Title: CO2 Emission and Outbound Tourism: Predicting the Maximum Emission Level in Destination Countries

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Abstract

The influence of environmental factors on outbound tourism has been investigated profusely by tourism researchers. However, the possible non-linear effect of environmental degradation on outbound tourism is yet to be explored. In this study, the emission of CO2 into the air is argued as a gradual process and as such, it is possible that the effect on outbound tourism will be positive until a maximum emission level is reached. Focusing on Nigeria, how CO2 emission in 67 destination countries affects outbound tourism were examined. Because of possible reverse causality between CO2 emissions, the square term and total outbound, valid instruments was employed and estimated a panel instrumental variable regression model with fixed effects. The result unveils that outbound tourism increases with CO2 emission until a maximum emission level is attained.

Keywords: CO2 Emission; Outbound Tourism; Nonlinear Effect; Nigeria; Maximum Emission Level

JEL Code: Q50; Q53; Z30

1. Introduction

Climatic conditions are major environmental factors that influence the tourism industry. Goh (2012) estimates the impact of numerous weather variables on tourist arrival in Hong Kong. He finds that climatic conditions are significant determinants of tourism demand. Similarly, the work of Rossello-Nadal & Font (2011) confirms the importance of climate variables such as sunshine, temperature, frosts and heat wave in explaining outbound tourism Britain.

One of the theoretical foundations of tourism research is the work of Dann (1977), which proposed the pull and push framework for explaining the travel motivations of people. Various push and pull factors that influence tourism demand have been identified in the literature (Sonmez & Graefe, 1998; Kim, Park, Lee & Jang, 2012; Dogru & Sirakaya-Turk, 2016; Bi & Lehto, 2018; Haque & Haque, 2018).

However, a factor can act as both pull and push. Take the effect of climatic factors; for instance, Alvarez-Diaz & Rossello-Nadal (2010) find that meteorological factors at the destinations significantly affect British outbound tourism. On the other hand, Wang, Fang & Law (2018) take tourism research to the next level by examining how air quality in the country of origin influences outbound tourism. Their results suggest that though deterioration in air quality increases outbound tourism, an increase in income can help mitigate such effect. This means that environmental factors in both origin and destination countries determine outbound tourism

In the literature, studies that have investigated how CO2 emission impacts outbound tourism are scarce, the reason being that it is not exactly clear that tourists consider the emission level at various destinations at the pre-travel phase. We start by showing the path through which this CO2 emission could affect tourism demand. The discharge of Carbon dioxide brings about changes in climate and an increase in temperature, thereby raising the formation of particulate matter and ozone. Thus, tourists that care about their health would choose less polluted countries with mild weather. The mechanism is summarized below.

CO2 Emission → Air Pollution, Extreme Weather → Outbound Tourism

According to Wang, Fang & Law (2018), existing empirical tourism demand studies focused on the effect of meteorological variables, which include temperature, rainfall and sunshine. They, therefore, add to the literature by investigating the impact of air quality in the country of origin on outbound tourism. Thus, this study fills the existing gaps in three ways, and the first is by examining the effect of air quality in the destination countries on outbound tourism of Nigeria.

Second, the possible nonlinear effect of CO2 emission on tourism demand were analyzed. The deterioration of the environment because of CO2 emission is a gradual process, and because of this, it is possible that the immediate impact on tourism is not negative until a certain emission level is attained. More specifically, there could exist a maximum CO_2 emission in the destination countries which tourists could tolerate.

Third, the likely reverse causality between CO2 emission and outbound tourism were considered. Keeping this in mind, valid instruments and instrument for CO2 emission and its quadratic term was employed, and then estimate a panel fixed effect model. We start with a model without a control variable but includes country and year fixed effects. Then we move on to the model that adds full set of control variables one after the other, till all the controls are added. Our instruments include a number of institutional factors that affect air pollution but not directly the outbound tourism. Of course, these instruments have to be relevant and exogenous for them to be valid. Our result revealed that air pollution increases outbound tourism up to a certain point after which outbound tourism starts to decline.

The rest of this paper is categorized into three sections. The first section reveals the empirical model of this study, estimation strategies, data and their sources. The estimation results are discussed in the second section, while the third section concludes the study and makes relevant recommendations.

