An Investigating of Cointegration between Co2, Tourism Expenditures, Economic Growth and Trade openness in Algeria during the period 1990-2017

اختبار التكامل المتزامن لانبعاث ثاني أكسيد الكربون، الإنفاق على السياحة، النمو الاقتصادي، والانفتاح التجاري بالجزائر خلال الفترة 1990–2017

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Abstract:

This study explore the impact of tourism on economic growth considering Co2 emissions and trade openness in Algeria. In the empirical analysis, unit root and cointegration tests using annual series from 1990 to 2017, are performed to examine the long-run equilibrium relationship among Co2, tourism, growth and trade openness. This positive long-run equilibrium between variables may suggest that tourism increase the level of Co2 emissions and has a statistically significant impact on sustainable economic growth as on tourism and trade openness in Algeria.

Keywords : CO2, Tourism Expenditures, Economic Growth, Trade Openness, Cointegration, FMOLS.

Jel Classification Codes:C22, O40, Q56, Z32.

Jel Classification Codes: XN1, XN2.

ملخص:

تهتم هذه الورقة بدراسة أثر قطاع السياحة على النمو الاقتصادي، وذلك بالأخذ بعين الاعتبار انبعاث ثاني أكسيد الكربون ومعدلات الانفتاح التجاري بالجزائر. حيث تم الاعتماد على اختبارات جذر الوحدة والتكامل المتزامن بالاعتماد على سلاسل زمنية للفترة ما بين 1990 إلى 2017، لسلاسل انبعاث غاز

ثاني أكسيد الكربون، الإنفاق على السياحة، النمو الاقتصادي، والانفتاح التجاري. وجاءت معلمات اختبار العلاقة التوازنية طويلة الأجل معنوية مما يعني أنه من الممكن لتدفقات القطاع السياحي أن تؤثر على النمو الاقتصادي المستدام ومنه معدلات الانفتاح التجاري بالجزائر.

كلمات مفتاحية: انبعاثات ثاني أكسيد الكربون، الإنفاق على السياحة، النمو الاقتصادي، الانفتاح التجاري، التكامل المتزامن، طريقة المربعات الصغرى المصححة كليا.

تصنيف JEL: C22، O40، Q56، Z32.

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1. INTRODUCTION

The relationship between the environmental indicator Co2, economic growth, trade openness and tourism expenditure has begun investigated in the literature. The relationship between these variables has not yet been sufficiently discussed in the literature **(Govdeli, 2019, p. 321)**. Tourism industry has become one of the most crucial parts for economic growth in the world. Currently it is the largest and rapidly growing driving force to make higher economic growth by generating significant quantity of foreign exchange earnings and job opportunities.

The importance of tourism development on economic growth is puzzling academics, scholars and practitioners for years. However, the vast majority of these studies is limited on the empirical investigation and validity of the so-called « Tourism-Led Growth Hypothesis » (TLGH) supporting in most cases direct effect from tourism activity to growth and suggesting that tourism increase foreign exchange income, creates employment opportunities, and increase economic growth. **(Georgantopoulos, Tourism Expansion and Economic Development: VAR/VECM Analysis and Forecasts for the Case of India, 2013, p. 464)** This hypothesis derives directly from the « Export-Led Growth Hypothesis » (ELGH) which states that the economic growth of countries can be generated not only by increasing the amount of labor and capital within the economy, but also by expanding exports. **(Georgantopoulos, 2012, p. 169)**

According to an investigation concluded by world tourism organization in 2017, worldwide international tourists arrivals reached 1.323 million, by growing of some 84 million or 7% over 2016. **(World Tourism Organisation, 2017, p. 12)** Most of the CO2 emissions related to tourism are produced by transport, especially by air travel. It is also estimated that greenhouse gas emissions from the tourism sector will increase by 3.2% between 2005 and 2035, if not well planned and managed, **(Peeters & Dubois, 2010, p. 447)** ; **(Tang, Shang, Shi, Liu, & Bi, 2014, p. 390)** but we find that, between 2009 and 2013, tourism's global Carbone emissions has increased from 3.9 to 4.5 Giga tones four times more than previously estimated, accounting for about 8% of global greenhouse gas emissions, transport,

shopping and food are significant contributors. **(Manfred, Ya-Yen, Futu, Yuan-Peng, Arne, & Arunima, 2018, p. 1)**

