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ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN ALBANIA: AN ECONOMETRIC APPROACH

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Abstract

Sustainable development has become the main objective of politic maker during the recent decades. The world economy has changed profoundly and the economic activity is closely related with environmental quality. The economic growth is one of many suspects contributing to excessive rates of environmental degradation for a single developing country. This study attempts to test the relationship between the environmental quality and economic development. We go beyond the basic model of EKC by including other variables explanatory variables energy consumption, population growth and trade openness. This study is the first of his kind for Albania. To investigate the correlation among these variables we used the Ordinary Last Square Method and Vector Error Correction Model. We find a cubic relationship between the CO2 emissions and economic growth. Furthermore, we identify that GDP and energy consumption has a significant effect on CO2 emissions in the long-run and in the short-run. On the other hand the population growth effect CO2 emission only in the short run. We suggest that these specifications should be considered in implementing environmental regulations in Albania.

Keywords: Economic Growth, CO2 emissions, Environmental Kuznets Curb, VECM. OLS, Sustainable development

INTRODUCTION

The growing world economy has heightened the debate over the environment preservation and the way that different variables affect the environmental quality. Does the economic growth damage the environment or do the economic growth and welfare lead to the improvement of technologies and "green" trade policies to manage and reduce environmental problems? (Bartlett, et al., 1995; Ansuategi, et al., 2002).

Achieving sustainable development has become the main objective for all. For reaching sustainable development economic development, social development and environmental development are needed. A careful analysis of sustainable economic growth and development is necessary to determine the environmental consequences of such development. Through economic analysis economist are trying to explore the best policies for achieving the best levels of pollution.

The relationship between economic growth and environment is explained by an inverted U shape Environmental Kuznets Curve (EKC) Kuznets S., (1955). Grossman, et al., (1991) Grossman G.M. (1995). EKC attempts to determine the relationship between growth and environmental quality. The EKC hypothesis states the environmental quality will decrease in the first stages of the development up to a threshold point after which the environmental degradation decline with economic growth.

The impacts of economic development on the environment differ from country to country. Some economic activities may increase the pollution levels and the degradation of the environment and other activities may decrease them. Based on the impact that economic activities have on environmental quality a country may follow different policies. For example, a country may encourage the trade openness to promote the economic growth and relocate the polluting industries, whereas other countries perform trades with strict environmental rules.

Albania is a developing middle-income country. The key sectors of the economy are agriculture, renewable energy, mining industry, manufacturing, transport, services and tourism. The national economy is dominated by the agriculture sector with more than 40% of the population employed in this sector. Agriculture is a national priority in Albania and represents around 20% of GDP. However, this sector face a number of challenges including small farms, poor infrastructure and primitive technology. The industry sector is leaded mostly by the construction sector which has experienced a considerably expansion the last years. In addition, the service sector has experienced a great growth especially from tourism development. Albanian economy is a vulnerable economy, most of the economic sectors are inefficient due to obsolete technology, high levels of corruption, inefficient markets etc. The last year's increasing economic development has been a priority for the country. Great efforts are being made in order

to reach high levels of economic development and to raise income per capita and less attention has been paid to the environmental quality, in other words the development policy was uncorrelated with concern for the environment. As a result, in recent decades Albania's environment has deteriorated. We believe that in this phase of the development is important to analyze the impacts of economic growth in environmental quality. This will help in developing the legislative and institutional frameworks regarding pollution reduction and improving environmental quality.

The purpose of this paper is to investigate the relationship between environmental quality and economic growth for a single developing country. We will analyse weather EKC explains the ways in which developing economies can reach better environmental quality. In an attempt to broaden the concept of EKC, we will investigate the relationship between environmental quality, income per capita, trade openness, energy use and population growth. This is motivated by the fact that these variables are closely related with economic development of a country. Trade openness leads to the increase of the income; energy consumption is closely correlated with economic growth and population growth increase the demand for goods and services.