2. Methodology

2.1 Model Specification

The regression model we want to estimate is specified below

$$lnY_{it} = \theta_1 lnP_{it} + \theta_2 (lnP_{it})^2 + \beta X' + \omega_i + \vartheta_t + \varepsilon_{it} \qquad (1)$$

In model 1 above, i and t represent destination country and time respectively, so Y_{it} is the total outbound tourists from Nigeria to destination i in year t. P_{it} is the CO2 emission level of destination country i in year t, the coefficient reveals the impact of CO2 emission on outbound tourism. To investigate possible inverted U-curve relationship, the square term of CO2 $(lnP_{it})^2$ was included. θ_1 and θ_2 are the two coefficients of interest throughout this paper. The natural logarithm of P_{it} and P^2 was made use of, so that their estimates can be interpreted as elasticities.

Great effort was made to reduce the bias associated with the estimates of the two coefficients by controlling for relevant factors that explain outbound tourism and correlate with pollution level in the destination countries. They are all bundled into the vector X'. One of such factors is the Gross Domestic Product of destinations (Bi and Lehto, 2018). Undoubtedly, a sustained increase in GDP implies an increase in wealth and with more wealth, tourist attractions can be built to raise the inflow of tourists. Moreover, Özokcu and Özdemir (2017) and Adu and Denkyirah (2018) reveal that an increase in productivity is significantly associated with more CO2 emission.

Terrorism is another factor included as a control variable. An upsurge in crime and terrorism in destination countries lowers the inflow of tourists into such countries (Drakos and Kutan, 2003; Yaya, 2009). At the same time, acts of terror that end up in bomb explosions deteriorate air quality. To control for terrorism, the absence of terrorism index from the World Bank was made use of. This index indicates the degree to which there is no crime, terrorism and political instability. The value ranges from -2.5 (more incidence of crime and terrorism) to +2.5 (less incidence of crime and terrorism). Destination population and the share of destination countries' export to the origin country was also considered. The activities of human beings through production to boost GDP and export increase emission of CO_2 into the air.

Also, tourists tend to travel to destinations that have a good trade relationship with their countries of origin. Santana-Jiménez and Hernández (2011) evince that population density influences the inflow of tourists. By applying the appropriate test, we verify that a fixed effect model is preferred to a random effect model. As a result, we also control for unobserved destination heterogeneities that are both time and destination invariant by including controls for year and destination fixed effects. A detail explanation of all variables can be found in Table 1.

Despite controlling for relevant factors and fixed effects, the estimates of θ_1 and θ_2 was still biased because of the problem of simultaneous causality between CO2 emission, the quadratic term and outbound tourism. Whether or not environmental degradation explains tourism is already established in the literature (Mayor and Tol, 2010; Wang, Fang and Law, 2018). Again, a massive influx of tourists leads to traffic congestion and increase the emission of CO2 into the air (Saenz-de-Miera and Rosselló, 2014; Azam, Alam and Haeez, 2018). Thus, there is a need to instrument lnP_{it} and $(lnP_{it})^2$ using instruments that meet the two instrumental variable regression assumptions. More specifically, instruments that strongly correlate with both CO2 emission and the square term was needed, but do not directly explain outbound tourism.

Table I: Variable Description and Data Sources

Variable	Definition	Data Source
Outbound Tourism	Total Number of Tourists Leaving Nigeria to a destination in a given year	World Tourism Organization
CO2	Total CO_2 Emission ofeach destination in a year	World Bank
GDP	GDP at constant Prices of each destination in a year (measured in USD)	World Bank
Population	Total population of a destination in a year	World Bank
Corruption Control	Perception of the degree of corruption ranges from -2.5 (weak) to +2.5 (strong).	World Bank
Total Export	Total export of a destination less the percentage to Nigeria	World Bank
Absence of Terrorism	Absence of political instability and violence, ranges from -2.5 (weak) to 2.5 (strong	World Bank
Voice and	The participation of citizens in government,	World Bank

Accountability	ranges from -2.5 (weak) to 2.5 (strong)	
Export to Nigeria	Export of each destination to Nigeria each year	World Integrated Trade Solution

It has been shown in the literature that different measures of institutions quality strongly influence air quality and CO_2 emission (Bernauer and Koubi, 2009; Goel, Herrala and Mazhar, 2013; Egbetokun, 2018). One of such indicators is the control of corruption. The existence of chronic corruption allows manufacturing firms to make informal payments to government officials to bypass the enormous taxes associated with high CO2 emission. The implication is that countries with better control over corruption can improve air quality using effective measures. It is also possible, however, for CO2 emission to keep rising as corruption is being put to check. This mostly obtains in developing countries that do not have well-developed institutions. To be precise, the indicator we adopt is corruption control, which indicates the extent to which corruption is perceived to exist in a country. As a result, a high perception will be associated with high CO2 emission.

