Determinants of Environmental Degradation under the Perspective of Globalization: A Panel Analysis of Selected MENA Nations

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ABSTRACT

This paper has examined the determinants of environmental degradation under the perspective of globalization in the case of selected MENA nations (Jordan, United Arab Emirates, Saudi Arabia, Algeria, Qatar, Lebanon, Egypt, Bahrain, Iran, Morocco, Israel, Kuwait, Oman and Tunisia) over the period of 1980 to 2013. ADF - Fisher Chi-square, Im, Pesaran and Shin W-stat, Levin, Lin & Chu t, and PP-Fisher Chi-square unit root tests are used for analyzing the stationarity of the variables. This study uses Panel ARDL approach for analyzing the co-integration among the variables. The causality between the variables is checked with the help of Granger Causality/Block Exogeneity Wald Tests. The estimated results of the study show that consumption of energy, economic growth, globalization and density of population have significant and positive relation with quality of environment in case of MENA nations. The results of this study show that most of the independent variables have causal relation with environmental degradation over the selected time period. The study concludes that inverted U-shaped KEC is not existed in the case of MENA nations.*

Keywords: economic development, population density, Globalization, environmental degradation
JEL Codes: O1, Q56, Q53

1. INTRODUCTION

Simply, environmental degradation refers to the deterioration in natural environment because of natural disasters and human activities (United Nations, 1997). From last few decades, the issue of environmental degradation has gotten so much attention among the policy makers of developmental and environmental sciences. The interaction between quality of environment and economic development is widely used to study Environmental Kuznets Curve (EKC) hypothesis. Hypothesis of EKC mentions that inverted U-Shaped relation exists between economic development and quality of environment. At first stage, the environmental quality degrades with rising economic development, but after passing a threshold level, the environmental quality starts to improve with rising economic development [Stern et al. (1996), Ekins (1997), Heil and Selden (2001), Managi and Jena (2008), Fodha and Zaghdoud (2010), Jaunky (2011), Ozturk and Acaravci (2010), and Saboori et al. (2012)]. At the end, it shows an inverse relation between rising economic development and environmental quality (Grossman and Krueger, 1991). While studying the determinants of Green House Gases (GHG), on one side the extensive focus is given on the relation between economic development and energy consumption while on the other side environmental pollution and economic development is also main topic of discussion (Kraft and Kraft, 1978). There are some studies found N-shaped relation between economic development and environmental degradation [Shafik (1994) and Friedl and Getzner, (2003)].

Recently, the process of globalization has entirely changed the international relation of nations and economies. Globalization is also impacting the environmental conditions of the world [Antweiler et al. (2001) and Liddle (2001)]. Empirics reveal that the nations having low level of economic development accept a rising amount of environmental degradation. But on the other hand, nations who have achieved higher level of economic development, are discouraging rising environmental degradation, they care about their-selves as well as their future generations [McAusland (2008)]. Managi et al., (2009) examine the relationship of economic development, openness of trade and environmental quality in case of selected non-OECD and OECD nations. The study finds that openness of trade is improving the quality of environment in OECD nations but it has negative environmental effect in non-OECD nations. Therefore, there is unique type of relationship between environmental degradation and globalization. On one side, globalization brings new

products and technology with it, but on the other side outdate machinery and cheap products bring environmental issues along (Copeland and Taylor, 2004). Therefore, there is a number of environmental issues that are attached to the globalization of markets. Natural resources depletion, rising desertification and deforestation, loss of biodiversity, ozone layer thinning and global warming are main issues that are emerging due to the rising globalization.

MENA nations have more than 41 %natural gas reserves and 57 %of oil reserves among the nations of the world. Around 85 %of Green House Gases (GHG) emissions in MENA nations come from the consumption and production of oil and gases. The subsidies on petroleum products make the situation worse for quality of environment. IEA (2008) points out that energy subsidies in MENA nations was 310$ billion in year 2007. Out of 20 nations who provide subsidies on gasoline 11 are MENA nations (Brown and Westaway, 2011). The massive subsidies on energy consumption distort the whole price system of the economy and generate the phenomena of resources inefficient allocation. The high intensity of the production and low price of gasoline increase the amount of transportation and environmental degradation in MENA nations (Ellis et al., 2010 and Von Moltke et al., 2004). Empirics show that during 1980 to 2000 the consumption of energy increased from 9 quads to 25 quads but the industrial development in MENA nations is still at its initial stages. The rising amount of fossil fuel resources and a hike in population growth in MENA nations as well as their movement towards high economic growth poses a threat to mitigating environmental changes and air pollution in the coming future. This study has tried to analysis the determinants of environmental degradation under the perspective of globalization in the MENA nation over the period of 1980 to 2013. Moreover, this study has also highlighted some of the main issues concerning to environmental degradation in MENA nations. This type of exercise is hardly applied in the MENA nations, so this study would be a resourceful addition towards relevant literature.

