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Strategic Signaling and Sustainable Consumer Purchase Behavior: The Case of Fast Fashion Supply Chains

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Abstract

In response to growing consumer demand for sustainability, the objective of this study is to investigate the impact of strategic sustainability signaling on consumer purchasing behavior, assess consumer perceptions, and identify key factors that enhance the effectiveness of these signals in promoting sustainable purchasing practices in the fast fashion industry in Albania. It adopts a quantitative research approach with an experimental setup featuring two surveys: one for a control group and one for a treatment group. Participants completed surveys distributed digitally, yielding 416 responses. Data was analyzed using Ordinal Logistic Regression and Structural Equation Modeling (SEM) to evaluate relationships between demographic factors, purchase preferences, perceived product attributes, and other relevant factors. Findings highlight the significant role of factors like sustainable packaging, perceived product attributes, sustainability awareness, social influence, brand loyalty, and exposure to sustainability signals in positively influencing sustainable consumer purchasing behavior. This study provides novel insights into how fast fashion brands can enhance sustainability initiatives. The application of signaling theory to sustainable packaging and its impact on purchase intentions offers a unique perspective, emphasizing the importance of credible and effective sustainability communication.

Keywords: *Sustainable packaging, Consumer behavior, Fast fashion, Strategic signaling theory, Sustainability Awareness*

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1. Introduction

The fast fashion industry has significantly transformed consumer behavior, revolutionizing clothing purchases by offering low-cost, short-trend-focused clothes with rapid turnover. Despite its economic success, the industry faces criticism for its negative environmental and social impacts. Its production processes rely heavily on intensive resource use and low-cost labor, often leading to ecological degradation, overproduction, and the exploitation of workers in regions with inadequate labor regulations (Sweeney, 2015). Additionally, the disposable nature of fast fashion contributes to significant textile waste and pollution, raising further sustainability challenges.

In recent years, growing consumer awareness of environmental issues has prompted many fashion brands to adopt sustainable practices, including eco-friendly materials and less polluting manufacturing techniques, leading to the emergence of "sustainable fashion" (Aßländer et al., 2016; Caniato et al., 2012; He et al., 2014). The use of sustainable packaging serves as a key medium for communicating a brand's commitment to sustainability. Sustainable packaging utilizes biodegradable or recyclable materials to minimize environmental impact, in line with consumers' increasing demand for environmentally conscious products as well as changing governmental regulations and environmental considerations. Nevertheless, despite these advances in sustainable practices, there still exists a gap between consumer intentions and their actual purchasing behavior, with factors like cost and convenience prevailing upon sustainable choices. This gap highlights a pressing research problem: the need to understand the mechanisms through which sustainability signals, such as packaging, influence consumer decisions. Fast fashion brands face the challenge of designing effective sustainability communication strategies to motivate eco-friendly purchase behaviors without compromising their competitive position in a price-sensitive industry.

Motivated by this consideration, this study aims to explore the impact of sustainable packaging and other antecedents as a strategic signal on consumer purchasing behavior within Albania’s fast fashion industry. By applying signaling theory, the research investigates how sustainability messages, when perceived as credible and aligned with consumer values, can bridge the information gap and increase trust. The study also examines critical factors, including demographic characteristics, sustainability awareness, and brand loyalty, that mediate this relationship.

To address the identified gaps and achieve the objectives of the study, the following research questions have been designed,

- How do consumers perceive sustainable packaging in the fast fashion industry, and to what extent does it impact sustainable consumer purchase behavior?
- What role do other sustainability signals play in promoting sustainable purchasing practices?

2. Literature Review

2.1. Conceptualizing Fast Fashion within Sustainable Supply Chain Management Frameworks

The concept of "fast fashion" has been explored by various researchers, each providing nuanced definitions that collectively capture the essence of this rapidly evolving segment within the fashion industry, characterized by its rapid production cycles, low-cost garments, and quick response to changing consumer demands (Claxton and Kent, 2020). This business strategy facilitates consumers to purchase the latest trends at affordable prices, thus driving frequent shopping behaviors and increasing overall consumption. Expanding on the concept, many authors explore environmental challenges, impacts, opportunities, and sustainability transition in the fast fashion supply chains through both theoretical and empirical studies (Arrigo, 2020; Chan et al., 2020; Coelho et al., 2020; Quadir, 2020; Busalim et al., 2022; Leclercq-Machado et al., 2022; Zhu, 2024).

Industry is a major contributor to global pollution, accounting for 8% of carbon emissions and 20% of wastewater (Bailey et al., 2022). Circular economy strategies, such as reuse, recycling, and repair, offer solutions to reduce its environmental footprint. However, barriers like technological limitations and low consumer awareness hinder their adoption (Ramírez-Escamilla et al., 2024). The Multi-Level Perspective (MLP) framework has also been used to analyze sustainability transitions in fast fashion. Dzhengiz et al. (2023) explore the conflict between sustainability goals and the industry's demand for speed and cost efficiency, where many companies struggle to balance these priorities, often resorting to superficial "greenwashing".

