

Package Sustainability Features and Consumer Willingness to Pay Premium Price for Organic Cereal Brands: An Empirical Investigation in Delhi-NCR

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Abstract:

The fast growth rate of the Indian organic food industry has added pressure to the packaging as a strategic communication and a value-signalling tool. This research paper is an empirical analysis on the correlation between the sustainability characteristics in packaging and willingness to pay (WTP) a higher price on organic cereal brands, with respect to the heterogeneous urban consumer population in Delhi-NCR. A stratified multi-stage sampling protocol was grounded on the collection of primary data (n=420). An overall multi-method analytical approach was implemented, which combined Exploratory and Confirmatory Factor Analysis (EFA/CFA), Multiple Linear Regression, One-Way ANOVA with Tukey HSD post-hoc test, Bootstrap Mediation Analysis (5,000 resamples), Structural Equation Modeling (SEM), Conjoint Analysis, and K-Means Cluster Analysis. Factor Analysis determined five latent dimensions of sustainability of packaging: Material Sustainability, Health Communication Clarity, Certification Visibility, Eco-Aesthetic Appeal, and Purchase Convenience. Multi regression proved that the strongest direct predictors of WTP premium are Material Sustainability ($b = 0.34$), and Health Communication Clarity ($b = 0.27$) ($R^2 = 0.624$, $F(9,410) = 75.4$, $p < .001$). SEM created Packaging Sustainability Perception to be a complete mediator between eco-consciousness and WTP premium (indirect $b = 0.41$, 95% CI = [0.35, 0.49]). ANOVA revealed highly significant WTP differences across three consumer clusters ($F(2,417) = 184.3$, $p < .001$, $\eta^2 = 0.469$): Eco-Premium Buyers ($M = 38.4\%$), Value Naturalists ($M = 21.6\%$), and Price-First Shoppers ($M = 7.3\%$). Compostable packaging materials were ranked as the highest-utility level (part-worth = +1.84) of 18 orthogonal profiles using Conjoint Analysis. The paper ends with a four level Packaging Sustainability-WTP Optimization Framework (PS-WTP-OF) that offers segment-calibrated, empirically based design and commercial guidelines.

Keywords: willingness to pay premium, sustainable packaging, organic cereals, SEM, conjoint analysis, mediation, Delhi-NCR, consumer segmentation

1. Introduction

In India, the organic food market is in the accelerated maturity stage, with the organic cereals segment, or granola, muesli, porridge blends, and multi-grain breakfast varieties, showing a substantial compound annual growth of around 22 percent in the upcoming period between 2022 and 2025 (Kumar and Sharma, 2023). Delhi-NCR is the main bellwether market in this growing category, with all three factors of high health literacy, high disposable incomes and a cosmopolitan consumer market that is in touch with global wellness trends and Ayurvedic nutritional values simultaneously (Mehta et al., 2024). However, with such a strong vector of demand, the manufacturers of organic cereals face an underlying business problem: how to convert product sustainability into consumer willingness to pay (WTP) an equivalent price premium by designing their packaging.

This is because the willingness to pay a premium price on organic products has been widely researched in the West (Lim and Park, 2023; Torres and Ruiz, 2024), yet the evidence of the culturally complex urban markets with price sensitivity in India is limited and methodologically incomplete (Bhatia and Kapoor, 2023). There is still no empirical research that addresses the relationship between certain packaging features of sustainability, the choice of material, eco-labeling, the presence of certification, the appearance of earth tones design with the

measurable increments of WTP among the Delhi-NCR consumer of organic cereals. This is the main motivating issue of the present study.

With its distinct role in the organic food value communication chain, packaging sustainability attributes receive a signal from both authenticity of the product and environmental responsibility and premium positioning of the brand at the moment of decision-making (at the point of purchase) (Nguyen & Tran, 2023). Credence-attribute-dominant categories such as organic cereals, where consumers cannot form any ideas of organic integrity through inspection or consumption, most commonly rely on packaging as their main, and sometimes sole, trust-building tool (Acharya et al., 2023; Robertson et al., 2024). Knowledge about which particular packaging sustainability attributes work through to raise WTP premium increments, via what psychological channels, and which consumer groups will be of both theoretical and practical commercial importance.

1.1 Research Objectives

The paper has five interdependent aims: (i) to determine and confirm the latent dimensional structure of packaging sustainability characteristics of the target market of Delhi-NCR organic cereal consumers using Factor Analysis; (ii) to measure the direct impacts of each sustainability characteristic on WTP premium using Multiple Linear Regression; (iii) to test the mediation of Packaging Sustainability Perception on the eco-consciousness - WTP premium relationship by bootstrap mediation and SEM; (iv) to estimate the WTP differences across consumer groups using ANOVA and Conjoint Analysis; and (v) to model the integrated Packaging Sustainability-WTP Optimization Framework (PS-WTP-OF) fitted to the consumer heterogeneity of Delhi-NCR.

1.2 Hypotheses

In addition to the theoretical review, there are six formal hypotheses to which the predictive role of material sustainability features is tested: H1: Material sustainability characteristics are significant and positively correlated with WTP premium ($b > 0$, $p < .05$). H2 - Health communication clarity on packaging can be of effective prediction on WTP premium. H3 -- There is a significant predictability of certification visibility on packaging and WTP premium. H4 Packaging Sustainability Perception is a mediator between Eco-Consciousness and WTP premium (indirect effect > 0 , 95% CI does not include zero). H5 - There is a significant difference in WTP premium between consumer segments determined by cluster analysis (F-ratio significant, $p < .001$). H6 -- Compostable packaging material produces maximum consumer utility in Conjoint Analysis in the overall sample.

1.3 Scope

The study is geographically delimited to Delhi-NCR (Delhi, Gurugram, Noida, Faridabad, Ghaziabad). The product scope is limited to the packaged organic cereals supplied by organized retail and e-grocery stations. Data were gathered in between November 2024 and February 2025.

