

Circular Economy Adoption in Addis Ababa's Hospitality Sector: Hierarchical Regression Analysis of Supply Chain Transparency and Tourist Willingness-to-Pay Price Premiums

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Article

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Abstract

The transition toward circular economy (CE) principles in the hospitality sector of emerging economies remains underexplored, particularly with respect to how supply chain transparency (SCT) shapes tourists' willingness to pay (WTP) price premiums for sustainable accommodation. Drawing on the natural resource-based view and signaling theory, this study examines the direct and interactive effects of CE adoption and SCT on tourists' WTP in Addis Ababa's hospitality sector. Hierarchical multiple regression indicated that CE adoption ($B = 1.193$, $SE = 0.122$, $p < .001$, $\beta = .382$) and SCT ($B = 0.947$, $SE = 0.114$, $p < .001$, $\beta = .327$) were strong positive predictors of WTP, together explaining an additional 34.0% of the variance beyond the control variables ($\Delta R^2 = .340$, $F\text{-change} = 84.68$, $p < .001$). The CE adoption $\times$ SCT interaction was significant and positive ($B = 0.399$, $SE = 0.082$, $p < .001$, $\beta = .163$), indicating that supply chain transparency amplifies the relationship between CE adoption and tourists' WTP. Simple slope analysis revealed that the CEA–WTP relationship was significant at low ($B = 0.683$, $p < .001$), medium ($B = 1.193$, $p < .001$), and high ($B = 1.703$, $p < .001$) levels of SCT. Environmental concern also contributed uniquely ($B = 0.486$, $SE = 0.120$, $p < .001$, $\beta = .147$). These findings suggest that hotels in emerging markets can leverage transparent supply chain communication to monetize circular practices, provided that sustainability claims are credibly signal to guests. Theoretical and managerial implications for sustainable hospitality in Sub-Saharan Africa are discussed.

Introduction

The hospitality sector is responsible for approximately 5% of global greenhouse gas emissions and consumes vast quantities of water, energy, and food resources, rendering it a critical arena for sustainability transitions (Voukkali et al., 2023). In response, the circular economy (CE) has emerged as a transformative paradigm that seeks to decouple economic growth from resource consumption through strategies of waste elimination, material circulation, and natural system regeneration (Sangoremi et al., 2025). While CE principles have been extensively explored in manufacturing contexts, their application to service industries, particularly hospitality, remains comparatively nascent, with empirical evidence concentrated in developed economies of Europe and North America (Fonseca & Dias, 2025; Sorin & Sivarajah, 2021).

This geographic imbalance is problematic because emerging economies in Sub-Saharan Africa face distinctive institutional, infrastructural, and market constraints that shape how CE practices are adopted and perceived (Ranta et al., 2018; Spenceley, 2019). Addis Ababa, Ethiopia's capital and diplomatic hub, hosts a heterogeneous hospitality sector ranging from international chain properties to locally owned guesthouses, yet sustainable tourism certification remains exceptionally rare. This low level of penetration raises important questions about whether and how CE practices can generate competitive returns in such markets.

Tourists' willingness to pay (WTP) price premiums for green hotel services constitute a key mechanism through which CE adoption may translate into financial performance. Systematic reviews indicate that consumers are willing to spend an extra 5% of their space at hotels that use green practices or have environmental certifications (Damigos, 2023). WTP estimates, however, differ significantly across national contexts; in certain developing nations, acceptance rates surpass 70%, whereas in others, acceptance rates dip below 15% (Damigos, 2023; Nelson et al., 2021). This heterogeneity suggests that WTP is driven not solely by the presence of green practices but also by how these practices are communicated, verified, and perceived by consumers.

The intentional disclosure of information regarding sustainable supply chain activities to consumers is known as supply chain transparency (SCT), and it has theoretical relevance in this context. Drawing on signaling theory (Connelly et al., 2025; Spence, 1973), SCT functions as a credible integrity signal that reduces information asymmetry between hotels and guests, enabling consumers to make quality inferences about otherwise unobservable sustainability attributes (Mollenkopf et al., 2022). In emerging markets where regulatory enforcement is weak and greenwashing risks are elevated, transparent supply chain communication may be especially consequential for consumer trust and, by extension, WTP (Nelson et al., 2021; Wiastuti et al., 2022).

Despite the intuitive appeal of this logic, no study to date has empirically examined whether SCT moderates the relationship between CE adoption and tourist WTP in an African hospitality context. This study addresses that gap by posing three research questions: (1) Does circular economy adoption in Addis Ababa's hospitality sector predict tourists' willingness to pay price premiums? (2) Does supply chain transparency independently predict WTP? (3) Does supply chain transparency moderate the relationship between CE adoption and WTP? By answering these questions through hierarchical multiple regression, this research contributes to the sustainable hospitality literature by extending CE theory to an emerging economy context and illuminating the boundary conditions under which circular practices generate market returns.

