statistically not significant result at 10% level, indicating the study suggests Age or Gender none of this has any strong relationship with WPP .

**Model Fitness**

The fitness of the overall model is evaluated through the F value of the baseline regression model, reporting $F(9, 198) = 3.60$, $p = .0004$ which is statistically significant. This suggests the nine predictors jointly explain significantly more variance in WPP than a model with no predictors, which justifying the relevance of the model.

To further evaluate the model fitness, the goodness of fit, Model R square value is evaluated. The model accounts for $R^2 = .1407$ of the variance in WPP, while modest in absolute terms, is a reasonable proportion for a single cross-sectional model of a complex, multiply-determined behavioral intention such as

willingness to pay, and is in line with typical effect sizes reported in the consumer sustainability literature. The R square indicates the explanatory power of the independent variables in the model in explaining the change in dependent variable.

Moreover, the comparative fit indices, AIC = 524.70 and BIC = 558.08, are reported here primarily as a baseline for comparison against the mediation model, where a lower AIC/BIC on the mediated model would indicate that accounting for GPI improves the trade-off between fit and model complexity.

**Hierarchical (Stepwise) Regression: Testing Mediation and Moderation**

To test whether Green Purchase Intention (GPI) mediates the relationship between the independent variables and WPP, and whether the strength of this indirect path is in turn moderated by Infrastructure Access (IA) and Packaging Visual Attractiveness (PVA), a four-step hierarchical regression was estimated. This approach follows the logic of the classic causal-steps approach to mediation (entering the mediator after its antecedents to observe whether antecedent coefficients attenuate), extended with a fourth step that adds interaction terms to test moderation of the mediator's own effect on the outcome jointly, a test of moderated mediation. Robust standard errors are used throughout, consistent with the diagnostic result.

- Model 1 enters only the demographic controls (Age, Gender, Income), establishing a baseline against which the explanatory contribution of the substantive predictors can be judged.
- Model 2 adds the four independent variables (OLL, EC, PCE, PGR), testing their direct effects on WPP net of demographics.
- Model 3 adds the hypothesized mediator, GPI, testing whether it independently predicts WPP and adds the coefficients of the variables entered in Model 2, the signature of mediation.
- Model 4 adds two interaction terms, GPI × IA and GPI × PVA, testing whether the strength of the GPI & WPP relationship depends on the level of infrastructure access or packaging attractiveness.

**Table 12: Hierarchical Regressions, Moderator as Interaction Variable**

| | (Model-1) | (Model-2) | (Model-3) | (Model-4) |
|---|---|---|---|---|
| | WPP | WPP | WPP | WPP |
| **Control Variables:** | | | | |
| Age | -.0332 | -.019 | -.0156 | -.0299 |
| | (.1439) | (.1394) | (.1486) | (.1253) |
| Gender | .0892 | .1221 | .0666 | .0685 |
| | (.1329) | (.1321) | (.1312) | (.1199) |
| Income | .1087 | .11 | .1011 | .1005 |
| | (.0764) | (.0765) | (.0758) | (.0627) |
| **Independent Variables:** | | | | |
| OLL | | .228*** | .2066** | .1879*** |
| | | (.0849) | (.0852) | (.0667) |
| EC | | .142*** | .0897* | .0825 |
| | | (.0528) | (.0516) | (.0566) |

| | | | | |
|---|---|---|---|---|
| PCE | | -.0187 | -.037 | -.0307 |
| | | (.0655) | (.0651) | (.0571) |
| PGR | | .0143 | .0142 | .0203 |
| | | (.0731) | (.07) | (.0664) |
| **Mediator Variable:** | | | | |
| GPI | | | .2796** | -.0267 |
| | | | (.1188) | (.2594) |
| **Moderator & Interaction Variables:** | | | | |
| IA | | | | -.1025 |
| | | | | (.1954) |
| PVA | | | | -.0425 |
| | | | | (.1789) |
| GPI_IA | | | | .0485 |
| | | | | (.0653) |
| GPI_PVA | | | | .0406 |
| | | | | (.0605) |
| _cons | 2.4064*** | 1.2289** | .8216 | 1.4415* |
| | (.3841) | (.4985) | (.5138) | (.8197) |
| Observations | 208 | 208 | 208 | 208 |
| R-squared | .0139 | .1153 | .1562 | .1724 |
| *Robust standard errors are in parentheses* | | | | |
| *** p<.01, ** p<.05, * p<.1 | | | | |

