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Research Article

Institutional Quality, Industrialization, and Environmental Degradation: An Analysis from Selected Asian Countries

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Abstract

Environmental pollution is an important problem in both developing and developed economies. The worsening of the environment has to be a direct influence on the quality of human beings, or a danger to the existence of human life. The aim is to examine the factors causing environmental degradation in some selected Asian countries. We investigate the nexus between industrial production, economic growth, institutional quality, and environmental degradation in the selected economies in Asia from 2011 to 2020 by applying the GMM technique. Findings reveal that the increase in industrialization and economic growth increases environmental degradation. Moreover, institutional quality, energy consumption, trade openness, and labor force participation rate are the major causes of environmental degradation in these selected Asian countries. Energy policies should emphasize on supply of better quality energy by using other sources. There is also a need to enhance the efficient use of energy consumption. Some measures should be taken to enhance the growth of the agricultural sector to alleviate environmental pressure. Institutional quality should be improved.

Keywords: GMM estimation, Environmental degradation, Industrialization, Asian Countries.

Introduction

Global ecological issues that result from severe changes in weather affect the world. Due to these concerns, world economies prefer to use green energy with a substantial decrease in CO_2 emissions. The current studies seem to indicate that developing economies are improving by increasing their economic growth, which results in much of the carbon emissions. Globalization gives an advantage to developing economies in the form of the removal of trade barriers and the transfer of technology; it also contributes to pollution due to increasing energy consumption. But now both environmental degradation and economic growth don't seem to compromise. However, environmentally friendly growth is the way to development. Carbon emissions have increasingly become a problem of worldwide concern due to environmental degradation. Providing better techniques for controlling carbon emissions gives the impression that there is an imperative requirement to speak about how features such as population and economic growth influence the release of CO_2 in any country. The foremost way of emission is mostly discharged from the burning of fossil fuels. Half of its emanation persists in the air, increasing the world's hotness, and the extra parts are captured by ordinary land-living and oceanic carbon tanks (Yeh & Liao, 2017).

The CO_2 emission and energy consumption are associated at the household level among urban and rural

inhabitants. Recently, as energy usage consumption and emission release have developed at a growing rate, more and more researchers have considered these issues. Therefore, plans and studies on the energy disaster and CO_2 release regulators are habitually concentrating on the manufacturing segment, taking no notice of the household subdivision, which is cheap energy consumption (Xiao-Wei et al., 2016). A greater quality of political institutions is inevitable for continuous and sustained financial and economic development; its calamitous contribution to the EKC context can hardly be ignored for decreasing the dreadful conditions of the environment (Apergis & Ozturk, 2015).

Economic growth can be determined by international trade; its effect on the environment cannot unable to observe. The trade influence on the environment has been broken down into scale, composition, and technique effects (Antweiler et al., 2001). The first one indicates better economic action for enhanced trade strength (Katırcıoğlu et al. 2016), which pollutes the environment for developed economic activity and advances energy usage. The structure of the country's output can be changed by trade. For instance, trade allows a country having more labor to produce environmentally friendly goods and vice versa, thus resulting in a positive or negative composition effect. The second one mentions to reduction in emission power, as trade leads to increased growth and cleaner environment demand upsurges with increasing income level. Consequently, trade may affect the quality of the environment in a positive and negative ways as a result of all three effects. Ecological footprints comprehensively manage the ecological loss, including greenhouse gas emissions. Rees (1992) recognized it and improved it by Rees and Wackernagel (1996) and Wackernagel and Rees (1998). Ecological footprints of an economy are the total generally productive land and water area required to produce means that are used by people and cultures to engross human pollution through widespread technology.

Ecological Footprints Consumption

The data shows that the ecological footprint of global hectares per person has shown an increasing trend. But, increasing movement of footprints is observed in Singapore. This high demand on nature can make these headed for assiduously blasting ecological deficit.

Industrialization

Industrialization has been increasing in developing countries due to high energy use. Over the years, income industrialization has tended to increase in most Asian countries. Data estimations show that industrialization has been tending to increase in India and has a decreasing trend in Bangladesh.

