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Tourism and CO_2 Emissions: A Case Study of Selected South Asian Countries

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Abstract

Purpose: The present study examines the effects of tourism on carbon dioxide emissions for selected South Asian economies over the time from 1995 to 2016. **Research design**, **data and methodology**: The present study is an annual time series analysis of tourism and CO2 emissions. The data is taken from World Development Indicators, an official data bank of World Bank. The study sample covers four South Asian countries, namely Bangladesh, India, Pakistan, Sri Lanka and Nepal. The empirical analysis is conducted by employing Pedroni panel cointegration, Fully Modified OLS, and Dynamic OLS approaches of estimation. **Results:** Tourism significantly increases environmental degradation in selected South Asian economies. The empirical estimated results indicate, that 1 % increase in tourism related activities leads to 0.16 % increase in CO2 emissions. In addition energy consumption and GDP are also causing an upsurge in CO2 emissions in the selected panel of South Asian economies. As the empirical results indicate that 1% increase in GDP stimulates carbon dioxide emissions by 0.23%. **Conclusion**: In order to protect the environment, the study emphasizes that sustainable tourism practices need to be promoted in the selected South Asian countries. Policy implication and provided and discussed.

Keywords: Tourism, CO2 Emissions, South Asian Countries.

JEL Classification Code: O44, P18, P28, P48, Q51, R11, Z30

1. Introduction

International tourism has become one of the fastest growing industries and one of the significant drivers of economic growth around the world (Isık 2015; Isık et al., 2017). According to World Tourism Organization (UNWTO 2016), the total number of international arrivals has increased to 1.245 billion in 2016 as compared to 524 million in 1995. Tourism sector accounts for almost 10% of world GDP and is supporting almost 10 % of total employment in the world (WTTC 2017). However, tourism sector is causing almost 8% of global greenhouse gas emissions (Lenzen et al., 2018). In this era where climate change has become a global concern, it is important for host economies to follow policies that ensure sustainable tourism (Chen et al., 2018). Natural environment is a significant component of tourism (Paramati et al., 2017). Consequently, policy makers confront with a double-edged problem because promoting tourism requires natural beauty and more tourism can deteriorate the quality of natural environment (Wu et al., 2010; Gössling, 2013; UNWTO, 2016).

Literature supports both negative and positive impacts of tourism on the economies; some of the positive impacts include increase in income, consumption, investment and expansion in employment (Jago, 2012; Kumar et al., 2013; Kumar & Hussain, 2014). Tourism also brings foreign reserves that help to narrow down receipts and payment gap (Akan et al., 2009; Ohlan, 2017). On the other hand,

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tourism-oriented activities pose a serious challenge to environment in many developed and developing countries around the world. The adverse impacts of tourism include increased congestion, air pollution and despoliation of fragile environments (Gössling 2002; Ozturk et al., 2016).

Different human activities such as burning of oil, coal, gas and deforestation are significantly causing carbon dioxide emissions (IPCC, 2014). The literature suggests that increasing level of CO2 emissions in the atmosphere is major cause of environmental degradation. Previous studies also highlight this fact that excessive use of energy required for tourism activities causes an increase in emission of greenhouse gases and, thus, could be one of the significant factors that are affecting environmental quality (Tool, 2007; Ooi et al 2013; Cadarso et al., 2014; Paramati 2017; Tugso & Topso 2018; Majeed and Luni, 2019). To focus on this issue, the economists and climate change specialists continuously draw attention to find out the underlying relationships between tourism and environmental degradation. South Asia is recognized as a distinct region with a huge variety of natural resources. It includes mountains, rivers, coastal areas, deserts, forests, grasslands, and diverse climatic conditions. Such diverse natural characteristics make this region even more attractive for the tourists across the world. In 2016, South Asian countries received 105 million tourists (WTTC,2017).

