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Research Article

THE EFFECT OF TRADE LIBERALIZATION ON THE QUALITY OF THE ENVIRONMENT IN BOTH DEVELOPED AND DEVELOPING COUNTRIES

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ABSTRACT
In this study, the relationship between environmental quality and trade liberalization in developed and developing countries during the years 1990-2013 were examined. In this context, the two indicators of carbon dioxide emissions (air pollution) and organic materials (water pollution) was used to demonstrate the quality of the environment. . The results of combined data modeling for both developing and developed countries showed that there is a long-term relationship between the quality of the environment indicator variable and trade liberalization. Also, the environmental Kuznets curve for both types of pollution in developed countries and to air pollution for developing countries was approved. On the other hand, the results showed the absence of the above curve is for water pollution in developing countries.

Keywords: *Environmental Kuznets Curve, Trade Liberalization, Water Pollution, Air Pollution, the Group of Developed Countries, Developing Countries*

INTRODUCTION
Today, environmental issues, particularly the issue of water and air pollution have become one of the most important global concerns. Air pollution affects the health of living beings and the natural ecosystems (Sadeghi *et al.*, 2011). During recent decades, environmental problems were considered from different aspects, the wave of public interest in environmental issues occurred during the 1960s and the main focus of attention on industrial pollution were due to industrial economies growing (Halyngr, 2008). In the late 1970s trade and environment issues gained momentum and environmentalists to protest the plight of the environment resulting from increasing trade, ordered opposition and widespread failures in different parts of the world. According to their belief, effects of trade liberalization and increasing of exports, economic activity and the spread of pollutants and use of energy resources increased inappropriately (Khalil and Zyshan, 2006).
Trade liberalization policies affect the total structure of the economy. Importing countries by imposing tariffs and exporting countries by subsidies of agricultural export have tried to put their production under the protection (Naghshineh and Mohammadi, 2006).
In the economic literature, inverted U relationship between GDP per capita and environmental degradation is known as Environmental Kuznets Curve (EKC). In recent years several studies, including study of Shafyk (1994), Leden and Sang (1994), Grossman and Krueger (1995) and Kole and others (1997) have investigated the existence of EKC curve, but growing and increasing research about literature on environmental Kuznets curve introduced the unique relationship between per capita income and pollution weak and fragile and have provided a more accurate interpretation in this area. One of the main criticisms on the environmental Kuznets curve, lack of attention to the business model (Barghi, 2008).
According to Kuznets hypothesis, economic growth does not always lead to environmental degradation. In the EKC literature researchers consider mainly greenhouse gases, especially CO2 as an indicator for the overall degradation of the environment. If the EKC hypothesis is confirmed, then based on the feature of Kuznets curve, economic growth rather than a threat to the environment, it becomes a tool to improve environmental quality (Halykyvgla, 2008).
On the relationship between trade volume, export and environmental quality there have been several studies that the majority of these studies have been conducted in developed countries. Moreover, in most empirical studies in the form of cross- country the effects of trade on environmental quality indicators

have been discussed in which case the results to the choice of environmental pollution indicator and also studied countries will be critical.

Asghari and Rafsanjani (2013), in this study examines the impact of FDI on emissions of CO2, as an indicator of environmental pollution for 12 selected countries for the period 2011-1990. The results of this study indicate that the entry of foreign direct investment in the region has a significant and positive effect on the level of CO2 emissions. Motefakker and Khnaghahi (2012), the main objective of this study was to investigate the effects of economic growth, energy consumption and trade openness on Environmental Quality in Iran. And for this purpose used from time series data during 2007 -1967. The results indicate a positive impact of economic growth variables, energy consumption and trade openness on CO2 emissions per capita as a measure of environmental degradation and deny an inverted U relationship between per capita carbon emissions and per capita income. Dehghan (2009), discussed the effect of international trade on the environment in the oil markets during the years 2005 to 1980. The results show that the effect of trade openness on oil markets is positive, but the separation of the studied sample showed the negative effect on APEC member countries and for non-member countries of APEC positive effect.

Shen (2008), in their study using panel techniques to evaluate the effects of scale, composition and technology on environmental degradation in the state of China in the period 1993-2002. His results show that the hypothesis of a factor for the states of China is approved and the increase of exports will lead to environmental degradation.