The second institution variable made use of is voice and accountability. This variable indicates the extent to which citizens can participate in the election of people into government positions. The question is, how does this affect the emission of CO2? When citizens participate actively in electing people into the government, they can choose a leader who will help fight corruption and solve the problem of environmental degradation. So, it makes sense to think that political participation will increase the chances of electing good leaders who will combat all sorts of environmental problems. We also make use of the total export of the destinations as an instrument. However, we worry that even though this variable is correlated with CO2 emission, it will have a positive impact on outbound tourism. This is because having a good trading relationship with origin country will increase outbound tourism. To take out such relationship, we subtract the export of each destination to Nigeria from total export for all the years. We ascertain the erogeneity of the instruments empirically by testing for over identification restriction. The first stage regression models are specified below

$$lnP_{it} = \rho_1 CC_{it} + \rho_2 VA_{it} + \rho_3 TE_{it} + \gamma X' + \alpha_i + \tau_t + \mu_{it} \quad (2)$$

$$(lnP_{it})^2 = \pi_1 CC_{it} + \pi_2 VA_{it} + \pi_3 TE_{it} + \sigma X' + \varphi_i + \delta_t + \epsilon_{it} \quad (3)$$

In the models above, CC is corruption control, VA is voice and accountability, and TE is the total export of each destination after subtracting export to Nigeria. Relevant controls (X') was included and fixed effects to better estimate lnP_{it} and $(lnP_{it})^2$. It is expected that the two institution quality indicators will be highly correlated. To ensure this does not influence the first stage results, we first estimate the models with each instrument, include two at a time and finally add the three instruments.

2.2 Data and Sources

Data used are from multiple sources and cover the period from 2000 to 2014. We make use of 67 destinations. Data for outbound tourism are from the website of the World Tourism Organization, and data for CO2 emission, GDP, terrorism, population, total export and all the indicators of institutions quality are from the World Bank website. Data on the export of destination countries to origin countries are from the World Integrated Trade Solution. Summary statistics and correlation matrix are in Table 2 and 3 respectively.

Table 2: Summary Statistics

Variable	N	Min	Mean	Max.	SD
LnOutbound Tourism	1005	0	6.070	12.054	3.148
LnCO2	1005	5.251	10.376	16.147	2.470
LnSquare CO2	1005	27.569	113.761	260.721	51.473
LnGDP	1005	20.069	24.704	30.489	2.359
LnPopulation	1005	11.304	16.394	21.034	1.912
Corruption Control	1005	-2.5	0.003	2.5	0.987
LnTotal Export	1005	0	23.123	28.532	4.294
Absence of Terrorism	1005	-2.5	-0.145	2.5	0.870
Voice and Accountability	1005	-2.5	-0.081	2.5	0.918
Export to Nigeria	1005	0	7.760	16.549	4.923

Table 3: Correlation Matrix

	Tour	CO2	Square	GDP	Popu	Terror	Voice	Corrup	Export	TotalEx
Tour	1.0000									
CO2	0.3633	1.0000								
Square	-0.2779	0.9373	1.0000							
GDP	0.4814	0.7912	0.6529	1.0000						
Popu	0.2070	0.7380	0.6561	0.3897	1.0000					
Terror	0.0312	-0.0007	-0.0151	0.1357	-0.1630	1.0000				
Voice	0.1139	-0.0183	-0.0904	0.2182	-0.0804	0.6552	1.0000			
Corrup	0.2138	0.0859	0.0306	0.2660	-0.0699	0.7152	0.7889	1.0000		
Export	0.4709	0.8351	0.8662	0.6828	0.6419	0.0355	0.0608	0.1241	1.0000	
TotalEx	0.5325	0.8469	0.7492	0.8997	0.5080	0.1698	0.2081	0.3104	0.8443	1.0000

Source: Author Calculation

3. Results

3.1 First-Stage Results

To ensure that the instruments are strongly correlated with pollution and its square term, the first-stage regression results was documented. Table 4 presents the first-stage results with CO2 emission being the dependent variable and Table 5 shows the first-stage results with the square term being the dependent variable. For all the results, controls for destination was included and year fixed effects. As pointed out in the previous section, our instruments include two institutional quality variables and the total export of destination countries. The two institutions variables will be highly correlated, so we do not include both in regression at a time.