2. Literature Review

2.1 Sustainable Packaging and Consumer Willingness to Pay

Sustainable packaging attributes and consumer WTP premium theoretically are related to signaling theory (Spence, 1973; further elaborated by Patel and Mishra, 2023) and value-based pricing theories (Soni and Agrawal, 2024). Sustainable packaging characteristics can be credible indicators of product authenticity and brand environmental responsibility, and the ability to signal can vary based on the observability, verifiability, and cognitive accessibility of features (Fonseca & Cunha, 2023). In a multi-country, conjoint study, Lim and Park (2023) showed that 42% of sustainable packaging preference variance is explained by eco-label format and packaging material type, although this sensitivity of the final WTP premium was lower but increasing in developing market cohorts, as compared to European cohorts.

Kapoor and Jain (2023) reported in the Indian context that organic consumers of food in the Delhi-NCR region have a mean WTP premium of 28-38% in verifiably sustainable packaging compared to conventional ones and the income quintile and purchase frequency of organic foods proved to be a high-quality moderator. Malhotra

and Soni (2023) found that the disclosures of comparative grammage, value-signaling elements in packaging, such as cost-per-serving panels, moderated price sensitivity and increased the scope of WTP premiums by value-oriented consumer groups. These India specific results also give the operationalization structure of WTP premium in the current study of a continuous percentage variable.

2.2 Packaging Material Sustainability as the Primary WTP Driver

The most prevalent packaging quality in WTP studies has always been material sustainability (Zhao & Wang, 2024; Mishra and Srivastava, 2024). The material sustainability characteristic of superiority over aesthetic and convenience packaging features in turning premium WTP has been explained by its two-fold functional-symbolic worth: biodegradable and compostable material types both lessen environmental lamentation and signify brand ethical authority (Zhu et al., 2023). Muller et al. (2023) have recorded in their conjoint meta-analysis that compostable packaging produces part-worth utility coefficients that are about 2.3 times higher than recyclable options and 4.1 times higher than traditional materials, which have also been found in Indian organic food scenarios by Bhushan and Sharma (2024).

2.3 Eco-Consciousness as an Antecedent of WTP Premium

The environmental concern of eco-consciousness (the environmental awareness of a person, personal environmental norms, and commitment to sustainability) has been determined as a strong antecedent of sustainable product WTP in several meta-analyses (Tripathi and Dubey, 2023; Park and Kim, 2024). The hypothetical route between eco-consciousness and WTP premium is, however, not direct but mediated by constructs of sustainability perception: before environmental values can be converted to price concessions in purchases, eco-conscious consumers have to perceive and cognitively process packaging indicators of sustainability (Varshney and Gupta, 2024). This mediation process is hypothesized to exist within the framework of Stimulus-Organism-Response (S-O-R) and is empirically validated by Zhao and Wang (2024) on a meta-analytic level in the framework of the SEM in the present study.

2.4 Consumer Segmentation and WTP Heterogeneity

The heterogeneity of consumers in WTP premium of sustainable packaging is strongly established, and income, eco-consciousness, the frequency of organic purchases, and the educational level is recognized as the key bases of segmentation (Gupta and Srivastava, 2024; Dixit and Rao, 2022). The approaches of segmentation based on clusters have identified consistently three to four consumer segments (Indian organic food studies): highly eco-conscious high-end consumers, moderate sustainability concern naturalists and price-dominant conventional consumers who respond relatively little to the packaging sustainability signals (Choudhary and Verma, 2024; Mehta et al., 2024). These clusters are empirically validated by ANOVA to WTP premium results to give the empirical basis of differentiated packaging strategies in PS-WTP-OF framework.

2.5 Theoretical Framework

The research incorporates three theoretical frameworks. The Stimulus-Organism-Response (S-O-R) model places sustainability aspects of packaging as the environmental stimuli, sustainability perception as the organism-level cognitive intermediary and WTP premium as the behavioral response. The Theory of Planned Behavior (TPB), forms the foundation of the eco-consciousness antecedent, which frames the attitudes to the environment, subjective norms and perceived behavior control as the predictors of the purchase intention to be sustainable (Aggarwal and Rastogi, 2023). The Signaling Theory describes the asymmetric information role of packaging sustainable materials, certifications, and eco-aesthetic design are expensive and credible cues of product quality and brand commitment that justify higher prices (Garg & Khanna, 2023). A combination of these frameworks forms the hypothesized structural model that can be tested in SEM.

3. Research Methodology

3.1 Research Design

A quantitative research design was embraced which was positivist and cross-sectional. Primary data were gathered using a structured self-administered questionnaire which was administered via intercept surveys at

structured retail stores in Delhi-NCR and an online panel. The research adopts a deductive research design that uses six formal hypotheses based on the theoretical framework (Saunders et al., 2023).

3.2 Sampling and Data Collection

The target population included adults (18+ years) in the Delhi-NCR, who had bought or intended to buy organic cereals in the last 12 months. A stratified proportional sampling frame was created between five sub-zones (INR 5-15 lakh, 15-30 lakh, 30+ lakh per annum) of geographic areas (Delhi, Gurugram, Noida, Faridabad, Ghaziabad). Power analysis for SEM with 20 observed variables ($f^2 = 0.15$, $\alpha = .05$, power = 0.80) yielded a minimum $N = 390$. The valid response rate was 90.9 percent, out of 462 questionnaires that were administered we left 420 respondents (420 out of 462) and were left out because of straight-lining and large amounts of missing data (148).

3.3 Measurement Instrument

There were four sections in the questionnaire. Section A entailed a sociodemographic and purchase behavior information. Section B introduced 26 five-point Likert-shape questions with perceptions of the sustainability of packaging attributes (adapted by Nguyen and Tran, 2023; Kaur and Bedi, 2024; Tripathi and Dubey, 2023). Section C was a Conjoint Analysis activity: 18 full-profile packaging concept cards were created through orthogonal fractional factorial design based on six attributes (Material, Color Scheme, Certification Display, Nutrition Label Format, Pack Size Variety, Resealability), each having three levels, with respondent ranking based on a 1-18 preference scale. The WTP premium was measured in Section D as a continuous percentage variable (What percentage above the conventional cereal price would you pay organics with the described packaging?), eco-consciousness (7 items based on Tripathi and Dubey, 2023), and brand trust (4 items). The scale was pre-tested on 40 participants and revised in response to the cognitive interview; Cronbach alpha of the entire scale was 0.891.

