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# Tourism-Led Employment Nexus In Saudi Arabia: An ARDL Analysis Of Vision 2030 Diversification Impacts

**Awad Mohamed Osman[1], Abdullah S Alharbi[2], Fathi Abdelrahman Ahmed Faramawi[3], Abdallah Ammar Hendaoui[4], Hadeel Fouad S Aljuwaie[5], Sara Qasem M Al-Suwaidi[6], Mohamed Ismail Abdulrahman Ismail[7], Mahmoud M. H. Alayis[8]**

*[1,2] Dep of Finance and Banking, College of Business Administration, [3,4,5,6] Dep of Accounting, College of Applied Studies and Community Services, [7]Deanship of Graduate Studies, [8] Dep of Business Administration, College of Applied Studies and Community Services.*
*Imam Abdurrahman Bin Faisal University, Dammam, Saudi Arabia.*
*Email: amhussein@iau.edu.sa, ashalharbi@iau.edu.sa , fafaramaue@iau.edu.sa, aahendaoui@iau.edu.sa, Hfaljuwaie@iau.edu.sa, Sqalsuwaid@iau.edu.sa, miismail@iau.edu.sa, mmhali@iau.edu.sa,*

**Abstract:**

This paper investigates the dynamic relationship between job creation and the development of Saudi Arabia's tourism sector within the Kingdom's Vision 2030 framework. Employing the Autoregressive Distributed Lag (ARDL) bound testing and the associated error correction model, the paper empirically examines both short–run and long–run effects of the key determinants, including tourist arrivals, tourism infrastructure investment, public expenditure, private sector investment expenditure, and Vision 2030 structural reforms. The model proves a stable long-run co-integrating relationship among the study's variables, supported by robust diagnostic tests and a statistically significant error correction term.

The empirical results reveal that tourist arrivals, Vision 2030-aligned infrastructure investment, and private capital expenditure have a significant positive impact on long-run employment. On the other hand, public investment shows a negative long-run impact, demonstrating crowding-out dynamics or inefficiencies. The short-run results reveal a positive role for tourist arrivals and private sector engagement as drivers of employment. While the interaction term that captures infrastructure investment in tourism under Vision 2030 showed a marginal, but significant, positive influence on employment, suggesting that recent policy-driven infrastructure improvements are the most influential external driver.

Tourism-led employment is mostly self-sustaining according to the variance decomposition and Impulse response analysis, with Vision 2030 infrastructure investment standing out as the most significant external determinant.

Strategic policy reforms, such as emphasizing private sector engagement, enhancing the effectiveness of public sector expenditure, and prioritizing infrastructure investment aligned with national development goals, must be implemented to optimize the employment potential of Saudi Arabia's tourism sector.

**Keywords:** Economic Diversification, Employment. Tourism-Led Employment, Infrastructure, Structural Reform, Cointegration, ARDL Approach.

**JEL:** O11, E24, J21, O20, C22

## 1. Introduction:

Diversifying the economy is the primary goal of Saudi Arabia's Vision 2030. At the core of the vision's initiatives is the growth of the tourism industry as an accelerator for job creation and economic growth. This is a view of tourism not just as a cultural bridge, but also as a driver of labour market growth. Additionally, analyses lack awareness of how tourism boosts employment from assessments that ignore the vital role of infrastructure, which supports labour absorption and facilitates tourist development.[1] In 2023. A total of 81.9 million domestic tourists, according to the Ministry of Tourism, the figure shows a steady increase in domestic tourism. Saudi Arabia achieved a new milestone in 2023 with the total number of inbound tourists exceeding 21.4 million.[2]

In its 2024 Article IV consultation report," Saudi Arabia Surpasses Vision 2030 Tourism Target" [3] Emphasizing the significance of the country's tourist industry is crucial to its economic diversification. Saudi Arabia's attainment of its vision 2030 tourism target-reaching 100 million annual visitors by 2023, represents a significant milestone. In parallel, tourism revenues totaled $36 billion in 2023, with net tourism income increasing 38%. Central to this growth has been a combination of strong domestic demand and increased international arrivals. Non-religious tourism has grown, with increased leisure travel and visits to friends and family driven by major international events like Formula One, the 2027 Asian Cup, and the 2030 World Expo. Red Sea Global and Diriyah Gate are examples of the giga projects that are seen to be efforts to boost the sector's growth as they focus on luxury tourism, cultural preservation, and infrastructure improvements. Vision 2030 maintains the Kingdom's overall economic transformation strategy, with tourism at its core. Saudi Arabia's tourism sector has enormous potential and could lead to sustainable economic growth in the years to come, as confirmed by the IMF's recognition of its achievements.

According to GASTAT, the unemployment rate reached historic lows. Principally, the private sector added over one million jobs in 2023; accordingly, the overall unemployment rate for Saudis dropped to 7.7 percent in the last quarter of 2023 — inching closer to the 2030 Vision objective of 7 percent. Labour force participation rates have remained at historically high levels but relatively flat over the past year for both men and women, albeit with the women's rate still comfortably exceeding the Vision 2030 goal of 30 percent. The unemployment rate has fallen to record lows. In 2023, the Saudi economy added more than one million jobs, the majority of which were in the private sector. The unemployment rate fell to 7.7 percent in the last quarter of 2023, from 7 percent.

