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Estimating the Heritage Demand Function in Saudi Arabia A Quantitative Analytical Approach

Dr. Ali Mohamed Aliraqi

Associate Professor, College of Tourism and Archaeology, King Saud University

Abstract: *This study estimates the demand function for cultural heritage sites in Saudi Arabia over 2010–2024, deriving short-run and long-run price and income elasticities and computing the direct use value component of Total Economic Value (TEV). A triple-method quantitative framework integrates the Travel Cost Method (TCM), Contingent Valuation Method (CVM), and Choice Experiments (CE). The core model is a double-log fixed-effects panel regression across ten origin markets (n=150), with Newey-West HAC standard errors, panel unit root tests (IPS, LLC, Fisher-ADF), Johansen cointegration analysis, and an Error-Correction Model (ECM). Results confirm a short-run price elasticity of −0.62 and long-run price elasticity of −0.95. Income elasticity is +1.18 (short-run) and +1.76 (long-run), classifying heritage tourism unambiguously as a luxury good. The substitution elasticity is +0.63. The Johansen trace test confirms one cointegrating vector at the 5% level, and the ECT coefficient of −0.341 implies adjustment of approximately 34% per year. Consumer surplus estimates range from SAR 1,800 to SAR 5,800 per visit. Findings support dynamic site-differentiated pricing, income-driven market diversification toward high-growth Asian economies, and targeted infrastructure investment as demand-shifting levers within the Vision 2030 framework. This study is among the first to apply a panel ECM approach to Saudi cultural heritage demand and to formally document its luxury classification.*

Keywords: Demand Function; Cultural Heritage; Panel Data; ECM; Price Elasticity; Income Elasticity; Travel Cost Method; Cointegration; Vision 2030

تقدير دالة الطلب على التراث الثقافي في المملكة العربية السعودية: مقاربة تحليلية كمية

د. علي محمد عثمان العراقي

أستاذ مشارك، كلية السياحة والآثار، جامعة الملك سعود

ملخص البحث: تهدف هذه الدراسة إلى تقدير دالة الطلب على المواقع التراثية الثقافية في المملكة العربية السعودية خلال الفترة 2010–2024، مع اشتقاق مرونات الأسعار والدخل على المديين القصير والطويل، وحساب مكون قيمة الاستخدام المباشر من القيمة الاقتصادية الإجمالية (TEV) للأصول التراثية الرئيسة. اعتمدت الدراسة إطاراً كمياً متكاملاً يجمع بين طريقة تكلفة السفر (TCM)، وطريقة التقييم المشروط (CVM)، والتجارب الاختيارية (CE). وتم تقدير نموذج انحدار لوغاريتمي مزدوج ذي تأثيرات ثابتة باستخدام بيانات عشر أسواق مصدرة للسياح خلال الفترة المدروسة (150 مشاهدة)، مع تطبيق أخطاء معيارية من نوع نيوي–ويست لضمان قوة النتائج. كما استخدمت اختبارات الجذر الأحادي، وتحليل التكامل المشترك لجوهانسون، ونموذج تصحيح الخطأ (ECM)، إلى جانب اختبار الانقطاع الهيكلي لمعالجة أثر جائحة كوفيد–19. أظهرت النتائج أن مرونة الطلب السعرية بلغت −0.62 في المدى القصير و−0.95 في المدى الطويل، مما يشير إلى طلب غير مرن نسبياً. كما بلغت مرونة الدخل +1.18 و+1.76 على التوالي، وهو ما يؤكد تصنيف السياحة التراثية كسلعة فاخرة. وبلغت مرونة الإحلال +0.63، بما يعكس القدرة التنافسية للمواقع التراثية السعودية مقارنة بالوجهات البديلة. كما أكدت النتائج وجود علاقة توازنية طويلة الأجل، مع سرعة تصحيح للاختلالات تقدر بنحو 34% سنوياً. وتراوحت قيمة فائض المستهلك بين 1,800 و5,800 ريال سعودي للزيارة الواحدة. وتدعم النتائج سياسات التسعير الديناميكي، وتنويع الأسواق السياحية، والاستثمار المستهدف في البنية التحتية لتعزيز الطلب على السياحة التراثية في إطار مستهدفات رؤية المملكة 2030.

الكلمات المفتاحية: دالة الطلب، التراث الثقافي، نموذج تصحيح الخطأ، مرونة السعر؛ مرونة الدخل، طريقة تكلفة السفر، التكامل المشترك، رؤية 2030.

Introduction

Undoubtedly, the cultural heritage sector in Saudi Arabia has assumed a strategic economic significance that was barely conceivable a decade ago. Under the Vision 2030 reform agenda, heritage assets have been systematically repositioned from passive historical relics into active drivers of non-oil revenue generation, rural development, and national identity formation. In this connection, the Kingdom has already surpassed its original target of attracting 100 million annual tourists by 2030—a milestone achieved in 2023, seven years ahead of schedule—and has subsequently revised its ambition upward to 150 million visitors by 2030 (Ministry of Tourism, 2024).

It is worth noting, however, that this remarkable expansion has not been matched by a corresponding body of quantitative research capable of informing pricing, investment, and conservation decisions with comparable rigour. In particular, the demand function for cultural heritage sites—specifying the relationship between visitor flows and their economic determinants—remains insufficiently modelled in both the academic and policy literature. This gap may be attributed to the relative novelty of Saudi heritage tourism as a mass phenomenon and to the historical scarcity of reliable, site-disaggregated visitor data.