Institutional Quality Index

It has also been observed that institutional quality is low in developing countries, and this ratio contributes too much to environmental degradation. During the past few years, institutional quality has tended to increase in most Asian countries. Moreover, the value of institutional quality is high in India and Singapore. However, low quality is observed in Pakistan. Existing studies on this topic suggest how the gross domestic product, trade openness, imports, exports, urban population, and foreign direct investment affect the ecological degradation in some countries. So, we will see the influence of industrialization, energy consumption, financial development, economic growth, labor force participation rate, and institutional quality on environmental degradation with the GMM technique in some selected Asian countries in this research. This study seems to contribute to the existing literature in numerous ways. Firstly, here we examine the environmental deterioration in Asian countries by including the ecological footprint, which is a better environmental degradation proxy. Secondly, we formulate a broad index to find diverse features of institutional quality. By reviewing the literature, we find hardly any studies showing the influence of political institutions (index) and industrialization on ecological footprints in addition to economic growth. However, we make an empirical analysis of factors leading to environmental degradation. It will give recommendations with the estimated evidence concerning this field and will positively contribute to the literature.

Literature Review

The review of important studies regarding environmental degradation and other significant factors is explained in this section. The economic growth results in high demand for consuming energy, and resultantly this is added to the environmental Kuznets curve hypothesis. As it contributes a lot to CO_2, the energy-economic growth nexus is incorporated as a significant cause of CO_2 emissions in research. Foreign trade is another important determinant of environmental degradation, and both are positively linked. Generally, trade openness helps to decrease CO_2 by increasing efficiency and growth. A significant and positive link between carbon dioxide and foreign direct investment has also been observed in these studies. Likewise, financial development also increases environmental degradation. High population growth is another hurdle in the way of environmental degradation in the economies. A few of the studies highlight this negative effect as well. The role of institutional quality cannot be ignored. The positive effect of institutional quality on environmental degradation has been mentioned in the following studies.

By using parameter estimation, Birdsall and Wheeler (1993) argued that trade liberalization and increasing foreign direct investment in Latin America had not been linked to industrial development with severe pollution. And protected nations were most probably in favor of industries with pollution intensity, whereas openness, openness fact encouraged cleaner industry by the import of advanced nation pollution standards. Pollution growth was very high for the initially poorest countries in terms of initial income level. However, the overall influence of income growth negatively affected the pollution intensity growth. The openness obviously reduced the high pollution through 1980, particularly for fast-growing economies. By adding growth, Lopez (1994) found that trade liberalization resulted in low natural resources ruin in case the producers internalized their standard response affects making. Moreover, economic growth was essentially unfavorable for preferences homothetic. In the non-homothetic case, pollution increased with income if the elasticity of substitution and the relative curvature coefficient were lower.

Antweiler et al. (2001) examined that openness affected pollution. The result found that trade produced comparatively minor variations in pollution attention when it changed the composition of national output. Moreover, the trade-inducing method and scale influence decreased pollution. Overall, free trade appeared to be favourable for the environment. Ang (2007) examined the dynamic causal link of emissions, energy usage, and output from 1960-2000. The author used cointegration and vector error-correction models, which are better techniques to find the relationship. The results indicated that more usage of energy resulted in environmental degradation, and CO_2 emission and output had a quadratic association. Furthermore, causality results highlighted that growth exerted a causal effect on energy use growth and pollution growth in the long run. However, Lin and Marinova (2009) used the STIRPAT model and showed that population affected the environment negatively. Urbanization level and population decreased environmental degradation. Industrialization level affected the environment negatively. Energy intensity and GDP per capita increased environment. Henceforth, China's One Child Policy proved an effective way of reducing the environmental impact of the country.

Similar to Ang (2007), an association of CO_2 and usage of energy was found by Jalil and Mahmud (2009) by using data from 1975 to 2005 in China. However, they used the Auto Autoregressive Distributed Lag method, which is simple technique. The result showed a one-way causality of growth to CO_2 emissions. The results showed that income and energy consumption led to an increase in CO_2 in the long run. Trade affected positively and significantly the CO_2.Comparatively, this research used a GMM method which is an appropriate technique to resolve the issue of endogeneity indicated by literature.

