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Tourism and economic growth (2005-2020):

A panel granger causality analysis

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Abstract ;

This paper empirically investigated the relationship between tourism revenue and gross domestic product (GDP). using the panel data of 2 groups of countries (9 European countries, 9 African countries). for the period 2005–2020. based on Cointegration test, and Panel Granger causality analysis. The findings indicated the existence of lang run relationship between tourism and GDP in case of Europe. Moreover, for the European region, there is causal relationship from tourism to GDP. thus, tourism contributes significantly to economic growth for European selected countries. however, the results for African region showed that there is a unidirectional causality from GDP to tourism revenue. the Non-existence causality for some economies may be result of small share of tourism sector in an economy.
Therefore, our results confirm the importance of this sector within national and international economies, necessitating concerted efforts towards its enhancement to elevate economic prosperity.

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- ✓ *Tourism*
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- ✓ *Panel Granger Causality*
- ✓ *Cointegration*

1. *Introduction*

According to the World Tourism Organization (UNWTO) data, starting from 2022 the international tourism is experiencing marked by an increased number of destinations around the world easing travel restrictions. International tourist arrivals have more than doubled compared to last year.

For Africa, in early 2022 has registered a growth of 51% compared to 2021, though numbers are still way below pre-pandemic levels of 2019 (UNWTO, 2022). For European region, during 2022, there was a recovery in the number of tourist arrivals in the EU, as some travel/tourism-related restrictions were lifted. Compared with 2019 and 2020. the number of arrivals in July and August 2020 was particularly low while the impact of the pandemic somewhat low (UNWTO R. D., 2020).

Regarding the importance of the tourism sector in the world economy, many countries are seeking to partner with international organizations and other tourism partners to take measures and policies for mitigating, accelerating recovery. combating the effects of the COVID-19 crisis on the tourism sector.

This study focuses on the Europe and Africa regions, which indicate a particularly interesting group of countries to consider whether they play important roles in the world economy based on their rapidly growing share in the economic relations in the last decades.

Several research's have examined the tourism and economic growth. However, limited studies were conducted to analyze the causal relationship between tourism and economic growth by employing the Granger Causality test and Co-integration test. Therefore, to fill this gap, our study investigates the direction of the causality between GDP (Economic Growth) and tourism divided geographically in two groups of countries. The first group composed of nine European countries (France, Germany, Greece, Portugal, Belgique, Finland, Bulgaria, Slovenia, Croatia). and the second group composed of nine African countries (Algeria, Morocco, Tunisia, Egypt, Mali, Nigeria, Niger, Benin, Ivory Coast).

So, the first section will present an overview on the existing empirical studies about Tourism and Economic growth. The Second section will provide an explanation of the methodology and data resources. The third section, presents the main results obtained from to the Panel Cointegration and Granger Causality estimations. In the last section, the main finding of this study will be concluded, with the discussion of economic interpretation.

2. *Previous studies*

Several studies have focused on studding Tourism and economic growth. However, there exists a scarcity of studies that have systematically investigated the causal relationship of both variables for countries worldwide. Lee and Chang (2008), employed a heterogenous panel co-integration methodology to explore the intricate causal interrelation between tourism and economic growth. Their investigation focused on two distinct sets: countries belonging to the OECD group and those outside the OECD purview. The outcome of their study elucidated

that both sets exhibited a panel co-integration connection between the evolution of tourism and the Gross Domestic Product (GDP). However, a noteworthy distinction emerged in terms of impact: tourism development exerted a more substantial influence on GDP within non-OECD countries. Upon a more extensive temporal horizon, the research revealed unidirectional causal relationships from tourism development to economic growth within the OECD country group. Conversely, in the context of non-OECD countries, a bidirectional relationship was indicated, underlining the intricate interplay between these variables

De Mello-Sampayo and De Sousa-Vale (2010),conducted an advanced analysis and revealed the existence of a panel co-integration link between tourism and economic growth within European countries. Their study discerned that, particularly in the context of both South and North European countries, tourism has a higher impact on the Gross Domestic Product (GDP).

