

The Nexus Between Environmental Pollution, Energy Use and Economic Growth of EAGLEs: A Panel Econometric Analysis

T. RAJASEKAR^{1,3*} AND MALABIKA DEO²

¹*Department of Management Studies, Er. Perumal Manimekalai College of Engineering, Koneripalli, Hosur, 635 117, India*

²*Department of Commerce, Pondicherry University, Kalapet, Puducherry, 605 014, India*

³*Presently at: Sheila Raheja School of Business Management and Research, Bandra(E), Mumbai, India.*

E-mail: rajakudal@gmail.com, deo_malavika@yahoo.co.in

***Author for correspondence**

ABSTRACT

The industrial revolution has resulted in faster economic growth, but it has also resulted in environmental degradation, which means that economic growth has polluted the environment. The primary focus of this research is to measure the affiliation with environment, energy and economy in Emerging and Growth-leading Economies. The results found that there is a direct relationship among energy and economy, as well as between energy use and environmental pollution. As a result, even though the countries require economic growth, these emerging and growth-leading economies must take precautionary measures to control their environmental pollution.

Key words: Environmental pollution, Energy, Economy, Emission, Econometric models

INTRODUCTION

The industrial revolution has resulted in faster economic growth, but it has also resulted in environmental degradation, which means that economic development has polluted the environment. On the eve of industrialization, natural resources were exploited, energies were used mindlessly, and the imbalances caused natural scenery of the environment, which later came in the form of global warming and climate change. Growth in any country is directly related to industrialization, which resulted in the consumption of energy and the exploitation of natural resources, resulting in environmental degradation due to the dumping of this energy waste. The rate of decomposition of environmental quality touched a distressing level, and its costs will affect not only the existing generation, but also future generations, which has recently received increased attention. The degradation of environmental quality occurred as a result of the industrial sector's high emission of greenhouse gases, particularly carbon dioxide. As environmental degradation worsens, global warming will worsen, potentially raising sea levels by 20 feet in the future, according to predictions. If global warming increases by 3 to 4 degrees Celsius, it will cause floods, scarcities, and other natural disasters that may disturb more than

340 million publics worldwide (Brain 2015). In this regard, several meetings are being held around the world to reduce carbon dioxide levels. At the Kyoto Protocol summit in 1997, governments from all over the world agreed to pay attention to the alarming situation of greenhouse gas emissions and agreed that countries should try to reduce their greenhouse gas emissions by 5% from 1990 levels by 2008-12 (United Nations Climate Change Report 1997). Recently, at a meeting in Paris (December 2015), all countries agreed to reduce emissions by 2% with immediate effect. Another meeting with Group Seven (G7) countries was held in Japan in June 2016 to discuss ways to reduce emissions (European Commission 2016). With all of these efforts, countries around the world are attempting to reduce environmental pollution in order to improve environmental quality. As a result, this may be a minor piece of research to determine the factors influencing increased emanations and the relationship between emissions, energy, and the economy.

REVIEW OF EARLIER STUDIES

According to previous research studies, three approaches have been used to relate environmental degradation, use of energy and economic

development in accordance with Zhang and Cheng (2009) and Gosh (2010). The basic approach was given the attention to relating the environment and economy by using EKC (Environmental Kuznet Curve) hypothesis. Few studies had concentrated by relating the environment and economy by using above hypothesis and found evidence of that (Sun 1999, Taskin and Zaim 2000, Canas et al. 2003, Bertineli and Strobl 2005, Galeotti et al. 2006, Azomahou et al. 2003, Dinda et al. 2006, Fodha and Zaghdoud 2010) but only few of these works examined the association between environment and economy and failed to find the evidence of EKC hypothesis (Dinda et al. 2000, Perman and Stern 2003, Halicioglu 2009, He and Sandberg 2012, Bekhet and Yashmin 2013, Lingraj and Shakti 2015). The subsequent approach is relating between energy and economy by using sophisticated econometric models as pioneered by Kraft and Kraft (1978). While relating energy and economy, few studies found the positive relationship (Lee 2006, Anthony and Ahemad 2015, Angelique and Odhiambo 2014, Haiyun 2016, Benanaya 2017, Mehmet et al. 2016) and some studies did not (Yu and Choi 1985, Ferguson et al. 2000, Toman and Jemelkova 2003, Shahateet 2014).

