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Green Economy Adoption and Profitability: The Serial Mediation of Smart Tourism and Business Saving

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Abstract

Tourism micro and small enterprises (SMEs) in Central Java, Indonesia, face increasing pressure to adopt green economy practices while maintaining profitability in a competitive and digitally transforming tourism environment. This study examines whether smart tourism capability and business saving behaviour explain the relationship between green economy adoption and profitability among tourism SMEs in Semarang City and Pekalongan Regency. The novelty of this study lies in developing and testing a serial mediation model linking Green Economy → Smart Tourism → Business Saving → Profitability, thereby integrating sustainability orientation, tourism-related digital capability, and internal financial behaviour in a single explanatory pathway. Using a cross-sectional survey of 250 tourism SME owners/managers, the data were analysed using PLS-SEM with reflective constructs measured on a 5-point Likert scale. The results show that green economy adoption was positively associated with smart tourism capability ($\beta = 0.431$, $p < 0.001$), smart tourism capability was positively associated with business saving behaviour ($\beta = 0.273$, $p < 0.001$), and business saving behaviour was positively associated with profitability ($\beta = 0.243$, $p = 0.015$). Green economy adoption was not directly associated with profitability in this sample ($\beta = -0.141$, $p = 0.100$), whereas the serial indirect effect through smart tourism capability and business saving behaviour was statistically supported ($\beta = 0.029$, $p = 0.046$). These findings suggest that green economy adoption may become financially meaningful when supported by tourism-related digital capability and disciplined business saving behaviour. Practically, tourism SMEs and local policymakers should integrate green-transition initiatives with smart tourism enablement and basic cash-flow and saving routines. Given the cross-sectional and self-reported design, the findings should be interpreted as evidence of an associated serial indirect pathway rather than definitive causal sequencing.

KEYWORDS

green economy adoption; smart tourism; business saving; profitability.

Introduction

Tourism SMEs face dual pressures to remain competitive in rapidly digitalising tourism markets while aligning operations with green economy agendas. Globally, tourism SMEs constitute the vast majority of tourism-related businesses and are widely recognised as core contributors to destination competitiveness and employment (Karadağ, 2015; Sotiriadis, 2018). In emerging economies, SMEs are frequently described as the backbone of local economies, supporting employment and strengthening destination resilience through local embeddedness, networks, and adaptive capacity (Karadağ, 2015; Korsgaard et al., 2020; Lachhab et al., 2022; Tan et al., 2024). Nevertheless, adopting green practices is not costless: limited resources, capability gaps, and complex regulations often constrain implementation (Chien et al., 2021; Martínez & Poveda, 2022). Importantly, evidence on whether sustainability adoption improves profitability remains mixed, particularly for resource-constrained firms

facing short-term cost burdens (Coles & Zschiegner, 2011; Martínez & Poveda, 2022; Tegethoff et al., 2025). Accordingly, the following discussion maintains a global scope for these baseline claims, while the empirical evidence of this study is subsequently situated in the Central Java tourism SME context.

Prior research provides inconsistent evidence on whether green economy adoption improves SME profitability. Positive outcomes are often attributed to efficiency gains and eco-innovation that reduce resource use and operating costs, as well as reputational benefits that help firms differentiate and capture environmentally conscious markets (Cerciello et al., 2022; Hao et al., 2024; Martínez & Poveda, 2022; Ringle & Sarstedt, 2016; Tegethoff et al., 2025). However, many studies also report weak or negative financial effects, particularly for resource-constrained SMEs facing high implementation costs, limited managerial expertise, and non-linear time-lag dynamics in which short-term costs precede long-term gains (Clemente-Almendros et al., 2025; Zheng et al., 2024). Additional complications arise when symbolic disclosure or greenwashing undermines value creation and invites penalties once exposed (Testa et al., 2018; Xu et al., 2023). Thus, a key gap is not whether green economy adoption “matters”, but through which organisational mechanisms it becomes economically meaningful for tourism SMEs.

In this study, green economy adoption (GE) refers to the extent to which SMEs implement environmentally oriented practices and resource-efficient operations, including the use of sustainable inputs and willingness to invest in sustainability-supporting technologies. Smart tourism capability (ST) denotes firm-level digital capability for tourism operations and service delivery, reflected in digital promotion, online transactions, use of digital reviews, participation in digitalisation learning, and customer-data integration (Gretzel et al., 2020; Vuković et al., 2019; Xiang et al., 2021). Business saving (BS) refers to the deliberate accumulation of internal funds (retained earnings/cash buffers) for reinvestment and resilience, consistent with precautionary saving and pecking-order logic in SME finance (Carreira & Silva, 2010; Cowling et al., 2020; Fasano & Deloof, 2021). Profitability (P) captures the firm’s perceived improvement in income, net profit, and cash-flow adequacy over time.