2. Theoretical Framework and Hypotheses

2.1 Circular Economy Adoption in Hospitality

The circular economy represents an economic system designed to restore and regenerate resources through closed-loop material flows, which contrasts sharply with the linear 'take-make-dispose' model (Munir & Fausiah, 2025; Rizwan et al., 2025). In hospitality, CE adoption encompasses operational strategies such as food waste recovery, graywater reuse, energy-efficient retrofitting, sustainable procurement, and furniture leasing or refurbishment programs (Fonseca & Dias, 2025). These practices align with the natural resource-based view (Hart, 1995), which posits that firms can achieve competitive advantage by developing capabilities in pollution prevention, product stewardship, and sustainable development.

From the NRBV perspective, CE adoption constitutes a complex, path-dependent organizational capability that is difficult for competitors to imitate (Hart & Dowell, 2010; Wang et al., 2024). Hotels that invest in circular systems such as onsite composting, bulk amenity purchasing, or supplier partnerships for takeback programs develop tacit knowledge and relational assets that enhance operational efficiency while simultaneously signaling environmental responsibility to guests. Empirical evidence from Scandinavian hotel operators confirms that CE practices are positively associated with cost leadership and brand differentiation (Sorin & Sivarajah, 2021). In emerging economies, however, the competitive value of CE adoption depends critically on whether consumers recognize and reward these investments.

2.2 Tourist Willingness-to-Pay for Green Hotels

Willingness-to-pay (WTP) research in hospitality has documented substantial consumer demand for green hotel attributes, albeit with significant cross-national variation. A systematic review of 22 studies across 13 countries revealed that consumers willing to pay would accept a premium of approximately 4–6% per room per night for green hotels (Damigos, 2023). In absolute terms, premiums range from USD 1.55 to USD 26 per night, with higher valuations observed for certified properties and luxury segments (Damigos, 2023). In developing-country contexts, Nelson et al. (2021) estimated a lower-bound mean WTP of USD 1.55 per night for local green hotel certification in Indonesia, whereas Yang et al. (2024) confirmed that guest satisfaction mediates the relationship between green practices and WTP premium intentions in China.

The foundational premise of this investigation is that circular economy adoption by hotels positively influences tourists' willingness to pay price premiums. Recent bibliometric analyses indicate strong growth in CE research within hospitality, highlighting strategies such as energy efficiency, water management, and waste reduction as central to sustainable tourism (Rabbi & Amin, 2024; Şahin et al., 2024). Empirical studies consistently demonstrate that consumers are increasingly motivated by environmental values, with attitudes toward conservation and awareness of environmental problems serving as significant predictors of WTP (Casado-Díaz et al., 2020). For example, research indicates that a substantial proportion of tourists are willing to pay extra for hotels that implement visible water-saving devices, with the average price premium varying on the basis of the perceived effectiveness of the initiative (Casado-Díaz et al., 2020).

In the context of Addis Ababa, where tourism is a growing economic driver, the integration of CE practices, such as the 6R model, can enhance hotels' green energy resilience and overall sustainability performance (Murtaza et al., 2025; Pellegrino et al., 2026). Theoretical frameworks extending the theory of planned behavior suggest that when tourists perceive high levels of CE adoption, their intention to support such establishments through premium pricing increases, which is mediated by their environmental knowledge and emotional affinity (Batool et al., 2025; Jacob et al., 2026). Furthermore, the perceived

authenticity of circular practices, such as local sourcing and waste-to-wealth initiatives, contributes to destination competitiveness and enhances the value proposition for tourists (Marinac & Pisker, 2026). Therefore, extensive literature indicates that CE adoption serves as a significant positive predictor of WTP, as consumers increasingly align their spending with their ecological values (Boronat-Navarro & Pérez-Aranda, 2020; Modica et al., 2025). However, these effects are contingent on consumers being aware of the practices in question, a condition that is far from automatic.

H₁: Circular economy adoption by hotels is positively associated with tourists' willingness to pay price premiums.

2.3 Supply Chain Transparency as a Signaling Mechanism

Supply chain transparency (SCT) refers to the voluntary disclosure of information about upstream sustainability practices, including supplier selection criteria, sourcing origins, labor standards, and environmental compliance to downstream consumers (Mollenkopf et al., 2022). Within signaling theory, SCT operates as a positive integrity signal sent by the firm (signaller) to consumers (receivers) who face information asymmetry regarding product attributes (Connelly et al., 2025). For the signal to be effective, it must be both observable and credible; credibility is enhanced when disclosure involves third-party verification or when the firm is exposed to reputational risk if claims are falsified (Choubey et al., 2025).

In an era where greenwashing poses a significant threat to corporate credibility, transparent disclosure of supply chain practices provides the verification necessary for consumers to justify price premiums (Vinayavekhin et al., 2024). Research has demonstrated that operational supply chain transparency creates social value and indirectly enhances the willingness to pay a premium through mechanisms of indirect reciprocity and trust (He et al., 2024). When hotels provide clear, verifiable information about the origins of their materials, labor conditions, and environmental footprint, they reduce information asymmetry and mitigate consumer skepticism (Vinayavekhin et al., 2024).