Mychlr and Fang (2007), in his study discussed the relationship between trade liberalization and the environment in America manufacturing industries. The results show that the impact of trade liberalization on environmental quality in the manufacturing industries of the country depends on the local, regional or global industry. Mangi (2006), in a study using a panel data approach studied the relationship between exports and economic growth and environmental quality in high and low income countries in the years 1999-1960. The results show that exports led to increased pollution.

Theoretical Base and Research Method

The term of developed countries is used to describe the countries based on some standards achieved to development. Set an example for the measure of a development has already been discussed, but overall the economic criteria are usually developed as the main index for developed countries. For example, per capita income is one of the most important criterions and therefore, countries with high rates of GDP are developed.

Another important measure of the economy is the country's industrial level. Another measure that has recently received considerable attention is human development index. The index combined economic measures such as income with something like life expectancy and level of general education. Thus, countries with a higher score on the Human Development Index are said developed countries and the rest are developing countries.

Developing countries or growing countries are the country with a relatively low standard of living, undeveloped industrial base and low human development index (HDI). The term with the made previous statements is different in this case, including the so-called Cold War that defines the Third World, and brings to mind the negative secondary meaning. Other synonymous terms for developing countries are less developed country (LDC) or less economically developed country (LEDC).

Economically less-developed countries is a term used by new geographers to describe the countries that are closer to classified as developing countries with the property that they are economically less developed, and usually have the most correlation with other factors as low human development.

In the early 70's at the Club of Rome, a group of experts in various fields concerns about growth limit and the suggestions received about the availability of natural resources of earth. Environmental economists noted to the limitation of environmental resources that could be cited obstacle to economic growth and in order to have the sustainable economy insist restrictively on the ecology scenarios application (Safv, 2002).

Accordingly, the general pattern have been used by most researchers, is a simple model of a quadratic function that it's mathematical form as follows:

$$E_t = \beta_0 + \beta_1 Y_t + \beta_2 Y^2_t \quad (1)$$

Here, Y_t is per capita income , Y^2_t is its square and E_t is level of pollutant emissions as the endogenous variable is used in econometrics . In the above equation, if $0 > \beta_2$ an inverse U-shaped relationship between E and Y will be shaped.

Based on the pattern to find the return point can consider derivative of y equal to zero and obtain critical Y_t. Thus the critical value of equivalent income $Y_t=-\beta_1/2\beta_2$ will be achieved. Due to the quadratic pattern of equation EKC, its diagram will be as follows (ASafv, 2002) :

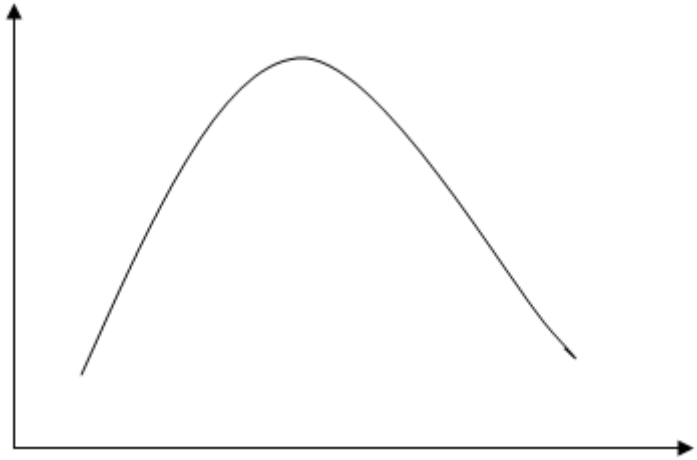

Figure 1: Environmental Kuznets Curve

Note that is seen in the environmental Kuznets curve assumptions is that the assumptions made no clear reference to time; means that by considering the other conditions of the countries, separately in the process of its growth experience income conditions and destruction that all are set on the similar EKC curves. Given the assumption that all countries follow an EKC, so at any point of time slices should be observed that poor countries are shaping the early stages of the EKC and some developing countries are close to the EKC peak or have started to decline and other rich countries, form the decline and descending part of EKC (Dynda, 2004).

In this study, the GDP per capita (GDP) as a measure of economic growth and CO2 emissions and BOD, respectively, were used as indicators for air and water pollution. Despite the critical importance of the emission and the urgent need for all countries to have complete information, in most countries, access to information and required data about environmental issues face with defect, wrong, the lack and non-reliability.