Şak and Çağlayan (2012) conducted an extensive study encompassing 135 countries, revealing a distinct pattern in the causal relationship between tourism revenue and GDP across regions. In Europe, the relationship was found to be bidirectional, while in regions such as America, Latin America, East Asia, South Asia, Oceania, and the Caribbean, as well as in countries worldwide, the causality was unidirectional. Focusing on 12 Mediterranean countries, Bilen M et al (2015), have tested the causal relationship between economic growth and tourism development during the period 1995–2012, using recently developed panel Granger causality tests that allow for country-level heterogeneity, thus leading to more accurate results for the 12 Mediterranean countries. the main finding of this study indicated that there is bidirectional causality relationship between tourism development and economic growth.

In other study, Fahimi A et al (2018), have tested the relationship between tourism, economic growth, and investment in human capital in the microstates during 1995 to 2015. The results obtained indicated that there is a bidirectional relationship between tourism and GDP. In the same vein, Seyi Saint et al (2019), examined the causal direction between geopolitical risk, tourism, and economic growth in Turkey Amid geopolitical shifts like the "Arab Spring,"(1985Q1-2017Q4). Using a modified Granger causality approach, results revealed unidirectional causality from geopolitical risk to both tourism and economic growth.

Wu, T-P et al (2020), have employed a multivariate wavelet approach to explore the causal relationship between tourism and economic growth across 11 Asian regions from 1995 to 2016. Both time-domain and frequency-domain analyses revealed strong linkages among real international tourism receipts, tourist arrivals, capital formation, and real GDP. Consequently, advocating for increased tourism demand and nurturing supply expansion emerges as a recommended government strategy.

In other study conducted by Jinghua Tu and Dapeng Zhang (2020), aimed to evaluates the influence of tourism on economic growth using a threshold model and a panel data encompassing 75 Chinese ethnic autonomous counties spanning the years 2007 to 2016. The findings revealed a non-linear impact, indicating a decrease in the contribution of tourism to

economic growth as specialization in tourism increases. This outcome provides practical insights for consideration.

Seyi Saint et al (2020), have examined the direction of causality between tourism, economic growth and carbon emissions, and globalization across 16 small island developing countries (1995-2014). Unsing panel Granger causality testing, the study substantiated supports for the demand-flowing and supply-leading hypotheses. Moreover, the research accentuated the role of internal factors in contributing to environmental pollution within territories focused on tourism.

Similarly, Su, et al (2021) investigated if tourism affects economic growth of China during the period (2000-2019). using VAR and VECM models alongside Granger causality tests, the study established a strong connection between tourism industry development and economic growth. Furthermore, Long-term growth is reinforced by tourism-related activities, while VECM models validate short-term economic growth.

Recently, Mishra, P.K., et al (2022) study explored tourism's influence on BRICS economies using PMG-based ARDL analysis over an augmented growth model (1995-2019). The Results obtained confirmed the positive impact of international tourism on BRICS growth, particularly with controlled human development. This adds to existing evidence of tourism-led growth in BRICS, supporting policies for tourism sector expansion to enhance real economic growth.

More recently, based on data for 23 developing and developed countries, Enilov M et al (2022), have examined the causal relationship between foreign tourist arrivals and economic growth during 1981–2017. using a bootstrap mixed-frequency Granger causality approach and using a rolling window technique to evaluate the approach’s stability and persistency over time concerning economic growth. The results demonstrated that, in contrast to wealthy nations, the tourism industry in developing nations continues to be a major contributor in future economic growth.

3. Data and methodology

3.1 Data

In order to examine the direction of causal relationship among tourism and economic growth, we use annual frequency panel series data over the periods 2005-2020 for two groups. Europe, which includes (France, Germany, Greece, Portugal, Belgique, Finland, Bulgaria, Slovenia, Croatia). For Africain countries (Algeria, Morocco, Tunisia, Egypt, Mali, Nigeria, Niger, Benin, Ivory Coast).