There is burgeoning research during the past decade, most studies have been limited to a singular focus within a prescribed year(s) in time, and apply survey data. **(Paramati, Alam, & Chen, 2017, p. 712)** Hence, additional research is needed due to the limited quantitative understanding associated with low-carbon economy and tourism, such as :

-Relative relationship between tourism-induced CO2 emissions and economic growth. This can be measured by the decoupling of Carbone emissions to reveal the status of tourism development within a low-carbon economy approach. **(Tapio, 2005, p. 137)**

-Separate effects of tourism on CO2 emissions to highlight the underlying factors to influence emissions, which can be investigated by the Logarithm Mean Divisia Index (LMDI) decomposition method. This method has been preferred to explore the key factors that contribute to changes caused due to economic growth, environment pressures, and social development. **(Sun, 2016, p. 326)**

Collectively, these two issues provide a comprehensively quantitative basis to assess the linkage of tourism, Carbone emissions and economic growth. **(Tang, Shang, Shi, Liu, & Bi, 2014, p. 390)**

2. THEORETICAL FRAMEWORK

A number of studies have been focused on the relationship between tourism and Sustainability as CO2 emissions and Growth for different countries by using different methods; some literature reviews are as follow:

An analysis shows the relationship between tourism and environmental degradation and economic development indicators, and more particularly the EKC hypothesis, using the tools of econometric analysis. **(Shafik & Bandy opadhy ay, 1992)** A study for Latin American countries shows that the tourism sector is the main driving force for economic expansion in medium or low-income countries, while not applicable for rich countries. **(Eugenio-Martin, Morales, & Scarpa, February 2004, p. 19)**

Accordingly, based on a case study of Algeria, the purpose of this research is to explore the relationship between tourism, CO2 emissions, trade openness and economic growth. Four mains aspects are analyzed: (A) dynamics of tourism-induced CO2 emissions; (B) decoupling relation between CO2 emissions and economic growth in tourism; and (C) separate effects of tourism on CO2

emissions; (D) tourism and CO2 emissions in Algeria. The objective is to assist in the formulation of specific and effective methods that will reduce Carbone emissions due to tourism.

A) Dynamics of tourism-induced CO2 emissions

Peters and Dubois found total CO2 emissions in 2010 from tourism were 103(mt), which accounted for 4.95% of global emissions. **(Peeters & Dubois, 2010)** UNWTO and UNEP estimated the tourism related CO2 emissions contributed a range of 5% of the global emissions, and accounting for 10% of world's GDP, 7% of global trade in 2017. **(World Tourism Organisation, 2017)**

Petar and Al., analyze the relationship between GDP and CO2 emissions for 17 transitional economies based on a series from 1997 to 2014, the analysis was conducted using Dynamic OLS and FMOLS approaches, the results clearly suggest the existence of statistically significant long-run cointegration relationship between CO2 emissions and GDP, a 1% change in GDP leads to around a 0.35% change of CO2 emission on average for the considered group of countries. **(Petar, Olja, & Aleksandar, 2017, p. 1)**

Martinez and Bengochea even extended the functional form to cubic specification in addressing the relationship between CO2 and GDP for 22 OECD countries for the period 1975-1998. The cubic function indicated that a decline CO2 emission when income is rising can be expected, but only up to certain level, and then an increase of pollution can be expected again at higher incomes. **(Martinez & Bengochea, 2004, p. 121)** Kapusuzoglu uses also variance decomposition within cointegration analysis to provide similar evidence on the causality from CO2 emissions to GDP in developing economies, but not in OECD and European countries. **(Kapusuzoglu, 2014, p. 5)**