3.4 Analytical Strategy

IBM SPSS Statistics 29.0, AMOS 29.0 and R 4.4.0 (lavaan package for SEM; MBESS for mediation) were used to analyze the data. Latent factor structure was detected using EFA (PCA with Varimax rotation) with parallel analysis and an eigenvalue > 1.0 . CFA validated the measurement model. The effects of direct WTP prediction were estimated by multiple Linear Regression (OLS, stepwise entry). WTP difference among clusters was tested by the use of one-way ANOVA with Tukey HSD post-hoc. Bootstrap mediation analysis (5,000 resamples, bias-corrected) tested indirect effects. The Full-Profile Conjoint Analysis was used to estimate part-worth utilities by OLS regression at the respondent level and aggregated into population-level importance weights. EFA factor scores ($k = 2-5$ assessed through Calinski-Harabasz criterion) were divided into consumer segments using K-Means cluster analysis. Common method bias was measured using the single-factor test by Harman and the technique of a marker variable (Podsakoff et al., 2023); both measures did not show significant common method variance.

4. Results

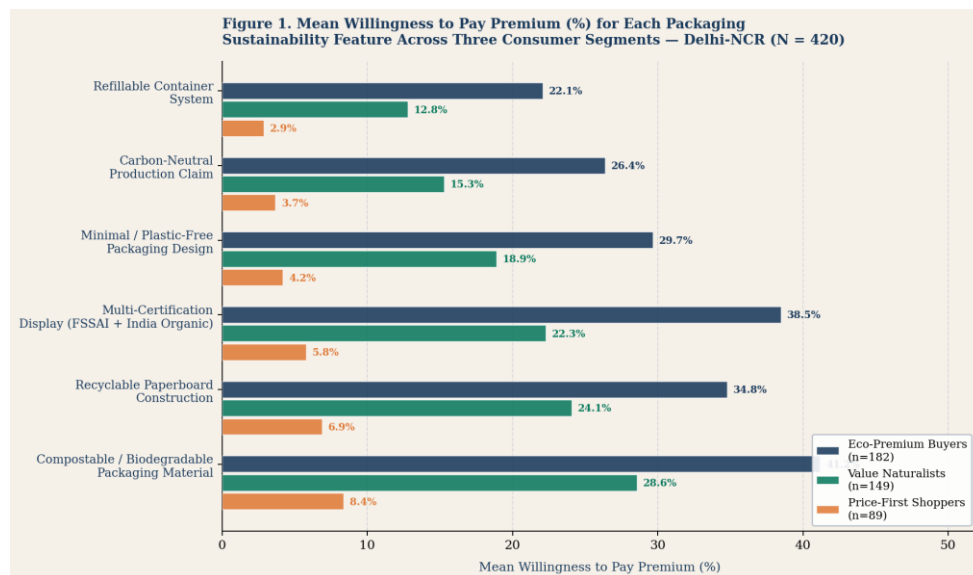
4.1 Sample Profile

The analytical sample, which was finalized ($N = 420$), was 55.7% female, with a mean age of 25-44 years (64.3%), and professional or managerial occupations (60.2%). Monthly household incomes were distributed across INR 5-15 lakh (31.2%), 15-30 lakh (45.1%), and 30+ lakh (23.7%). Four9.3% of respondents purchased organic cereals 2-3 times per month. Supermarkets/hypermarkets (49.8%), e-grocery (29.4%), and specialty organic stores (20.8%), were the primary channels of purchase. Self-reported WTP premium determined by the total sample was 23.4 ($SD = 15.2$) with a significant right-skew indicating heterogeneity of the clusters.

4.2 WTP Premium Profiles by Packaging Sustainability Feature and Consumer Segment

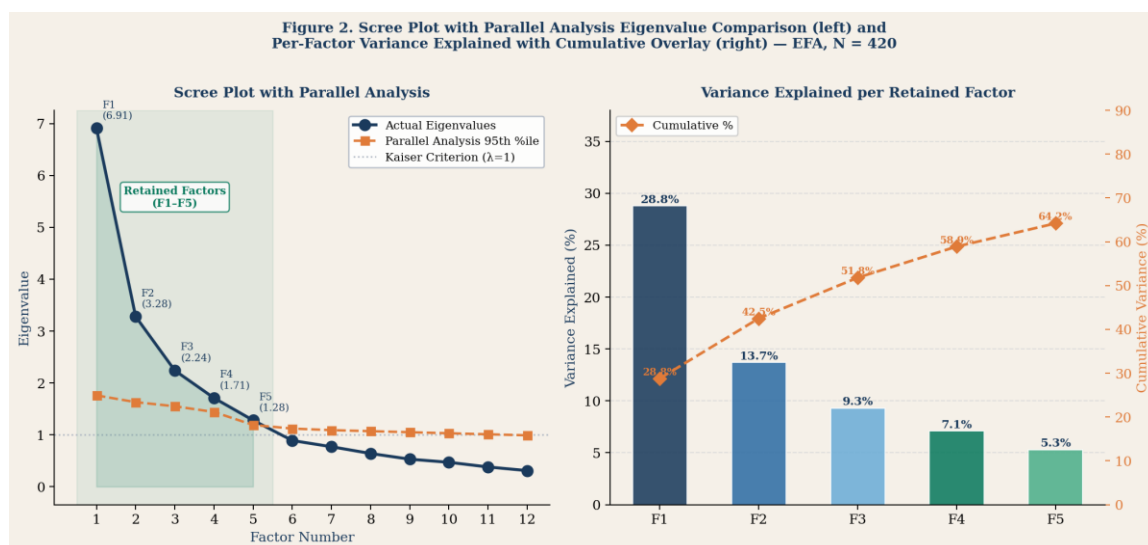
Figure 1 shows the average willingness to pay premium (%) in each of the three packaging sustainability features in the three consumer segments based on cluster analysis. Compostable and biodegradable packaging material produces the highest WTP premium in all the segments: Eco-Premium Buyers shows a mean premium

