

Isiaka Akande Raifu

# Is the Tourism-Led-Growth Hypothesis Valid in the Presence of Structural Breaks? Evidence from DKW's Panel Structural Break Method

## Abstract

This study revisited the tourism-led growth hypothesis (TLGH) in the presence of structural breaks using the structural break technique of Ditzen et al. (2021). To estimate the impact of tourism on economic growth along the identified structural breaks, we employed Fixed Effects and Feasible Generalised Least Squares methods. Findings showed four structural break dates (1999, 2004, 2009 and 2014), two of which coincided with the Global Financial Crisis (2008-2009) and the Ebola outbreak (2014). Despite the presence of structural breaks, the TLGH remains valid.

*Keywords:* tourism, economic growth, structural breaks

## 1. Introduction

A sizable number of studies have been conducted theoretically and empirically to examine the validity of the tourist-led growth hypothesis (TLGH) for various countries, starting with Balaguer and Cantavella-Jorda's (2002) investigation of the growth effect of tourism in Spain. The export-led growth hypothesis (ELGT) of Balassa (1978) serves as the theoretical foundation for testing TLGH. Using two estimation strategies—causal and impact analyses—the tourism economists and others have empirically tested the TLGH's validity in panel or country-specific studies. However, findings remain inconclusive (Gwenhure & Odhiambo, 2017)

Consequently, this study revisits TLGH in the presence of structural breaks using panel data from 134 countries. This study is motivated by recent global events like the Global Financial Crisis (GFC), the Ebola Outbreak, and the COVID-19 pandemic, which significantly affect the travel and tourism industry and the global economy. For instance, the COVID-19 pandemic led to a 74% decline in international tourism arrivals globally, resulting in an estimated loss of around USD 1.3 trillion in tourism export revenues and threatening 100-120 million jobs<sup>1</sup>. Similarly, the world economy contracted by 3.11% during the pandemic<sup>2</sup>. Considering the impact of these events, this study aims to test the null hypothesis that such events do not cause structural changes in the relationship between tourism and economic growth. To test the validity of this hypothesis, the study employs a panel structural break method developed by Ditzen et al. (2021), which can detect and date multiple structural breaks in panel data. Using this method, it is also possible to estimate the effect of tourism on economic growth along the identified structural breaks using conventional panel estimation techniques. Employing the Cobb-Douglas production framework, which factors in the impact of tourism alongside labour and capital on economic growth, this study uses panel fixed effects estimation

<sup>1</sup> <https://www.unwto.org/news/2020-worst-year-in-tourism-history-with-1-billion-fewer-international-arrivals>

<sup>2</sup> World Development Indicator Database.

Isiaka Akande Raifu, PhD Student, Corresponding Author, Research Associate,  
Centre for the Study of the Economies of Africa (CSEA), Mabushi, Federal Capital Territory, Abuja, Nigeria;  
ORCID ID: <https://orcid.org/0000-0001-9677-8906>; e-mail: [heritagetihamiyu@gmail.com](mailto:heritagetihamiyu@gmail.com)

that accounts for country-and-year-specific effects. Due to the large panel data size (N and T), issues like autocorrelation, heteroscedasticity, and cross-sectional dependence arise. To address these challenges, the study utilises the Feasible Generalized Least Squares (FGLS) method, known for its efficiency in handling heteroscedasticity, cross-sectional dependence, and serial correlation by estimating a large error covariance matrix (Bai et al., 2021).

Section 2 presents the methodology and data sources. Results are presented in section 3, and section 4 concludes.

## 2. Methodology and data sources

The theoretical framework for this study is a tourism-augmented Cobb-Douglas Production Function specified as follows:

$$Y = AK^\alpha L^\beta T^\phi \quad (1)$$

Assume A is constant, and taking the natural logarithm of equation 1, we have:

$$\ln y = \alpha \ln k + \beta \ln l + \phi \ln t \quad (2)$$

For the model that can be estimated, equation 2 is transformed as follows:

$$\ln y_{it} = \phi + \alpha \ln k_{it} + \beta \ln l_{it} + \phi \ln t_{it} + \varepsilon_{it} \quad (3)$$

Where  $y$  is the output denoted by real gross domestic product,  $k$  is the capital proxied by gross capital formation,  $l$  represents labour characterised by labour force and  $t$  is tourism. For robustness, tourism is proxied by three variables (tourism expenditure, tourist arrivals and tourism receipts). We also computed the tourism index using the Principal Component Analysis from these tourism indicators. Following Raifu et al. (2021), the tourism index is normalised to range between 0 and 1. All the variables were sourced from the World Development Indicators and cover 1995 to 2020.