To explain how green economy adoption can become economically meaningful, this study positions smart tourism as a capability bridge between sustainability intent and operational outcomes. At the firm level, smart tourism reflects the integration of digital technologies and data-driven decision-making, such as platform-based service design and digitally connected processes, to enhance tourist experience, efficiency, and sustainability-related performance (Ferraro et al., 2025; Isensee et al., 2024; Purnomo & Purwandari, 2025; Sarango-Lalangui et al., 2023). Grounded in the resource-based view and dynamic capabilities perspectives, ST is conceptualised as a reconfigurable capability that enables SMEs to sense, seize, and reconfigure resources to operationalise green practices. Empirically, sustainability orientation has been shown to stimulate digital transformation capability in SMEs, as green-oriented firms align stakeholder expectations and mobilise digital engagement to achieve sustainability goals (Chang, 2024; Öztürk et al., 2024; Permatasari et al., 2021; Zhang et al., 2022). Thus, green economy adoption may catalyse smart tourism capability development, providing a plausible pathway for subsequent economic outcomes.

In this study, business saving is conceptualised as the deliberate accumulation of internal funds—retained earnings and cash buffers to support operations, finance investment, and absorb shocks. In SME finance, this behaviour is commonly explained by the precautionary saving motive,

whereby firms hold cash to manage uncertainty and financing constraints, and by pecking order theory, which posits that SMEs prefer internal finance over debt and equity due to information asymmetry (Carreira & Silva, 2010; Cowling et al., 2020; Fasano & Deloof, 2021; Rocca et al., 2022). Linking the “green-digital” logic to an “internal finance behaviour” channel, we argue that ST strengthens BS by improving demand forecasting, cash-flow visibility, and operational control, thereby enabling more disciplined retention of earnings. Evidence across SME contexts indicates that digitalisation and ICT adoption enhance cash and working-capital management, reduce transaction costs and information asymmetry, and support real-time monitoring of receivables and liquidity risk (Anorue & Ugwoke, 2022; Johri et al., 2024; Kumar et al., 2023; Ps et al., 2022; Wuisang et al., 2023).

Business saving is expected to enhance SME profitability because internal funds stabilise liquidity and reduce dependence on costly external borrowing. Consistent with pecking order theory, profitable SMEs tend to accumulate retained earnings and rely less on leverage, while cash holdings provide financial flexibility to sustain operations and exploit investment opportunities (Agyei et al., 2020; Dimitropoulos et al., 2019; Verma et al., 2020). Evidence also shows that the performance value of cash buffers becomes stronger when external finance is constrained, such as during periods of restricted bank lending or institutional frictions (Dimitropoulos et al., 2019; Fasano & Deloof, 2021). This mechanism is particularly salient for tourism SMEs, where seasonality and demand shocks frequently disrupt cash inflows and working capital cycles, increasing exposure to financing costs and liquidity shortfalls (Calgaro & Lloyd, 2008; Hossain et al., 2022; Song et al., 2022).

Prior studies on sustainability and SME performance frequently emphasise direct effects or examine single mediators (e.g., innovation, reputation, financing access), and the digitalisation literature often models capability as a mediator between strategic orientation and outcomes. However, few studies integrate sustainability orientation, a tourism-specific digital capability (smart tourism), and an internal-finance behaviour (business saving) in a single sequential mechanism to explain profitability in tourism SMEs. Building on this gap, this study offers three contributions. First, it specifies and tests a serial mediation pathway (GE → ST → BS → P) that explains why green economy adoption may not translate into profitability through a direct effect. Second, it integrates strategic management theory (RBV/dynamic capabilities) with SME finance theory (precautionary saving and pecking order) to explain how capability development converts sustainability intent into financial outcomes. Third, it provides evidence from tourism SMEs in Central Java (Semarang City and Pekalongan Regency), adding context-specific insight to the mixed sustainability–profitability literature.

Based on the above gaps, this study aims to examine whether green economy adoption improves profitability in tourism SMEs and whether this relationship operates through a serial mechanism involving smart tourism capability and business saving. Figure 1 presents the proposed research model.

Although the main theoretical argument of this study emphasises a serial indirect mechanism through smart tourism capability and business saving behaviour, a positive direct association between green economy adoption and profitability is also hypothesised because prior sustainability–performance literature suggests that green practices may generate efficiency gains, reputational benefits, and market differentiation. Based on this model, the following hypotheses are developed:

H1: Green economy adoption positively influences smart tourism capability.

H2: Green economy adoption positively influences profitability.

