

Biofuels, technological change and uncertainty: Evidence from France

Topic: CGE and Econometric Input-Output Modeling

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The increasing constraints on crude oil resources have contributed to the emergence of liquid biofuels as an alternative for road transport fuels. However, first-generation biofuels have been denounced as harmful in regards to their impacts on food crops prices, land use changes and ecological damages. As a consequence, some European Union (EU) governments have decided to reorient public subsidies from crop-based to cellulosic biofuels. More recently, the EU Parliament has called for a 6% limitation of crop-based biofuels and proposed a 2.5% binding incorporation target for cellulosic biofuels by 2020. In spite of this stated objective, the horizon of a large-scale adoption for advanced biofuels remains largely uncertain. Indeed, biofuels competitiveness is tightly linked to crude oil prices that also follow an uncertain evolution. In this context, including both uncertainties into the same analysis framework could be challenging.

Focusing on France, the main objective of this work is to assess the economic and environmental impacts of first and second-generation biofuels. We also determine the conditions under which advanced biofuels could become available earlier regarding to the evolution of oil prices and public subsidies. For this purpose, we develop an original approach to incorporate uncertainty within a dynamic computable general equilibrium (CGE) model calibrated on 2009 French data. In line with the existing literature, cellulosic biofuels are modeled as latent technology and biofuels by-products are included into the analysis. Different scenarios depending on the oil price volatility and the changes in the fiscal incentives are considered using stochastic programming. We compare the effects of first and second-generation biofuels as regards mainly agricultural land, food production and greenhouse gas (GHG) emissions. These simulations provide guidelines for public deciders to design alternative fiscal policies to support advanced biofuels hand in hand with economic, social and environmental impacts.