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Modelling the Sustainable Link Between Tourism and Economic Development in Africa

Manuchehr IRANDOUST[1]
Independent Researcher, Mellbystrand, Sweden
https://orcid.org/0000-0003-0447-9349

Ghada Gomaa MOHAMED
Global Forward Academy, USA
https://orcid.org/0000-0002-2598-5710

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Abstract

This study examines the link between tourism and economic growth in four African nations from 1995 to 2019, aligning its findings with the United Nations Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure). The research employs a three-step methodology. First, a likelihood-based panel cointegration method identifies long-term relationships. Second, an ARMA intervention model determines the variable that best fits the model. Third, the bootstrap panel Granger causality test, accounting for structural breaks, explores causal relationships. The findings confirm a long-term association between tourism and economic growth, though the magnitude varies across countries. The study highlights the need for sustainable tourism policies and targeted export-oriented initiatives to stimulate economic growth while supporting SDG 12 (Responsible Consumption and Production) by addressing tourism's economic and environmental impacts.

Keywords: tourism; economic growth; SDGs; ARMA; likelihood-based panel cointegration; Africa.

JEL Classification: O47; Z3; Z32.

Introduction

Prior to its recent finding as a potential source of economic growth and the eradication of poverty in developing economies, tourism was widely perceived as a luxury enjoyed by the

[1] Corresponding author

wealthy and well-off (World Travel & Tourism Council or WTTC, 2019; United Nations Conference on Trade and Development or UNCTAD, 2013). Numerous governments have invested in the tourism sector as a result of the finding. As per UNCTAD (2013), the significance of tourism in fostering economic expansion and eliminating poverty stems from its ability to encompass a wide range of stakeholders. These include the government, which designs desirable policy and regulatory interventions and delivers infrastructure, as well as businesses in the private sector that develop the platform and tourism industry.

According to UNCTAD (2013), the complex arrangement and structure of these tourist stakeholders creates links with all other economic sectors, fostering economic expansion and diversity. Because of this intricacy, small enterprises are also able to participate significantly in tourism-related activities, fostering equitable growth and sustainable economies. An economy's balance of payments situation can also be strengthened by tourism exports, which also contribute to general macroeconomic stability. Being a significant source of foreign exchange reserves, particularly for economies that rely heavily on tourism, it can assist in reducing any current account deficit by offsetting a trade deficit through increased earnings from services exports.

Economic growth and employment opportunities are thought to be achievable from the tourism industry as well. The WTTC (2020) estimates that the tourism industry contributed roughly 10.3% of GDP and 10.3% of all jobs to the world economy. The pandemic had a significant negative impact on the tourism industry, and in 2020, tourism's GDP contribution dropped to 5.3%. This percentage increased to 6.1% in 2021 and the Travel and Tourism GDP may reach 2019 levels in 2024, indicating the tourism sector's resiliency (WTTC, 2022). It is anticipated that this industry would provide up to 126 million new employments during the next ten years. These figures demonstrate that the tourist sector contributes to national development by boosting output and generating both direct and indirect jobs. Because of this, there is a great deal of interest in comprehending how tourism and growth are related.

The Tourism-Led Growth Hypothesis (TLGH), which holds that the growth of the tourism industry spurs economic growth, has been the focus of extensive study. It is acknowledged that the work by Balaguer & Cantavella-Jordá (2002) was the first to analyse the TLGH. The export-led growth hypothesis (ELGH), which contends that increasing exports can spur economic growth, can theoretically be used to derive the TLGH (Balassa, 1977; Krueger, 1980). Exports support economic growth by fostering technological advancement that can raise total factor productivity and by supplying foreign exchange, which is required to acquire capital goods for manufacturing (McKinnon, 1964).

In order to help countries move from primary industry-based economic activities like agriculture to services-oriented sectors like export revenue, tourism serves as a diversification agent (Signe, 2018). Due to its low levels of input requirements, capital injections, and overall expertise, tourism contributes to economic growth and diversification much more easily than other sectors like manufacturing (World Bank, 2011; Signe, 2018). As a result, tourism is a desired economic booster in developing nations since it fosters cross-cultural communication, creates jobs, and attracts investment. However, there are expenses related to tourism that are social, economic, and environmental (Palmer & Riera, 2003). The rise of the tourism industry may actually impede economic growth if the drawbacks of the industry outweigh the advantages.

Research on the relationship between tourism and growth has increased dramatically in the previous few decades. Both in developed and developing nations, a great deal of research has been done on the significance of growth and the factors that influence it. The body of research has shown that tourism plays a significant role in determining economic growth. Due to the many benefits, it offers, including increased employment, foreign exchange production, household income, government revenue through multiplier effects, improved balance of payments, and an increase in the number of government policies supporting tourism, the importance of tourism has grown exponentially.

As noted by Pablo-Romero & Molina (2013) and Brida et al. (2016), a growing number of empirical research have been conducted since the ground-breaking work with the goal of determining whether there is a cointegration and causal relationship between tourism and economic growth. Both time series analysis and panel data have been used in many of this research to evaluate the TLGH. Furthermore, the TLGH study is more global and the conclusions can be utilized as general growth recommendations because the panel data comprises a bigger sample of countries. Subsequent to this investigation, numerous scholarly works have been released concerning the TLGH. These include the works of Castro-Nuño et al. (2013), Pablo-Romero & Molina (2013), Brida et al. (2016), Li et al. (2018), Chingarande and Saayman (2018), Comerio & Strozzi (2019), Ahmad et al. (2020), Fonseca & Sánchez-Rivero (2020), and Nunkoo et al. (2020).

The bulk of these review studies demonstrate that even after a thorough investigation of the connection between tourism and economic growth, the findings are still unclear. A considerable number of studies (Katircioglu, 2009; Ozturk & Acaravci, 2009; Brida et al., 2011; Tang, 2011) showed no substantial association between tourism and economic growth, whereas many others (e.g., Mitra, 2019; Albaladejo, et al. 2023) found evidence in support of the theory.

These discrepancies in the findings appear to be caused by the use of various econometric techniques, the variables selected to gauge economic growth and tourism, as well as country-specific elements like the importance of tourism to the nation's overall economy or degree of economic development. The variables employed to indicate the relationship between economic growth and tourism may potentially have an impact on the empirical analysis's findings (Castro-Nuño et al., 2013; Rosselló-Nadal & He, 2019; Fonseca & Sánchez-Rivero, 2020).

