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Beyond ESG: Unpacking Brand Loyalty Through the Emotional Mechanisms Lenses of Attachment and Love—A Hierarchical Regression Study of Alibaba in China

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ABSTRACT

Currently, research on Environmental, Social, and Governance (ESG) initiatives primarily emphasizes consumers' cognitive evaluations—such as awareness, knowledge, and rational assessment—providing a limited perspective on the underlying mechanisms that drive brand loyalty. However, the internal structural pathway between ESG and brand loyalty remains underexplored, particularly with regard to emotional mechanisms. This study addresses that gap by examining how ESG perceptions influence brand loyalty through the sequential mediating roles of brand attachment and brand love. The research moves beyond cognitive frameworks to uncover the emotional pathways through which ESG initiatives shape consumer behavior. Using survey data, the study applies hierarchical regression analysis alongside a sequential mediation model to assess the emotional effects of ESG perceptions. The findings reveal that the environmental and social dimensions of ESG are especially effective in fostering emotional bonds with consumers. ESG efforts serve as credibility signals, evoke emotional responses, and fulfill consumers' intrinsic needs for connection and attachment. The study concludes that ESG is not merely a tool for regulatory compliance or corporate image management, but a strategic resource for cultivating long-term consumer loyalty through emotional engagement. By integrating theories of signaling, consumer emotion, and emotional attachment, this research offers a comprehensive framework for understanding the emotional impact of ESG on consumer-brand relationships. The results provide practical insights for brands seeking to strengthen loyalty by aligning ESG initiatives with consumers' emotional values and expectations.

1. Introduction

Amid the intensifying climate crisis, 136 nations—including the US, EU, China, Japan, Germany, and South Korea—have pledged to achieve carbon neutrality by 2050 [1], underscoring the global

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urgency for sustainable development. In this context, ESG (Environmental, Social, and Governance) considerations have evolved into critical components of corporate strategy and operational practice [2]. Although ESG has gained widespread recognition as a corporate strategy for sustainable development [3], existing research has demonstrated that ESG adoption can enhance corporate brand image by aligning with social values and ethical standards [4]. However, existing research remains predominantly centered on consumers' cognitive evaluations and general attitudes toward ESG communications [5]. Although currently, research recognizes ESG as a critical component of corporate strategy, there remains a limited understanding of the emotional mechanisms through which ESG messaging influences consumers. This gap highlights the need for deeper exploration of how ESG communications evoke emotional responses and shape consumer behavior beyond purely cognitive assessments.

Building upon the integrated application of multiple theoretical perspectives, this research constructs a comprehensive framework to explain the strategic and psychological significance of ESG in shaping consumer behavior. Alibaba Corporation, founded in 1999 with the launch of China Pages, has evolved over the past 25 years into a world-class technology conglomerate that plays a central role in Chinese consumers' lives—ranging from e-commerce platforms like Taobao and Tmall to digital services such as Gaode Map and Ele.me. In response to growing global and domestic environmental and social responsibility awareness, Alibaba formally adopted ESG as a core corporate strategy at the end of 2021. The company established a three-tier sustainable development governance structure to ensure its effective implementation, including a board-level committee, senior management oversight, and ESG working groups integrated across business units. With a massive and loyal user base, Alibaba represents a compelling case for exploring ESG impacts in the context of China's digital economy.

While prior research has emphasized the cognitive aspects of ESG—such as transparency and rational decision-making [6-7]—it has largely overlooked the emotional and behavioral mechanisms that drive consumer loyalty. This study addresses that gap by proposing an integrated framework in which emotional mechanisms—such as brand attachment and brand love—are grounded in deeper intertemporal decision-making tendencies. Specifically, consumers who are loyal to ESG brands may exhibit lower subjective discount rates, demonstrating a preference for long-term societal benefits over immediate gratification [8]. These future-oriented behavioral preferences serve as the psychological foundation upon which emotional bonds are formed. Drawing on Alibaba's ESG practices, the study employs a quantitative approach to examine how ESG communication evokes emotional and behavioral responses in emerging markets [9]. By integrating Signaling Theory, Emotional Attachment Theory, and the Theory of Planned Behavior, this research highlights ESG's dual role as both an emotional branding strategy and a behavioral signal, offering new insights for aligning corporate initiatives with culturally embedded values and long-term sustainability goals [10].

2. Literature Review

2.1 Environment, Social, Governance (ESG)

In recent years, Environmental, Social, and Governance (ESG) practices have become a core element of corporate sustainability strategies [11]. ESG encompasses standards evaluating a company's environmental impact, social responsibility, and governance. Beyond compliance and risk management, ESG reflects firms' ethical commitments and long-term strategic vision [12], playing an increasingly important role in brand positioning and communication. Drawing on Signaling Theory [13], firms use credible and costly ESG initiatives—such as carbon neutrality pledges and inclusive employment policies—to signal their authentic sustainability commitments, reducing consumer

perceived risk and fostering trust essential for brand loyalty [14]. For example, Alibaba's 2021 ESG strategy demonstrates clear, measurable environmental goals, reinforcing its commitment through observable actions.