We use international tourism revenue (TR) in current US dollars and GDP (Economic Growth current US (the data sourced from World bank).

3.2 Methodology

A three-step Panel Granger analysis will be employed to investigate the causal relationship between tourism revenue and GDP. This testing approach entails a sequential procedure that reveals the directional linkage between the variables. The initial stage involves an examination of the integrated order of the variables based on a panel will be identifies. Subsequently, in the second stage, panel unit root properties for the relevant variables. In the third stage, a panel co-integration analysis is conducted on the variables that exhibit same order integration *(Engel & Granger, 1987)*.

So then, the following models are estimated:

$$LogGDP_{it} = a_{0i} + b_i LogTR_{it} + e_{it}$$

Where: logGDP represents Economic Growth current US; t, is the period; i, is the country; a, is a constant and logTR revenue.

4. Empirical Results

4.1 The optimal delays

We have first to determine the optimal delays**.**

Table.1. The optimal lag selection (Africa)

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-187.4261	NA	0.114422	3.507891	3.557560	3.528030
1	238.5952	828.3748	4.62e-05	-4.307319	-4.158312*	-4.246902*
2	242.3142	7.093560	4.64e-05	-4.302114	-4.053769	-4.201419
3	244.7252	4.509608	4.78e-05	-4.272690	-3.925006	-4.131717
4	250.9964	11.49716*	4.59e-05*	-4.314749*	-3.867727	-4.133497

Note: * indicates the delay order **Source:** (EViews12)

Table.2. The optimal lag selection (Europe)

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-221.0913	NA	0.213433	4.131320	4.180989	4.151459
1	260.9356	937.2745	3.05e-05	-4.721029	-4.572022*	-4.660612
2	261.7914	1.632350	3.24e-05	-4.662803	-4.414458	-4.562108
3	273.1804	21.30164	2.82e-05	-4.799637	-4.451953	-4.658664
4	279.5474	11.67295*	2.70e-05*	-4.843471*	-4.396449	-4.662220*

Note: * indicates the delay order **Source:** (EViews12)

Based on the LR, FPE, and AIC criteria, the results of the optimal number of lags presented in Table 01 and Table 02 indicated that for Africa the number of lags is 4. In general, three out of five tests show that the optimal number of lags is 4. For Europe, there are four out five test show that the optimal number of lags is 4.

4.2 Unit root test

We use Im, Pesaran and Shin (1997) panel unit root test (hereafter IPS), the LLC, ADF, BRT and MW for identification of the order of integration of the series of LogGDP and LogTR in a three-stage Panel Granger Causality Analysis. Table 3 presents results of the IPS panel unit root test.