The study fills two important gaps: the lack of integrated application of dynamic econometrics techniques that capture both short-run fluctuations and long-run equilibrium relationships, and the absence of integrated modelling of policy reforms (Vision 2030) and infrastructure investments in tourism-driven employment outcomes.

As a consequence, the study question will be: to what extent do Vision 2030 changes influence direct employment in Saudi Arabia's tourism sector between 1990 and 2024? Methodologically, the paper adopts the Autoregressive Distributed Lag (ARDL) model and the error correction modeling to empirically investigate short–run and long–run relationships between tourism-led employment and a set of explanatory

[1] The National Tourism Strategy ( https://mt.gov.sa/investment-and-attraction/tourism-strategy/nts )

[2] https://misa.gov.sa/

[3] https://www.imf.org/en/News/Articles/2024/06/13/mission-concluding-statement-saudi-arabia-concluding-statement-of-the-2024-article-iv-mission

variables comprising tourist arrivals, tourism infrastructure investment, public expenditure, private sector capital expenditure, and Vision 2030 structural reform. The model proves a stable long-run co-integrating relationship, evidenced by a statistically significant error correction term.

The paper is organized into five main sections. The study's theoretical framework and relevant literature are reviewed in Section 2. In Section 3, the econometric methodology and data sources will be presented. The empirical results are shown in Section 4 along with model diagnostics and stability checks. Section 5 investigates policy implications and concludes the study.

**2: literature review:**

The nexus between tourism development and employment generation has garnered significant scholarly attention, reflecting tourism's role as a driver of inclusive economic growth.

Pablo-Romero and Molina (2013) systematically reviewed the literature on the connection between tourism and economic growth, arranging it chronologically and thematically according to three methods: cross-sectional data, time series, and panel data. They concluded that a nation's tourism specialization is one of the elements that affects the relationship between tourism and growth, and that the model assumptions and econometric techniques, more complex analytical techniques that are gaining popularity, have an impact on the actual results. (del P. Pablo-Romero & Molina, 2013)

The long-term connections between tourist development and economic growth in OECD and non-OECD nations between 1990 and 2002 are examined using a heterogeneous panel cointegration approach. According to the study by Lee and Chang (2008), GDP and tourist development are cointegrated, with tourism having a greater effect on GDP in non-OECD nations, especially those in Sub-Saharan Africa. Additionally, economic growth is influenced by the actual effective exchange rate. They highlighted Important policy implications are highlighted using the panel causality test, which shows unidirectional causation from tourism to growth in OECD nations, bidirectional causality in non-OECD countries, and weak connections in Asia. (Lee & Chang, 2008)

Williams and Shaw (1992) marked a pivotal shift in the debate, changing the focus of the tourism-employment debate from quantitative to qualitative issues. Seasonality, poor pay, part-time contracts, and little opportunity for career advancement are only a few of the structural issues in tourist employment that are critically highlighted. A significant contrast between employment volume and job quality was introduced in the literature by the work. They emphasized how excessive dependence on tourism may lead to labour market instability, advocated for measures that increase employment sustainability, lessen seasonality, and strengthen career routes and training. (Leslie, 1992).

Using qualitative and quantitative approaches and data concerning Polish migrant workers in the UK tourist industry, Janta et al. (2011) examined how jobs in tourism affect migrant workers' adjustment to their new communities, emphasizing how these jobs provide access to social networks that improve cultural competency and lessen some of the difficulties associated with relocation. It also discusses how connections between foreign employees affect recruiting and chain migration procedures.(Janta et al., 2011).

Lin et al. (2019) investigated the causal relationships between China's regional economic growth and the increase in foreign tourists from 1978 to 2013. Their results show that nine regions had economy-driven tourism growth (EDTG) and ten out of 29 regions had tourism-led growth (TLG). Using Bayesian probit models, less developed economies, larger economies, and wider geographic areas are more likely to experience TLG, whereas less developed economies are also more likely to experience EDTG.(Lin et al., 2019)

Chao et al. (2009) examined the short- and long-term impacts of tourism on employment and wellbeing using a dynamic open-economy model with pay indexation. According to their study, while a rise in the demand for non-traded items raises their relative prices and increases labour employment in the near term,

higher salaries over time may have a detrimental effect on employment. Tourism may improve employment and wellbeing under some circumstances, but it may also lead to cost rises that eventually hurt both. Hong Kong-relevant simulations are used to demonstrate the findings. (Chao et al., 2009)

Alhowaish (2016) investigated the causal relationship between tourism development and economic growth in Gulf Cooperation Council (GCC) countries in a multivariate model, using panel data for the period 1995-2012, adopting a panel Granger causality analysis approach to assess the contribution of tourism to economic growth in GCC countries as a whole, and in each country. The results show a one-way Granger causality from economic growth to tourism growth. Furthermore, Kuwait, Saudi Arabia, Qatar, and the United Arab Emirates follow the path of economy-driven tourism growth, as hypothesized. The reverse hypothesis (i.e., tourism-led growth hypothesis) holds for Bahrain, while there is no causal relationship between tourism and economic growth in the case of Oman.(Alhowaish, 2016)