*Source: Author's Estimation*

**Model 1: Demographic Controls Only**

Model 1 is not statistically significant, F(3, 204) = 0.96, p = .413, and explains almost no variance in WPP ($R^2$ = .014, Adjusted $R^2$ = -.001, effectively zero once the small-sample correction is applied). None of Age, Gender, or Income individually predicts WPP at this step. This confirms that willingness to pay a premium for bioplastic packaging in this sample is not simply a function of who the respondent is demographically setting up Model 2 to show how much of the (as-yet-unexplained) variance the attitudinal and knowledge-based predictors can account for.

**Model 2: Adding the Independent Variables**

Model 2 adds OLL, EC, PCE, and PGR and is now highly significant, $F(7, 200) = 3.72$, $p = .001$, with $R^2$ rising to .115 (Adjusted $R^2$ = .084) an increase of $\Delta R^2$ = .101 over Model 1, $F$-change(4, 200) = 5.73, $p < .001$, confirming that the four independent variables jointly add significant explanatory power beyond demographics alone. At this step, OLL ($\beta$ = .228, $p < .01$) and EC ($\beta$ = .142, $p < .01$) are both highly significant predictors of WPP, replicating the pattern seen in the baseline model, while PCE ($p > 0.10$) and PGR ($p > 0.10$) remain non-significant. This step establishes the total (unmediated) effects of OLL and EC on WPP, against which the mediated results in Model 3 can be compared.

**Model 3: Introducing the Mediator (GPI)**

Model 3 introduces Green Purchase Intention as a mediating variable. The model remains significant ($F(8, 199) = 4.61$, $p < .001$), and goodness of fit improves further to $R^2 = .156$ (Adjusted $R^2 = .122$), an increase of $\Delta R^2 = .041$ over Model 2, a significant improvement attributable specifically to the addition of GPI.

GPI itself is a significant positive predictor of WPP (b = .280, SE = .119, t = 2.35, p = .020, indicating that consumers with stronger green purchase intentions are more willing to pay a premium to act on that intention. The critical result for mediation, however, lies in what happens to the coefficients carried over from Model 2: the EC coefficient shrinks from b = .142 ($p < .01$) in Model 2 to b = .090 ($p<0.10$). OLL, by contrast, remains significant in Model 3 ($\beta = .207$, $p < 0.05$) and its coefficient shrinks only marginally (from .228 to .207, an 9% reduction), indicating that lifecycle literacy retains a substantively strong direct effect on WPP that is largely independent of, and not explained away by, green purchase intention.

**Model 4: Testing Moderated Mediation: The Interaction Terms**

Model 4 is the step of greatest theoretical interest for the moderation component of the model, and is discussed in detail here given its central role in testing the two moderating hypotheses.

**Construction of the interaction terms:** Two multiplicative interaction terms were formed to test whether the strength of the GPI to WPP relationship established in Model 3 depends on the level of a third variable: GPI × IA (the product of Green Purchase Intention and Infrastructure Access) and GPI × PVA (the product of Green Purchase Intention and Packaging Visual Attractiveness). The Moderator variables IA (Infrastructure Access) & PVA (Packaging Visual Attractiveness) and both interaction terms (GPI_IA & GPI_PVA) were added simultaneously in the final step, after their constituent ("lower-order") terms, GPI in Model 3, and IA/PVA present as moderators so the interaction coefficients can be interpreted as the change in the GPI–WPP slope attributable specifically to the moderator, net of the moderator's and mediator's own main effects.

**Rationale:** The inclusion of IA as a moderator test whether the practical, structural ability to act on a green purchase intention having a proper drop-off or collection point accessible determines how strongly that intention converts into an actual willingness to pay more. The theoretical expectation is that intention should translate into a price premium more strongly when the infrastructure exists to make the corresponding disposal behavior feasible, and more weak when it does not. Similarly, PVA is included as a moderator to test whether the visual appeal of eco-friendly packaging amplifies the conversion of green intention into willingness to pay the idea being that an intention to purchase sustainably is more readily acted upon, and rewarded with a price premium, when the packaging is also aesthetically appealing, since visual cues may reduce the perceived trade-off between sustainability and product appeal.