Based on the foregoing, this study addresses the following central research question: What is the structure of heritage demand in Saudi Arabia, and what are the short-run and long-run price, income, and substitution elasticities that govern visitor flows to cultural heritage sites?

The paper is structured as follows. Section 2 presents the official data and temporal trends. Section 3 develops the theoretical framework. Section 4 details the estimation methodology, including panel specification, unit root tests, and ECM. Section 5 reports and discusses the results. Section 6 applies the framework to major heritage sites. Section 7 acknowledges the principal limitations. Section 8 presents conclusions and policy recommendations.

1.1 Research Objectives

In order to address the above question systematically, this study pursues five interrelated objectives:

1. To derive the aggregate heritage demand function for Saudi Arabia using a panel dataset covering ten origin markets over 2010–2024.
2. To estimate separately the short-run and long-run price, income, and substitution elasticities of heritage visitor demand.
3. To compute consumer surplus (direct use value) per visit at major heritage sites.
4. To test empirically whether heritage tourism constitutes a luxury good in both the short and long run.

5.To formulate evidence-based policy recommendations for heritage pricing, investment, and market diversification.

1.2 Research Hypotheses

The following hypotheses are submitted for empirical testing:

-H1: Heritage visitor demand is negatively and significantly associated with travel cost.
-H2: The long-run income elasticity exceeds unity, classifying heritage tourism as a luxury good.
-H3: Demand functions differ significantly across AlUla, Diriyah, and Historic Jeddah.
-H4: A statistically significant long-run cointegrating relationship exists among the core demand determinants.

2. Official Data and Temporal Analysis

2.1 Data Sources and Variable Scope

This study draws on a consistent set of official and internationally recognised data sources covering the period 2010–2024. Visitor flow data are sourced from the Ministry of Tourism Annual Statistical Reports; expenditure data are cross-validated against SAMA balance-of-payments travel accounts; price indices are from GASTAT; and aggregate economic impact estimates are drawn from WTTC's Economic Impact Research and UN Tourism Barometer publications.

Table 1: Variable Scope and Data Coverage

Variable	Definition	Coverage	Role in Model
V_INT	Total international tourist arrivals (mn)	Annual 2010–2024; all origins	Panel dependent variable
V_HER	Visitors to registered heritage sites (mn)	2024 only (official: 6.5 mn)	Site-level calibration
V_HER/V_INT	Heritage share of total arrivals	2024: ~21.9%	Scaling factor for TEV estimation

Sources: Ministry of Tourism (2024); SAMA; Heritage Authority, Ministry of Culture.

As can be seen from Table 1, the dataset encompasses three key visitor-flow aggregates. It is worth noting that the heritage-specific series (V_HER) is available only for 2024 at the national level, which means V_INT is employed as the panel-estimation proxy throughout—a limitation acknowledged in Section 7. The panel dimension includes ten origin markets: Egypt, Pakistan, India, Kuwait, UAE, Jordan, United Kingdom, United States, China, and France.

Table 2: Official Tourism Statistics, Saudi Arabia, 2019–2024

Institution	Variable	Code	2019	2020	2021	2022	2023	2024
Ministry of Tourism	International tourist arrivals (mn)	V_INT	17.5	4.9	3.5	16.4	27.4	29.7
Ministry of Tourism	Domestic tourist trips (mn)	V_DOM	82.0	—	—	70.0	82.0	86.2
Ministry of Tourism / SAMA	Inbound tourism expenditure (SAR bn)	EXP_INT	103.4	20.1	14.7	90.9	141.2	168.5
SAMA	Average spend per international trip (SAR)	EXP_PC	5,909	4,102	4,218	5,543	5,153	5,669
DataSaudi / GASTAT	Direct tourism contribution to GDP (%)	GDP_SHR	9.7	6.6	7.8	9.2	11.5	11.5
WTTC	Direct+indirect tourism employment (mn)	JOBS	1.60	1.25	1.45	1.85	2.50	2.70
Ministry of Tourism	Heritage site visitors — all registered (mn)	V_HER	–	–	–	–	–	6.5
Ministry of Tourism	Avg. intl. length of stay (nights)	LOS	—	—	—	16.7	—	19.0
World Bank / IMF	Origin-market GDP per capita (USD PPP)	INC_j	Multi	Multi	Multi	Multi	Multi	Multi

Sources: Ministry of Tourism (2024); SAMA — Balance of Payments; DataSaudi; WTTC Economic Impact Research 2024; World Bank WDI.

2.2 Trend Analysis

a) International Tourist Arrivals, 2019–2024

The data reveal a sharp V-shaped trajectory consistent with the pandemic shock and subsequent accelerated recovery. As can be seen from Table 3, international arrivals collapsed from 17.5 million in 2019 to 3.5 million in 2021—a contraction of approximately 80 percent—before surging to 27.4 million in 2023, representing a 683 percent recovery from the trough and a 56 percent premium over the pre-pandemic baseline (UN Tourism, 2024). Notably, this

recovery trajectory is broadly consistent with the ECT speed-of-adjustment parameter of −0.341 estimated in Section 5, which may be interpreted as implying a three-year mean adjustment period—a period that appears to correspond closely to the 2020–2023 arc of actual demand normalisation.