2. LITERATURE REVIEW

There is large number of studies which examine the determinants of environmental degradation but here are the most relevant studies given as literature review. Southgate and Pierce (1988), Southgate (1988), Jaganathan and Mundial (1989), Ives and Messel (1989), Mink (1993) and FAO (1994) point that population is contributing to environmental degradation in many ways. The idea about inverted U-shaped relation of economic development and quality of environment goes back to mid-1990's, when Grossman and Krueger (1991) have empirically examined this relationship. Afterwards, theoretical and empirical discussion has been started. Numerous studies which examine inverted U-shaped relation between quality of environment and economic development such as Shafik (1994), De Bruyn et al., (1998), Carson et al. (1997), Grossman and Krueger (1995), Holtz-Eakin and Selden (1995), McConnell (1997), Moomaw and Unruh (1997), Rothman (1998), Vollebergh and Kemfert (2005), Suri and Chapman (1998), Heil and Selden (2001) and Galeottietal (2006). But the studies like Kaufmann et al. (1998), Spangenberg (2001), Tapio et al., (2007) and Perman and Stern (2003) point out that there is no inverted U-shaped relation existed between quality of environment and economic development. Selden and Song (1995) point out that in the beginning stages of development, quality of environment degrades but after achieving a specific level of development the environmental quality starts improving.

Grossman and Krueger (1991) provide the theoretical basis on how trade openness impacts the quality of environment among nations. Copeland and Taylor (2004), Antweiler et al. (2001) and Liddle (2001) mention that international trade encourages comparative advantages of nations and impacts quality of environment, following the environment and trade policies of the nation. Levinson and Taylor (2001, 2008) mention that tight rules and regulations about environmental degradation are linked to the level of net imports. Therefore, quality of environment and foreign direct investment in less developed nations have got little policy consideration. Frankel and Rose (2005), Antweiler et al. (2001) and Liddle (2001) point out that openness of trade is beneficial for improving quality of environment in case of developed as well as developing nations. Kukla-Gryz (2009) finds that in first stage of development, rising international trade also rises air pollution in developing nations. Baek et al. (2009), Mani and Wheeler (1998), Low and Yeats (1992) and Dinda (2006) mention that openness of trade may impact environmental quality in less developed nations but openness of trade improves environmental standards in developed nations. Managi et al., (2009) investigate the interaction of economic development and openness of trade in 43 countries from 1971 to 1996. The estimated results of the study indicate that openness of trade enhances the standard of

environment in OCED countries. But for non-OECD countries, it cannot play an important role in improving environmental standards.

Takeda and Matsuura (2006) examine the how openness of trade impacts environmental standards in East Asian nations from 1988 to 2000. Temurshoev (2006) analyzes the relation of environmental quality and openness of trade in less developed countries. Acharyya (2009) analyzes the advantages and disadvantages of foreign direct investment in India from 1980 to 2003. The study finds that FDI has a detrimental effect on environmental degradation. Kohler et al., (2013) examines the relation of trade liberalization, consumption of energy, CO2 emissions and economic growth by using the case study of South Africa. The results show that there is co-integration between trade openness and CO2 emissions in South Africa. It is found that there is bidirectional causality running between openness of trade and environmental standards. Dean (2002), McAusland (2008), Frankel (2009), Shahbaz et al. (2013), Shahbaz et al. (2013b) and Shahbaz et al, (2017) mention that globalization promotes better the quality of environment.

Lisea (2006) examines the interaction between economic development and CO2 emissions in Turkey from 1980 to 2003. The estimated results mention that there is a rising trend of CO2 emissions and energy intensity. Therefore, economic development is positively linked to degradation of environment in Turkey. The study reports that Turkey has an extra 7 %potential GDP growth rate which is very high among eastern European countries. World Bank and UNDP mention that CO2 emissions in Turkey would be reach to 6th time increment in 2025 compared to1990. So Turkey has to face a great challenge to attain both objectives (high growth and low degradation of environment) at the same time. Junyi (2006) examines the relation between per capita income and emissions of CO2 in Chinese provinces from 1993 to 2002. For empirical analysis, simultaneous equations model (SEM) is used. The overall results report that some rich provinces have inverted U-shaped EKC whereas some poor provinces have not EKC in inverted U-shaped.

Yaguchi et al. (2007) examine the existence of inverted U-shaped EKC in China and Japan over the period of 1975 to 1995. The study finds an inverse relation between environmental standards and economic development. Liu, et al. (2007), Song et al. (2008), He (2009), Zhang and Cheng (2009), Diao, et al., (2009), Jalil and Mahmud (2009) and Brajer et al., (2011) investigate the relation of environmental quality and economic growth in China at aggregate and disaggregate level. The results of these studies confirm inverted U-shaped EKC. But the studies of Byard et al., (2011) and Halkos and Tzeremes (2011) approve the non-existence of inverted U-shaped EKC in China. Shahbaz et al (2017) investigate the relation between quality of environment and globalization in China over the period of 1970 to 2012. For empirical analysis this study uses Bayer and Hanck and autoregressive distributed lag model at the same time. The study finds feedback impact between CO2 emissions and globalization. Moreover, this study confirms that globalization has promoted a better quality of environment in China.

