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# THE RELATIONSHIPS BETWEEN CARBON DIOXIDE (CO2) EMISSIONS, ENERGY CONSUMPTION AND GDP FOR SAUDI ARABIA

## 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: petroleum products and the direct combustion of crude oil, natural gas, and electricity), CO2 emissions and gross domestic product (GDP) for Saudi Arabia using time series analysis from the year 1980-2010. To investigate the relationships between the variables, this paper employs the Augmented Dickey-Fuller (ADF) and the Phillips–Perron (PP) unit root tests for stationarity, Johansen maximum likelihood method for cointegration and a Vector Error Correction Model (VECM) for both short- and long-run causality among the research variables for the sample. All the independent variables in this study show very strong significant effects on the GDP in the country for the long term. The long-run equilibrium in the VECM suggests negative long-run causalities from the CO2 emissions and the consumption of petroleum products and the direct combustion of crude oil to the GDP. Conversely, positive impacts of the natural gas use and the electricity consumption on the GDP found to be significant in Iraq during the period. In the short run, there also exists a negative unidirectional causality running from the GDP to the electricity consumption. The results partly support and also partly deny the conventional arguments that there is a short-run positive effect from environmental quality and energy use on economic output but they eventually reduce economic output in the long run. Overall, this study found that the associations could to be differed by the sources of energy in the case of Saudi Arabia over of period 1980-2010.

## Keywords:

CO2 emissions, energy consumption, GDP, Saudi Arabia, time series analysis