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Integrating Biofuels into Simulation Models: How Does it Influence the Results of World Agricultural Market?

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Abstract

Over the last ten years biofuels production has increased dramatically. This strong increment in production has been fostered mainly by governmental interventions, like mandatory blending targets, tax exemptions and subsidies. Since commercially available biofuels employ almost uniquely food crops as their feedstock, *i.e.*, mostly sugar cane, corn and oilseeds, concerns have been raised about the economic, social and environmental impact of biofuel production. Therefore, simulation models have gained increased attention for their capability to analyse the linkages between agricultural and energy sectors, and to measure the impacts of biofuel production on the world economy.

Based on that, this study aims first to provide a literature review of the evolution on how biofuels have been introduced into the frameworks of simulation models. Secondly, it seeks to analyse the empirical results implementing agricultural trade liberalisation shocks by developed countries using the Global Trade Analysis Project (GTAP) model. Here we employ two different structures of the model. The first structure resembles the standard GTAP model where biofuel production and consumption is only modelled implicitly. The second structure of the GTAP model employs an extension with separated biofuel sectors as well as a differentiated production and consumption structure, so that biofuel is modelled explicitly. From the first result of the empirical analysis, it can be concluded that the different structures of biofuel modelling used have only slightly changed the results, mainly due to the lack of biofuel traded in the period analysed. Additional shocks, like biofuel mandates, could be tested in these and other structures including relevant specifications, *e.g.*, land use module, and by-products from biofuel production.

In general, these analyses can benefit future researchers with more coordinated modelling efforts about how to incorporate biofuels in simulation models. Additionally, this study also serves as a guide for future researches and to support policy makers in better understanding how distinct modelling approaches could possibly deliver different results for the world economy.

Keywords: Agricultural trade liberalisation, biofuels, modelling framework, simulation model