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Economy-wide impacts of biofuels in Argentina

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HIGHLIGHTS

- Argentina is one of the largest biodiesel producer and exporter using soybeans.
- Economy-wide impacts are assessed using a CGE model for Argentina.
- Policies simulated are feedstock and biodiesel price change, and domestic mandates.
- Increases in international prices of biofuels and feedstock benefit the country.
- Domestic mandates for biofuels cause small losses in economic output

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ABSTRACT

Argentina is one of the world's largest biodiesel producers and the largest exporter, using soybeans as feedstock. Using a computable general equilibrium model that explicitly represents the biofuel industry, this study carries out several simulations on two sets of issues: (i) international markets for biofuel and feedstock, such as an increase in prices of soybean, soybean oil, and biodiesel, and (ii) domestic policies related to biofuels, such as an introduction of biofuel mandates. Both sets of issues can have important consequences to the Argentinean economy. The simulations indicate that increases in international prices of biofuels and feedstocks would increase Argentina's gross domestic product and social welfare. Increases in international prices of ethanol and corn also can benefit Argentina, but to a lesser extent. The domestic mandates for biofuels, however, would cause small losses in economic output and social welfare because they divert part of biodiesel and feedstock from exports to lower-return domestic consumption. An increase in the export tax on either feedstock or biodiesel also would lead to a reduction in gross domestic product and social welfare, although government revenue would rise.

1. Introduction

Argentina is a competitive producer of oilseeds and has developed a world-class vegetable oil industry. It is also an efficient producer of wheat and corn, its traditional grains. Since the 1980s, the country has emerged as one of the main exporters of oilseeds and vegetable oil to the international market, at the top of the exporters' ranking in soybean oil and sunflower oil. Also, it is the second largest exporter of maize to the world.

Due to this well-tested comparative advantage, the domestic producers and processors of oilseeds in Argentina perceived the increasing international demand for biofuels as a new business opportunity. Thus the private sector engaged in new investments that put in place an exporting industry in only 4 years. At the same time, the economy was facing declining natural gas reserves and pressures on environmental issues. The government responded by passing several laws promoting the use of renewable energy sources, specifically the blending of biofuels in transportation fuels. At present, there are several plants already producing biodiesel using soybean oil and ethanol from corn or sugar cane, and there is the expectation that their production will grow rapidly. The mandatory substitution has been complemented with a selective regime of subsidies to biofuel production. But the actual effect on the industry scale and dynamics depends on more subtle questions since other government actions are indirectly at work.

Will the industry be developed and become sustainable by itself in a country with clear advantages for the production of alternative agricultural products that compete for the use of land,

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and in which prices of agricultural goods have great influence on real wages, external trade balance and fiscal surplus? To answer this question, changes in relative prices are relevant since they have the potential to modify the value of projects and subsequently determine whether the technologies of production of biofuels become feasible. The evaluation of project viability under endogenous relative prices is one of the contributions of the general equilibrium perspective to the analysis.

At present, biofuels do not represent a significant portion of the economy. But when we consider their potential as substitutes of traditional fuels, and the interaction with the agricultural and oil industries via input/output relations. In order to address these issues, this paper presents the results of the analysis of the biofuel sector in Argentina using a Computable General Equilibrium (CGE) model. Up to now, most of the claimed positive results of the development of this industry in the country are conjectural or based in sectoral studies (Cámara Argentina de Energías Renovables, 2009; Chisari, 2009). Our objective is to evaluate the gains and losses of the production of biofuels for Argentina, taking into account opportunity costs of resources and overall impact on economic performance.

We focus in the assessment of costs and benefits in an economy which can be characterized by the following stylized facts. Firstly, biofuels are already being produced, but there are clear differences between biodiesel and bioethanol in terms of development of the industry and competitiveness (with respect to other countries, such as Brazil). Secondly, Argentina has comparative advantages for several agricultural products at the international level, a fact that creates opportunity costs for land use and for direct exports of crops. Also, the country has a developed oilseed industry, with potential complementarities with biofuel production. Additionally, there is a complex tax structure, that has a direct incidence on agricultural exports, and that is subject to changes that accommodate fiscal results and the need of sustaining a positive trade balance. Finally, the cost of capital has been structurally high – basically due to the country risk component – and has discouraged investments in general and biofuel projects in particular.