**Results**: Neither of the interaction term reported statistically significant association with GPI × IA ($\beta = .0485$, SE = .0653, $p>0.1$) and GPI × PVA ($\beta = .0406$, SE = .0605, $p>0.1$). The overall model remains significant, $F(10, 197) = 4.06$, $p < .001$, and fit improves marginally to $R^2 = .171$ (Adjusted $R^2 = .129$), an increase of only $\Delta R^2 = .015$ over Model 3, $F$-change(2, 197) = 1.75, $p = .177$ a non-significant increment, confirming that the two interaction terms do not, jointly or individually, add meaningful explanatory power. OLL remains the only predictor that is significant in every one of the four models ($\beta = .1879$, $p < 0.01$ in Model 4), underscoring its status as the most robust and consistent predictor of willingness to pay identified in this study.

**Model Comparison Summary**

Table 13 consolidates the fit statistics across all four hierarchical steps to summarize the incremental contribution of each block of variables.

**Table 13: Incremental Model Fit Summary**

| Model | Variables Added | $R^2$ | $\Delta R^2$ | F-change | df | p (F-change) |
|---|---|---|---|---|---|---|
| 1 | Controls (Age, Gender, Income) | .014 | — | — | — | — |
| 2 | OLL, EC, PCE, PGR | .115 | .101 | 5.73 | (4, 200) | <.001 |
| 3 | GPI (mediator) | .156 | .041 | 9.65 | (1, 199) | .002 |
| 4 | IA, PVA, GPI×IA, GPI×PVA (moderators) | .172 | .016 | 1.75 | (2, 197) | .177 |

*Source: Author's Estimation*

The pattern of F-change statistics makes clear where the model's explanatory power comes from: the independent variables (Model 2) contribute by far the largest and most significant increment to model fit, the mediator GPI (Model 3) contributes a smaller but still statistically significant increment, and the moderating interaction terms (Model 4) contribute a small, non-significant increment. This ordering directly supports the substantive conclusions drawn above direct effects and partial mediation are supported by the data; moderated mediation is not.

# 7. Hypothesis Testing and Discussion

## 7.1 Overview of the Regression Models

Two regression specifications were used to run hypothesis tests. In the Baseline Model (Table 11), both Organic/Baseline Lifecycle Literacy (OLL) and Environmental Concern (EC) were found to be direct determinants of Willingness to Pay Premium (WPP), along with Perceived Consumer Effectiveness (PCE), Perceived Greenwashing Risk (PGR), Infrastructure Access (IA), and Packaging Visual Attractiveness (PVA), but not Green Purchase Intention (GPI). The predictors were introduced in steps across four models:

**Model 1 – control variables;**

**Model 2 – OLL + EC + PCE + PGR;**

**Model 3 – GPI, as a mediator**

**Model 4 – IA + PVA + GPI_IA + GPI_PVA; to test the proposed moderating relationships.**

Model's explanations became more powerful at each step. $R^2$ increased from 1.4% in Model 1 to 11.5% in Model 2, 15.6% in Model 3, and 17.2% in Model 4. This means that the second block of variables (after using the first one) added to the model's predictive power of consumers' willingness to pay a premium for green products.

## 7.2 Theoretical Implications

The implications of the findings for the theory are discussed below using each hypothesis.

**H1: Organic/Bioplastic Lifecycle Literacy has a positive prediction of willingness to pay premium**

Organic/Bioplastic Lifecycle Literacy (OLL) was hypothesized to have a positive relationship with Willingness to Pay Premium (WPP). The results are more robust than those of the other proposed direct predictors. OLL was a positive and statistically significant predictor of WPP and remained significant after the GPI terms and the interaction terms were added. In the fully specified model the standardized result was positive ($\beta = .1879$ and $p < .01$).

**H1 is supported.**

This positive correlation is explained by the fact that some environmental knowledge is used to explain the "real value" of sustainable products to consumers. Lifecycle literacy is not just a knowledge of the existence of a product as being "eco-friendly. Consumers should know what will happen to a material all the way through its lifecycle – whether it will be composted, mechanically recycled, biodegraded under specific conditions or require specific waste management infrastructure. This type of information makes the positive impact on the environment more real and can give consumers a better reason to pay the increased price of the product.

