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Economic Growth and Air Pollution in Iran During Development Programs

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1. Introduction

Air pollution means combination of air with gases that lead to decrease in quality of the air. Pollutant elements are Carbon dioxide, Monoxide, Sulfur Dioxide and etc.

Estimated annual losses of mortality due to urban air pollution are 640 million dollars i.e. 5100 billion Rials that is equivalent 0.57 percent of GDP. The disease caused of urban air pollution creates 260 million- dollar or 2100 billion- Rial cost (0.023 percent of GDP) for the economy of Iran. (World Bank, 2005).

Grossman and Krueger (1991) has analyzed relationship between air pollution and economic growth in USA. GNP per each person, time and pollution index were input in that model. Results show that there is relationship like "U" between GNP per each person and SO_2 emission.

Lee (1996) has surveyed air pollution in Korea during 1985-92. The effects show that CO and income have relationship as "U" whereas Sulfur Dioxide, NO_2 and Ozone did not have it.

Khan (2002) has perused correlation between revenue in each family and CO, NO and Ozone in USA for the year of 1990. One of the important things is that in this research population, labor force, unemployment, literate people, workmen's, housekeeper, rental house that have an effect on pollution, were Exogenous Variables. Consequences expressed that linkage in equation between income and pollution of gasses is inverse.

Pazhoyan and etal (2007) have examined respect of economic growth and air pollution with Kuznets hypothesis in 67 countries with different income. The effect of economic growth, rural population, provision of environment, number of cars, the ratio of summation of export and import on GNP have been surveyed and results emphasized Kuznets curve for environment in those countries.

This study surveys relationship between air pollution and economic growth and also, evaluation of Economical and Social Development Programs in the field of air pollution reduction. For this purpose, the study used data for 1979-2005 from the Balance Sheet Energy (2009), Iran Department of Environment (2009), Central Bank of Iran (2009) and World Development Reports (2008) has been collected. Calculation and estimates is done by Shazam and SPSS packages.

2. Methodology

The estimation of relationship between economic growth and environmental destruction has done by the use of Grossman and Krueger model with some adjustments (Eq. (1))

$$LNP = \alpha_0 + \alpha_1 LNGDP + \alpha_3 LNGDP^2 + \alpha_4 LNcar + \alpha_5 LO + \alpha_6 LNU + \alpha_7 D_1 + \alpha_8 D_2 + \alpha_9 D_3 + \varepsilon \quad (1)$$

Where LNP: the logarithm of pollution variable (carbon dioxide emissions per capita in thousand tons), LNGDP: the logarithm of GDP per capita in Iran (billion Rials), $LNGDP^2$: the square logarithm of GDP per capita in Iran, LNCAR: the logarithmic number of cars produced and imported, LNO: the logarithm of the degree of openness of an economy (ratio of total exports and imports to GDP), LNU: logarithm of population (thousands), D_1: dummy variable for the function of first Development Program, D_2: dummy variable for the function of second Development Program, D_3: dummy variable for the function of third Development Program (in each dummy variables, the number 1 is related to the program years and the number 0 for the other years). For each of the variables some classes are considered, and then the effect of them is investigated by the find results from SPSS package. Many studies done in the field of air pollution considered carbon dioxide emissions as an index of the air pollution and this gas is one of the most important gases leading to climate change and global warming. Additionally, about 72 percent of greenhouse is related to carbon dioxide, so in this study carbon dioxide emission is a criterion for air pollution.

3. Summary and conclusion

Study data are time series, so stationary test is done and the result is available in Table (1) that shows two lags are optimal and whereas calculated value is more than critical value the model is stationary.

Error term	Description
data level	Variable
-5.835	AIC criteria
2	Lag length
3.5573*	Calculated value
-2.57	Critical value

(Source: research findings)
* 10% significance level

Table 1. Generalized
Dickey – Fuller Unit root test results

Chi-square test shows that there are significant differences in carbon dioxide per capita for various variable levels. Considering the fifth column table (2), when the population is over 60 million people, 100 percent of pollution will be more than five ton. Significant differences exist in different classes of the export and import at one percent level of and when imports increase the level of pollution also increases. It is obvious that the highest pollution level in import and export class is in 40 to 50 billion-dollar level.