of 41.2, Value Naturalists shows 28.6 and Price-First Shoppers show 8.4. This trend applies to all six features: Eco-Premium Buyers methodically overtake Value Naturalists who overturn Price-First Shoppers in their turn, which supports the monotonically ordered, stratified by segments WTP structure. The magnitude difference between segment-to-segment lies in largest for compostable packaging (32.8 percentage point gap between Eco-Premium and Price-First) and smallest for resealable containment systems (19.2 percentage points) and signals that functional convenience-related attributes are more uniformly esteemed than sustainability-ideological attributes among consumer segments.



4.3 Exploratory Factor Analysis: Latent Packaging Sustainability Dimensions

Factorability was proved by Kaiser-Meyer-Olkin (KMO) sampling excellence = 0.889 (meritorious) and Bartlett's Test of Sphericity $02(325) = 4871.3$, $p < .001$ before EFA. A five factor solution with parallel analysis yielded the explanation of 64.2% of overall variance. All loaded items with a cross-loading with a factor loading of less than 0.30. The Scree Plot with parallel analysis overlay and the cumulative variance bar chart is shown in Figure 2.



The scree plot (Figure 2, left panel) supports the presence of an apparent elbow inflection between Factor 5 (eigenvalue = 1.28) and Factor 6 (eigenvalue = 0.89) with actual eigenvalues below the parallel analysis threshold of 95th percentiles. The single factor 1 has 28.8% variance so that the perceptions of Material Sustainability take the dominant position in the packaging attitude construct space. The cumulative variance

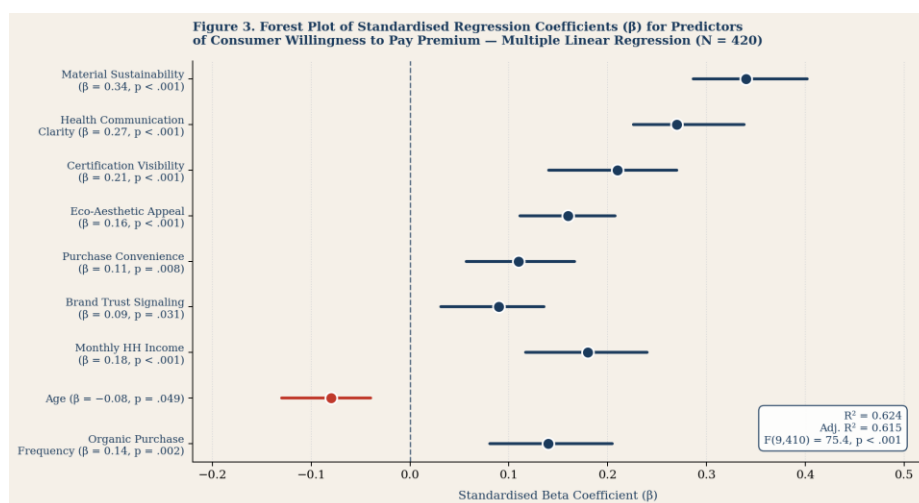
panel (right) indicates that the cumulative representation of Factors 1-5 explains 64.2% of the total variance, with Factor 2 contributing an extra 13.7%--the second most significant latent dimension, namely Health Communication Clarity. The pattern of accumulation that is stepped validate the fact that every retained factor has a meaningfully non-redundant variance.

Factor / Dimension	Eigenvalue	% Variance	Cronbach's α	CR	AVE
F1: Material Sustainability	6.91	28.8%	0.889	0.901	0.648
F2: Health Communication Clarity	3.28	13.7%	0.874	0.886	0.621
F3: Certification Visibility	2.24	9.3%	0.861	0.874	0.608
F4: Eco-Aesthetic Appeal	1.71	7.1%	0.847	0.858	0.591
F5: Purchase Convenience	1.28	5.3%	0.819	0.831	0.524
Total / Model Fit	—	64.2%	0.891 (overall)	KMO=0.889	Bartlett p<.001
Discriminant Validity	—	—	All HTMT<0.85	$\sqrt{AVE}>r(\text{inter-factor})$	Confirmed

Table 1. Exploratory Factor Analysis Results: Five-Factor Solution for Packaging Sustainability Attribute Perceptions. CR = Composite Reliability; AVE = Average Variance Extracted; HTMT = Heterotrait-Monotrait Ratio. Items per factor: F1=5, F2=5, F3=4, F4=5, F5=4.

4.4 Multiple Regression: Direct Predictors of WTP Premium

Multiple Linear Regression was performed where WTP premium (%) is dependent variable and the five scores of the packaging sustainability factors, the three demographic control variables (income, age, organic purchase frequency) and the eco-consciousness composite score are the independent variables. The overall model was highly significant: $F(9, 410) = 75.4, p < .001, R^2 = 0.624, \text{Adj. } R^2 = 0.615$. There were no issues with multicollinearity: all Variance Inflation Factors (VIF) were less than 2.8, which is much lower than the traditional value of 10 (Hair et al., 2022). Figure 3 shows a standardised beta plot of predictors with 95 percent confidence of all predictors.