Table.3. The results for the Unit root test

Methods		*ADF - Fisher Chi-square*	*PP - Fisher Chi-square*	*Im, Pesaran and Shin W-stat*	*Breitung t-stat*	*Levin, Lin & Chu t**	*Hadri Z-stat*
LOGGDP				***Level***			
None	Africa	11.2421 (0.8838)	12.4975 (0.8205)	-	-	-0.14320 (0.4431)	-
	Europe	4.18689 (0.9997)	3.53172 (0.9999)	-	-	2.17183 (0.9851)	-
Individual intercept	Africa	30.9090* (0.0295)	24.5222 (0.1387)	-1.08033 (0.1400)	-	-0.32090 (0.3741)	5.56044 (0.0000)
	Europe	44.6960 (0.0005) *	76.3870 (0.0000) *	-3.56899* (0.0002)	-	-4.51339* (0.0000)	5.63121 (0.0000)
Individual intercept and trend	Africa	21.9492 (0.2343)	13.2000 (0.7796)	-0.45982 (0.3228)	4.54182 (1.0000)	0.98264* (0.8371)	2.77421 (0.0028)
	Europe	29.1118 (0.0470) *	54.6081 (0.0000) *	-2.18681* (0.0144)	-1.78481* (0.0371)	-3.35780* (0.0004)	4.30799 (0.0000)
				1st Difference			
None	Africa	104.442* (0.0000)	92.886* (0.0000)	-	-	-8.91275* (0.0000)	-
	Europe	99.7655* (0.0000)	97.0921* (0.0000)	-	-	-8.95336* (0.0000)	-
Individual intercept	Africa	37.8056* (0.0041)	58.284* (0.0000)	-2.71657* (0.0033)	-	-3.01563* (0.0013)	2.00750 (0.0223)
	Europe	58.9225* (0.0000)	62.1073* (0.0000)	-5.09864* (0.0000)	-	-6.46140* (0.0000)	1.86052 (0.0314)
Individual intercept and trend	Africa	24.9335 (0.1268)	39.822* (0.0022)	-1.03714 (0.1498)	4.02621 (1.0000)	-2.03873* (0.0207)	4.17734 (0.0000)
	Europe	34.7250* (0.0102)	49.5941* (0.0001)	-2.12931* (0.0166)	-0.74344 (0.2286)	-4.91614* (0.0000)	4.07390 (0.0000)
LOGTR				***Level***			
None	Africa	0.67281 (1.0000)	0.78900 (1.0000)	-	-	6.69139 (1.0000)	-
	Europe	9.63379 (0.9432)	10.7554 (0.9044)	-	-	0.78041 (0.7824)	-
Individual intercept	Africa	36.5708* (0.0060)	76.868* (0.0000)	-1.67950* (0.0465)	-	-4.43137* (0.0000)	7.85230 (0.0000)
	Europe	47.7529* (0.0002)	19.6527 (0.3527)	-3.96971* (0.0000)	-	0.89068 (0.8135)	0.92845 (0.1766)
Individual intercept and trend	Africa	22.0891 (0.2281)	35.5280* (0.0081)	0.30455 (0.6196)	-1.79800 * (0.0361)	-2.16984* (0.0150)	6.60106 (0.0000)
	Europe	20.2882 (0.3168)	21.7198 (0.2447)	-0.62500 (0.2660)	1.66786 (0.9523)	6.29325 (1.0000)	5.90661 (0.0000)
				1st difference			
None	Africa	73.3383* (0.0000)	72.245* (0.0000)	-	-	-7.35733* (0.0000)	-
	Europe	78.9549* (0.0000)	57.0644* (0.0000)	-	-	3.32040 (0.9996)	-
Individual intercept	Africa	54.6293* (0.0000)	56.713* (0.0000)	-4.45078* (0.0000)	-	-6.26642* (0.0000)	3.52846 (0.0002)
	Europe	36.5823* (0.0059)	36.4825* (0.0061)	-2.34178 (0.0096)	-	0.89068 (0.8135)	2.86926 (0.0021)
Individual intercept and trend	Africa	50.7856* (0.0001)	65.039* (0.0000)	-3.84995* (0.0001)	-2.96232* (0.0015)	-3.98142* (0.0000)	4.76835 (0.0000)
	Europe	25.9258* (0.1015)	28.3609* (0.0568)	-1.18272 (0.1185)	4.02462 (1.0000)	6.29325 (1.0000)	3.88828 (0.0001)

Note: * denote the null hypothesis of unit root is rejected at 5% level. **Source:** (EViews12)

The results indicate that both LogGDP and LogTR are integrated into one (1) for Africa and Europe. For further analysis of the long-run relationship between LogGDP and LogTR in these groups of countries Pedroni (1999, 2004) panel cointegration technique is used.

Pedroni (1999, 2004) refers to seven different statistics for panel cointegration analysis: the panel v-statistics, panel rho-statistics, panel PP-statistics, panel ADF statistics, group rho-statistics, group PP-statistics and group ADF-statistics. Pedroni (1999) panel co-integration tests are based on the within dimension and the between dimensions approach.

4.3 Co-integration test

The Results obtained of the Pedroni panel co-integration test are presented in Table 04.