This study extends the literature on tourism and environment nexus by empirically nalyzing the impact of tourism arrivals on environmental quality of selected South Asian countries. We have observed that there is an immense literature available on the impact of CO2 on tourism (Tiwari et al., 2013; Jebli et al., 2014; Ghobadi & Verdian, 2016; Zaman et al., 2016; Katircioglu, 2014; Lee & Brahmasrene, 2013 ;)—make sure the references are cited correctly with correct punctuations, etc.), but to our knowledge, there is not a single study that focuses exclusively on South Asia. The present analysis for selected South Asian economies (Nepal, Sri Lanka, Pakistan, India and Bangladesh) due to the availability of annual data series from 1995 to 2016, and it also provides useful insights for policy makers to invest in different policies with respect to sustainable tourism in South Asia. The rest of present study is structured as follows: section 2 discusses the existing literature about the issue at hand—tourism and environment nexus; section 3 presents the data and methodology; section 4 explains the methods and empirical results; and in the final section will conclude the study and provide few important policy implications.

2. Literature Review

During the 1980s, tourism and related activities gained immense importance, which led researchers to focus on relationship of tourism with different sectors in the economy, including environmental degradation. Pioneer studies discussed the relationship between tourism and pollution emissions (Pigram, 1980; Hunter and Greene, 1995; Lukashina et al., 1996; Hughes, 1996; Butler, 2000). We found an extensive literature on the possible impacts of tourism on CO2 emissions for different countries around the globe. These studies used different sets of methodologies and highlighted the important channels through which tourism impacts the environmental degradation. This section provides a brief literature review of the related studies on tourism and environmental quality.

Lee and Brahmasrene (2013) have explored the effect of tourism on economic growth and carbon dioxide emissions over the time period of 1988 to 2009 for 10 states of European Union. The results have revealed that increase in FDI and tourism promotes economic growth by creating employment opportunities. In addition, the results have shown that due to increase in the use of energy, economic growth stimulates the use of CO2 emissions? Don't you mean the creation of or increase in, thereby causing pollution emissions. Ozturk *et al*. (2015) have investigated the environment Kuznets curve hypothesis for the time period of 1988-2008. The study has used Generalized Method of Movement $A = \pi r^2$ econometric estimation technique and the empirical analysis showed the mixed- both positive and negative - relationship between energy consumption and ecological footprints in high income counties. In addition, the study found a conventional EKC in the selected panel of high- income countries. The empirical analysis also found a positive association between GDP from tourism sector and environmental degradation in the selected panel.

Dogan *et al*. (2015) have elaborated the nexus between selected macroeconomic variables and tourism for OECD countries. By using Dynamic OLS and Fully Modified OLS estimation techniques, the results have revealed that tourism arrivals are positively associated with CO2 emissions.

Paramati *et al*. (2016) have explored the impact of tourism on CO2 emissions over the time period 1995-2012. The results also support the positive nexus between tourism and CO2 in the selected group of economies. Zaman *et al*. (2016) have explored the same relationship for non-OECD and OECD countries for the time period 2005-2011. The results have revealed that tourism leads to the environmental degradation. Siddique *et al*. (2016) have examined the energy consumption- CO2 nexus for the time period of 1983-2013 for selected South Asian countries. The results from empirical estimation have indicated that energy consumption, as well as economic growth, is positively associated with environmental degradation. Dogan and Aslam (2017) have analyzed the nexus between pollution emissions and tourism for the time period 1995-

2011 based on a panel of European Countries. The empirical results have indicated that excessive use of energy leads to increase in carbon dioxide emissions, but that tourism reduces carbon dioxide emissions.

Paramati et al. (2017) investigated the effect of tourism on CO2 emissions and economic growth for the time period of 1991-2013 for selected 28 European countries. The empirical analysis utilized Fully Modified OLS estimation methodology for the estimation. The results demonstrate that tourism has a positive effect on economic growth of both Western and Eastern European states. In addition, the results show that tourism mitigates CO2 emissions in West Europe countries while the tourism increases CO2 emissions in East Europe countries. Qureshi *et al*. (2017) explored the relationship among tourism, energy demand, health and income for the time period 1995 to 2015 for 80 international tourism destinations. The study used GMM technique and the empirical results indicate that increase in tourism stimulate the CO2 emissions and thus causing environment degradation. In addition, the results confirm the existence of EKC in the selected group of countries. — so, are all these studies in conflict with each other with regard to tourism and CO2? Furthermore, the results show that trade and FDI do not have a significant impact on CO2 emissions. The Granger causality test results indicate that tourism granger causes per capita income while bidirectional causality is running between the CO2 emissions, energy, and FDI with income per capita. In a recent study Azam et al. (2018) explore the effect of tourism on environmental degradation for the time period 1990-2014 for three Asian countries, Singapore, Thailand and Malaysia. The study used Fully Modified OLS estimation approach, and the empirical results highlighted the fact that tourism is negatively affecting environment in Malaysia whereas the opposite is true for rest of the two countries.