Almathami et al (2022) explored the challenges for women working in the KSA event and festival sector using a case study approach involving semi-structured interviews with personnel from within event and festival organizations and ministries in KSA. They identified several challenges to Saudi women's inclusion in the sector: cultural values, social network, workplace environment, education and training, gender diversity, and regulation. Addressing these issues through evidence-based strategies can improve empowerment and inclusion of women in the event and festival sector. The lessons learned can also be applied to other employment sectors in KSA and extend our current knowledge of challenges to women's empowerment by providing new perspectives arising from the context of KSA. (Almathami et al., 2022)

Naseem (2021) investigated the role of tourism in promoting economic growth in the Kingdom of Saudi Arabia by using annual time series data from 2003 to 2019 Johansen co-integration test, and the Granger causality test to check the relationship between tourism and economic growth. The results show that economic growth has a long-run relationship with tourism receipts, tourism expenditures and the number of tourist arrivals; the number of tourist arrivals has a strong relationship with economic growth, compared to other parameters. The empirical results validate the concept that tourism promotes economic growth in the kingdom of Saudi Arabia.(Naseem, 2021)

Balaguer and Cantavella (2002) taking the case of Spain, examined the role of tourism in the long-run economic development. The tourism-led growth hypothesis is confirmed through cointegration and causality testing. Their results indicate that, at least, during the last three decades, economic growth in Spain has been sensible to persistent expansion of international tourism. The increase of this activity has produced multiplier effects over time. External competitivity has also been proved in the model to be a fundamental variable for Spanish economic growth. From the empirical analysis, it can be inferred that the positive effects on income that government policy, in the adequacy of supply as well as in the promotion of tourist activity, may bring about. (Balaguer & Cantavella-Jordá, 2002)

The aforementioned previous studies represent only a part of the research that has addressed the relationship between the labour market, job creation, and its determining factors. Among these studies (Ayad, 2022) , (Kožić et al., 2022), (Lejsek, 2011) , (Tosun et al., 2023), (Voumik et al., 2023), (Hassanein & Özgit, 2022), (Rotar et al., 2023), (Ladkin et al., 2023), (Nguyen et al., 2025), (Manzoor et al., 2019) , and (Chinasa & Ozgit, 2024).

## 3. METHODOLOGY

### 3.1. Model Specification: Tourism-Led Employment Framework:

The study’s proposed ARDL model is compatible with economic theory and earlier studies on tourism-driven growth and job creation. The Saudi economy’s structural features are demonstrated by a set of selected explanatory variables that address the main issues highlighted in Vision 2030.

Direct employment in the tourism sector (EMPL) is the dependent variable in our model, and the independent variables are tourism arrivals (TOUR), infrastructure investment in tourism sector (INFR), a structure reform dummy representing the launch of Vision 2030 initiatives (D_V2030), public expenditure on tourism (PINV), and domestic capital expenditure by private sector (DCEP).

The model's functional form is defined as follows:

LOGDEMPL = f (LOGTOUR, D(LOGINFR×D_V2030), LOGPINV, LOG DCEP) (1)

Where:

**EMPL**: Log of direct tourism employment

**TOUR**: Log of tourist arrivals

**INFR**: Log of infrastructure investment in tourism

**V_2030**: Dummy variable for Saudi Vision 2030

**PINV**: Log of public expenditure on tourism

**DCEP**: Log of Domestic capital expenditure by the private sector

**Δ**: First difference operator

The ARDL model, which takes into consideration both short-run volatility and long-run equilibrium relationships, was developed to examine the evolving relationship between tourism-driven employment and macroeconomic indicators within the context of Saudi Arabia's Vision 2030.
The dependent variable is the natural logarithm of direct employment in the tourism sector (ln EMPL), while the explanatory variables are tourism arrivals (lnTOUR), infrastructure investment in tourism (lnINFR), public expenditure on tourism flows (lnPINV), strategic activity by the private sector domestic capital expenditure (ln DCEP), and the Vision 2030 reform dummy (D_V2030). All series are represented logarithmically to facilitate elasticity comprehension and manage any nonlinearities.

### 3.2: The dynamic form of the ARDL model is structured as:

Since the relationship between the model's macroeconomic explanatory variables is likely not stationary, the model is converted to a linear form by taking the natural logarithm values of the variables. This converts the model's variables into growth rate form and specifies the parameters to be elasticities. The model in the econometric logarithm format is:

Ln EMPL = $\alpha 0 + \beta_1$LnTOUR + $\beta_2$ Δ(INFRA×V2030) + $\beta_3$LnINV + $\beta_4$ Ln DCEP + Ut (2)

The ARDL bounds testing approach developed by Pesaran et al. (2001) stated that it applies to a set of time series of both I(1) and/or I(0).

The general ARDL (p, q) functional form model of $X_t$ as independent and $Y_t$ as a dependent is given by:

$$\Delta Y = \alpha_0 + C_0 t + \sum_{i=1}^{p} \beta i \Delta Y_{t-i} \sum_{j=0}^{q} \gamma j \Delta X_{t-j} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \varepsilon_t \quad (3)$$

Where:

$\Delta Y_t$ and $\Delta X_t$ are the differences of $Y_t$and $X_t$

p and q are the respective lags: i=1, 2, …, p; q=1, 2, …, q

t indicates the periods t=1, 2, …, T

The coefficients $\alpha_0$, $C_0$ are the drift and trend coefficients, respectively

$\in_t$ is the white noise error.

