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Abolishing biofuel policies: Possible impacts on agricultural price levels, price variability and global food security

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ABSTRACT

In this paper we assess the impact of abolishing biofuel policies (mandates, tax credits, import and export tariffs) on agricultural price levels and price variability as well as some aspects related to global food security. For the analysis we employ a recursive-dynamic agricultural multi-commodity model within a stochastic framework. Results of the 10-years forward looking scenario indicate that the removal of biofuel policies would have a significant effect on price variability of biofuels, but only a marginal impact on the variability of agricultural commodity prices. Without biofuel policies, global biofuel demand would decrease by 25% for ethanol and 32% for biodiesel. Moreover, prices would only moderately decrease for ethanol feedstock commodities like wheat and coarse grains, while prices for biodiesel feedstock commodities, specifically vegetable oils, would be more affected. Due to competing uses of crop production such as feed and industrial use, abolishing biofuel policies would not necessarily lead to an increase in global food security, as food use increases would remain low for most crops and regions.

Introduction

The food price crisis in 2008 entailed the rise and subsequent fall in agricultural food prices, and lead to a wide range of studies devoted to understanding drivers of high prices and increased price variability in agricultural markets. Regarding the drivers, researchers come to different conclusions on the relative importance of the underlying causes, but there is a general consensus that biofuel policies are one of the culprits along with a combination of factors, comprising harvest failures in various parts of the world, subsequent export restrictions or bans for some agricultural commodities by several countries, increasing crude oil prices, slowing down of crop yield trends, global stock declines of several agricultural commodities in the years preceding the price peak, increasing investment in commodity funds and related financial speculation, decreasing economic growth, and the depreciation of the US dollar (see e.g. Headey and Fan, 2008; Trostle, 2008; Baffes and Haniotis, 2010; Gilbert, 2010; Naylor and Falcon, 2010; FAO et al., 2011a; Tadesse et al., 2014). Due to their potentially harmful effects for consumers and producers, high prices and increased price variability in agricultural markets brought the topic of food security[1] back to the top of the international policy agenda (FAO, 2009, 2010; FAO et al., 2011a,b).

As mentioned above, biofuel policies are considered as one of the potential drivers for both high prices and increased price variability in agricultural markets. Global biofuels production has grown fundamentally over the last ten years. In the period 2005–2010 the world production of ethanol increased from 46 to 101 billion litres and biodiesel production grew from 3.7 to 20 billion litres. The increase in biofuels production has continued also over the last five years, and by 2014 ethanol production has reached about 114 billion litres and biodiesel production about 30 billion litres (OECD-FAO, 2015). The rise in biofuels production has substantially been stimulated by specific biofuel policies, which have been implemented by several countries, such as the US, European Union (EU), Brazil, Argentina and Australia, with the aim to favour the use of biofuels, primarily in order to reduce greenhouse gas emissions and dependency on fossil fuels (OECD, 2008). There is a wide array of policy measures to promote biofuels, but the three

[1] According to the FAO, food security encompasses four pillars: availability (whether enough food is available either through domestic production or imports), access to food (physically and economically, with the latter comprising prices), utilisation (concerns regarding health and nutritional diet) and stability (whether a state of food (in)security is transitory or permanent) (FAO, 1996, 2009; Pinstrup-Andersen, 2009). The issues of high food prices and fluctuations especially affect the pillars of availability, access and stability.

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most common mechanisms to promote the production and use of biofuels are tax credits (concessions), blending or use mandates and trade restrictions (OECD, 2008; Blanco et al., 2010; Sorda et al., 2010). Tax credits provide tax concessions to biofuel producers (refineries) or users. Tax credits do not create an obligation to produce or consume certain quantities of biofuels, but they make biofuel more price-competitive with fossil fuels, and hence constitute incentives for the consumption of biofuels. Their effectiveness depends not only on the amount of the tax credit, but also on the relative competitiveness of fuels on the market (OECD, 2008; CBO, 2010; Rajcaniova et al., 2013). Blending or use mandates operate in a different way. As they require biofuels to represent a certain minimum quantity or share in the transport fuel market, they can potentially create an obligation to consume or produce. For example, the biofuel mandate in the USA is a fixed quantity, which sets a minimum consumption; it is considered to be binding if markets would have consumption below the mandate in its absence. In the EU, the obligation is to reach a specific share of the transport fuel consumption. Thus there is a co-movement between fossil and biofuels demand. This adds an upward pressure on the price of biofuels, which will tend to be above the price level they would reach in the absence of the mandate. Other factors like production costs and imports might help to reduce the pressure, but production costs in the EU are higher than in other regions of the world and the EU imposes preferential tariffs to biodiesel imports, which makes it more likely that biofuel mandates in the EU result in a binding mandate (OECD, 2008; de Gorter and Just, 2009; Ziolkowska et al., 2010; Rajcaniova et al., 2013). Biofuels related trade restrictions come mainly in the form of import tariffs. Import tariffs may be designed to protect a less competitive domestic fuel industry from foreign lower-cost biofuel suppliers, resulting in higher domestic biofuel prices and restrained development perspectives for more competitive foreign suppliers (OECD, 2008; Janda et al., 2012).