However, current research suggests that the validity of the TLGH depends on national characteristics, including the degree of economic and tourism growth (Pablo-Romero & Molina, 2013; Enilov & Wang, 2021). But most of these studies focus on developed and developing economies in Asia and Latin America, therefore developing economies in Africa receive less attention. Since Africa has so many natural resources (beaches, wildlife, cultural history, and adventure opportunities) it has a particularly high potential for tourist market expansion and the growth it brings (Signe, 2018; Nyasha, et al., 2020).

This study aims to re-examine the relationship between tourism and economic growth in four African nations between 1995 and 2019 utilizing the multivariate likelihood-based panel cointegration, an ARMA (autoregressive moving average) intervention model, and the bootstrap panel Granger causality. Our control variables include trade openness, political stability, and foreign direct investment. Using the likelihood-based panel cointegration method has the benefit of solving the normalization problem and relaxing the need for a unique cointegrating vector. For inference in panel-vector autoregressive (VAR) models, the estimate procedure is an asymptotic theory of likelihood-based panel test of the cointegrating rank that supports multiple cointegrating vectors (Larsson et al., 2001).

To deal with causality, the bootstrap panel Granger Causality approach, developed by Konya (2006), is applied to the variables in the presence of structural breaks. Comparing this method to traditional panel causality methodologies, there are some advantages. First, as long as the variables are used at their levels and no stationarity constraints are applied, there is no need to test the unit root or cointegration. Second, given the contemporaneous correlations across nations (i.e., the equations indicate a Seemingly Unrelated Regressions system or SUR system), more panel data can also be gathered.

To the best of the authors' knowledge, this study is the first to examine the relationship between tourism and economic growth in four African countries using likelihood-based panel cointegration. Additionally, an ARMA intervention model was employed to investigate the impact of tourism on the time path of economic growth, as well as causality analysis in the presence of structural breaks.[2]

The following is how the paper is organized: Section 1 describes data and methodology, in Section 2 the empirical findings and discussions are presented, and the conclusion is given in Section 3.

1. Data and Methodology

The sample consists of four major tourism countries in Africa from 1995 to 2019: Egypt, Morocco, Tunisia, and South Africa. The chosen nations receive the largest number of international tourists' arrivals in Africa in 2019 (Statista, 2024). The availability of the data dictates the selected time frame. The data was limited to 2019 because of COVID-19. The variables are real per capita GDP, RGDPC, (constant 2015 US$) is as indicator of economic growth, international tourism receipts, ARRX (% of total exports), and number of international tourist arrivals per capita, NAC, (the value is divided by the population of the country making it per capita) which denotes the level of specialization in tourism. Furthermore, international tourism receipt can be used to assess how specialized, concentrated, and reliant on tourism the nation is. As a result, the indicator offers an alternative way to evaluate tourism.

Trade openness (TO), political stability (POLST), and net inflows of foreign direct investment (FDIY) are used as control variables. Trade openness represents the proportion of goods and services that are imported and exported in relation to the GDP. FDI represents net inflows as a percentage of GDP. Political stability and absence of violence/terrorism measures people's beliefs about the probability of political unrest. Since the value of political stability was missing in 1996, 1998, and 2000 for all countries in the sample, this variable was filled by mean imputation. The World Bank is the source of the variables[3]. Figures 1 -4 and Tables 1 display the time plot of the variables and descriptive statistics, respectively.

[2] The standard residual-based cointegration tests, e.g., Kao (1999), Pedroni (1999) don't have these features.
[3] The Central Bank of Egypt provided the variable for FDI, which was missing in 2011 for Egypt.