However, focusing on the direct positive link between environmental damage and energy usage with industrialization, Ramos et al. (2010) found that the developing economies observed enormous growth at the cost of high energy usage, and this has contributed to an increase in pollution to the environment. Over the last few years, energy consumption has tended to increase in most Asian countries. In addition to energy consumption, industrialization contributed a lot to environmental degradation. Halicioglu (2009) used the

data from 1960 to 2005 in Turkey and applied a simple model (ARDL). They found that energy consumption, income, and foreign trade increased carbon emissions. Moreover, the author also checked the Granger causality analysis. How trade, growth, and energy consumption influenced CO_2 was found by Ozturk and Acaravci (2010) in Turkey. They used data from 1968 to 2005, and the author applied ARDL techniques used by Halicioglu (2009) and Jalil and Mahmud (2009). The estimated 0.606 and 1.375 income elasticity of CO_2 and the income elasticity of energy usage per capita, respectively. Finally, the EKC hypothesis was generally found in Turkey.

Nevertheless, Arouri et al. (2012) extended the work done by Ang (2007) using bootstrap panel unit root tests and cointegration methods and found a relationship og growth, energy usage, and CO_2 in Middle East and African economies. Pane error correction estimations (GCE-MG estimations) highlighted that run energy consumption positively affected the emissions in the long run. Results also showed that growth exhibited a quadratic association with CO_2 emissions. By using data from 1965 to 2010 and applying a simple technique (ARDL), Hitam and Borhan (2012) focused on the role of foreign direct investment on ecological damage in Malaysia. The author incorporated population density, exports, and imports in the analysis and found that income square and exports decreased the CO_2 emissions. The Environmental Kuznets curve has been similar to Ang (2007), and population density, foreign direct investment, had increased environmental degradation. But the study employed GMM to avoid the endogeneity issue.

In one more study by Saboori and Suleiman (2013), the association of economic growth, environmental degradation, with energy usage in Malaysia was studied. Autoregressive Distributed Lag methodology and vector error correction model results showed shreds of proof of the EKC hypothesis. Mercan and Karakaya (2015) found that high use of energy increased ecological loss, but growth led to a decrease in this ecological damage. Similar to Saboori and Sulaiman (2013), Allali et al. (2015) focused on increasing emissions at the world level because of many sources of energy usage from 1990-2100 in Algeria. The study found a positive long-run association of CO_2 emissions and usage of energy by using a structural production function and the Cobb-Douglas methodology.

Xiao-wei et al. (2016) found that growth and population growth enhanced CO_2 emission by increasing energy consumption, as indicated by Ang (2007), Arouri et al. (2012), Mercan and Karakaya (2015), Saboori and Sulaiman (2013), and Allali et al. (2015). The energy intensity decreased the growth of emissions, and the decrease in emission reduction was comparatively corresponded to the energy intensity growth rate. Dissimilar the researchers mentioned above, Wawrzyniak and Doryń (2020) criticized the work done earlier that has used complicated models for analyzing baking and finance data without considering specifications to the choice of the econometric model. Dividend policy, as the most contentious topic incorporate finance literature, was examined by employing unsuitable methodologies, and the analysis led to misleading conclusions. The authors addressed this matter by using Tobit and GMM techniques by using 160 firm-year bank observations listed on the Karachi Stock Exchange. They concluded that Pakistani banks have not followed a steady dividend policy.

In another study by Parker and Bhatti (2020), per capita CO_2 emissions convergence in the Asian region due to its high population and growth was examined. They found the region was slowly converging on the way to a common steady state over the period. The authors utilized a temporal version to comprehend club formation and a cross-sectional version to know within-club variation. The decomposition results indicated that the per capita income was determined mainly by the club formation. However, fuel mix also led to increasing emissions over the period, though for nearly all countries, energy intensity fell. Finally, the within-club analysis indicated that a group of high emitters was sigma-converging, and gamma convergence existed within clubs. The role of institutional quality on the basis of data from five South Asian countries from 1984 to 2018 was analyzed by Hunjra et al. (2020). Panel regression results found that financial development increased CO_2 emissions in this region, indicating that countries utilized financial development for capitalization despite refining production technology. The result also found that institutional quality improved the environment.

Our research is an extended form of the earlier studies mentioned above, and specifically research done by

Ang (2007), Parker and Bhatti (2020), Hunjra et al. (2020), and Wang et al. (2020). However, the dependent variable is ecological footprints, which measures well the environmental damage, and is not used in the work in the studies mentioned above. In order to avoid the endogeneity issue, we have used the generalized moment method, which is a more appropriate approach to avoid any issue of endogeneity. The study aims to find out how to control environmental degradation and quality of life through improved institutional quality in Asian countries.