The final approach relating to the combination of above two approaches i.e., relationship among environment, energy and economy and highlighted positive relationship among the variables (Kruger 1991, Shafik and Bandyopadhyay 1992, Grossman and Panayotou 1993, Selden and Daqing 1994, Shafik 1994, Ang 2007, Chebbi and Boujelbene 2008, Jalil and Mahmud 2009, Halicioglu 2009, Ghosh 2010, Tiwari 2011, Hussain et al. 2012, Silva 2012, Sharif 2012, Khalid and Javid 2012, Yazdi and Shakouri 2014, Dritsaki and Melina 2014, Linh and Shih 2014, Shahateet 2014, Khan and Faisal 2015, Mehmet 2015, Obradovic and Nemanja 2016, Mohammed and Pablo-Romero 2016, Wahid et al. 2017 and Lu 2017, Maiti and Jadhav 2021). Very few studies found negative relationship among above said variables (Borhan et al. 2012, Bozkurt and Yusuf 2014).

As per the earlier studies all the three approaches found both positive as well as negative relationship while relating environment, energy and economy with various combinations of countries such as G7, G20, OECD, MENA, OPEC, Emerging Economies,

developing countries, and so on. Nevertheless, still the studies are lacking to find the relationship among environment, energy and economy specific country group wise. Hence this study considering the lack point and made an attempt to examine the relationship among environment, energy and economy specifically Emerging and Growth-leading Economies.

METHODOLOGY

The primary focus of this research is to measure the affiliation with environment, energy and economy in Emerging and Growth-leading Economies such as Bangladesh, Brazil, Peoples Republic of China, Egypt, India, Indonesia, Iran, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Russia, Turkey and Vietnam, because so far the study has not done in this region. The variables used in this study are carbon dioxide emissions, per capita gross domestic product (GDP), and energy use in various sectors such as petroleum products, natural gas, coal and lignite, and electricity. Since the data belongs to secondary nature was collected from World Energy Outlook. The nature of data belongs to both time and individual; the sophisticated panel econometric models were used to measure the relationship among the said variables.

RESULTS AND DISCUSSION

As per the environmental Kuznets curve hypothesis, the energy use was positive throughout the study period, indicating that these countries rely on energy for economic growth, which leads to increased economic growth while also increasing environmental pollution, i.e., carbon dioxide emissions (Table 1). Thus our study did not support EKC hypothesis which means that whatever happens in the economy will not take into account the environmental factors, because these countries' environmental quality is subpar. As a result, necessary steps must be taken while taking into account of their environmental pollution.

The preliminary step in econometric analysis is to check the integration properties of the variables, which is quite normal. Because the data is panel, unit root tests are used to measure the integration properties, such as the order in which the variables

Table 1. Energy use analysis by environmental Kuznetz Curve Hypothesis (EKC)

Variable	Co-efficient	S.E.	t-value	P-value
C	0.8574	0.2210	3.8787	0.0001 ***
Energy	0.09022	0.0502	21.6856	0.0000 ***
GDP	0.09595	0.01443	6.7373	0.0000 ***
GDP2	0.04798	0.0071	6.7548	0.0000 ***
GDP3	0.03498	0.0047	6.8597	0.0000 ***

*** Significant at 1% level

Table 2. Results of panel unit root test

	Level			First Difference		
	Levin et al. (2002)	Breitung (2000)	Im et al. (2003)	Levin et al. (2002)	Breitung (2000)	Im et al. (2003)
CO ₂	-4.8403 (0.4884)	1.6764 (0.9532)	-0.0477 (0.4809)	-4.5765 (0.0000)	-7.0274 (0.0000)	-11.3950 (0.0000)
Energy Use	-1.0718 (0.1419)	2.5407 (0.9945)	0.2607 (0.6028)	-9.8896 (0.0000)	-7.5910 (0.0000)	-10.0322 (0.0000)
GDP	-0.9139 (0.1804)	1.5232 (0.9362)	-0.0214 (0.4914)	-4.5767 (0.0000)	-7.0274 (0.0000)	-11.4578 (0.0000)