Figure 1. Time plot of the variables, Egypt

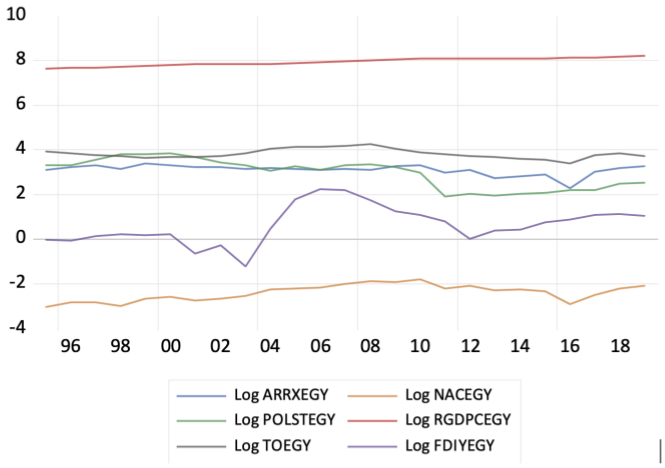

Figure 2. Time plot of the variables, Morocco

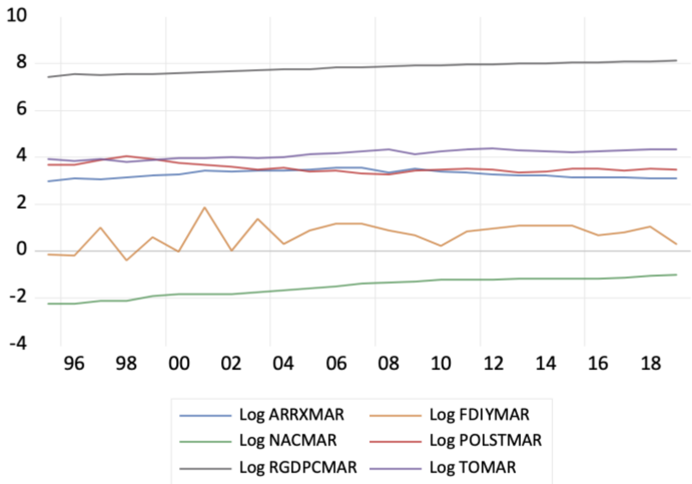

Figure 3. Time plot of the variables, South Africa

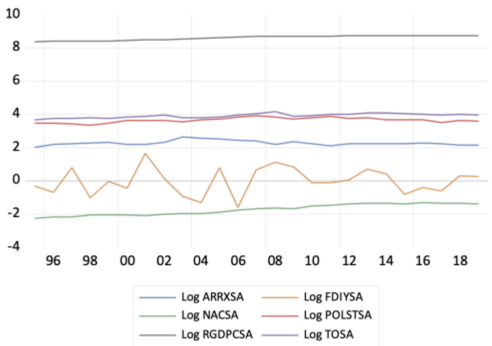

Figure 4. Time plot of the variables, Tunisia

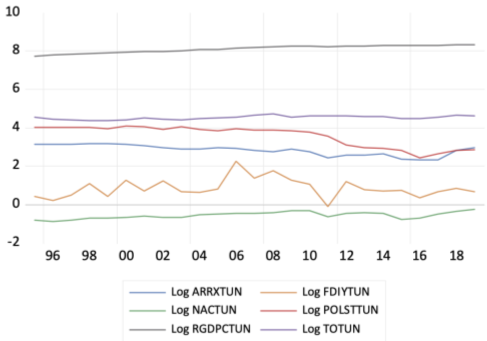

Table 1: Descriptive statistics of the variables, 1995-2019, n = 25 for each country

Variable	Mean	S.D.	Skewness	Kurtosis
DIYEGY	2.642	2.423	1.659	4.870
ARRXEGY	22.904	4.416	-1.145	4.425
NACEGY	0.096	0.033	0.361	2.236
TOEGY	46.759	10.312	0.846	2.915
RGDPCEGY	2,860.570	487.560	-0.091	1.625
POLSTEGY	23.060	12.981	0.297	2.024
FDIYMAR	2.290	1.248	1.346	5.940
ARRXMAR	26.993	4.593	0.265	1.875
NACMAR	0.230	0.082	-0.128	1.594
RGDPCMAR	2,534.792	526.002	-0.007	1.636
TOMAR	63.489	11.159	-0.133	1.487
POLSTMAR	35.641	7.518	1.347	4.370
ARRXTUN	17.594	4.502	-0.194	1.916
FDIYTUN	2.702	1.752	2.512	9.950
NACTUN	0.574	0.100	0.259	2.071
TOTUN	92.540	9.166	0.339	2.484
RGDPCTUN	3,381.818	590.847	-0.416	1.715
POLSTTUN	40.276	17.102	-0.576	1.618
RGDPCSA	5536.722	707.791	-0.406	1.468
NACSA	0.187	0.059	0.155	1.403
ARRXSA	9.905	1.505	1.343	4.221
TOSA	51.115	6.569	0.083	2.397
FDISA	1.332	1.142	1.921	7.250
POLSTSA	39.241	5.797	0.112	2.357

Researchers have generated a large body of literature showing the detrimental consequences of political instability on a variety of macroeconomic factors, such as inflation, GDP growth, and private investment. Asongu et al.'s study (2022) considers the governance dynamics of political stability and the rule of law to make the case that both tourist receipts and expenditures can have a favourable impact on economic development when these conditions are met. We can apply the following model in light of the previously provided background:

$$log(RGDPC)_{it} = \alpha_{0t} + \beta_{1i}log(NAC)_{it} + \beta_{2i}log(ARRX)_{it} + \beta_{3i}log(TO)_{it} + \beta_{4i}log(FDIY_{it}) + \beta_{5i}log(POLST)_{it} + \varepsilon_{it}, \quad i = 1,\ldots,N, \text{ and } t = 1,\ldots,T \quad (1)$$

where: *RGDPC* is real GDP per capita, *NAC* is international tourism arrival per capita, *ARRX* is international tourism receipt (as a percentage of total exports), *TO* is trade openness, *FDIY* is the net inflows of FDI as a percentage of *GDP*, and *POLST* is political stability, the cross-sectional dimension and the time dimension are indicated by the indexes i and t, respectively, and ε is a well-behaved error term.

When conducting the analysis, two distinct variables (NAC and ARRX) were taken into account: the proportion of arrivals to the export and the percentage of arrivals relative to the population, which determines tourism specialty. These two metrics offer distinct insights into a destination's tourism development. The investigation is carried out in three steps. First, unlike previous studies, panel cointegration based on likelihood is employed. The second step involves using an ARMA intervention model to determine which significant variable best fits the model. Third, the bootstrap panel Granger causality in the presence of structural breaks is investigated for the sample countries.

The likelihood-based panel framework developed by Larsson and Lyhagen (1999) and Larsson et al. (2001) is applied to estimate the process.[4] Unlike the typical residual-based testing of cointegration methodology, this method relaxes the assumption of a unique cointegrating vector and the normalization problem. Let the *p*-vector of variables for group *i* at time *t* be given by $y'_{it} = \{y_{i1t}, y_{i,2t}, \dots, y_{ipt}\}'$ and define $Y_t = \{Y'_{1t}, Y'_{2t}, \dots, Y'_{Nt}\}'$ as the *Np*-vector of the panel of observation available at time *t* on the *p* variables for the *N* groups. By following Larsson et al. (2001), Larsson & Lyhagen (1999), we can write in a compact manner as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{k=1}^{m-1} \Gamma_k \Delta Y_{t-k} + \varepsilon_t, \qquad (2)$$

where: ε_t is assumed to be multivariate normally distributed with mean zero and covariance matrix $\Omega = \{\Omega_{ij}\}$. Then consider the reduced rank specification of the panel model, where the matrix Đ is of rank $\sum ri, 0 \le r_i \le p$ specified as $\Pi = AB'$, where the matrices A and B are both of order $Np \times \sum ri$ given by $A = \{\alpha_{ij}\}$ and $B = \{\beta_{ij}\}$ such that *A* contains the short-run coefficients and *B* the long-run coefficients.

This method allows for heterogeneous long-run cointegration relationships within each group by modelling the long-run interactions between many variables for a panel of groups simultaneously. Cointegrating relations are allowed only inside each of the N countries; nonetheless, the model allows significant short-run dependency between the panel groups.

