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Prices matter: Analysis of food and energy competition relative to land resources in the European Union☆

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ABSTRACT

We advance a conceptual framework to put the debate about food versus fuel in the European Union into perspective. We show that many of the problems identified for the food and bioenergy production in the European Union have been priced via several rules and regulations, including water use, fertilizer and pesticide use, and protection of habitats. Therefore, products produced at lower costs (including environmental costs) require fewer resources and can be considered more environmentally friendly. Our results suggest that, from a resource efficiency point of view, the European Union should consider importing more biofuels and biofuel feedstocks from other countries.

1. Introduction

Production of biofuels has become a controversial topic of academic and public debate over the past decade. By providing tax credits and tax exemptions and by introducing minimum blending requirements for biofuels, the United States and the European Union embarked on significantly promoting the use ethanol and biodiesel in the early 2000s.[1] The United States and the European Union implemented their biofuel policies with the stated objectives of reducing greenhouse gas emissions and the dependence on imported oil in the transport sector; promoting the security of energy supply by increasing domestically produced energy; promoting technological development and innovation; and providing opportunities for employment and regional development in rural and isolated areas.

However, as the production of biofuels was increasing worldwide so was the intensity of arguments pointing to its adverse effects. Perhaps, the two most distinguished streams of critique are the food versus fuel argument and the adverse environmental effects of biofuels production.

The food versus fuel debate centers on whether agricultural crops should be diverted to biofuels to the detriment of food supply. On the other hand, the negative environmental effects of biofuel policies include various “leakages” of carbon emissions (e.g., in the land market—the indirect land-use change effect; or in the fuel market—the indirect output use change effect) as well as other adverse effects such as loss of natural habitats or increased fertilizer and pesticide use due to a higher intensity of crop production.

The argument we want to make in this paper is that the debate about food versus fuel is often misleading. The reason for this is that many of the problems identified for food and bioenergy production in the European Union, on which we focus, have already been priced via several rules and regulations, including water use, fertilizer and pesticide use, protection of habitats, and sustainability of biofuels. Hence, products produced at lower costs (including the environmental cost) require fewer resources and can be considered more environmentally friendly.

To illustrate, consider the EU Fuel Quality Directive (FQD)[2] that requires an overall reduction in the greenhouse gas intensity of the fuels used in vehicles by 6 percent by the year 2020 relative to 2010. The FQD stipulates minimum carbon savings of biofuels relative to fossil fuels. Such a regulation affects the relative price of biofuels and fossil fuels. Thus, the observed market prices of biofuels and agricultural commodities implicitly reflect additional costs related to complying with the environmental and other regulations

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[1] Some ethanol production in the United States existed also before 2000.

[2] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0030&from=EN

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both in the European Union and worldwide. On the assumption that market participants behave rationally, the observed market prices stem from optimal participants' responses to a given institutional environment.

Therefore, instead of discussing whether agricultural crops should be used in food or fuel production, we propose to compare production costs across products and countries to determine the resource efficiency. One implication of this approach for the European Union is that imports of biofuels/biofuels feedstocks from abroad might be preferred from a resource use efficiency point of view.

2. Historical overview of the EU biofuel policies

The policies governing the production and consumption of biofuels in the European Union are complex. The complexity has three main dimensions. First, the biofuels production and consumption are regulated by the Renewable Energy Directive (RED) and by the Fuel Quality Directive (FQD). Second, three EU institutions shape the EU biofuel policies: the Commission, the Parliament, and the Council. In addition, a number of pro- and anti-biofuel lobby groups are active in (re)designing biofuel policies. For example, many EU biodiesel producers are associated in the European Biodiesel Board (EBB). Third, although the EU directives state general objectives to be achieved and principles to be followed at the EU level, the actual implementation of the biofuel legislation differs across the 28 EU Member States.

Large-scale biofuels production in the European Union started only after the EU Parliament and the Council passed the Directive 2003/30 on the promotion of the use of biofuels for transport in May 2003. The objectives of this Directive were to replace diesel and gasoline in the transportation sector to contribute to (*i*) meeting the EU climate change commitments, (*ii*) achieving environmentally friendly security of energy supply, and (*iii*) promoting renewable energy sources. The Directive stipulated a target of 5.75 energy percent by 2010.

