

# A Critical Study of Environmental Degradation and Economic Growth : Evidence for a Developing Country

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## ABSTRACT

This paper examines the relationship between economic growth and environmental degradation in Ecuador from 1971 to 2010. We estimate this relationship in a country with a heavy reliance on revenue from the exploitation of natural resources, the depletion of vegetation cover in recent decades and a low level of participation of industry in GDP. We show the existence of an inverse relationship between real GDP and vegetation cover, indicating that the output of this country is based on environmental degradation. Through Johansen co-integration tests, we check that there is a relationship of longterm equilibrium between the first differences of real GDP, vegetal cover and the urbanization rate. The ECM shows that there is a short-term relationship between vegetation cover, the GDP and the rate of urbanization. Finally, we did not find Granger causality between the variables. A policy implication based on our findings is that policies to protect the environment should not jeopardize economic growth and not limit the rapid urbanization in the country.

**Keywords :** Economic Growth ,Vegetation Cover, Urbanization , Ecuador

## I. INTRODUCTION

The effects of climate change and global warming on the quality of life have increased in recent years. It is believed that one of the main causes giving rise to this phenomenon is the growing economic activity and the consequent environmental degradation. In developing countries, the relationship between economic activity and environmental degradation could be more harmful to the environment due to the production structure of these countries. For example, Ecuador is a country characterized by a low level of participation of manufacturing in the gross domestic product (GDP); most of national income and state budget come from primary exports aimed at international markets, especially petroleum exports (Central Bank of Ecuador [BCE] 2015). There has been increasing interest in Ecuador in recent years in

environmental contamination caused by private sector agricultural activity, especially due to deforestation associated with expansion of the agricultural frontier. Further, this country spends about one-sixth of the national budget to subsidize energy consumption (Ministry of Finance of Ecuador [MFE] 2015). The issue of reducing this spending has generated a broad academic debate with some public policy implications. The main argument for reducing or eliminating this spending is that the subsidy system increases environmental contamination, while not necessarily benefitting low-income persons (Whitley 2013). Nevertheless, institutional weakness and social pressure will likely lead Ecuadorean policy-makers to maintain spending on these subsidies.

In Ecuadorean context, the relationship between product, as a proxy for economic activity, and

deforestation, as a proxy for environmental degradation, strengthens over time because of the historic dependence of the country on primary exports. The production structure of this country leads the increase in output causes a decrease in vegetal cover (forest area). In this context, the objective of this research is to examine the relationship between the economic activity and environmental degradation in Ecuador using unit root tests of Dickey and Fuller (1979), Johansen co-integration techniques (1988, 1991), error correction model (Engle and Granger 1987), and Granger causality models (1969). Our results indicate the existence of two vectors of co-integration among the first differences of the real GDP, vegetal cover and the urbanization rate. The environmental policy should focus on avoiding the expansion of the agricultural frontier without halting economic growth neither the accelerated process of urbanization that Ecuador is experiencing in recent decades. The need for increasing national output at sustained rates to reach development and for increased efficiency provoking urbanization (Henderson 2003) supports this recommendation. The efforts of environmental policy-makers aimed at limiting the expansion of the agricultural frontier could be more effective by increasing protected areas through legal mechanisms, the creation of more nature reserves and the use of commercial policy instruments.

This work includes four sections additional to the introduction. Section 2 provides a theoretical synthesis of the mechanism that sustains the relationship between economic activity and environmental degradation, as well as a brief review of the related literature. Section 3 describes the materials and methods employed. Section 4 discusses the results found, and finally in Sect. 5, we present our conclusions and discuss the implication of our results on economic policy.

## II. LITERATURE REVIEW

In order to study the determinants of environmental pollution and design mechanisms to reduce it, in recent years, there has been a growing theoretical and empirical literature that verifies the relationship between economic growth, energy consumption and CO<sub>2</sub> emissions (Pao and Tsai 2011). Three lines of research have been identified in this ample literature, which are oriented to studying the relationship among these variables. The first verifies the validity of EKC, the second examines the nexus between energy consumption and product and the third combines the first two lines (Ozcan 2013; Ozturk and Acaravci 2010; Halicioglu 2009).

The environmental Kuznets curve (EKC) is an extrapolation of the original equity– income relation proposed by Kuznets (1955). Following the underlying logic of the EKC, in the initial stages of development, both production and contamination are low. Thus, as production increases, contamination also increases, and the interest in the quality of the environment is marginal, and therefore, the contamination will increase more rapidly than production. This is strengthened during the transition from an agricultural economy to one based on manufacturing activity (Cherniwchan 2012). However, when countries become more developed and consequently people have higher per capita incomes and the level of education is higher, greater interest arises among the population in the environment quality, which is reinforced by increased efficiency and improvements in the productive technologies used. This results in the contamination increasing at a slower rate than in the early stages of development. The relationship between national output and contamination weakens over time due to pollution caused by manufacturing activity shifted to developing countries (Cherniwchan 2012; Fæhn and Bruvoll 2009). Based on a profit threshold, productive efficiency and greater interest in environmental quality lead to a

situation where production is nature-friendly, which reduces total contamination. In this sense, the relationship between the environmental contamination and the economic activity is approximated by an inverted U-shape (Panayotou 2003). In this context, economic growth benefits the current population with higher per capita income and future population with higher incomes and better quality environment.

### **Materials and methods: Statistical sources and an econometric strategy**

In order to verify that with increasing national output also increased environmental degradation, this section presents the origin of the data and the econometric strategy used. We use data from secondary sources of information available online. We divide the econometric strategy into the following steps: unit root test of Augmented Dickey and Fuller (1979) and Phillips and Perron (1988), Johansen co-integration test (1988) and Granger causality models (1969) based on error correction models (Engle and Granger (1987). The application of this econometric strategy is similar empirical research developed by Chang and Carballo (2011), Azlina and Mustapha (2012), Halicioglu (2009), Ozturk and Acaravci (2010), among others.

### **CONCLUSION**

In this research, we verify the relationship between real GDP, vegetal cover and the urbanization rate in a country with the following principle characteristics: high dependence on income from primary exports, drastic reduction in the vegetal cover in recent years with the expansion of the agricultural frontier and low participation of industrial activity in GDP. In relation to stationary series, the statistical analysis indicates an inverse relationship between real GDP and vegetal cover, which is consistent with the productive structure of the country. An implication for public policy arising from our results is that it

would be necessary to limit the expansion of national output in order to reduce the expansion of the agricultural frontier. However, the imperative of increasing national output sustainable over time to reduce poverty and achieve development leads to the conclusion that environmental regulation should put at risk the volatile economic growth of developing countries. Encouraging change in productive activities, more efficient energy use, and, in particular, more efforts in changing energy sources can lead to a situation in which GDP can increase without necessarily harming the environment. Finally, future research may focus on the formalization of the effect of economic activity on other environmental variables of environmental pollution and not focus solely on CO<sub>2</sub> emissions, and the choice of the environmental variable will depend on the economic context and environmental context of each country.

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