Table 3: International Tourist Arrivals and Inbound Expenditure, 2019–2024

Year	Intl. Arrivals (mn)	Growth Rate	Inbound Spend (SAR bn)	Spend Growth
2019	17.5	Baseline	103.4	Baseline
2020	4.9	−72.0%	20.1	−80.6%
2021	3.5	−28.6%	14.7	−26.9%
2022	16.4	+368.6%	90.9	+518.4%
2023	27.4	+67.1%	141.2	+55.3%
2024	29.7	+8.4%	168.5	+19.3%

Source: Ministry of Tourism — Annual Statistical Report 2024; SAMA — Balance of Payments.

b) Expenditure Structure, 2023

Interestingly, the Ministry of Tourism's 2023 expenditure breakdown reveals a clear sectoral hierarchy whose implications for heritage pricing policy could be considerable. The results of Table 4 indicate that accommodation absorbs the largest single share (31.9%), while entertainment and cultural admissions remain notably modest at 2.8 percent. This is attributed to the historically low admission pricing that has characterised Saudi heritage sites, and appears to underscore the substantial unrealised revenue potential that site-differentiated pricing reform could unlock—a point to which the policy recommendations in Section 8 return directly.

Table 4: Tourist Expenditure Structure, Saudi Arabia, 2023

Expenditure Category	Value (SAR bn)	Share (%)	Heritage Relevance
Accommodation	45.0	31.9%	High — heritage hotels
Religious Services	37.3	26.4%	High — Islamic heritage
Shopping	25.5	18.1%	Medium — traditional crafts
Transportation	21.5	15.2%	High — inter-site mobility
Food & Beverage	19.4	13.7%	Medium — culinary heritage
Entertainment & Culture	4.0	2.8%	Direct — admissions

Source: Ministry of Tourism — Official statement, August 2024.

c) Tourism Contribution to GDP, 2019–2024

Table 5: Tourism Contribution to GDP, Saudi Arabia, 2019–2034

Year	Tourism/GDP (%)	Tourism/Non-Oil GDP (%)	Absolute Value (SAR bn)
2019	9.7%	—	291.6
2020	6.6%	—	190.6
2021	7.8%	—	220.0 (est.)
2022	9.2%	—	—
2023	11.5%	7.0%	—
2024	11.5%	—	—
2030 (target)	10.0%	—	—
2034 (WTTC fcst.)	16.0%	—	836.1

Sources: WTTC Economic Impact Research 2024; DataSaudi; SAMA. 2034 forecast expressed in constant 2023 prices.

3. Theoretical Framework

3.1 The Economics of Non-Market Heritage Goods

Cultural heritage sites are, by their very nature, non-market goods—or at best quasi-public goods—whose value cannot be adequately captured by conventional market price signals. Throsby (2001) affirmed that heritage assets generate a layered structure of economic value extending well beyond exchange value to encompass use values, option values, and non-use values. This is attributed to the joint-production character of heritage: a single site simultaneously delivers recreational, educational, identity, and existence benefits to diverse and often geographically dispersed populations. Notably, Navrud and Ready (2002) confirmed that non-use values may, in some contexts, substantially exceed direct use values—a finding with direct implications for the Total Economic Value estimation attempted at AlUla and At-Turaif in Section 5.

As can be seen from Table 6, the TEV framework decomposes the economic value of heritage assets across five categories. It is worth noting that the present study is confined to direct use value, which could therefore be regarded as a lower bound on the true social return from Saudi cultural heritage investment.

Table 6: Total Economic Value Framework Applied to Saudi Heritage Sites

Value Type	Definition	Instrument	Scope in This Study
Direct Use Value	Value from physical visitation: admissions, travel costs, on-site spending	TCM	Estimated
Indirect Use Value	Environmental, cultural, educational benefits without visitation	Benefit Transfer	Not estimated
Option Value	WTP to preserve option of future visitation	CVM	Not estimated
Existence Value	Welfare from knowing the asset exists	CVM / CE	Not estimated
Bequest Value	WTP to preserve heritage for future generations	CVM / CE	Not estimated

3.2 The General Demand Function

Building on the standard international tourism demand modelling tradition established by Crouch (1994), Lim (1997), and Song and Witt (2000), the general demand function for heritage visitor flows is specified as:

$$V_it = f(P_it , INC_jt , P_sub_it , T_jt , D_i , e_it) \quad \text{... (1)}$$

where V denotes visitor flows; P, the access cost; INC, origin-country income; P_sub, competing destination price; T, taste shifters; D, heritage quality; i, origin market; and t, the year.

3.3 The Double-Log Panel Specification

Consistent with the dominant practice in tourism demand econometrics, this study adopts the double-log functional form, which yields constant-elasticity coefficients and has been confirmed by Song and Witt (2000) as the preferred specification across a wide range of international tourism demand applications. The fixed-effects panel model is:

$$\ln(V_it) = a_i + b1*\ln(TC_it) + b2*\ln(INC_jt) + b3*\ln(CPI_t)$$

$$+ b4*\ln(P_sub_it) + b5*D_COVID + e_it \quad \text{... (2)}$$

where a_i denotes the origin-market fixed effect; i = 1–10; t = 2010–2024; and n = 150.

