Resistive Economics
International Journal

The Open Access Journal of Resistive Economics (OAJRE)/
Volume 3, Number 18, 2014 Published Online August 23

The Environmental Issues and Forecasting Threshold of Income and Pollution Emissions in Iran Economy

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ABSTRACT: Undesirable environmental changes such as global warming and rising greenhouse gases emissions has created much concerns in the worldwide during recent decades. Environmental problems have become a polemical issue to achieve higher economic growth rate. In this research, the effects of financial development and trade are tested on environmental quality. So the shape of Environmental Kuznets Curve is examined by using the data during the period of 1970-2011 and Auto Regression Model Distributed Lag (ARDL) for Iran. Then the threshold of income and environmental emission have predicted. The results show that financial development increase the degradation of the environment and the increase in trade openness reduce the degradation of the environment and Environmental Kuznets Curve hypothesis is approved in Iran. Also, the amount of environmental emission will reach to 623 million tons which the threshold of income is 343 milliard dollars.

KEYWORDS: Environmental Emissions, Threshold Income, Auto Regression Model Distributed Lag (ARDL).

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1. INTRODUCTION

Environmental pollution and protecting the environment have been among the global issues that have even now entered the political domain of countries. According to the Kyoto Protocol (1997) countries of the world have taken appropriate executive measures to preserve the environment as common public goods, they have also introduced some penalties for the world's major polluting countries. Pollutants and greenhouse gases arising from the activities of energy sector have undeniable environmental effects at the regional and global level. Pollutant gases cause acid rain, health risks to humans and other creatures, climate change and global warming. In this study, environmental quality index is a combination of various contaminants that is obtained by Principal Component Analysis (PCA).

Financial development through various channels could be effective on the quality of the environment: (1) Financial development through providing the necessary capitals for industrial and factory activities may lead to environmental pollutions (Sadorsky, 2010). (2) Financial intermediaries may access to the environmental friendly new technology that can improve the environment (Tamazian et al., 2009). (3) Financial development may provide more financial resources with less financial costs, for instance, for environmental projects (Tamazian et al., 2009; Tamazian and Rao, 2010).

The paper is organized as follows: Research literature discusses Theoretical framework and presents a review of the literature, part 3 presents data description and the econometric procedure. The last two parts comprise the study results and conclusions.

2. THE RESEARCH LITERATURE

2.1. Theoretical Framework

2.1.1. Environmental Kuznets Curve

Greenhouse gases emission from fossil fuels and other human activities are serious threat to global temperature. Changes in weather patterns may disrupt the environment and human activities.

A number of studies argue that the relationship between economic growth and environmental degradation follows an inverted U curve. This inverted U is known as environmental Kuznets curve, accordingly, the use of natural resources and energy to achieve high economic growth increases the primary stages of industrialization process due to the high priority of production and employment over clean environment and low-technology, and consequently enhances the emission of pollution. At this stage economic agents cannot supply the costs of reducing pollution due to the low per capita income, and thus the environmental impacts of economic growth are ignored. However, per capita income will improve the quality of the environment in the next stages of industrialization process after reaching certain level of per capita income, so that in such situation the indicators of environmental pollution reduce with regard to the importance of clean environment, high technology and appropriate environmental laws and regulations.

The first experimental study on the Environmental Kuznets curve was conducted by Grossman and Krueger (1991) in a report format in 1991 as the environmental effects of the North American free trade agreement. They reviewed the relationship between air quality and economic growth in the 42 countries and concluded that the relationship between economic growth and the concentration of suspended particles in the air and sulfur dioxide is in the form of inverted U. This study was the basis for the next studies in this field.

Several studies, including Shafik (1994), Selden and Song (1994), Cole et al. (1997), Lieb (2004), Aldy (2005), Song et al. (2008), Iwata et al. (2010), Wang (2013) and Lau et al. (2014)

tested the hypothesis of EKC. Although the hypothesis of EKC has been confirmed in the most of studies, the results of some studies suggest the existence of a uniform or third degree form relationship between pollution emissions and economic growth.

2.1.2. Impact of Financial Development and Trade on Environmental Quality

Despite many studies about the relationship between economic growth and environmental quality, a number of researchers including Tamazian and Rao (2010), Zhang (2011), Pao and Tsai (2011), Jalil and Feridun (2011) and Shahbaz et al. (2013) considered financial development as an important factor affecting the environmental quality in recent years. Well-developed capital markets and the strong banking system can promote the progress of technology and productivity. Capital of technologies that need large sums of investment can easily be provided in the developed financial systems (Tamazian et al., 2009). The financial markets provide the implementation of such technologies with risk sharing for investors.