Another issue is that export correlates with CO2 emission and will also influence outbound tourism. Studies have shown that tourists tend to travel to countries that have an excellent trading relationship with their country of origin. To fix this problem, we identify the percentage of the export of each country to Nigeria for the sample period and subtract accordingly. More specifically, for example, the export of the United States to Nigeria in 2000 is deducted from the total export of the United States in that Year. In this way, we take out the component of total export that correlates with outbound tourism.

For Table 4, Column 1 includes only corruption perception as an instrument, and the estimate is positive and significant. The implication is that a higher perception of corruption is associated with higher CO2 emission. The existence of high corruption allows firms to make informal payments and bypass government regulation concerning pollution. Corruption perception is consistently positive and significant across all the columns, and the first stage f- statistic is greater than 10, suggesting that it is a strong instrument. Also, the first-stage R^2 reveals that the model in column one explains about 99 percent of the variation in CO2 emission.

Table 4: First-Stage Regression with lnCO2 as the Dependent Variable

	1	2	3	4	5	6	7
Corruption Control	0.120***			0.117***		0.126***	0.096***
	(0.034)			(0.035)		(0.034)	(0.034)
Voice and Accountability		0.148***			0.138***	0.096***	0.115***
		(0.035)			(0.036)	(0.034)	(0.035)
LnTotal Export			0.006***	0.005***	0.004***		0.004***
			(0.001)	(0.001)	(0.001)		(0.001)
LnExport to Nigeria	0.007**	0.007**	0.008**	0.007**	0.007**	0.006*	0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LnGDP	0.298***	0.310***	0.298***	0.291***	0.304***	0.303***	0.297***
	(0.031)	(0.030)	(0.031)	(0.031)	(0.030)	(0.030)	(0.030)
LnPopulation	1.312***	1.213***	1.212***	1.296***	1.204***	1.283***	1.273***
	(0.113)	(0.113)	(0.114)	(0.113)	(0.113)	(0.113)	(0.112)
Absence of Terrorism	-0.013	-0.015	0.005	-0.009	-0.012	-0.024	-0.021
	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)
Destination Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-Stage R^2	0.9972	0.9972	0.9972	0.9972	0.9972	0.9973	0.9973
First-Stage F-Statistic	11.73	17.53	18.12	14.48	15.38	11.91	12.65
Observation	938	938	938	938	938	938	938

Notes: For all the regression, the dependent variable is lnCO2. Export to Nigeria is the export of each destination to Nigeria, and total export is the total export of each destination less the export to Nigeria. ***, ** and * indicate significance at 1%, 5% and 10% respectively. Robust standard errors are in parenthesis.

Table 5: First-Stage Regression with ln of Square CO2 as the Dependent Variable

	1	2	3	4	5	6	7
Corruption Perception	2.216***			2.211***		2.082***	2.082***
	(0.665)			(0.667)		(0.664)	(0.664)
Voice and Accountability		1.178*			1.174	0.695	0.691
		(0.696)			(0.717)	(0.672)	(0.692)
LnTotal Export			0.017	0.010	0.001		0.001
			(0.024)	(0.024)	(0.027)		(0.026)
LnExport to Nigeria	0.100	0.119*	0.129**	0.100	0.120*	0.096	0.096
	(0.061)	(0.062)	(0.063)	(0.061)	(0.063)	(0.061)	(0.061)
LnGDP	6.783***	6.962***	6.911***	6.769***	6.960***	6.808***	6.806***
	(646)	(0.643)	(0.658)	(0.654)	(0.650)	(0.641)	(0.649)
LnPopulation	22.139***	20.458***	20.523***	22.107***	20.454***	21.978***	21.974***
	(2.160)	(2.096)	(2.097)	(2.165)	(2.098)	(2.168)	(2.173)
Absence of Terrorism	-0.711*	-0.574	-0.431	-0.704*	-0.573	-0.773**	-0.772**
	(0.371)	(0.378)	(0.365)	(0.374)	(0.383)	(0.382)	(0.387)
Destination Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-Stage R^2	0.9975	0.9975	0.9974	0.9975	0.9975	0.9975	0.9975
First-Stage F-Statistic	11.09	2.86	0.51	5.77	1.55	5.92	4.05
Observation	938	938	938	938	938	938	938