The coefficients $\beta i$ and $\gamma j$ for all j correspond to the short-run relationship, while the $\delta j$ corresponds to the long-run relationship.

Based on the ARDL general functional form model shown above, our study model will be specified in such a way that the dynamic relationship between the dependent variable LOG(EMPL) and the independent variables LOG(TOUR), D(LOGINFR×D_V2030), LOG(PINV), and LOG (DCEP) is defined as follows:

$$\Delta LnEMPL_t = \alpha_0 + \propto_1 t + \sum_{i=1}^{p} \propto_{2i} \Delta LnEMPL_{t-i} + \sum_{i=1}^{q1} \propto_{3i} LnTOUR_{t-i} + \sum_{i=1}^{q2} \propto_{4i} D(LnINFR * D\_V20230)_{t-i} + \sum_{i=1}^{q3} \propto_{5i} LnPINV_{t-i} + \sum_{i=1}^{q4} \propto_{6i} LnDCEP_{t-i} + \propto_{10} LnEMPL_{t-1} + \propto_{10} LnEMPL_{t-1} + \propto_{11} LnTOUR_{t-1} + \propto_{12} LnD(LnINFR * D\_V20230)_{t-1} + \propto_{13} LnPINV_{t-1} + \propto_{14} LnDCEP_{t-1} + \varepsilon_t \quad (4)$$

Where:

ΔLnEMPL$t$, ΔLn TOUR $t-i$, ΔLn D(LnINFR*D_V2030) $t-i$, ΔLn PINV t−$i$, and Ln DCEP t−$i$ represent Explanatory variables respective difference values; $\alpha 2$, $\alpha 3$, $\alpha 4$, $\alpha 5$, and $\alpha 6$ represent the short-run dynamic relationships; $\alpha_{10}$, $\alpha_{11}$, $\alpha_{12}$, $\alpha_{13}$, and $\alpha_{14}$ denote long-run dynamic relationships; P shows the lag period of the dependent variable; $q_1$, $q_2$, $q_3$, and $q_4$ indicate the lag period of the independent variables, respectively; and $\epsilon_t$ is the error term.

## 4. EMPIRICAL ANALYSIS

### 4.1. Unit root test:

As a first stage in the empirical investigation, the stationary properties of the variables were evaluated using the Augmented Dickey-Fuller(ADF). By determining the order of integration for each series, this approach guarantees the accuracy of the resulting econometric modelling.

**Table 1: Augmented Dickey-Fuller (ADF) Unit Root Test Results**

**The Null hypothesis: the variable is non-stationary**

| Variable | Transformation | Exogenous Terms | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value | p-value | Stationarity Decision |
|---|---|---|---|---|---|---|---|---|
| LOG EMPL | First Difference | Constant | -8.331 | -3.670 | -2.964 | -2.621 | 0.0000 | Stationary |
| LOGTOUR | Level | Constant + Trend | -5.539 | -4.285 | -3.563 | -3.215 | 0.0004 | Stationary |
| D(LOGINFR×D_V2030) | Level | Constant | -3.6463 | -3.654 | -2.954 | -2.615 | 0.0000 | Stationary |
| LOGPINV | First Difference | Constant | -4.997 | -3.646 | -2.954 | -2.616 | 0.0003 | Stationary |
| LOGDCEP | Level | Constant + Trend | -4.410 | -4.441 | -3.633 | -3.255 | 0.0107 | Stationary |

Source: own calculations.

**Note**: Lag lengths were automatically determined using the Schwarz Information Criterion (SIC).

All variables in Table (1) exhibit stationarity either at the level or first difference, based upon statistically significant test statistics ($p < 0.05$)

The use of VAR analysis and cointegration is backed by these results.

**4.2: ARDL Bounds Test for Cointegration:**

According to the ARDL Bounds Test results shown in Table 3, the F-statistic is 10.150, indicating 1% significance; this suggests that the null hypothesis is rejected and that the long-run cointegration is confirmed. In this case, the model equation demonstrates a 1% cointegration.

**Table 2: ARDL Bounds Test for Cointegration (Sample, n = 35)**

**Null Hypothesis: No long-run relationships exist**

| Test Statistic | Value | Significance Level | Critical Value I(0) | Critical Value I(1) | Conclusion |
|---|---|---|---|---|---|
| F-statistic | 10.150 | 1% | 4.093 | 5.532 | Cointegration (F > I(1) Bound) |
| | | 5% | 2.947 | 4.088 | Cointegration (F > I(1) Bound) |
| | | 10% | 2.460 | 3.460 | Cointegration (F > I(1) Bound) |

Source: own calculations.

According to Table (2) above, statistical evidence of strong and a steady long-run cointegration between direct employment in tourism and its explanatory variables, in addition the accurateness of the long-run estimation generated by the ARDL model is confirmed by this finding's stability over a range of significance levels to strong statistical evidence of cointegration, indicating that error correction model may be used to investigate short-run dynamics.