We are interested in two possible hypotheses based on the panel model mentioned above. The rank of the panel group-specific matrices Π is taken into account in the first hypothesis. The null hypothesis $H_0: rank\,(\Pi_i) = r_i \le r,\ \forall_i = 1, \dots, N$ is tested against the alternative: $H_1: rank\,(\Pi_i) = p,\ \forall_i = 1, \dots, N$ using the likelihood test ratio. The asymptotic distribution of the test is shown in Larsson and Lyhagen (1999). Given the assumption of equal rank, it is of interest to test the null hypothesis: H_0: $\beta_1 = \beta_2 = \cdots = \beta_N$, against the alternative: H_1: $\beta_i \ne \beta_j$ for some $\beta_i \ne \beta_j$. The test statistic is again a likelihood ratio test statistics and is asymptotically x^2distributed with *(N-1)r(p-r)* degrees of freedom[5].

With respect to the causality, since there are two distinct measures of tourism (number of arrivals per capita and tourism receipt as a percentage of export), we use Enders (1995)'s intervention model ARMA to identify the most important variable. The intervention ARMA model for X is described by the following equation[6]:

$$growth_{jt} = \propto + A(L) growth_{j(t-1)} + c(X)_{jt} + \beta(L)\varepsilon_{jt} \qquad (3)$$

where: *j* refers to the country in the analysis, *t* refers to the time, *X* is intervention variable either log(ARRX) or log(NAC), ε is a white noise disturbance term, $A(L)\ [1 + a_1L + a_2 L^2 + \dots + a_qL^q]$ and $B(L)[1 + b_1L + b_2L^2 + \dots + b_qL^q]$ are polynomials in lag operator *L*. The conventional augmented Dickey-Fuller test is used to assess each country's growth series for unit root, accounting for the intercept.

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[4] It is based on Johansen's (1995) maximum likelihood approach.
[5] Further applications of the likelihood-based panel cointegration can be found in Irandoust & Ericsson (2005), Irandoust (2019).
[6] Further applications of the intervention ARMA model can be found in Mohamed & Irandoust (2022).

The best fit model for each nation is investigated using the least squares (LS) regression method. This is accomplished by choosing the diagnostic tests together with the lowest AIC and SC criteria, as well as the highest adj R2. The presence of autocorrelation is also examined in the best fit intervention model. To perform the panel analysis of the intervention, we create new autoregressive terms. We also carry out the growth forecasts for each nation and panel.

We apply Kónya's (2006) approach based on the seemingly unrelated regression systems (SUR) estimation and identification of Wald tests with country-specific bootstrap critical values. The following is a compact form of this procedure:

$$y_{it} = \alpha_{1,i} + \sum_{s=1}^{ly1} \beta_{1,,i,s}\, y_{i,t-s} + \sum_{s=1}^{lx\,1} \delta_{1,i,s}\, x_{1,t-s} + \sum_{s=1}^{lz\,1} \theta_{1,i,s}\, z_{1,t-s} + \varepsilon_{1,i,t}, \quad (4)$$

$$x_{it} = \alpha_{2,i} + \sum_{s=1}^{ly2} \beta_{2,i,s}\, y_{i,t-s} + \sum_{s=1}^{lx\,2} \delta_{2,i,s}\, x_{1,t-s} + \sum_{s=1}^{lz\,2} \theta_{2,i,s}\, z_{2,t-s} + \varepsilon_{2,i,t}, \quad (5)$$

where: y is RGDPC, x is ARRX, z represents our control variables, i ($I = 1\ldots, N$) is the number of panel members, t is the period ($t = 1, \ldots T$), and s is the lag length selected in the system. The common coefficient is α, the slopes are β, δ, and θ while ε is error term.

To test for Granger causality in this system, alternative causal relations for each country are likely to be found: (i) there is one-way Granger causality from x to y if not all $\delta_{1,i}$ are zero, but all $\beta_{2,i}$ are zero; (ii) there is one-way Granger causality from y to x if all $\delta_{1,i}$ are zero, but not all $\beta_{2,i}$ are zero; (iii) there is two-way Granger causality between x and y if neither $\delta_{1,I}$ nor $\beta_{2,i}$ are zero; and (iv) there is no Granger causality between x and y if all $\delta_{1,i}$ and $\beta_{2,i}$ are zero. It is also allowed the maximal lags to differ across variables, but the same across equations. It is assumed that 1 to 4 lags exist. Then the combinations that minimize the Schwarz Bayesian Criterion are chosen.

Upon closer examination of the data, the majority of break dates line up with significant events like the financial crises of 1997–1998 and 2007–2008, as well as the 2001 economic downturn. These structural breaks exist, so we decide to include them in our testing model because excluding them would bias the results. We use the process used by Tsong & Lee (2011), and Enders & Holt (2012) to adjust the data as follows because Kónya (2006) cannot allow different break dates into the testing model:

$$\hat{y}_t = y_t - \hat{\alpha} - \sum_{l=1}^{m+1} \hat{\theta}_l DU_{l,t} - \sum_{i=1}^{m+1} \hat{\rho}_i DT_{i,t} - \varepsilon_{t},, \quad (6)$$

where: $\hat{y}_t$ (either *RGDPC* or *ARRX*) is adjusted by the effect of possible structural breaks, y_t is *RGDPC* or *ARRX*, m is the number of breaks, DU_t, and DT_t are defined as the following:

$$DU_{k,t} = \begin{cases} 1 & if TB_{k-1} \prec t \prec TB_k \\ 0 & otherwise \end{cases} \quad (7)$$

$$DT_{k,t} = \begin{cases} t - TB_{k-1} & if TB_{k-1} \prec t \prec TB_k \\ 0 & otherwise \end{cases} \quad (8)$$

The terms *DU* and *DT* are entered in the model to capture the sharp and smooth shifts, respectively. The panel should be checked for cross-sectional dependence and cross-country heterogeneity. The first problem means the transmission of shocks from one variable to another. In other words, all of the sample countries share comparable economic characteristics and are impacted by globalization.

The latter aspect increases the possibility that an important economic partnership in one country would not be replicated in the others. The cross-sectional dependence test (CD) proposed by Pesaran (2004, 2021) is utilized to statistically validate the existence of common shocks that impact our sample. The CD test statistic converges in distribution to a standardized normal distribution function with a null mean and unit variance based on the null hypothesis that there is no connection between the units. Monte Carlo simulations indicate that even with fixed N and T, the CD test should still perform well.