This is especially relevant for bioplastic products as many of the environmental benefits that can be achieved with them may not be apparent at first sight in the store. The consumer might read "bioplastic" on the packaging but not know if they can compost, recycle or safely degrade it in their area. If you don't know what you're paying for, the premium price might not seem like it's worth it. However, if the consumer is more aware of the product's lifecycle and its significance to the environment, it will be easier for them to assess the environmental value in the product.

The present finding is thus very significant in the context of a developing market like Bangladesh. The word environmentally friendly is not enough to persuade consumers to pay more if it is a generic term. Consumers need to be given clearly defined environmental literacy to learn how to identify which of two materials is more environmentally preferable. In the context of green consumption, research also points to the environmental knowledge as one of the factors affecting consumers' evaluation and buying of sustainable products (Barber, 2014); (Joshi, 2015).

The finding can also be attributed to a difference in consumers' education, income, environmental awareness and exposure to sustainability information. Bangladeshi consumers are not uniform consumers. Some consumers may not be aware of the environment, and focus on the initial cost of a product whereas others may be more educated, environmentally aware, or have received greater exposure to information about sustainability. If the middle-class consumer is aware of the environmental impact of traditional plastic, he or she may be willing to pay more, whereas the middle-class consumer might care more about the price.

The results of Bangladesh also show that environmental knowledge and concern matters in the green procurement of consumers (Chowdhury & Alamgir, 2021); (Niloy & Sultana, 2023).

Hence, the positive influence of OLL suggests that when consumers have a specific lifecycle knowledge, an abstract environmental claim is translated to a tangible perception of product value and the extra monetary cost becomes more justifiable.

**H2: Positive relationship between willingness to pay premium and environmental concern**

Experimental variables were hypothesized to positively predict WPP, with the exception of EW, which was hypothesized to have a negative relationship with WPP. EC was a significant positive predictor in Model 2 ($\beta = .1420$, $p < 0.01$). GPI was subsequently added to Model 3 and the coefficient of this model dropped back to about $\beta = .0897$, and the p value to $p < 0.10$.

**The relation between H2 and the direct-predictor stage is supported, and weakens when introducing GPI**.

The first positive link between the two is theoretically plausible as consumers with a greater concern for environmental degradation will see value in environmentally preferable products. With an increased focus on environmental issues, including plastic waste, waste production, resource depletion and ecological degradation, the motivation to choose alternative sustainable products becomes more salient.

It is true from the evidence in the context of Bangladesh. (Chowdhury & Alamgir, 2021) also noted that environmental concern was significant for green purchase intention among the young consumers of Bangladesh and (Niloy & Sultana, 2023) also remarked that environmental concern was likewise important for the green purchase intention among the urban consumers of Bangladesh.

The present results also show an important attitude–behavior gap, however. The descriptive results show that the mean scores of the environmental concern values were around 3.68 on the 5-point scale and the willingness to pay scores were around 2.55 on the 5-point scale. That is, there is a potential for high levels of environmental concern from respondents and relatively low levels of willingness to make an extra financial sacrifice.

This is in line with the general findings of green attitude–behavior gap in sustainable-consumption literature. However, consumers might be very concerned about environmental issues, but not willing to pay more for the more environmentally-friendly alternative (Joshi, 2015).

The economic environment of Bangladesh is important to explain it. If a consumer has a low income, they might be very concerned about plastic waste but be choosing a conventional product as they are thinking more about what is on the bottom of their list. An affluent green consumer, on the other hand, might be able to afford the extra cost. One consumer who is environmentally literate, but whose income level is considered to be in the middle range, might also be willing to pay more if he or she deems the environmental benefits as being of significant value.

Furthermore, the substantial drop (approximately 37% reduction) in the coefficient between environmental concern and WPP in Model 3 ($b = .0897$) compared to Model 2 ($b = .142$) suggests that part of the relationship between environmental concern and WPP is mediated by GPI. That is, it's not enough that people are generally concerned about the environment - they have to make an actual decision to buy green products.

This finding is supported by the studies that indicate purchase intention can be an effective channel in converting environmental attitudes to willingness to pay for sustainable products (Aqmar, 2026).

In this way, EC offers the environmental incentive, and GPI offers the behaviorally proximal pathway by which that incentive can enhance premium willingness.