This research aims to demonstrate that ESG initiatives directly influence brand loyalty—by enhancing perceived corporate credibility—and indirectly, through emotional responses such as brand attachment and brand love [15]. In addition, consumer loyalty to ESG-oriented brands reflects intertemporal decision-making tendencies, whereby individuals with lower subjective discount rates are more willing to forgo immediate gratification in favor of long-term environmental and social benefits [16]. These future-oriented behavioral preferences form the psychological foundation of emotional loyalty, reinforcing the mechanisms through which ESG communications cultivate brand attachment and love. At the macro level, such voluntary sustainable consumption can contribute to internalizing environmental externalities, thereby reducing reliance on fiscal interventions such as carbon taxes and potentially reshaping public finance structures [17]. Accordingly, ESG functions not only as a signaling mechanism for ethical and credible corporate behavior, but also as a behavioral and economic lever that strengthens emotional brand bonds and promotes long-term sustainability preferences among consumers.

Hypothesis 1: ESG practices can directly enhance consumers' brand loyalty.

2.1.1 Brand Attachment

Brand attachment describes the emotional and psychological bonds connecting consumers to brands, involving affective, cognitive, and identity-related components [18-19]. Emotional Attachment Theory explains that consumers seek emotional security and identity coherence through brands, especially when brand values align with personal or societal ideals [20]. ESG initiatives function as powerful moral signals fostering emotional congruence and shared purpose, thus strengthening brand attachment [21]. This attachment mediates the impact of ESG on loyalty by transforming ethical commitments into personal emotional bonds. Furthermore, consumers' intertemporal decision-making tendencies enhance this effect, as those valuing long-term sustainability are more likely to form enduring attachments to ESG brands.

Hypothesis 2: Brand attachment positively mediates the relationship between ESG practices and brand loyalty.

2.1.2 Brand Love

Brand love refers to deep emotional devotion beyond rational satisfaction, characterized by passion, closeness, and enduring positive feelings [22]. Consumer Emotion Theory emphasizes the role of emotions in shaping long-term consumer-brand relationships. Authentic ESG engagement evokes trust, admiration, and moral approval, which are foundational to brand love [23-24]. Brand love drives loyalty behaviors such as repurchase intentions and advocacy, further supported by consumers' future-oriented choices consistent with lower discount rates favoring sustainability. Hence, brand love mediates ESG's influence by reinforcing emotional satisfaction that is aligned with consumers' long-term values.

Hypothesis 3: Brand love positively mediates the relationship between ESG practices and brand loyalty.

2.2 Brand Loyalty

Brand loyalty is a sustained commitment to repurchase a favored brand despite competitive pressures [25]. Emotional bonds—such as attachment and love—play a crucial role in loyalty

formation, supported by Signaling Theory, Emotional Attachment Theory, and Consumer Emotion Theory [26]. Corporate ESG actions shape consumer perceptions and emotional engagement, indirectly enhancing loyalty [27]. Moreover, loyalty toward ESG brands reflects future-oriented intertemporal decision-making, where consumers prioritize long-term benefits over immediate gratification, reinforcing sustainable consumption patterns. At a broader scale, widespread ESG loyalty can influence economic systems by reducing negative externalities and modifying fiscal policy needs [28].

2.3 Personal Sustainability

Grounded in the Theory of Planned Behavior [29], intertemporal decision-making constitutes a fundamental basis for understanding consumers' sustainable behavioral intentions. This theory posits that behavioral intentions are shaped by attitudes, subjective norms, and perceived behavioral control, which collectively influence whether an individual engages in a given behavior. In the context of sustainable consumption, intertemporal decision-making reflects consumers' ability to reconcile environmental, social, and economic goals by prioritizing long-term benefits over immediate gratification [30]. Individuals with lower discount rates and greater patience are more likely to save, avoid debt, and adopt sustainable consumption patterns, demonstrating a future-oriented intention [31].

Moreover, personal sustainability functions as a control variable in the relationship between emotional responses to ESG—such as brand attachment or brand love—and actual sustainable behaviors [32-34]. By accounting for individuals' time preferences and future orientation, personal sustainability helps isolate the emotional impact of ESG perceptions on behavioral outcomes. In this way, intertemporal decision-making and associated psychological traits clarify how ESG-driven loyalty translates into lasting consumer commitment and broader sustainability outcomes [35].