In this study, the effect of trade liberalization on the environment pollution (where the measurements of CO2 and water pollution with organic matter) based on the Kuznets curve for the period 1990-2013 for 12 countries was examined. Of these 12 countries, six countries, developed (Australia, Canada, France, Spain, Italy and Japan) and other six countries, developing countries (Singapore, Iran, Oman, Malaysia, Turkey and South Africa), which in the end impact of trade liberalization on the environment in the two countries are compared.

Estimation of the model studied in this research is panel data pattern that is frequently used in econometrics. The sample in this model is a combination of statistics and information about the sections and the time series. To estimate the model at first, the unit root test was performed and then to select the correct method for estimating the model, F test and Hausman test is conducted (Baltajy, 2002).

The model used in this study is as follows (Ismaili and Abdullah, 2009):

$$LnW_{it} = \beta_0 + \beta_1 LnY_{it} + \beta_2 LnY^2_{it} + \beta_3 Lnopen_{it} + u_{it} \quad (2)$$

$$LnC_{it} = \alpha_{.} + \alpha_{1} LnY_{it} + \alpha_{2} LnY_{it}^{2} + \alpha_{3} Lnopen_{it} + \varepsilon_{it}$$

Where, W is indicator of water pollution (BOD emissions or organic pollutants), C is air pollution index (released CO2), Y is GDP per capita and open is trade liberalization index (based on imports and exports).

The data used were obtained from the World Bank website. In this regard, the first 44 were randomly selected among all nations and among these 44 countries, 10 developed countries and 12 developing countries were separated and because of the lack of complete data for all countries, 12 countries which their complete statistics were available are selected.

RESULTS AND DISCUSSION

In this part of the study presents the results of estimating the fitted model. In this regard, the Manayy variables and then long-term relationship between the variables of the model is studied and then Chow test, Hausman and other estimation procedures are performed.

Unit Root Test Investigation

Before the model estimation, at first, it is required to examine the Manayy of variables used in the model by using unit root test and in the case of non-Manayy the long-term relationship between them will be tested, because otherwise the existence of false regression is possible and the obtained results are not reliable.

Table 1: Static test results of variables

Variables	developed countries		Developing countries	
	Prob level	Prob With one difference of degree	Prob level	Prob With one difference of degree
LNco2	0.8385	0.0007	0.7240	0.0000
LNBOD	0.1914	0.0000	0.9850	0.0000
LN y	0.8141	0.0000	0.9967	0.0000
LNy2	0.8057	0.0000	0.9968	0.0000
LNopen	0.8795	0.0007	0.9650	0.0000

Resource: findings of the author

The results of static variables are presented in Table 1. As is clear from the results above, all of the variables are in unstable levels and with one time differencing they would be stable.

The Long-term Relationship Investigation

By using of the Johansen co-integration test long-run relationship between the variables were studied. The results of this test are as follows:

Table 2: Johansen test results

Description	Developed countries		Developing countries	
	t-Statistic	Prob.	t-Statistic	Prob.
Water pollution model	-2.5989	0.0047	-2.1358	0.0163
Air pollution model	-1.6628	0.0482	1.6402	0.0505

Resource: authors' findings

Johansen co-integration test results indicate that a long-term equilibrium relationship is between emissions of air and water pollutants and independent variables.

Chow Test

First and foremost, must specify the data type in the panel aspect or being Pulyan of which for the purpose of Lymr test will be used which has the statistic F. In this case, there are two positions; weather

the data is Pulyng so they should be estimated using the joint effects method, or data is panel of the in which case they should be estimated by using one of two fixed effects or random effects methods that it is provided in the following.

Table 3: Test results F Lymr

Description	Developed countries			Developing countries		
	Statistic	d.f.	Prob.	Statistic	d.f.	Prob.
Water pollution model	80.65098	(5, 135)	0.0000	170.8639	(5, 135)	0.0000
Air pollution model	746.36200	(5, 135)	0.0000	41.3032	(5, 135)	0.0000

Resource: authors' findings

Chow test results for both countries and for both water and air pollution model shows hypothesis H0 rejection. The combined data confirmed the complicated data.

Hausman Test

The method used in this research is panel data. In this method , the model is estimated with one of two-state fixed or random effects.