**H3: The extent to which consumers think the product is effective is positively related to their willingness to pay a premium**

Perceived Consumer Effectiveness (PCE) was expected to positively predict WPP. But PCE was not statistically significant. The estimated relationship was slightly negative ($\beta = -.0370$, $p > .10$).

**H3 is not supported**.

The results suggest that the individual belief that consumption decisions can help address environmental issues is not alone a significant predictor of willingness to pay a premium.

This distinction is theoretically significant as it is not the same psychological assessment as perceived effectiveness and the willingness to sacrifice financially. Perhaps a consumer strongly feels that their own purchases have consequences and that the choice of a product that is more eco-friendly should cost significantly more, but they will not do it.

A consumer might, for instance, think that if they decrease the use of conventional plastics then that will have a cumulative positive effect on the environment. But if the same consumer is presented with a bioplastic product at a higher price, they might be tempted to opt for the cheaper one due to lack of funds, or maybe because of the other needs of the family. Here, environmental self-efficacy is present but not adequate to overcome the monetary barrier.

Contrary to other studies, e.g., (Kovacs & Keresztes, 2022) who identified a positive correlation between perceived consumer effectiveness and willingness to pay for sustainable food attributes. This difference could be due to the difference in product category, economic conditions, consumer characteristics, and the perception of the need for the product.

Thus, the negligible relationship observed in the current study means that the belief of making a difference is not enough to create a premium-paying decision, if monetary factors are salient.

**H4: Perceived Greenwashing Risk Negatively Predicts Willingness to Pay Premium**

Perceived Greenwashing Risk (PGR) was expected to negatively predict WPP. This relationship was, however, not statistically significant, and was slightly positive ($\beta = .0142$, $p > .840$).

**H4 is not supported**.

In theory, the more people think environmental claims are green washed, the less they are willing to pay a premium, and the less they will trust the claims. The negligible result, however, implies that greenwashing skepticism was not large enough to affect willingness to pay a premium in this sample.

It is possible that consumers with a better understanding of the concept of greenwashing also have a better understanding of being more environmental. Awareness of greenwashing needs to have a bit of exposure to environmental marketing, sustainability information, or corporate environmental claims. Thus, a skeptical consumer can have a significant underlying commitment to protection and preservation of the environment and at the same time he/she may have a weak commitment to the greenwashing.

A consumer might feel that some firms overstate their green marketing efforts but feel it is important to lower the use of traditional plastics. In such a case, the skepticism of consumer towards the company's communication does not prevent one from supporting sustainable consumption.

Another possible explanation is due to information asymmetry. Consumers might become aware of the problem of greenwashing but not necessarily have the technical expertise to identify if a specific product's green label is authentic. Perceived greenwashing risk can therefore impact brand trust, although not necessarily reduce WPP.

Therefore, the performance of PGR seems more relevant to the credibility and trust evaluation than to the actual economic choice to pay a 'premium' or not.

**H5: There is a positive correlation between Green Purchase Intention and the Willingness to Pay Premium**

Green Purchase Intention (GPI) was expected to have a positive effect on WPP. GPI was introduced in Model 3 and was a significant positive predictor ($\beta = .2796$, $p < .05$). When it was added it improved its explanatory power to $R^2 = 15.6\%$ (from 11.5%), the greatest of all the incremental additions to the model.

**H5 is supported**.

The positive relation is theoretically plausible since purchase intention is a much more proximal antecedent of purchasing than general environmental concern. A consumer may have an interest in environmental issues, but a consumer with a strong green purchase intention has developed a definite preference towards environmentally preferable products.

This distinction is particularly important in the present study. Concern about the environment was fairly high, but willingness to pay was fairly low. This suggests that concern alone does not necessarily produce an economic commitment. GPI is the level at which the motivation of the environment is more directly related to the purchase.

For instance, an eco-conscious consumer might consider, “Pollution from plastic is a big issue.” A consumer with a strong GPI, on the other hand, is more likely to move towards the concrete form of the behavioral intention: “When buying packaging products, I want to buy an environmentally friendly alternative”. The second one feels more like a conceptual link to WPP.

The finding aligns with the study conducted among Bangladeshi consumers which revealed environmental attitude/concern has positive impact on green purchase intention (Chowdhury & Alamgir, 2021); (Niloy & Sultana, 2023). It is also supported by other findings showing that purchase intention can link environmental motivations with the willingness to pay for sustainable products (Aqmar, 2026).