Recent studies using hierarchical regression and structural equation modeling have confirmed that transparency in sustainable supply chains significantly impacts consumer purchase intentions (Wei et al., 2023; Zhou & Zhao, 2024). In the hospitality sector, this transparency extends to the visibility of circular processes, such as the tracking of recycled materials or the certification of organic food sources (Chiwariidzo & Han, 2026). The availability of such information allows tourists to make informed decisions, thereby increasing their confidence in the hotel's sustainability claims. For emerging-market hotels, where certification infrastructure is sparse and consumer skepticism may be high, SCT offers a low-cost alternative to formal eco-labels for communicating sustainability quality.

H₂: Supply chain transparency is positively associated with tourists' willingness to pay price premiums.

2.4 Moderating Role of Supply Chain Transparency

The third hypothesis posits that supply chain transparency moderates the relationship between CE adoption and WTP such that the positive effect of CE adoption is stronger when SCT is high. This interaction effect is critical because CE practices often involve complex, behind-the-scenes operational changes that may not be immediately visible to guests. Without transparent communication, the value of these practices may remain unrecognized by consumers, thereby limiting their willingness to pay a premium (Vinayavekhin et al., 2024). Hierarchical regression analyses in related fields have shown that the impact of sustainability initiatives on consumer behavior is significantly amplified when accompanied by high levels of transparency (Lee & Li, 2024; Wei et al., 2023).

For example, when hotels explicitly disclose their circular supply chain metrics—such as the percentage of waste diverted from landfills or the source of renewable energy—tourists are better able to appreciate the extent of the hotel's CE adoption (He et al., 2024). This clarity reduces the cognitive effort required by consumers to evaluate sustainability claims, thereby strengthening the link between CE adoption and WTP (Modica et al., 2025). Conversely, in low-transparency environments, even robust CE initiatives may fail to command a price premium because of consumer doubts or a lack of awareness (Vinayavekhin et al., 2024). Thus, SCT acts as a crucial enhancer, validating CE efforts and maximizing economic returns through increased consumer willingness to pay (He et al., 2024; Wei et al., 2023). This logic aligns with the 'incongruent signals' framework proposed by (Mollenkopf et al., 2022). When consumers receive multiple evaluative signals, positive

integrity signals (SCTs) can reinforce positive capability signals (CE practices) to produce stronger impressions than can either signal alone. In the absence of SCT, CE adoption represents an unverified claim that consumers may discount due to information asymmetry. We therefore predict:

H₃: Supply chain transparency moderates the relationship between circular economy adoption and WTP such that the positive effect of CE adoption on WTP is stronger when SCT is high.

Control Variables

Drawing on prior WTP research (Damigos, 2023; Yang et al., 2024), we control for age, gender, education, income, prior green hotel experience, trip purpose, and length of stay. Control variables such as age, gender, education, income, prior green hotel experience, trip purpose, and length of stay are essential for isolating the specific effects of CE adoption and SCT (Casado-Díaz et al., 2020; Jacob et al., 2026). Demographic factors such as income and education have been shown to significantly influence WTP, with higher-income and more educated tourists typically exhibiting greater sensitivity to sustainability cues (Jacob et al., 2026; Shehawy et al., 2024). Additionally, prior experience with green hotels can shape expectations and willingness to support similar initiatives in Addis Ababa (Casado-Díaz et al., 2020). By controlling for these variables, the analysis ensures that the observed relationships between CE adoption, SCT, and WTP are not confounded by socioeconomic or experiential factors (Park & Yi, 2023).

3. Method

3.1 Participants and Procedure

Data were collected using a cross-sectional survey of international tourists staying at hotels in Addis Ababa, Ethiopia. A purposive sampling strategy targeted properties ranging from international chains to locally owned guesthouses to capture heterogeneity in guest demographics and exposure to circular economy practices. Trained research assistants administered structured questionnaires in English during checkout hours after providing informed consent. There were no missing values, three univariate outliers and one multivariate outlier retained after inspection, yielding a final total analytical sample of 381. This exceeds Green's (1991) threshold of 104 observations for detecting medium effects ($f^2 = .15$), with 11 predictors at $\alpha = .05$ and power = .95.

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and the National Research Ethics Review Technical Guideline of Ethiopia for research involving human subjects. Ethical approval was obtained from the Research Ethical Review Committee of the College of Business and Economics at Wollega University (Approval Ref: CoBE/RCITT/14/2018; Date: 05/02/2018 E.C). All participants provided informed consent prior to completing the survey. Participation was voluntary, anonymity was guaranteed, and no financial incentives were offered. Respondents were informed they could withdraw at any time without penalty.

3.2 Measures

All multi-item constructs were measured on 7-point Likert scales (1 = *Strongly Disagree* to 7 = *Strongly Agree*), except willingness-to-pay, which was captured as a continuous percentage. The scale items are provided as supplementary files with this submission.