In sum, grounded in intertemporal decision-making, the Theory of Planned Behavior integrates cognitive, affective, and behavioral economic perspectives to explain how controlling for personal sustainability enhances our understanding of ESG strategies' effectiveness in fostering long-term consumer loyalty and systemic sustainability impact [36-37].

3. Research Methodology

3.1 Measurement

A self-administered questionnaire comprising eight sections was developed to validate the research framework. Each section utilized a 5-point Likert scale and was adapted from validated measures in prior studies to ensure reliability and validity. Specifically, ESG dimensions were assessed using 12 items from Puriwat's research [38], covering environmental, social, and governance factors equally. Brand attachment was measured with four items adapted from Rotschedl's research [39], brand love with four items based on Sherifs research [40], brand loyalty with four items from Sierra [41], and personal sustainability with three items from Smith's research [42]. Table 1 details the items for each construct, reflecting rigorous adherence to established methodologies.

Table 1

Observed variables and questionnaire constructs

| Constructs | Items | Observed Variables | Source |
|-------------------------|-------|---|--------|
| Environmental | E1 | 1. Minimizes negative impact | [38] |
| | E2 | 2. Reduces resource consumption | |
| | E3 | 3. Extensive eco-friendly materials | |
| | E4 | 4. Efficient waste recycling | |
| Social | S1 | 1. Adheres to social norms | [38] |
| | S2 | 2. Enhances societal well-being | |
| | S3 | 3. Drives social growth | |
| | S4 | 4. Supports disadvantaged welfare | |
| Governance | G1 | 1. Follows legal regulations | [38] |
| | G2 | 2. Fulfills partner obligations | |
| | G3 | 3. Prioritizes ethical standards | |
| | G4 | 4. Prevents corruption efforts | |
| Brand attachment | BA1 | 1. Strong brand affection | [39] |
| | BA2 | 2. Deep brand passion | |
| | BA3 | 3. feel genuinely if lost | |
| | BA4 | 4. Significant importance in my life. | |
| Brand love | BL1 | 1. Remarkable and exceptional | [40] |
| | BL2 | 2. Brings joy and satisfaction | |
| | BL3 | 3. Strong brand affection | |
| | BL4 | 4. Passionate about brand | |
| Brand loyalty | Lo1 | 1. Determined to repurchase next time. | [41] |
| | Lo2 | 2. Fully committed buyer from this firm or brand. | |
| | Lo3 | 3. Wholehearted brand commitment | |
| | Lo4 | 4. Willing to pay a premium | |
| Personal sustainability | Ps1 | 1. eco-products preference | [42] |
| | Ps2 | 2. Reduce plastic use | |
| | Ps3 | 3. Sustainable brands preference | |

3.2 Conceptual Framework

Building on prior research and a comprehensive literature review, this study develops a conceptual framework to examine the relationships among brand attachment, brand love, and brand loyalty, positioning ESG as a central antecedent variable. The model incorporates personal sustainability as a control variable to further substantiate this role, accounting for its potential influence on the ESG–brand loyalty pathway.

Crucially, the framework embeds intertemporal preference within the broader context of emotional mechanisms, proposing it as a psychological foundation that shapes consumers' capacity to form and sustain emotional bonds with ESG-oriented brands. Specifically, individuals with lower subjective discount rates and a heightened sensitivity to long-term outcomes are more inclined to develop deep emotional attachment and brand love toward firms perceived to create enduring social and environmental value. In this sense, intertemporal orientation reinforces the emotional processes through which ESG signals translate into brand loyalty.

As illustrated in Figure 1, the proposed conceptual model integrates ESG signaling theory, emotional attachment theory, behavioral tendencies, and contextual control variables, offering a comprehensive and psychologically grounded perspective on how ESG initiatives cultivate long-term consumer loyalty.