Further development of financial sector can facilitate more investment with low cost, which also includes investment in environmental projects. Ability to increase such investments in environmental protection as the work of the public sector can be important for states in the local, state and national levels (Tamazian and Rao, 2010). Corporate access to advanced and clean technologies, with the financial development that decreases CO_2 emissions and increases domestic production; financial and investment regulations are promoted for the benefit of environmental quality (Yuxiang and Chen, 2010). Financial systems with better performance, release restrictions of the foreign financing provision which prevents industrial and corporative development and make way for economic growth (Monsef et al., 2013, Sameti et al., 2012, Shahbazi and Saeidpour, 2013). Thus, financing provision for industrial large activities can increase environmental pollutions (Levine, 2005).

The effects of trade liberalization on environment are separated into three effects: scale effect, composition effect and technology effect. The effect of scale represents the change in the size of the economic activities, second effect represents the change in the composition or basket of the manufactured goods and the effect of technology represents the change in the production technology, especially shift to clean technologies. The effect of the scale increases environmental degradation and the effect of technology reduces environmental degradation in trade liberalization. The effect of composition depends on the type of relative advantage. So according to the concept of comparative advantage, if a country has advantage in the polluting goods and has expertise in its production, then composition effect has negative effects on the environment due to the changes in the composition of the country's manufactured goods to polluting goods; and if due to comparative advantage, the combination of a country's manufactured goods change to clean ones, then the composition effect will have positive effect on the environment. Generally, following trade liberalization if the effect of technology dominant the scale and composition effects (in a country with a comparative advantage in polluting industries) or if the effect of technology and composition (in a country with a comparative advantage in clean industries) dominate the effect of scale, then trade liberalization will lead to positive environmental outcomes (Grossman and Krueger, 1991).

2.2. Empirical Studies

Many studies have been conducted on the relationship between economic growth and environmental quality. A number of researchers have examined the role of factors such as energy consumption (Ang, 2007 and Alam et al., 2007), foreign trade (Halicioglu, 2009), electricity consumption growth and population growth (Tol et al., 2006), human resources and capital (Soytas et al., 2007) on the environment. Financial development has been considered as one of the effective factors on the environment.

Tamazian et al. (2009) examined the effect of Financial Development in the BRIC countries (Brazil, Russian Federation, India, and China), using the modeling approach of the standard reduced form during 1992-2004. Results showed that higher levels of financial and economic development reduce environmental pollution, while financial liberalization and financial openness are crucial factors for reducing CO_2 emissions. In addition, adopting policies relevant to financial liberalization and openness to attract greater levels of Research and Development (R&D) and foreign direct investment may reduce environmental pollution in these countries.

Tamazian and Rao (2010) in their study examined the effects of financial and institutional development on CO_2 emissions in 24 countries in transition period from 1993 to 2004. The results confirmed the existence of environmental Kuznets curve. The importance of institutional quality and financial development on environmental performance was also confirmed. Based on the results, financial development had a positive effect on the environmental protection in the countries in transition. Results also indicated that financial liberalization might be harmful to the quality of the environment if it is not implemented in a strong organizational structure. Trade openness in these countries has led to an increase in pollution.

Using panel cointegration and Granger causality test for BRIC countries paid Pao and Tsai (2011) examined the relationship between long-term and dynamic causality of carbon dioxide emissions, energy consumption, FDI and GDP. The results indicate that in the long-run equilibrium, carbon dioxide emissions compared to energy consumption is elastic and compared to foreign direct investment is inelastic. The results also confirm the EKC hypothesis in the studied countries.

Zhang (2011) examined the effect of financial development on CO_2 emissions in China during the 1994-2009 periods, and employed techniques such as Johansson counteraction vector, Granger Causality test and variance analysis. The results show that the financial development of China acts as an important stimulus in raising the greenhouse emissions. The size and scale of financial intermediaries were more important than other indicators of financial development. Nevertheless, the effect of financial intermediaries is far weaker. The size and scale of China's stock market has relatively greater effect on carbon emissions while Foreignal Direct Investment (FDI), due to its small share from GDP, has the least effect on Carbon emissions. Using the ARDL model, Jalil and Feridun (2011) also examined the effects of growth, financial development and energy consumption on CO_2 emissions in China in the two periods 1953-2006 and 1987-2006. In their study, the share of cash debt from GDP, the share of commercial bank assets from total assets of the banking system and the share of foreign assets and liabilities from GDP were used as indicators of financial development. The results showed that financial development contributes to reducing environmental pollution in China. The results also confirmed the existence of Environmental Kuznets curve in China.