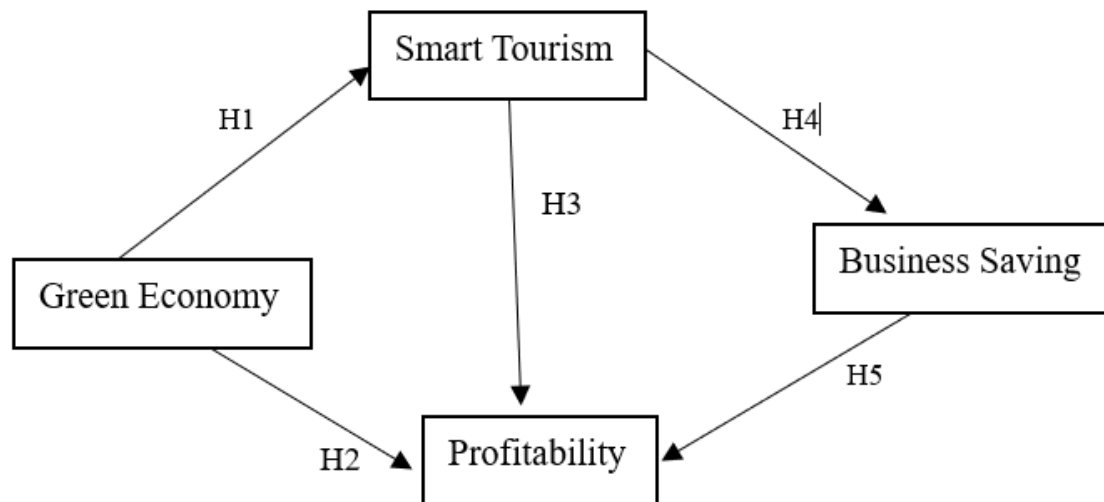


Figure 1. Research Model

H3: Smart tourism capability positively influences profitability.
 H4: Smart tourism capability positively influences business saving behaviour.

H5: Business saving behaviour positively influences profitability.

Mediation hypotheses:

H6: Smart tourism capability mediates the relationship between green economy adoption and business saving.

H7: Business saving behaviour mediates the relationship between smart tourism capability and profitability.

H8: Smart tourism capability and business saving behaviour serially mediate the relationship between green economy adoption and profitability.

H9: Smart tourism capability mediates the relationship between green economy adoption and profitability.

Methods

Research Type

This study employed a quantitative approach using a cross-sectional survey design to examine the profitability implications of green economy adoption and to test the proposed serial mediation mechanism involving smart tourism and business saving. The analytical strategy was variance-based structural equation modelling (PLS-SEM) implemented in SmartPLS 3. PLS-SEM was selected because it is well suited for prediction-oriented research, accommodates complex models with mediation, and is widely recommended for analysing latent constructs in management and SME research (Hair, 2021; Hair et al., 2019, 2022).

Population and Sample/Informants

The target population comprised owners/managers of tourism-related SMEs in Semarang City and Pekalongan Regency, Central Java, Indonesia. These two locations were selected because they represent local tourism-SME environments where firms increasingly face pressures to adopt environmentally oriented practices, strengthen digital capability, and maintain financial resilience.

SMEs were identified through local tourism-SME networks, community/association listings, and field-based referrals. A non-probability purposive sampling approach was applied to reach respondents who met the study criteria. The inclusion criteria were: (1) being an owner or manager of a tourism-related SME; (2) operating an active business during the survey period; and (3) being willing to complete the

questionnaire. Responses were excluded when questionnaires were incomplete or when respondents did not meet the tourism-SME criteria. Data were collected from June to September 2025 through face-to-face interviews administered by trained enumerators. A total of 265 respondents were approached; after screening for completeness and eligibility, 250 fully completed questionnaires were retained for analysis, resulting in a usable response rate of 94.34%.

Research Location

The study was conducted in Central Java Province, Indonesia, specifically in Semarang City and Pekalongan Regency. These tourism-related SME settings represent local business environments where firms increasingly confront simultaneous pressures to improve sustainability practices (green economy adoption) while strengthening digital capability (smart tourism) and internal financial resilience.

Instrumentation or Tools

Data were collected using a structured questionnaire consisting of four latent constructs measured with reflective indicators: Green Economy (GE), Smart Tourism (ST), Business Saving (BS), and Profitability (P). The measurement items were adapted from prior studies, as listed in Table 1. The cited sources were used only when they provided validated, previously applied, or conceptually appropriate measurement domains relevant to the item content. Because the items were adapted to fit the tourism-SME setting in Central Java, the wording was contextually adjusted while maintaining the conceptual meaning of each construct. All indicators were measured using a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree.