Regarding the country-specific heterogeneity assumption, the slope homogeneity tests ($\bar{\Delta}$ and $\Delta_{\bar{adj}}$) of Pesaran and Yamagata (2008) are applied. The cross-sectional dependence of the contemporaneous error terms is not taken into consideration by the panel unit root tests previously used. Results could be biased if cross-sectional dependence is not considered. This problem is thus resolved by using the cross-sectionally augmented panel unit root test (CIPS), which allows for parameter heterogeneity and serial correlation between the cross-sections (Pesaran, 2007). Given the nonstandard nature of the asymptotic distribution, the critical values of the CIPS test statistic are determined numerically. It is also important to look for unit roots in growth series separately before performing any ARMA intervention tests.

Lastly, we check to see if the basic assumptions are satisfied, i.e., if the residuals are autocorrelation-free and have a normal distribution. The multivariate Bowman-Shenton test for normality was developed by Doornik & Hansen (1994), whereas the Ljung-Box test statistics is used to look for autocorrelation. We further verify the robustness of the results and check for the presence of the usual asymptotic distributions of the Granger causality test statistics.

2. Estimation Results

We examine cross-sectional dependence and slope homogeneity assumptions. Table 2 shows the results of cross-sectional dependence test (CD) and slope homogeneity tests ($\bar{\Delta}$ and $\Delta_{\bar{adj}}$). The first cross-sectional dependence test clearly demonstrates the rejection of the null hypothesis that there is no cross-sectional dependence. In other words, this implies that in the case of our sample countries, there is a cross-sectional dependence. Any shock that occurs in one nation spreads to others. The second section of the table demonstrates the rejection of the slope homogeneity null hypothesis for both tests and all significance levels. In this instance, the economic ties between one nation and the others are not reciprocal. The cointegration tests can be applied because there are slope heterogeneity and cross-sectional dependence.

Table 2: Cross-sectional dependence and slope homogeneity tests

Method	Test statistic
Cross-sectional dependence test (CD)	28.369*** (0.001)
Slope homogeneity tests	
$\bar{\Delta}$ test	7.121***(0.000)
$\Delta_{\bar{adj}}$ test	9.104***(0.000)

Note: *** indicate significance for 0.01 levels. The numbers within parentheses show p-values; CD test shows the cross-sectional dependence tests of Pesaran (2004, 2021); $\bar{\Delta}$ and $\Delta_{\bar{adj}}$ tests show the slope homogeneity tests proposed by Pesaran & Yamagata (2008).

Table 3. Panel unit root test

Variable	CIPS statistic
log(RGDPC)	-1.296*
log(ARRX)	−1.736***
Log(TO)	−1.747***
Log(FDIY)	−2.394***
Log(NAC)	-1.470**
Log(POLST)	-1.833**

Note: ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 3 indicates the cross-sectionally augmented (CIPS) test results. We only include a constant term after reviewing the data (it can possibly be because of measurement errors). The common lag length was set to three when determining the ideal lag length using the Schwartz criterion. According to the table, every variable appears to be in favour of the panel non-stationarity null hypothesis (exception is RGDPC which is significant at 10%). Furthermore, take note that our method does not rule out the inclusion of stationary variables. One stationary variable causes the rank order in the system to grow by one.

Table 4. Test for the cointegrating rank

H_o	ACV [a]	BCV [b]	$-2\log Q_T$
R=0	*526.16*	*657.58*	685.13
R≤1	*274.37*	*528.19*	430.42
R≤2	*126.10*	*295.26*	194.51

Note: [a] is the asymptotic critical values at 5% significance level; [b] refers Bartlett corrected critical values at 5% significance level.

Tables 4 presents the results of the likelihood ratio tests. The sample mean is ascertained by using the estimated model as a data-generating approach to obtain the Bartlett adjusted critical values. The test accepts the null of the 1 cointegrating vector but rejects the null of the 0 cointegrating rank using the Bartlett adjusted critical values. Since the panel cointegration tests show that the common cointegrating rank is one, it is interesting to estimate the cointegrated vectors. Note that if we use the asymptotic critical values, the estimated rank is 2. The estimated cointegrating vectors that have been adjusted for RGDPC are shown in Table 5.

Table 5: Cointegrating vectors normalized on (log)RGDPC

Variable	Egypt	Morocco	Tunisia	South Africa
(log)*RGDPC*	-1.000	-1.000	-1.000	-1.000
(log)*ARRX*	3.752	2.619	2.533	4.785
(log)*NAC*	0.402	0.258	0.074	0.346
(log)*FDI*	0.627	0.093	0.521	0.064
(log)*TO*	0.016	0.955	0.769	5.368
(log)POLST	4.257	3.429	1.945	0.072

RGDPC and ARRX exhibit a positive association in the study countries, as Table 4 illustrates. This suggests a long-term link between economic growth and tourism receipts. All nations except Tunisia exhibit favourable relationships between RGDPC and NAC. With the exception of Morocco and South Africa, FDI has a positive relationship with RGDPC. Trade openness and RGDPC have a positive relationship, with the exception of Egypt. All countries, except South Africa, indicate that RGDPC has a positive relationship with political stability. However, the criteria' magnitude vary from country to country. Additionally, we obtain a test result of 10.906 with a matching p-value of 5.3% when we run the likelihood ratio test to identify a common cointegrating vector that accepts the common cointegrating vector (1.000, 0.847). The findings of the diagnostic testing are shown in Table 6. The normality null hypothesis is rejected, and increasing the number of lags would not solve the issue. The p-value shows that the autocorrelation is not problematic.

Table 6. Diagnostic tests for likelihood-based panel cointegration

Normality[b]	Autocorrelation[c]
0.332	0.721

Notes: The table reports the p-values; [b] - test is a multivariate extension of the Bowman–Shenton test developed by Doornik & Hansen (1994); [c] - is the Ljung–Box test statistics for autocorrelation.