Katircioglu et al. (2013) found a long-run positive nexus between energy consumption, tourism and CO2 emissions in Cyprus. Solarin et al. (2014) examined the determinants of carbon dioxide emissions, tourism, real GDP, financial development, energy consumption and urbanization over the period 1972-2010 for Malaysia. The results depict that unidirectional causality is running from tourism to carbon dioxide emissions, but no evidence of causality is being found from tourism to economic growth over the time period. Katircioglu (2014a) explored the nexus among tourism, energy consumption and environment degradation over the time period of 1970-2009 in Turkey. The results indicate that tourism show a significantly positive effect on energy consumption and CO2 emissions in the long-run.

Katircioglu (2014b) analyzed the nexus among energy consumption, real income, tourism development and CO2 emissions for the period 1971-2010 for Singapore and tested tourism-induced environment Kuznets curve hypothesis. The study used dynamic ordinary least square approach for empirical estimation. The results indicate about the existence of tourism-induced environment Kuznets curve and also there exists a long-run nexus between tourism and CO2 emissions through the channel of real income and energy consumption. Liu et al. (2011) explored the impact of tourism on carbon dioxide emissions based on Chengdu domestic tourist expenditure survey involved 50000 tourists over the period of 1999-2004 for China. The results revealed that increase in tourism it leads to enhance in energy demand and CO2 emissions. Furthermore, the results indicate that transport sector is a major contributor to energy consumption of tourism sector.

In nutshell the literature largely suggest that tourism increases CO2 emissions with some exceptions where opposite or no relationship is found. To the best of our knowledge there is not even a single study that focuses on South Asian countries exclusively. The present study will contribute to the existing empirical literature by taking into account the case study of selected South Asian countries namely Nepal, Pakistan, Sri Lanka, India and Bangladesh.

3.Model and Data

Following Katircioglu (2014) and Dogan and Aslan (2017) the present study used the following functional form, where carbon dioxide emissions is the dependent variable while explanatory variables are tourism (TOR), energy consumption (EC) and gross domestic product (GDP).

$$CO_2 = (\text{TOR, EN, GDP}) \quad (1)$$

The equation will be further specified into following econometric model:

$$CO_{2_{it}} = \beta_{o_{it}} + \beta_1 TOR_{it} + \beta_2 EN_{it} + \beta_3 GDP_{it} + \epsilon_{it} \quad (2)$$

Where as β_k (k=1,2,3) are the coefficients of tourism, energy consumption and gross domestic product. The terms used in the study are explained as follows;CO_2 stands for carbon dioxide emissions; TOR is the number of international tourist arrivals in the selected South Asian countries; we took GDP at the constant dollars (2010 US$) and energy use kg of oil equivalent per capita as a proxy of energy consumption. The annual data of the selected variables are taken from World Development indicators (WDI 2016) over the period of 1995-2016. Keeping in view the importance of South Asian region for tourism.

4. Methods and Empirical Results

4.1. Descriptive Analysis

The descriptive statistics and the correlation matrix are reported in Table 1. According to the Jarque-Bera values, carbon dioxide emissions, tourism and energy consumption are normally distributed. The results from the correlation analysis show a positive correlation between tourism, CO2 and other selected variables such as energy consumption, GDP. The results prove that gross domestic product is highly correlated with carbon dioxide emissions as compared to tourism. In addition, energy consumption shows the moderate positive correlation with carbon dioxide emissions.