3. MODEL SPECIFICATION AND DATA SOURCES

This study examines the effect of population density, economic growth, consumption of energy, on environmental degradation under the perspective of globalization in MENA nations over the period of 1980 to 2013. The data of some variables is collected from World Development Indicator (WDI) databases preserved by World Bank. The data of globalization is taken KOF globalization index maintained by university of Gotham Burg. Globalization index is measured with the help of economic integration, personal contacts, political engagement and technological connectivity. Following the detailed literature review, this study follows the methodology of Shahbaz et al. (2013c), Govindaraju and Tang (2013), Ali and Audi (2016), Audi and Ali (2017) and Shahbaz et al., (2017). The functional form of the model for this study will become as:

$$ED_t=f(ENC_t,GDPP_t,GLOB_t,POP_t) \quad (1)$$

Where
ED_t= environmental degradation (CO2 emissions)
ENC_t= energy consumption
$GDPP_t$= economic growth (per capita income)
$GLOB_t$= globalization index
POP_t= population density (population living per seq. kilometer)

t= time period
For measuring the elasticity of the variables, we can take the natural logarithm of the equation. 1. The econometric model of the study becomes as:

$$\ln ED_t=\beta_0+ \beta_1 ENC_t+ \beta_2 GDPP_t+\beta_3 GLOB_t+ \beta_4 POP_t+\mu_t \quad (2)$$

wehre u= error term

4. ECONOMETRIC SPECIFICATION

While using time series data in panel studies there are more chances of unit root problem. Levin et al., (2002) have presented different unit root tests based on different specifications. LLC unit root test perpetrates homogeneousness as compared to autocorrelation coefficient. LLC unit root test is base of ADF methodology for investigating the unit root issue in the data set. The simple form of LLC is as:

$$\Delta y_{i,t} = \gamma_{0i} + py_{it-1+} \sum_{i-1}^{pi} \gamma_{1i} \Delta y_{i,t-j} + u_{i,t} \quad (3)$$

In equation (3) γ_{0i} is the constant term that is considered to be different across the cross sectional units and p is the undistinguishable coefficient of autoregressive, γ_i indicates the lag order, $u_{i,t}$ is the error term that is considered independent across the panel units and following the ARMA stationary procedure for each cross section becomes as:

$$u_{i,t} = \sum_{j-0}^{\infty} \gamma_{1i} \Delta y_{i,t-j} + \varepsilon_{i,t} \quad (4)$$

Now we can develop null and alternative hypotheses as:

H_0: $p_i = p = 0$

H_a: $p_i = p < 0$ for all i

t-statistic is basis of this LLC model, here p is considered constant across the units under the null and alternative hypothesis.

$$t_p = \frac{\overset{\Lambda}{p}}{\overset{\Lambda}{SE(p)}} \quad (5)$$

As we have assumed that error term is white noise, the panel regression test statistic tp converge to standard normal distribution when N and $T \to \infty$ and $\sqrt{\frac{N}{T}} \to 0$. But if the cross sectional units are dependent, error term is serially correlated and time trend is present then test statistic does not converge to 0. Under such situations LLC suggests modified version of the test statistics as:

$$t_p = \frac{t_p - N\tilde{T}\hat{S}_N \hat{\sigma}^{-2}(p)\hat{u}^*_m}{\sigma^*_m} \quad (6)$$

Where u^*_m and σ^*_m are adjusted mean of error term and standard deviation of error term, the estimates of u^*_m and σ^*_m are collected with the help of Monte Carlo Simulation by LLC (2002).

Im et al., (2003) introduce a unit root test for examining the stationarity of the variables when there is heterogeneous panel data set is available. This test too follows the methodology of ADF unit root test but this test uses simple mean of each series, a series in ADF panel is denoted as:

$$\Delta y_{i,t} = \bar{w}_i + py_{it-1+} \sum_{i-1}^{pi} \gamma_{1i} \Delta y_{i,t-j} + v_{i,t} \quad (7)$$

Heterogeneity in v_i value is also allowed in IPS test, the equation of IPS unit root test can be presented as:

$$\bar{t}_T = \frac{1}{N}\sum_{i-1}^{N} t_{1,i}(\mathrm{p}_i) \qquad (8)$$

Where $t_{i,t}$ is the ADF test statistic, p_i is the lag order. This can be calculated in ADF unit root test as:

$$A_t - = \frac{\sqrt{N(T)}[\bar{t}_T - \mathrm{E}(\mathrm{t}_T)]}{\sqrt{Var(\mathrm{t}_T)}} \qquad (9)$$

