

Disentangling the Environmental Kuznets Curve

Henry Aray (University of Granada)

Greenhouse gas (GHG) emissions are considered to be primarily responsible for climate change, constituting the greatest challenge facing sustainable development. World Bank data show that while rich countries are the main emitters of GHG per capita, their trends are decreasing or stable over time. Similar pattern shows the ecological footprint indicator (EF) developed by the Global Footprint Network (GFN). However, developing countries, and especially the so-called BRICS (Brazil, Russia, India, China and South Africa) and large countries, such as Mexico, Indonesia and Turkey, have increasing trends. Such behavior, which seems to be repeated over time, is what leads much of the empirical literature that studies at a macroeconomic level the relationship between an indicator of environmental impact and economic activity to use as a starting point the approach given by the environmental Kuznets curve (EKC) by Grossman and Krueger (1995). The EKC states that the relationship between an environmental impact indicator, for instance, CO₂ emissions, usually used in the literature, and the GDP per capita is nonlinear, specifically it has an inverted “U” shape, indicating that the first stages of the development of a country is associated with a growing evolution of harmful emissions to the environment until reaching a maximum from which the relationship is decreasing. Such a relationship suggests that developing countries are in the growing part of the function while developed countries would be in the declining part.

Kijima et al. (2010) pointed out that the most common explanations for the EKC are the following: First, when a country achieves a sufficiently high standard of living, individuals assign greater value to environmental services (Pezzey, 1992; Selden and Song, 1994; Baldwin, 1995). Second, the change in the economic structure, from a rural or agricultural economy to an industrial or urban economy, accelerates environmental degradation, which begins to fall with the development of energy-intensive industrial services and technology-based intensive industry in knowledge (Grossman and Krueger, 1995). Third, as rich countries can afford to spend more on R&D, technological advances occur with economic growth, while obsolete and polluting technologies are replaced by technology that improves the quality of the environment (Komen et al. 1997). Fourth, the characteristics of the political system or some cultural values play an important role in the implementation of environmentally friendly policies (Ng and Wang, 1993). Such policies are more frequent adopted in an economy after it reaches a sufficiently high level of income. Such explanations, in any case point towards changes in the production function of the economy.

Despite the extensive empirical evidence found for the EKC, there is an important theoretical and empirical literature that suggests poor robustness of the EKC.

In a very influential article, Copeland and Taylor (2004) express their skepticism about the existence of a simple relationship between pollutant emissions and income, and suggest going beyond the relationship given by the EKC by scrutinizing the determinants of emissions and income, and demonstrating that the accumulation of physical capital and human capital can produce different patterns of behavior in the emission-income ratio. They showed that if growth occurs only due to the accumulation of physical capital, income and emissions increase. Should growth is due to the accumulation of human capital, production in non-polluting industries is stimulated, and consequently, a negative relationship between income and polluting emissions is obtained. Therefore, Copeland and Taylor (2004) concluded that the different sources of economic growth condition the income-emissions ratio.

This article goes beyond the standard methodology used to estimate the EKC considering the recommendations given by Copeland and Taylor (2004). Thus, it is proposed to decompose the production function of the economy, such that instead of directly introducing the GDP per worker (or per capita), which usually constitutes the independent variable of interest, its components are

introduced: capital per worker, human capital and total factor productivity (TFP). Despite the intuitiveness of this proposal, there is no empirical evidence in the literature that relates the evolution of an environmental impact indicator with the sources of economic growth.

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