Supply Chain Management (SCM) plays a pivotal role in addressing these challenges. Sustainable Supply Chain Management (SSCM) integrates economic, environmental, and social dimensions into traditional SCM practices to meet customer and stakeholder sustainability goals (Khan et al., 2021; Fritz & Ruel, 2024). The concept has evolved significantly, driven by the need to manage material, information, and capital flows while meeting the sustainability goals derived from customer and stakeholder requirements. However, gaps remain between theory and practice, as firms focus on short-term concerns rather than a holistic view of the supply chain.

The fast fashion industry, known for its quick production cycles, frequent release of new collections, and budget-friendly prices, has transformed conventional fashion supply chains. The fast fashion industry, despite its economic success, faces significant sustainability challenges, particularly in its environmental and social impacts. Key issues include high greenhouse gas emissions, water pollution from dyeing processes, and substantial waste generation due to unsold inventory and short product lifecycles (Niinimäki et al., 2020). To address these issues, Chan et al. (2020) advocate for tailored corporate social responsibility (CSR) strategies, while

Guo et al. (2020) propose a "co-opetition" approach, blending competition and cooperation among retailers to develop eco-friendly products.

More recent studies delve deeper into consumer behavior and corporate responsibility. Hageman et al. (2023) highlight an attitude-behavior gap among female consumers, where awareness of sustainability initiatives often fails to curb fast fashion consumption, largely due to the influence of advertising and social media. Garcia-Ortega et al. (2023) propose a sufficiency-driven framework based on circular economy principles but warn against "anti-consumerist washing," a subtle form of greenwashing that undermines genuine progress, while Fan and Chang (2023) emphasize the importance of corporate responsibility and fostering consumer engagement in sustainable clothing design.

2.2. Signaling Theory and its Application in Fast Fashion

Signaling Theory explains how individuals or firms communicate intentions to reduce information asymmetry between parties, where one possesses more knowledge than the other (Spence, 1973). Information asymmetry can lead to adverse selection and moral hazards, necessitating the use of signaling to bridge this gap. Therefore, understanding the recipient's perspective is crucial for ensuring successful communication of the signal. Signaling theory is frequently utilized to decrease information asymmetry and establish trust between parties (Connelly et al., 2011). Understanding how companies communicate their environmental and social practices to consumers and other stakeholders is crucial in this field.

In the fast fashion industry, brands increasingly use eco-friendly packaging to signal commitment to sustainability. For such signals to impact consumer behavior, they must be credible and visible, fostering trust and enhancing brand perception (Bird & Smith, 2005). Various firms often utilize signaling theory to convey a company's dedication to sustainable practices. This involves utilizing certifications, sustainability reports, eco-labels, and marketing campaigns to communicate sustainable practices to consumers, investors, and other stakeholders. The effectiveness of these signals depends on their ability to build credibility and reduce skepticism (Quadir, 2020; Williams & Hodges, 2022; Zhu, 2024).

In this context, Quadir (2020) highlights the role of CSR perceptions in shaping purchase intentions and reducing skepticism in fast fashion. Similarly, Williams and Hodges (2022) underscore the importance of clear sustainability messaging, such as informative labeling on clothing, to address information gaps and support informed consumer decisions. These studies emphasize the critical role of robust sustainability communication systems in enhancing trust and mitigating information imbalances.

2.3. The Impact of Sustainability on Consumer Behavior, Case of Sustainable Materials and Textiles

Consumer behavior in sustainable fashion is shaped by factors such as environmental awareness, product value, social norms, personal values, and perceived behavioral

control (Dangelico et al., 2022; Leclercq-Machado et al., 2022). Eco-labels and certifications bridge the information gap, fostering trust and influencing purchase intentions by effectively communicating environmental benefits (Busalim et al., 2022; Paço et al., 2021).

Socio-demographic factors play a key role in sustainable purchasing behavior. Generation Z is driven by peer and media influence but is limited by affordability (Alghamdi & Agag, 2024). Higher education improves understanding of sustainability labels (Yener et al., 2023), while women tend to engage more in sustainable purchasing despite barriers like cost and convenience (Yener et al., 2023; Alghamdi & Agag, 2024). Income also affects perceptions of sustainable fashion quality and status (Dangelico et al., 2022). However, a gap between attitudes and behaviors persists, highlighting the need for further research (Busalim et al., 2022).

The fast fashion industry has begun incorporating sustainable materials to reduce environmental harm. Designers play a vital role by enhancing garment durability reducing waste (Claxton & Kent, 2020) and fostering stronger consumer-product connections through emotionally committed design practices (Heinze, 2020). Biobased materials, aligned with circular economy principles, show potential for transforming textile manufacturing and reducing environmental impact (D'Itria & Colombi, 2022).

However, despite progress, significant barriers remain to the widespread adoption of sustainable materials in the fashion industry, including technological limitations, high costs, ethical challenges, R&D constraints, and the need for transparency and traceability in supply chains (Claxton & Kent, 2020; Heinze, 2020; Islam et al., 2021).

2.4. Conceptual Framework and Hypotheses

This study explores factors influencing consumer purchasing behavior in the fast fashion industry, focusing on sustainable packaging and other antecedent factors. Building on the literature, it examines the roles of demographics, perceived product qualities, social influence, and sustainability consciousness in shaping consumer choices. Based on the research objectives, the following hypotheses were developed:

Ho1: *Sustainable packaging positively influences consumer purchase behavior in the fast fashion industry.*

Sustainable packaging signals a brand's commitment to environmental responsibility, reducing information asymmetry and fostering trust. Such perceptions enhance brand evaluations and drive purchase intentions (Dangelico et al., 2022; Orzan et al., 2018). The perception of environmental responsibility conveyed through sustainable packaging can lead to a more favorable evaluation of the brand and its products.