B) Decoupling relation between CO2 emissions and economic growth in tourism

Decoupling was introduced to environmental sciences discipline to measure the de-linking relationship between economic growth and resource consumption. When economic growth is achieved with steady or even decreased resource consumption, it relates to the general discourse of de-linking from increased environmental problems. **(Tapio, 2005, p. 137)** The organization for Economic Co-operation and Development first proposed the decoupling indicator to block the connection between economic change and environmental pollution. **(Tapio, 2005, p. 140)**

In the tourism discipline, it has been noted that a long-run equilibrium linkage exists between, CO2 emissions and economic development. **(Katiecioglu, Fridun, & Kilinc, 2014, p. 634)**

Lingling and al., are quantifying the dynamics of regional tourism in a low-carbon economy context is a pivotal issue to develop energy policies, and to decompose the national carbon abatement, the analysis decoupling variables, results from 2001 to 2015 indicated that tourism- induced energy consumption and CO2 emissions, additionally, industry size and expenditure size effect were principal factors to promote Carbone emissions growth, whereas energy intensity, spatial structure and sectorial structure had negative effects. **(Lingling, Brijesh, & Wei, 2018, p. 1)**

C) Separate effects of tourism on CO2 emissions

The aim of decomposition is to identify the effects by which CO2 emissions from tourism can be assessed along with its evolution and importance. Besides the relationship between individual tourism sectors, factors and CO2 emissions it should also identify the directions for policies with respect to emission reductions for low-carbon development. **(Robaina, Moutinho, & Costa, 2016, p. 520)** As to the decomposition methods, based on the decomposition of a differential quantity, LMDI decomposition is proposed. The result of this method generates no residual and accommodates the value zero in the dataset, which can overcome the key limitations with respect to traditional decomposition methods. **(Ang, Liu, & Chew, 2003, p. 1561)** Additionally LMDI can play a role in the analysis to determine the separate effects on CO2 emissions due to energy use by the tourism industry. **(Sun, 2016, p. 326)**

D) Tourism and CO2 Emissions in Algeria

Algerian economy's tourism trends are presented in Table1. According to Table1., the tourism expenditure in the 1990s was 186 million . It increased from 200 million in the 2000s to 700 million in the 2010s and to 1.05 billion in 2017. The main reasons for the increase are the tourist arrivals can be cited as the country's natural beauty, recent tourism investments and political stability.

Table1. Trend of CO2 Emissions, Tourism, GDP and Trade Openess in Algeria

Time period	CO2 emissions (kt)	Tourism Expenditures (curent US$)	GDP (constant 2010 US$)	Trade Openess (% of GDP)
1990S	80000	186000000	8,884E+10	48,38

2000S	100000	200000000	1,0396E+11	62,85
2010S	120000	700000000	1,6082E+11	69.86
2017	250855,803	1,051093012	1,9515E+11	56.14

Source: World Bank Data (2018)

Algeria's CO2 emissions in the 1990's were 80000 (kt). CO2 emissions in the 2000s were 100000 (kt) and increased to 120000 (kt) on 2010, the CO2 emissions continued to increased about two times in 2017 were 250855 (kt). The energy and tourism and other sectors can be affecting CO2 emissions in Algeria.

Trade Openess in Algeria has been increased from 48.38% in 1990s to 62.85% in 2000s and to 69,86 in 2010s, but it has been decreased to 56.14% in 2017. The main reasons for the decrease are the later effect of the monetary crisis.

The GDP trend, which is indicator of economic growth, is presented in Table1. While GDP was 8,884E+10$ in the 1990s, in the 2000's it grew to 1,0396E+11$. In the 2010s, GDP increase to 1,6082E+11$ and to 1,9515E+11$ in 2017 mainly because world prices grew to an average 25 $ a barrel in 2016.

3. Material AND METHODS

In this paper, annual series are generated for the period 1990-2017. Data on Co2 emissions (LnCo2), real GDP (LnGDP), trade openness (LnOP) and tourism expenditure (LnTE), were retrieved from World Bank data. Co2 emissions are measured by the carbon dioxide emissions kilo tonne. Gross Domestic Product is used as a proxy of income as constant 2010 US$. Tourism Expenditures are expenditures of international outbound visitors in other countries, including payments to foreign carriers for international transport are measured in current US$. Trade Openness is the sum of exports and imports of goods and services measured as share of gross domestic product. All variables are expressed in natural logarithm.