After fixing the unit root problem of the data sets, now we can find the short run and long run relation of the variables. In the recent literature, as availability of larger data set is easy nowadays, panel data analysis uses models based on large sample size. The asymptotic of enormous cross section (N) and large time periods (T) dynamic panels are diverse from the asymptotic of the usual large number of cross sections (N) and small time period (T) dynamic panels. In the case of small time period, panel estimations are based on fixed and random effects estimators or Generalized Methods of Moments (GMM) [Arellano and Bond (1991)]. These methods are using pooling of individual cross sections and their constant term varies across cross sections. The large N, large T, has homogeneousness of slope coefficient which is unsuitable for panel studies [Pesaran and Smith (1995); Pesaran et al., (1999); Phillips and Moon (2000); Im et al., (2003)]. Recently, a number of dynamic heterogeneous panel methods are available for large N and T. In fixed effect model, time series data for each cross section are pooled and intercept term is allowed to vary across cross sections. If the slope coefficients vary then fixed effect results are misleading. In such conditions, the model can develop an individual cross section and arithmetic mean of the coefficient can be obtained. This procedure is known as Mean Group (MG) estimator [Pesaran and Smith (1995)]. In this method intercepts, slope coefficients and error variances are allowed to differ across cross sections. Pesaran et al., (1999) develop a Pooled Mean Group (PMG) method to estimate non-stationary dynamic panels. Non-stationarity of the data is an important issue for dynamic panels analysis. PMG method is based on averaging and amalgamating of the coefficients [Peraran et al., (1999)]. Under the assumptions of PMG, the short run parameters such as intercepts terms and error variance can be varied across group. But long run coefficients are sustained. The general form of the PMG can be written as:

$$y_{it} = \sum_{j-1}^{p} \lambda_{ii} y_{i,t-j} + \sum_{j-0}^{q} \delta_{ij} X_{i,t-j} + u_t + \varepsilon_{it} \qquad (10)$$

Where number of cross section i=1,2,3,4,5,…..N and time t=1,2,3,4,5,…..T. X_{it} is a vector of Kx1 regressors, λ_{ij} is a scalar, u_i is group specific effects. If the variables are I(1) cointegrated then the disturbance term is an I(0) process. A major characteristic of co-integrated variables is their rejoinder to any deviance from long run equilibrium. This characteristic infers error correction dynamics of the variables in the system that are swayed by the deviance from equilibrium. The error correction term can be written as:

$$y_{it} = \phi_i y_{i,t-j} - \theta_i X_{i,t-j} \sum_{j-1}^{p-1} \lambda_{ii} \Delta y_{i,t-j} + \sum_{j-0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + u_t + \varepsilon_{it} \qquad (11)$$

The error correction parameter φ_i indicates the speed of modification from short run towards long run. $\varphi_i = 0$ shows the existence of long run relation the variables. For convergence, it is a necessary and sufficient condition that φ_i must be negative and significant.

After establishing the long run relations of the variables. Now we can explore the causal relation of the variables. For this purpose, VAR Granger Causality/Block Exogeneity Wald Tests is selected. This test treats an endogenous variable as an exogenous variable. We used the chi-square (Wald) statistics to test the joint significance of each of the other lagged endogenous variables in each equation of the model & also for joint significance of all other lagged endogenous variables in each equation of the model.

5. Empirical Results and Discussion

This paper studies the impact of population density, consumption of energy and economic growth on environmental degradation under the perspective of globalization in MENA nations. The descriptive statistics of the selected indicators are given in table 01. The summary of the descriptive statistic gives the value of Mean, Median, Maximum, Minimum, Standard Deviation, Skewness and Kurtosis. The estimates show that there are not much variations between the maximum and minimum value of all the selected variables in model. The Kurtosis and skewness use to analyze the volatilities of data. The estimated results in the table 01 show that environmental degradation, consumption of energy, economic growth and population density are positively skewed whereas globalization is negatively skewed. The results reveal that all the selected variables have positive Kurtosis. The estimated results show that much variation is found in population density as the MENA region faces high population density in the coming future.

Tabe-01 Descriptive Statistic

	LED	LENC	LGDPP	LGLOB	LPOPD
Mean	10.67578	7.737832	8.649251	3.975398	4.057343
Median	10.58244	7.514597	8.677198	4.001627	4.032536
Maximum	13.33712	9.996952	11.39149	4.361092	7.443269
Minimum	8.460996	5.578822	6.249260	3.054103	1.316360
Std. Dev.	1.130887	1.208385	1.225315	0.252431	1.362556
Skewness	0.377367	0.187108	0.092590	-1.245114	0.236825
Kurtosis	2.337289	1.732674	1.947111	4.795039	2.607628
Sum	5081.671	3683.208	4117.043	1892.290	1931.295
Sum Sq. Dev.	607.4806	693.5927	713.1635	30.26763	881.8649
Observations	476	476	476	476	476

The table 02 gives the results of correlation between the variables. The results indicate that consumption of energy and economic growth have significant and positive correlation with environmental degradation in MENA nations over the selected time period. Whereas, population density and globalization have negative and significant correlation with environmental degradation in MENA nations. The outcomes explain that population density, economic growth, and globalization have positive and significant correlation with energy consumption in MENA nations. The estimates indicate positive correlation between globalization and economic growth, between population density and economic growth. Globalization has a positive correlation with population density. The estimated outcomes reveal that all the selected independent variables do not have a very strong positive correlation among each other, so there are less chances of high multi-collinearity among independent variables. The selected panel model fulfills the basic assumption of model specification of simple OLS and panel OLS. The selected model also meets the assumption of reliability of relationship among the variables.