Shahbaz et al. (2013) examined the effect of financial development on economic growth and energy consumption, CO_2 emissions in Malaysia during 1971-2011. The results showed financial development in Malaysia led to decrease in CO_2 emissions, while, economic growth and energy consumption increased CO_2 emissions. In another study, Shahbaz et al. (2013) examined the effect of economic growth, energy consumption, financial development and trade openness on CO_2 emissions in the 1975-2011 periods in Indonesia. In their study, real per capita domestic credit to the private sector was considered as a measure of financial development. Results showed that economic growth and energy consumption in Indonesia increased CO_2 emissions, while, financial development and trade will diminish them. Furthermore, inverted U relationship between financial development and CO_2 dissemination was also confirmed.

Ozturk and Acaravci (2013) examined the effect of financial development, trade, economic

growth, and energy consumption on CO_2 emissions over the period of 1960-2007 in Turkey, using the co-integration approach. Results showed that in the long-term, trade increases CO_2 emissions, and financial development variable is not significant on the CO_2 emissions. EKC hypothesis was confirmed in Turkey as well.

In Iran, many researchers have studied the factors affecting the environmental quality. A number of studies have addressed the relationship between environmental quality and economic growth (Pazhouan and Moradhasel, (2007); Pourkazemi and Ebrahimi, (2008); Salimifar and Dehnavi, (2009); Ghazali and Zibaee, (2009) and Mowlayi et al., (2010)), energy consumption (Behboodi and Barghi Golazani, (2008) and Lotfalipour et al., (2010)), trade openness (Barqi Askooei, (2008); Behboodi et al., (2010); Agheli et al., (2010) and Lotfalipour et al., (2012)), factors of the labor force and capital (Sharzaei and Haghani, (2009)), the value added share of the industrial sector from GDP (Nasrollahi and Ghaffari Goolak, (2009) and Vaseghi and Esmaeili, (2009)). Sadeghi and Feshari (2010) in an article using Johansson's co-integration approach over the period of 1971-2007 with regard to indices of carbon dioxide emissions and arable land for the environmental quality concluded that in addition to long-run equilibrium between the export and environmental quality indices, the variables of exports and foreign direct investment had a significant negative impact on environmental quality indices.

Fotros and Maboodi (2010) used econometric approach of Yamamato, investigating the existence and direction of causality between energy consumption, urbanization, economic growth and carbon dioxide emissions over the period of 1971-2006. Results indicate a causal relationship between energy consumption, GDP, urbanization and carbon dioxide emissions. Estimation of the relationship between carbon dioxide emissions, energy consumption, urban population and GDP showed that U hypothesis about environmental pollution and GDP in Iran is true. Sadeghi et al. (2012) addressed the causal relationship between carbon dioxide emissions and FDI variables, per capita energy consumption and GDP in the environmental Kuznets hypothesis in Iran over the period 1980-2008. Results verified the bilateral causal relationship between variables of CO_2 emissions and per capita energy consumption, and unidirectional causal relationship from GDP to per capita energy consumption.

Using panel data and generalized moments approach, Barqi Askooei et al. (2012) estimated the impact of variables such as energy consumption, factory products, economic openness, foreign direct investment and economic growth on the carbon dioxide emissions for the period between 1990 to 2010 in D8 countries. The results showed that in the approach of fixed effects, all variables except FDI had a positive and significant relationship with carbon dioxide emissions.

3. MATERIALS AND METHODS

3.1. Data

Using principal component analysis which is based on a linear combination of the original variables on the variance-covariance matrix and using the following indices, this study tries to extract the general index for financial development (FD) and address all aspects of financial development.

1. Index of financial development depth: the ratio of cash to GDP in current prices

2. Basic index of financial development: the ratio of domestic bank assets to total assets of commercial banks and the Central Bank

3. Index of financial development performance: the ratio of private sector's debt (to the banking system) to GDP

4. Instrumental index of financial development: the ratio of money held by the public to total money supply

5. Structural index of financial development: the ratio of banking system claim of private sector to total banking system credit.