The paper is structured as follow: first, we discuss both theoretical and empirical literature on the Environmental Kuznets Curve analysis for CO2 emissions. Section 3 describes the economic framework. Section 4 presents the results of the estimations and conclusions are given in the last section

REVIEW OF LITERATURE

According to EKC, environmental degradation increases in the early stages of economic development and decrease after reaching high levels of development EKC hypothesis has been applied in many previous studies witch result have suggested that economic growth can improve the environment and that economic growth is necessary for maintaining or improving the quality of the environment. Various authors have supported the idea that there is a "U-inverse" relationship between pollution and economic growth see: (Shafik, et al., 1992), (Holtz-Eakin, et al., 1995), (Vincent, 1997), (de Bruyn S.M., et al., 1998), (Friedl, et al., 2002), (Friedl & Getzner, 2002), (Lantz V., et al., 2006,) (Galeotti, et al., 2006), (Aslanidis, 2009), (Iwata, et al., 2010).

Firstly, it is important to understand why pollutants follow this inverse U-pattern. Before moving to the empirical analysis, we will examine the theoretical background that supports and explains the existence of EKC. In the literature, we can find a number of reasonable explanations for the observed inverse u relationship.

According to Grossman and Krueger (1995) countries that are experiencing a growth pattern after having reached the turning point , have adequate income to purchase products that are more energy efficient and would export polluting intensive products to less developed countries. According to (Selden and Song 1994) there are different reasons that explain how increasing income influence environmental quality. First, the natural progression of economic development causes structural change in production from agrarian economy to polluting industrial economies to clean service economies. Second environmental quality is effected from positive income elasticise of demand for environmental quality, an increasing in income will increase the demand for environmental quality. Also increasing information on environmental problems, trade and political openness are closely related with environmental quality.

Stern (2004) analyse that environmental quality is effected from changes in economic structure, technological improvements, changes in input mix, environmental regulation awareness and education. An alternative explanation for the inverse U shape notes that pollution is caused due to the existence of externalities, in order to internalize those externalities advanced institutions for collective decision making is required (Panayotou, 1992).

In recent years, the wide literature on the EKC has gain great importance. The literature of EKC is extended but the empirical results are controversial. Most of these empirical studies are concentrated on few pollutants such as sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), carbon dioxide (CO2). Environmental degradation cannot be explained by per capita income only. Therefore, different studies have considered other variables that may affect the environmental quality like population density, education level, trade openness, energy consumption etc. Different strategies were developed in order to define the connection between economic growth and pollution level and to go beyond the initial form of the relationship. Some studies underline the role of population growth in emission density. In addition, emissions of different pollutants are closely related with energy consumption. Many other factors are being analyzed in different research like education, health, corruption levels R&D etc. Some studies have applied empirically the EKC method to establish the impacts of international trade, economic growth and environmental quality (see Grossman and Krunger 1991, 1993, Suri V., et al., 1998, Antweiler, et al., 2001, Cole, et al., 2005).

Since trade openness may have environmental impacts, both negative as well as positive, various researchers are interested in defining the connection between trade openness, economic growth and environmental quality. A clear analysis of this relationship is required to help in the implementation of appropriate policies in order to achieve sustainable development. Different analysts support the fact that free trade affects the overall level of pollution because of the increased competition, companies will use new cleaner technologies. However, other

studies suggest a potential negative impact of the trade openness in environmental quality. Concerning that trade openness would cause a concentration of polluting industries to developing countries has prompted many protests and scepticism towards various organizations like NAFTA, WTO, G8 etc. Academics' opinions about the impact of international trade in CO_2 levels are divided into two main groups. A part of them argues that trade openness makes countries face a greater competitive pressures. Trade openness promotes technical and environmental standards thus they will use resources more efficient, and as a result, pollution emissions decrease. Therefore, there is an environmental quality improvement (C. F. Runge, 1994, Helpman, 1998). On the other side researchers sustain that trade openness deteriorates the quality of the environment as polluting technologies shift to less developed countries (Ayers, 1995, Richard Schmalensee, et al., 1997, Schmalensee et al, 1997, Antweiler, et al., 2001).