Table 4: Hausman test results

Description	Developed countries			Developing countries		
	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.	. Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Water pollutants model	4.09458	3	0.2544	1.1329	3	0.7691
Air pollutants model	8.9079	3	0.0305	1.0051	3	0.8000

Resource: authors' findings

Using of Hausman test, water and air pollution models for developing countries and water pollution model for developed countries using random effects and air pollution for developed countries using fixed effects are estimated.

Estimation of the Model

Kuznets curve coefficients for developing and developed countries separately in both air and water pollution models were estimated that the results are shown in the Tables 9 and 10.

Expected if the environmental Kuznets curve is approved, Y variable will be positive and the Y^2 will be negative.

Table 9: Environmental Kuznets curve coefficients in studied groups for water pollution

Variables	Developed countries		Developing countries	
	coefficient	Prob.	coefficient	Prob.
c	-11.4768	0.0484	15.64	0.0004
lny	0.2537	0.0501	-1.46	0.0351
Lny2	-0.01	0.0364	0.055	0.0192
lnopen	0.3683	0.0301	-0.94	0.0012

Resource: authors' findings

According to the water pollution model estimates for developed countries, confirms Kuznets curve but the developing countries do not follow the Kuznets curve. According to the principles mentioned, Kuznets curve model with random effects and 144 observations for the group of developed countries is estimated. In the pattern of water pollution, the variable coefficient of the logarithm of GDP per capita is obtained positive and about 0.253. Positive and statistically significant coefficient of per capita GDP, suggesting that in these countries, the increase of income in per capita has led to increased water pollution and for

every one percent increase in GDP per capita by considering other things constant, water pollution will intensify 0.25 percentages.

Being the variable coefficient of squared logarithm of GDP per capita equal to -0.01 and negative, is representative of the downward section of Kuznets curve and indicates that in these countries after crossing the return point of environmental curve, the relationship between economic growth and water pollution is on the way down.

Coefficients obtained for the degree of trade openness is positive and statistically significant and suggests that this leads to an increase in environmental pollution. For every one unit increase in trade openness index, assuming other conditions constant, water pollution increases 0 / 36 %. Developed countries confirm the Kuznets curve for water pollution.

According to the principles mentioned, Kuznets curve model with random effects and having 144 observations, for group of developing countries are estimated for water pollution.

In the pattern of water pollution, the logarithm coefficient of GDP per capita is negative and is about -1.4 and squared coefficient of the logarithm variable of GDP per capita is obtained positive and about 0.055. As a result, the water pollution model in developing countries rejects environmental Kuznets curve.

Table 10: Environmental Kuznets curve coefficients in study groups to air pollution

variables	**developed countries**		**developing countries**	
	coefficient	**Prob.**	**coefficient**	**Prob.**
c	-13.86	0.0099	-18.97	0.0000
lny	3.21	0.0021	4.58	0.0000
Lny2	-0.156	0.0022	-0.25	0.0000
lnopen	0.0541	0.2354	-0.088	0.6010

Resources: authors' findings

According to model estimates of air pollution, both developed countries and developing countries follow the Kuznets curve. According to the principles mentioned, Kuznets curve model with fixed effects and having 144 observations for a group of developing countries are estimated to air pollution. In the pattern of air pollution, the log of GDP per capita variable coefficients is obtained positive and about 3.217. Positive and statistically significant coefficient of per capita GDP, suggesting that in these countries, the increase in income per capita has led to an increase in CO2 emissions. And for every one percent increase in GDP per capita with other conditions constant, CO2 increases by about 3.2 percent.

Negative logarithm of GDP per capita squared variable rate equal to -0.156 is representative of the Kuznets curve is downward. And suggests that in this group of countries across the back curve of the environment, the relationship between economic growth and CO2 is placed in the descending direction.

Coefficients obtained for the degree of trade openness is positive and statistically significant, and suggests that this leads to an increase in environmental pollution. For every one percent increase in trade openness index by considering of other conditions constant, the release of CO2, increase 0.05. Developing countries confirm the Kuznets curve for air pollution.

According to the principles mentioned, Kuznets curve model with random effects and having 144 observations for a group of developing countries are estimated to air pollution.