To strengthen content validity, the adapted questionnaire was reviewed before data collection by the research team to ensure consistency between item wording, construct definition, and the theoretical domain of the cited sources. The review focused on item relevance, clarity, contextual suitability for tourism SME owners/managers, and the appropriateness of each item as a reflective indicator. Items were retained only when they were judged to represent the intended construct rather than merely relate to the broader topic. A formal translation/back-translation procedure and pilot testing were not conducted; therefore, this issue is acknowledged as a methodological limitation. To reduce this limitation, enumerators were briefed on the meaning of each construct and item to support consistent administration during face-to-face interviews. The empirical validity and reliability of the

Table 1. Measurement Items

Variable	Code	Measurement Item	Source
Green Economy (GE)	GE1	My business adopts eco-friendly practices in daily operations.	Conceptually adapted from studies on SME green economy adoption, eco-friendly practices, sustainable resource use, efficiency, green-policy awareness, and sustainability-oriented technology investment (Fu & Mishra, 2022; Lingaitiene & Burinskiene, 2024; Munir & Watts, 2024; Wang et al., 2022; Zhao et al., 2022).
	GE2	I use sustainable or recyclable raw materials.	Same source
	GE3	My business is concerned with energy and water efficiency.	Same source
	GE4	I am aware of government programmes related to the green economy.	Same source
	GE5	I am willing to invest in technology that supports sustainability.	Same source
Smart Tourism (ST)	ST1	I use digital media to promote my tourism business.	Conceptually adapted from studies on smart tourism capability, tourism digitalisation, digital media promotion, online transactions, digital-review use, digital learning, and customer-data utilisation (Deb et al., 2022; Gretzel et al., 2020; Jabbour Al Maalouf et al., 2025; Othman et al., 2020; Xiang et al., 2021).
	ST2	I accept orders or transactions through online platforms.	Same source
	ST3	I use digital reviews to improve service quality.	Same source
	ST4	I have participated in training or self-learning related to tourism digitalisation.	Same source
	ST5	I integrate customer data to improve service.	Same source
Business Saving (BS)	BS1	I have business savings for emergency needs.	Conceptually adapted from studies on saving behaviour, SME financial resilience, financial behaviour, retained earnings, reinvestment, emergency funds, and business continuity (Damayanti et al., 2024; Nassuna et al., 2023; Rikwentishe et al., 2015; Widagdo & Sa'diyah, 2023).
	BS2	I set aside part of my income for business reinvestment.	Same source
	BS3	I have a financial recording system to monitor my business savings.	Same source
	BS4	I have specific goals for retaining business profits.	Same source
	BS5	I believe that saving plays an important role in business continuity.	Same source
Profitability (P)	P1	My business income has increased in the last six months.	Conceptually adapted from studies on MSME performance, perceived financial performance, profitability, income growth, operating-finance capacity, cash flow, and profit improvement (Damayanti et al., 2024; Dogru et al., 2020; Fomum & Opperman, 2023; Nassuna et al., 2023; Yusuf et al., 2022).
	P2	My business's net profit shows a positive trend.	Same source
	P3	I am able to finance my business operations without additional loans.	Same source
	P4	My business has positive cash flow.	Same source
	P5	I feel that my business is more profitable than in the previous year.	Same source

Note. "Same source" indicates that the item was conceptually adapted from the same set of sources listed in the first item of the corresponding construct. The cited sources were used to support the conceptual domains of the constructs rather than to indicate direct replication of a single established scale.

instrument were subsequently assessed through outer loadings, Cronbach's alpha, composite reliability, AVE, Fornell–Larcker criterion, and HTMT ratios.

Data Collection Procedures

Survey targeted SME owners/managers who met the study criteria (tourism-related SMEs and active business operation). Participation was voluntary, and respondents were informed about the study purpose, confidentiality, and the anonymous use of data for academic research. Data collection was conducted via face-to-face interviews administered by enumerators to ensure item comprehension and response completeness. To reduce evaluation apprehension and socially desirable responding, the survey emphasised confidentiality/anonymity of responses, used neutral wording, and separated construct blocks with clear instructions.

Data Analysis

Data analysis proceeded in two stages using PLS-SEM (SmartPLS 3) following well-established reporting and evaluation guidelines (Hair, 2021; Hair et al., 2019, 2022) and common practice in SME survey studies (Peiris, 2021; Yakob et al., 2021). PLS-SEM settings and inference. Bootstrapping was performed with 5,000 subsamples using a two-tailed test and 95% confidence intervals (bias-corrected, if selected in SmartPLS) to assess the significance of direct and indirect effects (Hair et al., 2022; Nitzl et al., 2016; Streukens & Leroi-Werelds, 2016; Yakob et al., 2021). Sample size adequacy was assessed based on the maximum number of predictors directed at any endogenous construct in the structural model. In this model, profitability received the largest number of predictors, namely green economy adoption, smart tourism capability, and business saving behaviour; therefore, the maximum predictor number was three. Using a conventional power-analysis logic for multiple regression with three predictors, a medium expected effect size ($f^2 = 0.15$), 5% significance level, and 80% statistical power, the minimum required sample size is approximately 77 respondents. The final sample of 250 respondents therefore exceeds this minimum requirement. The 10-times rule was retained only as a supplementary heuristic and interpreted cautiously, consistent with PLS-SEM guidance (Hair et al., 2019, 2022).