Trade openness index (OP) is the ratio of total exports and imports to GDP; and environmental quality index (EN) is a combination of Sulfur Oxide pollutants, SO_2 and SO3, Nitrogen Oxides of NO_X, Carbon Monoxide, SPM suspended particles, and Carbon Dioxide which are examined in PCA approach. Data on emissions of SO_2, SO_3, NO_X, CO and SPM were obtained from energy balance sheet of Ministry of Energy, Department of Power and Energy. Data on CO_2 were collected from Carbon Dioxide Information Analysis Center, data on GDP and the GDP squared (GDP^2) were obtained from UNCTAD (United Nations Conference on Trade and Development) and data on indices of financial development and trade were obtained from economic reports and balance sheet of the Central Bank. In this study, the period between 1970-2011 was examined, and Microfit 4.0 and Matlab 8.01 were used for the estimation and forcasting.

3.2. Financial Development and Trade in Iran

Chart 1 shows the trend of financial development in Iran. As the chart shows in the period between 1970 to 2011 financial development has declined and then increased due to Imposed War. Overall financial development in Iran has been increasing. However, the amount of financing for the industrial activities has increased over the period. As chart 2 shows the amount of financing for the country's industrial sector compared to other sectors and activities has had incremental growth, and shows this sector has received more attention than other sectors in financial development process.

Chart 1. Financial development and its trend in the period between 1970-2011.

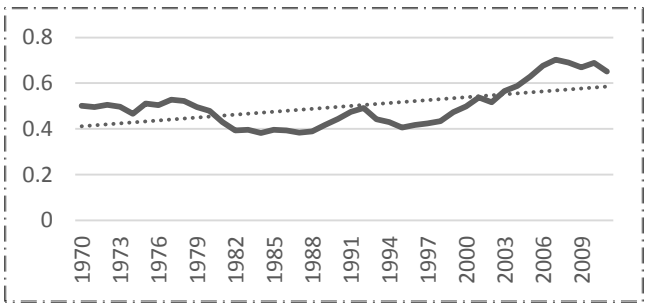
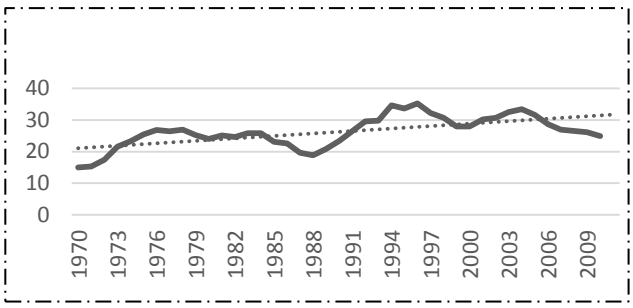


Chart 2. The financing of industrial activities compared to other activities



Source: Economic reports and balance sheet of the central bank

Chart 3 shows the amount of exports and imports in Iran. Exports and imports have increased over the years of the study.

Chart 3. Exports and imports in the period between 1970-2011.

Source: Economic reports and balance sheet of the central bank

Industries such as cement, glass, ceramics, iron and steel, pulp and paper, etc, apply a wide range of environmental effects and release in the air plenty of oxides of Carbon, Sulfur and Nitrogen.

Chart 4. Trend of exporting polluting goods over period 1970-2011.

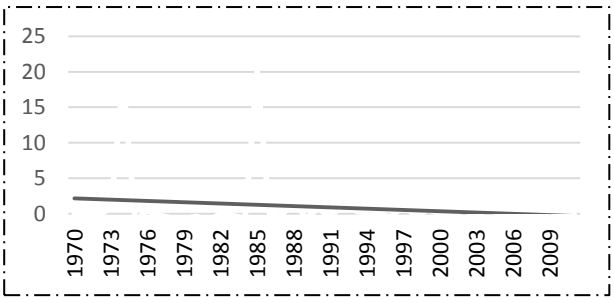
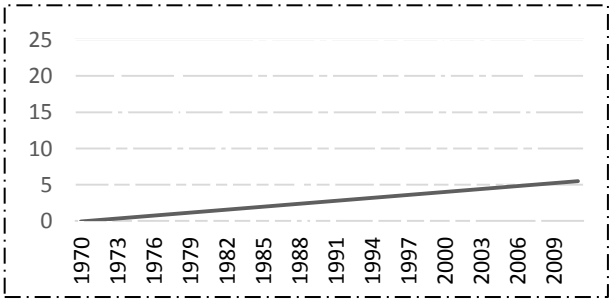


Chart 5. Trend of importing polluting goods over period 1970-2011.