Table.4. Results of Panel Co-integration Tests between LGDP and LTR

Panel Cointegration Test Statistics	***Deterministic intercept and trend***		***No deterministic trend***		***No deterministic intercept or trend***	
Europe						
Panel v-Statistic	2.157802*	0.581922	3.681075*	2.577568*	4.700152*	3.651885*
Panel rho-Statistic	-0.295015	-0.405251	-0.787254	-1.509584	-1.833417*	-2.018289*
Panel PP-Statistic	-0.576695	-1.380508*	-0.257393	-1.025008	-1.584241*	-1.655186*
Panel ADF-Statistic	-4.448729*	-3.032203*	-1.430995	-1.474199	-1.242246	-1.560885*
Group rho-Statistic	0.817591		-0.287704		0.351566	
Group PP-Statistic	-0.931998		-0.186183		-0.698753	
Group ADF-Statistic	-5.463400*		-4.345274*		-0.883130	
Africa						
Panel v-Statistic	3.251760*	0.677500	0.541069	0.729677	1.380723	0.201722
Panel rho-Statistic	0.147813	0.190850	0.400987	-0.184462	-3.076666*	-3.236184*
Panel PP-Statistic	0.270553	-1.132884	-0.239298	-1.171905	-1.064446	-1.078330
Panel ADF-Statistic	0.023055	-0.797433	-0.183265	-1.086880	-1.289419	-1.327725
Group rho-Statistic	1.293365		0.916795		-1.797245*	
Group PP-Statistic	-0.288997		-0.766109		-0.736579	
Group ADF-Statistic	-1.799495*		-0.552188		-2.071223*	

Notes: * denotes the rejection of the null hypothesis of no co-integration at the 5% level. **Source:** (EViews12)

Based on Pedroni cointegration statistical tests. (Panel PP-Statistic, Panel ADF-Statistic, and Panel PP-Statistic) and for the between-dimension tests, (Group PP-Statistic and Group ADF-Statistic) tests. The results obtained demonstrate the existence of inter-variable cointegration between TR and GDP for both Africa and Europe.

Therefore, we estimate the long run pooling relationship based on the FMOLS and DOLS estimators. The results obtained are presented on the following Table.

Table.5. Estimated long run relationship

		DOLS		**FMOLS**	
Dependent variable *LogGDP*		*LogTR*		*LogTR*	
Heterogeneous panel		Pooled estimation	Grouped estimation	Pooled estimation	Grouped estimation
Groups	*Europe*	1.712125* (0.0060)	1.890917* (0.0034)	0.602694* (0.0012)	0.604776* (0.0012)
	Africa	-0.869062* (0.0191)	0.253174 (0.9064)	0.131557 (0.1108)	0.199770 (0.1910)

Note: Significance * 1%, **5% **Source:** (EViews12)

The results presented in table 05 for FMOLS/DOLS show that the coefficients of the heterogeneous panel pooled estimation and grouped estimation are positive and significant at 5% for Europe. The obtained results suggest that 1% increase in TR increases the GDP by %1.712125 and %1.890917 at the long run. for Africa, the Dols estimation results show that the coefficient of the heterogeneous panel pooled estimation is negative and significant at 5%. However, for the coefficient of the heterogeneous grouped estimation are not Significant. Moreover, for the FMOLS estimation. the coefficients of the heterogeneous panel pooled and grouped estimations are not Significant.

4.4 Granger causality analysis

We use Granger causality analysis based on lag lengths were selected using the Schwartz criteria. for both variables. Then, the short-term causality is investigated for all groups.

The results of Panel Granger causality tests are presented in Table06.

Table.6. Results of Panel Granger Causality Test

Groups	***Europe***		***Africa***	
GDP	TR		TR	
	1.73458	(0.1484)	2.08649	(0.0882)
TR	GDP		GDP	
	2.43416*	(0.0523)	1.06234	(0.3793)

Notes: * denotes the rejection of the null hypothesis of no causality at the 5% level. **Source:** (EViews12)

**** denotes the rejection of the null hypothesis of no causality at the 10% level.

According to the results presented in Table 06, there is no causal relationship from TR to GDP in case of Africa at the short run. In other hand, the causality from GDP to tourism is found in 10%. Thus, these results suggest that gross domestic product affect Tourism in case of Africa. In case of Europe, there is a one-way causality from TR to GDP, which is significant in 5%. Furthermore, the results show that there is no causality from GDP to TR. Therefore, the results suggest that at the short run there is an effect from tourism to gross domestic product.