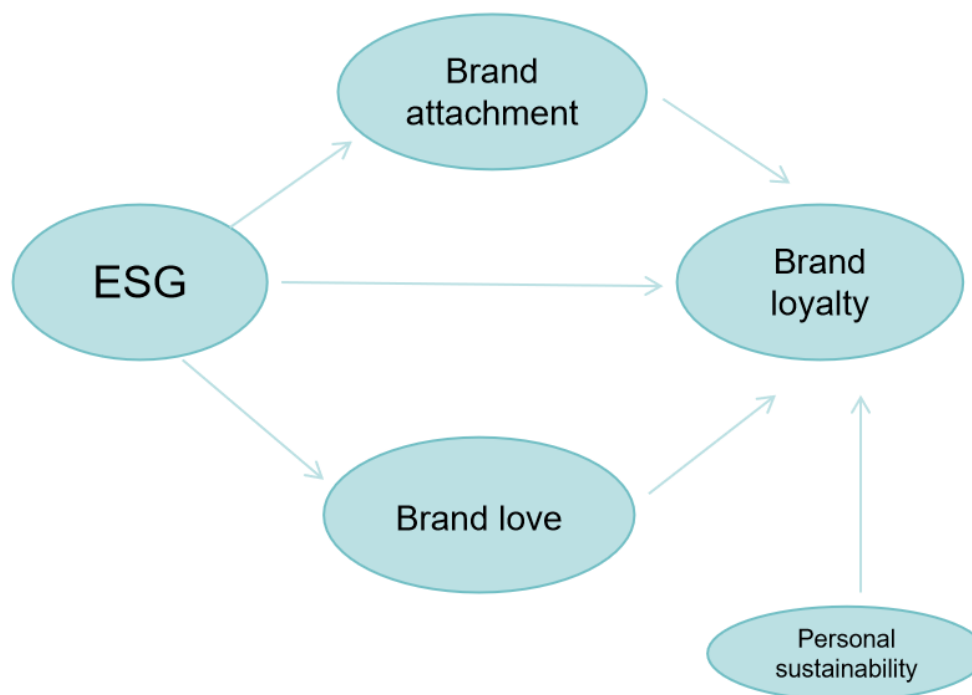


Fig. 1. The conceptual framework of the research

3.3 Data collection

The dataset for this research was obtained through an online survey targeting Chinese consumers who are familiar with Alibaba's platforms. A random sampling method was employed to ensure a broad and representative sample, utilizing the internet to reach a diverse pool of respondents. This approach enhanced the generalizability of the findings by capturing a wide range of demographic characteristics. A total of 1,042 valid responses were collected and used in the empirical analysis. The sample was demographically diverse in terms of gender, marital status, education level, income, and age, ensuring representativeness across different consumer groups. The survey employed a structured questionnaire with 24 measurement items based on previously validated scales, measured on a 5-point Likert scale. Each construct in the research—ESG perception, brand attachment, brand love, and brand loyalty—was operationalized using a minimum of three items to ensure reliability and construct validity. The demographic characteristics of the sample are summarized in Table 2.

The final sample consisted of 1,042 valid responses, representing a relatively balanced gender distribution (53.55% male, 46.45% female) and a predominantly unmarried population (58.93%). Respondents were generally well-educated, with the majority holding either a graduate degree or diploma, and a smaller segment possessing postgraduate qualifications. In terms of income, the sample skewed toward the lower to middle-income brackets, with most participants reporting monthly earnings between 5,000 and 10,000 RMB, and a smaller proportion earning above 15,000 RMB. The age distribution was notably concentrated among younger adults, with nearly half of the participants aged between 25 and 30, followed by those in the 30–40 range. Young, moderately educated, and economically diverse demographic composition reflects a relevant consumer segment for exploring perceptions and emotional responses toward ESG-related brand strategies in contemporary China.

Table 2
Demographic details of the sample

| Attributes | | Frequency | (%) |
|------------|--------------|-----------|-------|
| Gender | Male | 587 | 56.33 |
| | Female | 455 | 43.67 |
| | Total | 1042 | 100 |
| Marriage | Married | 428 | 41.07 |
| | Unmarried | 614 | 58.93 |
| | Total | 1042 | 100 |
| Education | Postgraduate | 206 | 19.77 |
| | Graduate | 445 | 42.70 |
| | Diploma | 391 | 37.52 |
| | Total | 1042 | 100 |
| Salary | Over20K | 42 | 4.03 |
| | 15K-20K | 92 | 8.83 |
| | 10K-15K | 184 | 17.65 |
| | 5K-10K | 472 | 45.30 |
| | Less 5k | 252 | 24.18 |
| | Total | 1042 | 100 |
| Age | Over 45 | 115 | 11.04 |
| | 40-45 | 210 | 20.15 |
| | 30-40 | 352 | 33.78 |
| | 25-30 | 188 | 18.04 |
| | Less 25 | 177 | 16.98 |
| | Total | 1042 | 100 |

3.4 Empirical model

This study constructs a series of hierarchical regression models to investigate the impact of Environmental, Social, and Governance (ESG) performance on brand loyalty and the underlying emotional mechanisms. Previous studies have extensively examined consumer brand loyalty, but the role of ESG as a determinant remains underexplored. Therefore, this study proposes a multiple regression framework to assess the direct and indirect effects of ESG on brand loyalty, incorporating brand attachment and brand love as mediators and personal sustainability (SUS) as a control variable. The base empirical model is specified as:

