

# ***A QUANTITATIVE ANALYSIS OF THE DRIVERS OF THE ENERGY MIX: THE ROLE OF ENERGY PRICES***

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## **Overview**

The objective of this paper is to show that international energy prices drive the fossil fuel energy mix, but only when there are no substantial changes in the energy policy. As a corollary, this paper suggests that standard macroeconomic models can lead to misleading results, if energy policies are not taken explicitly into consideration.

Policymakers perceive the volatility of energy prices as a continuous risk to their economies. They try to shape, through energy policies, the energy mix to make the economy less vulnerable to shocks. As a result, the observable energy mix is the result of the interaction of fuel prices, available technologies, and energy policies. In other words, the energy mix is determined by the relative costs of fuels, but is also distorted by local policies addressing security, environment, economics and social aspects. Changes in any of these components lead to variations in the energy mix.

The aim of this paper is to understand the role of prices of primary energy sources in the energy mix. This was undertaken by studying three advanced economies, Germany, United Kingdom and the United States for the period 1980-2014. These countries have had different policies along the last decades, each resulting in different energy mixes. We use a Dynamic Stochastic General Equilibrium (DSGE), calibrated for Germany, the United Kingdom and the United States as our methodological approach. Our results confirm that the energy mix is shaped by prices of fuels if energy policy does not change substantially. However, the dramatic changes in the energy policy that occurred in Germany and in the UK in the 90s reduce the role of prices in the energy mix.

## **Methods**

We use a Dynamic Stochastic General Equilibrium (DSGE), calibrated for Germany, the United Kingdom and the United States as our methodological approach. Our results confirm that the energy mix is shaped by prices of fuels if energy policy does not change substantially. However, the dramatic changes in the energy policy that occurred in Germany and in the UK in the 90s reduce the role of prices in the energy mix.

## **Results**

We find that the impact of changes in the relative prices of fossil fuels on the energy mix during times with stable energy policies (2003-2014) is relatively similar in the three countries. The impact of natural gas or coal shocks in the energy mix seems as relevant as oil shocks. This is an innovative result. Academic literature focus on oil prices and their impact on economic activity, but it pays little attention to the impact of oil prices on the energy mix (see for example, Hamilton (1983, 2003), Kilian (2008, 2009), de Miguel et al (2003), Kesicki (2010) and Herrera et al (2015)). For both Germany and the United States, the increase in oil prices explains the decline of oil in the energy mix. In addition, the cheap prices of natural gas in the United States explains the increase of its share in this hydrocarbon energy mix. According to our results, coal shocks, natural gas shocks and oil shocks are not independent and fossil fuel prices trend to move in parallel. In this sense, the impact of oil prices in the economy could be oversized since they collect also the impact of coal and natural gas prices.

## **Conclusions**

Our study assesses the role of prices in the hydrocarbons energy mix, using a Dynamic Stochastic General Equilibrium model.

The results suggest that, under a relative stable energy policy, the evolution of energy prices is critical for the energy mix. However, prices became supporting actors under the presence of sharp changes in the energy policy. This result is backed by the reasonable results that our model generates for Germany and the UK.

The evolution of the energy mix in the period 2003-2013 is more driven by the evolution of prices. In general terms, the increase in oil prices explains the decline of oil in the energy mix. In addition, the cheap prices of natural gas in the United States back the increase the share of this commodity in the hydrocarbon energy mix.

Another interesting result is that oil shocks have an enormous impact on aggregate activity compared with natural gas shocks and coal shocks. From a gross domestic product perspective, oil prices are the main source of potential disruptions. From an energy mix perspective, natural gas and coal prices are as relevant as oil prices. The volatility of the energy mix is explained in a similar way by natural gas prices, oil prices and coal prices.

A final insight of our analysis is related to price shocks. According to our results and during the period 1980-2013, the prices of the three fossil fuels were influenced by similar macroeconomic factors. As a result of this, the evolution of fossil fuel prices is linked and prices tend to move in parallel.

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