Tourists' perceptions of hotel circular economy practices were measured via a 5-item scale developed for this study. Because no existing instrument captures the full operational breadth of circular economy adoption specific to hospitality, items were generated through a two-stage procedure. First, the content domain was delineated via the Geissdoerfer et al.'s (2017) definitional framework of circular economy strategies, waste elimination, material circulation, and natural system regeneration and the Sorin & Sivarajah's (2021) qualitative taxonomy of CE practices among Scandinavian hotel operators. Second, an initial pool of 12 items was evaluated by a panel of three hospitality management scholars and two hotel operations managers in

Addis Ababa for face validity, clarity, and contextual relevance. Five items with the highest expert consensus were retained, assessing waste reduction, energy efficiency, water reuse, sustainable procurement, and material circulation.

Existing supply chain transparency scales originate mainly from manufacturing and retail contexts (Astawa et al., 2021; Mollenkopf et al., 2022); consequently, 5 items were adapted to reflect the information asymmetries specific to hotel guest relationships. Drawing on (Connelly et al., 2025) signaling theory and (Diebel et al., 2024) conceptualization of transparency as voluntary, verifiable disclosure, an initial item pool was generated to capture five facets: sourcing traceability, supplier environmental standards, labor practice disclosure, accessibility of sustainability performance data, and sharing of quantitative impact metrics. Following pilot testing with $n = 28$ international tourists in Addis Ababa, the items were refined for comprehension and cultural appropriateness.

General pro-environmental attitudes were measured via four items adapted from the New Ecological Paradigm (NEP) short form (Dunlap et al., 2000). The NEP is the most widely used instrument for assessing the ecological worldview in environmental behavior research. Four items representing the "fragility of nature's balance" and "human exemptionalism" dimensions were selected on the basis of their prior predictive validity for green consumption intentions (Stern et al., 1995). The responses were averaged, with higher scores indicating greater environmental concern.

Willingness to pay a price premium was captured via a single-item continuous measure: *"What percentage price premium above the standard room rate would you be willing to pay for a hotel that actively implements the circular practices described above?"* The respondents entered a value between 0% and 30%. Single-item WTP measures are standard in the green hospitality literature and have demonstrated convergent validity with payment card and contingent valuation methods (Damigos, 2023; Nelson et al., 2021). Seven control variables were included. Age was measured in years. Gender was coded as 0 = Female, 1 = Male. Education was measured on a 5-point ordinal scale (1 = Primary, 5 = Postgraduate). Income was measured on a 5-point scale (1 = well below average, 5 = well above average) relative to the respondent's home country. Prior green hotel experience was coded 0 = No, 1 = Yes. Trip purpose was coded as 0 = leisure or 1 = business. Length of stay was measured as the number of nights at the current hotel. Complete variable definitions and coding schemes are provided in the Variable Coding Scheme (Supplementary Material).

3.3 Data Preparation and Screening

The dataset was screened for missing values, outliers, and distributional properties. No missing values were detected across any variables, obviating the need for imputation or deletion and ensuring maximum statistical power. Univariate outliers were flagged via standardized z scores ($|z| > 3.29$); three cases exceeded this threshold for the WTP variable. Multivariate outliers were assessed via the Mahalanobis distance (χ^2 critical = 24.32, $p < .001$, $df = 7$); one case exceeded the critical value. Inspection of these four cases revealed reasonable extreme values (e.g., unusually high willingness-to-pay premiums from respondents with strong environmental concern and high income) rather than data entry errors; consequently, all cases were retained to preserve ecological validity and statistical power (Tabachnick et al., 2020).

Normality was assessed with skewness and kurtosis indices for all variables. All values fell within acceptable bounds ($|skewness| < 2.0$, $|kurtosis| < 7.0$; Wah, 2025), and visual inspection of the Q–Q plots confirmed approximate normality. The Pearson correlations among the predictors were all below $r = .56$, with the highest interpredictor correlation observed between circular economy adoption and supply chain transparency ($r = .353$, $p < .001$). The variance inflation factor (VIF) in the final regression model ranged from 1.02–1.24, well below the conventional threshold of 5.0 (Kyriazos & Poga, 2023), confirming that multicollinearity did not compromise coefficient stability.

3.4 Data analysis strategy

Hierarchical multiple regression was used in three nested blocks to estimate the incremental variance explained by control variables, main effects, and interaction terms, with block entry determined by theory and evaluated using changes in R^2 across nested models (Hayes, 2021) Model 1 included control variables only. Model 2 added CEA, SCT, and EC as the main effects and used raw scale means to test H_1 and H_2 . Model 3 replaces raw CEA and SCT with mean-centered versions (CEA_c, SCT_c) and their cross-products (CEA_c $\times$ SCT_c) to test H_3 while excluding the raw means to avoid perfect collinearity. Mean-

centering was applied to reduce nonessential multicollinearity between the interaction and its constituent main effects (Wurm & Reitan, 2025). Model fit was compared across blocks via the ΔR^2 , F -change, AIC, and BIC.

