RELEVANCE OF THE EVER INCREASING MODEL IN DESCRIBING THE CARBON DIOXIDE EMISSIONS

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The functional relationships considered between the pollutant, per capita carbon dioxide emissions, and per capita income in the literature are log-linear and log-quadratic. While log-linear relationship is found to be strong, certain studies supported the log-quadratic, inverted U-type curve, popularly known as the "*Environmental Kuznets* curve". It suggests that the per capita emissions increase with increasing income up to certain income levels, and then the per capita emissions start to decline as income further increases. In a recent cross-sectional study, an alternative functional form known as the "*Ever Increasing Model*" has been shown to explain the relationship between the emissions and income reasonably well. According to this model, per capita carbon dioxide emissions increase with increasing income level towards a saturated value.

A panel data analysis is carried out in this study in search of the best model to describe the relationship between the per capita CO_2 emissions and per capita income (taken as GDP per capita). We covered a maximum of 171 countries for a period of thirty six years (1960-1996), and the data set was analysed by dividing it into different types of income clusters, with income fixed effects for intercepts and slopes. The rigorous statistical analyses and tests carried out guarantee the validity of the three per capita models investigated in this study, namely, the *Linear Model* (LM), *Environmental Kuznets Curve (EKC),* and the *Ever-Increasing Model (EIM).* However, the coefficient of determination (R^2-adjusted) of the three per capita models lie in the range of 74 to 76. The R^2-adjusted values improve to the range of 90 to 92 when the per capita models are modified such that the CO_2 emissions are modeled as functions of GDP per capita and population, as in the *Improved Linear Model (ILM), Improved Environmental Kuznets Curve (IEKC)* and *Improved Ever Increasing Model (IEIM).* Therefore, it is clear that the improved models, which also satisfy all the statistical tests, are superior to the per capita models. Tests also proved the non-existence of multicollinearity.

When considering the p-values of the estimated coefficients of the above six models, all the coefficients were significant except for certain coefficients of the EKC and IEKC models. Thus, we may consider the EKC-based models to be inferior to the LM and EIM based models. The linear models of the individual income clusters when put together to cover the full income range studied, show a progressive reduction in the elasticity of the GDP per capita term, but the elasticity never becomes negative. It shows that the overall nature of the model matches that of the EIM, in which CO_2 emissions reaches a saturation value with increasing income, and not the EKC, which claims that the CO_2 emissions reduce with increasing income beyond a threshold per capita income.

Therefore, policy makers should recognize the deficiencies of the Environmental Kuznets' Curve and should rethink whether *EKC* is suitable for drawing policy prescriptions in relation to CO_2 emissions as there is the Ever Increasing Model, which is proven as in this study to do better in describing the relationship between the emissions and the income.