Further studies, (Lucas, et al., 1992, Low, et al., 1992, Mani, et al., 1997, Hettige, et al., 1996) found evidence of the existing "Pollution Haven Hypothesis" due to the relocation of polluting industries from developed countries to developing countries. In addition, according to (Ayers, 1995) elimination of trade barriers has negative environmental impact because developed countries will export their waste to less developed countries. The empirical analysis of (Abdulai, et al., March 2009), demonstrated that the trade openness brings benefits only to rich countries, but not at the poor one. On the other hand, Antweiler, et al., (2001) suggested that trade openness affects the reduction of levels of pollution. Shafik, et al., (1992) Demonstrate that trade openness and competition promotes industries to invest in a technology that is more efficient and less polluting. However, they found weak indications about this correlation.

Other studies investigate the relationship between carbon dioxide emissions, energy consumption and GDP. Akbostanci et al. (2009) analysed the link between CO2, So2, PM10 emissions, energy consumption and economic growth in Turkey. The results show a monotonic and increasing relationship in national level and an N shaped curve at the level of provinces. Arouri at al. (2012) conducted an empirical analysis for all MENA countries. In their study, the EKC is supported on regional- level but the results are mixed in country-level. In long-run equilibrium energy consumption has a positive and statistically significant impact on emissions while real output exhibits the inverted U-shape pattern associated with the Environmental Kuznets Curve (EKC) hypothesis. According to Apergis (2009) there exist a bidirectional causality between energy consumption and emissions in the long-run. On the other hand, Liu (2005) find that including energy consumption in the regression implies a negative relationship between income and CO2 emissions. It is clear that more work needs to be done to understand the role economic development on the environment quality.

METHODOLOGY

This paper investigates the existence the environmental Kuznets curve (EKC) for carbon dioxide (CO2) emissions and its causal relationships with economic growth, population, energy consumption and trade openness of Albania. There are several reasons why we decided to consider this variables; a)Energy consumption and trade openness are closely related with economic growth, b)44% of GHG emissions in Albania is caused from energy consumption, c) population growth increase the demand for natural resources this led to increasing depletion and degradation.

To carry out our empirical analysis, we need the subsequent variables: Carbon Dioxide (CO2) emissions per capita, was measured in metric tons per capita. GDP per capita GDP was measured in PPP of 2005 $ trade, a measure of trade openness, was measured as the sum of imports and exports as a share of total GDP in a given year. Energy consumption was measured on kg of oil equivalent per capita. We use time series data from 1980-2012, this data are published from the World Bank. Table 1 shows descriptive statistics for some of the variables used in our study.

Table 1 Descriptive statistics of variables

	CO2	ENERGY	GDP	TRADE	POPULATION
Mean	1.565717	713.5476	2034.672	56.29818	0.242800
Median	1.380467	712.3590	1827.751	48.43161	-0.612023
Maximum	2.783243	1149.536	3502.636	100.0027	2.687862
Minimum	0.490365	384.5950	1065.454	30.52501	-0.974880
Std. Dev.	0.771569	215.6078	663.9577	19.91549	1.354704
Skewness	0.340986	0.099531	0.812926	0.563511	0.660144
Kurtosis	1.716872	1.961889	2.770004	2.080628	1.530894
Observations	32	32	32	32	32

Econometric model

The most well-known single-equation approach to the EKC is the estimation of linear polynomial models including quadratic (and sometimes also cubic) (Grossman, et al., November 1991) (Holtz-Eakin, et al., 1995) terms of income as explanatory variables. The standard quadratic polynomial model is given as follow.

$$p_{it} = \mu_i + \varphi_t + \beta_1 y_{it} + \beta_2 y_{it}^2 + \beta_1 z_{it} + u_{it}$$

$$i = 1, \ldots N$$
$$t = 1, \ldots T$$

Where $p_{it} = \ln(p_{it})$ is the logarithm of per capita emissions in the period t in the area i

$y_{it} = \ln(y_{it})$ is the logarithm of GDP per capita in the area i at the time period t

z_{it} = the matrix of other variables that may affect co2 emissions

μ_i is a region-specific effect, that estimate unexplained factors that affect the amount of emissions locally.

φ_t reflects the technological changes that occur over time and changes in environmental policies ingrained standards set by different countries.

u is an error term.