4. *CONCLUSION*

This research was conducted to examined the relationship between tourism revenue and GDP, using the panel Granger causality test and Co-integration tests with panel data from 2005 to 2020 of 18 countries classified geographically in two groups (9 European countries and 9 African Countries).

The results obtained from the co-integration test. showed a long-run relationship between tourism and economic growth in case of Europe. for the causality analysis the results show unidirectional causality from tourism revenue to GDP in short run that's means that tourism has the ability to boost economic. while the estimation results from GDP to tourism do not confirm existence of causal relationship between GDP and tourism.

With regard to the estimation results of causality in case of Africa did not confirm the existence of causal relationship between tourism and GDP. However, the causality has found from GDP to Tourism. Therefore, Non-existence causality for some economies may be result of small share of tourism sector in an economy. Moreover, within the designated study duration, countries may traverse by circumstances amidst a multitude of economic vicissitudes, fluctuations, and political dynamics. The prevailing conditions have the potential to ameliorate or deteriorate in subsequent time frames.

In other hand, these difference in the results obtained between the groups of countries may be due to several factors related to different economic conditions, and also to other factors related to encompassing diverse economic circumstances, as well as additional variables pertaining to the degree of openness in international trade indicators, the accessibility of foreign investment opportunities, and The presence of robust infrastructure along with other pertinent factors unique to each individual country.

The existence of a causal relationship between tourism and economic growth. This affirms the pivotal role of this sector within national and international economies, necessitating concerted efforts towards its enhancement to elevate economic prosperity.

5. Bibliography List

MISHRA, P. K., Debasis, S., Himanshu, B. R., CHAINI , S. R., & Pradip, K. (2022). Does Tourism Foster Economic Growth in BRICS Region? Empirical Evidence. *Environmental Management and Tourism, 4*(60), 1089-1099. doi:10.14505/jemt.v13.4(60).15

Bilen , M., Yilanci , V., & Eryu¨zlu¨ , H. (2015). Tourism development and economic growth: a panel granger causality analysis in the frequency domain. *Current Issues in Tourism, 20*(1), 27-32. doi:https://doi.org/10.1080/13683500.2015.107323

De Mello-Sampayo, F., & De Sousa-Vale, S. (2010). Tourism and Growth in European Countries: An Application of Likelihood-Based Panel Cointegration. *Working Papers(0510)*. ISCTE, UNIDE, Economics Research Centre.

Engel, R. F., & Granger, C. W. (1987). Cointegration and error correction: representation, estimation, and testing. *Economitrica, 55*, 251-276.

Enilov , M., & Wang , Y. (2022). Tourism and economic growth: Multi-country evidence from mixed-frequency Granger causality tests. . *Tourism Economics, 28*(5), 1216-39. doi:https://doi.org/10.1177/1354816621990155

Fahimi, A., Akadiri, S. S., Seraj , M., & Akadiri , A. (2018). Testing the role of tourism and human capital development in economic growth. A panel causality study of micro states. *Tourism Management Perspectives., 28*, 62-70. doi:https://doi.org/10.1016/j.tmp.2018.08.004

Jinghua, T., & Dapeng , Z. (2020). Does tourism promote economic growth in Chinese ethnic minority areas? *Journal of Destination Marketing & Management, 18*. doi:https://doi.org/10.1016/j.jdmm.2020.100473

Lee, C., & Chang, C. (2008). Tourism development and economic growth: A closer look at panels. *Tourism Management, 29*, 180-192.

Şak , N. C., ağlayan , E., & Karymshakov , K. (2012). Relationship between tourism and economic growth: A granger causality panel data approach. . *Asian Economic and Financial Review, 2*(5), 518-529.