That biofuel markets are indeed quite policy-dependant can already be observed via the close link between current developments on the biofuel markets and the policies enforced (EC, 2014; OECD-FAO, 2015). One example of the policy dependency can be found in the European Union, where the present Renewable Energy Directive (RED) is due to be replaced in 2020 (Council of the European Union, 2009). Currently it is not yet decided what will be the EU biofuels policy after 2020, and this uncertainty about the future development in the EU biofuels policy is directly reflected in both a lack of investment in biofuels production, such that the fulfilment of the present mandates is not achieved, and an ongoing debate concerning the sustainability of first generation biofuels (OECD-FAO, 2015). Another example for the policy dependency can be observed in the US, where the future development of biofuels is driven by assumptions on decisions taken by the Environmental Protection Agency (OECD-FAO, 2015).

The analysis of the impact of biofuels on agricultural market developments and related price levels and variability commonly draws on either econometric approaches (time-series analysis) or the use of economic partial or general equilibrium models. Time-series analysis relies on the estimation of several parameters for which a relative large number of available observations is needed. Furthermore, the analysis based on time series makes use of prices and other variables like macroeconomic indicators, which are recorded by several organisations and are therefore easily accessible. An overview of agricultural price volatility analysis is given in Brümmer et al. (2013). Serra and Zilberman (2013) present an extensive review of time-series literature analysing the impacts of biofuels on agricultural commodity prices. Most of the reviewed time-series based literature concludes that biofuel and crude oil prices drive agricultural price levels and that price volatility in energy markets is transferred to agricultural markets (see Serra and Zilberman, 2013, and the reviewed literature). A general limitation of the studies done with time-series is that they mainly focus on the empirical analysis of price links without imposing a theoretical structure. While they are very relevant and powerful in characterising price behaviour, in many cases their analysis is limited to few variables, and therefore the interactions of different market fundamentals cannot be fully explored (de Gorter et al., 2013).

There is also a wide range of economic modelling studies assessing the impact of biofuels on agricultural markets, especially regarding price levels. A review on economic modelling studies assessing the impact of biofuels on agricultural markets is given in Zhang et al. (2013). In general, this studies all project upward trends in both agricultural commodity production and prices due to biofuel policies (see Zhang et al., 2013 and the reviewed literature). While economic modelling is widely used to analyse developments of production and price levels, it is generally less used in studies related to price variability, as the latter requires the use of stochastics. Two examples for the latter are the work done by Taya (2012), who assesses price volatility with the Aglink–Cosimo model by means of yield shocks, and Artavia et al. (2014) who, in addition to yield shocks, also include macroeconomic uncertainty in their analysis. Some other studies with equilibrium modelling approaches, such as McPhail and Babcock (2008, 2012), Hennessy (1998), and Debnath et al. (2014), aimed, rather than to solely study price variation, at understanding how different levels of uncertainty might affect the linkages among market determinants and the policies regulating these markets. The use of economic models is especially useful in the sense that it can represent specific shocks and evaluate the price movements resulting from that specific shock.

Against this background the purpose of this paper is to complement the existing literature, by quantitatively assessing the potential future impact of biofuel policies on both agricultural price levels and price variability as well as its effect on global food security. For the analysis we employ the Aglink–Cosimo model with its partial stochastic analysis framework. The remainder of the paper is organised as follows. Section 'Modelling approach and scenario setting' describes the Aglink–Cosimo model and the underlying assumptions of the simulated scenarios. Section 'Analysis of the scenario results' reports and analyses the scenario results with regard to changes in commodity balances, market prices and related effects on food security. Section 'Main findings and concluding remarks' concludes the paper.

Modelling approach and scenario setting

Aglink–Cosimo is a global economic model covering the main agricultural traded commodities. The model was developed by the OECD and FAO Secretariats,[2] with the purpose of preparing medium-term agricultural market projections by integrating market expertise from national agencies and market experts (i.e. what is usually called the 'Outlook exercise'). Moreover, the model provides a consistent quantitative framework for counterfactual policy analysis. Currently, this Outlook work is performed on an annual basis in the form of an OECD-FAO joint publication and serves as a reference for policy making (OECD, 2007; Himics et al., 2014; OECD-FAO, 2015). A similar exercise is carried out at EU level, on the basis of the EU module of the Aglink–Cosimo model (EC, 2014; Araujo Encisco et al., 2015).

[2] The results of any analysis based on the use of the Aglink-Cosimo model by parties outside the OECD are outside the responsibility of the OECD Secretariat. Conclusions derived by third-party users of Aglink-Cosimo should not be attributed to the OECD or its member governments.