The result consequently confirms the mechanism suggested, i.e., that environmental concerns are converted to an economically relevant purchasing intention. When an individual has reached the level of intention to buy a green product, consumers are more likely to accept a premium.

**H6: Infrastructure Access is a moderator of the relationship between GPI and WPP**.

It was hypothesized that Infrastructure Access (IA) would strengthen the relationship between GPI and WPP. However, the GPI × IA interaction was statistically insignificant ($\beta = .0485$, $p > .10$).

**H6 is not currently supported**.

Access to infrastructure could theoretically reinforce the intention–WPP link: if sustainable options are not accessible or they are not easy to obtain, then consumers are unable to act on their green intentions.

But the two are not always the same thing: getting access to the product is not the same as paying a premium. When two consumers have strong green purchase intentions and can easily obtain sustainable products, there is less significance for differences in infrastructure access. Rather, their willingness to pay may be influenced by income, price sensitivity, their beliefs about the environmental benefits, product quality, or brand trust.

On the other hand, if access is not easy, a motivated consumer could actively look for sustainable products on the internet, in specialized stores or in other distribution channels.

Thus, there was no significant interaction between Infrastructure Access and the strength of the relationship between green purchase intention and willingness to pay in this sample.

**H7: GPI is moderated by the packaging Visual Attractiveness**

Packaging Visual Attractiveness (PVA) was suggested to have a positive moderating effect on the relationship between GPI and WPP. However, the GPI × PVA interaction was statistically insignificant ($\beta = .0406$, $p > .10$).

**H7 does not support as moderating relationship.**

However, PVA had a highly positive direct impact on WPP. The direct effect of PVA on WPP in Table 11, in the baseline regression model, is reported as $\beta = .11$, $p=0.0325$.

This is a distinction that is theoretically significant. Packaging attractiveness does not significantly change how strongly green purchase intention translates into willingness to pay, but attractive packaging itself can increase consumers' willingness to pay.

Packaging can be a quality cue that is not inherent in the product, but important for the product's aesthetic appeal. Some consumers rely on the visual features of a product as indicators of quality, modernity, sophistication, convenience and premium positioning. This means that packaging can bring extra perceived value to the product, not just because it is environmentally motivated.

For instance, a consumer might go for a gorgeous bioplastic package on account of its environmental-friendly impacts, whereas another might go for the same product on account of the packaging appearing high-quality and top-tier. In the first, attractiveness can boost WPP, but in the second it does not necessarily make the green purchasing intention more influential to the consumer.

Thus, the effect of PVA would seem to be more of an independent value-enhancing attribute than a moderator of the GPI–WPP relationship.

## 7.3 Practical Implications

The results offer a number of implications for firms, marketers, policy makers, and organizations to advocate sustainable and bioplastics products in Bangladesh.

### 7.3.1 Create Lifecycle Based Consumer Education.

The most applicable practical implication is from H1. Companies ought to go beyond “eco-friendly”, “green” or “sustainable” claims, because OLL is the most consistent indicator of WPP.

Rather consumers should be offered information which is specific and verifiable for the life cycle. Explain by means of packaging and promotional communication:

- Whether it is biodegradable or compostable;
- Under what conditions decomposition does not occur;
- Whether it is a viable component for reuse; and

It is different from traditional plastic in the following ways:

- What happens after disposal; and
- What the environment gains by the consumer's decision to buy the product.

This is especially critical, as consumers might consider bioplastic products to be the same as conventional plastic, but just more expensive.

Thus, companies must convert technical lifecycle data into simple communication for consumers. This can help raise the value perceived by the consumer, and give them a rational reason to pay a premium.

The work explained the how to translate concerns about the environment into actual purchases.

### 7.3.2 Convert Environmental Concern into Concrete Purchase Intention

The EC and GPI results show that concern for the environment is not enough. Even though consumers want to care a lot about environmental degradation, they are not willing to pay significantly more.

Marketing strategies must therefore aim to make people more likely to make a specific purchase because of their concern about the environment. Rather than just stating that plastic is bad, marketers can tie the environmental issue into the product:

**Environmental Problem → Consumer Choice → Specific Product Benefit → Environmental Outcome**

Campaigns can for instance describe how by selecting a specific bioplastic product, one helps to decrease the use of conventional plastics.