Measurement model assessment evaluated indicator reliability (outer loadings), internal consistency (Cronbach's alpha and composite reliability), and convergent validity (average variance extracted/AVE). Discriminant validity was assessed using the Fornell–Larcker criterion and HTMT ratios as recommended in contemporary PLS-SEM reporting guidance (Hair et al., 2019, 2022). Structural model assessment estimated path coefficients and explanatory power (R^2) for endogenous constructs (smart tourism, business saving, and profitability), along with effect sizes where appropriate. Statistical checks for bias and robustness were also conducted. To assess potential collinearity among predictors, inner VIF values were examined. The inner VIF values ranged from 1.000 to 1.316 (maximum VIF = 1.316), which is well below common conservative thresholds (e.g., <3.3), indicating no critical multicollinearity concerns among the predictors in the structural model.

Result and Discussion

To provide context for the model testing, this section first reports the respondents' characteristics. Describing the respondent profile is important to show the demographic and business background of the sampled tourism SMEs and to support the interpretability of subsequent findings. The

distribution of respondents by gender, age, education, length of time in business, and business savings category is presented in Table 2.

As shown in Table 2, the sample is relatively balanced by gender, comprising 122 male respondents (48.8%) and 128 female respondents (51.2%). In terms of age, the largest group is above 45 years (35.6%), followed by 35–45 years (32.4%) and below 35 years (32.0%), indicating a fairly even age distribution. Regarding education, most respondents completed high school (50.0%), while 45.2% reported below high school, and only 4.8% were university graduates. Business tenure statistics were re-checked and are consistently reported across the manuscript (Table 2 and Method): <1.5 years (23.6%), 1.5–2.5 years (58.4%), and >2.5 years (18.0%) ($N=250$). Finally, the business savings profile is dominated by the 1–1.5 category (42.8%), followed by above 1.5 (37.2%) and below 1 (20.0%).

Before evaluating the hypothesised structural relationships, the measurement model was assessed to ensure that the latent constructs were measured reliably and validly. Following common PLS-SEM reporting practice, this study evaluated indicator reliability (outer loadings), internal consistency reliability (Cronbach's alpha and composite reliability/CR), and convergent validity (average variance extracted/AVE). Discriminant validity was assessed using both the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT).

Table 3 reports the outer loadings and reliability/validity statistics. The outer loadings indicate that the indicators load strongly on their intended constructs. Cronbach's alpha and CR values demonstrate satisfactory internal consistency reliability across constructs, and AVE values support convergent validity. The Fornell–Larcker matrix (Table 4) shows that the square roots of AVE exceed inter-construct correlations, and HTMT ratios (Table 5) fall below common thresholds, supporting discriminant validity.

The outer loadings (Table 3) generally indicate that the indicators load adequately on their intended constructs. One exception is BS1, with an outer loading of 0.693, which is slightly below the conventional 0.70 threshold. However, BS1 was retained because it represents an important content domain of business saving, namely the availability of business savings for emergency needs. This item is conceptually central to the construct because emergency saving reflects the precautionary and resilience-oriented function of business saving among tourism SMEs. In addition, the loading remains close to 0.70 and is acceptable for exploratory or contextually adapted measurement. A sensitivity check showed that deleting BS1 did not materially improve the construct reliability and validity: the Business Saving construct remained reliable and valid whether BS1 was retained ($CR = 0.893$; $AVE = 0.628$) or excluded ($CR = 0.888$; $AVE = 0.665$). Therefore, BS1 was retained to preserve the conceptual coverage of the Business Saving construct. Cronbach's alpha and CR values demonstrate satisfactory internal consistency reliability across constructs, and AVE values support convergent validity.

To further confirm construct distinctiveness, Table 4 presents the Fornell–Larcker matrix. Discriminant validity is supported when the square root of AVE for each construct (diagonal elements) exceeds its correlations with other constructs (off-diagonal elements), indicating that each construct shares more variance with its own indicators than with other constructs.

The Fornell–Larcker results (Table 4) indicate that the square roots of AVE on the diagonal are higher than the inter-construct correlations, supporting discriminant validity. Fornell–Larcker may be conservative in some settings, discriminant validity was also examined using the HTMT ratio. Table 5 reports HTMT values for each construct pair. Discriminant validity is supported when HTMT values are below

Table 2. Respondent profile

Variable	Description	Frequency	(%)
Gender	Male	122	48.8
	Female	128	51.2
Age (years)	<35	80	32
	35-45	81	32.4
	>45	89	35.6
Education	< High school	113	45.2
	High school	125	50
	Graduate	12	4.8
Business tenure (years)	<1.5	59	23.6
	1.5-2.5	146	58.4
	>2.5	45	18
Business Savings (Million IDR)	<1	50	20
	1-1.5	107	42.8
	>1.5	93	37.2

Table 3. Outer loadings, reliability, and convergent validity

Construct	Item	Outer loading	Cronbach's alpha	CR	AVE
Business Saving (BS)	BS1	0.693	0.851	0.893	0.628
	BS2	0.755			
	BS3	0.839			
	BS4	0.802			
	BS5	0.861			
Green Economy (GE)	GE1	0.831	0.871	0.905	0.656
	GE2	0.752			
	GE3	0.796			
	GE4	0.843			
	GE5	0.824			
Profitability (P)	P1	0.810	0.906	0.930	0.728
	P2	0.862			
	P3	0.775			
	P4	0.916			
	P5	0.895			
Smart Tourism (ST)	ST1	0.922	0.941	0.954	0.807
	ST2	0.901			
	ST3	0.896			
	ST4	0.900			
	ST5	0.873			

Note. CR = composite reliability; AVE = average variance extracted. Cronbach's alpha, CR, and AVE are reported at the construct level and therefore appear only once for each construct.