It is important to notice that the targets in the Directive 2003/30 were (and to this date are) expressed as an energy share, as opposed to a volumetric share used in other countries (e.g., the United States or Brazil). Most importantly, however, the targets were not binding. This implies that as long as a Member State was able to explain why a lower energy share of biofuels had been achieved, no consequences followed. To illustrate the non-binding character of the target, note that the share of biofuels in total transportation fuels in the European Union reached 1.02 percent in 2006 and 3.9 percent in 2010,[3] and 22 out of 27 EU Member States failed to achieve their target for 2010 (European Commission 2013).

Another important piece of legislation affecting the production and consumption of biofuels in the European Union is the Fuel Quality Directive of 2009. The FQD addresses the reduction in life cycle greenhouse gas emissions of transportation fuels by 6 percent by the year 2020 as compared to 2010. With respect to biofuels, it specifies criteria that need to be met for biofuels to count toward the mandatory consumption targets.

Perhaps the most important of these criteria is a requirement that biofuels should save at least 35 percent of greenhouse gas emissions compared to the fossil fuels they are to replace. This threshold increases to 50 percent starting from January 1, 2017. Moreover, from January 1, 2018 the saving shall be at least 60 percent for biofuels produced in plants that started production on or after January 1, 2017. It is important to note, however, that the greenhouse gas emissions savings above do not take into account carbon emissions from land use change—a topic that gave rise to a heated debate on biofuels in the European Union after 2012.

In addition to emissions reduction, the FQD also specifies requirements for the origin of biofuel feedstocks. The energy from biofuels can only be counted toward a national target if the feedstock or a biofuel complies with additional sustainability criteria detailed in the FQD. For example, the feedstock cannot be obtained from land with a high biodiversity value (e.g., primary forest and other wooded land of native species); from areas designated for nature protection or for protection of rare, threatened, or endangered ecosystems; from highly biodiverse grassland that is natural or rich in species; from land with high carbon stock (e.g., wetlands) or from peat. Moreover, the FQD allows imports of biofuels or biofuel feedstocks only from countries that have ratified important international conventions such as the Convention on International Trade in Endangered species of Wild Fauna and Flora; the Cartagena Protocol on Biodiversity; or conventions of the International Labor Organization.

The food commodity price booms of 2008 and 2011 and the intensifying food versus fuel debate have been an impetus for the reform of the EU biofuel policy. In October 2012, the European Commission proposed to reform the EU biofuel policy (represented by the RED and FQD directives).[4] In the proposal, the Commission assigned indirect land use change (ILUC) factors to different biofuels but failed to account them for the climate performance of biofuels. Thus, the ILUC factors are currently used only for reporting purposes. In recognition of adverse inflationary effects of first-generation (i.e., land-based) biofuels on food commodity prices, the Commission also proposed to cap the use of these biofuels to 5 energy percent. Environmentalists, such as Transport and Environment—a Brussels-based environmental organization—were not happy with this proposal as it did not mean complete abolition of biofuels produced from food crops.

The 2012 EU Commission proposal also specified weights for biofuels feedstocks to be used in counting the contribution of various biofuels toward the overall target. For example, the energy content of biofuels from used cooking oil, animal fats, or non-food cellulosic material should be counted twice, and that of biofuels from feedstock like algae, straw, or biomass fraction of industrial waste should be counted four times. First-generation biofuels have a contribution factor of one.

The reshaping of the EU biofuel policy continued in July 2013 when the European Parliament's Environmental Committee voted for the inclusion of the ILUC factors into the RED and for capping all first-generation biofuels at 5.5 percent. Later in September 2013, the European Parliament voted to cap the first-generation biofuels at 6 percent and placed a 2.5-percent minimum requirement to be achieved by 2020 for advanced (third-generation) biofuels from, for example, seaweed or certain types of waste [11]. In June 2014, the Council of energy ministers decided to cap the use of land-based biofuels to 7 percent and to put a 0.5-percent floor for advanced biofuels.[5] Importantly, the Council did not propose to include ILUC estimates in sustainability criteria for biofuels.

3. Food versus fuel debate

3.1. Agricultural land availability

Large-scale global production of biofuels requires agricultural feedstock to be converted into motor fuels. Although in the long-run the supply of productive agricultural land is limited, an FAO study

[3] http://ec.europa.eu/agriculture/markets-and-prices/medium-term-outlook/2015/tables_en.pdf (based on Table: Biofuels balance sheet for the EU, 2005–2025 (million tonnes oil equivalent))

[4] http://ec.europa.eu/clima/policies/transport/fuel/docs/com_2012_595_en.pdf

[5] http://gr2014.eu/sites/default/files/indirect%20land-use%20change_1.pdf

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