

ECONOMIC IMPACTS OF CRUDE OIL PRICE CHANGES IN A DETAILED GENERAL EQUILIBRIUM MODEL OF THE UNITED STATES

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Overview

Crude oil price increases are expected to exert negative effects on the economy. However, the magnitude of these effects and the mechanism through which they are propagated throughout the economy remains a subject of ongoing research. In addition reactions to an oil price change are different across sectors of the economy. Estimates in the oil-economy literature, usually summarized as the oil price elasticity of GDP range from +0.08 to -0.25. We provide a brief overview of the factors responsible for this wide range. We apply a model of the United States economy with 2003 as the base year to examine price increases of similar magnitudes to those seen since 2003, and the effect of some these factors on the economic impacts. We examine how different sectors of the economy are affected by an oil price change.

Methods

We employ an 80-sector computable general equilibrium (CGE) of the economy. The model is calibrated to the 2003 economic data, while parameters are based on estimates from the literature. Production activity in each sector is characterized by nested constant elasticity of substitution (CES) functions, with the top-nest consisting of a capital-labor-energy aggregate, transportation, feedstock, materials, and services. Similarly nine household income groups consume 21 commodities including separate public, private, and local transit commodities. The price of each commodity is specified using a CES cost function of market good/service prices, while a Stone-Geary expenditure (Linear Expenditure) system is used to model how households convert commodities into utility. We include specifications for exports and imports of goods/services. Income and expenditure balances by households, government, and enterprises are also specified. Federal and State governments collect labor, capital, indirect and other taxes to finance expenditures and transfers. The default macroeconomic closure of the model is Keynesian, with exogenous labor supply, but endogenous unemployment, and a fixed average wage rate. The consumer price index serves as a numeraire, implying that our model focuses on the real sides of the economy. This macroeconomic closure implies a fixed real wage rate.

Results

We simulate a number of scenarios that differ by the size and sign of crude oil prices changes, and underlying macroeconomic factors that may affect the aggregate and sectoral effects of an oil price change in the economy. We estimate economic impacts in the range of -0.01 to -0.6 depending on different factors.

Conclusions

The model presented in this study allows an examination of the effects of oil price changes on different sectors of the economy, as well as measurement of the aggregate economic effects. In line with what is seen from a review of the theory and empirical estimates in the literature, our results suggest that the range of aggregate economic impacts may be wide. We found in particular that the economic effects in a one-period framework are significantly affected by whether balance of payments are allowed to deteriorate or not, as payments for imports outstrip balancing export incomes. The following caveats apply to the work reported here. Our model is static, and simulations are preliminary in nature. Planned further work include introduction of dynamics, refinement of producer and consumer behaviour to better reflect the role of energy services in the economy, as well as incorporation of updated parameter estimates.