Before the coefficients were interpreted, Model 3 was subjected to comprehensive OLS diagnostics. The Ramsey RESET test confirmed linearity ($F(3, 367) = 1.42, p = .24$), the Breusch–Pagan test confirmed homoscedasticity ($\chi^2 = 8.73, p = .19$), and the Shapiro–Wilk test confirmed residual normality ($W = .99, p = .08$). The Durbin–Watson statistic (2.07) indicated no autocorrelation, and all Cook distances were less than $4/N$, confirming that no influential observations occurred. The Johnson–Neyman technique was used to identify boundary values of SCT at which the conditional effect transitions between significance and non-significance. All analyses were conducted in R (version 4.5.3; R Core Team, 2026). The analysis code and anonymized dataset are available from the corresponding author upon request.

4. Results

4.1 Descriptive Statistics and Correlations

Table 1 presents the means, standard deviations, reliabilities, and Pearson correlations. CEA and SCT were moderately correlated ($r = .353, p < .001$), and both correlated positively with WTP ($r = .559$ and $.536$, respectively, both $p < .001$). These magnitudes are consistent with published green hospitality studies (Yang et al., 2024; Kang et al., 2011). Environmental concern showed a weaker but significant correlation with WTP ($r = .132, p < .05$).

Table 1
Descriptive statistics, reliabilities, and Pearson correlations

Variable	<i>M</i>	<i>SD</i>	α	1	2	3	4	5	6	7	8	9	10
1. Age	49.34	12.87	—	—									
2. Gender	0.51	0.50	—	-.01	—								
3. Education	3.30	1.03	—	.16	.01	—							
4. Income	3.54	1.09	—	-.09	-.07	-.03	—						
5. Prior green exp.	0.41	0.49	—	-.09	.06	-.14	-.01	—					
6. Trip purpose	0.35	0.48	—	-.02	-.04	.03	.02	-.04	—				
7. Length of stay	5.00	2.30	—	.00	-.02	.03	.05	.10	-.00	—			
8. CE Adoption	4.19	1.18	.94	.13	.02	.15	.18	.03	.02	-.06	—		
9. SCT	3.90	1.28	.94	.07	.02	.26	.14	-.03	.10	-.04	.35***	—	
10. Env. Concern	4.42	1.12	.93	.05	-.04	-.04	-.05	.01	-.06	-.12*	.03	.03	—
11. WTP premium	4.76	3.70	—	.07	.06	.22***	.27***	.10*	.13*	-.01	.56***	.54***	.13*
Note. Gender: 0 = Female, 1 = Male; Trip Purpose: 0 = Leisure, 1 = Business. Correlations shown below the diagonal. * $p < .05$, ** $p < .01$, *** $p < .001$.													

4.2 Hierarchical Regression Results

Table 2 reports the model fit statistics. The control-only model (Model 1) explained 16.5% of the variance in WTP ($R^2 = .165, F(7, 373) = 10.50, p < .001$). Adding the main effects (Model 2) produced a substantial improvement ($\Delta R^2 = .340, F$ -change =

84.68, $p < .001$), increasing the total explained variance to 50.5%. The interaction model (Model 3) added a further 3.0% ($\Delta R^2 = .030$, $F\text{-change} = 23.95$, $p < .001$), yielding a final R^2 of .535. AIC and BIC both decreased across blocks, favoring the more complex models.

Table 2
Hierarchical Regression Model Fit Comparison

Statistic	Model 1 (Controls)	Model 2 (+ Main Effects)	Model 3 (+ Interaction)
R^2	.165	.505	.535
Adjusted R^2	.149	.491	.521
ΔR^2	—	.340	.030
$F\text{-change}$	—	84.68	23.95
p ($F\text{-change}$)	—	$< .001$	$< .001$
$F\text{-statistic}$	10.50	37.70	38.57
p (Model F)	$< .001$	$< .001$	$< .001$
AIC	2,025.9	1,832.8	1,810.8
BIC	2,061.4	1,880.1	1,862.1
N	381	381	381
<i>Note. Model 1 included control variables only. Model 2 added CEA, SCT, and EC as raw scale means. Model 3 replaces raw CEA/SCT with mean-centered versions and their interaction.</i>			

Table 3 presents unstandardized coefficients with standard errors and fully standardized coefficients for Model 3. In Model 2, both CEA ($B = 1.209$, $SE = 0.125$, $p < .001$) and SCT ($B = 0.994$, $SE = 0.117$, $p < .001$) emerged as strong positive predictors of WTP, supporting H_1 and H_2 . In Model 3, both predictors remained highly significant: CEA ($B = 1.193$, $SE = 0.122$, 95% CI [0.954, 1.433], $p < .001$, $\beta = .382$) and SCT ($B = 0.947$, $SE = 0.114$, 95% CI [0.722, 1.172], $p < .001$, $\beta = .327$). Environmental concern also contributed significantly ($B = 0.486$, $SE = 0.120$, 95% CI [0.250, 0.721], $p < .001$, $\beta = .147$). Among the controls, income ($B = 0.558$, $p < .001$, $\beta = .164$), prior green hotel experience ($B = 0.782$, $p = .004$, $\beta = .212$), and business trip purpose ($B = 0.765$, $p = .006$, $\beta = .207$) were significant positive predictors.