Table 4. Panel Error Correction Test

Variables	Lag	Co-eff	SE	t-value	Lag	Co-eff	SE	t-value
CO ₂	1	0.0554	0.0435	-1.2729	2	-0.0174	0.0306	-0.5712
Energy use	1	0.2524	0.0863	2.9225	2	0.1419	0.0823	1.7251
GDP	1	0.0911	0.0860	1.0599	2	0.0353	0.0836	0.4230
Cons		0.013555***	0.00212					
U _t (Error term)		0.0050 ***	0.0016	3.0788				
Wald F – stat		4.3858		0.536				

t value indicates significant level at 5%

are integrated; for this, we used three sophisticated econometric unit root statistics, LLC, Breitung, and IPS. The results indicate that all the variables exhibit non-stationarity at the level and stationarity in first differenced data (Table 2). Once the data is first order, the cointegration test can be used to determine the long run effect of these variables.

The test of co-integration attempts to examine the relationship among environment, energy and economy in long-term as well as short-term in Emerging and Growth-leading Economies. This study employed the well-known Petroni (2000) co-

Table 3. Panel Co-integration test

Statistics	Co-eff	P-value
P V- stat	3.7526	0.0001
P Rho - stat	-7.8349	0.0000
P PP - stat	-10.8708	0.0000
P ADF - stat	0.0776	0.5309
G Rho - stat	-2.3380	0.0097
G PP - stat	-4.9783	0.0000
G ADF - stat	-0.5292	0.2983

P value indicates significant level at 5%

integration test, which employs seven statistics to assess the long-term and short-term relationship among environment, energy and economy. Our study demonstrates that there is a long-term relationship between the variables, as evidenced by the majority of the statistics (Table 3). As a result, it can be concluded that if these countries' pollution, energy usage and economic growth are evidenced in a long-term rather than a short-term manner, the effect will likely persist in these countries for a long time.

The panel error correction model results indicate that variables with a negative indication and a

significant value will be considered to have a long run relationship (Table 4), whereas the variable with a negative indication but no significant value indicates that the relationship is only in the short run. Wald – F statistics can be used to confirm the model. The error term (U_t) for the relationship can predict the overall model. The VECM results are presented in the tables above; it was discovered that the coefficient value was positive and significant, indicating that environment, energy and economy have a long-term relationship with the variables rather than a short-term relationship. Overall, the model's error correction term was found to be positive and significant, implying that the model supports both long-term and short-run relationships between CO₂ emissions, energy use, and economic development of emerging and growth-leading economies. The study also confirmed the relationship using Wald statistics, which were found to be insignificant and confirmed that no short run relationship exists between the variables.

Table 5. Results of panel granger causality test

Variables	CO ₂	Energy	GDP
CO ₂	-	0.1073 (0.8982)	0.6924 (0.5007)
Energy	12.0243 (0.0000)	-	7.2426 (0.0000)
GDP	9.9251 (0.0000)	3.3155 (0.0369)	-

P value indicates significant level at 5%

The results of panel granger causality tests (Table 5), which show that more energy use causes environmental pollution, followed by the country using more energy as economic growth increases, which also leads to increased environmental pollution. According to the findings, countries with increasing economic growth use more energy resources, and this energy consumption leads to increased economic growth. According to the findings, there is a direct relationship among energy and economy, as well as between energy use and environmental pollution. As a result, even though the countries require economic growth, these emerging and growth-leading economies must take precautionary measures to control their

environmental pollution.

CONCLUSIONS

The industrial revolution has resulted in faster economic growth, but it has also resulted in environmental degradation, which means that economic growth has polluted the environment. The result of co-integration test concluded that the selected countries pollution, energy usage and economic growth are evidenced in a long-term rather than a short-term manner, the effect will likely persist in these countries for a long time. The results of granger causality test shows that countries with increasing economic growth use more energy resources, and this energy consumption leads to increased economic growth. The results also highlighted there is a direct relationship among energy and economy, as well as between energy use and environmental pollution. As a result, even though the countries require economic growth, these emerging and growth-leading economies must take precautionary measures to control their environmental pollution. As a result, even though the countries require economic growth, these emerging and growth-leading economies must take precautionary measures to control their environmental pollution. Hence these countries should take the policy decision with the consideration of environmental aspects. The present study have undertaken Emerging and growth leading economies future study may be done in different group of countries and also future study may be done in by adding greenhouse gases, methane etc

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