Source: Economic reports and balance sheet of the central bank

According to chart 4 and 5, exports of polluting goods has declined in the period between 1970-2011 and has a downward trend. However, the growth in imports of polluting goods compared to total imported goods has risen. Therefore, the amount of pollutants produced during this period has a downward trend.

3.3. Model

In this study, Autoregressive Distributed Lag Modeling Approach was employed which, was proposed by Pesaran and Shin (1999). Most of recent studies suggest that ARDL approach is preferable to other approaches such as Engel-Granger, in examining the co-integration and long-run relationship between the variables. Whether the variables in the model are I (0) or I (1) this approach is applicable, and in small samples it is relatively more efficient than other approaches. ARDL Model is as follows:

$$\varphi(L,P)Y_t = \sum_{i=1}^{k} b_i(L,q_i)X_{it} + c'w_t + u_t \quad (1)$$

Where

$$\varphi(L,P)Y_t = 1 - \varphi_1 L - \varphi_2 L^2 - \cdots - \varphi_p L^p$$

(2)

$$b_i(L, q_i) = b_{i0} + b_{i1}L + \cdots + b_{iq}L^q \qquad i = 1,2,\ldots,k$$

(3)

In the above relationships YT is dependent variable and Xit is the independent variables. L is Lag operator and wt is a vector of categorical variables including predetermined variables in the model, such as intercept, dummy variables, time trend and other exogenous variables. P is the number of lags used for the dependent variable and q is the number of lags used for the independent variables. Number of optimal lags for each of the explanatory variables could be set by a measure of Akaike, Schwarz-Bayesian, Hanan-Queen or adjusted coefficient of determination. In this study, given the small size of the data set, Schwartz-Bayesian measure was used. Long-run coefficients are calculated as follows:

$$\theta_i = \frac{\hat{b}_i(L,q_i)}{1-\hat{\varphi}(L,p)} = \frac{\hat{b}_{i0}+\hat{b}_{i1}+\cdots+\hat{b}_{iq}}{1-\hat{\varphi}_1-\hat{\varphi}_2-\cdots-\hat{\varphi}_p} \qquad i = 1,2,\ldots,k$$

(4)

ARDL approach consists of two steps to estimate the long-run relationships. First, the dynamic ARDL model is tested for long-run relationship, and in the next step, long-run and short-run coefficients are estimated. The second step is conducted only if the long-run relationship is verified in the first step. Having estimated ARDL dynamic model, we tested the following hypothesis:

$$H_0 = \sum_{i=1}^{p} \varphi_i - 1 \geq 0$$

$$H_1 = \sum_{i=1}^{p} \varphi_i - 1 < 0$$

(5)

The null hypothesis implies the absence of a long-run relationship. Quantity t statistics requires performing the test as follows:

$$t = \frac{\sum_{i=1}^{p} \hat{\varphi}_i - 1}{\sum_{i=1}^{p} s_{\hat{\varphi}_i}}$$

(6)

If t statistics obtained from the absolute critical values provided by Banerjee, Dolado and Mester is larger, then the null hypothesis based on absence of co-integration is rejected, and long-run relationship is accepted (Nowferesti, (1999)). In the second step, if the presence of co-integration is approved, the long-run relationship would be estimated.

4. STUDY RESULTS

Before the test, reliability of all variables is checked to ensure that none of the variables are I (2). If there are any I (2) variables in the model, F statistics is not reliable. To ensure variables of time series used in the model are stationary or none-stationary, Augmented Dickey Fuller test (ADF) has been used. Table 1 shows the Augmented Dickey Fuller test results in the level for the variables. Usually the Schwarz Bayesian Criterion (SBC) saves the number of lags. Therefore, in this study, number of optimized lags is selected based on SBC criteria. OP and GDP[2] variables in the level, while without trend, are stationary, but for the variables of FD, GDP and EN Absolute Dickey Fuller statistic in both cases is smaller than the critical values. Therefore, the variables in level are none-stationary and the unit root hypothesis on the variables is not rejected.