Table 02 Correlation Matrix

Covariance Analysis: Ordinary Sample: 1980 2013 Included observations: 476					
Variables	LED	LENC	LGDPP	LGLOB	LPOPD
LED	1.000000 ----- -----				
LENC	0.121312 2.660793 0.0081	1.000000 ----- -----			
LGDPP	0.150329 3.310520 0.0010	0.893161 43.23755 0.0000	1.000000 ----- -----		
LGLOB	-0.123661 -2.713124 0.0069	0.484992 12.07410 0.0000	0.606510 16.60805 0.0000	1.000000 ----- -----	
LPOPD	-0.305288 -6.979799 0.0000	0.150902 3.323426 0.0010	0.140968 3.100042 0.0021	0.336140 7.770442 0.0000	1.000000 ----- -----

This study has applied Levin, Lin & Chu t*, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square unit root tests for examining the stationarity of the variables. The results of Levin, Lin & Chu t* test reveal that environmental degradation is stationary at level. But the results of Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square unit root tests show that environmental degradation is not stationary at level. The estimated results of Levin, Lin & Chu t* test reveal that energy consumption is stationary at level. But the results of Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square unit root tests show that energy consumption is not stationary at level. The results of Levin, Lin & Chu t*, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square unit root tests show that economic growth and globalization are not stationary at level. The results of Levin, Lin & Chu t* and PP - Fisher Chi-square unit root tests reveal that population density is stationary at level. But the results of Im, Pesaran and Shin W-stat and ADF - Fisher Chi-square show that population density is not stationary at level. The estimated results of Levin, Lin & Chu t*, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square unit root tests show that environmental degradation, energy consumption, economic growth, population density and globalization are stationary at I(1). The overall outcomes of the model present mix integration of variables. This is the most suitable condition for applying panel ARDL co-integration for examining the short run and long run relationship among variables.

Table 03 Unit Root Tests Results

Variables	Test	Statistic	Prob**	Cross-Section	Obs
LED I(0)	Levin, Lin & Chu t*	-2.53107	0.0057	14	451
	Im, Pesaran and Shin W-stat	1.72261	0.9575	14	451
	ADF - Fisher Chi-square	16.2444	0.9621	14	451
	PP - Fisher Chi-square	16.3455	0.9604	14	462
LENC I(0)	Levin, Lin & Chu t*	-1.50225	0.0665	14	453
	Im, Pesaran and Shin W-stat	0.24350	0.5962	14	453
	ADF - Fisher Chi-square	37.2199	0.1141	14	453
	PP - Fisher Chi-square	32.3497	0.2605	14	462
LGDPP I(0)	Levin, Lin & Chu t*	3.60826	0.9998	14	457
	Im, Pesaran and Shin W-stat	5.97222	1.0000	14	457
	ADF - Fisher Chi-square	3.02808	1.0000	14	457
	PP - Fisher Chi-square	3.27022	1.0000	14	462
LGLOB I(0)	Levin, Lin & Chu t*	-0.44544	0.3280	14	458
	Im, Pesaran and Shin W-stat	2.79244	0.9974	14	458
	ADF - Fisher Chi-square	13.1579	0.9922	14	458

	PP - Fisher Chi-square	15.3906	0.9740	14	462
LPOPD I(0)	Levin, Lin & Chu t*	-3.56389	0.0002	14	406
	Im, Pesaran and Shin W-stat	0.60313	0.7268	14	406
	ADF - Fisher Chi-square	31.2565	0.3058	14	406
	PP - Fisher Chi-square	122.107	0.0000	14	462
dLED I(1)	Levin, Lin & Chu t*	-22.4407	0.0000	14	446
	Im, Pesaran and Shin W-stat	-21.5430	0.0000	14	446
	ADF - Fisher Chi-square	344.587	0.0000	14	446
	PP - Fisher Chi-square	380.343	0.0000	14	448
dLENC I(1)	Levin, Lin & Chu t*	-19.4440	0.0000	14	445
	Im, Pesaran and Shin W-stat	-19.4740	0.0000	14	445
	ADF - Fisher Chi-square	303.518	0.0000	14	445
	PP - Fisher Chi-square	332.660	0.0000	14	448
dLGDPP I(1)	Levin, Lin & Chu t*	-13.6178	0.0000	14	445
	Im, Pesaran and Shin W-stat	-13.2569	0.0000	14	445
	ADF - Fisher Chi-square	206.717	0.0000	14	445
	PP - Fisher Chi-square	221.294	0.0000	14	448
dLGLOB I(1)	Levin, Lin & Chu t*	-15.2305	0.0000	14	447
	Im, Pesaran and Shin W-stat	-14.8160	0.0000	14	447
	ADF - Fisher Chi-square	230.608	0.0000	14	447
	PP - Fisher Chi-square	228.249	0.0000	14	448
dLPOPD I(1)	Levin, Lin & Chu t*	-2.00502	0.0225	14	406
	Im, Pesaran and Shin W-stat	-4.21293	0.0000	14	406
	ADF - Fisher Chi-square	64.0485	0.0001	14	406
	PP - Fisher Chi-square	28.6547	0.4302	14	448

This paper is going to examine the effect population density, consumption of energy, economic growth and globalization on environmental degradation in selected MENA nations such as United Arab Emirates, Saudi Arabia, Oman, Qatar, Morocco, Algeria, Kuwait, Bahrain, Jordan, Egypt, Iran, Israel, Tunisia, Lebanon over the period of 1980 to 2013. LR, FPE, AIC, SC and HQ methods are used for lag order selection. The results of VAR are presented in table 04. On the basis of LR, FPE and AIC maximum 8 lag length is selected for the model of this study.