Table 4. Fornell–Larcker criterion

Construct	BS	GE	P	ST
Business Saving (BS)	0.792			
Green Economy (GE)	0.096	0.810		
Profitability (P)	0.236	-0.107	0.853	
Smart Tourism (ST)	0.273	0.431	0.029	0.898

Note. Diagonal values represent the square root of AVE. Off-diagonal values represent inter-construct correlations.

Table 5. HTMT ratios

	Business saving	Green economy	Profit	Smart tourism
Business saving				
Green economy	0.146			
Profit	0.257	0.120		
Smart tourism	0.300	0.442	0.053	

commonly used thresholds (e.g., <0.85 or <0.90), indicating that constructs are empirically distinct.

HTMT values (Table 5) fall below the recommended threshold, providing additional evidence of discriminant validity. Overall, the measurement model evaluation indicates that the constructs meet the recommended criteria for reliability and validity. Therefore, the study proceeds to the structural model assessment to test the hypothesised direct and indirect relationships.

After establishing satisfactory reliability and validity of the measurement model, the structural model was evaluated to test the hypothesised relationships among green economy adoption (GE), smart tourism (ST), business saving (BS), and profitability (P). The assessment focuses on (1) explanatory power (R^2) of the endogenous constructs, (2) model fit indices as supplementary diagnostics, and (3) the significance and direction of direct, indirect, and total effects, including the proposed serial mediation pathway.

To address reporting completeness, Table 6 presents a compact summary of structural-model quality, including R^2 for endogenous constructs, model fit indices (SRMR, NFI), and predictive relevance metrics (Q^2) where available.

As shown in Table 6, the R^2 values indicate modest explanatory power for Smart Tourism, Business Saving, and Profitability. The Q^2 values are above zero, suggesting in

Table 6. Structural-model quality and diagnostics

Indicator	ST	BS	P	Model-level / range
R ²	0.186	0.075	0.073	—
Q ² (blindfolding)	0.139	0.044	0.049	—
SRMR	—	—	—	0.067
NFI	—	—	—	0.802
Inner VIF	—	—	—	1.000–1.316

Note. ST = Smart Tourism; BS = Business Saving; P = Profitability. R² indicates explanatory power, while Q² values were obtained through the blindfolding procedure and indicate in-sample predictive relevance. SRMR and NFI are reported from the estimated model as supplementary model-fit diagnostics. Inner VIF values indicate collinearity diagnostics for the structural paths.

-sample predictive relevance based on the blindfolding procedure. The estimated model produced an SRMR value of 0.067 and an NFI value of 0.802, which are reported as supplementary model-fit diagnostics. The inner VIF values ranged from 1.000 to 1.316, indicating that collinearity was not a concern in the structural model. Path coefficients were estimated and their significance assessed via bootstrapping. Table 7 summarises the direct effects and specific indirect effects. The 95% bootstrapped confidence intervals are reported for specific indirect effects only, while direct effects are evaluated using β , t-values, and p-values.

Overall, green economy adoption shows a positive and significant effect on smart tourism (GE→ST), and smart tourism shows a positive and significant effect on business saving (ST→BS). Bootstrapped confidence intervals for the indirect effects indicate that GE→ST→BS, ST→BS→P, and the serial indirect effect GE→ST→BS→P exclude zero (supporting mediation), whereas GE→ST→P includes zero (not supported). Business saving is positively associated with profitability (BS→P). The direct path from green economy adoption to profitability (GE→P) is not supported.

Mediation interpretation: Given that GE→P is not significant while the serial indirect effect (GE→ST→BS→P) is significant, the findings support an indirect-only serial effect pattern for the relationship between green economy adoption and profitability. This suggests that green economy adoption is more likely to be associated with profitability through the sequential mechanism of smart tourism capability and business saving rather than through a direct path. However, because the data are cross-sectional, the causal sequencing of this mechanism should be interpreted cautiously.