In the pattern of air pollution, the log of GDP per capita variable coefficient is positive and about 4.58. Positive and statistically significant coefficient of per capita GDP, suggesting that in these countries, the increase in per capita income has led to an increase in CO2 emissions and for every one percent increase in GDP per capita with other conditions constant, CO2 increases by about 4.5 percent. Negative logarithm of GDP per capita squared variable coefficient equal to -0.254 is representative of the Kuznets curve is downward. And it suggests that in this group of countries across the back curve of the environmental curve, the relationship between economic growth and CO2 is placed in the descending direction.

Coefficients obtained for the degree of trade openness is negative and statistically significant. Developing countries confirm the Kuznets curve for air pollution.

Estimation of Model based on FMOLS Approach

If there is a co-integration relationship between the variables of the model, FMOLS approach can be used to estimate the model coefficients in long-term. To study the accuracy and correction of the estimate, the procedure is done. The results are as follows. Sign of long-term factors should also be as estimated model symbol with positive lny and negative lny2.

Table 11: Environmental Kuznets curve in the long run coefficients evaluated for water pollution

Variables	Developed countries		Developing countries	
	coefficient	Prob.	coefficient	Prob.
lny	0.7466	0.0009	-7.94	0.0084
Lny2	-3.54	0.0009	0.44	0.0092
lnopen	0.4862	0.0000	-0.55	0.0178

Resource: authors' findings

Based on the water pollution model estimates for developed countries, confirms Kuznets curve but the developing countries do not follow the Kuznets curve.

Table 12: Long-term coefficients of Environmental Kuznets curve in the studied groups for air pollution

Variables	Developed countries		Developing countries	
	coefficient	Prob.	coefficient	Prob.
lny	12.28	0.0000	7.93	0.0000
Lny2	-0.602	0.0000	-0.42	0.0000
lnopen	0.025	0.5590	-0.31	0.0046

Resource: authors' findings

According to model estimates of air pollution, both developed countries and developing countries follow the Kuznets curve.

Summary and Conclusions

Over the past two decades, the relationship between the level of development of society and the achievement of environmental standards and with interpretations of environmental compliance has been the focus of researchers. This issue in the field of economy with special approach was and is focused. One of the subjects that allocate different studies to it is the relationship between the income level of the society and the pollution emission.

Based on the theoretical foundations of the environment economy, income per capita as one of the major factors affecting the spread of pollution and environmental quality is concerned, so that in the 1990s , with observing the evidence of the relationship between various indicators of environmental degradation and per capita income in the form of an inverted U - Kuznets curve login in studies of the environment and the relationship between economic growth and indicators of pollution in the form of an inverted U, was known as the environmental Kuznets curve. As mentioned before, the degree of tradeoff is the sum of exports and imports to GDP. The ratio may have the positive or negative relationship with emission. Although in the view of many economists, trade liberalization is known as a positive and effective factor in economic growth and rising prosperity but in recent decades in many countries, growing business, regardless of environmental criteria and standards and only in order to gain access to markets in other countries, resulted in the widespread and incorrect use of resources and energy under the non-friendly technologies environmental pollution and has led to many of the world 's greenhouse gas emissions.

Model results show that in most countries there is a positive relationship between per capita income and the amount of polluting emissions.

Significant and positive coefficient of per capita GDP, indicating that the increase in GDP per capita, increases the level of contamination. This indicates that the level of pollution emissions by increasing the

scale of the investment increases. This variable as an indicator of the economic situation in the host country can be effective on pollution and essentially economic growth with creating and increasing air pollution.

Increasing environmental degradation can be described by two factors. First, in the early stages of economic growth, according to the top priorities of the national production and employment levels, abundantly the natural resources and energy are used to achieve high economic growth. Secondly, due to low per capita income the enterprises are not able to pay for pollution reduction.

Offers

- Encourage and support the vigorous production of goods with high quality (clean) and being away from products that in production path use the relative merits of contaminants, can help in reducing the problem of pollution in the country.
- Improvements in fuel quality, fuel substitution with less pollution and reduce pollution equipment will reduce CO2 emissions in the environment.
- In most developing countries and including Iran, because of failing to monitor the release of CO2, emissions of this toxic gas have gotten increasing trend. Due to the time of decreasing of these gas emissions through achieving higher per capita income and higher economic growth, It is necessary by imposing strict rules and using modern technology and the using of economic tools such as taxes prevent growing greenhouse gas emissions and through this method control the pollution.

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