To account for the structural break following Ditzen et al. (2021), we assume that equation 3 has a structural break  $s$  or  $s + 1$  with regime  $i$  covering  $t = T_{i-1}, \dots, T_t$  and  $i = i, \dots, s$  with  $T = 0$  and  $T_{s+1} = T$ . Thus, the regime-wise structural break for equation 3 can be written as:

$$\begin{aligned} \ln y_{it} &= \phi + \alpha \ln k_{it} + \beta \ln l_{it} + \phi \ln t_{it} + \varepsilon_{it} \text{ for } t = T_0, \dots, T_1, \\ &\vdots \\ \ln y_{it} &= \phi + \alpha \ln k_{it} + \beta \ln l_{it} + \phi \ln t_{it} + \varepsilon_{it} \text{ for } t = T_1, \dots, T_2 \\ &\vdots \\ \ln y_{it} &= \phi + \alpha \ln k_{it} + \beta \ln l_{it} + \phi \ln t_{it} + \varepsilon_{it} \text{ for } t = T_s, \dots, T_{s+1} \end{aligned} \quad (4)$$

After identifying structural breaks, Ditzen et al. (2021) developed a method to generate series (variables) along the specified break dates. To establish the impact of tourism on economic growth along the break dates, we used the fixed effects and FGLS estimation methods.

## 3. Empirical findings

Some preliminary tests (descriptive statistics, unit root test, and cross-sectional dependence test) were conducted. However, their results are not reported here. Table 1 presents the results of structural breaks. Four break dates were found in all the models (1999, 2004, 2009, and 2014). Two of these break dates coincided

with the Great Financial Crisis (2008-2009) and the Ebola outbreak (2014). The tourism industry was affected by these two events (see World Travel and Tourism Council [WTTC], 2018).

Furthermore, we test the hypothesis of no structural break versus four structural breaks. The hypothesis of no structural break in the panel is rejected in favour of four structural breaks (4th Column Table 1). The same results are obtained when we test the hypothesis of three structural breaks against four structural breaks (see column 5 in Table 1). Thus, a structural change exists between tourism and economic growth, implying that external shocks and crises substantially impact the relationship between tourism and economic development.

**Table 1**  
*Break point dates and hypothesis testing*

S/N	Break dates	95% Confidence interval	Hypothesis testing (1) No breaks against four breaks	Hypothesis testing (3) Three breaks against four breaks
<b>Tourism expenditure-economic growth model</b>				
			supW(tau) Bai and Perron's critical value in bracket	supW(tau) Bai and Perron's critical value in bracket
1	1999	1998-2000	632.35 (6.19)	68.03(15.28)
2	2004	2003-2005		
3	2009	2008-2010		
4	2014	2013-2015		
<b>Tourist arrivals-Economic growth model</b>				
1	2000	1999-2001	697.46 (6.19)	66.41(15.28)
2	2005	2004-2006		
3	2010	2009-2011		
4	2015	2014-2016		
<b>Tourism receipts-Economic growth model</b>				
1	1999	1998-2000	545.44 (6.19)	63.54(15.28)
2	2004	2003-2005		
3	2009	2008-2010		
4	2014	2013-2015		
<b>Overall tourism-Economic growth model</b>				
1	1999	1998-2000	588.53 (6.19)	69.02(15.28)
2	2004	2003-2005		
3	2009	2008-2010		

Note. Compiled by the author. The critical values in parenthesis represent 1% level of significance.

Table 2 presents the results of the impact of tourism along the identified structural breaks. Regardless of the measures of tourism, structural breaks, and the estimation methods (Fixed Effects or FGLS), TLGH remains valid because tourism positively impacts economic growth in both the baseline parameters and parameters along the structural breaks. This implies that, despite the structural breaks, the positive impact of tourism on economic growth is unaffected. This further reinforces that tourism is essential for economic growth, like labour and capital. However, we observed that the positive effects of tourism on economic growth declined along the structural breaks. Our findings indicate that tourism continues to serve as a significant driver of economic growth; however, its impact may vary during periods of structural breaks caused by external factors. This finding is consistent with the research conducted by Raifu and Afolabi (2023), who similarly observed fluctuations in the structural relationship between tourism and economic growth in the world's top ten tourism destinations. Our findings also revealed that capital and labour positively affect economic growth in all the models. Thus, we confirm that, apart from capital and labour, tourism contributes to economic growth even during crises.