Data and Methodology

This study critically evaluates the environmental degradation in selected Asian countries (i.e., Pakistan, Bangladesh, India, Sri Lanka, Indonesia, Philippines, Malaysia, Singapore, Thailand, Iran, and Jordan), taking into consideration macroeconomic variables like institutional quality, industrialization, energy consumption, trade openness, urban population, and labor force participation rate. Due to the unavailability of data in some countries, we have selected these Asian countries.

Here, we have used unbalanced panel data of 11Asian countries, from 2011–2020, to show the impact of industrialization, GDP per capita, institutional quality, trade openness, energy consumption, urban population, and labour force participation rate on the ecological footprints. We have used ecological footprint data. The annual data for industrialization, energy consumption, trade openness, urban population, and labor force participation rate are withdrawn from World Development Indicators (EDI). The ecological footprint data is drawn from Global Footprint Network. The data for Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption are drawn from Worldwide Governance Indicators (WGI), World Bank, and used in constructing an index by PCA method to find out the quality of institutions.

Model Specification

The study shows the influence of industrialization, institutional quality, financial development, trade openness, energy consumption, unemployment, and gross fixed capital formation on EF in selected Asian countries. We attempt to find out how industrialization, institutional quality, trade openness, energy consumption, urban population, and labor force participation rate affect ecological footprint in 11 Asian countries. To investigate the linkages, we have chosen the GMM estimators as GMM with assurance resolves the endogeneity problems by accounting for instrumental variables (Omri and Chaibi, 2014). Moreover, this method does not remove cross-country differences, and country-specific heterogeneities are removed by GMM.

Finally, empirical models are given as:

Model 1

$$LEFit = \beta_0 + \beta_1 IQit + \beta_2 LECONit + \beta_3 TOPNit + \beta_4 INDSit + \beta_5 LURBNPit + \beta_6 LFPit + uit \quad (1)$$

Model 2

$$LEFit = \beta_0 + \beta_1 IQit + \beta_2 LECONit + \beta_3 TOPNit + \beta_4 LGDPPCit + \beta_5 LURBNPit + \beta_6 LFPit + uit \quad (2)$$

Where the subscript "i" shows selected countries (i = 1...11 for selected developing Asian countries), however, "t" reveals time specification. Where LEFit is the natural logarithm of per capita ecological footprint, while INDS measures the industrialization (Manufacturing value added growth), LGDPPC shows gross domestic product per capita, whereas IQit indicates the institutional quality index. TOPNit indicates the trade openness. Moreover, energy consumption has been represented by LECONit. Finally, lnLURBNPit and LFPit measure the natural log of urban population and labor force participation rate, respectively. We have taken the log form of some of the variables to convert the variables into percentage form and to get improved values of the coefficients of the concerned variables.

Results and Discussion

In this section, we empirically analyze how the explanatory variables affect the environmental degradation in some selected Asian countries. Table 1 shows the descriptive statistics of the concerned factors. Large differences in data are observed. In the case of institutional quality, the sample covers countries with an index ranging from -2.0761 percent to 2.6133 percent. The average IQ index across Asian countries is -0.0000 percent over the period 2009- 2018. Likewise, variations are observed in industrialization from -8.3159 to 29.6749 along with variables. The average energy consumption across countries is 2.9879 percent.

Table 1. Descriptive statistics of variables.

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
LEF	88	0.2615	0.2835	-0.1573	0.8839
IQ	110	0.0000	1.0000	-2.0761	2.6133
LENUSE	66	2.9879	0.4054	2.2857	3.7094
TOPN	109	96.1668	88.9915	25.3062	379.099
INDS	109	4.6912	4.8441	-8.3159	29.6749
GDPPC	109	8249.638	14187.02	748.2961	58247.87
LURBNP	110	7.5198	0.5857	-6.5648	8.6630
LFP	110	65.3228	7.6766	53.204	79.069

Table 2. GMM Results of model 1 and model 2.