In terms of methodology, the construction of the empirical model specification in order to capture the hypothesis suggested in theoretical relationship between Co2 emissions and Gross Domestic Product, Trade Openness and Tourism Expenditure. As stated earlier the objective of the present study is to empirically examine the influence of tourism on sustainable growth.

One important econometric issue is the verification of the existence of the long-run equilibrium relationship among variables. This can be maintained by employing the Johansen co-integration approach (1991) or Engle-Granger procedure (1987). The Johansen approach is based on the use of the Vector

Autoregressive models (VAR), whereas the Engle-Granger procedure is based on testing the stationarity of the regression residuals. However, there is a difference between the two approaches; the EG procedure did not allow the testing of the hypothesis on the co-integrating relationships themselves, but Johansen approach tests the hypothesis of the long run equilibrium relationships. Another important issue is to determine the order of integration of each series I(d) of variables. This can be done by applying ADF test (unit root test).

It is required that the stationarity property of the time series be investigated to ensure the use of OLS or not. This station is due to the fact most of the macroeconomic variables are non-stationary, and hence, the estimation of parameters using OLS obtains a very high R2, and the rise of spurious regression problem may be generated by a non-stationary process. The Augmented Dickey-Fuller (ADF) test is used. The ADF test takes the following form:

$$\Delta y_t = a_0 + \sigma y_{t-1} + \sum_{j=1}^{m} \beta j \Delta y_{t-1} + \varepsilon_t \qquad (01)$$

The test for a unit root is a test of significance of the coefficient of (Y*t-1*) and one cannot reject the hypothesis of unit root when the ADF test-statistic (t-statistic) is less (in the absolute value) than the Mackinnon critical values.

The starting point of cointegration is that the variables are integrated of order one, I(1), it is required to determine existence of at least one linear combination I(0) of these variables that is a stable and non-spurious relationship exist among variables. The Johansen co-integration method was used to determine the number of co-integrated vectors for any given number of non-stationary variables of the same order. Since the Johansen test is very sensitive to the lag length employed in the VECM, the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) statistics are employed to determine the optimal lag length.

A linear model representing the relationship between tourism and sustainable growth is as follows, where all variables are in natural logarithms, as indicated by a leading « Ln » in variable names :

$$LnCo2 = \beta_0 + \beta_1 LnGDP + \beta_2 LnOP + \beta_3 LnTE + u_t \qquad (02)$$

Various modern econometric techniques were introduced to investigate the existence of a long-run relationship among variables. The study uses the Fully modified ordinary least squares (FMOLS) approach to investigate the relationship between Co2 emissions and, Gross Domestic Product, Trade Openness and

Tourism Expenditure in Algeria. The FMOLS method produces reliable estimates for small sample size and provides a check for robustness of the results.

Fully modified ordinary least squares was developed by Phillips and hansen **(Phillips & Hansen, 1990, p. 100)**, has advantages such as correcting for endogeneity and serial correlation effects. **(Narayan & Narayan, 2007, p. 104)** Mathematical derivation of the FMOLS model is given in Phillips and Hansen (1990) and not discussed here for brevity. Advocated by stock and watson (1993) **(Stock & Watson, 1993, p. 785)**, DOLS is employed to estimate long-run equilibria that is corrected for potential simultaneity bias among explanatory variables. **(Narayan & Narayan, 2007, p. 106)**

The fully modified OLS (FMOLS) estimation is based on a direct non-parametric correction and dynamic OLS (DOLS) estimation **(Saikkonen, 1991, p. 4)**, where the correction is achieved by running lead and lag augmented regressions. In this paper we consider FMOLS estimation which requires consistent estimators of the bias terms, this technique modifies least squares to account for serial correlation effects and test for the endogeneity in the regressors that result from the existence of co-integrating relationships. **(Shahbaz & Rukhsana, 2008, p. 1455)**

4. DATA AND EMPIRICAL ANALYSIS

This study used annual data from Algeria for the period from 1990 until 2017. In the empirical study, variables such as Co2 emissions, economic growth, tourism expenditure and trade openness were used. The natural logarithm of all variables was taken into account and added to the model.