variable	variables Classification	1-2 ton (Percent)	3-4 ton (Percent)	3-4 ton (Percent)	More than 5 ton (Percent)	Total	Test Results χ^2
Country population	20-30	25	0	8	0	7	**20.87
	40-60	50	50	0	0	22	
	50-60	25	50	33	0	33	
	More than 60	0	0	59	100	38	
Total export and import (million person)	20000-30000	75	25	0	0	18	**22.02
	40000-50000	25	25	50	0	34	
	50000-60000	0	37.5	16	0	19	
	More than 60000	0	12.5	34	100	29	
GDP in fixed price (billion Riala)	100000-200000	100	37.5	0	0	25	***31.16
	200000-300000	0	62.5	59	0	44	
	300000-400000	0	0	41	60	25	
	More than 400000	0	0	0	33	3	
The numbers of produced and imported cars	8000-28000	50	37.5	0	0	18	**17.54
	28000-48000	0	25	8	0	11	
	48000-68000	0	37.5	25	0	22	
	More than 68000	50	0	67	100	49	

(Source: research findings),** 5%,*** 1% significance level

Table 2. Estimated effects of different factors on carbon dioxide emissions

Considering table (3) the emissions of CO2 during various Development Programs is different. In first and second Development Programs pollution emissions is almost equal, while during third Development Program pollution increase has had significant decrease.

The highest effect on pollution is related to economic growth variable. Since increase in economic growth is as an important goal for all government, it is necessary to this reach this goal while sustainable development is considering and environmental damage is at least.

As an illustration the most important variable that has an effect on pollution is GNP after that population has significant effect that Government must control it with training them to protect the environment.

Although summation of import and export on GNP are not punctual, it explains if importing and exporting is done easier, we can hope that productions with high expenditure will be imported without harmful effect on effect on economy of the Iran.

Instead of that we can export productions with competitive advantages.

Also government must supervise the number of cars and consumption of fuel with pollution must be prohibited, rules in big city should be modified and etc.

The of third Development Program had the remarkable effect on falling the pollution. Authorities should expand it if they want to receive sustainable development I the world.

variables	coefficients	standard deviation	t statistic
The logarithm of GDP in fixed price	-7.7103***	1.729	-4.458
the logarithm of GDP square in fixed price	2.842***	0.5672	5.011
The logarithm of total vehicles number produced and imported	0.0292	0.0204	1.432
Logarithmic degree of openness in a economy	-0.2879	0.0960	0.2998
The logarithm of population	0.3372**	0.1491	2.262
dummy variable for the function of first Development Program	0.200***	0.0394	5.079
dummy variable for the function of second Development Program	0.2447***	0.0532	4.596
dummy variable for the function of third Development Program	0.0794**	0.0436	1.821
Constant coefficient	2.6196	2.249	1.165
R-SQUARE = 0.9494 R-SQUARE ADJUSTED = 0.9270 DURBIN-WATSON = 2.7128 JARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)=1.6833 P-VALUE=0.431			

(Source: research findings),** 5%,*** 1% significance level

Table 3. Estimated logarithmic model

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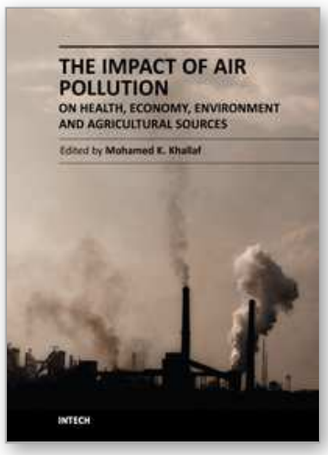
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The Impact of Air Pollution on Health, Economy, Environment and Agricultural Sources

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This book aims to strengthen the knowledge base dealing with Air Pollution. The book consists of 21 chapters dealing with Air Pollution and its effects in the fields of Health, Environment, Economy and Agricultural Sources. It is divided into four sections. The first one deals with effect of air pollution on health and human body organs. The second section includes the Impact of air pollution on plants and agricultural sources and methods of resistance. The third section includes environmental changes, geographic and climatic conditions due to air pollution. The fourth section includes case studies concerning of the impact of air pollution in the economy and development goals, such as, indoor air pollution in México, indoor air pollution and millennium development goals in Bangladesh, epidemiologic and economic impact of natural gas on indoor air pollution in Colombia and economic growth and air pollution in Iran during development programs. In this book the authors explain the definition of air pollution, the most important pollutants and their different sources and effects on humans and various fields of life. The authors offer different solutions to the problems resulting from air pollution.

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