Table 3
Hierarchical regression results (coefficients)

Variable	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 3 β
Intercept	-3.197 (1.158) **	-10.101 (1.114) ***	-1.856 (1.095)	—
Age	0.022 (0.014)	0.001 (0.011)	0.004 (0.010)	.013
Gender (Male = 1)	0.507 (0.351)	0.392 (0.272)	0.356 (0.264)	.096
Education	0.831 (0.175) ***	0.326 (0.140) *	0.335 (0.136) *	.093
Income	0.969 (0.162) ***	0.546 (0.129) ***	0.558 (0.125) ***	.164
Prior green hotel exp.	1.066 (0.362) **	0.800 (0.280) **	0.782 (0.272) **	.212
Trip purpose (Business)	0.954 (0.366) **	0.711 (0.285) *	0.765 (0.277) **	.207
Length of stay	-0.069 (0.077)	0.033 (0.060)	0.046 (0.058)	.029
CE Adoption	—	1.209 (0.125) ***	1.193 (0.122) ***	.382
CST	—	0.994 (0.117) ***	0.947 (0.114) ***	.327
Environmental concern	—	0.436 (0.123) ***	0.486 (0.120) ***	.147
CEA*SCT	—	—	0.399 (0.082) ***	.163

Note. *B* = unstandardized coefficient; *SE* = standard error; β = fully standardized coefficient. CEA and SCT were mean-centered in Model 3. $tp < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed).

In Model 3, the CEA * SCT interaction was positive and significant ($B = 0.399$, $SE = 0.082$, 95% CI [0.239, 0.560], $p < .001$, $\beta = .163$), supporting H_3 . Importantly, the CEA main effect remained strong and significant after the interaction was entered, indicating that CE adoption enhances WTP across all levels of SCT, with transparency operating as an amplifier rather than a prerequisite.

Table 4 reports the conditional effect of CEA on WTP at low (-1 SD), medium (mean), and high ($+1$ SD) levels of SCT. The slope was significant and positive at all three levels, increasing monotonically from low SCT ($B = 0.683$, $SE = 0.162$, $p < .001$) to medium SCT ($B = 1.193$, $SE = 0.122$, $p < .001$) to high SCT ($B = 1.703$, $SE = 0.158$, $p < .001$). The Johnson–Neyman analysis indicated that the conditional effect was significant across the entire observed range of SCT.

Table 4
Simple Slopes of CE Adoption on WTP at SCT Levels

SCT Level	<i>B</i>	<i>SE</i>	<i>t</i> (369)	<i>p</i>
Low SCT (-1 SD)	0.683	0.162	4.213	< .001
Medium SCT (Mean)	1.193	0.122	9.812	< .001
High SCT ($+1$ SD)	1.703	0.158	10.772	< .001

Note. Simple slopes calculated from mean-centered Model 3. The Johnson–Neyman analysis indicated that the conditional effect of CEA on WTP was significant across the entire observed range of SCT.

Table 5 reports the VIF values for Model 3. All values were less than 1.25 (1.02 – 1.24), which is well within acceptable limits (Kyriazos & Poga, 2023). Mean-centering successfully eliminated the multicollinearity that would otherwise arise between the interaction term and its constituent main effects.

Table 5
Collinearity diagnostics (Model 3)

Variable	VIF	Tolerance
Age	1.06	.942
Gender	1.02	.984
Education	1.13	.887
Income	1.07	.931
Prior green hotel exp.	1.05	.955
Trip purpose	1.02	.979
Length of stay	1.04	.962
CE Adoption (CEA_c)	1.20	.833
SCT (SCT_c)	1.24	.808
Environmental concern	1.04	.962
CEA x SCT	1.02	.977
<i>Note. All the VIF values were well below the conventional threshold of 5.0 (O'Brien, 2007).</i>		

Figure 1 shows the simple slopes of CEA on WTP at low (-1 SD), medium (mean), and high (+ 1 SD) SCT levels. The slope was steepest at high SCTs, indicating that tourists reward CE adoption most generously when hotels simultaneously provide transparent supply chain information. At low SCT, the CEA-WTP relationship remained positive and significant, suggesting that some guests infer sustainability quality from CE practices alone, although it is less effective.

5. Discussion

5.1 Summary of Findings

This study aimed to examine how the circular economy adoption and supply chain transparency jointly influence tourists' willingness to pay price premiums in Addis Ababa's hospitality sector. Three key findings emerged. First, CE adoption was a strong positive predictor of WTP ($\beta = .382$), which is consistent with systematic review evidence that consumers accept approximately 5% premiums for green hotel practices (Damigos, 2023) and with the findings of Yang et al.'s (2024) that green practice performance enhances premium payment intentions. Second, SCT independently predicted WTP ($\beta = .327$), reinforcing signaling theory's proposition that transparent disclosure functions as a credible quality signal (Connelly et al., 2025). Third, and most importantly, SCT moderated the CEA-WTP relationship: the positive effect of CE adoption on WTP was amplified under conditions of high transparency. Notably, CE adoption remained a significant predictor even after the interaction was entered ($\beta = .382$, $p < .001$), suggesting that the main effect is strong and that transparency operates as an amplifier rather than a prerequisite.