Notes: For all the regression, the dependent variable is ln of square term of CO2. Export to Nigeria is the export of each destination to Nigeria, and total export is the total export of each destination less the export to Nigeria. ***, ** and * indicate significance at 1%, 5% and 10% respectively.

Robust standard errors are in parenthesis.

Log of total export is consistently positive and significant, suggesting that an increase in export is associated with an increase in CO2 emission. This makes complete sense because high productivity raises pollution emission. Voice and accountability, on the other hand, is significant, but it does not have the correct sign. A government that takes into consideration the needs of the people, say, complaints about high environmental degradation, will take effective measures to reduce the problem. So, an increase in voice accountability is expected to decrease CO2 emission. Including two instruments at a time and all the instruments still generate consistent results, with high R^2 and F-statistics greater than 10. As a result, it was concluded that the three instruments are strongly correlated with CO2 emission.

Table 2 presents the same set of regressions, except the dependent variable is now the square term of CO2 emission. Corruption perception is positive and significant in all the regressions. Also, the f-statistic (11.73) in column one is greater than 10, suggesting that corruption perception is a strong instrument. However, the two other instruments are not significant, and the f-statistics from column two to seven are less than 10. The implication is, while corruption perception, log total export, and voice accountability are strongly correlated with CO2, only corruption perception has a high correlation with the square term.

3.2 Main Results

Table 6 presents the main estimates of the impact of CO2 emission on outbound tourism. We started by including the control variables one after the other to observe how the coefficient estimates change, but finally, all of them were added and the results estimated in column seven. Log of CO2 emission is consistently positive and significant, except in column four, which includes only the absence of terrorism as a control. In column seven, the estimate is 7.194, and it is significant at the 5% level. This value means that an increase in CO_2 emission by 1% will increase outbound tourism by 7.194%. The apparent reason is that pollution has not reached a critical stage which tourists cannot tolerate.

The coefficient of the square term of pollution is -0.359, and it is significant at the 5% level. This estimate means that an increase in CO2 emission by 1% will decrease outbound tourism by 0.359%. This result implies that there is the maximum level of CO_2 emission which tourists can entertain so that having emission beyond such level will start to reduce outbound tourism. Figure 1 below displays the inverted U-shaped relationship between total outbound tourism and CO2 emission. As the emission of CO2 into the air increases, outbound tourism continues to increase, but when the maximum of 47221 kt (ln47221 = 10.7626) is attained, total outbound tourism is at 13421 (ln13421 = 9.5046). Beyond this maximum emission level, outbound tourism starts to decline.

Table 6: Effect of CO2 Emission on Outbound Tourism

	1	2	3	4	5	6	7
LnCO2	9.136**	4.047*	8.355**	6.001	5.514**	6.588**	7.194**
	(4.013)	(2.082)	(4.097)	(4.053)	(2.700)	(3.100)	(2.961)
Square LnCO2	-0.442**	-0.144	-0.420**	-0.331*	-0.289*	-0.340**	-0.359**
	(0.200)	(0.101)	(0.201)	(0.197)	(0.150)	(0.170)	(0.152)
LnGDP	0.688				1.002*	1.098*	0.802*
	(0.459)				(0.544)	(0.588)	(0.411)
LnPopulation		-0.422***			0.206	0.179	0.298
		(0.132)			(0.171)	(0.179)	(0.198)
LnExport to Nigeria			0.197***			0.079*	0.085*
			(0.067)			(0.047)	(0.049)
Absence of Terrorism				0.085			0.340
				(0.127)			(0.218)
Destination Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0034	0.0772	0.1618	0.1758	0.0237	0.0149	0.0133
Sargan Statistic	0.8284	0.4711	0.0640	0.5347	0.5920	0.0561	0.1868
P-value	(0.3627)	(0.4925)	(0.8003)	(0.4646)	(0.4416)	(0.8128)	(0.8913)
Observation	938	938	938	938	938	938	938

Notes: For all the regression, the dependent variable is ln total outbound tourism. Export to Nigeria is the export of each destination to Nigeria, and total export is the total export of each destination less the export to Nigeria. P-values are for the Sargan statistics. ***, ** and * indicate significance at 1%, 5% and 10% respectively. Standard errors are in parenthesis.