Following Puriwat's research, we conducted a hierarchical regression analysis to test the mediating roles of brand attachment and brand love [15]. The stepwise regression models are specified as:

$$\text{Brand loyalty}_{it} = \alpha + \beta \text{ ESG} + \beta_1 \text{ Brand attachment} + \beta_2 \text{ Brand love} + \beta_3 \text{ SUS} + \gamma_{it} \quad (1)$$

Mediation through Brand Attachment:

$$\text{Med-Bait} = \alpha + \beta_1 \text{ ESG} + \beta_2 \text{ SUS} + \gamma_{it} \quad (2)$$

$$\text{Brand loyalty}_{it} = \alpha + \text{Med-Bait} + \beta_1 \text{ ESG} + \beta_2 \text{ SUS} + \beta_3 \text{ ESG} * \text{SUS} + \gamma_{it} \quad (3)$$

Mediation through Brand Love:

$$\text{Med-Blit} = \alpha + \beta_1 \text{ ESG} + \beta_2 \text{ SUS} + \gamma_{it} \quad (4)$$

$$\text{Brand loyalty}_{it} = \alpha + \text{Med-Blit} + \beta_1 \text{ ESG} + \beta_2 \text{ SUS} + \gamma_{it} \quad (5)$$

4. Results

4.1 Reliability and validity

Table 3 demonstrates that all key constructs exhibit strong reliability and validity, supporting their suitability for regression analysis. Cronbach's α values for all variables exceed 0.80, indicating high internal consistency, with ESG (0.959) and brand loyalty (0.932) among the highest. KMO values above 0.75 confirm sampling adequacy for factor analysis. Composite Reliability (CR) values range from 0.903 to 0.973, surpassing the 0.70 benchmark, while Average Variance Extracted (AVE) values all exceed 0.50, confirming strong convergent validity. The high AVE scores also establish discriminant validity, indicating that each construct is empirically distinct. Together, these results validate the measurement quality of ESG, brand attachment, brand love, brand loyalty, and personal sustainability, ensuring the constructs are both theoretically sound and statistically robust for subsequent regression and mediation analysis.

Table 2

Result of reliability and validity (N = 1042)

| Factors | Cronbach's α | KMO | CR | AVE |
|-------------------------|---------------------|-------|-------|-------|
| ESG | 0.959 | 0.781 | 0.973 | 0.924 |
| Brand attachment | 0.852 | 0.823 | 0.903 | 0.701 |
| Brand love | 0.884 | 0.831 | 0.920 | 0.742 |
| Brand loyalty | 0.932 | 0.858 | 0.951 | 0.829 |
| Personal sustainability | 0.945 | 0.842 | 0.942 | 0.851 |

4.2 Regression Analysis

This research employs hierarchical regression analysis to examine the mediating effects of brand attachment and brand love in the relationship between ESG and brand loyalty while controlling for personal sustainability (SUS). The regression results are presented in Table 4.

4.2.1 Hierarchical mediation regression result

The hierarchical mediation regression analyses shown in Table 4 reveal significant relationships among ESG, brand attachment, brand love, personal sustainability, and brand loyalty. Model 1 demonstrates that ESG has a strong direct positive effect on brand loyalty ($\beta = 0.588$, $p < 0.001$), explaining 23.4% of the variance ($R^2 = 0.234$). Models 2-1 and 2-2 further indicate that ESG positively influences both brand attachment ($\beta = 0.374$, $p < 0.001$, $R^2 = 0.143$) and brand love ($\beta = 0.324$, $p < 0.001$, $R^2 = 0.090$), suggesting that ESG initiatives effectively foster emotional connections between consumers and brands.

When brand attachment and brand love are included as mediators in Models 3-1 and 3-2, the direct effect of ESG on brand loyalty decreases but remains significant ($\beta = 0.103$ and 0.363 , respectively; $p < 0.001$), while brand attachment ($\beta = 0.394$, $p < 0.001$) and brand love ($\beta = 0.529$, $p < 0.001$) exert strong positive effects on brand loyalty. Importantly, the explained variance of brand loyalty increases markedly, with R^2 rising to 0.367 in Model 3-1 and 0.430 in Model 3-2, indicating that these emotional attachments significantly enhance the model's explanatory power. Personal sustainability also shows a positive and significant effect in both models, further highlighting its role in shaping consumer loyalty. Overall, these findings provide robust support that ESG practices strengthen brand loyalty both directly and indirectly by deepening emotional bonds such as brand attachment and brand love, elucidating the psychological mechanisms through which sustainability initiatives influence consumer behavior.