Variables	Model 1 Coefficients, Standard Errors and T-values	Model 2 Coefficients, Standard Errors and T-values
LEF1	0.7734*	0.7829**
	0.2221	0.3397
	(3.48)	(2.30)
LEF2	0.1979	0.3760
	0.1532	0.2756
	(1.29)	(1.36)
IQ	-0.0101	-0.0140
	0.240	0.0269
	(-0.42)	(-0.52)
LECON	0.5867**	0.5061***
	0.2707	0.2420
	(2.17)	(2.09)
TRDOPN	0.0059*	0.0066*
	0.0016	0.0024
	(3.69)	(2.75)
INDS	0.0022**	.....
	0.0009	
	(2.67)	

LGDPPC	.....	0.0142*
		0.0051
		(2.79)
LURBNP	0.8963*	0.8961**
	0.2518	0.3484
	(3.56)	(2.57)
LFP	0.0134**	0.0117***
	0.0059	0.0065
	(2.28)	(1.80)
AR1	0.042	0.071
AR2	0.352	0.341
Sargan test	0.363	0.360

Dependent variable is ecological footprints consumption per capita; T-values are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

In Table 2, GMM results show that the coefficients of one year lag in LEF are positive and statistically significant. However, the results for two years lag in EF are insignificant in both models.

The energy consumption variable damages the environment through the accumulation of EF, as indicated by its positive coefficients in both models. The results highlight that a% increased energy consumption will tend to raise EF by 0.4942% and 0.51 % respectively. These results are supported by Charfeddine and Mrabet (2017) and Hunjra et al. (2020). A high working population leads to high mass consumption income. So more people contribute to environmental degradation. Population growth also contributes to environmental degradation.

Trade openness also affects the environment in developing countries. One unit of increased trade openness will increase EF by 0.0059% and 0.0066 % respectively. The possible reasons may be that the high usage of energy for high production in harmful effects on the environment and decreases its quality, and increases pollution emissions. A high working population leads to high mass consumption income. So more people contribute to environmental degradation. Population growth also contributes to environmental degradation. The results oppose (Charfeddine and Khediri, 2016). Political institutions have advantageous environmental effects in developing economies. However, the coefficients of the political institutions variable are insignificant. The coefficients of LURBNP are positive and significant. A one percent increase in urban population increases environmental degradation by 0.8963 percent and 0.8961 percent, respectively. The coefficient on the variable, industrialization, is positive and significant, i.e., it shows the quality of the environment by increasing EF in developing countries. The EF consumption increases by 0.0022%. The results are in line with Lin and Marinova (2009). The beneficial environmental influence of industrialization, which equipoises its damaging influences, might be because of different causes. As industrialization is supplemented along with greater energy usage, which enhances the environment-friendly industrial sector and also makes a stronger demand for environmental quality, this tends to increase ecological footprints. Secondly, industrialization also increases EF because of high urbanization and high population. Economic growth may also lead to high ecological footprint consumption. A lot of economic activities done by the population also deteriorate the environment. The result shows that a one percent increase in per capita income may lead to environmental deterioration by 0.0142 percent in model 2. The study results are supported by Jalil and Mahmud (2009) and Halicioglu (2009). The coefficients on the variable, labor force participation rate, are positive and significant in both models. It shows the quality of the environment by increasing EF in developing countries. The EF consumption increases by 0.0114%and 0.0137 % respectively.

Conclusion and Recommendations

In this research, the influence of industrialization, institutional quality, energy consumption, gross domestic

product per capita, trade openness, and labor force participation on EF is checked in 11 selected Asian countries. We have used the GMM technique to find out the link between factors. We have incorporated the ecological footprint (a comprehensive proxy) for the deterioration of the environment and have established an index for institutional quality with the help of principal component analysis. The results reveal that energy consumption, trade openness, labor force participation, industrialization, gross domestic product per capita, and urban population are the major causes for the environmental degradation in this analysis. This study strongly recommends that governments can play a role in decreasing the ecological effect of ecological footprints by making easy-to-form flexible arrangements of institutions that can lower ecological footprints for promoting green growth. In addition, governments must strengthen the strategies to improve the environment to put green controls on the polluting industries and energy usage. The apprehensive powers should thoroughly espouse apprehensions of ecological quality in their monetary variations and macroeconomic plans carefully condense social requirement on natural surroundings and attain persistent financial growth. Sustainable growth can be possible with the energy demand enhancement. Energy policies should emphasize on provision of better-quality energy by using other sources of energy. There is also a need to enhance the efficient use of energy consumption. Rapid industrialization hugely contributes to environmental degradation. Some measures should be taken to promote the agricultural sector to alleviate environmental pressure. And finally, there is a serious need to control population growth for low environmental degradation.

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