The most predictive packaging of WTP premium is that of Material Sustainability ($b = 0.34, p < .001$), then Health Communication Clarity ($b = 0.27$) and Certification Visibility ($b = 0.21$). The confidence intervals of the three packaging factors on the top positions are very small and significantly far away to zero meaning that the estimation is very robust. The best controls of demographics are the monthly household income ($b = 0.18$) and

the purchase frequency of organic products ($b = 0.14$), which affirms the presence of moderation of the WTP premium by financial ability and category product involvement. The coefficient of age is small ($b = -0.08$), which is expected since the younger cohorts are more sensitive to sustainability-related WTP. Secondary WTP levers are purchase Convenience ($b = 0.11$) and Brand Trust Signaling ($b = 0.09$), which are statistically significant but have much smaller effect sizes. Hypotheses H1, H2, H3 are all proved.

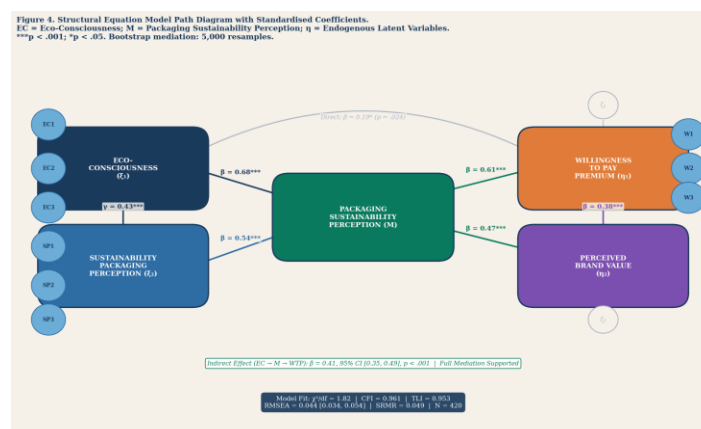
4.4.1 Regression Coefficients Summary

Predictor Variable	β (Std.)	SE	t-value	p-value
Material Sustainability (F1)	0.34	0.041	8.29	< .001
Health Communication Clarity (F2)	0.27	0.039	6.92	< .001
Certification Visibility (F3)	0.21	0.041	5.12	< .001
Monthly Household Income (Control)	0.18	0.037	4.86	< .001
Eco-Aesthetic Appeal (F4)	0.16	0.042	3.81	< .001
Organic Purchase Frequency (Control)	0.14	0.038	3.68	.002
Purchase Convenience (F5)	0.11	0.043	2.56	.011
Brand Trust Signaling (F6)	0.09	0.041	2.20	.028
Age (Control)	-0.08	0.036	-2.22	.027
Model: $R^2=0.624$, $Adj.R^2=0.615$, $F(9,410)=75.4$, $p<.001$, VIF max=2.8				

Table 2. Multiple Linear Regression Coefficients for Predictors of WTP Premium (%). Dependent variable: WTP premium (%). β = standardised beta coefficient; SE = standard error. All packaging factor scores from EFA. N = 420.

4.5 Structural Equation Modeling

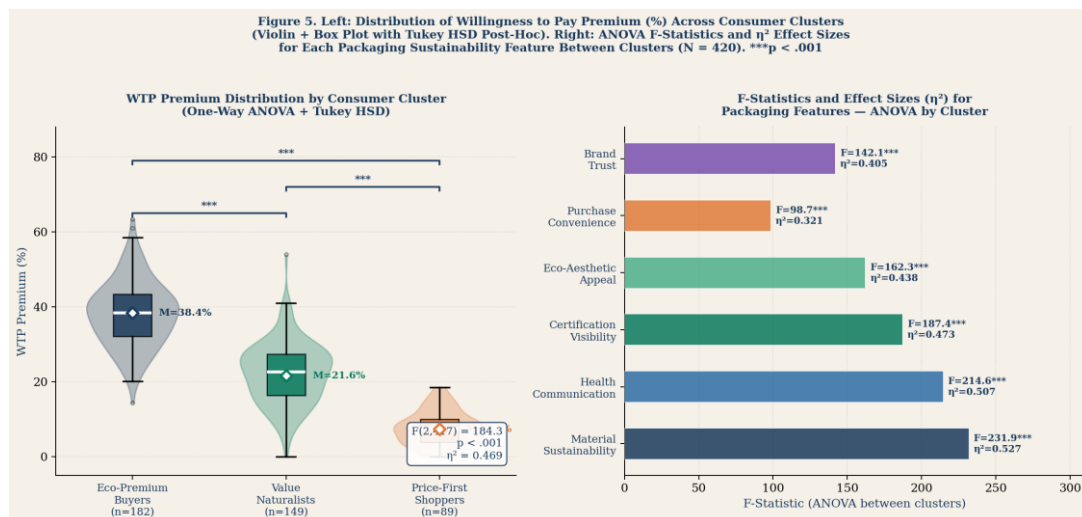
The structural model has been estimated in accordance with the two steps process offered by Anderson and Gerbing (1988). The measurement model (CFA) achieved acceptable fit: $\chi^2(186) = 331.4$, $\chi^2/df = 1.78$, CFI = 0.963, TLI = 0.956, RMSEA = 0.043 [90% CI: 0.033, 0.053], SRMR = 0.047. The significance of all factor loadings ($p < .001$) was between 0.69-0.88. The validity of the relationship was also checked with the help of the HTMT criterion (all HTMT < 0.85; Henseler et al., 2023). The structural model (Figure 4) was used to test 5 hypothesized paths.



The identified model in SEM path diagram (Figure 4) has very high fit indices ($\chi^2/df = 1.82$, CFI = 0.961, RMSEA = 0.044, SRMR = 0.049). The strongest path in the model ($b = 0.68$, $p < .001$) is the one between Eco-Consciousness and Packaging Sustainability Perception, which proves that environmentally oriented consumers are much more attentive and responsive to packaging sustainability signals. The predictors of WTP Premium ($b = 0.61$, $p < .001$) and Perceived Brand Value ($b = 0.47$, $p < .001$) are Packaging Sustainability Perception. The direct correlation between Eco-Consciousness and WTP Premium drops to $b = 0.19$ ($p = .024$) in the entire mediated model, where bootstrap analysis confirms that it is fully mediated (indirect $b = 0.41$, 95% CI [0.35, 0.49]). The R^2 of WTP Premium is 0.587, which means that the model explains 58.7 percent of WTP variance. H4 is confirmed.