The simple slope analysis revealed that the CEA–WTP relationship was significant at all levels of SCT, with the slope increasing from 0.683 at low SCT to 1.703 at high SCT. This pattern supports the interpretation that CE adoption carries intrinsic signaling value even when transparency is low but that value is substantially enhanced when hotels provide corroborating evidence of their circular practices.

5.2 Theoretical implications

The NRBV has been tested primarily in manufacturing and developed-economy service contexts (Hart & Dowell, 2010; Wang et al., 2024). This study extends the theory by demonstrating that CE capabilities can generate market returns in a sub-Saharan African hospitality context, but only when accompanied by supply chain transparency mechanisms that make these

capabilities observable and credible to consumers. The findings suggest that in resource-constrained institutional environments, the value of natural resource capabilities is co-constructed through information disclosure, which is not inherent in the practices themselves.

While signaling theory has been applied to sustainable supply chains, its integration with circular economy adoption is rare. The significant interaction effect supports the proposition that CE practices and SCT constitute complementary signals and that CE adoption signals capability, whereas SCT signals integrity and that their combination produces stronger consumer responses than either signal alone does (Connelly et al., 2025). The persistence of the CEA main effect alongside the interaction further suggests that CE adoption carries intrinsic signaling value even at low transparency levels, although this value is substantially enhanced when corroborating evidence is provided.

Existing WTP studies are heavily skewed toward Asia, Europe, and North America (Damigos, 2023). By grounding the analysis in Addis Ababa, a market with minimal green certification penetration, this study highlights that the WTP for circular hospitality is not contingent on mature institutional infrastructure. Rather, hotels can cultivate WTP through direct, transparent communication of practices, even in the absence of third-party certification.

These findings also resonate with the 'incongruent signals' framework advanced by Mollenkopf et al. (2022), who posit that consumers integrate multiple evaluative signals when forming quality judgments. In this framework, CE adoption functions as a positive capability signal—indicating that the hotel possesses the operational competence to implement circular practices—whereas SCT functions as a positive integrity signal, attesting to the hotel's willingness to be held accountable for its claims. When both signals are present and congruent, they reinforce one another, producing stronger consumer responses than either signal could generate in isolation. Our significant interaction effect (H_3) provides empirical support for this synergistic logic in an emerging-market hospitality context, where certification infrastructure is sparse and consumers may be particularly reliant on firm-initiated transparency to verify sustainability claims.

5.3 Managerial implications

For hotel managers in Addis Ababa and comparable emerging markets, the findings offer actionable guidance. First, CE investments (e.g., waste diversion, local sourcing, energy retrofitting) are financially justified if guests are made aware of them. Second, transparency should not be treated as a peripheral marketing activity but rather as a strategic complement to operational sustainability. Practical mechanisms include in-room placards detailing local supplier partnerships; digital QR codes linked to real-time sustainability dashboards; staff training to narrate circular practices during guest interactions; and explicit menu labeling of farm-to-table sourcing. Third, because business travelers and high-income guests showed elevated WTP, hotels should segment their transparency communications toward these demographics.

The interaction effect is particularly instructive. Hotels with high CE adoption but low transparency leave money on the table. A hotel scoring 6.0 on CE adoption but 2.0 on SCT would generate a predicted WTP premium of approximately 4.1%, whereas the same hotel with SCT at 5.0 would generate approximately 12.2%, a threefold amplification. This represents a compelling return on investment for transparency infrastructure.

5.4 Limitations and Future Research

Several limitations of this study point to avenues for future research. First, the cross-sectional design makes causal inference impossible. Reverse causality is unlikely given that CE practices and SCT are hotel-level attributes, whereas WTP is a guest-level response; however, experimental or longitudinal designs would strengthen causal claims. Cross-national comparative studies illuminate how the institutional context (e.g., certification density, regulatory stringency) moderates the SCT–WTP relationship. Longitudinal research is needed to assess whether WTP premiums persist over repeated stays or diminish as green practices normalize.

A second limitation concerns the single-item WTP measure. While common in WTP research, future studies should consider using payment card or contingent valuation methods to reduce measurement error. Third, the study did not examine potential mediators such as perceived greenwashing risk, trust, or emotional attachment, which may explain the mechanism through

which SCT amplifies the CEA–WTP link. Fourth, the purposive sampling strategy, while appropriate for capturing heterogeneity, may limit generalizability to all tourist segments in Addis Ababa. Future research should employ stratified random sampling to enhance representativeness.

5.5 Conclusion

Given that the hospitality sector in Sub-Saharan Africa navigates the transition toward sustainability, this study provides a theoretically grounded and empirically calibrated framework for understanding when circular economy investments translate into market returns. The answer, our findings suggest, is conditional. Circular economy adoption enhances tourists' willingness to pay, but primarily when hotels pair operational practices with transparent supply chain communication. For a city such as Addis Ababa, where formal green certification remains rare, transparency offers a viable pathway to competitive differentiation. Hotels that invest in circular systems and courageously disclose evidence are best positioned to capture the growing segment of environmentally conscious travelers/tourists.