Table 1. Results of Unit Root Tests in the level

	With intercept and without trend *			With intercept and trend **		
variables	optimal lag	ADF statistics	Test results	optimal lag	ADF statistics	Test results
EN	0	-0.95	Non-stationary	0	-2.11	Non-stationary
GDP	0	2.51	Non-stationary	5	0.25	Non-stationary
GDP^2	0	4.75	Stationary	0	0.67	Non-stationary
FD	1	-0.74	Non-stationary	0	-2.79	Non-stationary
OP	9	-4.55	Stationary	9	-3.53	Non-stationary

*Critical value at the confidence level of 95% in cases without trend is -2.96.
** Critical value at the confidence level of 95% in cases with trend is -3.56.
Source: research findings

To find the stationary degree of the variables, Augmented Dickey Fuller test was replicated for the first-order difference of the variables. Test results showed that variables get stationary by making one deduction.

Table 2. Results of unit root tests on the first difference of the variables

	With intercept and without trend *			With intercept and trend **		
variables	optimal lag	ADF statistics	test results	optimal lag	ADF statistics	Test results
EN	0	-5.28	stationary	0	-5.38	stationary
GDP	0	-3.81	stationary	4	-5.29	stationary
FD	0	-3.94	stationary	0	-3.71	stationary

*Critical value at the confidence level of 95%, in cases without trend is -2.96.
**Critical value at the confidence level of 95%, in cases without trend is -3.57.
Source: research findings

Result of estimation of ARDL model is based on the three parts: dynamic, short-run and long-run relationships. The following equation as the dynamic relationships between variables can be specified and estimated:

$$EN = \alpha + \sum_{j=1}^{p} \alpha_{1j} EN_{t-j} + \sum_{j=0}^{q_1} \alpha_{2j} GDP_{t-j} + \sum_{j=0}^{q_2} \alpha_{3j} GDP_{t-j}^2 + \sum_{j=0}^{q_3} \alpha_{4j} FD_{t-j} + \sum_{j=0}^{q_4} \alpha_{5j} OP_{t-j} + U_t \quad (7)$$

To estimate the relationship, as the data are on annual basis, the maximum lags was taken 2, and using Schwarz-Bayesian criterion, dynamic relationships between variables were selected. The optimal lags for each of the variables were set and the model was estimated as ARDL (1,0,0,0,0). To study the long-run relationship of the variables, the value of computational statistics of Banerjee, Dolado and Mestre is calculated in the following way:

$$t = \frac{0.52-1}{0.12} = -4 \quad (8)$$

The value of Banerjee, Dolado and Mestre table at confidence level of 90% for a model with

intercept is equal to -3.64; thus, the existence of long-run relationship between the variables is confirmed. Having ensured the long-term relationship, results of estimation would be provided in Table 3.

Table 3. Result of estimation of long-run relationship

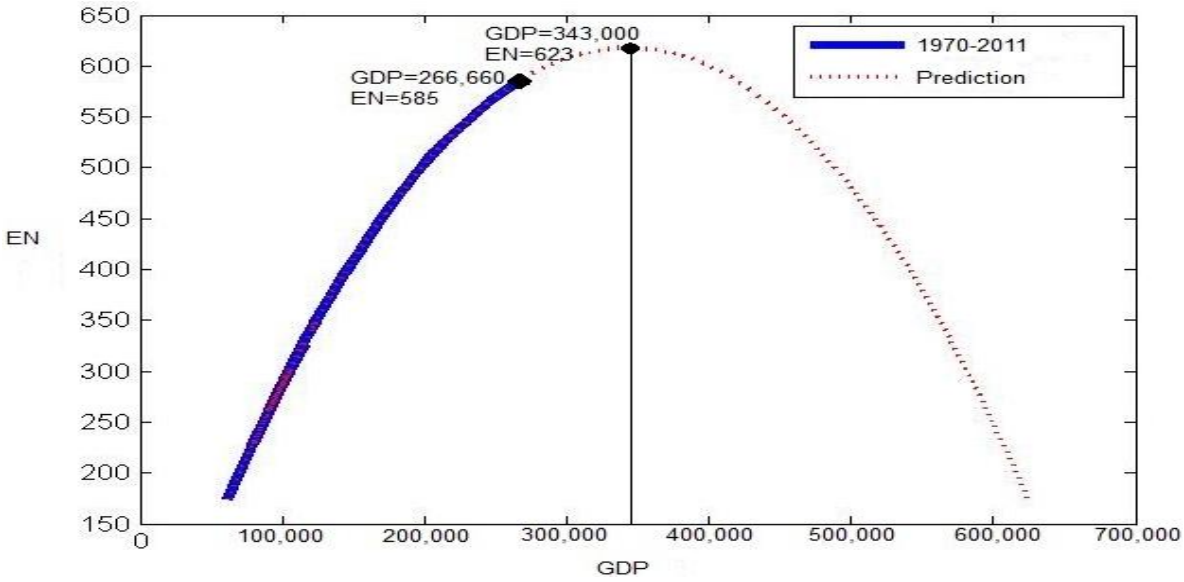
Variables	Coefficients	Standard deviation	t statistics	Critical value
GDP	38.42	8.92	4.31	0.000*
GDP^2	-0.56	0.24	-2.32	0.026*
FD	33.60	14.74	2.28	0.029*
OP	-32.75	9.13	-3.59	0.001*