An Importance–Performance Map Analysis (IPMA) was conducted to complement the structural model results by identifying the relative importance and performance of each construct in relation to profitability. Table 8 presents the compact IPMA results. Business saving shows the highest total effect on profitability (0.241) and a relatively high performance score (77.302), indicating that disciplined saving and reinvestment routines represent the most actionable managerial priority in the model. Smart tourism shows a relatively small total effect on profitability (0.057) and the lowest performance score (54.379). This finding should be interpreted cautiously because the direct effect of smart tourism on profitability was not significant; therefore, smart tourism should not be viewed primarily as an immediate direct driver of profitability. Rather, its contribution appears to operate mainly through business saving within the proposed serial indirect pathway. Green economy shows a slightly negative total effect on profitability (−0.097) with moderate performance (69.225). This result should not be interpreted as evidence that green practices are financially harmful.

Instead, it is consistent with the non-significant direct effect of green economy adoption on profitability and suggests that green economy adoption may require supporting mechanisms before its financial relevance becomes visible. In this study, the supported mechanism is the serial pathway in which green economy adoption is linked to smart tourism capability, which then strengthens business saving behaviour and, subsequently, profitability.

Interpretation of Key Findings

This study investigated whether green economy adoption is associated with profitability in tourism SMEs and whether this relationship is explained through an indirect association involving smart tourism capability and business saving. The results show that green economy adoption is positively associated with smart tourism capability, and smart tourism capability is positively associated with business saving. Business saving, in turn, is positively associated with profitability. Importantly, the direct association between green economy adoption and profitability is not supported, while the serial indirect association linking green economy adoption, smart tourism capability, business saving, and profitability is statistically supported.

This pattern suggests that green economy adoption is not directly associated with profitability in this sample. Instead, the results indicate that the financial relevance of green economy adoption may be better understood through its association with tourism-related digital capability and internal financial discipline. This interpretation strengthens the manuscript's theoretical positioning by framing the serial mechanism as a statistically supported indirect association, rather than as evidence of a proven causal sequence.

Comparison with Previous Studies

The non-significant direct relationship between green economy adoption and profitability is consistent with mixed findings in the sustainability–performance literature, where financial benefits depend on cost structure, resource constraints, and the time required for sustainability investments to yield returns (Clemente-Almendros et al., 2025; Martínez & Poveda, 2022; Tegethoff et al., 2025). In tourism SMEs, the direct GE→Profit link may fail because green practices can impose upfront implementation and compliance costs that are difficult to monetise immediately, particularly when managerial and digital capabilities are limited (Chien et al., 2021; Martínez & Poveda, 2022). At the same time, the positive GE→ST link aligns with evidence that sustainability orientation can stimulate digital transformation and responsible innovation in SMEs (Chang, 2024; Öztürk et al., 2024; Zhang et al., 2022), while firm-level work conceptualises smart tourism/AI-enabled capability as a strategic resource supporting sustainability-related outcomes and competitiveness (Ferraro et al., 2025). The observed ST→BS and BS→Profit relationships also align with SME finance evidence that internal funds and cash buffers improve viability and performance, especially under financing frictions (Dimitropoulos et al., 2019; Fasano & Deloof, 2021). Overall, the results support the view that the sustainability–profitability relationship is better explained through mediated mechanisms than direct effects, particularly in resource-constrained SMEs.

Practical Implications

Managerial implications: Tourism SME managers should treat green economy adoption as a strategic orientation that requires operationalisation through smart tourism capability building. Priorities include strengthening digital promotion and distribution, improving online transaction readiness, and systematically using customer feedback and basic analytics to stabilise demand and reduce operational frictions. These improvements should be paired with explicit saving practices—setting reinvestment targets, maintaining emergency buffers,

Table 7. Direct effects and specific indirect effects

Relationship	β	t-value	p-value	95% CI for indirect effects (LL, UL)
BS $\rightarrow$ P	0.243	2.435	0.015	—
GE $\rightarrow$ P	-0.141	1.646	0.100	—
GE $\rightarrow$ ST	0.431	7.131	<0.001	—
ST $\rightarrow$ BS	0.273	3.852	<0.001	—
ST $\rightarrow$ P	0.023	0.256	0.798	—
GE $\rightarrow$ ST $\rightarrow$ BS	0.118	3.854	<0.001	[0.062, 0.182]
ST $\rightarrow$ BS $\rightarrow$ P	0.066	1.987	0.048	[0.017, 0.143]
GE $\rightarrow$ ST $\rightarrow$ BS $\rightarrow$ P	0.029	2.005	0.046	[0.007, 0.062]
GE $\rightarrow$ ST $\rightarrow$ P	0.010	0.250	0.802	[-0.082, 0.080]

Note. CI = confidence interval; LL = lower limit; UL = upper limit. Bootstrapped 95% confidence intervals are reported for specific indirect effects only. A dash (—) indicates that the confidence interval was not reported for direct effects. P-values below 0.001 are reported as $p < 0.001$.

Table 8. Importance–Performance Map Analysis (IPMA) for profitability

Construct	Importance: total effect on profitability	Performance	Interpretation / managerial priority
Business Saving	0.241	77.302	High importance and relatively high performance; maintain and strengthen disciplined saving and reinvestment routines.
Smart Tourism	0.057	54.379	Lower importance but lowest performance; improve digital promotion, online transactions, digital reviews, and customer-data use.
Green Economy	-0.097	69.225	Slightly negative total effect and moderate performance; interpret cautiously. Green practices should be integrated with smart tourism capability and financial discipline rather than treated as a standalone profitability strategy.