Ho2: *Perceived product attributes significantly influence consumer purchase behavior*

Attributes such as quality and sustainability are key determinants of purchase intentions. High-quality, sustainable products enhance perceived value, encouraging purchases (Busalim et al., 2022; Paço et al., 2021). These attributes enhance the perceived value of the product, thereby driving purchase intentions.

Ho3: *Sustainability awareness has a significant impact on consumer purchase behavior in the fast fashion industry.*

Awareness of sustainability issues enhances consumer responsiveness to sustainability signals, fostering sustainable purchasing decisions (Zhu, 2024). When consumers are more aware of and knowledgeable about sustainability issues, they are more likely to be influenced toward sustainable purchasing decisions.

Ho4: *Social influence positively impacts consumer purchase behavior*

Social factors play a crucial role in shaping consumer behavior, particularly in the context of sustainability. Social proof and peer influence shape consumer behavior, increasing receptivity to sustainability messages when endorsed by social circles (Dangelico et al., 2022).

Ho5: *Demographic factors influence the consumer purchasing behavior.*

Previous research highlights that socio-demographic factors, including age, education, income, and gender, significantly shape responses to sustainability cues, with women and younger, educated, and higher-income individuals engaging more with eco-friendly initiatives (Alghamdi & Agag, 2024; Yener et al., 2023).

Ho6: *Purchase motivators have a significant effect on consumer purchase behavior in the fast fashion industry.*

Purchase motivators such as price, convenience, and product functionality are major drivers of purchasing behavior, with clear sustainability claims encouraging eco-friendly choices (Camilleri et al., 2023). Dlamini et al. (2024) further confirm that price remains the dominant motivator, but clear sustainability claims can shift consumer choices towards more eco-friendly options.

Ho7: *Brand loyalty positively influences consumer purchasing behavior in the fast fashion industry.*

Research by Jones-Garcia et al. (2022) indicates that loyal customers are more likely to be influenced by a brand's sustainability efforts and are more responsive to purchase motivators aligned with their loyalty. This suggests that brand loyalty can strengthen sustainable consumer behavior.

Ho8: *Exposure to sustainability signals affects consumer purchase behavior.*

Clear and credible sustainability signals, such as eco-friendly packaging, build trust and enhance purchase intentions by bridging information gaps (Dangelico et al., 2022; Orzan et al., 2018).

Accordingly, the proposed conceptual model for this study is as follows in Figure 1,

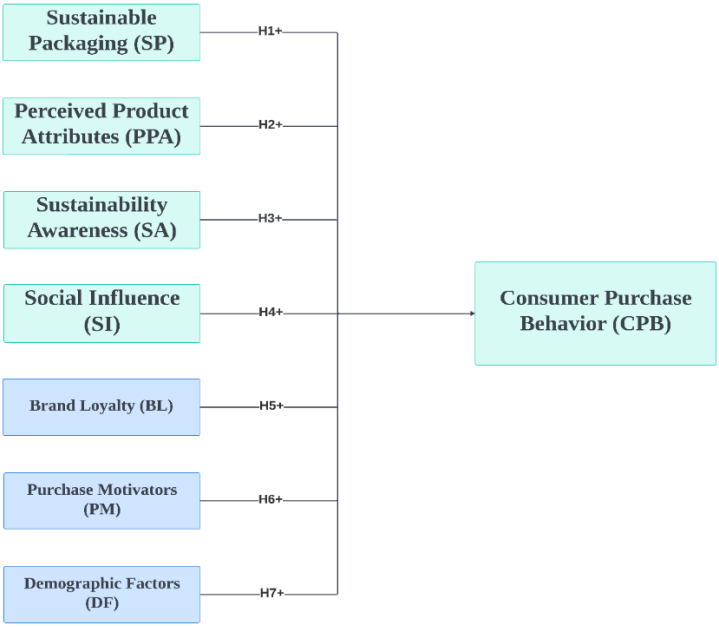

Figure 1. Conceptual Model

Source: Authors' own elaboration

3. Methodology

This study adopts a quantitative research approach to examine the impact of strategic signaling in sustainable packaging on consumer purchase behavior in fast fashion. The research design incorporates an experimental setup with two separate surveys: one for a control group and another for a treatment group. The surveys were adapted from Dangelico et al. (2022) and Orzan et al. (2018). The surveys comprise three sections, one section aims to collect socio-demographic information, another section focuses on consumer buying patterns, including purchase motivators and preferences, and the third section aims to distinguish between the control and treatment groups. The control group survey assesses general consumer involvement with fast fashion, while the treatment group survey includes an introductory sustainability prompt, followed by questions about sustainable purchasing behavior and willingness to pay extra for environmentally friendly products. Survey questions addressing purchase preferences, perceived product attributes, social influence, sustainability awareness, and consumer purchasing

behavior are measured using a 5-point Likert scale ranging from 1 (not important) to 5 (extremely important). Binary variables are used to capture specific motivators, such as price, style, and convenience. Brand loyalty is also represented as a binary variable (1 for loyal and 0 for non-loyal). In the treatment group, additional factors such as engagement in sustainable purchasing (yes = 1, no = 0) and willingness to pay a premium price (yes = 1, no = 0) are included to assess sustainability-related behavior.