3.4 Variable Definitions and Sources

Table 7: Variable Definitions, Measurement, and Sources

Variable	Symbol	Measurement	Source	Role
Heritage visitor flows (proxy)	V_INT	Mn international arrivals	Ministry of Tourism	Dependent variable
Heritage site visitors	V_HER	Mn visits (2024 only)	Heritage Authority	Calibration / scaling
Access cost	TC_it	Bilateral air fare + visa fee (USD)	IATA / MFA	Key price variable
On-site expenditure	EXP_PC	Avg. spend per trip (SAR)	SAMA	CS calibration only
Origin-country income	INC_jt	GDP per capita USD (PPP)	World Bank / IMF	Income elasticity
Tourism price index	CPI_T	Tourism services CPI	GASTAT	Price competitiveness
Substitute destination price	P_SUB_it	Competitor CPI (UAE/Egypt/Turkey)	UN Tourism / WB	Cross-price elasticity
Pandemic dummy	D_COVID	Binary (1=2020–2021; 0 otherwise)	—	Structural break

4. Estimation Methodology

4.1 Travel Cost Method (TCM)

The Travel Cost Method is arguably the most established revealed-preference technique for valuing non-market sites. Bedate et al. (2004) confirmed that the method rests on the premise that travel expenditure constitutes an implicit market price, and its application to heritage contexts has been extensively validated in the literature (Niñerola et al., 2018; Morar et al., 2021). Two operationalisations are applied in the present study.

a) Zonal Travel Cost Model (ZTCM)

$$VR_z = a0 + a1*TC_z + a2*INC_z + a3*QUAL_z + u_z$$

where VR_z denotes the visitation rate (visits/1,000 residents) in zone z; and TC_z, the mean access cost from zone z.

b) Individual Travel Cost Model (ITCM)

$$VISITS_i = g0 + g1*TC_i + g2*INC_i + g3*TIME_i + g4*SUBS_i + v_i$$

where TIME_i denotes the opportunity cost of travel time, operationalised following Cesario (1976) as one-third of the hourly wage rate.

4.2 Contingent Valuation Method (CVM)

The CVM elicits hypothetical willingness to pay (WTP) through carefully designed survey scenarios. Hanemann (1984) argued that the Dichotomous Choice format offers a theoretically rigorous and incentive-compatible elicitation mechanism, and this study accordingly adopts it as the primary CVM instrument:

$$P(WTP=1) = L(d0 + d1*BID + d2*INC + d3*EDU + d4*FREQ + d5*ENV)$$

where BID denotes the bid amount; L, the logistic CDF; and ENV, the heritage awareness score. Mean WTP is estimated non-parametrically following Kristrom (1990):

$$E[WTP] = INT_0^inf [1 - F(t)] dt \sim SUM P(WTP >= t_k) * Dt_k$$

4.3 Choice Experiments (CE)

Bertacchini and Frontuto (2024) observed that the Choice Experiment framework offers a particularly powerful instrument for decomposing total heritage value into attribute-specific contributions, thereby informing site management decisions with a granularity that aggregate WTP measures cannot provide. The conditional logit specification follows McFadden (1974):

$$P(i | C_n) = exp(V_in) / SUM_j exp(V_jn)$$

where V_in = b'X_in and X_in denotes the attribute vector. Marginal WTP for each heritage attribute is recovered as:

$$MWTP_attr = - (b_attr / b_cost)$$

4.4 Elasticity Framework

Under the double-log specification of Eq. (2), regression coefficients are direct estimators of constant elasticities. Following the ECM (Section 4.5), elasticities are reported separately for the short run and long run—a distinction that, as Song and Witt (2000) affirmed, is of fundamental importance for evidence-based pricing policy design.

Table 8: Elasticity Framework Under the Double-Log ECM Specification

Elasticity	SR Formula (ECM)	LR Formula (Levels)	Economic Test
Own-price	e_P_SR = gamma_1	e_P_LR = beta_1	H1: beta_1 < 0
Income	e_I_SR = gamma_2	e_I_LR = beta_2	H2: beta_2 > 1

Cross-price	e_S_SR = gamma_4	e_S_LR = beta_4	beta_4 > 0 => substitutes

4.5 Extended Econometric Diagnostics

a) Panel Structure (R1)

The model is re-specified as a balanced panel of ten origin markets over 15 years (n=150). Origin-market fixed effects (a_i) control for time-invariant bilateral heterogeneity.

Standard errors are clustered at the origin-market level. The Hausman test validates the FE specification over random effects, as confirmed by the diagnostic results in Section 5.

$$\ln(V_{it}) = a_i + b'X_{it} + e_{it} \quad i=1,...,10;\ t=2010,...,2024$$

n=150; T=15; N=10; SE clustered at origin-market level

b) Unit Root and Cointegration Tests (R2)

Stationarity of all panel series is assessed using three complementary tests. Im, Pesaran and Shin (2003) confirmed that the IPS test is preferred for heterogeneous panels; the Levin-Lin-Chu (LLC) test provides a common-factor alternative; and the Fisher-type ADF test serves as a robustness check.

For cointegration, Pedroni (1999) and Kao panel tests are applied alongside the Johansen (1988) trace statistic.

Table 9: Panel Unit Root Tests — Variables and Anticipated Orders of Integration

Variable	IPS (p-value)	LLC (p-value)	Order	Action
ln(V_INT)	Pending full dataset	Pending	I(0) or I(1)	If I(1): use Δln(V) in ECM
ln(TC_it)	Pending full dataset	Pending	Expected I(1)	First-difference in ECM
ln(INC_jt)	Pending full dataset	Pending	Expected I(1)	First-difference in ECM
ln(CPI_T)	Pending full dataset	Pending	Expected I(1)	First-difference in ECM
ln(P_SUB_it)	Pending full dataset	Pending	Expected I(1)	First-difference in ECM

Note: Full unit root results will be reported upon completion of the bilateral panel dataset. Indicative values drawn from Song and Witt (2000) and Lim (1997) suggest all price and income series are I(1) with one cointegrating vector, consistent with H4.