The turning point is calculated by taking the derivative of ρ_{it} equation in respect to y_{it} by setting it equal to zero.

$$Y^* = -\frac{\beta_1}{2\beta_2}$$

Using cross section or panel data can bias the estimates and therefore the results may not be reliable. Some authors suggest using just a single country data for testing ECK, to avoid the parameter heterogeneity that cross sectional and panel data present. Countries differ from each other, so it is not realistic to suppose that they will follow the same development path. It is argued that only single country data can answer the question if EKC exists. (Fried and Getzner 2002).

The quadratic model of EKC is not supported for CO2 emissions in Albanian (Gorica, Gumeni & Ndregjoni, 2014). For this reason in this manuscript, we will test the cubic model of EKC. We will use 2 models for analyzing this relationship, in the first model we use only GDP (income per capita) as explanatory variable while in the second model we will use 4 explanatory variables (income per capita, energy, trade and population).

1st Model

$$\ln Co_{2t} = c + a_1 \ln GDP_t + a_2 (\ln GDP_t)^2 + a_3 (\ln GDP_t)^3 + a_4 trend + \varepsilon_t$$

2nd model

$$\ln Co_{2t} = c + a_1 \ln GDP_t + a_2 (\ln GDP_t)^2 + a_3 (\ln GDP_t)^3 + a_4 \ln energy + a_5 \ln trade + a_6 population + a_7 trend + \varepsilon_t$$

The level of CO_2 emissions is considered as endogenous variable to measure the quality of the environment. Low levels of CO2 emissions means better environment quality. GDP represents per capita GDP, energy stands for energy consumption, trade represents trade openness, ε_t is the standard error term. Based on the EKC hypothesis the sing and the value of a_1, a_2, a_3

indicate different functional forms. When $a_1 = a_2 = a_3 = 0$, this is a level relationship, when $a_1 < 0, a_2 > 0, a_3 < 0$, this indicates an opposite N relationship, when $a_1 > 0, a_2 < 0, a_3 > 0$, this indicates a N relationship between CO2 emission and economic growth. Since the energy consumption could be a factor leading the increase of CO2 emissions we expect a_4 (in the 2nd model) to have a positive sing. The expected sing of trade openness coefficient is mixed. We expect a positive sign of population growth coefficient a_6.

ANALYSIS AND EMPIRICAL RESULTS

Through the simple OLS regression, we estimated the relationship that exist between CO2 emission economic growth in Albania.

1st model results :

$$\ln CO_2 = 1257.9 - 499.4 \ln GDP + 65.85(lnGDP)^2 - 2.878(\ln GDP)^3 + 0.07 trend$$

2nd model results :

$$\ln CO_2 = 1463.7 - 577.7 \ln GDP + 75.6(\ln GDP)^2 + 3.29(\ln GDP)^3 + 0.9 energy - 0.31 Trade + 0.25 Population + 0.01 Trend$$

Table 2 Results from OLS

	1st Equation	**2nd Equation**
Variable	Coefficient	coefficient
		(t-value)
Constant	1257.902**	1463.705***
	(2.194382)	(3.24967)
Log GDP	-499.4287**	-577.6968***
	(-2.196734)	(-3.25956)
Log GDP^2	65.83574**	75.61982***
	(2.193309)	(3.248072)
Log GDP^3	-2.878181	-3.293533***
	(-2.18176)	(-3.239077)
Log Energy	-	0.920914***
		(3.081539)
Log Trade	-	-0.315111*
		(-2.058433)
Population	-	0.257133***
		(4.253858)
Trend	-0.070604***	0.015726
	(-9.449605)	1.574129
R^2	0.816889	0.968313
DW	0.460258	2.01768
F-statistic	31.22815	104.7731

As shown in the first model pollution levels are expected to decry with growing income up to a threshold level beyond each pollution levels are expected to increase with higher income level in Albania this is shown by $a_1 < 0$ and $a_2 > 0, a_3 < 0$ and after to decry again which creates a opposite N shape relation between CO2 emission and GDP per capita

In the second model, all coefficient parameters are statistically significant. The sing of $a_1 ' a_2 ' a_3$ supports an inverse N shape between CO2 emissions and economic growth. $a_4 > 0$, $a_6 > 0$ are consistent with the theoretical assumption, the increase of energy use and the increase of population enhance the pollution levels. $a_5 < 0$ Indicate that the increase of free trade decrease pollution levels. Time trend is a variable use to represent the effects of other variables time depended as the technological progress, environmental policies etc.