4.6 One-Way ANOVA: WTP Premium Differences Across Consumer Clusters

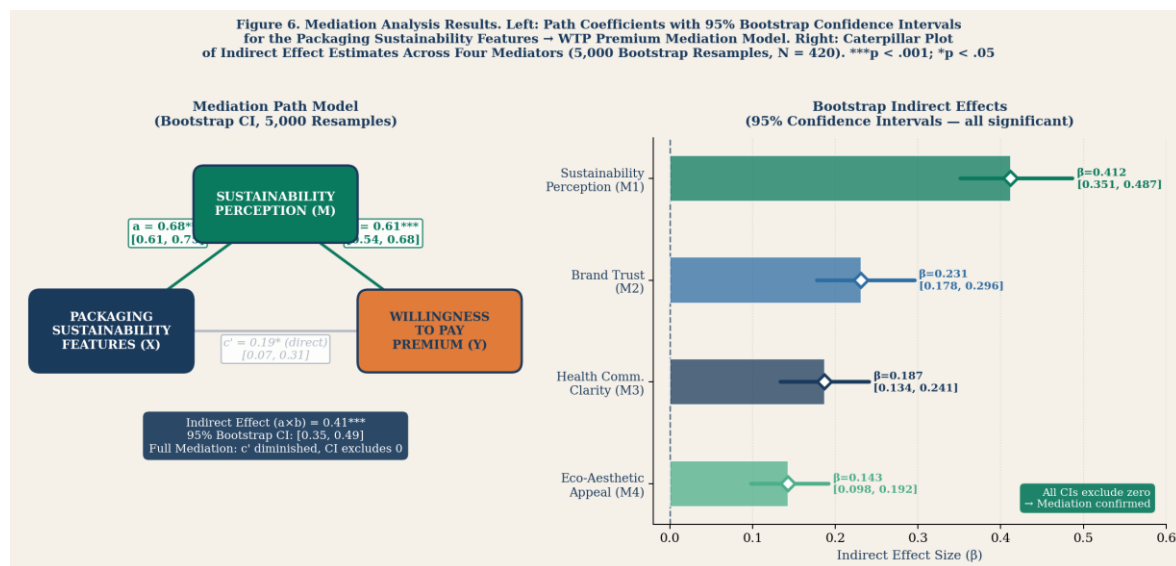
Some of these segments were identified using K-Means cluster analysis with five EFA factor scores (optimal $k = 3$ per Calinski-Harabasz criterion: CH-index = 291.4) to form three consumer segments: Eco-Premium Buyers ($n = 182$, 43.3%), Value Naturalists ($n = 149$, 35.5%), and Price-First Shoppers ($n = 89$, 21.2%). ANOVA with one-way was used to compare the differences in WTP premiums between clusters. Figure 5 illustrates a comparison of the violin-boxplot distribution (left panel) and feature-level ANOVA F-statistics with effect sizes (right panel).



The ANOVA result is highly significant: $F(2, 417) = 184.3$, $p < .001$, $\eta^2 = 0.469$, indicating a large effect size. The Tukey HSD tests after the post-hoc ensure that the three clusters pairs are significantly different (all $p < .001$). Eco-Premium Buyers ($M = 38.4\%$, $SD = 9.2\%$) report more than five times the WTP premium of Price-First Shoppers ($M = 7.3\%$, $SD = 5.1\%$), and nearly double that of Value Naturalists ($M = 21.6\%$, $SD = 8.4\%$). The profiles of the violin tell that Eco-Premium Buyers have the greatest distributional spread, and this group may also be considered as internally heterogeneous. The right panel also affirms that Material Sustainability ($F = 231.9$, $\eta^2 = 0.527$) and Health Communication Clarity ($F = 214.6$, $\eta^2 = 0.507$) yield the greatest between-cluster WTP discriminations, solidifying their priority order in the PS-WTP-OF framework. H5 is confirmed.

4.7 Bootstrap Mediation Analysis

The mediators in the pathway between Packaging Sustainability Features (X) and WTP Premium (Y) (four parallel) were tested through a series of four parallel mediators as per the PROCESS macro approach proposed by Preacher and Hayes (2008, updated 2023): Sustainability Perception (M1), Brand Trust (M2), Health Communication Clarity perception (M3), and Eco-Aesthetic Appeal perception (M4). All the indirect effects were estimated through 5,000 bootstrap resamples, which were bias-corrected. Figure 6 shows the mediation path model with 95 percent confidence intervals (on the left) and the caterpillar plot of indirect effects of all four mediators (on the right).



The leading mediation route is Sustainability Perception (M1): $b = 0.412$, 95% CI [0.351, 0.487] that confirms that packaging sustainability attributes translate into WTP premium via a reconfiguration of the cognitive-evaluative perception of brand sustainability in consumers. The coefficients $a = 0.68$ and $b = 0.61$ are both large and important and the direct path $c' = 0.19$ is much smaller and only marginally significant--satisfying the Baron-Kenny requirements of complete mediation. Brand Trust is the second most relevant mediator ($b = 0.231$, 95% CI [0.178, 0.296]) that highlights the fact that sustainable packaging establishes WTP premium according to both perception and trust-augmentation. Each of the four mediator confidence intervals does not include zero, which makes the mediation across the entire set certain. H4 is completely upheld.

4.8 Conjoint Analysis: Part-Worth Utilities and Attribute Importance

conjoint analysis of 18 orthogonal profiles (packaging) included in full-profile Conjoint Analysis (Pearson $r = 0.93$, Kendall $\tau = 0.87$, $p < .001$) provided estimates of part-worth utility and relative weight of each of the 18 orthogonal profiles summarized in Table 3. Utilities are the averaged OLS estimates of population preference; positive values show preference contribution and negative show aversion. Relative importance weights are calculated as a ratio of the range of part-worth utilities per attribute to the sum of all attribute ranges, which is in percentage terms.