Note. Importance represents the total effect of each construct on profitability. Performance represents the latent variable performance score generated from the IPMA procedure.

and formalising basic financial records—to institutionalise business saving behaviour that supports profitability.

Policy implications: Local policymakers in Central Java can improve programme effectiveness by designing integrated “green–digital–finance” support packages rather than stand-alone environmental campaigns. This includes targeted mentoring and incentives for smart tourism adoption (training, access to digital tools, and digital infrastructure support) alongside financial capability interventions that strengthen saving discipline (cash-flow monitoring tools, budgeting routines, and simplified record-keeping). This implication is consistent with the model’s mechanism: smart tourism enables operational control and data visibility, while business saving directly supports profitability and resilience to shocks.

Limitations and Cautions

First, the study is cross-sectional, which limits causal inference and cannot fully capture time-lag effects in sustainability investments, where short-term costs may precede longer-term gains (Clemente-Almendros et al., 2025). Second, the study relies on self-reported measures, including self-reported perceived profitability, which may introduce reporting bias and common method bias (CMB). This study applied procedural remedies to reduce potential CMB, including confidentiality/anonymity assurances, neutral wording, and clear separation of construct blocks. However, no additional statistical CMB diagnostic, such as full-collinearity VIF, a marker-variable approach, or a single-factor assessment, was conducted. Therefore, the possibility of common method bias cannot be fully ruled out and should be acknowledged as a limitation. Third, serial mediation in cross-sectional data cannot fully establish temporal ordering among green adoption, capability development, saving behaviour, and profitability; therefore, the mechanism should be

interpreted as a plausible indirect association rather than definitive causal sequencing. Finally, the empirical context is limited to tourism SMEs in Semarang City and Pekalongan Regency, which may constrain generalisability to regions with different institutional support and digital infrastructure.

Recommendations for Future Research

Future studies should employ longitudinal or time-lagged designs to capture the cost-to-benefit dynamics of green economy adoption and to strengthen inference about serial mediation. Researchers should also incorporate objective financial indicators (e.g., ROA, margins, sales growth, and cash-flow ratios) and more granular digital adoption measures to reduce self-report bias and better quantify smart tourism capability. Further work should test boundary conditions that may strengthen or weaken the serial mechanism, such as digital readiness, access to finance/green finance constraints, environmental turbulence, and firm size/age (Chien et al., 2021; Zhang et al., 2022). Finally, future research may compare alternative mechanisms, such as eco-innovation, efficiency gains, reputational benefits, or access to green finance, with business saving to refine the explanatory scope of the green–digital–finance pathway (Cerciello et al., 2022; Tegethoff et al., 2025).

Conclusion

This study found that green economy adoption was not directly associated with self-reported perceived profitability in this sample of tourism SMEs; however, the proposed serial indirect pathway through smart tourism capability and business saving behaviour was statistically supported. These findings suggest that the financial relevance of green economy adoption may depend on whether sustainability-oriented practices are accompanied by tourism-related digital capability and disciplined

internal financial behaviour. The study contributes to the sustainability–performance literature by integrating green orientation, smart tourism capability, and business saving within a single explanatory pathway. Practically, tourism SME managers may benefit from connecting green practices with digital promotion, online transactions, customer-data use, cash-flow tracking, saving targets, reinvestment routines, and emergency buffers, rather than treating green practices as a standalone profitability strategy. For policymakers, integrated green–digital–finance support programmes may help tourism SMEs strengthen the organisational and financial conditions needed to benefit from sustainability initiatives. Given the cross-sectional design and the use of self-reported perceived profitability, the findings should be interpreted as evidence of statistically supported associations rather than definitive causal relationships. Future studies should use longitudinal or time-lagged designs, incorporate objective financial indicators, and examine boundary conditions such as digital readiness, access to finance, environmental turbulence, and firm size or age.

Author contributions

Dwi Pratiyo Hadi conceptualised the study, led the research design, coordinated field implementation, and prepared the initial manuscript draft. Efriyani Sumastuti contributed to the theoretical framing, instrument refinement,

and manuscript development (introduction, discussion, and conclusion), and ensured consistency with the target journal template. C. Tri Widiastuti managed data curation, performed the PLS-SEM analysis (measurement and structural models, including mediation testing), and prepared the results section and statistical reporting. Rizka Ariyanti supported data collection and verification, assisted in compiling respondent profiles and descriptive results, and contributed to editing and formatting of tables/figures. Ali Imron contributed to the interpretation of findings (including IPMA insights), strengthened the practical and policy implications, and conducted critical reviewing and final proofreading. All authors reviewed the final manuscript and approved the submitted version.

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