Table 4

Hierarchical mediation regression analyses for Brand attachment and Brand love

| Variables | Model1 (Y-X) | Model 2 -1 (M1-X) | Model 2 – 2 (M2-X) | Model 3 – 1 (Y-X+M1) | Model 3 – 2 (Y-X+M2) |
|-----------------------------------|-----------------|----------------------|-----------------------|-------------------------|-------------------------|
| ESG(X) | 0.588*** | 0.374*** | 0.324*** | 0.103*** | 0.363*** |
| Brand attachment(M1) | - | - | - | 0.394*** | - |
| Brand love(M2) | - | - | - | - | 0.529*** |
| Personal Sustainability (Control) | - | - | - | 0.362** | 0.05*** |
| F | 153.34 | 81.730 | 53.91 | 96.63 | 125.77 |
| R2 | 0.234 | 0.143 | 0.09 | 0.367 | 0.43 |
| ΔR2 | 0.232 | 0.138 | 0.09 | 0.363 | 0.42 |
| N | 1042 | 1042 | 1042 | 1042 | 1042 |

Dependent variable(Y): Brand loyalty. *P < 0.05 (two-tailed), **P < 0.01 (two-tailed).

4.2.2 Mediation regression analyses Robustness Check

A non-parametric bootstrap procedure was employed to ensure the robustness of the mediation effects identified in the hierarchical regression models, following the approach recommended by Preacher and Hayes. While the initial stepwise regressions (Equations 1–5) confirmed the mediating roles of brand attachment and brand love in the relationship between ESG performance and brand loyalty, the bootstrap method offers a distribution-free technique to validate the significance and stability of these indirect effects. A total of 5,000 bootstrap resamples were generated to estimate the sampling distribution, and bias-corrected 95% confidence intervals (BC-CIs) were constructed for each mediating path.

The bootstrap analysis tested brand attachment and brand love as parallel mediators, while personal sustainability (SUS) was consistently included as a control variable [42]. Indirect effects are considered statistically significant if the BC-CIs do not include zero. This resampling-based robustness check reinforces the empirical credibility of the model's proposed emotional mechanisms, enhancing confidence in the mediation paths identified through regression analysis [43].

Table 5 shows that ESG performance has a significant positive effect on brand loyalty ($\beta = 0.269$, $p < 0.01$), suggesting that stronger ESG initiatives are linked to increased consumer loyalty. Both brand attachment ($\beta = 0.253$, $p < 0.01$) and brand love ($\beta = 0.444$, $p < 0.01$) exhibit substantial positive impacts on brand loyalty, underscoring the pivotal role of emotional connections in building customer commitment. Personal sustainability also positively affects brand loyalty ($\beta = 0.087$, $p < 0.05$), although the effect size is smaller and its confidence interval indicates greater variability. These findings confirm that ESG efforts significantly contribute to fostering brand loyalty when combined with emotional drivers.

Table 5

Bootstrap Regression Results(N = 1042)

| Variable | Coef | Std.Err | T | 95% CI | |
|------------------|---------|---------|------|--------|-------|
| ESG | 0.269** | 0.076 | 3.54 | 0.120 | 0.418 |
| Brand attachment | 0.253** | 0.050 | 5.06 | 0.155 | 0.351 |
| Brand love | 0.444** | 0.057 | 7.83 | 0.333 | 0.555 |
| Sus | 0.087* | 0.069 | 1.26 | 0.483 | 0.222 |

Dependent variable(Y): Brand loyalty. *P < 0.05 (two-tailed), **P < 0.01 (two-tailed).

5. Robustness Check

5.1 Sample Selection Bias Correction: Heckman Two-Stage Estimation

To ensure the robustness of the findings and address potential sample selection bias stemming from individual differences in sustainability consumption propensity, this study adopts the Heckman

two-stage model. In the first stage, a Probit model estimates the likelihood that an individual belongs to the high-sustainability group, effectively modeling the probability of participating in sustainable consumption behavior. As shown in Table 6, demographic variables such as gender, marital status, education level, income, and age exhibit significant explanatory power in the selection equation. These results confirm that personal background characteristics are closely linked to consumers' sustainability-related decisions. The Inverse Mills Ratio (λ), derived from the Probit model, captures potential selection bias and is included in the second-stage regression to correct it.

In the second stage, both structural models—with brand attachment and brand love as mediators—are re-estimated, and the results remain robust: ESG performance continues to exert a significant positive influence on brand loyalty even after accounting for potential selection effects [44]. As shown in Table 6, the mediating roles of emotional brand factors are confirmed, highlighting the pivotal role of brand attachment and brand love in shaping consumers' responses to ESG initiatives. Although the Inverse Mills Ratio (IMR) is not statistically significant—indicating no substantial selection bias—the inclusion of IMR enhances model specification and estimation reliability. These findings suggest that the observed relationships are not artifacts of unobserved sample characteristics, thereby reinforcing the robustness and internal validity of the proposed model.