Seyi Saint , A., Kayode , K. E., Ada , C. A., & Turgay , A. (2019, August). Does causality between geopolitical risk, tourism and economic growth matter? Evidence from Turkey. *Journal of Hospitality and Tourism Managemen*. doi:https://doi.org/10.1016/j.jhtm.2019.09.002

Seyi Saint , A., Taiwo, T. L., Gizem, U., & Ada , C. A. (2020). Examining the causal impacts of tourism, globalization, economic growth and carbon emissions in tourism island territories:bootstrap panel Granger causality analysis. *CURRENT ISSUES IN TOURISM, 23*(4), 470-484. doi:https://doi.org/10.1080/13683500.2018.1539067

Su, Y., Cherian, J., Sial, M. S., Badulescu, A., Thu, P. A., & Badulescu, D. (2021). Does Tourism Affect Economic Growth of China? A Panel Granger Causality Approach. *Sustainability, 13*(1349). doi:https://doi.org/10.3390/su13031349

UNWTO. (2022, MAy). Africa News. *21*. Récupéré sur https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2022-05/220516-africa-newsletter-21-en.pdf?VersionId=jiOOv9lQL75uK12k8smJCWEs6CnFRzls

UNWTO, R. D. (2020, December). AFRICA NEWS. *18*. Récupéré sur https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2021-12/18-africanewsen-1220.pdf?VersionId=h8TyBMRRINZn6UGegWIq7pHhvE1ECFtu

Wu, T. P., Wu, H. C., Wu, Y. Y., Liu, Y. T., & Wu, S.-T. (2020). Causality between Tourism and Economic Growth. *Journal of China Tourism Research*, 1-18. doi:10.1080/19388160.2020.1801545

6. *Appendices*

Appendices (AF)

VAR Lag Order Selection Criteria
Endogenous variables: LOGGDP LOGTR
Exogenous variables: C
Date: 07/31/23 Time: 11:35
Sample: 2005 2020
Included observations: 108

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-187.4261	NA	0.114422	3.507891	3.557560	3.528030
1	238.5952	828.3748	4.62e-05	-4.307319	-4.158312*	-4.246902*
2	242.3142	7.093560	4.64e-05	-4.302114	-4.053769	-4.201419
3	244.7252	4.509608	4.78e-05	-4.272690	-3.925006	-4.131717
4	250.9964	11.49716*	4.59e-05*	-4.314749*	-3.867727	-4.133497

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Pedroni Residual Cointegration Test
Series: LOGGDP LOGTR
Date: 07/31/23 Time: 12:10
Sample: 2005 2020
Included observations: 144
Cross-sections included: 9
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or trend
Automatic lag length selection based on SIC with a max lag of 4
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	1.380723	0.0837	0.201722	0.4201
Panel rho-Statistic	-3.076666	0.0010	-3.236184	0.0006
Panel PP-Statistic	-1.064446	0.1436	-1.078330	0.1404
Panel ADF-Statistic	-1.289419	0.0986	-1.327725	0.0921

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	-1.797245	0.0361
Group PP-Statistic	-0.736579	0.2307
Group ADF-Statistic	-2.071223	0.0192

Dependent Variable: LOGGDP

Method: Panel Dynamic Least Squares (DOLS)
Date: 08/08/23 Time: 22:25
Sample (adjusted): 2010 2019
Periods included: 10
Cross-sections included: 9
Total panel (balanced) observations: 90
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=4)
Coefficient covariance computed using default method
Long-run variance (Bartlett kernel, Newey-West fixed bandwidth) used for coefficient covariances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	-0.869062	0.347884	-2.498140	0.0191

Dependent Variable: LOGGDP
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 08/08/23 Time: 22:22
Sample (adjusted): 2006 2020
Periods included: 15
Cross-sections included: 9
Total panel (balanced) observations: 135
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Coefficient covariance computed using default method
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	0.131557	0.081926	1.605813	0.1108