**4.3. Long-Run Equilibrium Relationship:**

**Table 3: Long-Run Equilibrium Relationship**

Dependent Variable: ΔLOG EMPL
Selected ARDL Model: ARDL (2, 2, 2, 0, 2)
Sample Period: 1990–2024 (32 observations)
Case: Restricted Constant, No Trend (Case 2)

| Variable | Coefficient | Std. Error | t-Statistic | p-value |
|---|---|---|---|---|
| LOGTOUR | 0.664*** | 0.037 | 18.104 | 0.000 |
| D(LOGINFRA×D_V2030) | 0.017* | 0.009 | 1.965 | 0.064 |
| LOGPINV | -0.228*** | 0.048 | -4.732 | 0.001 |
| LOG DCEP | 0.179*** | 0.025 | 7.210 | 0.020 |
| Constant | 2.703*** | 0.120 | 22.499 | 0.000 |

Source: own calculations.

**Long-run Equation:**

$$LOG\ EMPL = 0.664\ LOGTOUR + 0.017\ \Delta(LOGINFR \times D\_V2030) - 0.228\ LOGPINV + 0.179\ LOG\ DCEP + 2.703$$

The ARDL model estimation has provided a substantial confirmation of the long-run cointegration relationship between the logarithm of direct employment (LOG EMPL) and the major explanatory factors. The results reveal that the long–run elasticity of the international tourist arrival (LOGTOUR), estimated at 0.66 ($p<0.01$), has a positive and significant statistical impact on employment in the tourism sector, emphasizing the vital role of tourist arrivals in generating jobs.
The interaction term that captures infrastructure investment in tourism under Vision 2030 (Δ(LOGINFR x D_V2030)) showed a marginally significant positive influence on employment, suggesting that recent policy–driven infrastructure improvements are starting to promote job creation.

Conversely, the results revealed a significant negative long-run relationship between tourism employment and public investment spending (LOGPINV) (coefficient = -0.228, $p < 0.01$), as public investment crowds out direct employment (-0.228%). Equilibrium correction is validated by the significant error correction term (-0.837). This indicates inefficient resource allocation or crowding out for the job creation in the tourism sector.

A significant correlation between employment and the private sector domestic capital expenditure (LOGDCEP) (Coefficient = 0.179, $p < 0.01$) was shown in our results, emphasizing the important role played by the investment of the private sector in achieving long–run employment growth in the tourism sector.

The above results assure a positive long-run equilibrium relationship at the 1% level and cointegration level by the boundaries test ($F=10.15 > 5.532$), also the results highlight the strategic significance of investment and policy efforts by Saudi Arabia's Vision 2030 framework.

### 4.4. Short-run Equilibrium Relationship:

**Table 4: Short-Run Dynamics and Error Correction Term**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| ΔLOG EMPL (-1) | -0.195 | 0.056 | -3.476 | 0.0025 |
| ΔLOGTOUR | 0.575 | 0.011 | 54.256 | 0.0000 |
| ΔLOGTOUR (-1) | 0.098 | 0.029 | 3.395 | 0.0030 |
| $\Delta^2$(D_V2030 × LOGINFR) | 0.006 | 0.001 | 6.769 | 0.0040 |
| $\Delta^2$(D_V2030(-1) × LOGINFR (-1)) | -0.002 | 0.000 | -5.655 | 0.0000 |
| ΔLOG DCEP | -0.019 | 0.017 | -1.080 | 0.2939 |
| ΔLOG DCEP (-1) | -0.086 | 0.025 | -3.510 | 0.0023 |
| Error Correction Term (CointEq(-1))* | -0.837 | 0.095 | -8.771 | 0.0001 |

Source: own calculations.

P-value incompatible with t-Bounds distribution.

| | | | |
|---|---|---|---|
| R-squared | 0.9985 | F-statistic | 10.150 |
| Adjusted R-squared | 0.9980 | Akaike Information Criterion (AIC) | -7.321 |

The ARDL Error Correction Model provides robust evidence of the short-run dynamics and long-run adjustment mechanisms underlying the tourism-led employment nexus in Saudi Arabia.

The short–run results showed a positive, statistically significant effect of international tourist arrivals on job creation in the tourism sector, estimated at 0.575% for each 1% change in tourists' arrivals. The lagged effect (0.098) also showed a positive and significant effect, suggesting that the impact extends beyond the initial period.

Infrastructure investment under Vision 2030 and according to the second difference showed a short–run positive impact on employment estimated at (0.006), although its lag presented a negative impact (-0.002), indicating that large-scale infrastructure projects may cause spin or delayed benefits.

The results showed a mix of short–run impact of the private investment flows: a negative lagged term (-0.086) indicating adjustment cost in the private sector operations, and statistically insignificant in the current change. Additionally, there is corrective behavior exposed by the large negative change in employment (-0.195)

The negative highly significant error correction term (CoinEq(-1)) of -0.832 confirms a stable long–run equilibrium correction characteristics by about 83.7% of any employment level of imbalance may be corrected in a single period, highlighting the model's strong convergence properties. Moreover, the model affirms the ARDL specification's robustness, which is assured by the R-squared (0.9985) and low standard error of regression (0.0056), and favorable information criteria (AIC = -7.321)

**4.6. Diagnostic Tests:**

The following diagnostic tests will be carried out to ensure the validity, robustness, and reliability of the estimated relationships: serial correlation, heteroscedasticity, and stability.

