

The EKC hypothesis in Greece based upon Human Development Index

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INTRODUCTION

The concept of Environmental Kuznets Curve (EKC) relies on the theory proposed by S. Kuznets in 1955 concerning the relationship between income inequality and economic growth [1]. According to the Environmental Kuznets Curve (EKC) hypothesis, the process of economic growth is expected eventually to limit the environmental degradation created in the early stages of economic development [1]. Under this view, each economy should focus on its economic growth and any environmental problems will be eventually eliminated by the same process of economic growth [1].

The EKC hypothesis has been tested empirically by many authors for many countries (or set of countries) and for various time periods but results are at best mixed since the hypothesis is neither confirmed nor rejected adequately [1]. Especially, in studies that consider CO₂ emissions as an index of environmental degradation (dependent variable), the EKC hypothesis does not fit in describing adequately the CO₂ emissions-income relationship [1, 2, 3].

A strong limitation of the EKC hypothesis is that the empirical test of the EKC hypothesis is based on the use of Gross Domestic Product (GDP) as an index of economic growth which is a quantitative rather a qualitative index [4]. The GDP series counts the national income or product produced over a certain time period, usually on a yearly basis, as reported by national accounts in each country. The yearly changes in GDP indicate the economic growth of an economy, i.e. improvements in income. However, the GDP series tells nothing about improvements in the quality of life over time. This indicates that the effort of empirical EKC studies is set to the notion of economic "growth" rather than that of economic "development". Economic development refers to improvements in quality of life in economic, political and social terms. Therefore, economic "development" is a more qualitative notion of economic progress over time [4, 5].

This work attempts to evaluate the EKC hypothesis by adopting the Human Development Index (HDI) as a qualitative index representing economic growth. The study considers the Greek economy and CO₂ emissions as an index of environmental degradation. Greece is an interesting case study because it is considered as a small open economy which in late 2008 encountered a severe economic crisis for almost a decade. As a result, the average income dropped about ¼ which affected the public perception of citizens in Greece concerning the issue of climate change [6]. Also, Greece has been tested empirically under the EKC hypothesis with respect to CO₂ emissions [7].

METHODOLOGY

The initial data are derived from The World Development Indicators (WDI) database provided by the World Bank [8] and cover years from 1960-2019. In particular, initial data are CO₂ emissions per capita expressed in metric tons per capita (CO₂pc) and GDP per capita expressed in constant 2010 US\$ (GDPpc).

Concerning the Human Development Index (HDI), data are gathered by the Human Development Reported produced by UNDP in 2020 [9]. The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living [9]. The HDI

takes into account the health dimension (life expectancy at birth), the education dimension (mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age), the standard of living dimension (gross national income per capita). The scores for the three HDI dimension indices are then aggregated into a composite index using geometric mean [9].

A strong limitation concerning HDI is that, because of its complicated calculation, data are not complete. The report estimates the values of HDI in 1990, 2000, 2010, 2014, 2015, 2017, 2018 and 2019.

RESULTS

Figure 1 depicts the evolution over time of CO₂ emissions per capita (CO₂ pc), Gross Domestic Product per capita (GDP pc) and Human Development Index (HDI). The values in 2000, 2010, 2014, 2015, 2017, 2018 and 2019 are expressed considering 1990 as the base year.

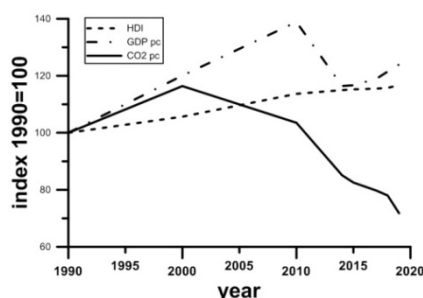


Fig. 1: Evolution of CO₂ emissions per capita (CO₂ pc), Gross Domestic Product per capita (GDP pc) and Human Development Index (HDI). Base year 1960=100

The Gross Domestic Product per capita, reaches in 2010 +39 % compared to respective value in 1990. Contrary, the Human Development Index in 2010 reaches only +14% compared to 1990 levels. Therefore, in 2010, there is a remarkable progress in income per capita (GDP per capita) compared to 1990 but not a relative improvement in Human Development Index in Greece.

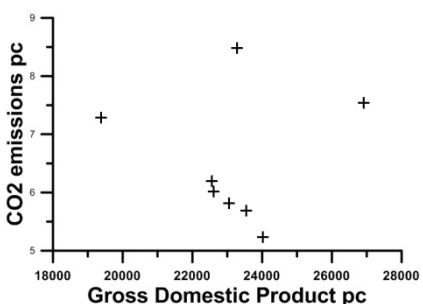


Fig. 2: Scatter plot between CO₂ emissions per capita (CO₂ pc) and Gross Domestic Product per capita (GDP pc)

Figure 2 depicts a scatter plot between CO₂ emissions per capita and GDP per capita according to the EKC hypothesis, while Figure 3 depicts a scatter plot between CO₂ emissions per capita and Human Development Index.

Comparing the relationships between figures 2 and 3, it could be said that figure 3 that uses the Human Development Index (HDI) depicts a more clear cut relation with respect to CO₂ emissions per capita.

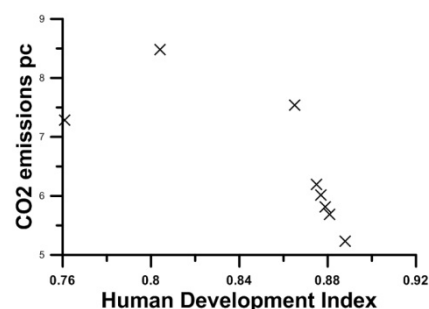


Fig. 3: Scatter plot between CO₂ emissions per capita (CO₂ pc) and Human Development Index (HDI)

CONCLUSIONS

The consideration of the economic growth - environmental degradation nexus, needs to take into account qualitative variables rather than quantitative variables. The process of economic growth alone can not surpass environmental problems created in the early phases of growth. In order to test the EKC hypothesis properly, it needs to develop complete series of qualitative variables to be incorporated in relevant empirical estimations.

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