Table 04 VAR Lag Order Selection Criteria

Endogenous variables: LED LENC LGDPP LGLOB LPOPD
Exogenous variables: C
Sample: 1980 2013
Included observations: 364

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1869.311	NA	0.020425	10.29841	10.35194	10.31969
1	2248.236	8099.351	3.50e-12	-12.18811	-11.86692	-12.06045
2	2550.336	585.9418	7.64e-13	-13.71064	-13.12178*	-13.47660
3	2617.853	129.0978	6.05e-13	-13.94425	-13.08773	-13.60382
4	2668.086	94.66864	5.27e-13	-14.08289	-12.95871	-13.63608
5	2729.252	113.5947	4.32e-13	-14.28160	-12.88976	-13.72841
6	2785.613	103.1218	3.64e-13	-14.45392	-12.79441	-13.79434*
7	2823.735	68.70380	3.39e-13	-14.52602	-12.59885	-13.76006
8	2849.188	45.17157*	3.39e-13*	-14.52850*	-12.33368	-13.65616

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The outcomes of ADF - Fisher Chi-square, Im, Pesaran and Shin W-stat, Levin, Lin & Chu t* and PP - Fisher Chi-square unit root tests approve a mix integration of the variables. Panel ARDL bound testing approach is used for examining the co-integration. Null hypothesis of ARDL is based on Wald-test. The results of panel ARDL approach are given in table 05. The estimated outcomes reveal that F-statistic is greater than Pesran et al., (1999) upper bound at 1 %. Here null hypothesis of ARDL is rejected for alternative. This show that environmental degradation, population density, consumption of energy, economic growth and globalization have co-integrational relationship in selected MENA nations during 1980 to 2013.

Table 05 Wald Test of Co-integration

Test Statistic	Value	Df	Probability
F-statistic	1039.772	(4, 276)	0.0000
Chi-square	4159.087	4	0.0000
Null Hypothesis: C(1)=C(2)=C(3)=C(4)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(1)		0.745226	0.044301
C(2)		0.040508	0.019501
C(3)		0.186393	0.059021
C(4)		0.877950	0.038103
Restrictions are linear in coefficients.			

After examining the co-integration, long run relationship can be examined. The long run outcomes are given in the table 06. The long run outcomes reveal that consumption of energy has positive and significant relation with standard of environment in MENA nations. The estimates reveal that 1 % rise of energy consumption permits (0.745226) % rise in environmental degradation. The findings are consistent with the findings of Tiwari et al. (2013), Du et al. (2012), Govindaraju and Tang (2013) and Xu et al., (2011). The outcomes show that economic growth puts significant and positive impact on environmental degradation in MENA nations. The results reveal that 1 % rise in economic growth permits (0.040508) % rise in environmental degradation in MENA nations. These outcomes are coherent with the findings of Shahbaz et al. (2012), Du et al. (2012), Liu et al. (2007), Jayanthakumaran et al. (2012), Brajer et al. (2011), Song et al. (2008), Jalil and Mahmud (2009), Junyi (2006), Diao et al. (2009), Shahbaz et al. (2013), Tiwari et al. (2013), He (2009) and Shahbaz et al. (2014). This highlights that the MENA nations still cannot reach at the stage of inverted U-shaped EKC. In the first stages of EKC economic growth puts positive influence on environmental degradation. The outcomes reveal that globalization has significant and positive influence on environmental degradation in MENA nations. This estimates reveal that 1 % rise in globalization brings (0.186393) % rise in environmental degradation in MENA nations. These findings are coherent Shahbaz et al., (2017). This highlights that globalization is still not environment friendly in MENA nations as compared to China and some other East Asian nations. The outcomes reveal that population density puts significant and positive influence on environmental degradation in MENA nations. The outcomes show that 1 % rise in population density brings (0.877950) % rise in bad environment in MENA nations. The results are similar with the estimated results of Zhang and Cheng (2009). Southgate and Pierce (1988), Southgate (1988), Jaganathan (1989), Ives and Messel (1989), Mink (1993) and FAO (1994) also point out that denser areas are creating more environment unfriendly gases which degrades environment. The overall long run outcomes reveal that energy consumption, economic growth, globalization and population density are enhancing environmental degradation in MENA nations (Jordan, United Arab Emirates, Saudi Arabia, Algeria, Qatar, Lebanon, Egypt, Bahrain, Iran, Morocco, Israel, Kuwait, Oman and Tunisia) over the selected time period.