This is especially significant in Bangladesh as consumers vary widely in terms of income and buying power. Therefore, premium products should be marketed in such a way that customers are convinced that the premium price is worth it, not just for the environmental benefit of the products.

### 7.3.3 Avoid over-reliance on consumers' sense of individual effectiveness

The small PCE figure implies that marketers shouldn't expect consumers who think their individual actions are important to pay more.

An all-message such as "Your individual choice can save the planet" environmental campaign might lead to positive attitudes without surmounting price resistance.

Instead, firms should integrate the elements of the environmental appeal with the elements of the functional and economic value proposition such as durability, convenience, quality, safety, design, and long-term usefulness.

### 7.3.4 Build Credibility Rather Than Merely Increasing Green Claims

Avoid making green claims without substantiating evidence.

The negligible relationship between PGR and the insignificant Skepticism about greenwashing suggests that there is not a direct connection between greenwashing skepticism and WPP within this sample. This should not be taken as an excuse for companies not to be aware of concerns about greenwashing.

Environmental information is to be made transparent and verifiable, using recognized certifications, clear material description, disposal instructions and evidence-based environmental claims, to be provided by companies.

This might help minimize the information asymmetry and increase consumer trust, though trust did not seem to be the only factor behind the choice of WPP in this model.

### 7.3.5 Use Packaging as a Value-Creation Mechanism

PVA has a direct positive effect: this is an important practical lesson to learn. Packaging attractiveness is not a moderator of GPI but it is directly linked with increased WPP.

But when it comes to sustainable-product manufacturers, sustainable packaging shouldn't be a functional necessity. The value can be added through visual design.

A bioplastic product that has a beautiful typography, modern design, colors, environmental information and premium visual presentation can be thought of as more valuable than another product made of the same material, but with different packaging.

It gives firms the chance to demonstrate that they have a premium to justify by doing a mix of:

**Functional Value + Environmental Value + Aesthetic Value**

### 7.3.6: Segment customers based on Knowledge and Purchasing Power

The results further suggest that marketers selling sustainable products should not practice one-size-fits-all marketing in the Bangladeshi market.

Consumer groups can have various mixes of:

- Environmental knowledge;
- Income;
- Environmental concern;
- Price sensitivity;
- Green purchase intention; and
- Willingness to pay.

More affluent, and highly environmentally knowledgeable consumers may be more receptive to premium sustainable products. The target group of middle-income customers with a high level of environmental

knowledge can also be reached by communicating education which provides a concrete benefit of the product.

But for buyers who are more price sensitive, companies may have to offer smaller package sizes, low-cost alternatives, discounts or a slow rollout of the product.

## 7.4 Summary of Hypotheses Testing Results

**Table 14: Summary of Hypotheses Testing Results**

| Hypothesis | Structural Path / Statement | Empirical Coefficient / t-value | p-value | Decision |
|---|---|---|---|---|
| $H_1$ | OLL → WPP (+) | β = .1879 | p < .01 | Supported |
| $H_2$ | EC → WPP (+) | β = .1420 (in Model 2) | p <.10 | Supported |
| $H_3$ | PCE → WPP (+) | β = -.0370 | p >.10 | Not Supported |
| $H_4$ | PGR → WPP (-) | β = .0142 | p >.10 | Not Supported |
| $H_5$ | GPI → WPP (+) [Mediation] | β = .2796 | p < .05 | Supported |
| $H_6$ | GPI × IA → WPP (+) [Moderation] | β = .0485 | p >.10 | Not Supported |
| $H_7$ | GPI × PVA → WPP (+) [Moderation] | β = .0406 | p >.10 | Not Supported *(Direct PVA effect is significant)* |

**Additional findings for H7:** The direct effect of PVA on WPP is also significant and positive, with β = .11, p<0.05, albeit the interaction between PVA and GPI is not significant.

## 7.5 Overall Discussion

The results all together indicate that attitudinally, the premiums paid for green products is more related to the specific environmental knowledge and concrete purchasing motivation than to general environmental beliefs.

The most significant result is that Organic/Bioplastic Lifecycle Literacy is at the heart of the findings. OLL is the best and most consistent predictor of WPP. This implies that those who claim to be environmentally conscious do not necessarily charge a higher price for their products. They're more likely to agree to a

premium if they know the product is good for the environment and where the material ends up after the product is used.