The integration order of the variables is examined by employing ADF unit root test with only the intercept, and with the intercept and trend.

Table2. The Results of the ADF Unit Root Test

	ADF			
Variables	**Intercept**		**Trend and intercept**	
	t-statistic	P value	t-statistic	P value
LnCo2	-0.296057	0.9132	-1.082032	0.9137
d(LnCo2)	-5.166156	0.0003	-5.543266	0.0007
LnGDP	1.168220	0.9970	-3.754905	0.0355
d(LnGDP)	-4.788187	0.0007	-4.594488	0.0059
lnTE	-1.128889	0.6892	-3.100242	0.1263
d(LnTE)	-5.351436	0.0002	-5.220753	0.0015

lnOP	-1.665181	0.4368	-1.181271	0.8944
D(LnOP)	-4.861183	0.0006	-4.872145	0.0031

Note: Critical values are indicated by 1%.

Source: Prepared by researcher based on outputs. (E-views-10)

The results of the ADF unit root test are given in **table2**. According to the test results, it was found that sample statistics of LnCo2, LnGDP, LnTE, LnOP variables are lower than the critical values in absolute terms, meaning the null hypotheses (H_0: ...*has unit root*) are not rejected and varables were not stable at level. By taking the difference, all variables became stable at the first dlevel I(1).

Table3. Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	129.9949	NA	4.93e-10	-10.07959	-9.884574	-10.02550
1	234.5735	167.3257*	4.21e-13*	-17.16588*	-16.19078*	-16.89543*
2	249.1080	18.60414	5.30e-13	-17.04864	-15.29346	-16.56182
3	260.3400	10.78277	1.07e-12	-16.66720	-14.13194	-15.96403

*indicates lag order selected by the criterion LR is sequential modified LR statistics FPE denotes Final prediction error
AIC refers to Akaike information criterion SC is Shwarz information criterion
HQ denotes Hannan-Quinn information criterion

Source: Prepared by researcher based on outputs. (E-views-10)

A maximum of three period lag is taken to find the appropriate lag length as the present study is using annual data and on the basis of Shwarz information criterion and Hannan-Quinn information criterion a one period lag is taken.

Johansen Cointegration test results are tabulated in **Table 4**.

Table 4. Result of Johansen's Cointegration Test

	Trace test		
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P value**
r*=0	**r≤1**	**77.52642**	**0.0000**

r=1	**r≤2**	**35.98346**	**0.0085**
r=2	**r≤3**	**13.22199**	**0.1069**
r=3	**r≤4**	**0.295805**	**0.5869**
	Max. eigenvalue test		
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P value**
r*=0	**r≤1**	**41.54296**	**0.0004**
r=1	**r≤2**	**22.76147**	**0.0292**
r=2	**r≤3**	**12.92678**	**0.0804**
r=3	**r≤4**	**0.295205**	**0.5869**
Cointegration Vector : LnCo2=+1.470516 LnGDP* + 1.412498 LnOP*** - 1.010525 LnTE***			
[0.26958]	**[0.33295]**	**[0.16167]**	

Note: r* is the number of cointegrating vectors under the null hypothesis. Figures in brackets are t-statistics.

Source: Prepared by researcher based on outputs. (E-views-10)

The results of cointegration analysis show that the trace statistics and maximum Eign values are greater than the ritical values at 5 percent and 10 percent level of significance respectively, for no cointegration (r=0) and less than the critical values for at least one cointegration (r≤1). Hence it is evident that there is one cointegrating vector among the variables included in the model. In other words, there is a unique long run equilibrium relationship between LnCO2, LnGDP, LnTE and LnOP of Algeria.

The next step is where equation (02) is estimated to examine the long-run relationship among the variables. As suggested by **(Narayan & Narayan, 2007)**. Since the observations are annual, we choose 1 as the maximum order of lags in the FMOLS and estimate for the period of 1990-2017. The calculated F-statistics for the cointegration test is displayed in **Table 5**. The critical value is reported together in the same table which based on critical value suggested by **(Narayan & Narayan, 2007)**.