Before running an ARMA intervention test, we check for unit roots of growth series separately using the ADF test. Table 7 displays the test results, which reveal that there are no unit roots. The best fit intervention ARMA model is presented in Table 8 for each nation and for a panel of four countries. The regression was performed using the LS (least square) method. Based on the diagnostic checks, lowest AIC and SC criteria, and highest adj R2, the best fit model for each country was chosen. We also looked for potential autocorrelation in the best-fit intervention model. It was found that none of the four best fit models showed any signs of autocorrelation. To determine which intervention model best fits each nation, we carried out ARMA up to (5,5). As the findings show, there is a significant relationship between RGDPC and ARRX (NAC was not as significant as ARRX, according to the results of the ARMA intervention model, which aren't presented here). We created new autoregressive terms in order to perform the intervention panel analysis. The sample countries and panel forecasts of the best fit model are shown in Figures 5-14.

Table 7: Unit root test for the dependent variable for the 4- countries using Augmented Dickey-Fuller Unit root test with the intercept

Country	T-statistics	P values
Egypt	-3.246459	(0.0313)
Morocco	-11.58551	(0.0000)
Tunisia	-3.286169	(0.0276)
South Africa	-2.676102	(0.0933)

Table 8. The summary of the best-fit intervention ARMA model for each country and panel.

Variable/country	Egypt	Morocco	Tunisia	South Africa
Intercept	-0.071582 (0.0808)	-0.110060 (0.0204)	-0.114303 (0.0032)	-0.116143 (0.0693)
log(ARRX)	+ 0.030414 (0.0239)	+ 0.041569 (0.0056)	+0.049122 (0.0006)	+0.056881 (0.0430)
AR (1)		- 0.916575 (0.0000)		
AR (4)	-0.561854 (0.0019)			
Adjusted R^2	0.389562	0.590488	0.397233	0.135839
AIC SC	-5.739738 -5.543395	-5.127726 -4.931384	-5.337889 -5.311849	-5.217125 -5.118954
Panel: $growth_t = -0.028567 + 0.015945 \log(ARRX)_t + 0.191545\, growth_{t-2} + e_t$ (0.0217) (0.0005) (0.0355) Adj R2 = 0.2119431 AIC = -5.316616 SC = -5.232161				

Notes: The LS method was used; The dependent variable is the economic growth rate (*growth*); The numbers in parenthesis indicate p values. All best fit models were tested for autocorrelation. The Q-stat. table shows no autocorrelations in the best fit model for the 4-countries.

Figure 5. The forecast of Egypt's economic growth rate series, *growthf*, based on the best-fit intervention model

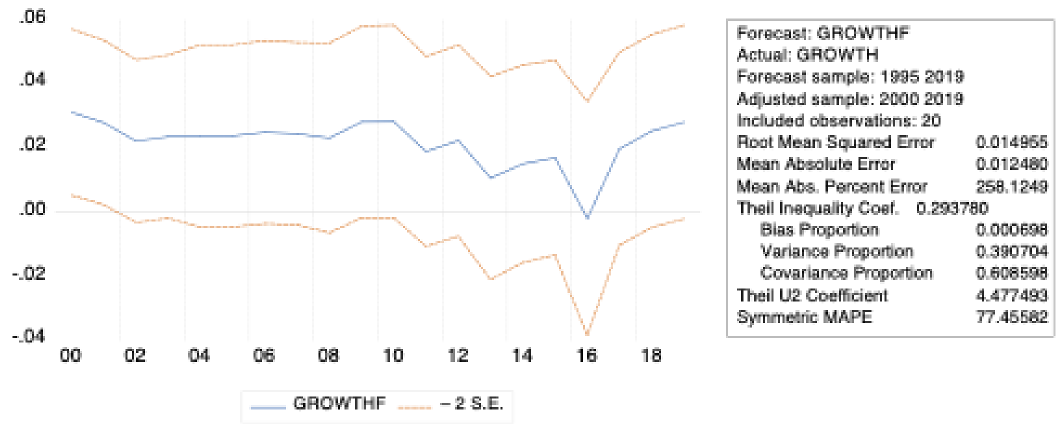


Figure 6: Comparison of Egypt's economic growth rate (*growthf*) and its forecast using the best-fit intervention model

Figure 7. The forecast of Morocco's economic growth rate series, growth, based on the best-fit intervention model

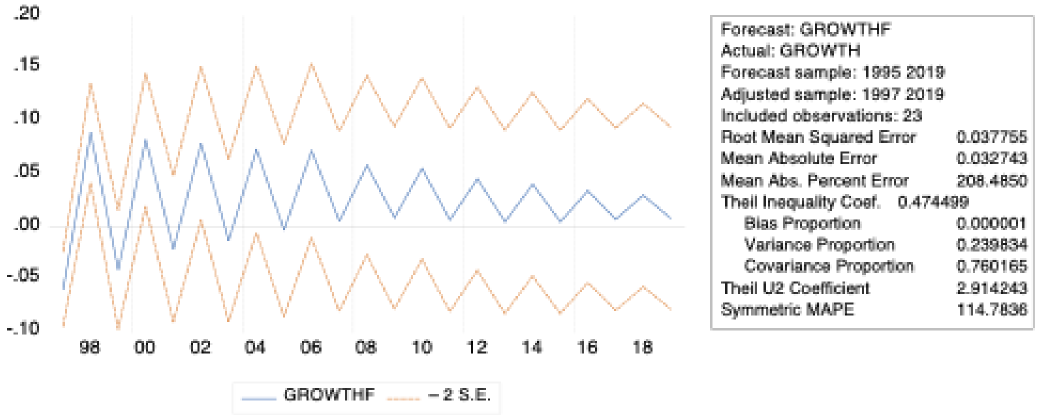


Figure 8. Comparison of Morocco's economic growth rate (*growthf*) and its forecast using the best-fit intervention model

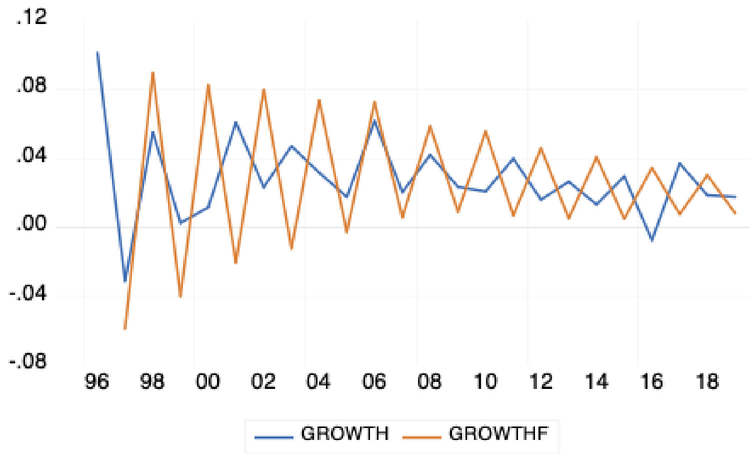


Figure 9. The forecast of Tunisia's economic growth rate series (*growthf*) based on the best-fit intervention model