Participants were selected using a convenience sampling method, with the primary inclusion criterion being active fast fashion consumers. Surveys were distributed via Google Forms over two months, resulting in 430 responses and after screening for incomplete entries, 416 valid responses were retained for analysis.

The study considered consumer purchasing behavior as the dependent variable. For the main constructs, Structural Equation Modeling (SEM) was employed to examine complex interrelationships between variables. It is also important to take into account various factors such as demographics, purchase preferences, willingness to pay, factors that motivate purchases, etc. that impact consumer purchase behavior. For this reason, Ordinal Logistic Regression was used to analyze ordered categorical variables, enabling better estimation of relationships between the independent and dependent variables. This method relies on the proportional odds assumption, ensuring consistency across outcome groups.

The Ordinal Logistic Regression Model:

$$\log\left(\frac{P(Y \leq j)}{P(Y > j)}\right) = \alpha_j + \beta_1 Age + \beta_2 Gender + \beta_3 Edu + \beta_4 Employment + \beta_5 Income + \beta_6 Purchase\ preference + \beta_7 Willingness\ to\ pay + \beta_8 Price\ motivators + \beta_8 Style\ motivators + \beta_{10} Control/Treatment\ Group$$

Where:
Y= Dependent variable representing consumer purchasing behavior,
j= Category of the outcome variable,
α_j=Intercept for category j,
$\beta_{1\text{-}10}$= Coefficient for Age, Gender, Educational Level, Employment Status, Income Level, Purchase Preferences, Willingness to Pay, Price Motivators, Style Motivators, Brand Loyalty, and Control/Treatment Group.

Data analysis was conducted using the R programming language. The ordinal package was used for logistic regression to capture the hierarchical structure of the variables. For Likert-scale-based survey variables, SEM, a statistical framework that examines the connections between observed and unobservable variables (latent) was performed using the lavaan package, combining Confirmatory Factor Analysis (CFA) and path analysis. Preliminary factor analysis helped reveal the underlying structure of the data, while CFA validated the constructs identified through Exploratory Factor

Analysis (EFA) and the estimation of the relationships between latent constructs and observed variables.

Other tests ensured the reliability and validity of the analysis. Cronbach's Alpha confirmed the internal consistency of the survey scales, with a value of 0.812 indicating strong reliability. Goodness-of-fit tests assessed model accuracy, while multicollinearity among predictors was evaluated using the Variance Inflation Factor (VIF), confirming no significant multicollinearity issues.

Regarding ethical considerations, participation was voluntary, and informed consent was obtained from all respondents. Participants were briefed on the purpose of the study and assured that their responses would remain confidential and used solely for academic research.

4. Data Analysis and Findings

4.1. Descriptive Statistics

The survey collected socio-demographic data, including gender, age, education level, and average monthly household income. The findings, summarized in Table 1, indicate that the majority of participants were female (69.5%), male (28.4%), and 2.2% preferred not to disclose their gender.

Table 1. Descriptive statistics

Category	Feature	People	Percentage
Age	18-24	388	93.30%
	25-34	22	5.30%
	35-44	2	0.50%
	45-54	3	0.70%
	55 and above	1	0.20%
Gender	Female	289	69.50%
	Male	118	28.40%
	Prefer not to say	9	2.20%
Education	Bachelor's degree	189	45.40%
	High School degree	197	47.40%
	Master's degree	22	5.30%
	PhD degree	8	1.90%
Income	$1000 to $2000	138	33.20%
	$2001 to $3000	102	24.50%
	$3001 to $4000	35	8.40%
	Above $4000	60	14.40%
	Below $1000	81	19.50%

Most respondents (93.3%) were aged 18–24, highlighting a focus on young adults actively engaged with fast fashion. Regarding education, 47.4% of participants reported holding a high school diploma, and 45.4% held a bachelor's degree,

reflecting the youthful demographic. A smaller proportion had attained a master's degree (5.3%) or a PhD (1.9%). Income levels varied, with 33.2% reporting incomes between $1,000 and $2,000, 24.5% between $2,001 and $3,000, and 19.5% earning less than $1,000. This diversity in income demonstrates a broad representation of economic backgrounds among respondents.

Table 2 shows the factors influencing consumers to switch to fast fashion brands. Poor product quality was the leading reason, cited by 60.1% of respondents, followed by environmental impact, which influenced 21.2%, demonstrating a moderate level of concern for sustainability.

Table 2. Factors Influencing Brand Switching in Fast Fashion

Factors	Percentage
Environmental impact	21%
Labor concerns	6%
Lack of uniqueness	9%
Poor quality	60%
Rapid trend cycles	3%
Personal preference	1%

Table 3 highlights the channels through which consumers learn about new products or trends in fast fashion. Social media emerged as the dominant source, with 76.7% of participants relying on it, highlighting its significant role in shaping consumer awareness and trends.