Table 5. FMOLS results

Method : Fully Modified Least Squares (FMOLS)				
Variable	Coefficient	Std. Error	t-statistic	Prob
LnGDP	1.544812	0.283173	5.455360	0.000
lnTE	0.539727	0.259658	2.078610	0.0490
lnOP	-0.515215	0.147873	-3.484781	0.0020

C	-9.451855	2.059782	-4.588765	0.0001
R-Squared	0.855750	Adjusted R-Squared		0.810848

Source: Prepared by researcher based on outputs. (E-views-10)

Regarding the gross domestic development, tourism expenditure and trade openness variables, the GDP variable is positive and significant, the tourism expenditure is also positive and significant at 4%, while trade openness is significant but negative. As a result a 1% increase in CO2 emissions leads to 1.54% increase in GDP, and 0.53% in tourism expenditure. While a 1% change in CO2 emissions leads to a -0.51% change in trade openness. The close of long-run coefficient for all estimations confirm the robustness of the estimated results.

5. RESULTS AND DISCUSSION

The nexus between the environment and economic growth is one of the most important relationships, for policy makers, academia and industry alike. As early as the 1980s this relationship has been the focal point of theoretical and empirical research, because a direct consequence of pollutant emissions is climate change and especially global warming.

This paper shows the relationship between CO2 emissions, GDP, tourism expenditure and trade openness in Algerian tourism industry for the period 1990 to 2017. We used Cobb Doulags production function (eq 02). The cointegrating relationship was estimated by using FMOLS, results suggest the existence of long-run cointegrating relationship between CO2, GDP, TE and OP that is statistically significant. Which means that, on average, a 1% change in CO2 emissions leads to 1.54% change in GDP and a 0.53% change in tourism expenditure, but a -0.51% change in trade openness due to the political measures to reduce pollutant factors on imports and exports. Close values of long-run coefficients for all estimations confirm the robustness of the estimated results.

According to the significant values of variables, the increase in tourism expenditures increases CO2 emissions causing air pollution in Algeria. Policy makers must take measures to enable the tourism sector to grow and help reduce air pollution. Environmental pollution can be prevented by using clean energy in industries heavily reliant on energy, such as logistics and tourism. In addition, necessary measures must be taken in order to minimize damage on the environment from new touristic areas.

Furthermore, it is necessary to state that this result does not explain the factors behind the observed CO2-GDP-TE-OP relationship. Future research

should introduce new variables and methods.

Algeria needs to follow global policy incentives to implement new mechanisms and instruments for the purpose of reducing CO2 emissions, such as environmental taxes, emissions-trading schemes, and carbon capture and storage. With economic growth, the welfare and living standards of countries increase. However, along with economic growth comes the issue of increasing environmental pollution. Policy makers need to make the right decisions to prevent this happening. It is necessary to aim at reducing environmental pollution without compromising economic growth. Adequate incentives should be provided and investments should be made in technologies that reduce environmental pollution. Clean and renewable energy sources should be used instead of energy sources that pollute the environment.

6. Bibliography List:

- Ang, B. W., Liu, F. L., & Chew, E. P. (2003). Perfect Decomposition Techniques in Energy and Environmental Analysis. *Energy Policy, Vol 31* .
- Eugenio-Martin, J. L., Morales, N. M., & Scarpa, R. (February 2004). Tourism and economic growth in Latin American Countries: A Panel Data Approach "FEEM". *International Conf. Tourism and Sustainable Economic Development Macro and Micro Economic Issues, No 26.* Italy.
- Georgantopoulos, A. G. (2012). Forecasting Tourism Expenditure and Growth: A VAR/VECM Analysis for Greece at both Aggregated and Didaggregated Levels. *International Research Journal of Finance and Economics* .
- Georgantopoulos, A. G. (2013). Tourism Expansion and Economic Development: VAR/VECM Analysis and Forecasts for the Case of India. *Asian Economic and Financial Review, 3 (4)* .
- Govdeli, T. (2019). Investigating the relationship on Co2, Tourism, Economic Growth and Trade Openness in Turkey. *Manisa Celal Bayar Universitesi I.I.B.F* , p. 321.
- Kapusuzoglu, A. (2014). Causality Relationship between Carbon Dioxide Emissions and Economic Growth: Results from a Multi-Country Study. *Int. J. Econ. Prespect, Vol 6* .