The discovery is of special importance to Bangladesh. The sustainability message alone won't sell in the sustainable-products market. Consumers need well-defined information about the material, its life cycle, disposal and consequence. When the environmental benefit is specific knowledge, it can be reworked to become a tangible product benefit.

The second finding related to the attitude-behavior gap. The mean values for the respondents were relatively high for environmental concern (3.68 out of 5) and lower for willingness to pay (2.55 out of 5). This is an illustration of the fact that concern for environmental issues does not necessarily result in willingness to pay an extra cost.

Another indication of the pathway between environmental concern and willingness to pay is the further decrease in EC's coefficient from $\beta = .142$ in Model 2 to $\beta = .0897$ in Model 3, which corresponds to a decrease of about 37%. It becomes clearer, then, to think of the conceptual process as:

**Environmental Concern → Green Purchase Intention → Willingness to Pay Premium**.

rather than:

**Environmental Concern (WC) → Willingness to Pay Premium (WP)** as a direct link only.

Results for PCE and PGR also help to confirm the need to separate beliefs and real economic choices. When consumers feel that their actions are important but are not willing to pay for this due to economic reasons, they are in a situation. Likewise, consumers might not believe companies' environmental statements and still buy sustainable products, as they continue to hold concerns about environmental issues.

The moderation results give another salient point of interest. The relationship between GPI and WPP doesn't significantly change as a result of either Infrastructure Access or Packaging Visual Attractiveness. However, there is a major direct impact of PVA on WPP. This suggests that the attractiveness of the packaging also creates a perceived value of the product, which is not the same as the strength of green intention to pay for a premium, but is rather an independent source of it.

Overall, the final model accounts for 17.2% of the variance of WPP, which means that the model has some explanatory ability, though not enough. Payment willingness, however, is a multi-dimensional concept and can be influenced by other factors than are captured in the current model, including disposable income, actual price difference, perceived product quality, brand confidence, social influence, availability, convenience and individual price sensitivity.

Overall, the theoretical model proposes that the value of sustainable products is first recognized depending on specific lifecycle literacy, then based on environmental concern, and finally depending on the product level attributes, such as product visual attractiveness, which can independently increase the perception of the value of the product.

# 8. Conclusion

Overall, the results indicate that there is a clear consumer interest in bioplastic packaging, not just for its environmental benefits, but also for the practical considerations of its life cycle. Life-cycle knowledge seems

to be more important than general environmental awareness, and it can empower consumers as informed actors who can influence the outcomes of the circular economy after purchase. Although environmental attitudes are important, they are reinforced when they become actual purchasing behavior and are also reinforced by visual appeal and functional quality, which also influence perceived value. Therefore, the growth of the bioplastic packaging market in Bangladesh relies more on the informed consumers, credible sustainability communication and packaging that provides both environmental and functional value. This needs to be accompanied by more transparent life-cycle information, such as separating industrial compostability from mechanical recyclability, and by credible sustainability labelling standards to cut consumer confusion and greenwashing. Finally, effective material recovery will rely on investments in suitable collection, sorting and treatment facilities, which will allow sustainable consumer choices to be realized.

## 8.1 Limitations & Future Research Scope

The results of this study should be viewed in the context of the following scope limitations. First, the results of the study are not generalizable to the larger population of Bangladesh, as the non-probability snowball sampling method was used and the respondents were mostly from Dhaka and focused on younger consumers (Etikan & Musa, 2016). More extensive and representative sampling of age, income and geographic groups could then be used in future research. Second, the cross-sectional design only provides a snapshot of consumer perceptions and intentions at one point in time, and cannot be used to establish causal or temporal relationships (Bryman, 2016). Further research using either a longitudinal or experimental design might explore the relationship between lifecycle literacy and ongoing willingness to pay and actual purchase behavior. Third, Infrastructure Access and Packaging Visual Attractiveness were each assessed by a single item, which restricted the ability to assess the measurement properties of these items (Fornell & Larcker, 1981); future studies could use validated multi-item scales to further investigate these relationships. Lastly, willingness to pay was measured as a stated preference instead of actual purchase behavioor, so future research could include real purchase data and other factors like price sensitivity, brand trust, perceived quality and convenience to better understand consumers' premium-payment decisions.

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