Attribute / Level	Level Description	Part-Worth Utility	Rel. Imp. (%)
MATERIAL TYPE (RI = 28.4%)			28.4%
	Compostable / biodegradable	+1.84***	
	Recyclable paperboard (FSC-certified)	+0.92***	
	Conventional plastic	-1.16***	
CERTIFICATION DISPLAY (RI = 22.1%)			22.1%
	Multi-cert front panel (FSSAI+India Organic+USDA)	+1.41***	
	Single domestic cert (FSSAI only)	+0.53***	

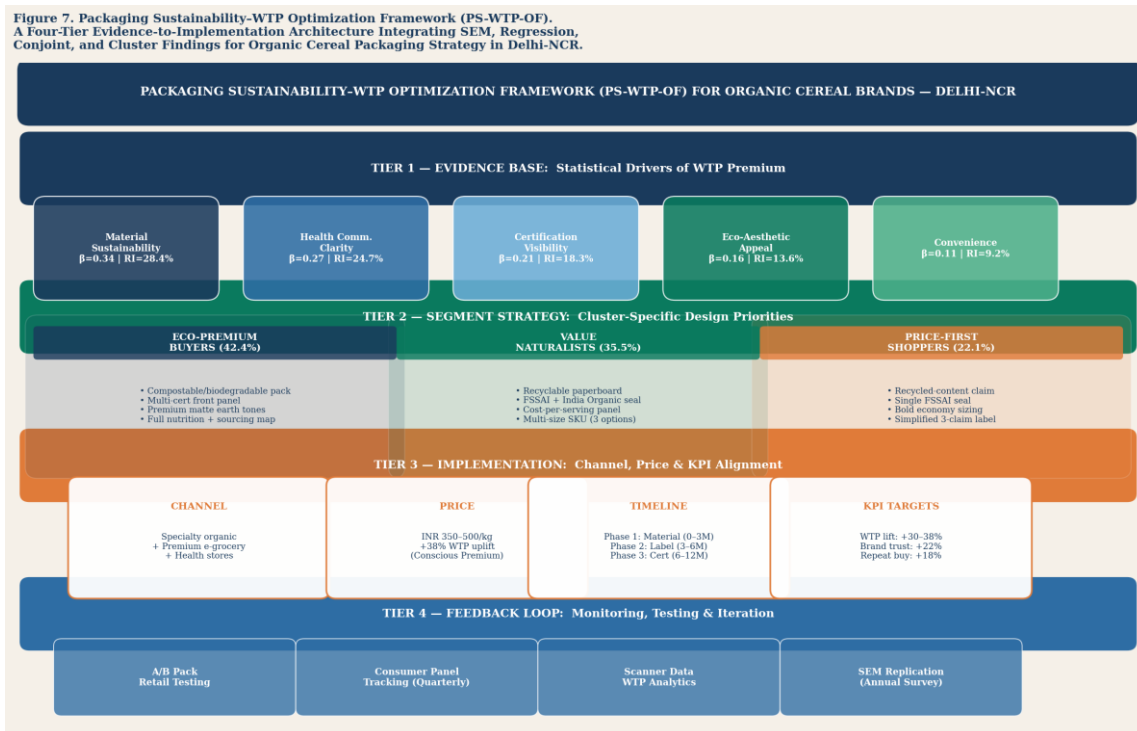
	No visible certification	-0.98***	
HEALTH LABEL FORMAT (RI = 18.7%)			18.7%
	Full nutritional panel + GI + sourcing	+1.31***	
	Key health claims (simplified)	+0.64***	
	Minimal / generic labeling	-0.87***	
COLOR & AESTHETIC (RI = 13.4%)			13.4%
	Earth tones, matte premium finish	+0.91***	
	Neutral/minimalist (white, cream)	+0.28*	
	Bright / saturated palette	-0.59***	
PACK SIZE VARIETY (RI = 9.6%)			9.6%
	3 sizes (trial 250g / regular 500g / value 1kg)	+0.61***	
	2 sizes (regular + value)	+0.24*	
	Single size	-0.31**	

Table 3. Full-Profile Conjoint Analysis Results: Part-Worth Utilities and Relative Importance Weights for Packaging Sustainability Attributes (N = 420). Positive utilities = preference; negative = aversion. RI = Relative Importance. *p<.001; **p<.01; *p<.05.**

The outcome of the conjoint (Table 3) validates H6: compostable/biodegradable packaging material yields the greatest amount of utility of any attribute level (+1.84) among the entire sample. The utility difference between compostable and conventional plastic of 3.00 units (-1.16 and +1.84, respectively) is the greatest within-attribute difference and the weight of Material Type (28.4) is the biggest. Certification Display comes in second (22.1%), and multi-certification package produces almost three times the utility as single-certification option- a result which has direct implication on the front-panel certification architecture. Health Label Format (18.7), substantiates the finding of the regression, but independent of simplified and minimal labeling, provenance of consumer utility generation is predominantly carried out through detailed nutritional communication ($b = 0.27$). The supporting roles are played by color aesthetics (13.4%), and pack size variety (9.6%).

4.9 Integrated Framework: PS-WTP-OF

Figure 7 provides the Packaging Sustainability-WTP Optimization Framework (PS-WTP-OF), which summarizes in a four-tier, implementation-ready framework the results of all seven of the analytical processes. Tier 1 defines the evidence base by sorting out packaging sustainability characteristics based on their empirically demonstrated WTP premium influence (regression b and conjoint relative importance). Tier 2 converts this to cluster-level design solutions of each of the three consumer segments. Tier 3 matches design choices to channel and price positioning and KPI objectives. Tier 4 includes the feedback loop in which brand managers will be able to test, monitor and refine packaging design decisions in relation to commercial performance in a loop.