- Katiecioglu, S. T., Fridun, M., & Kilinc, C. (2014). Estimating Tourism-induced Energy Consumption and CO2 Emissions: The Case of Cyprus. *Renew. Sustain. Energy Rev, Vol 29* .
- Lingling, C., Brijesh, T., & Wei, Y. (2018). The Relationship between Tourism, Carbon Dioxide Emissions, and Economic Growth in the Yangtez River Delta, China. *Sustainability Journal, Vol 10* .
- Manfred, L., Ya-Yen, S., Futu, F., Yuan-Peng, T., Arne, G., & Arunima, M. (2018). The Carbon Footprint of Global Tourism. *Nature Climate Change, Springer* .
- Martinez, Z. I., & Bengochea, M. A. (2004). Pooled Mean Group Estimation of an Environmental Kuznets Curve for CO2. *Econ. Lett, Vol 82* .
- Narayan, s., & Narayan, P. K. (2007). Detemninants of Demand for FIJI's Exports: an Empirical Investigation. *Wiley Online Library* .
- Paramati, S. R., Alam, M. S., & Chen, C. F. (2017). The effects of Tourism on Economic Growth and CO2 Emissions: A Comparaison between Developed and Developing Economies. *Travel Res, Vol 56* .
- Peeters, P., & Dubois, G. (2010). Tourism Travel Under Climate Change Mitigation Constraints. *Journal of Transport Geography, 18 (3)* .
- Petar, M., Olja, M. I., & Aleksandar, Z. (2017). A Cointegration Analysis of Real GDP and CO2 Emissions in Transitional Countries. *Sustainability Journal, Vol 9, 568* .
- Phillips, P., & Hansen, B. (1990). Statistical Inference in Instrumental Variables Regression with I(I) Processes. *Review of Economic Studies Vol 59, Issue 1* .
- Robaina, A. M., Moutinho, V., & Costa, R. (2016). Change in Energy-Related CO2 (Carbone Dioxide) Emissions in Portuguese Tourism: A Decomposition Analusis from 2000 to 2008. *J. Clean. Prod. Vol 11* .

- Saikkonen, P. (1991). Asymptotically Efficient Estimation of Cointegration Regression. *Econometric Theory Vol 7, Issue 1* .
- Shafik, N., & Bandy opadhy ay, S. (1992). Economic Growth and Environmental Quality: Time-Series and Cross-country Evidence. *World Bank Publications, Washington, DC, USA, Vol 904* .
- Shahbaz, M., & Rukhsana, K. (2008). Remittances and Poverty Nexus: Evidence from Pakistan. *Oxford Business & Economics Conference Program.*
- Stock, J. H., & Watson, M. W. (1993, July). A Simple Estimator of Cointegration Vectors in Higher Order Integrated Systems. *Econometrica Vol 61, No 4* .
- Sun, Y. Y. (2016). Decomposition of Tourism Greenhouse Gas Emissions: Revealing the Dynamics between Tourism Economic Growth, Technological Efficiency and Carbon Emissions. *Tourism Management, Vol 55* .
- Tang, Z., Shang, J., Shi, C., Liu, Z., & Bi, K. (2014). Decoupling Indicators of CO2 Emissions from the Tourism Industry in China. *Ecological Indicators, Vol 46* .
- Tapio, P. (2005). Towards a Theory of Decoupling: Degrees of Decoupling in the EU and the Case of Road Traffic in Finland between 1970 and 2001. *Transport Policy, Vol 12* .
- World Tourism Organisation, U. (2017). *2017 Annual Report: World Tourism Organization.* Madrid: UNWTO.