Table 06 Long Run Estimates

Dependent Variable: D(LED) Method: ARDL Sample: 1983 2013 Included observations: 434 Dynamic regressors (3 lags, automatic): LENC LGDPP LGLOB LPOPD Fixed regressors: C Selected Model: ARDL(1, 3, 3, 3, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LENC	0.745226	0.044301	16.82198	0.0000
LGDPP	0.040508	0.019501	2.077226	0.0387
LGLOB	0.186393	0.059021	3.158097	0.0018
LPOPD	0.877950	0.038103	23.04160	0.0000

After examining the long run results, now we come to examine the short run dynamic of the variables. The outcomes of short run dynamic are presented in table 07. The outcomes of the short run dynamic reveal that most of the independent variables have insignificant and negative influence on environmental degradation in MENA nations (Jordan, United Arab Emirates, Saudi Arabia, Algeria, Qatar, Lebanon, Egypt, Bahrain, Iran, Morocco, Israel, Kuwait, Oman and Tunisia) over the selected time period. The outcomes indicate that only globalization has significant relationship with environmental degradation. This reveals that environmental degradation in MENA nations is not short run phenomena. ECT show the convergence from short run towards long run. The outcomes reveal that the coefficient of ECT is theoretical correct. This certifies the long run relation of the variables. ECT result reveals that 64 %short deviations are corrected towards the equilibrium path in the very next year. The results show that short run needs one year and six months for complete convergence in the long.

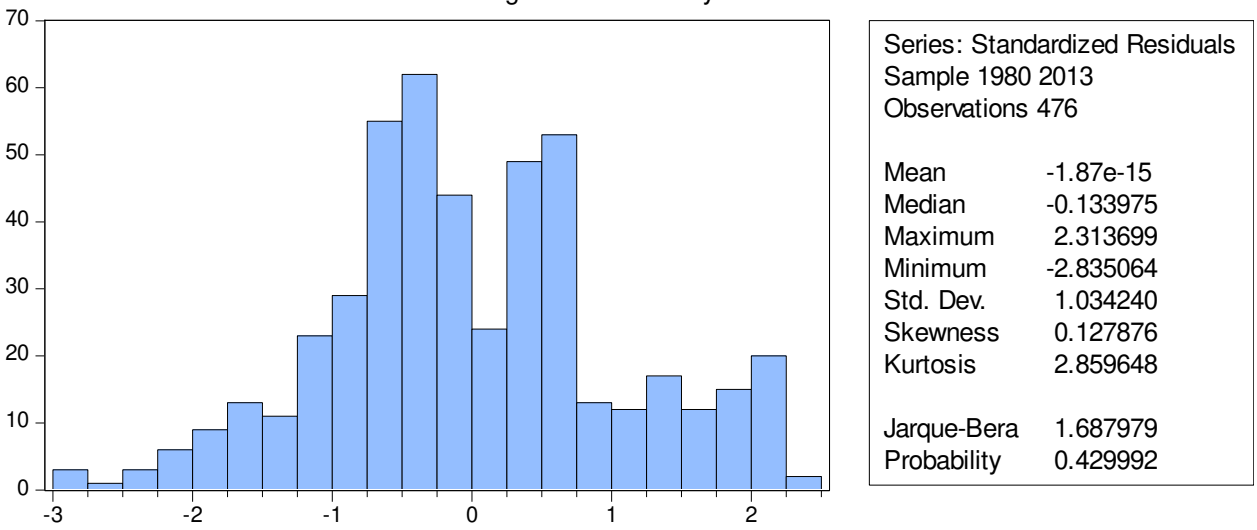
Table 07 Short Run Estimates

Dependent Variable: D(LED) Dynamic regressors (3 lags, automatic): LENC LGDPP LGLOB LPOPD Selected Model: ARDL(1, 3, 3, 3, 3)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
COINTEQ01	-0.649908	0.076695	-8.473970	0.0000
D(LENC)	0.080377	0.146336	0.549264	0.5833
D(LENC(-1))	-0.150003	0.096877	-1.548383	0.1227
D(LENC(-2))	-0.155976	0.108362	-1.439399	0.1512
D(LGDPP)	0.001803	0.073874	0.024406	0.9805
D(LGDPP(-1))	-0.030523	0.064469	-0.473454	0.6363
D(LGDPP(-2))	-0.013852	0.052213	-0.265298	0.7910
D(LGLOB)	0.103349	0.176503	0.585538	0.5587
D(LGLOB(-1))	-0.140976	0.194827	-0.723594	0.4699
D(LGLOB(-2))	0.446704	0.249552	1.790024	0.0745
D(LPOPD)	3.075810	6.897292	0.445945	0.6560
D(LPOPD(-1))	-6.948039	16.86196	-0.412054	0.6806
D(LPOPD(-2))	3.194548	11.36752	0.281024	0.7789
C	0.329755	0.414630	0.795300	0.4271
Mean dependent var	0.045649	S.D. dependent var		0.134104
S.E. of regression	0.095587	Akaike info criterion		-2.120975
Sum squared resid	2.521759	Schwarz criterion		-0.370799
Log likelihood	704.7920	Hannan-Quinn criter.		-1.432777
*Note: p-values and any subsequent tests do not account for model selection.				