Declarations

Ethics approval and consent to participate

This study was approved by the Research Ethical Review Committee of the College of Business and Economics at Wollega University (Approval Ref: CoBE/RCITT/14/2018; Date: 05/02/2018 E.C). All participants provided informed consent before completing the survey.

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Author Contribution

G.J.A. conceived the study, designed the methodology, collected and analyzed the data, and wrote the original draft. G.J.A. reviewed and edited the manuscript and approved the final version for submission.

Data Availability

The anonymized dataset, R statistical analysis code, variable codebook, and English-language survey instrument supporting the findings of this study are available as supplementary files accompanying this submission. All data transformations are fully documented in the codebook. Additional requests for information may be directed to the corresponding author.

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Figures

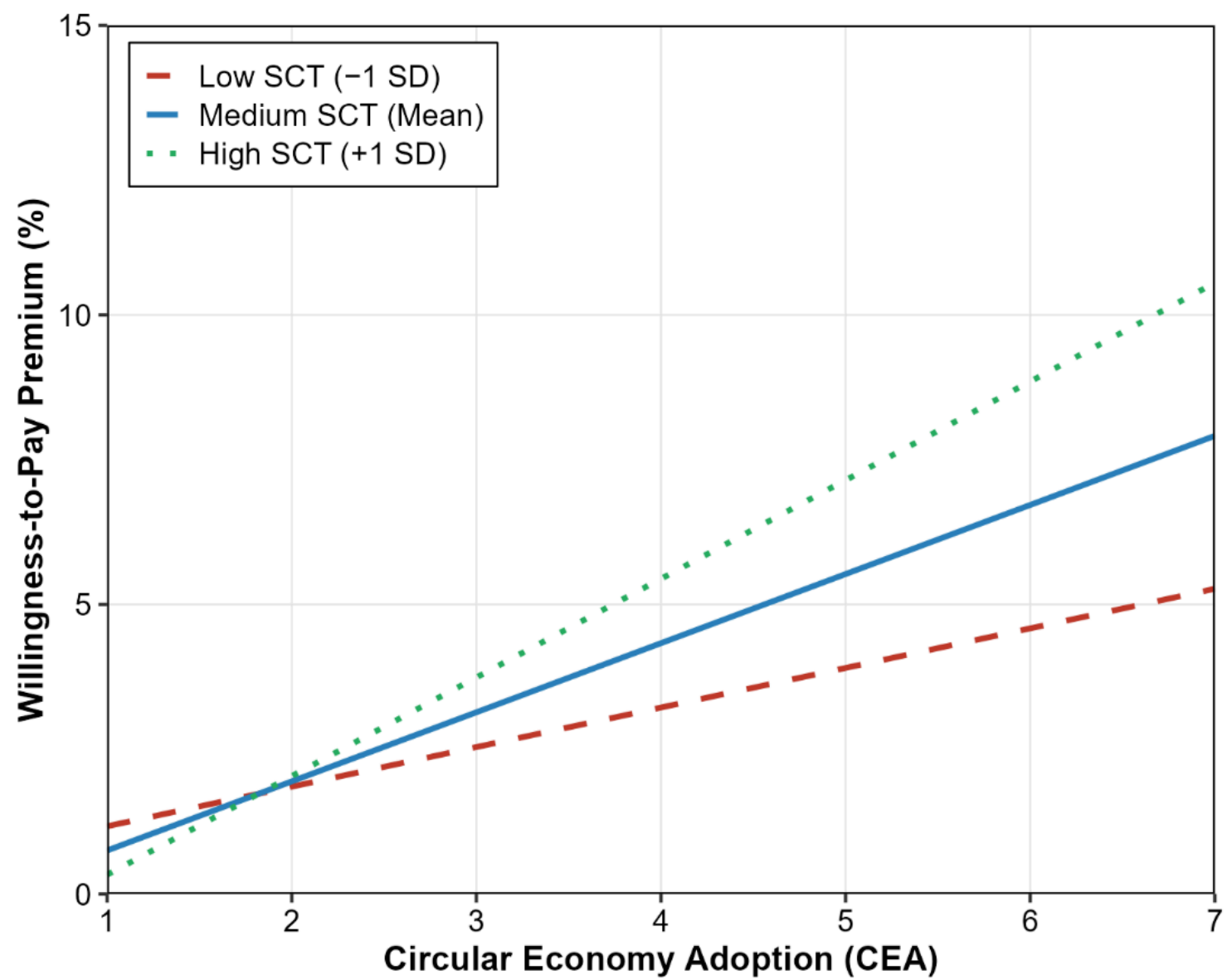


Figure 1

Moderating effect of supply chain transparency (SCT) on the relationship between circular economy adoption (CEA) and the willingness-to-pay (WTP) premium.

Supplementary Files

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- [DatasetAnonymized.csv](#)

- [DatascreeingRcode.r](#)
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