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A MODEL TO ESTIMATE THE EFFECT OF OIL PRICE ON RENEWABLE ENERGY CONSUMPTION, CASE STUDY: EUROPE

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Overview

Increased concern over issues related to energy security and global warming suggests that in the future there will be a greater reliance on the consumption of renewable energy. Therefore, it is not surprising that renewable energy sources have become a focal point for policymakers in the design of a sustainable energy future. On the other hand, oil price fluctuations play an important rule on determining energy policies. As an example, the effect of cheap oil that jeopardizes environmental policy-making process should not be neglected. The goal of our study is to propose a statistical model based on the macroeconomics theory to grasp the effect of oil price variations on renewable energy consumption. On the next step, we apply the model to nine major renewable energy consumers among European countries and the whole Europe as a separate body.

Methods

Following the literature on equilibrium in market clearing condition and production function theory in short time, we assumed that, in an energy system, which only consists of renewables and non-renewables as homogeneous products, a fluctuation of oil price could indirectly induce a variation in terms of renewables consumption. Given that renewable energy could be considered a substitute for oil, an increase in the price of oil should have a positive impact on renewable energy consumption. In order to verify our model we considered nine major countries, which produce 80% of Europe's renewable energies, and Europe28 as an independent body. After that, we gathered renewable energy consumption and Brent's oil price yearly averaged data during 1990 until 2014 from European Union's statistical office, Eurostat. In order to get normalised data we divided the renewable consumption by the population to get per capita values. Consequently, we did unit root and autocorrelation tests to ensure that the data complies with the time-series regression assumptions. At the end, we did some other tests to the model, like skewness and kurtosis tests, heteroskedasticity tests, etc. to ensure reliability of the results.

Results

The model was able to capture the relation between difference of oil price and variation in renewable consumption per capita for five countries with 5% significance. For each country, there is a relation with a different time lag of oil price fluctuation but mostly the coefficient (β) is positive with two time lag. On the other hand, for some countries like Germany and Spain the model could not capture significant coefficient. Furthermore, we noticed a relation between the amount of the β and countries' renewable energy consumption per capita. Finally, we interpreted the outcomes of the model according to the economic theories.

Conclusions

The scheming of lags successfully gave us univocal answers. On average, we have seen that economies have in discrete time the same response time to oil price shocks. Significant coefficients were positive for most of the cases following the theory. Given the outcomes, we concluded that, according to the model, renewable energy consumption could appreciate competitive gains due to positive shocks of oil prices. We also captured scale economies augment effect from the relation between the amount of β coefficient and renewable consumption, which means that higher level of renewable energy consumption will be appreciate more the competitive gain. We interpreted non-significant outcomes with the capacity of the economic system or the set of policies in that country to "sterilize" exogenous effects of oil price fluctuations to energy consumptions.

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