The study has examined the effect of energy consumption, economic growth, globalization and population density on environmental degradation in MENA nations over the period of 1980 to 2013. For checking the

normality of the data, standardized residuals test is used. Figure 01 explains the selected data conditions. The results in the figure and attached table show that the selected data is normally distributed and gives reliable results.

Figure 01 Normality Test



This study uses Granger Causality/Block Exogeneity Wald Tests for examining the causal relation of the variables. The results of Granger Causality/Block Exogeneity Wald Tests are presented in the table 08. The estimates reveal that bidirectional causality is running between environmental degradation and consumption of energy in selected MENA nations. These findings are following Apergis and Payne (2010). The estimates highlight bidirectional causal relation between standard of environment and economic growth. Diao et al. (2009) also point out strong causal relationship between growth and environment. The results reveal, unidirectional causality is running from globalization to quality of environment in MENA nations. The results highlight non-causal relation of environmental degradation and population density. The estimated results reveal, bidirectional causality is running between economic growth and energy consumption in MENA region. There is no causal relationship between globalization and consumption of energy. The results reveal, unidirectional causality is running from population density to energy consumption. This shows that more populations need more energy consumption for the living hood. The estimated results show that unidirectional causality is running from globalization to GDP growth as well population density to GDP growth. The estimates reveal no causal relation between population density and globalization in MENA nations. The overall causality relationship shows that most of the selected explanatory factors have significant causal relation with environmental degradation in selected MENA nations.

Table 08 Granger Causality/Block Exogeneity Wald Tests

Dependent variable: LED			
Excluded	Chi-sq	df	Prob.
LENC	24.81900	2	0.0000
LGDPP	7.406149	2	0.0246
LGLOB	1.234217	2	0.5395
LPOPD	1.136092	2	0.5666
All	41.96015	8	0.0000
Dependent variable: LENC			
Excluded	Chi-sq	df	Prob.
LED	8.068593	2	0.0177
LGDPP	7.417429	2	0.0245
LGLOB	1.796545	2	0.4073
LPOPD	6.832429	2	0.0328
All	18.17444	8	0.0200
Dependent variable: LGDPP			
Excluded	Chi-sq	df	Prob.
LED	12.48189	2	0.0019
LENC	3.779822	2	0.0511
LGLOB	16.28204	2	0.0003
LPOPD	8.027923	2	0.0181
All	40.00137	8	0.0000
Dependent variable: LGLOB			
Excluded	Chi-sq	df	Prob.
LED	5.939821	2	0.0513
LENC	1.872291	2	0.3921
LGDPP	1.396889	2	0.4974
LPOPD	1.024550	2	0.5991
All	8.337931	8	0.4012
Dependent variable: LPOPD			
Excluded	Chi-sq	Df	Prob.
LED	3.022344	2	0.2207
LENC	4.119575	2	0.1275
LGDPP	1.890273	2	0.3886
LGLOB	0.151508	2	0.9270
All	14.71746	8	0.0649

6. CONCLUSIONS AND POLICY IMPLICATIONS

This paper has examined the determinants of environmental degradation under the perspective of globalization in selected MENA nations (Jordan, United Arab Emirates, Saudi Arabia, Algeria, Qatar, Lebanon, Egypt, Bahrain, Iran, Morocco, Israel, Kuwait, Oman and Tunisia) over the period of 1980 to 2013. ADF - Fisher Chi-square, Im, Pesaran and Shin W-stat, Levin, Lin & Chu t*, and PP-Fisher Chi-square unit root are used for analyzing the stationarity of the variables. Panel ARDL approach is selected for co-integration. The causal relationship was examined with the help of Granger Causality/Block Exogeneity Wald Test. The estimated results reveal that population density, consumption of energy, economic growth and globalization have positive impact on environmental degradation in MENA nations. The findings of this paper are consistent with Southgate (1988), Jayanthakumaran et al. (2012), Shahbaz et al. (2014), Jalil and Mahmud (2009), He (2009), Jaganathan (1989), Brajer et al. (2011), Mink (1993), Song et al. (2008), Du et al. (2012) and Junyi (2006), Shahbaz et al. (2012), Liua et al. (2007), Govindaraju and Tang (2013) and Tiwari et al. (2013), Diao et al. (2009), Shahbaz et al. (2013), Tiwari et al. (2013) and Du et al. (2012). The causal relationship shows that consumption of energy and economic growth have a bidirectional causal relationship with environmental degradation in MENA. Whereas globalization and population density has a unidirectional causal relationship with environmental degradation. This study concludes that the MENA nations still cannot be under the inverted U-shaped relationship EKC. The estimated results reveal that

environmental degradation is not short run phenomena in selected MENA nations over the selected time period.

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