4.2. Panel Unit Root Tests and Results

In order to check the order of integration of selected variables present study used various unit root tests. The panel unit root tests results are reported in Table 2. The tests statistics for selected variable are stationary at first difference. In addition, the empirical findings are also explored the consistency and reliability of these panel unit test results.

4.3. Panel Co-integration Tests and Results

Since our variables are stationary at first difference in the next step, we will apply Pedroni (1999) panel cointegration and Kao (1999, 1990) panel co-integration tests to find out the long-run nexus among selected variables. Pedroni cointegration test is divided into two categories the first one assumes common auto regressive coefficients within dimension across countries and the second part assume individual auto regressive coefficient between dimensions for each country in the panel. The first part includes four statistics such as panel v-statistics, panel rho-statistics, panel PP-statistics and panel ADF-statistics the second part include three statistics such as Group rho-statistics, Group PP-statistics and Group ADF-statistics. These tests are based on the residuals from the equation (1). In the panel cointegration test, the null hypothesis shows no cointegration while alternative hypothesis shows the existence of cointegration between all the variables. After these tests we also applied Kao homogeneous panel cointegration test. The main benefit of pedroni cointegration test is that it resolves the issue of heterogeneity across countries.

The results of pedroni co-integration test are reported in Table 3. The null hypothesis shows that there is no cointegration while alternative hypothesis shows the existence of cointegration. The decision is based on 5 % level of significance. The results from Pedroni cointegration test within dimensions such as panel PP-statistics and panel ADF-statistics' probability and with weighted probability can reject the confirmation of null hypothesis and between dimension two tests panel PP-statistics and panel ADF-statistics and panel PP-statistics and panel ADF-statistics also confirm the rejection of null hypothesis. While the four tests among seven confirm the long-run relationship between the variables. Finally, we can conclude that all the variables are cointegrated at the 5 % level of significance.

4.4. Fully Modified OLS Long-run Estimates and Results

In order to estimate the long run coefficients, the present study used Fully Modified OLS (FMOLS). This technique is initially proposed by Pedroni (2001, 2004). Generally, FMOLS is considered to be reliable than Ordinary Least Squares technique. The FMOLS approach has several advantages such as this approach is non-parametric and resolves both the problems such as serial correlation and endogeneity biasness.

Table 1: Descriptive Statistics

Variables	CO2	TOR	EN	GDP
Mean	4.69	5.851	2.560	10.88
Median	4.62	5.703	2.621	10 .83
Maximum	6.35	7.163	2. 804	12.36
Minimum	3.31	5.096	2.120	9.64
Std. dev.	0.90	0.477	0.183	0.71
Skewness	0.34	0.845	-1.157	0.26
Kurtosis	2.02	3.124	3.206	2.38
Jarque-Bera	6.48	13.186	24.771	3.012
Probability	0.04	0.0013	0.000	0.22

The results of Fully Modified OLS are represented in Table 4. All variables are converted into the natural logarithm; we can interpret estimated coefficients as long run elasticities. As the estimated results represented in Table 5 showed that all coefficients are statistically significant at 5% level of significance. According to the FMOLS tourism is causing CO2 emissions in the selected panel of countries and it is statistically significant as well. The empirical result from Fully Modified OLS indicates that 1% increase in tourist arrival lead to 16 % increases in the level of CO2 emissions in selected countries. However, coefficient of tourism is smaller as compared to the energy consumption. The results indicate that tourism sector

stimulate the carbon dioxide emission in selected South Asian countries through the various channels such as building to tourist facilities, local and government services and transportation. The result is similar with Dogan et al. (2015) in case of OECD countries, Solarin (2014), katircioglu et al. (2014), katircioglu (2014b) and De Via et al. (2015).

Table 2: Output of Correlation Matrix

Variables	CO2	TOR	EN	GDP
CO2	1			
TOR	0.69	1		
EN	0.30	0.71	1	
GDP	0.86	0.71	0.29	1

The use of energy consumption is even more intensively affecting the environment. The results indicate that 1% increase in energy consumption then carbon dioxide emissions increase by 0.57% in selected panel of countries. The main reason behind this evidence is the excessive dependence on fossil fuel that causes CO2 emissions. The result is similar to Shahbaz et al. (2014), Ozturk and Acaravci (2010), Ang (2017), Kashman and Duman (2015), Omri (2013), Shakeel et al., (2014), Siddique & Majeed (2015) and Majeed (2018).