Obs*R-squared The ARDL model does not show evidence of autocorrelation,

**Table 5: Breusch-Godfrey Serial Correlation LM Test:**

| | | | |
|---|---|---|---|
| F-statistic | 0.874087 | Prob. F(8,11) | 0.5650 |
| Obs*R-squared | 12.43651 | Prob. Chi-Square(8) | 0.1328 |

Source: own calculations.

According to the Breusch-Godfrey LM test, the F-statistic (0.874087, p = 0.5650) and the Obs*R-squared statistic (12.43651, p = 0.1328) indicate that there is no significant evidence of serial correlation at the 5% level. We accept the null hypothesis that no serial correlations exist in the time series residuals, signifying that residuals are normally distributed.

**Table 6: Breusch-Pagan-Godfrey Heteroskedasticity Test Results**

| Statistic | Value | Degrees of Freedom | p-value |
|---|---|---|---|
| F-statistic | 1.367 | F(12, 19) | 0.2625 |
| Obs*R-squared | 14.829 | Chi-square(12) | 0.2509 |
| Scaled Explained SS | 4.175 | Chi-square(12) | 0.9801 |

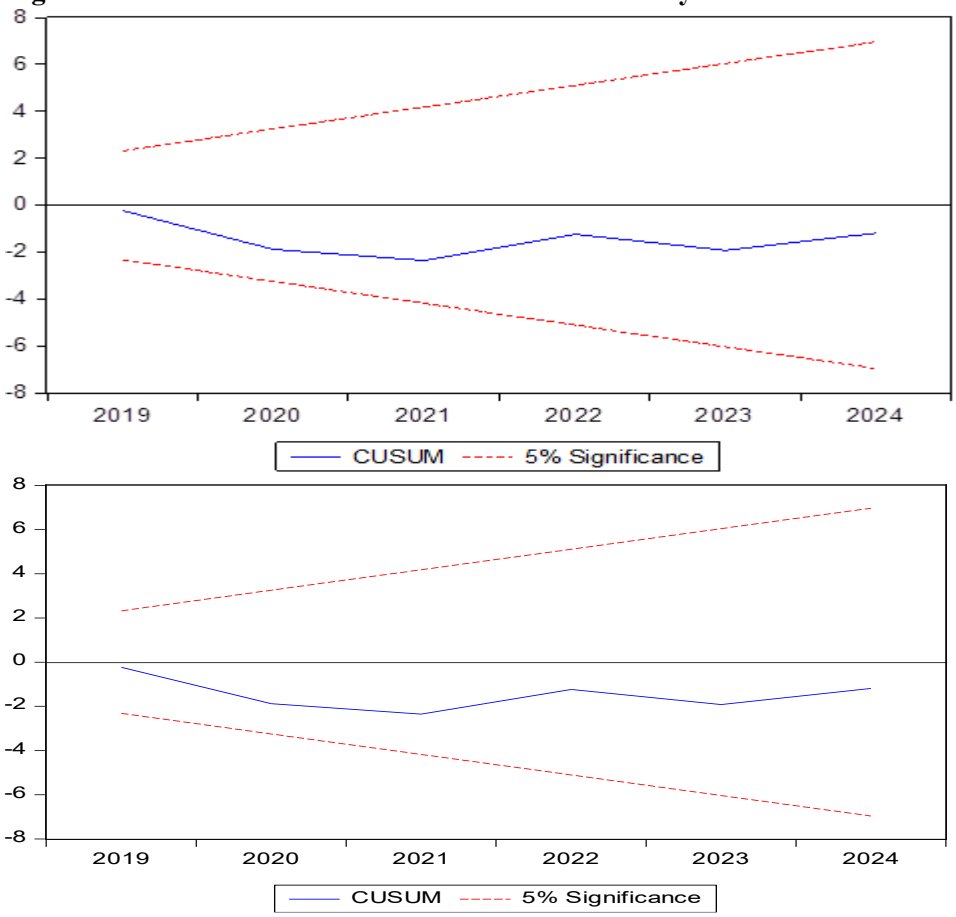
Source: own calculations.

Based on the results obtained from the Breusch-Pagan-Godfrey test, all three test statistics—F-statistic, Obs*R-squared, and Scaled Explained SS—yield p-values well above the conventional 5% significance level, indicating no evidence of heteroskedasticity.

**4.7. Robustness Checks**

Diagnostic tests were conducted to evaluate the serial correlation and heteroscedasticity to ensure the reliability of the ARDL model. The results of the Breush-Godfrey test for serial correlation were an Ons*R-squared value of 7.155 (p= 0.0279) and an F-statistic of 2.448 (p = 0.1163). The Chi-square statistic shows little indication of serial dependency despite the F-test suggesting no significant autocorrelation at 5% level of significance. This calls for consideration of other possible lag structures. All test statistics revealed non-significant findings from the Breusch-Pagan – Godfrey test for heteroscedasticity: F statistics = 1.367(p=0.265), Obs*R-Squared = 14,829, suggesting no indication of heteroscedasticity in the residuals.