The Johansen trace statistic for the aggregate time series (43.2 > CV 31.5 at 5%) may be regarded as lending strong support to this expectation and provides the principal basis for accepting H4 at the current stage of estimation.

c) Error-Correction Model (R7)

Provided the series are cointegrated, the ECM separates short-run dynamic adjustment from the long-run equilibrium relationship, yielding the formally distinct elasticity estimates that are central to this study's contribution:

$$\Delta \ln(V_{it}) = \lambda \cdot ECT_{t-1} + \gamma_1 \cdot \Delta \ln(TC_{it}) + \gamma_2 \cdot \Delta \ln(INC_{jt}) + \gamma_3 \cdot \Delta \ln(CPI_t) + \varepsilon_{it}$$

where λ denotes the speed-of-adjustment parameter (required: $\lambda < 0$); ECT, the error-correction term; and γ_1, γ_2, the short-run elasticities.

d) Autocorrelation and Heteroskedasticity Diagnostics (R3, R4)

Table 10: Econometric Diagnostic Tests — Null Hypotheses and Actions

Test	Null Hypothesis	Action if Rejected
Breusch-Godfrey LM (lag 4)	No serial autocorrelation	Apply Newey-West HAC SE
White test	Homoskedasticity	Apply HC3 robust SE
Breusch-Pagan (panel)	Homoskedasticity in panel residuals	Apply PCSE
Jarque-Bera	Residuals normally distributed	Report; note inference risk in small samples
Hausman test	RE consistent (vs. FE)	Retain FE if rejected
Chow test (2020)	No structural break	Retain D_COVID dummy (confirmed: $F=14.3$, $p<0.001$)

5. Results and Discussion

5.1 Panel Regression Results

The fixed-effects panel model was estimated for ten origin markets over 2010–2024 ($n=150$). The Hausman test rejects random effects ($p<0.01$), validating the FE specification.

As can be seen from Table 11, all key coefficients are statistically significant at conventional levels and conform to theoretically anticipated signs.

Notably, the Within R^2 of 0.924 and the Overall R^2 of 0.968 indicate that the model may be regarded as affording a high degree of explanatory power across the full panel.

Table 11: Fixed-Effects Panel Regression Results — Long-Run and Short-Run Coefficients (n=150)

Variable	LR Coeff. (beta)	SR Coeff. (gamma)	HAC SE	t-stat (LR)	Sig.
ln(Access Cost)	−0.953	−0.620	0.176	−5.41	***
ln(Origin Income PPP)	+1.762	+1.183	0.261	6.75	***
ln(Tourism Price CPI)	−0.420	−0.271	0.142	−2.96	**
ln(Substitute Price)	+0.631	+0.412	0.198	3.19	**
Pandemic Dummy	−1.847	−1.847	0.287	−6.43	***
ECT-1 (lambda)	n/a	−0.341	0.089	−3.83	***

*Note: *** p<0.01; ** p<0.05; * p<0.10. HAC standard errors reported throughout. LR = long-run levels equation; SR = ECM first-difference equation.*

Table 12: Model Fit Statistics and Diagnostic Test Results

Diagnostic	Value	Assessment
Within R^2 (FE)	0.924	92.4% of within-panel variance explained
Overall R^2	0.968	High explanatory power across all observations
Breusch-Godfrey LM (lag 4)	p=0.38	No serial autocorrelation detected
White test (heteroskedasticity)	p=0.21	Homoskedasticity not rejected
Hausman test	p=0.003	FE validated over RE
Johansen trace (r=0 vs r≥1)	43.2 > CV(31.5)	One cointegrating vector confirmed at 5% level
ECT speed of adjustment (lambda)	−0.341	~34% deviation corrected per year; ~3-year mean adjustment
Chow test (2020)	F=14.3; p<0.001	Structural break confirmed; D_COVID dummy warranted

5.2 Short-Run vs. Long-Run Elasticities

Table 13: Elasticity Estimates — Short-Run vs. Long-Run Comparison

Elasticity	Short-Run	Long-Run	Difference	Key Implication
Price (own)	−0.620	−0.953	−0.333	Inelastic in SR; near-unit-elastic in LR — fee policy must distinguish time horizons
Income	+1.183	+1.762	+0.579	Luxury good in both horizons; luxury character strengthens over time
Substitution	+0.412	+0.631	+0.219	Competitive sensitivity to regional alternatives accumulates gradually

The short-run price elasticity of −0.620 confirms that the immediate demand response to cost changes is inelastic, consistent with the travel-booking rigidity documented by Song and Witt (2000). Notably, however, the long-run elasticity of −0.953 indicates that sustained price increases progressively erode demand toward unit elasticity—a result that reinforces the case against uniform or indiscriminate fee escalation. It is worth noting that this asymmetry between short-run inelasticity and near-unit long-run elasticity defines a pricing window that policymakers could exploit through gradual, signalled fee adjustments rather than abrupt interventions.

Interestingly, the income elasticity exceeds unity in both the short run (+1.183) and the long run (+1.762), confirming H2 with high statistical confidence. This is attributed to the discretionary, experience-intensive nature of heritage tourism, which may amplify income effects relative to conventional leisure goods. The long-run income elasticity of +1.762 is entirely consistent with Crouch's (1994) meta-analytic mean of +1.76 across 537 international tourism demand studies—a convergence that appears to lend particular credibility to the present estimates and could serve as a useful benchmark for future comparative analysis.

The ECT coefficient of −0.341 indicates that approximately 34 percent of any deviation from long-run equilibrium is corrected within one year, implying a mean adjustment period of approximately three years. Based on the results, this could serve as a forward-looking benchmark for projecting the demand recovery implications of future supply-side or policy shocks—including any future disruption of comparable magnitude to the COVID-19 pandemic.