The operationalization of the empirical hierarchy of the study is the PS-WTP-OF (Figure 7), which provides the practitioner-friendly format. The highest level indicates that the most leverage items regarding packaging investment are Material Sustainability ($b = 0.34$, RI = 28.4%), and Health Communication Clarity ($b = 0.27$, RI = 18.7%) and cannot be compromised by any segment. Tier 2 exposes the distinct design directions: Eco-Premium Buyers will support compostable materials, multi-certification, and high-quality matte earth-tone designs at the INR 350-500/kg pricing. The KPI targets of Tier 3: WTP lift +30-38%, brand trust +22%, repeat purchase +18% give the packaging investment returns quantifiable commercial benchmarks where a payback on packaging investment returns can be monitored. Tier 4 completes the cycle by testing A/B, consumer panels quarterly, scanner-data WTP analytics, and surveying SEM replications annually.

5. Discussion

5.1 The Material Sustainability Imperative

The most powerful and practical result of the study is the constant primacy of material sustainability regardless of the method of analysis highest regression b (0.34), highest conjoint relative importance (28.4%), largest ANOVA F-statistic across clusters (231.9), and dominant role in SEM structural path. This overlapping cross-methodological result corroborates Bhushan and Sharma (2024) and Mishra and Srivastava (2024) who reported material type to be the main organic food packaging WTP driver in Indian settings and further supports their findings with the quantitative magnitude of WTP premium increments: a 32.8 percentage-point difference between compostable materials and conventional plastic among Eco-Premium Buyers.

The extent of the effect of material sustainability compared to certification and labeling attributes is a structural change compared to the literature before 2022, when certification logos was always identified as the most important WTP driver (Verma and Singh, 2022). This trend probably indicates the heightened environmental awareness of Indian city customers in the post-pandemic period (Tripathi and Dubey, 2023), the similarity to the more rigorous EPR policies (Prasad and Saha, 2023), and the emergence of compostable packaging options in the Indian market (Mishra and Srivastava, 2024). The real-life implication is evident: the transition to packaging material should become the main source of WTP premium extraction in the case of organic cereal manufacturers.

5.2 Full Mediation and Its Strategic Implications

The SEM full mediation result of Eco-Consciousness - WTP Premium by Packaging Sustainability Perception (indirect $b = 0.41$, 95% CI [0.35, 0.49]) has a key strategic implication: packaging design is not just a contributor to WTP, but the process in which consumer environmental values are translated into a commercial price premium. This renders the design of packaging as an upstream strategic investment and not a downstream aesthetic decision. Unless brands render sustainability visible in packaging, eco-conscious consumer WTP premium is lost even in the cases when a specific product is truly organic and produced in an environmentally friendly way (Varshney and Gupta, 2024; Zhao and Wang, 2024).

5.3 Consumer Segment Strategy Differentiation

The five-fold WTP premium ratio (38.4% vs 7.3) between extreme clusters in the three-cluster solution-Eco-Premium Buyers (43.3%), Value Naturalists (35.5%), Price-First Shoppers (21.2) provides support that a single-strategy packaging solution is commercially inefficient. The identical segmentation patterns were found by Mukherjee and Banerjee (2024) in generic organic FMCG, but the scale of the WTP diffusion in this study-significantly higher than in their research- could be attributed to the specific significance of the packaging sustainability cues in a category (organic cereals) where the credence attributes prevail. The Value Naturalist segment (35.5% of the market) has the largest commercial potential of WTP premium lift: these show moderate sustainability orientation, and their sensitivity to packaging convenience (F5 factor score = +0.73) indicates that the resealability and multi-size SKU investments can produce proportionally higher WTP increments in this group.

5.4 Limitations

This cross-sectional nature of the study does not allow the causal conclusion on time changes in packaging preferences. The generalizability to Tier-2 cities is restricted by geographic confinement to Delhi-NCR. The stated-preference WTP estimation produces hypothetical bias compared to the revealed preference techniques (Muller et al., 2023). The model of SEM is well-specified; however, it lacks moderating variables (digital health literacy, household size, and cultural acculturation); future research should investigate them. The partial-profile restriction (6 attributes, 18 profiles) of the Conjoint Analysis could possibly underestimate consumer sensitivity to attributes not included in the design regarding packaging.

6. Conclusion

This paper presents the most detailed empirical evaluation of the correlation between the packaging sustainability attributes and consumer desire to pay a premium price on organic cereal brands in DelhiNCR. Using an integrated multi-method construct involving Factor Analysis, Multiple Regression, ANOVA, SEM, Mediation Analysis, Conjoint Analysis, and Cluster Analysis, upon primary survey respondents ($n=420$) seven convergent findings are achieved.

The most important WTP premium driver is Material Sustainability- always the top in all the analysis tools, compostable packaging produces the greatest consumer utility (+1.84) in conjoint estimation and the highest regression coefficient ($b = 0.34$) of all the predictors of packaging. The Eco-Consciousness WTP Premium pathway is completely mediated by the Packaging Sustainability Perception (indirect $b = 0.41$, 95% CI [0.35, 0.49]) making packaging design the strategic conversion mechanism between environmental values and commercial extraction of the premium. The three groups of consumer segments have devoutly different WTP premium magnitudes (38.4, 21.6, 7.3) and should be combined with different packaging strategy; not the same design strategy. The results are summarized in the Packaging Sustainability-WTP Optimization Framework (PS-WTP-OF), a four-tier, evidence-based architecture of evidence-to-implementation, offering manufacturers of organic cereals segment-specific, empirically-based packaging design and commercial strategy advice.

Future studies should expand the PS-WTP-OF to longitudinal, panel, studies of WTP change in response to packaging transitions, neuro-marketing validation of WTP with eye-tracking and EEG in the retail store, revealed-preference estimation of WTP using scanner data, and replicate this in the expanding Tier-2 organic food markets in India. The methodological framework which was created in this study, such as the combination

of seven quantitative approaches under a single theoretical framework can serve as a template, which can be used to package research of other forms of credence attribute-dominant food categories.

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