Table 6
Heckman Two-Stage Estimation Results

| Variables | Probit (Selection Equation) | Std. Err. | Model3-1(Y-X+M+IMR) | | Model3-2(Y-X+M+IMR) | |
|-----------------------------------|-----------------------------------|--------------|---------------------------|-----------|---------------------------|-----------|
| | | | OLS (Outcome Equation) | Std. Err. | OLS (Outcome Equation) | Std. Err. |
| Gender | -0.227 | 0.117 | | | | |
| Married | 0.330** | 0.125 | | | | |
| Education | 0.387*** | 0.088 | | | | |
| Salary | 0.385*** | 0.080 | | | | |
| Age | -0.157*** | 0.059 | | | | |
| Inverse Mills Ratio (λ) | | | 0.096 | 0.168 | 0.087 | 0.176 |
| ESG | | | 0.098** | 0.181 | 0.267** | 0.175 |
| Brand attachment(M1) | | | 0.289*** | 0.144 | - | - |
| Brand love(M2) | | | - | - | 0.518*** | 0.138 |
| Personal Sustainability (Control) | | | 0.262*** | 0.145** | 0.05*** | 0.143 |

Notes: Robust standard errors reported. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Inverse Mills Ratio (IMR) is derived from the first-stage Probit model to adjust for selection bias. F-test for IMR = 0: $F(1, 515) = 2.8$, $p = 0.08$.

5.2 Heterogeneity analysis

The heterogeneity regression analysis results presented in Table 7 provide insights into how the effects of ESG and emotional factors on brand loyalty differ across consumer groups with low versus high levels of personal sustainability (SUS). For consumers with low SUS, ESG significantly influences brand loyalty both directly ($\beta = 0.304$, $p < 0.001$) and indirectly through brand attachment ($\beta = 0.456$, $p < 0.001$). Similarly, for those with high SUS, the effect of ESG is even stronger ($\beta = 0.446$, $p < 0.001$), though the mediating effect of brand attachment is comparatively lower ($\beta = 0.245$, $p < 0.001$). This suggests that consumers with higher personal sustainability are more responsive to ESG initiatives directly, while brand attachment plays a larger mediating role among those with lower sustainability awareness [45].

A parallel pattern emerges in the brand love model, where ESG has a significant positive effect on brand loyalty across both low SUS ($\beta = 0.337$, $p < 0.001$) and high SUS groups ($\beta = 0.529$, $p < 0.001$). Brand love remains a strong predictor of brand loyalty in both segments, with coefficients of 0.538

($p < 0.001$) for low SUS and 0.515 ($p < 0.001$) for high SUS consumers. These consistent findings across subgroups confirm the robustness of the proposed relationships and highlight the nuanced role of personal sustainability in shaping how ESG and emotional attachments contribute to brand loyalty [46]. Overall, the heterogeneity analysis strengthens confidence in the generalizability of the results while revealing important differential effects based on consumer sustainability orientations.

Table 7
Results of Heterogeneity Regression Analysis

| Model | Variables | Coef (low sus) | T (Low sus) | 95% CI | | Coef (high sus) | T (High sus) | 95% CI | |
|--------------------------------|------------------|----------------|-------------|--------|-------|-----------------|--------------|--------|-------|
| Model3-1 (Brand attachment) | ESG | 0.304 *** | 4.59 | 0.173 | 0.434 | 0.446 *** | 3.19 | 0.170 | 0.722 |
| | Brand attachment | 0.456 *** | 7.56 | 0.337 | 0.575 | 0.245 *** | 2.98 | 0.832 | 0.407 |
| Model3-2 (Brand love) | ESG | 0.337 *** | 5.50 | 0.216 | 0.457 | 0.529 *** | 4.29 | 0.286 | 0.772 |
| | Brand love | 0.538 *** | 9.90 | 0.431 | 0.645 | 0.515 *** | 7.13 | 0.372 | 0.657 |

6. Conclusions and Implications

6.1 Theoretical and Practical Contributions

This research advances the understanding of how Environmental, Social, and Governance (ESG) practices influence consumer brand loyalty in the e-commerce sector by uncovering emotional mechanisms that complement cognitive evaluations. Prior literature has predominantly emphasized rational assessments of ESG initiatives. In contrast, this study addresses a notable gap concerning internal emotional pathways by identifying brand attachment and brand love as crucial emotional mediators linking ESG efforts to consumer loyalty outcomes [47-49].

By integrating Signaling Theory, Emotional Attachment Theory, Affective Transfer Theory, and the Theory of Planned Behavior (TPB), this research proposes a dual-process psychological framework illustrating how consumers process ESG messaging through cognitive and emotional channels. The findings indicate that ESG messages characterized by clarity, credibility, and value congruence act as strong signals of brand authenticity and trustworthiness. Meanwhile, emotionally resonant, narrative-driven ESG content fosters deeper consumer-brand emotional bonds. Positive affective responses further enhance brand evaluations and loyalty through affective transfer. Additionally, ESG communications aligned with consumers' personal values and perceived social norms significantly bolster intentions toward sustainable consumption.