Table 3. Sources of Information on Fast Fashion Trends

Sources	Percentage
Fashion websites	9%
Friend	9%
In-store displays	5%
Social media	77%

Table 4 shows the types of information consumers seek to validate a brand's sustainability claims. Third-party certifications, such as the Global Organic Textile Standard and Fair Trade, were the most trusted sources, with 15.1% of respondents relying on them. Material sourcing information was important to 11% of consumers, while 8.7% prioritized transparency in supply chain practices. Customer reviews and testimonials also played a key role, emphasizing the importance of peer feedback in evaluating sustainability claims.

Table 5 outlines consumer preferences for how fast fashion brands communicate their sustainability efforts. Nearly half of respondents (47.2%) favored product labeling as the primary method, indicating a strong demand for clear and accessible sustainability information. Marketing campaigns were the second most preferred channel (26.5%), followed by company websites (14.8%) and social media platforms (8%). Only 2% of participants believed that communicating sustainability efforts was

unnecessary, reinforcing the expectation for transparency from brands regarding their sustainability practices.

Table 4. Assessing the Credibility of Sustainability Claims

Factors	Percentage
Carbon footprint data	1%
The company's environmental and social responsibility reports	1%
Customer reviews and testimonials	6%
Details on material sourcing	11%
Information on waste management practices	0%
Partnerships with environmental organizations	0%
Publicly available life cycle assessments	1%
Published sustainability audits	1%
Sustainable product labeling (e.g., eco-labels)	5%
Third-party certifications (e.g., Global Organic Textile Standard, Fair Trade)	15%
Transparency in supply chain practices	9%

Table 5. Communication Methods for Sustainability Efforts by Fast Fashion Brands

Factors	Percentage
Company website	14%
Marketing campaigns	28%
Product labeling	48%
Social media	8%
Not necessary	2%

4.2. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA)

Exploratory Factor Analysis (EFA) was conducted to determine the underlying factor structure of the dataset. EFA is essential for identifying the dimensions represented by the data and addressing potential issues related to common method variance. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.702, indicating that the sample size was suitable for factor analysis. Bartlett's Test of Sphericity yielded a significant result ($\chi 2\backslash chi^2 = 4249.330$, df = 231, pp < 0.05), confirming that the correlation matrix was not an identity matrix and that the data were appropriate for factor analysis.

The normality of the data, a necessary condition for Structural Equation Modeling (SEM), was evaluated. Skewness and kurtosis values were close to 0 and 3, respectively, indicating a normal distribution. This finding was further supported by the Kolmogorov-Smirnov test, where most variables showed p-values above 0.05, reinforcing the assumption of normality for the dataset.

The survey's reliability was assessed using Cronbach's Alpha, which yielded a value of 0.812, signifying a strong level of internal consistency across the 22 items.

Additionally, Cronbach's Alpha for standardized items was 0.800, further confirming the reliability of the measurements after standardization. These results indicate that the survey items accurately captured the intended constructs and are reliable for further analysis.

To evaluate the questionnaire's effectiveness, both convergent and discriminant validity were assessed. Convergent validity measures how well a set of items represents a specific factor, while discriminant validity examines the extent to which constructs are distinct from one another. A Confirmatory Factor Analysis (CFA) was performed to verify these elements. CFA results demonstrated that the constructs—purchase preferences, perceived product attributes, social influence, sustainability awareness, and sustainable packaging—were valid, with Composite Reliability (CR) values ranging from 0.77 to 0.82 and Average Variance Extracted (AVE) values between 0.883 and 0.965. These findings confirm the robustness of the constructs for further analysis. Additionally, discriminant validity analysis, summarized in Table 6, confirmed that each construct was distinct and measured unique concepts.

Table 6. Discriminant validity

	Discriminant validity				
Variable	**Purchase preference**	**Perceived attributed**	**Social influence**	**Sustainability awareness**	**Sustainable packaging**
Purchase preference	0.901				
Perceived attributes	0.076	0.892			
Social influence	0.047	0.4	0.89		
Sustainability awareness	0.491	0.23	0.349	0.805	
Sustainable packaging	0.39	0.73	0.444	0.414	0.878

Source: Compiled by the author, 2024

Path coefficient analysis and hypothesis testing, as shown in Table 7, revealed statistically significant relationships between survey constructs and consumer purchasing behavior. The R^2 score of 0.75 signifies that 75% of the variation in customer purchasing behavior can be accounted for by these factors, indicating a strong and reliable model.

Table 7. Path coefficients

Construct relationships	**Dependent variable**	**Standardized Weight**	**Critical Ratio**	**Significance**
Purchase Preference	Consumer Purchasing Behavior	0.22	3.5	$p < 0.001$
Perceived Attributes	Consumer Purchasing Behavior	0.18	2.6	$p = 0.009$
Social Influence	Consumer Purchasing Behavior	0.225	3.8	$p < 0.001$
Sustainable Packaging	Consumer purchasing behavior	0.15	3.72	$p < 0.001$
Sustainability Awareness	Consumer Purchasing Behavior	0.31	4	$p < 0.001$
R^2 (Consumer Purchasing Behavior)		**0.75**		

These findings confirm the assumptions and emphasize the significance of purchase preferences, perceived product attributes, social influence, sustainability awareness, and sustainable packaging in impacting customer purchasing behavior.