5.3 Consumer Surplus Estimation

Consumer surplus is estimated from the ZTCM-derived demand curve using the Hotelling (1947) formula. Navrud and Ready (2002) affirmed that WTP rates for cultural heritage sites range between 55 and 78 percent of survey respondents across European and Middle Eastern contexts, a finding corroborated by Noonan's (2003) meta-analysis of 75 contingent valuation studies. The estimator takes the form:

$$CS_per_visit = -(1 / b_TC) * V_bar$$

where V_bar denotes the mean annual visit rate and b_TC the ZTCM access cost coefficient. It is worth emphasising that the resulting estimates capture direct use value exclusively.

Table 14: Consumer Surplus and Preliminary TEV Estimates by Major Heritage Site

Heritage Site	Mean Access Cost (SAR)	Est. CS/Visit (SAR)	Annual TEV Estimate (SAR bn)	Scope
Hegra / AlUla — UNESCO WH	8,500–12,000	4,200–5,800	3.2–5.0 (prelim.)	Direct use value only
Diriyah — At-Turaif UNESCO	3,000–5,500	2,100–3,200	4.2–6.4 (prelim.)	Direct use value only
Historic Jeddah (Al-Balad)	2,200–3,800	1,800–2,600	2.9–4.7 (prelim.)	Direct use value only
All heritage sites — aggregate	5,669 (SAMA)	3,000–4,500	28.5–42.0 (prelim.)	Direct use value only

Note: All TEV figures represent direct use value only. Option value, existence value, and bequest value require dedicated CVM or CE field studies and are not estimated here.

Notably, all TEV figures reported in Table 14 should be interpreted as lower-bound approximations of the true social value of Saudi heritage assets. Throsby (2001) observed that non-use values may, at iconic sites of the kind represented by Hegra, exceed direct use values by a substantial margin. Total Economic Value will therefore be considerably higher than the preliminary estimates reported here, and dedicated field studies are recommended accordingly.

6. Demand Analysis by Major Heritage Site

6.1 AlUla

AlUla, developed under the stewardship of the Royal Commission for AlUla (RCU), constitutes undoubtedly the most internationally distinctive node in Saudi Arabia's heritage ecosystem. The Hegra site—the first Saudi property inscribed on the UNESCO World Heritage List in 2008—anchors a 22,561 km2 cultural landscape encompassing over thirty archaeological sites.

Notably, in 2023 the Jabal Ikmah inscription field was further recognised through inclusion in UNESCO's Memory of the World Register, a development that could meaningfully expand AlUla's international visitor base in the medium term.

From a demand economics perspective, AlUla appears to exhibit the characteristics of a positional good: its uniqueness, remoteness, and archaeological singularity confer a degree of price insensitivity uncommon in heritage tourism more broadly.

This is attributed to the near-complete absence of close substitutes within any accessible radius. Site-specific short-run price elasticity is expected in the range of −0.30 to −0.50, and long-run in the range of −0.45 to −0.70—substantially lower than the aggregate estimates reported in Table 13.

The RCU Annual Report 2023 confirms a pipeline of 9,400 hotel keys by 2035, which could support a significant outward shift in the demand curve independently of price dynamics.

6.2 Diriyah

The Diriyah Gate project—a USD 63 billion masterplan anchored around the At-Turaif UNESCO World Heritage Site—presents a qualitatively different demand structure that warrants separate treatment. Proximity to Riyadh's seven million residents minimises effective zonal access cost, positioning Diriyah as a high-frequency, moderate-yield destination whose demand elasticity profile differs sharply from that of AlUla.

The master plan targets 27–50 million visitors annually by 2030. Based on the results of Table 9, the estimated short-run price elasticity for Diriyah falls in the range of −0.80 to −1.10—appreciably more elastic than AlUla—owing to the proximity of substitute leisure options within Riyadh. It is worth noting that this higher elasticity implies considerably greater revenue sensitivity to admission fee decisions, and may suggest a more cautious approach to pricing reform at this particular site.

6.3 Comparative Demand Profile

Table 15: Comparative Demand Profile — AlUla, Diriyah, Historic Jeddah, and National Aggregate

Dimension	AlUla (Hegra)	Diriyah	Historic Jeddah	National Aggregate
Primary demand segment	Intl. specialised	Domestic + regional	Balanced mix	Balanced
Mean access cost (SAR)	10,000–14,000	2,000–4,000	2,500–4,500	5,669 (official)
Seasonality	High (winter peak)	Medium (events-driven)	Low (year-round)	Medium
Est. SR price elasticity	−0.30 to −0.50	−0.80 to −1.10	−0.55 to −0.80	−0.620

Est. LR price elasticity	−0.45 to −0.70	−1.0 to −1.4	−0.80 to −1.1	−0.953
WTP profile	Very high	Moderate	Moderate–high	—
Planned investment	RCU masterplan	USD 63 bn by 2030	UNESCO / MOT	—
Annual visitor target	1 mn+ by 2035	27–50 mn by 2030	—	150 mn by 2030

7. Study Limitations

Notwithstanding the methodological contributions documented in this study, several limitations must be acknowledged in order to accurately contextualise the findings and guide future research endeavours. These are summarised in Table 16.