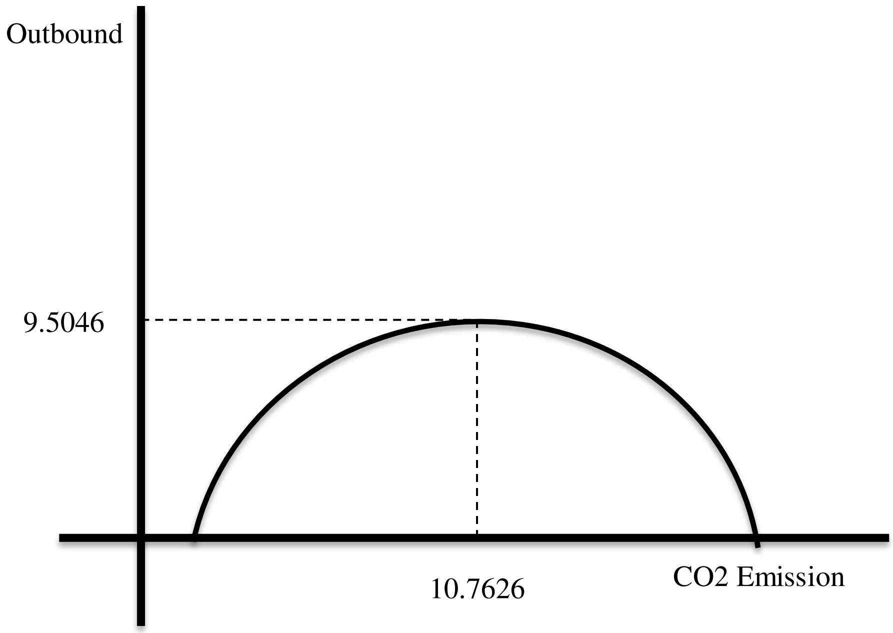

Figure 1: Inverted U-Curve Total Outbound Tourism and CO2 Emission

3.3 Robustness Results

Majority of the destination countries in our sample are developing countries, and these countries tend to have low institutions quality and high CO2 emission level. So, it is possible that the estimates in Table 6 are biased towards developing countries. Therefore, some robustness checks were performed to verify the results. The destination countries were divided into developed and developing countries and then estimate the same model for each group.

Table 7 presents the results for developed and developing countries. We still document significant positive and negative coefficients for CO2 and the quadratic term for both developed and developing countries. However, the estimates for developing countries (6.020 and -0.287) are significantly larger than that of developed countries (3.278 and -0.103). The apparent reason for this is that developing countries have lower institutions quality and higher CO_2 emission, so the effect of CO2 is expected to be larger for them.

Table 7: Effect of CO_2 Emission on Outbound Tourism

	eveloped Countries	
LnCO2	3.278***	6.020**
	(1.254)	(2.820)
Square LnCO2	-0.103*	-0.287*
	(0.061)	(0.149)
LnGDP	0.141	0.568
	(0.342)	(0.457)
LnPopulation	-1.118***	-0.192
	(0.353)	(0.172)
LnExport to Nigeria	1.203***	0.224***
	(0.270)	(0.036)
Absence of Terrorism	-0.966***	0.096
	(0.306)	(0.236)
Destination Fixed Effect	Yes	Yes
Year Fixed Effect	Yes	Yes
R^2	0.8329	0.0106
Sargan	0.6488	0.2745
P-value	0.4205	0.6003
Observation	140	770

Notes: For all the regression, the dependent variable is ln total outbound tourism. Export to Nigeria is the export of each destination to Nigeria, and total export is the total export of each destination less the export to Nigeria. P-values are for the Sagan statistics. ***, ** and * indicate significance at 1%, 5% and 10% respectively. Standard errors are in parenthesis.