Ho1: *Sustainable packaging positively influences consumer purchase behavior in the fast fashion industry*

This hypothesis is accepted ($\beta = 0.15$, CR = 3.72, $p < 0.001$). Analysis reveals a clear and positive correlation between sustainable packaging and consumer purchase intentions. Consumers exposed to signals of sustainable packaging demonstrated a greater likelihood of intending to make a purchase, in comparison to those who were not exposed. These findings align and support the existing body of knowledge that highlights the increasing recognition and awareness among consumers for sustainable practices. Findings align with previous findings by Dangelico et al. (2022) and Williams & Hodges (2022) emphasize the impact of eco-friendly packaging on consumer perceptions and purchase intentions.

Ho2: *Perceived product attributes significantly influence consumer purchase behavior*

This hypothesis is **accepted** ($\beta = 0.173$, CR = 4.21, $p < 0.001$). Product attributes, including quality and sustainability, significantly affect consumer purchasing decisions. Consumers value products that are environmentally friendly and have exceptional quality. These findings align with recent research findings by Heinze (2020) and Dangelico et al. (2022) who highlight a noticeable shift in consumer behavior, with more individuals considering the sustainability and quality of products when making purchasing decisions. However, it is important for brands to ensure that quality remains a priority alongside sustainability efforts, as both factors play a crucial role in influencing consumer behavior.

Ho3: *Sustainability awareness has a significant impact on consumer purchase behavior in the fast fashion industry.*

This hypothesis is accepted ($\beta = 0.348$, CR = 7.4, $p < 0.001$). The analysis confirms that higher sustainability awareness significantly influences consumer behavior. Consumers with greater awareness of sustainability issues are more likely to respond positively to sustainability signals, such as eco-friendly packaging. Findings are in line with previous research conducted by Busalim et al. (2022) and Leclercq-Machado et al. (2022) that emphasize the positive impact of heightened awareness of sustainability issues on consumers' willingness to support sustainable practices and packaging. These results underscore the importance of educational campaigns and awareness initiatives in amplifying the effectiveness of sustainability efforts.

Ho4: *Social influence positively impacts consumer purchase behavior*

This hypothesis is accepted ($\beta = 0.24$, CR = 6.09, $p < 0.001$). The data indicates that social influence plays a significant role in shaping consumer responses to sustainability signals. Consumers who perceive social approval or endorsement from

peers are more likely to respond positively to such signals. This finding is in line with the research conducted by Williams & Hodges (2022) and Paço et al. (2021), emphasizing the importance of social norms and peer influence in shaping sustainable consumer behavior. A proper understanding of how social influence affects sustainability signals can provide valuable insights into firms' effectiveness in implementing sustainability practices and their attractiveness.

4.3. Ordinal Logistic Regression Analysis

Besides the constructs measured using a Likert scale, the researchers analyzed variables expressed in ordered categories with varying intervals, such as demographic variables, purchase motivators, brand loyalty, and willingness to pay. These variables were incorporated to explore their role as predictors of the dependent variable, consumer purchasing behavior. Ordinal Logistic Regression was employed to test these hypotheses, providing valuable insights into the effects of predictors such as age, gender, education, employment, income levels, and motivators.

To ensure the accuracy and dependability of the ordinal logistic regression models, multicollinearity among predictor variables was evaluated using the Variance Inflation Factor (VIF). All VIF values were well below the threshold of 10, with a mean VIF of 1.178, indicating no significant multicollinearity. This confirms the integrity and stability of the regression models, ensuring dependable and valid results. Ordinal Logistic Regression results are shown in Table 8.

Table 8. Ordinal Logistic Regression

Variable	Estimate	Std. Error	t value
Control/Treatment Group	0.27902	0.1268	2.2
Gender	0.45125	0.1227	3.6784
Age	0.17325	0.0856	2.024
Willingness to Pay	0.25244	0.1235	2.0437
Purchase Preference	0.18934	0.0911	2.078
Education	0.06727	0.1126	0.5974
Employment	0.16137	0.1506	1.0715
Low Income	0.18893	0.1103	1.7124
Price motivator	0.03749	0.1536	0.2441
Style motivator	0.11436	0.129	0.8863
Intercepts			
Value	**Std. Error**	**t value**	
112	2.954	0.4306	
213	1.6836	0.3012	
314	0.5636	0.2865	
415	0.7197	0.2878	
Residual deviance:	955.888		
AIC	983.888		

Considering the results from the data analysis a decision can be made for the rest of the hypotheses of this study as below,

Ho5: *Demographic factors influence the consumer purchasing behavior.*

Data analysis yielded mixed results, leading to the partial acceptance of this hypothesis. The analysis of demographic factors highlights the influence on sustainable purchasing behavior. Gender plays a significant role, with one gender being 36.3% more likely to engage in sustainable purchasing behavior compared to the other (odds ratio 1.57, t-value 3.6784, $p < 0.001$). Age is also important, as additional years in age increase the likelihood of sustainable purchase behavior by 15.9% (odds ratio 1.19, t-value 2.024, $p < 0.05$). Education has a minor and non-significant impact, increasing the odds by only 6.5% (odds ratio 1.07, t-value 0.5974, $p > 0.05$). Income level similarly shows a non-significant effect, while low income marginally influences behavior, increasing odds by 17.2% (odds ratio 1.21, t-value 1.7124, $p < 0.10$).