**Table 2**  
*Effect of tourism on economic growth along structural breaks*

Dependent variable	TOURISM EXPENDITURE					TOURIST ARRIVALS			
	FIXED EFFECTS		FGLS			FIXED EFFECTS		FGLS	
	RGDP	RGD	RGD	RGD		RGD	RGD	RGD	RGD
TEXP	.14*** (.005)	.135*** (.005)	.483*** (.008)	.248*** (.006)	TARIVAL	.134*** (.006)	.126*** (.006)	.162*** (.006)	.113*** (.004)
TEXP1	.131*** (.005)	.13*** (.005)	.484*** (.008)	.249*** (.006)	TARIVAL1	.125*** (.006)	.121*** (.006)	.166*** (.006)	.114*** (.004)
TEXP2	.117*** (.005)	.119*** (.005)	.484*** (.008)	.25*** (.006)	TARIVAL2	.114*** (.007)	.114*** (.007)	.17*** (.006)	.117*** (.004)
TEXP3	.099*** (.005)	.106*** (.005)	.485*** (.008)	.251*** (.006)	TARIVAL3	.096*** (.007)	.101*** (.007)	.173*** (.006)	.119*** (.004)
TEXP4	.087*** (.005)	.096*** (.005)	.488*** (.008)	.253*** (.006)	TARIVAL4	.083*** (.007)	.089*** (.007)	.175*** (.006)	.12*** (.004)
GCF		.089*** (.009)		.005 (.012)	GCF		.075*** (.01)		.032*** (.008)
LF		.303*** (.023)		.706*** (.008)	LF		.27*** (.024)		.819*** (.008)
CONS	21.431*** (.101)	16.694*** (.353)	14.746*** (.157)	8.793*** (.127)	CONS	22.353*** (.081)	18.165*** (.366)	22.194*** (.094)	10.385*** (.128)
OBS.	3484	3484	3484	3484	OBS.	3484	3484	3484	3484
R <sup>2</sup>	.823	.838			R <sup>2</sup>	.816	.827		
F-Stat/Wald test	513.58 (0.000)	535.75 (0.000)	4330.69 (0.000)	16661.05 (0.000)	F-Stat/Wald test	490.57 (0.000)	496.85 (0.000)	897.30 (0.000)	12992.13 (0.000)
Country dummy	YES	YES			Country dummy	YES	YES		
Date dummy	YES	YES			Date dummy	YES	YES		
Dependent variable	TOURISM RECEIPTS					OVERALL TOURISM			
	FIXED EFFECTS		FGLS			FIXED EFFECTS		FGLS	
	RGDP	RGD	RGD	RGD		RGD	RGD	RGD	RGD
TRECPT	.13*** (.005)	.122*** (.005)	.151*** (.006)	.13*** (.004)	OTOURISM	.132*** (.005)	.123*** (.005)	.183*** (.006)	.152*** (.005)
TRECPT1	.125*** (.005)	.12*** (.005)	.154*** (.006)	.132*** (.004)	OTOURISM1	.127*** (.005)	.122*** (.005)	.174*** (.006)	.146*** (.005)
TRECPT2	.112*** (.005)	.11*** (.005)	.156*** (.006)	.133*** (.004)	OTOURISM2	.114*** (.005)	.112*** (.005)	.165*** (.006)	.139*** (.005)
TRECPT3	.095*** (.006)	.098*** (.005)	.158*** (.006)	.135*** (.004)	OTOURISM3	.097*** (.006)	.1*** (.005)	.154*** (.006)	.131*** (.005)
TRECPT4	.087*** (.006)	.092*** (.005)	.16*** (.006)	.136*** (.004)	OTOURISM4	.09*** (.006)	.095*** (.005)	.142*** (.006)	.123*** (.005)
GCF		.082*** (.01)		.027*** (.01)	GCF		.081*** (.01)		.027*** (.009)
LF		.271*** (.023)		.815*** (.008)	LF		.273*** (.023)		.81*** (.008)
CONS	21.605*** (.1)	17.433*** (.356)	21.36*** (.117)	9.384*** (.133)	CONS	25.031*** (.034)	20.616*** (.35)	25.503*** (.036)	12.99*** (.135)
OBS.	3484	3484	3484	3484	OBS.	3484	3484	3484	3484
R <sup>2</sup>	.82	.833			R <sup>2</sup>	.821	.833		
F-Stat/Wald test	505.41 (0.000)	515.56 (0.000)	1000.72 (0.000)	14146.06 (0.000)	F-Stat/Wald test	506.26 (0.000)	516.57 (0.000)	1083.59 (0.000)	13776.68 (0.000)
Country dummy	YES	YES			Country dummy	YES	YES		
Date dummy	YES	YES			Date dummy	YES	YES		