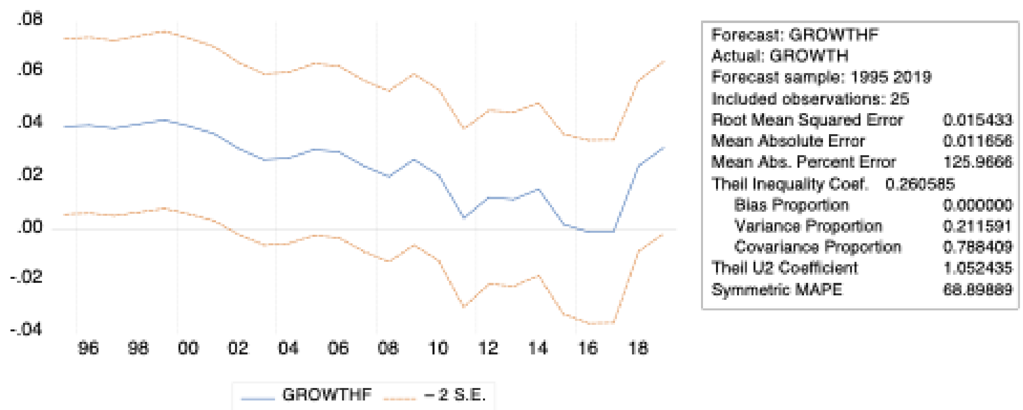


Figure 10. A comparison between the time series of the economic growth rate of Tunisia, "growth," and the forecast of the time series of the economic growth rate of Tunisia, "*growthf*," based on the best-fit intervention model

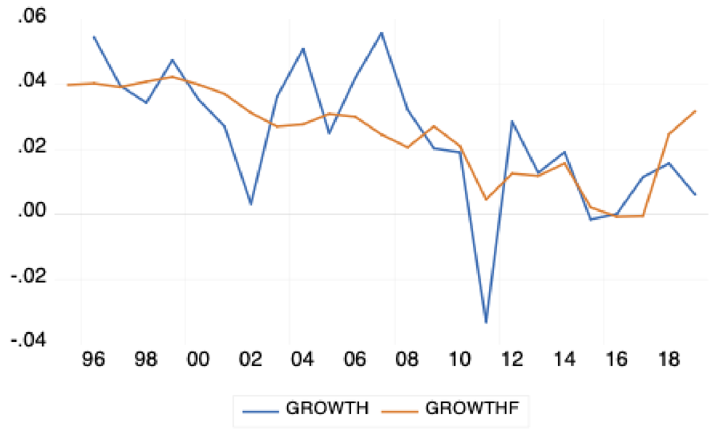


Figure 11. The forecast of South Africa's economic growth rate series, growthf, based on the best-fit intervention model

Figure 12. A comparison between the time series of the economic growth rate of South Africa (growth) and the forecast of the time series of the economic growth rate of South Africa (growthf) based on the best-fit intervention model

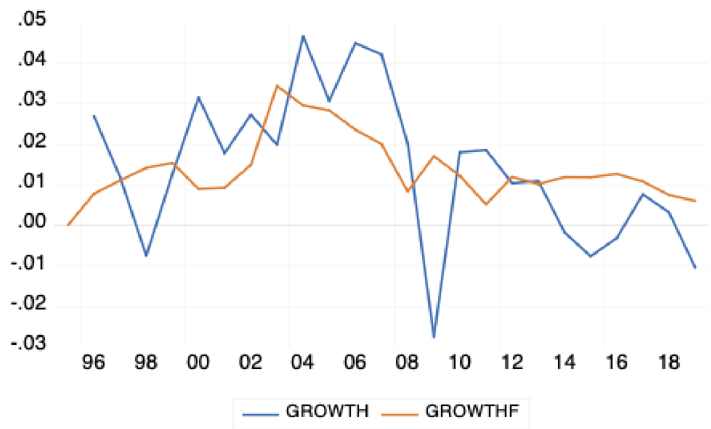


Figure 13. The forecast of the four countries' respective series of economic growth rates in a panel, (*growthf*) based on the best fit intervention model

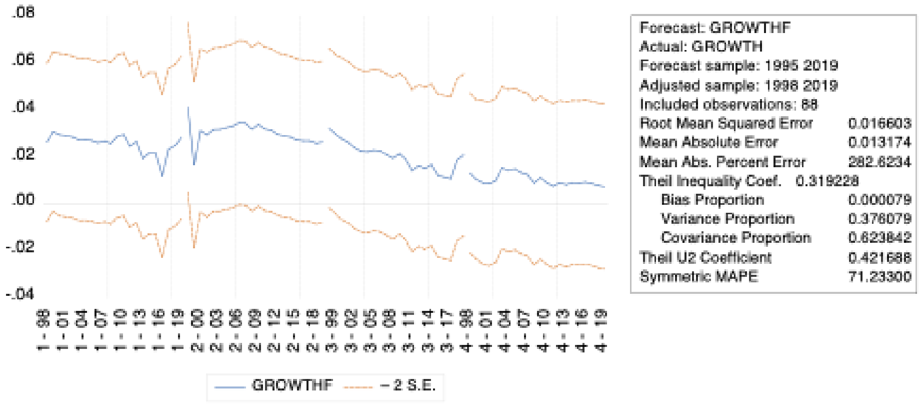
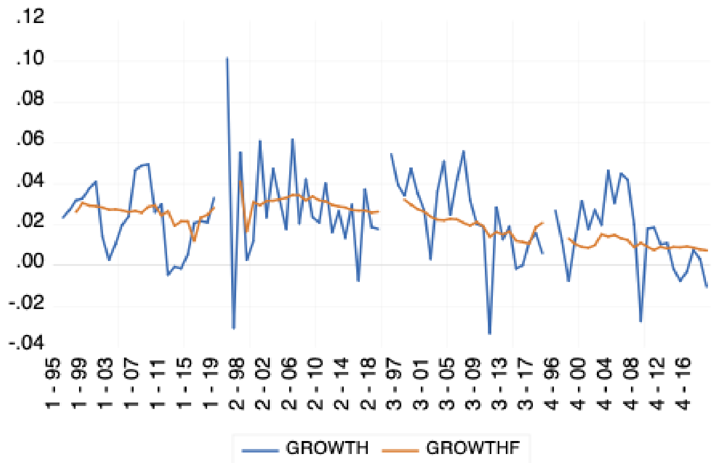