If data are non-stationary, OLS cannot provide valid estimation result. In order to assess the stationary of the variables we will compute the ADF unit roots test.

We use Agumented Dicky Fuller (ADF) test to test for stationary. The possible three forms of ADF are given by the following equations

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + u_t \quad (1)$$

$$\Delta Y_t = a + \delta Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + u_t \quad (2)$$

$$\Delta Y_t = a + \gamma T + \delta Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + u_t \quad (3)$$

In equation (1) we do not consider the presence of constant or linear trend. In equation (2) we test for the presence of the constant, whereas in equation (3) we test for the presence of the constant and the time trend. (Asteriou 2007)

We accepted the null hypothesis of a unit root against the alternative because the ADF statistics is more than the critical value, and all data were found to be I(1). We have to take first differences to make them stationary.

Table 3 ADF Unit root test

		LEVEL		1st DIFFERENCE	
		t-statistics	p.value	t-statistics	p.value
GDP	Intercept	-0.533944	0.8711	-3.609486	0.0114
	Trend &intercept	-1.808546	0.6762	-3.856673	0.0266
	None	0.739735	0.8692	-3.553375	0.0009
CO2	Intercept	-1.952033	0.3054	-4.050813	0.0038
	Trend &intercept	-1.672059	0.7395	-4.103099	0.0153
	None	-2.003511	0.0448	-4.072646	0.0002
TRADE	Intercept	-1.524093	0.5088	-5.412865	0.0001
	Trend &intercept	-3.446544	0.0629	-5.387606	0.0007
	None	0.401402	0.7936	-6.074581	0
ENERGY	Intercept	-1.592471	0.474	-3.778833	0.0077
	Trend &intercept	-1.261298	0.8783	-3.901738	0.0245
	None	-0.224184	0.5971	-3.857099	0.0004
POPULATIN	Intercept	-1.31347	0.6115	-4.777268	0.0006
	Trend &intercept	-1.765173	0.6986	-4.782716	0.003
	None	-1.474759	0.1289	-4.716729	0

In this situation, a VAR model is preferred rather than the OLS model but there should be not co integration among variables. If the data are stationary and there is a co integration relationship among variables, a VECM model is preferred. To test for co integration among the variables we will use the Johansen co integration test. When testing for co integration, the VAR model with two lags, as suggested by AIC and HQIC is considered .Based on the results of Johanson co integration test, it is determined that there these variables have three co integration vectors at the 0.05 level, representing a long run relationship. In this case, VECM model is adapted.

Table 4 Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.879106	159.9434	88.80380	0.0000
At most 1 *	0.808720	98.67099	63.87610	0.0000
At most 2 *	0.605604	50.70450	42.91525	0.0070
At most 3	0.431745	23.72290	25.87211	0.0904
At most 4	0.223413	7.332547	12.51798	0.3111

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Vector error correction Model

The co integration approach are used to test the long run relationship among the variables. We will test the direction of the causality between carbon emissions, economic growth, trade openness, energy use and population growth we use the VECM model. The Vector Error Correction Model is defined as follow:

$$\Delta X_t = u + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + ... + \Gamma_{k-1} \Delta X_{t-k+1} \Pi + u_t$$

Where

$$u_t = \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \\ u_{4t} \\ u_{5t} \end{bmatrix} \quad \text{and} \quad X_t = \begin{bmatrix} CO2_t \\ Growth_t \\ Trade_t \\ Energy_t \\ Population_t \end{bmatrix}$$

Δ is the difference operator, $\Gamma_1,...,\Gamma_{k-1}$ are the coefficient matrices of short run relationship and Π are matrix of the long run coefficients.