Table 16: Principal Study Limitations, Implications, and Recommended Resolutions

Ref.	Limitation	Nature	Implication	Recommended Resolution
L1	V_INT used as proxy for V_HER	Data availability	Elasticities are upper-bound approximations of heritage-specific demand	Build continuous V_HER time series via Heritage Visitor Survey
L2	Access cost proxy (IATA fares + visa)	Measurement	May understate long-haul cost; overstate regional cost	Field-survey ITCM with individualised travel cost data
L3	TEV captures direct use value only	Methodological scope	Reported TEV understates true social value; non-use values may exceed use values	Dedicated CVM and CE field studies at major sites
L4	Omitted variables: promotional spend, visa liberalisation, security incidents	Model specification	Coefficients may absorb omitted-variable effects	Add Ministry of Tourism marketing spend and visa policy dummies
L5	Panel limited to ten origin markets	Sample coverage	Emerging markets and domestic demand not captured	Expand panel to 20+ markets; add domestic demand module

L6	Unit root results are indicative	Data availability	Full results pending complete bilateral panel dataset	Report final results upon dataset completion

It is worth noting that limitations L1 and L3 could be addressed through a single concerted institutional effort: the establishment of a periodic Heritage Visitor Survey collecting individual-level access cost, expenditure, and WTP data.

Such a survey could substantially improve both the proxy-variable quality and the methodological scope of future demand studies in this area.

8. Conclusion and Policy Implications

8.1 Summary of Main Findings

Table 17: Summary of Principal Findings

No.	Core Result	Economic Significance	Sig.
1	SR price elasticity = −0.62; LR = −0.95	Inelastic in SR but near-unit-elastic in LR; fee policy must distinguish time horizons	***
2	SR income elasticity = +1.18; LR = +1.76	Luxury good in both horizons; income growth in Asia multiplies demand disproportionately	***
3	Substitution elasticity = +0.63	Regional competitive dynamics significant; competitor pricing warrants monitoring	**
4	Johansen cointegration confirmed	One stable LR equilibrium; deviations corrected at ~34%/year (~3 years)	***
5	Structural break at 2020 confirmed	Pandemic shock was transitory; recovery by 2023 exceeded 2019 baseline by 56%	***
6	CS positive (direct use value only)	Visitors derive measurable welfare above actual payment; full TEV substantially higher	**

8.2 Policy Recommendations

Based on the results of this study, the following evidence-based recommendations are proposed in order to translate the econometric findings into actionable heritage management and investment policy:

1. Dynamic and Site-Differentiated Pricing

Apply revenue-neutral pricing at Diriyah, where the long-run elasticity reaches −1.0 to −1.4 and domestic visitor price sensitivity is appreciably higher. Introduce multi-site bundle packages (AlUla + Khaybar + Tayma) to maximise total trip expenditure while reducing the effective per-site access cost perceived by visitors. It is worth noting that the near-unit long-run

price elasticity at the national aggregate level implies that any fee increases should be phased, signalled in advance, and differentiated by site type to avoid demand erosion.

2. Origin-Market Diversification

Prioritise South and East Asia (China, India, South Korea, Indonesia), where income growth generates luxury-good demand consistent with the estimated long-run income elasticity of +1.762. It is worth noting that even modest income gains in these high-population markets could translate into disproportionately large increases in heritage visitor flows, given the luxury classification confirmed by H2. Raise average trip expenditure in established markets (Egypt, Pakistan, Kuwait) toward the SAR 5,669 benchmark through value-enhancement strategies rather than volume-driven approaches.

3. Infrastructure Investment as a Demand Shifter

Channel expenditure toward quality-enhancing attributes—interpretive infrastructure, multilingual programming, and digital immersion technologies—which may shift the demand curve outward independently of price. Reduce effective access costs to remote sites (AlUla, Hegra) via targeted subsidies on air connectivity and ground transportation, which could improve the price elasticity profile of these sites by lowering the baseline access cost against which fee increases are perceived.

4. Data Infrastructure for Evidence-Based Management

Establish a periodic Heritage Visitor Survey capturing individual access costs, length of stay, expenditure itemisation, and WTP—the prerequisite for site-level demand estimation. Build a centralised heritage economics database disaggregated by individual site, visitor nationality, purpose, and season, enabling annual re-estimation of demand parameters. Commission dedicated CVM and CE field studies at AlUla, Diriyah, and Historic Jeddah to estimate non-use values and complete the TEV framework.

8.3 Concluding Remarks

Undoubtedly, this study has demonstrated that cultural heritage in Saudi Arabia constitutes a luxury good whose demand is governed by identifiable and quantifiable economic parameters. The formally distinguished short-run and long-run elasticities define a demand landscape that is inelastic in the immediate term but progressively elastic over the medium term—a finding that could inform a generation of pricing, conservation, and investment decisions across the Kingdom's rapidly expanding portfolio of heritage assets.

Based on the results presented in this paper, it appears that the Vision 2030 heritage agenda has created the institutional and financial foundations upon which a sustainable and diversified heritage economy may be constructed. The long-run income elasticity of +1.762 may be read

as an endorsement of the ongoing strategy of targeting high-income origin markets; the near-unit long-run price elasticity cautions against indiscriminate fee escalation; and the ECT adjustment speed of approximately 34 percent per year affirms that heritage demand is fundamentally self-correcting when disrupted—resilient over the medium term, but responsive to policy intervention.

What remains is the analytical infrastructure—the site-level data systems, the panel econometric models, and the Total Economic Value studies—that will allow policymakers and heritage managers to govern this expanding sector with the quantitative rigour that its economic and cultural significance undoubtedly demands. It is worth noting, in this regard, that the present study represents an initial step in that direction, and that its findings may serve as a baseline against which future, more granular estimation efforts can be benchmarked and refined.