Findings are in line with previous research conducted by D'Souza et al. (2007) and Leclercq-Machado et al. (2022), which emphasize the increased inclination toward sustainability among younger consumers. While Kim and Chung (2011) propose that women have a greater inclination towards eco-friendly products, the absence of a notable gender effect in this study indicates that there may be variations depending on the specific context. The varied outcomes regarding education and income highlight the complex nature of these variables, as pointed out by Dangelico et al. (2022).

Ho6: *Purchase motivators have a significant effect on consumer purchase behavior in the fast fashion industry*

According to the data analysis, this hypothesis was not supported. Price Motivator has a coefficient of 0.03749, resulting in an odds ratio of 0.04. The probability is 0.037, meaning price as a primary motivator has a negligible effect, with only a 3.7% increase in the odds of sustainable purchasing behavior. With a t-value of 0.2441, this result is not significant ($p > 0.05$), indicating that price motivation does not significantly affect sustainable purchasing behavior. Style Motivator too, with a coefficient of 0.11436, results in an odds ratio of 1.12. The probability is 0.108, suggesting that style as a motivator increases the odds of sustainable purchasing behavior by approximately 10.8%. However, this result is not significant (t-value = 0.8863, $p > 0.05$), indicating that style motivation does not have a substantial impact on sustainable purchasing behavior. These findings align with Busalim et al. (2022) and Paço et al. (2021), who observed a discrepancy between consumer attitudes toward sustainability and actual purchasing behavior. This highlights the "attitude-behavior gap" often discussed in sustainability literature.

Ho7: *Brand loyalty positively influences consumer purchasing behavior in the fast fashion industry.*

This hypothesis was accepted, indicating that brand loyalty plays a significant role in influencing consumer purchase behavior in relation to sustainability awareness and purchase motivators. Brand Loyalty has a coefficient of 0.72952, translating to an odds ratio of 2.07. The probability is 0.518, meaning brand loyalty significantly increases the odds of sustainable purchasing behavior by approximately 51.8%. This result is highly significant, with a t-value of 5.3088 ($p < 0.001$), underscoring the strong influence of brand loyalty on sustainable purchasing behavior. When consumers have a strong attachment to a brand, they are more inclined to make sustainable purchases if they are aware of the brand's sustainability initiatives. This suggests that trust and positive experiences play a crucial role in the success of sustainability signals. Findings are in line with the studies conducted by Williams and Hodges (2022) and Rizzotto (2020), highlighting the significance of trust and brand loyalty in influencing consumer reactions to sustainability signals. Strong customer loyalty plays a crucial role in promoting sustainable behavior. When customers are loyal to a brand, they are more inclined to trust and positively act to sustainability practices or initiatives of the respective brand.

Ho8: *Exposure to sustainability signals, affects consumer purchase behavior*

This hypothesis is accepted. The coefficient for Control/Treatment Group is 0.27902, which translates to an odds ratio of 1.32. The probability is $1 - e^{-0.27902} = 0.244$, meaning that the probability for higher sustainable purchasing behavior for the treatment group is 24.4% higher compared to the control group. With a t-value of 2.2, this result is significant at the 5% level, indicating that the treatment group, which received the sustainability signal, has a statistically significant positive impact on consumer purchasing behavior.

Table 9. Hypothesis summary table

Hypothesis	Description	Results
Ho1	Sustainable packaging positively influences consumer purchase behavior in the fast fashion industry.	Accepted
Ho2	Perceived product attributes significantly influence consumer purchase behavior.	Accepted
Ho3	Sustainability awareness has a significant impact on consumer purchase behavior in the fast fashion industry.	Accepted
Ho4	Social influence positively impacts consumer purchase behavior.	Accepted
Ho5	Demographic factors influence consumer purchasing behavior.	Partially accepted
Ho6	Purchase motivators have a significant effect on consumer purchase behavior in the fast fashion industry	Not accepted
Ho7	Brand loyalty positively influences consumer purchasing behavior in the fast fashion industry.	Accepted
Ho8	Exposure to sustainability signals affects consumer purchase behavior	Accepted

The treatment group, exposed to eco-friendly packaging and sustainability information, displayed significantly higher sustainable purchasing behavior than the control group. This finding emphasizes the importance of sustainability signals in bridging the information gap between brands and consumers. Previous studies too like Dangelico et al. (2022) and Orzan et al. (2018) indicate that clear and credible sustainability signals, such as eco-friendly packaging, can significantly enhance consumer trust and purchase intentions. Furthermore, Zhu (2024) highlights the critical role of strategic sustainability communication in building brand credibility and positively influencing consumer behavior.

This study's findings provide valuable insights into the influence of packaging on consumer purchasing behavior in the fast fashion industry, particularly in relation to strategic sustainability signaling. It adds to the existing body of literature on signaling theory by presenting empirical evidence of its applicability in the fast fashion industry. The study links sustainable supply chain management (SSCM) with consumer behavior, demonstrating the importance of integrating sustainability into supply chains to meet environmental and social goals.

