Introduction to Environmental Kuznets Curve (EKC)

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Can we sustain economic growth while the environment is continually degraded? Is the environment at the terminal stage? Is salvation just round the bend? We must attend these pertinent and urgent questions, lest we reach the terminal, blind and unwitting.

Scholars are divided on this issue. On one division, are those who hold the opinion that economic growth will result in greater environmental degradation leading to the extinction of the human race. On the opposite division are scholars who contend that sustainable economic growth is possible because it leads to improving the environment.

So what is the truth? Are we nearer to the end or are we nearer to salvation? Economists have an important role in this great debate because we have developed a number of tools to facilitate the seeking of truth. One such potentially important tool is the Environmental Kuznets Curve (EKC).

The EKC takes after the name of Nobel Laureate Simon Kuznets who had famously hypothesized an inverted 'U' income-inequality relationship (Kuznets, 1955). Later economists found this hypothesis analogous to the income-pollution relationship and popularized the phrase Environmental Kuznets Curve.

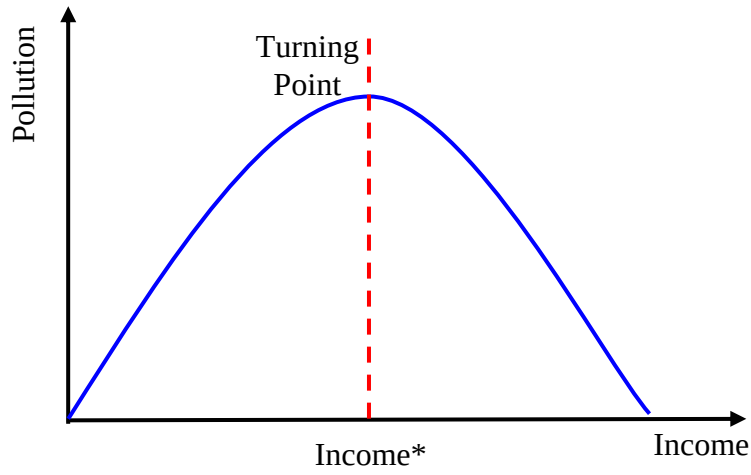

Figure 1: The Environmental Kuznets Curve (EKC)

The EKC hypothesis contends that pollution increases initially as a country develops its industry and thereafter declines after reaching a certain level of economic progress (Figure 1). This implicitly suggests that environmental damage is unavoidable in the initial stage of economic development and therefore, has to be tolerated until the inversion effect kicks in. It is oxymoronic that irreversible damage is to be accepted in return for future improvement, which will definitely not be able to restitute the environment to its pristine state.

Panayotou (2003) suggests the following 3 reasons for the inversion of pollution.

1. The turning point for pollution is the result of more affluent and progressive communities placing greater value on the cleaner environment and thus putting into place institutional and non-institutional measures to affect this.

2. Pollution increases at the early phase of a country's industrialization due to the setting up of rudimentary, inefficient and polluting industries. When industrialization is sufficiently advanced, service industries will gain prominence. This will reduce pollution further.

3. When a country begins industrialization, the scale effect will take place and pollution increases (Figure 2a). Further along the trajectory, firms switching to less-polluting industries results in the composition effect, which levels the rate of pollution (Figure 2b). Finally, the technique effect comes into play when mature companies invest in pollution abatement equipment and technology, which reduces pollution (Figure 2c).