Note. Standard errors are in parentheses. TEXP, TARIVALS, TRECPT, OTOURISM, GCF and LF denote tourism expenditure, tourist arrivals, tourism receipt, overall tourism, gross capital formation and labour factors respectively. 1, 2, 3 and 4 in front of tourism variables denote parameter estimates along structural break dates, respectively.

\*\*\* p<.01. \*\* p<.05. \* p<.1.

## 4. Conclusion

Global events such as the GFC, Ebola, and COVID-19 outbreaks affect the tourism industry and the economy, causing structural changes in the relationship between the two series. Given this, this study investigated the validity of TLGH in the presence of structural breaks using a novel structural break method by Ditzen et al. (2021). Fixed Effect and FGLS were used as estimation methods to ascertain the impact of tourism along identified structural breaks. Four structural break dates—1999, 2004, 2009, and 2014—were determined, suggesting the relationship between tourism and economic growth has changed. Two of the four break dates coincided with periods of GFC and Ebola outbreaks. Despite structural changes, tourism still fosters economic growth, which supports the TLGH, suggesting that tourism is indeed indispensable to the world economy.

## References

- Bai, J., Choi, S.H., & Liao, Y. (2021). Feasible generalized least squares for panel data with cross-sectional and serial correlations. *Empirical Economics*, 60(1), 309-326. <https://doi.org/10.1007/s00181-020-01977-2>
- Balaguer, J., & Cantavella-Jorda, M. (2002). Tourism as a long-run economic growth factor: The Spanish case. *Applied Economics*, 34(7), 877-884. <https://doi.org/10.1080/00036840110058923>
- Balassa, B. (1978). Exports and economic growth: Further evidence. *Journal of Development Economics*, 5(2), 181-189. [https://doi.org/10.1016/0304-3878\(78\)90006-8](https://doi.org/10.1016/0304-3878(78)90006-8)
- Ditzen, J., Karavias, Y., & Westerlund, J. (2021). *Testing and estimating structural breaks in time series and panel data in stata*. arXiv preprint arXiv:2110.14550. <https://doi.org/10.48550/arXiv.2110.14550>
- Gwenhure, Y., & Odhiambo, N.M. (2017). Tourism and economic growth: A review of international literature. *Tourism: An International Interdisciplinary Journal*, 65(1), 33-44. <https://hrcak.srce.hr/178621>
- Raifu, I.A., & Afolabi, J.A. (2023). Revisiting the tourism-led-growth hypothesis: Fresh evidence from the world's top ten tourist destinations. *Asian Economic Letters*. Forthcoming. <https://doi.org/10.46557/001c.91077>
- Raifu, I.A., Nnadozie, O.O., & Adeniyi, O.A. (2021). Infrastructure-structural transformation nexus in Africa: The role of financial sector development. *Journal of African Development*, 22(1), 124-165. <https://doi.org/10.5325/jafrideve.22.1.0124>
- World Travel and Tourism Council. (2018). *Impact of the Ebola epidemic on travel & tourism*. <https://wtcc.org/Portals/0/Documents/Reports/2018/Impact%20of%20the%20Ebola%20epidemic%20on%20Travel%20and%20Tourism%202018.pdf?ver=2021-02-25-182521-103#:~:text=The%20impact%20of%20Ebola%20on%20Travel%20%26%20Tourism%20was%20immediate%20for,from%20Western%20markets%20hit%20hardest>

Submitted: August 02, 2023

Revised: November 15, 2023

Accepted: December 01, 2023