Figure 14. A comparison between the time series of economic growth rates of four nations in a panel, growth, and the forecast of the series of economic growth rate of Egypt, growthf, based on the best-fit intervention model



Since the ARMA intervention and cointegration models both suggest that ARRX is the most important variable, we estimate a causality test between RGDPC and ARRX (with control variables). Tables 9 shows the direction of causality between these two variables. With the exception of South Africa, there is a unidirectional causality that runs from RGDPC to ARRX in the sample nations. Table 10 reveals that, with the exception of Tunisia, the countries under review have a unidirectional causality that runs from ARRX to RGDPC. The tables also show that there is a bidirectional causality or feedback effect in Morocco and Egypt. The level of significance differs from nation to nation. We also verified the robustness of the results and made sure the Granger causality test statistics have the usual asymptotic distributions[7].

[7] It is known that there is non-trivial limiting behavior for the Wald statistic with cointegration (or causality) and stochastic trends (Toda and Phillips 1993). When an asymptotic distribution of a test statistic is not continuous with respect to disturbances in the process of generating data, bootstrap is likely to be inconsistent in the absence of a well-behaved asymptotic distribution (Horowitz, 2001). If the test statistic's asymptotic distribution is dependent on the parameters of the data generation process, then the bootstrap distribution could deviate significantly from the latter. For imposing constraints on the

Table 9: The bootstrap panel Granger causality results

Country	Coef. value	Wald test	Bootstrap critical value		
			1%	5%	10%
H0: *RGDPC* does not Granger cause *ARRX*					
Egypt	0.925	29.206***	27.836	14.849	9.037
Tunisia	0.732	18.159 **	32.427	17.056	11.382
Morocco	0.604	13.912**	20.793	11.251	7.176
South Africa	0.163	5.943	18.950	10.414	6.378

Notes: **, and *** indicate significance at the 0.05 and 0.01 levels, respectively; Bootstrap critical values are obtained from 10,000 replications.

Table 10: The bootstrap panel Granger causality results

Country	Coef. value	Wald test	Bootstrap critical value		
			1%	5%	10%
H0: *ARRX* does not Granger cause *RGDPC*					
Egypt	0.475	6.985*	19.226	11.392	6.428
Tunisia	0.248	5.157	23.582	13.739	7.391
Morocco	0.856	31.528 ***	25.937	14.623	8.789
South Africa	0.619	19.762***	17.572	9.135	5.893

Notes: *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively; Bootstrap critical values are obtained from 10,000 replications.

The primary empirical conclusion is that there is a cointegration and causality between economic growth and tourism, which is in line with a lot of previous research. The underlying mechanisms driving the beneficial relationship between tourism and economic growth may be attributed to expansionary fiscal policy or appreciation of the exchange rate, both of which can happen when the number of foreign visitors to the country rises. An increase in government investment on infrastructure projects like new highways and airports may result from more tourism. Investments of this kind raise the economic activity level. Lastly, a significant factor is supplying limits. A price increase brought in by an increase in foreign tourism in the host sector draws in additional capital. The GDP and economic level rise as a result of the need for more workers, land, and equipment when capital is increased.

Conclusion

In this study, we have tried to address the aforementioned concerns by examining the relationship between tourism and economic growth. As stated in the introduction, this relationship suggests, in line with export-led development theory, that foreign tourism promotes growth in two ways according to the literature on growth. First and foremost, increasing efficiency by fostering competition between domestic industries and overseas locations.

parameters of a VAR (k), where k is the lag length of the system, Toda and Yamamoto (1995) and Yamada and Toda (1998) employ a modified Wald test (MWald). An asymptotic chi-square distribution is seen in this test when a VAR (k+dmax) is computed (where dmax is the maximum order of integration suspected to occur in the system). However, the results support our conclusions regarding the direction of causality.

Second, by making it easier for nearby businesses to take advantage of economies of scale. The positive association between tourism and economic growth could be explained by either an appreciation of the currency rate or an expansionary fiscal policy, which both occur when international visitors to the nation increase.

Analysis is done on annual data from 1995 to 2019 that covers the economy of four countries in Africa: Egypt, Tunisia, Morocco, and South Africa. This is the first study to investigate the relationship between tourism and economic growth in Africa using likelihood-based panel cointegration, ARMA intervention model, and the bootstrap panel Granger causality in the presence of structural breaks. As control variables, FDI, trade openness, and political stability were also included in the cointegration and causality tests. Based on the cointegration findings and the forecasting model, the tourism receipts as a proportion of export is the most important variable. Consequently, we evaluate the relationship between the receipts from tourism and real GDP per capita. The evidence indicates a causal association between the variables in the nations under study. Although there is considerable cross-country diversity in the data, the strength of this relationship differs from country to country.

The study suggests that the sample countries should undertake export-oriented tourism efforts and favourable tourism policies in order to stimulate economic growth, which will subsequently positively benefit international tourism. These policies may offer export-related subsidies and incentives to this industry.

Future research should focus on sectoral composition in order to more thoroughly analyse the factors driving both economic growth and tourism, as this is one of the study's primary flaws. It would be more intriguing to see an analysis that breaks down both variables by sector. Another limitation of our methods is that they do not take into account non-linearity. These concerns must to be taken into account in future research on the connection between tourism and economic growth.

Credit Authorship Contribution Statement

Both authors contributed equally to all aspects of this work, including the conceptualization, methodology, data analysis, writing, and review of the manuscript. Both authors have read and approved the final version of the manuscript and agree to take responsibility for the accuracy and integrity of the work.

Conflict of Interest Statement

There is no conflict of interest to declare.

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