Evaluating the Impacts of a Reduction in Crude Oil price on the Portuguese Economy with Input-Output Based Models

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Author: Ana Maria Dias

As a result of a considerable expansion in supply, combined with a moderation of demand for fossil fuels, the international price of crude oil has decreased significantly along the second half of 2014 and beginning of 2015. This paper presents the methodology and results for the evaluation of the impact, on the Portuguese economy, of reductions in the import price of crude oil, using a multisectoral (input-output based) model (MODEM 7) combined with an input-output (I-O) price model. MODEM 7 is a multisectoral model (considering 85 products, produced by 85 homogeneous industries), which includes an input-output based block (determining output, employment and taxes and subsidies on products, as well as imports by products, assuming that supply is determined by final demand, in line with the classic input-output Leontief quantitative model). All components of final demand are exogenous, with the exception of private consumption, which is determined by private disposable income. The model includes also macroeconomic equations determining private disposable income and consumption, GDP, total employment and the unemployment rate as well as public finance equations allowing the determination of public deficit and debt. Most of the equations (702) are simultaneously determined. All variables are defined at current prices, assuming that, for each model simulation, there are no price changes within each year. All equations are static, except for public debt. Model coefficients were estimated on the basis of the latest available system of I-O tables for Portugal (regarding 2008), as well as of other data from Portuguese national accounts and a reference simulation was performed for 2008, replicating the observed values for the Portuguese economy on that year.

As MODEM 7 does not include price equations, an input-output price model (disaggregated into the same 85 products and calibrated with the same system of I-O tables used for MODEM 7) was used to estimate total effects (direct and indirect) of the reduction in crude oil's import price on each product's price and on final demand deflators, using a cost-push assumption for price determination.
The price effects simulated with the price model for each crude oil price scenario were subsequently used to reestimate MODEM's nominal input-output coefficients, assuming that I-O coefficients (for intermediate consumption) remained unchanged in real terms. Final exogenous demand was assumed to remain constant in nominal terms (equal to the, before oil price change, reference scenario), except for Change in Inventories and for Exports, which were assumed to remain constant in real terms for each product. After these adjustments, simulations were performed with the adjusted MODEM and the impacts of the reduction in crude oil price were obtained through the comparison with the (before oil price change) reference simulation. These comparisons were made both in nominal and in real terms (after deflating nominal variables from each crude oil price scenario with the appropriate price deflators obtained from the I-O price model simulation).