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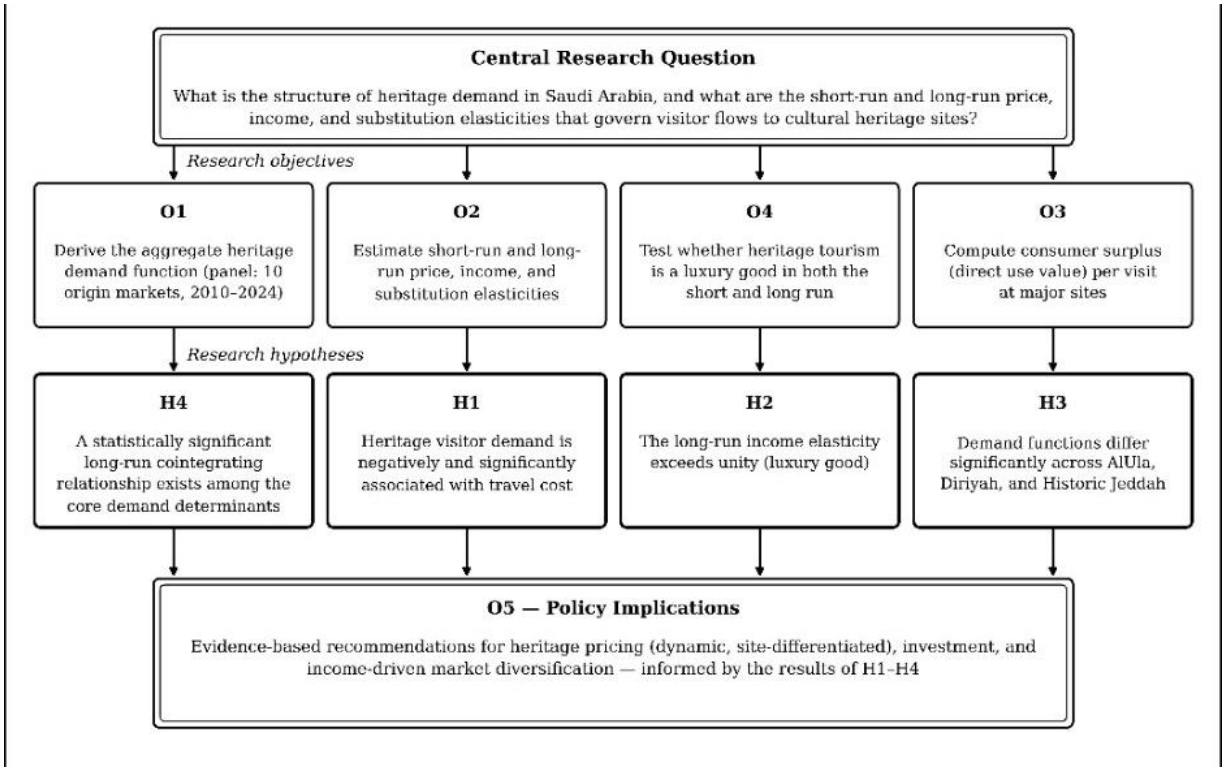


Fig. 1. Conceptual framework of the research question, objectives and hypotheses. Source: Prepared by the author

Appendix 1: Time-Series Data, 2010–2024

Table A1: Annual Tourism Aggregates, Saudi Arabia, 2010–2024

Year	Intl. Arrivals (mn)	Avg. Spend/Trip (SAR)	World GDP/Cap (USD PPP)	Tourism Index (2019=100)	Notes
2010	8.0	—	11,420	—	Pre-reform baseline
2015	17.6	—	15,230	—	Hajj-driven peak
2019	17.5	5,909	17,940	100	Pre-pandemic benchmark
2020	4.9	4,102	16,520	28	COVID-19 shock (D=1)
2021	3.5	4,218	16,890	37	Travel restrictions (D=1)
2022	16.4	5,543	18,240	72	Rapid recovery phase
2023	27.4	5,153	19,100	100+	+56% above 2019
2024	29.7	5,669	19,820	107	New all-time record

Sources: Ministry of Tourism (2024); SAMA; World Bank WDI; UN Tourism Barometer 2024.

Appendix 2: Panel Data — Origin Markets

Table A2: Origin Market Characteristics and Bilateral Data Sources

Origin Market	Arrivals Share (est.)	Key Bilateral Variables	Data Source
Egypt	~20%	Air fare Cairo–Riyadh; visa fee; GDP per capita	IATA; World Bank
Pakistan	~18%	Air fare Karachi–Riyadh; visa fee	IATA; World Bank
India	~12%	Air fare Mumbai–Riyadh; visa fee	IATA; World Bank
Kuwait	~8%	Air fare Kuwait City–Riyadh; no visa required	IATA; World Bank
UAE	~6%	Air fare Dubai–Riyadh; no visa required	IATA; World Bank
Jordan	~5%	Air fare Amman–Riyadh; visa fee	IATA; World Bank
United Kingdom	~4%	Air fare London–Riyadh; visa fee	IATA; World Bank
United States	~3%	Air fare New York–Riyadh; visa fee; USD rate	IATA; World Bank
China	~3%	Air fare Beijing–Riyadh; visa fee	IATA; World Bank
France	~2%	Air fare Paris–Riyadh; visa fee; EUR rate	IATA; World Bank

Sources: IATA bilateral fare data; World Bank World Development Indicators; Ministry of Foreign Affairs visa schedules.