**Figer 1: CUSUM Recursive Estimates Test for stability:**




Using recursive residuals, CUSUM tests were conducted to test the estimated model parameters for stability over time. Plots of the CUSUM statistics and the 5% significance bounds for the 2019 to 2024 sample period are depicted in Figure 3 above. The CUSUM line remains well inside the critical bounds, indicating no structural instability in the model, suggesting that the model is structurally stable.

Based on the outcomes of the diagnostic tests, which support the assumption of homoscedasticity and affirm the efficiency of the estimated coefficients, confirm the overall robustness of the ARDL specification, and reinforce the validity of the empirical findings, this makes the model suitable for use in policy-related decision-making.

### 4.8. Variance Decomposition Analysis:

**Table 7: Variance Decomposition**

| Period | S.E. | LOGEMPL | LOGTOUR | D(LOGINFR*D_V2030) | LOGPINV | LOGDCEP |
|---|---|---|---|---|---|---|
| 1 | 0.01751 | 100.0000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.03250 | 99.39737 | 0.018485 | 0.517775 | 0.046549 | 0.019821 |
| 3 | 0.04940 | 98.43515 | 0.038237 | 1.436192 | 0.021962 | 0.068458 |
| 4 | 0.06803 | 98.12236 | 0.101293 | 1.410506 | 0.054878 | 0.310958 |
| 5 | 0.12890 | 92.97742 | 0.028339 | 6.724062 | 0.071649 | 0.198533 |
| 6 | 0.13680 | 89.74227 | 0.994545 | 8.755836 | 0.319938 | 0.187409 |
| 7 | 0.16555 | 91.32562 | 1.258601 | 6.766808 | 0.395508 | 0.253460 |
| 8 | 0.19318 | 92.62765 | 1.099909 | 5.389649 | 0.426983 | 0.455811 |
| 9 | 0.21402 | 93.21392 | 0.923936 | 5.139166 | 0.347969 | 0.375011 |
| 10 | 0.24674 | 93.24479 | 1.031236 | 4.996941 | 0.278598 | 0.448439 |

**Source: own calculations.**

Table 6 enables us to determine how much of the forecast error variance of LOGEMPL is explained by shocks to itself and other variables (LOGTOUR, D(LOGINFR*D_V2030), LOGPINV, and LOGDCEP ) over time.

As expected, LOGEMPL accounts for all of its volatility during the first short-run period. In periods five and six, LOGEMPL's own contribution dropped substantially to about 93% and then 90%.

D(LOGINFR*V_2030)* makes a substantial contribution, peaking at 8.76% in period 6. In addition, LOGTOUR and LOG DCEP begin to have a greater impact. Over the long-run period (7–10), LOGEMPL's contribution ranges from 91 to 93 percent. Even if its influence has somewhat decreased, we can still conclude that D(LOGINFR_V2030)* is the most important external shock. Additionally, Other factors like LOGTOUR, LOGPINV, and LOG DCEP contribute somewhat but consistently.

### 4.9. Impulse Response Analysis:

The impulse response functions (IRFs) trace how a one-time shock to one variable affects the current and future values of another. The response of LOGEMPL(employment) is being examined here along with itself as well as with LOGTOUR, D(LOGIN FR*D_V2030), LOGPINV, and LOGDCEP.

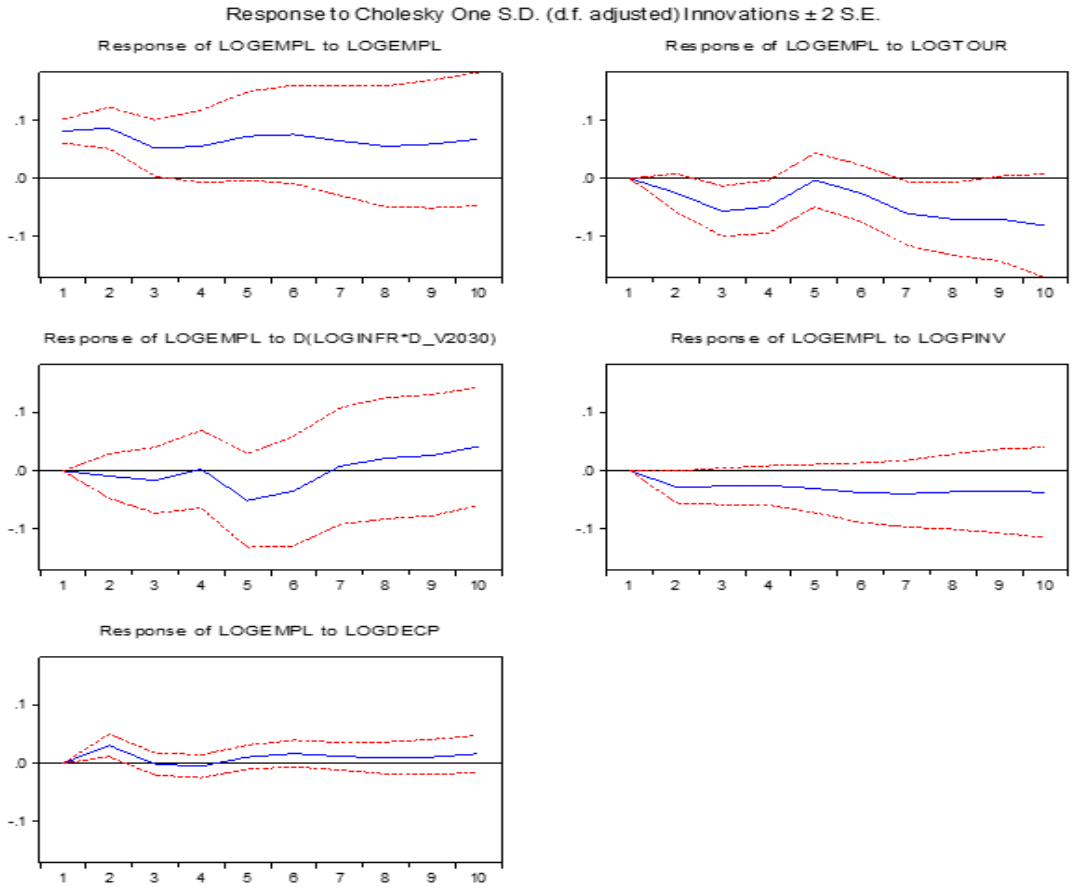
The response of LOGEMPL to itself is sustained and highly positive; its values gradually decrease but stay over zero, proving that employment shocks have long long-lasting positive effect on future employment and indicate inertia in labour dynamics.