Utilizing SEM and ordinal logistic regression, the methodological approach provided valuable insights into the factors that influence consumer purchasing behavior. The survey scales underwent testing for internal consistency using Cronbach's Alpha, revealing a high level of reliability in the collected data. The constructs used in the study were further validated through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The robust factor loadings and high reliability values offer strong support for the validity of the constructs related to purchase preferences, perceived product attributes, social influence, and sustainability awareness.

The findings reveal that sustainable packaging significantly impacts consumer purchasing behavior. The chances of engaging in sustainable purchasing behavior were approximately 24.4% higher for individuals in the treatment group compared to those in the control group. Consumer decision-making is significantly influenced by sustainability signals, according to this finding, which aligns with the principles of signaling theory, indicating that reliable signals can help address information gaps and foster consumer trust, ultimately influencing their purchasing decisions. Consumer preferences are evolving, with a growing emphasis on environmental factors when making purchasing choices. The widespread acceptance of sustainable packaging is a strong indicator of this change.

The study identified notable gender differences, with females being more likely to engage in sustainable purchasing, consistent with research highlighting higher environmental consciousness among women. Older consumers also displayed a stronger inclination toward sustainability, suggesting a potential generational trend. These demographic insights can help fashion brands tailor their sustainability initiatives to target specific consumer segments effectively.

Product attributes, especially quality and sustainability, are crucial in consumer decisions. This aligns with research on the perceived value of sustainable products shaping consumer behavior. Social factors also influence purchasing behavior, with social circles impacting sustainable purchase choices. Brands can leverage this by collaborating with social media influencers and fostering communities focused on sustainability.

The study highlights the pivotal role of social media in shaping consumer awareness and trends, with approximately 77% of participants relying on these platforms to stay informed about fashion trends. This finding emphasizes the need for brands to leverage social media effectively in their sustainability communication strategies to enhance consumer engagement and awareness.

Sustainability awareness emerged as a critical driver of consumer behavior, with informed individuals responding positively to sustainability indicators on packaging. This finding aligns with previous studies that suggest increased awareness can bridge the divide between intention and actual behavior in sustainable consumption. Transparent communication about sustainable practices fosters consumer trust and encourages sustainable purchasing.

5. Conclusion

This study examined the impact of strategic signaling through sustainability packaging and other antecedents on consumer purchasing behavior in the fast fashion industry. Factors that enhance the effectiveness of these signals in promoting sustainable practices are also explored. Findings revealed that sustainable packaging significantly affects consumer behavior, with the treatment group exposed to sustainability signals exhibiting a 24.4% increase in sustainable purchasing compared to the control group. This aligns with signaling theory, which suggests that reliable signals can bridge information gaps and build consumer trust, influencing buying patterns. Consumer perceptions of sustainable packaging are generally positive, with a preference for products using eco-friendly materials. Gender differences were noted, with females more likely to engage in sustainable purchasing, as supported previous research. Key factors contributing to the success of sustainability signals include product quality, perceived sustainability, social influence, and brand loyalty. Product attributes, especially quality and sustainability, were instrumental in shaping consumer buying choices, and consumers tend to lean towards purchasing sustainable products when they perceive them as high quality and are influenced by social norms and trusted brands.

By using strategic sustainability signaling, brands can improve market positioning and meet the growing demand for environmentally conscious practices, encouraging sustainable consumption patterns. The study underscores sustainable packaging as a strategic tool to shape consumer behavior, emphasizing the need for credible and transparent sustainability signals to bridge the gap between consumer intentions

and actual sustainable consumption. Fast fashion brands can use sustainable packaging as a strategic tool to enhance their brand image and build consumer trust by highlighting environmental responsibility. To communicate sustainability effectively, brands should tailor marketing strategies based on demographic insights. Emphasizing product quality and sustainability can boost perceived value and appeal to environmentally conscious consumers. Investing in sustainable packaging differentiates brands in a competitive market. Brands should consider long-term investments in sustainable packaging technologies and materials. The findings support developing policies and incentives to encourage sustainable practices in the fashion industry, including creating industry standards and certifications. Brands should seek certifications and engage in transparent reporting to build consumer trust and minimize greenwashing risks. Educating consumers about the environmental benefits of sustainable packaging can encourage informed buying decisions and foster brand loyalty.

This study has a few limitations. It focused mostly on young-aged samples, limiting its representation of all fast fashion consumers and affecting broader applicability. Additionally, it examined immediate behavioral intentions, not long-term purchasing behaviors, potentially missing sustainability signals' full impact. Self-reported data might also be considered a limitation as it may lead to social desirability bias. The use of a convenience sampling method may further restrict the representativeness of the findings, reducing their applicability to a broader consumer base.

Future research should involve diverse samples to enhance generalizability and offer a holistic view of consumer behavior regarding sustainability signals. Longitudinal studies can reveal the long-term effects of sustainability signals on consumer behavior. Mixed-method approaches, including observational studies and interviews, can complement survey data and address self-reporting limitations. Similar studies in other industries could determine if sustainability signals have broader implications beyond fast fashion. Further research should explore different sustainability indicators' effects, such as product materials and corporate social responsibility initiatives.

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