* Significant at 95% confidence level.
Source: Research findings

As the results of the classic test show the lack of successive correlation between components of disturbances, properly specified equation and equal variance, the results of long-run relationship are reliable. Results obtained from Table 3 show that all variables are significant at the 95% confidence interval. The positive coefficient of GDP (38.42) shows that economic growth in Iran is primarily associated with emission increase. The coefficient of long term emissions relative to variable of squared GDP is significant and negative (-0.56), which shows the Environmental Kuznets Curve hypothesis is true in Iran. Coefficient of financial development and trade liberalization are positive and negative respectively, which implies that increase in financial development causes rise in environmental degradation; however, trade increase promotes the quality of the environment.

For a more detailed review of the results, changes in the environmental degradation index and economic growth could be estimated in the model according to the coefficients, and assuming that all other conditions do not change, chart 6 was drawn.

Chart 6. Environmental Kuznets curve for Iran using Matlab



Sources: research findings

In this chart, the vertical axis and horizontal axis respectively represent the environmental emissions and GDP. As it is seen, the environmental Kuznets curve for Iran is similar to an inverted U, and the estimated model fully meets the theoretical expectations. In the period between 1970-2011, Iran was in the first half the Environmental Kuznets curve, and economic growth for real income levels higher than 343 thousand million dollars leads to improved environmental quality. Current level of environmental emissions equals to 585 million tonnes and will reach 623 million tonnes, which corresponds to the amount of the 343 milliard dollars threshold income.

The estimated error correction model to study adjustment of short-run disequilibrium towards long-run equilibrium is presented in Table 4.

Table 4. Results of the estimation of error correction model

variables	coefficients	standard deviation	t statistics	critical value
dGDP	18.48	4.61	4.00	0.000*
$dGDP^2$	-0.27	0.10	-2.67	0.012*
dFD	16.16	8.01	2.02	0.0052**
dOP	-15.75	5.74	-2.75	0.010*
ECM(-1)	-0.48	0.12	-3.89	0.000*

* Significant at 95% confidence level
** Significant at 90% confidence level
Sources: research findings

The value of -0.48 was obtained for error correction coefficients in the model, which means a 53 percent adjustment in each period to establish a long-run equilibrium. The results of CUSUM and CUSUMSQ tests for evaluating the estimated coefficients and the results of stability test for short and long run coefficients over the time were shown in chart 7 and 8.

Chart 7. Plot of Cumulative Sum of Recursive Residuals.

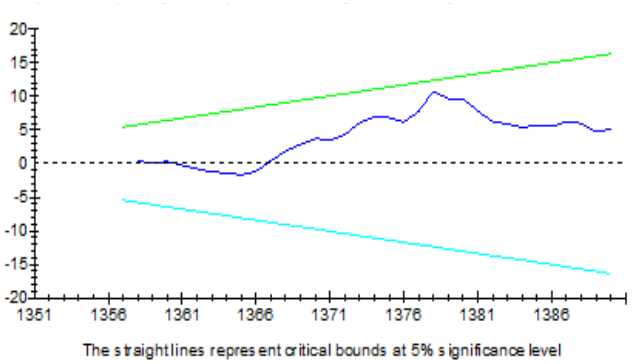
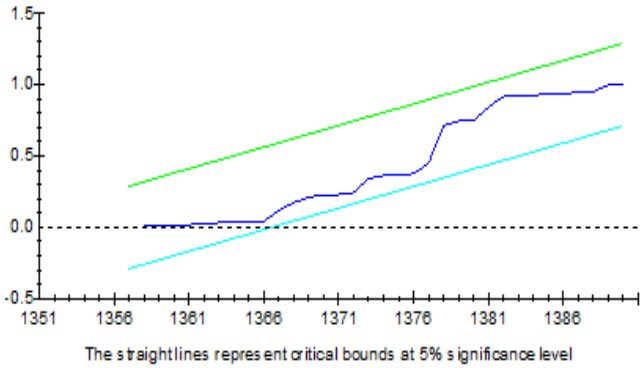