Response to LOGTOUR is positive and largely falling within the confidence ranges, which indicates that there may be a little temporary increase in employment due to international tourism arrivals, but not statistically significant.

Response to D(LOGINFR*D_V2030) responds positively, peaking early and then decreasing off; this suggests that spending on tourism infrastructure has a significant short-term effect on job creation, particularly under Vision 2030.

LOGPINV response is flat and close to zero, remaining within the error bands. This indicates that public investment expenditure has no immediate impact on employment; this might be because of indirect or lag-related transmission. Finally, the response to the (LOGDECP) is slightly positive, but not statistically significant. This suggests that the consequences (LOGDECP) of shocks on employment may be limited or delayed.

**Figer 2: Impulse Response**




## 5. CONCLUSIONS:

The study's main objective was to investigate the short-run and long-run dynamics of employment in Saudi Arabia, which is driven by tourism, using empirical data to assess the industry's influence on the domestic labour market. Tourist arrivals, tourism infrastructure, public expenditure, private sector capital expenditure, and Vision 2030 structural reforms were among the key determinants that were empirically examined using Autoregressive Distributed Lag (ARDL) bound testing and the associated error correction model

The model proves a stable long-run co-integrating relationship among the study's variables, supported by the F-Bounds test (F = 10.150), a statistically significant error correction term confirming convergence toward long-run equilibrium, diagnostic tests revealed a high R-squared of 0.9985, a low standard error (0.0056), and a decent AIC (-7.321), suggesting strong model fit.

The long-run dynamics showed a steady cointegration between the key determinants and job creation within the Saudi tourism sector, representing significant evidence for the Saudi tourist-led employment assumption. The tourist arrivals with elasticity 0.664 and $p>0.01$ showed a significant positive effect on employment generation, indicating that international tourist arrivals is an important driver of the labour market expansion. The infrastructure investment under Vision 2030 ($\Delta$(LOGINFR × D_V2030) illustrates the slightly significant positive effect of investment under Saudi Vision 2030($p=0.064$). This highlights how the infrastructure, in a steady manner, maximizes the chances of employment.

The results reveal a negative long-run relationship between public investment expenditure and tourism employment, with a coefficient =-0.228 and $p<0.01$. This outcome may be explained by the crowding-out effect or the inadequate use of resources, even if the objective of the public investment expenditure strategy is always to guarantee the creation of jobs in the tourist sector.

One of the most significant factors influencing long-run employment growth is domestic capital investment in the private sector, as evidenced by a coefficient = 0.179 and $p<0.01$, which shows the private sector's role in the labour market dynamics and job creation.

The short–run results showed a positive, statistically significant effect of international tourist arrivals on job creation in the tourism sector, estimated at 0.575% for each 1% change in tourists' arrivals. The lagged effect (0.098) also showed a positive and significant effect, suggesting that the impact extends beyond the initial period. Infrastructure investment under Vision 2030 and according to the second difference showed a short–run positive impact on employment estimated at (0.006), although its lag presented a negative impact (-0.002), indicating that large-scale infrastructure projects may cause spin or delayed benefits. The short-run results also showed a negative lagged term (-0.086) of the private investment flows, indicating adjustment costs in the private sector operations. Additionally, there is corrective behavior exposed by the large negative change in employment (-0.195)

In light of the study results, Saudi Arabia's tourist sector is rapidly growing as a major source for job creation. Short and long-run employment is significantly and consistently impacted by tourist arrivals, and private sector investment expenditure is vital to maintain growth. Vision 2030 infrastructure projects have made a significant difference, though their benefits may take years to manifest. Public investment expenditure has a detrimental impact on jobs in the tourist industry, likely as a result of inefficiencies or the crowding out of private initiatives. Based on these findings, public investment expenditure to be focused. Private sector involvement requires being promoted and better aligning infrastructure timelines with labour market readiness. Real-time employment monitoring and flexible policies will be crucial for managing short-run volatility and transition costs. Research that considers regional and gender dimensions will help ensure tourism-led employment growth.

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