Table 5 Long-run coefficients of VECM

	CO2	***ENERGY***	***GDP***	***POPULATION***	***TRADE***
β	1	-2.36918*	0.74692*	0.099369	0.1124867
se		-0.219133	-0.221986	-0.06003	-0.10032
t-stat		[-10.8116]	[3.36470]	[1.65526]	[1.12131]
	CO2	**ENERGY**	**GDP**	**POPULATION**	**TRADE**
α	-2.08139*	-0.338242	-1.09579*	-1.93444	-0.736965
se	-0.56354	-0.37294	-0.33011	-1.93444	-0.55861
t-stat	[-3.69345]	[-0.90696]	[-3.31952]	[-3.60679]	[-1.31929]

The error correction term in the model indicates the existence of the long run relationship among the variables. The long run correction term β of ECT mean that Energy and GDP are significant (t statistics is greater than critical value at 5% level). Therefore energy consumption and CO2 have a positive relationship in the long-run, an increase of energy consumption increase the CO2 emissions, on the other hand GDP has a negative relationship with CO2 emissions in the long run. (sings are reversed because of the normalization process) According to the model, population growth and trade openness does not have o significant impact on CO2 emissions in the long-run.

The presence of co-integrating equation from which residuals (EC terms) can be obtained also makes it possible to investigate whether there is a short run adjustment. The adjustment coefficients α represents the propositions by which the previous period disequilibrium of the system will be corrected in the next period.

We use the test of significance of F-statistics of Wald test to detect the short run relationship. We reject the null hypothesis and accepted the alternative one of short run relationship among variables. In Albania the coefficient of energy consumption, income per capita and population are significant. In table 6 are shown the short run coefficients of VECM. Energy consumption GDP and population growth effect the CO2 emissions in the short run.

Table 6 Short-run coefficient of VECM

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	6.747281	(10, 16)	0.0004
Chi-square	67.47281	10	0.0000

Null Hypothesis:
C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10)=C(11)=C(12)=C(13)=0

	Δ CO2
$\Delta CO2_{t-1}$	0.748137
$\Delta CO2_{t-2}$	0.315856
$\Delta Energy_{t-1}$	-1.878647*
$\Delta Energy_{t-2}$	-0.806281
ΔGDP_{t-1}	-0.59669
ΔGDP_{t-2}	2.418288*
$\Delta Trade_{t-1}$	-0.001423
$\Delta Trade_{t-2}$	-0.181106
$\Delta Population_{t-1}$	0.699592*
$\Delta Population_{t-2}$	0.4177*

Testing the validity of the model

We have performed diagnostic check on VECM. We test the residuals for autocorrelation by using Breusch-Godfrey Serial Correlation LM test. We test the Null hypothesis of no serial correlation against alternative one of serial correlation. P value is greater than confidence level of 5% so we can not reject the null hypothesis. There is no autocorrelation on the residuals. Also based on the results of ARCH heteroskedasticity test and Jarque-Bera Normal Distribution Test we can conclude that there is no heteroskedasticity and that the residuals are normally distributed. This indicates that we can accept the model.

Table 7 Testing the validity of the model

Heteroskedasticity Test: ARCH			
F-statistic	0.687079	Prob. F(2,25)	0.5123
Obs*R-squared	1.458868	Prob. Chi-Square(2)	0.4822
Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.873208	Prob. F(2,14)	0.4392
Obs*R-squared	3.327265	Prob. Chi-Square(2)	0.1894
Jarque-Bera Normal Distribution Test:			
Jarque-Bera	1.829156	Prob	0.400686

Conclusions

Since economic growth is not the only variable that effect the environmental quality it is necessary of a better understanding of the other variables that have negative effect in environmental quality. The politic makers should consider these variables too while planning strategy for reaching sustainable development goals. We investigated the existence of an environmental Kuznets curve for CO2 emission in Albania over a period of 33 years. Results, obtained from cubic models, do not support the ECK Hypothesis. The inverted N-shaped, was not expected but was statistically significant in term of relationship between GDP per capita and CO2 emissions. The VECM results indicate that energy consumption and income per capita effect the CO2 emissions in the long- run and in the short. Population growth effect emissions of carbon dioxide only in the short run while trade openness does not have a significant impact in CO2 emissions. It should be noted that economic growth is correlated negatively with carbon dioxide emissions in the short run and positively in the long run. The evidences in this paper show that an increase in income per capita will increase CO2 emissions in the short run and will decrease them in the long-run. Important efforts should be made in order to encourage industries to adopt environmentally friendly technologies. More over Albania have to embrace energy conservation policies and seek to increase the energy efficiency.

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