Table 3: Results of Panel Unit Root Tests

At levels				
	CO2	TOR	EN	GDP
Unit root (Common Unit Root Process)				
Levin, lin& Chu t	0.643	0.490	0.019	0.226
Breitung t-stat	0.417	0.337	0.714	0.824
Unit Root (Individual Unit Root Process)				
Im,Pesaran& shin W	0.633	0.690	0.061	0.329
ADF - Fisher Chi-square	0.676	0.735	0.087	0.203
PP-Fisher Chi-sq.	0.630	0.713	0.028	0.952
At First Difference				
Unit Root (Common Unit Root Process)				
Levin, lin& Chu t	0.000	0.000	0.000	0.000
Breitung t-stat	0.000	0.000	0.000	0.000
Unit Root (Individual Unit Root Process)				
Im,Pesaran& shin W	0.000	0.000	0.000	0.000
ADF - Fisher Chi-square	0.000	0.000	0.000	0.000
PP-Fisher Chi-sq.	0.000	0.000	0.000	0.000

The estimated results show that GDP increase by 1% it stimulates carbon dioxide emissions by 0.23%. The value of coefficient is small as compared to the energy consumption and lager than the tourism. This result indicates that increase in the GDP also one of the important causes of environmental degradation in the selected panel. This implies that there is a need to be substituted the energy with the clean energy and these countries should focus use efficient and innovative technology. The efficient technology produces more goods and consumes less energy and also protects the environment from pollution. Overall the results are consistent with Dogan and Turkekul (2015), Chandran and Tang (2013), Al-mulali (2015), Ozturk and Acaravci (2010) and Majeed & Mazhar (2019).

Table 4: Results of Pedroni Cointegration Tests

Common AR Coefficients Within Dimension		
	Prob.	Weighted prob.
V-statistics	0.336	0.304
Rho-statistics	0.213	0.304
PP-statistics	0.003	0.001
ADF-statistics	0.003	0.003
Individual AR Coefficients Between Dimension		
Rho-statistics	0.670	
PP-statistics	0.000	
ADF-statistics	0.004	
Kao`s Cointegration Test		
	t-statsitics	Probability
ADF	-3.890	0.000

Table 5: Results of Fully Modified and Dynamic OLS

Variables	Panel Fully Modified OLS		
	Coef.	t-stat.	prob.
TOR	0.156	3.39	0.00
EN	0.572	4.15	0.00
GDP	0.231	6.02	0.00
	Panel Dynamic OLS		
	Coef.	t-stat.	prob.
TOR	0.211	2.08	0.03
EN	O.390	2.38	0.01
GDP	0.245	-6.04	0.00

5. Conclusions and Policy Implications

The aim of the present study is to analyze the long-run relationship between carbon dioxide emissions and tourism, for the selected South Asian countries; Pakistan, Nepal, Sri-Lanka, Bangladesh and India over the period 1995 to 2016.

After testing the variables' stationarity, the study employed Pedroni co-integration approach to explain the long-run relationships between CO2 emissions and tourism. The empirical results estimated by Pedroni panel cointegration approach also confirm a long-run relationship between carbon dioxide emissions and tourism. In order to estimate long run elasticities, the study also used FMOLS approach. The results from fully modified OLS indicate that tourism significantly increasing environmental degradation, at the same time the energy use and GDP is also increasing carbon dioxide emissions.

It is evident from the analysis that in the selected countries are producing energy from conventional sources such as fossils fuels. Furthermore, shows a positive effect on CO2 emission in selected South Asian countries. It provides the evidence that tourism enhance the carbon dioxide emissions through the channel of increase in the demand of energy and transport to promote tourism sector. However, the policy makers should suggest policies in this regard for the environment protection and substitute conventional sources of energy to renewable energy. In addition, the South Asian region has a plenty of renewable sources; solar power, hydroelectric power and wind power. The investment in these sources not only protects the environment but it also meets the needs of increase in the demand of energy.

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