One key theoretical innovation of this study is successfully integrating the behavioral economic theory of intertemporal preference with psychological and emotional mechanisms. The research suggests that individuals with lower subjective discount rates and stronger long-term orientation are more inclined to form enduring emotional connections with brands that generate lasting social and environmental value. Through an illustrative case study of Alibaba, the theoretical framework is situated within the context of emerging markets, demonstrating how culturally attuned and emotionally compelling ESG communication strategies can effectively engage consumers. Alibaba's approach of combining brand storytelling with institutionalized ESG commitments exemplifies how firms can cultivate competitive advantage and long-term consumer loyalty by emphasizing long-term values and eliciting emotional resonance.

6.2 Limitations and Future Research Directions

Despite its contributions, this research has several limitations that warrant attention in future studies. First, the sample is drawn from a specific cultural and demographic context, limiting the

generalizability of findings. Cultural differences in sustainability awareness, emotional expression, and social norms necessitate broader cross-cultural samples to explore heterogeneous emotional responses to ESG communication.

Second, the cross-sectional design restricts insights into dynamic changes in consumer perceptions over time. Longitudinal research is encouraged to assess how ESG messaging effects evolve with shifting societal expectations, corporate behavior, and regulatory frameworks.

Third, potential endogeneity concerns arise from omitted variables such as prior brand trust, ethical orientation, or consumer skepticism, which could bias estimates. Future research should adopt advanced econometric methods—including instrumental variables (IV), generalized method of moments (GMM), and propensity score matching (PSM)—to strengthen causal inference.

Further investigation into additional psychological mediators like moral congruence, ethical identity, and perceived corporate hypocrisy is warranted to capture a fuller spectrum of emotional and moral responses to ESG messaging. Exploring moderators such as product category, consumer personality traits, and ESG familiarity can also reveal boundary conditions for ESG communication effectiveness.

An important area for further exploration is whether preferences for ESG-driven brands reflect deeper intertemporal preference traits, specifically the extent to which individuals prioritize long-term outcomes over immediate ones. Incorporating the subjective discount rate framework could offer richer insight into consumer motivations.

Moreover, the widespread adoption of ESG loyalty may represent a fiscal phenomenon with macroeconomic consequences, warranting further investigation within the realms of public finance and tax optimization [50,51]. This interdisciplinary topic merges sustainable consumer behavior, consumer psychology, and public economic policy, inviting future research to explore how micro-level ESG loyalty aggregates to macroeconomic and fiscal effects, potentially impacting tax planning, government subsidy policies, and green economic transitions.

Finally, given the focus on the e-commerce sector, the findings may not fully translate across industries. Variations in regulatory environments, consumer expectations, and product characteristics suggest that cross-industry and cross-national comparative research is needed to determine the generalizability or specificity of the identified emotional-cognitive mechanisms and to provide industry-tailored guidance.

6.3 Conclusions

This research provides robust empirical evidence and a comprehensive theoretical framework demonstrating how ESG practices impact consumer brand loyalty through intertwined emotional and cognitive processes. By highlighting brand attachment and brand love as pivotal emotional mediators and integrating signaling, emotional, and behavioral theories, it offers a holistic understanding of how strategically designed ESG communication can build consumer trust, enhance brand image, and drive loyalty.

Practically, the findings underscore the importance of e-commerce firms developing ESG strategies that communicate ethical commitments and evoke authentic emotional resonance aligned with consumer values and cultural contexts. Such ESG messaging is vital for cultivating lasting brand equity and customer loyalty in a digital marketplace increasingly driven by sustainability and ethics.

Overall, this research bridges significant gaps in the literature by connecting ESG communication with emotional branding and successfully integrating the behavioral economic model of intertemporal preference with emotional response mechanisms, opening new avenues for inquiry. It provides theoretical support for understanding how cognitive and emotional pathways jointly shape

consumer behavior in response to corporate sustainability efforts and offers valuable insights into the broader economic and policy implications of ESG-driven consumer loyalty, encouraging scholars and practitioners to think systemically about the value of sustainable business practices.

Author Contributions

Conceptualization, X. X. and P. T.; Methodology, X. X.; Software, X. X.; Validation, X. X.; Formal Analysis, X. X.; Investigation, X. X.; Resources, X. X.; Data Curation, P. T.; Writing – Original Draft Preparation, X. X.; Writing – Review & Editing, P. T.; Visualization, X. X.; Supervision, X. X.; Project Administration, X. X. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

All the data are included in the manuscript and supplementary files.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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