The plan of the paper is the following. In Section 2, we summarize the basic facts of the biofuels industry in Argentina. Then, the third section presents the database required for implementing the CGE model, organized in a Social Accounting Matrix. Most of the sectors in the value chain of bioethanol and biodiesel are disaggregated and introduced explicitly. After that, we discuss the main features of the CGE model (Section 4) and we conduct several counterfactual experiments, in Section 5, to study the response of the biofuel industry to policy shocks and to changes in international prices, as well as to appraise the reaction of the economy and of industries related to biofuels via substitution or complementarity relations. The final section concludes with main lessons obtained from the analysis.

2. The biofuel industry in Argentina

Oilseeds production has been growing in Argentina since the late 1980s. This trend corresponds to a long-term path that accelerated in the last 5 years. Production growth and area expansion were mainly due to the availability of new technologies in soybean production (GMO seeds plus the diffusion of zero tillage techniques)[1] that were so important as to increase the profitability of the agricultural sector on average. Biofuels played a minor role in this development, though gaining some importance in recent years.

Environmentalists and agricultural experts have raised concerns about the deforestation that accompanied the expansion of soybean area in the Northern provinces of Argentina. In their opinion, the expansion of soy production over the past several years has fueled deforestation, poor water resource management and increased land degradation (World Bank, 2009). In response, producers' organizations have pointed out that rotation practices have not been abandoned and that the spread of "zero tillage" practices compensates for the damages when combined with adequate fertilizer and agrochemicals adoption. However, the growth of soybean area in comparison to cereals or livestock created concerns on the possibility of persistent mono-cropping. These facts prompted interventions in the market through subsequent increases of export taxes on soybean grain, thus reducing price incentives to production of the crop. At the same time, due to the rally in international food prices, wheat and corn exports were banned transitorily. As a result, the effects on wheat and corn outweighed the diminished soybean profitability and soybean crop share kept its increasing trend in production.

Argentina started biodiesel production on a large scale in 2006. Bioethanol from sugarcane or corn did not start to develop until 2010. Previously, only anecdotal cases of biofuel production could be found. They consisted of a few producers that used own grains and oilseeds as fuels for self-consumption through simple transformation methods. In the case of ethanol from sugar cane, a previous failed experience of mandatory blending took place between 1984 and 1988.

The rapid development of biodiesel in comparison to ethanol shows a clear response of economic agents involved in the agro-industrial activity to market incentives. These incentives became apparent to investors in the early 2000s and were the following: (i) increasing international prices of biofuels attracting new investments to the value chain of an already highly competitive domestic industry of soybean oil, (ii) attractive (but not fully secure) demand from markets such as the EU, with traditional commercial ties with Argentine oilseeds exporters, (iii) excess domestic demand of diesel for transport uses covered through costly imports, (iv) increasing share of oilseed production in the agricultural activity, (v) scarce feed grains and sugar cane along with gasoline surplus that inhibited market incentives in the case of bioethanol and (vi) segmentation of the biofuels domestic market by Law in order to promote exclusive participation of small and medium enterprises (SMEs).

Brazil's competitiveness in the bioethanol international market has also opened a question on the role of Argentine potential supply, its costs and complementation/competition with the MERCOSUR main partner. Notwithstanding, some analysts[2] consider that bioethanol production will be organized in Argentina in view of the potential future constraints on gasoline. Currently this constraint is not binding, what may explain why oil distilleries are more interested in biodiesel relative to bioethanol mandatory blending. A new policy scenario that could re-launch investment in gas and oil could have retarding effects on the biofuels incipient domestic market. Biodiesel exports appear to be rather independent of this outcome but crucially dependent on EU regulations on biodiesel standards.[3]

[1] Zero tillage is a planting system to improve soil conservation where the new crop is planted stubble of the previous crop with even less soil disturbance than with minimum tillage. The importance of this agronomic practice in Argentina is reflected by the existence of an influential NGO of producers promoting its adoption: www.aapresid.org.ar

[2] The Argentine Chamber of Renewable Energies (CADER), in its periodic review of the biodiesel sector.

[3] This assessment was confirmed in an interview with managers at one of the major biodiesel exporting companies.