Dependent Variable: LOGGDP
Method: Panel Dynamic Least Squares (DOLS)
Date: 07/31/23 Time: 12:13
Sample (adjusted): 2010 2019
Periods included: 10
Cross-sections included: 9
Total panel (balanced) observations: 90
Panel method: Grouped estimation
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=4)
Long-run variances (Bartlett kernel, Newey-West fixed bandwidth) used for individual coefficient covariances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	0.253174	2.133122	0.118687	0.9064

Dependent Variable: LOGGDP
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 07/31/23 Time: 12:13
Sample (adjusted): 2006 2020
Periods included: 15
Cross-sections included: 9
Total panel (balanced) observations: 135
Panel method: Grouped estimation
Cointegrating equation deterministics: C
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	0.199770	0.151946	1.314744	0.1910

Appendices (EU)

VAR Lag Order Selection Criteria
Endogenous variables: LOGGDP LOGTR
Exogenous variables: C
Date: 07/31/23 Time: 12:07
Sample: 2005 2020
Included observations: 108

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-221.0913	NA	0.213433	4.131320	4.180989	4.151459
1	260.9356	937.2745	3.05e-05	-4.721029	-4.572022*	-4.660612
2	261.7914	1.632350	3.24e-05	-4.662803	-4.414458	-4.562108
3	273.1804	21.30164	2.82e-05	-4.799637	-4.451953	-4.658664
4	279.5474	11.67295*	2.70e-05*	-4.843471*	-4.396449	-4.662220*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Pedroni Residual Cointegration Test
Series: LOGGDP LOGTR
Date: 07/31/23 Time: 11:43
Sample: 2005 2020
Included observations: 144
Cross-sections included: 9
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or trend
Automatic lag length selection based on SIC with a max lag of 4
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	4.700152	0.0000	3.651885	0.0001
Panel rho-Statistic	-1.833417	0.0334	-2.018289	0.0218
Panel PP-Statistic	-1.584241	0.0566	-1.655186	0.0489
Panel ADF-Statistic	-1.242246	0.1071	-1.560885	0.0593

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	0.351566	0.6374
Group PP-Statistic	-0.698753	0.2424
Group ADF-Statistic	-0.883130	0.1886

Dependent Variable: LOGGDP
Method: Panel Dynamic Least Squares (DOLS)
Date: 08/08/23 Time: 22:19
Sample (adjusted): 2010 2019
Periods included: 10
Cross-sections included: 9
Total panel (balanced) observations: 90
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=4)
Coefficient covariance computed using default method
Long-run variance (Bartlett kernel, Newey-West fixed bandwidth) used for coefficient covariances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	1.712125	0.572597	2.990105	0.0060

Dependent Variable: LOGGDP
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 08/08/23 Time: 22:16
Sample (adjusted): 2006 2020
Periods included: 15
Cross-sections included: 9
Total panel (balanced) observations: 135
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Coefficient covariance computed using default method
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	0.602694	0.194065	3.105634	0.0023

Dependent Variable: LOGGDP
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 07/31/23 Time: 11:51
Sample (adjusted): 2006 2020
Periods included: 15
Cross-sections included: 9
Total panel (balanced) observations: 135
Panel method: Grouped estimation
Cointegrating equation deterministics: C
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	0.604776	0.182126	3.320647	0.0012

Dependent Variable: LOGGDP
Method: Panel Dynamic Least Squares (DOLS)
Date: 07/31/23 Time: 12:04
Sample (adjusted): 2010 2019
Periods included: 10
Cross-sections included: 9
Total panel (balanced) observations: 90
Panel method: Grouped estimation
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=4)
Long-run variances (Bartlett kernel, Newey-West fixed bandwidth) used for individual coefficient covariances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGTR	1.890917	0.587164	3.220423	0.0034

Pairwise Granger Causality Tests
Date: 07/31/23 Time: 12:06
Sample: 2005 2020
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGTR does not Granger Cause LOGGDP	108	2.43416	0.0523
LOGGDP does not Granger Cause LOGTR		1.73458	0.1484