Chart 8. Plot of Cumulative Sum of Squares of Recursive Residuals.



As in both tests, the statistics were within the 95% confidence intervals, null hypothesis based on the stability of the coefficients was accepted and at the confidence level of 95%, the obtained results are valid.

5. CONCLUSION

Due to the different reliability degrees of the variables, long-run ARDL model was employed. The results show that the coefficient of financial development is positive and is significant at the 0.05% probability level, and suggest that in addition to economic growth, financial development also affects environmental quality in Iran, and has led to increase environmental pollution. Based on the chart 2, financing for industrial activity has increased compared to other activities, and industries have been inefficient in protection of the environment. Financial development has made way for destruction of environment. In fact, the investments were only effective in increasing the volume of industrial activities and have not resulted in technological advancement in the industry.

Results show that economic growth had a significant and positive impact on emissions. The negative coefficient of squared GDP implies that Environmental Kuznets curve hypothesis, inverted U-shaped relationship is true for Iran. Results show that Iran is on the upside half of Kuznets curve and according to predictions made on the basis of the GDP of approximately 343 billion dollars in Iran, that correspond to the amount of 623 million tonnes of emissions on the environment, economic growth will lead to improved environmental quality.

The study results also suggest that increased trade openness has led to improvement of environmental quality in the country. This could be because the goods which produce large quantities of pollutants in the manufacturing process are imported from other countries like China. As a result, the pollution increases in the exporting countries, and in Iran as an importing country, pollution reduces because of the reduction in production of polluting goods. Furthermore, it might be due to decline in export of polluting goods, which reflects low production and reduced pollution in Iran. Decline in the proportion of heavy polluting products' export such as cement, glass, ceramics, iron and steel, which produce large amounts of pollutants in manufacturing process (chart 5), and increased proportion of imports (chart 4) confirm the results of the model. In addition, economic openness leads to an increase in imports of high tech intermediary and capital goods that creates less pollution in production process.

As Iran is one of the developing countries and in developing countries, natural and ground resources make up a large share of GDP, economic growth leads to environmental degradation. Given the high importance of development for developing countries, including Iran, to support environmental policies is of low priority. Thus, to pay due attention to environment after

achieving 343 billion dollars of GDP could bring irreparable damage to the environment.

6. POLICY RECOMMENDATIONS AND SUGGESTIONS

Various schemes have been implemented to improve environmental quality and reduce air pollution over time in Iran, especially in big cities. The existence of strong institutional structure will be carried out successful implementation of policies and programs. Thus, efforts to increase the participation of citizens, policy makers, the academic community, and owners of industrial and representatives NGOs is essential to increase cooperation and collaboration through specialized workshops and conferences (for training and participation). Awareness and active participation of the population is necessary to adopt pollution control policies. Also, regarding that economic growth creates pollution, and on the other hand, reduction of growth is not reasonable; therefore, emissions reduction policies should encourage economic growth and consider the initial costs and investment efficiency.

Also, due to the positive effect of financial development on environmental emissions in research results, can be said the financial development only have been affected in increasing the volume and size of Industrial activities while, it has not led to improve technology and access environmentally friendly technologies. Hence, the exact scale of contaminants created by various industries and sectors must be determined so that to achieve the correct conclusions in this field. Policy makers can plan for absorption of foreign direct investment and technology of high performance and low energy consumption to improve environmental quality. Also providing cheap facilities to industrial enterprises and effective laws can be required them to invest in green projects to improve manufacturing processes and reception of their environmental certification.

Research findings indicate that trade openness reduces environmental degradation. The change in the composition of commercial goods towards goods that creates less pollution in the manufacturing process is one of the effective elements in reducing emissions in the country. In other words, the government can combine both trade and environmental policies to provide benefits of trade with the protection of the environment.

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