Furthermore, the robustness of our results was verified by estimating our model using the System Generalized Method of Moment (GMM) method. It is essential to point out that what matters is not for the GMM estimates to only have the correct signs and be significant, but for the results to still pass the post-estimation diagnostic checks. The lag of the dependent variable is included to verify its persistence in our results. The coefficient is positive and significant in all the columns, suggesting that a positive correlation between outbound tourism and its first lag. The GMM estimates of the two coefficients of interests still have appropriate signs, and they are significant. However, the magnitude of the estimates is smaller compared to the estimates obtained from the IV method. The probability value of Sagan statistic in all the columns is large, suggesting that the instruments are exogenous. The hypothesis of no autocorrelation in the residuals is not rejected given the probability values that are large.

Table 8: Effect of CO2 Emission on Outbound Tourism (GMM)

	1	2	3	4	5	6	7
LnOutbound (-1)	0.616***	0.662***	0.635***	0.645***	0.627***	0.620***	0.620***
	(0.042)	(0.041)	(0.040)	(0.041)	(0.042)	(0.041)	(0.041)
LnCO2	1.663***	1.715***	1.856***	0.916*	1.582**	1.408**	1.425**
	(0.587)	(0.588)	(0.587)	(0.526)	(0.612)	(0.597)	(0.599)
Square LnCO2	-0.064**	-0.073***	-0.045*	-0.046*	-0.059**	-0.054**	-0.055**
	(0.025)	(0.025)	(0.024)	(0.024)	(0.026)	(0.026)	(0.027)
LnGDP	0.473***				0.481***	0.423**	0.415**
	(0.176)				(0.180)	(0.175)	(0.176
LnPopulation		-0.130***			-0.042	0.075	0.048
		(0.030)			(0.161)	(0.159)	(0.170)
LnExport to Nigeria			0.380***			0.047*	0.047*
			(0.026)			(0.027)	(0.027)
Absence of Terrorism				-0.218			-0.099
				(0.209)			(0.224)
Constant	0.879	3.720	6.340**	6.599**	-0.318	-0.422	0.203
	(3.464)	(3.820)	(2.732)	(2.759)	(4.082)	(4.059)	(4.302)
AR(1)	0.044	0.038	0.034	0.030	0.042	0.037	0.033
AR(2)	0.362	0.388	0.322	0.391	0.340	0.400	0.313
Sargan p-value	0.451	0.600	0.642	0.411	0.619	0.438	0.559
Instruments	34	34	34	34	36	37	38

Observations	938	938	938	938	938	938	938

Notes: For all the regression, the dependent variable is ln total outbound tourism. Export to Nigeria is the export of each destination to Nigeria, and total export is the total export of each destination less the export to Nigeria. P-values are for the Sagan statistics. ***, ** and * indicate significance at 1%, 5% and 10% respectively. Standard errors are in parenthesis.

4. Conclusion

In this study, CO2 emission affects outbound tourism from Nigeria to 67 destination countries from 2000 to 2014 were analyzed. After accounting for possible endogeneity of CO2 emission, the square time and outbound tourism, a significant positive relationship between CO_2 emission and outbound tourism was documented. The coefficient estimate of the quadratic term is negative and significant, confirming the existence of the highest CO_2 emission level which tourists can tolerate. More specifically, a maximum emission level of 47221 kt was predicted.

The results have some policy implications for developing countries because they dominate the sample. Since they tend to have low institutions quality and high air pollution level, it stands to reason that these countries should adopt appropriate measures and reduce the emission of CO2 in other to ensure a sustained inflow of tourists from different countries. Increasing emission tax is one measure which has proved useful in developed countries. However, this will only be effective if the high incidence of corruption among public officials is curbed. Though there is evidence suggesting that measure is put in place to reduce CO2 emission, they are not exactly effective because of this high incidence of corruption. The norms include capping the maximum monthly emission and increasing pollution taxes So it is as good as concluding that there are no emission norms in Nigeria.

Gravity model estimation is an importation method for estimating tourism flow. However, the methodology wasn't applied in this study because it focuses on outbound tourist from a single country, which is Nigeria. Also, a regional analysis to see how the effect of C02 on outbound tourism differs across different regions was unable to conduct, so suggesting further empirical studies to attempt such kind of analysis.

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