

The Relationships between Energy Consumption, Carbon Dioxide (CO₂) Emissions, and GDP for Egypt: Time Series Analysis, 1980-2010

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Abstract : The relationships between environmental quality, energy use and economic output have created growing attention over the past decades among researchers and policy makers. Focusing on the empirical aspects of the role of carbon dioxide (CO₂) emissions and energy use in affecting the economic output, this paper is an effort to fulfill the gap in a comprehensive case study at a country level using modern econometric techniques. To achieve the goal, this country-specific study examines the short-run and long-run relationships among energy consumption (using disaggregated energy sources: crude oil, coal, natural gas, electricity), CO₂ emissions and gross domestic product (GDP) for Egypt using time series analysis from the year 1980-2010. To investigate the relationships between the variables, this paper employs the Augmented Dickey-Fuller (ADF) test for stationarity, Johansen maximum likelihood method for co-integration and a Vector Error Correction Model (VECM) for both short- and long-run causality among the research variables for the sample. The long-run equilibrium in the VECM suggests some negative impacts of the CO₂ emissions and the coal and natural gas use on the GDP. Conversely, a positive long-run causality from the electricity consumption to the GDP is found to be significant in Egypt during the period. In the short-run, some positive unidirectional causalities exist, running from the coal consumption to the GDP, and the CO₂ emissions and the natural gas use. Further, the GDP and the electricity use are positively influenced by the consumption of petroleum products and the direct combustion of crude oil. Overall, the results support arguments that there are relationships among environmental quality, energy use, and economic output in both the short term and long term; however, the effects may differ due to the sources of energy, such as in the case of Egypt for the period of 1980-2010.

Keywords : CO₂ emissions, Egypt, energy consumption, GDP, time series analysis

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