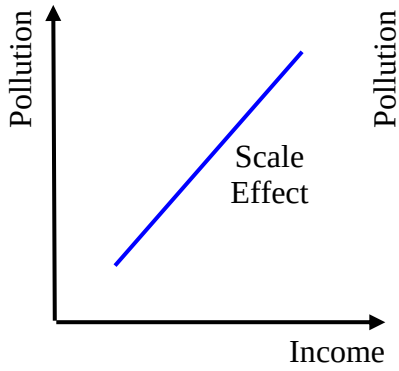

Figure 2a

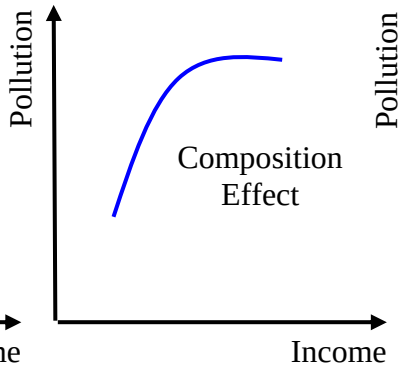

Figure 2b

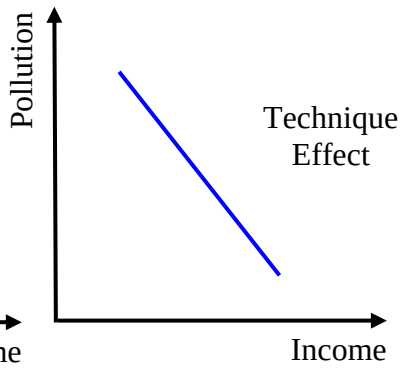

Figure 2c

Does EKC exist? If it does, where is the critical turning point? A survey of literature on EKC has shown a gamut of models underpinning a distinct lack of agreement on measures and explanatory variables amongst researchers. Not surprisingly, the results have also been different and wide in range. A sample of turning points demonstrates this disparity (Table 1).

Pollutant	Shafik et al. (1994)	Panayotou (1993)	Grossman & Krueger (1993)	Selden & Song (1994)	Kaufman et al. (1998)	Cole et al. (1997)
$S0^2$	$3670	$3000	$4107	$8900	$11577	$9400
CO^2	$4000	Not tested	Not tested	$19100	Not tested	$25100

Table 1: Sample of Turning Points

Researchers like Panayotou (1997), have even found a significant cubic Income-SO^2 relationship that takes the form of an N curve (Figure 3) where the turning points are $5000 and $15000. This means that in this example. SO^2 will increase indefinitely beyond $15000.

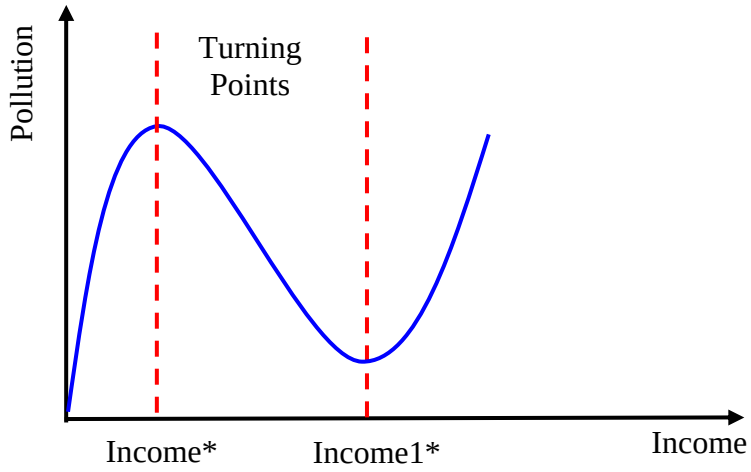

Table 3: Income-SO^2 with N Form

Besides this, there were also other examples that either showed a very weak correlation between Income and Pollutants or indicated a purely linear relationship.

Following is a non-exhaustive summary of the sources for the different outcomes.

a) Different measures such as taking the variable in intensive or non intensive form e.g. GDP, GDP per capita, pollutant level, pollutant per capita
b) Different measuring equipments and sensitivities
c) Different pollutants e.g. $C0^2$, SO^2, NOx, Biological Oxygen Demand (BOD)
d) Different sets of explanatory variables e.g. inclusion of variables for education, democracy, NGO pressure groups, Institutions, regulations, enforcements, number of vehicles, industry densities, land area etc.
e) Different functional forms e.g. cubic instead of quadratic form
f) Different sets of sample size and members
g) Different time periods
h) Use of GDP deflators and Purchasing Power Parity

After all the empirical work to prove and disprove EKC, several pertinent questions remained unanswered.

a) How much environmental damage will incur before the critical turning point?
b) Which institutional reforms would hasten environment improvement?
c) Should economic growth be encouraged to bring the economy to the turning point?

A satisfactory answer to these questions would enable us to move the EKC model beyond the theory so that policy makers are able to use it as a practical tool to enhance their decision-making. Hopefully, this would avoid the inconsistencies of past policies, which have often sacrificed the environment for short-term gain.

References

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