The EU-Argentinean Trade Dispute on Biodiesel: An Economic Assessment

Alexandre Gohin, Fabrice Levert and Agneta Forslund
UMR SMART Agrocampus Ouest INRA, Rennes, France

Abstract

Argentina has a long record of taxing agricultural exports. In 2013, the European Commission started to impose antidumping duties on exports of Argentinean biodiesel. They were considered being dumped due to reduced export taxes compared to those applied to soybean oil exports. The objective of this paper is to analyze the economic consequences of these Argentinean differential taxes on the European biodiesel and related sectors. Thanks to an original model simulating the world markets of main arable crops, we first analyze the results of an increase of the export tax on biodiesel only. We then simulate the consequences of a reduction of export taxes on soybean products. Finally, we assess the impacts of the overall Argentinean policy of differentiated taxation of agricultural exports. One main conclusion is that European biodiesel producers are relatively more penalized than biodiesel producers in other countries by the current Argentinean policy, due to a relatively greater production of rapeseed. US and Brazilian producers suffer from welfare losses in all scenarios due to the indirect effects on soybean markets. The welfare impacts on consumers and taxpayers are often opposite to the welfare impacts on producers, leading to small global welfare effects.

Key Words

export taxes; biodiesel; world trade organization; Argentina

1 Introduction

Since 2006, when the production capacity was virtually nil, the Argentinean production capacity of biodiesel has grown considerably. In 2010, the Argentina biodiesel exports represented 50% of the world total. The strong development of this sector has been supported by the Argentinean government with tax incentives for the construction of biofuel plants. The sector also benefited from lower taxation of exports relative to the export tax on soybean oil and soybeans. This expansion of the Argentinean industry and its exports, mainly to European markets in the first years, competed with producers in other countries. This competition was deemed unfair by the biodiesel producers of the European Union (EU). Therefore, they filed in 2012 a complaint against the dumping of biodiesel exports from Argentina (and also from Indonesia) with the European Commission (EC) (EUROPEAN COMMISSION, 2012). The argument developed in this complaint is that the lower taxation of biodiesel exports relative to exports of soybean oil constitutes a subsidy that allows Argentinean biodiesel producers to export below their production costs. Dumping, which corresponds to the export of a product at a price lower than the domestic price, is permitted under the WTO unless the foreign producers can demonstrate the negative effects of the practice. In that case, nations can use antidumping measures such as tariffs and quotas. The EC then imposed provisional antidumping duties in the beginning of 2013 and then definitive antidumping duties on these exports for at least a 5 year period starting in late 2013. Following the implementation of these duties, Argentina requested in 2014 a panel at the WTO to fight them. In the beginning of 2016, the panel concluded that the European Union inconsistently computes production costs and dumping margins and accordingly sets excessive antidumping duties. Both countries contested the panel conclusions and decided to appeal them. With antidumping duties, the Argentinean producers are no longer competitive on the European market. They have to reduce their production and develop their exports partly to the USA. In turn, the US stakeholders sent comments in late 2014 to the US Trade Representative also claiming that they suffer from the Argentinean export tax policy.

The objective of this paper is to assess the consequences of these differential taxes on world agricultural markets as well as on the European/American sectors producing biodiesel and related feedstocks. We develop an original simulation model of world agricultural markets taking into account the Argentinean policy of differentiated taxation of exports. This model is used to simulate the effects of different levels of export tax on market equilibrium and producers' profits and more generally on the welfare of all market participants. It thus allows for the evaluation of the damages suffered by third-country biodiesel producers, including European and American ones, and the benefits enjoyed by third country consumers.

The paper is structured as follows. The first section presents the issue and provides a brief literature review. Our model is described in the second section. Counterfactual simulation results are analyzed in the third section. A sensitivity analysis of these results to some behavioral parameters is also provided. The final section summarizes the main results and suggests avenues for further research.

2 Context

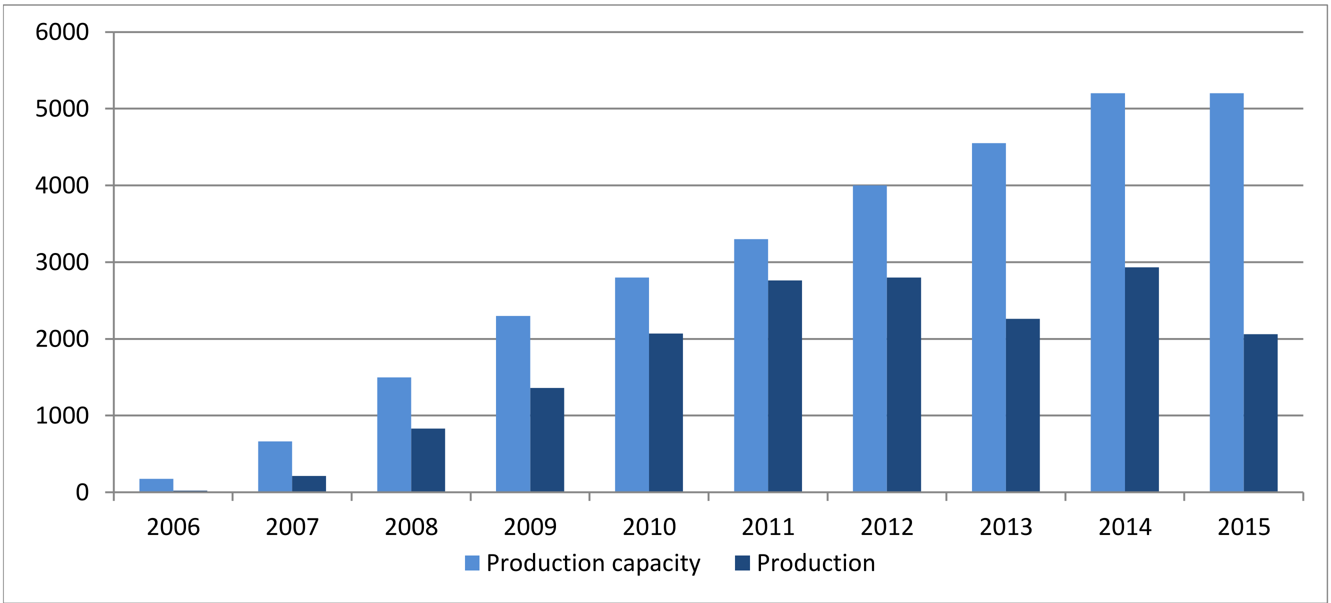
In this section, we first give a short review of the evolution of the Argentinean biodiesel sector and the policy instruments in favor of this sector. We then present the trade disputes on the Argentinean biodiesel exports, first with the EU and more recently with the USA. Finally, we briefly review the economic literature that focuses on the Argentinean policy of differentiated export taxes.

2.1 The Evolution of the Argentinean Biodiesel Sector and Policy

In 2006, the world production of biodiesel was 5.76 million tons, of which Argentina produced less than 0.05 million tons (that is less than 1%, according to F.O. LICHT, 2012). Six years later, Argentina's production was estimated at 2.35 million tons, about 13% of the estimated world production of 18.51 million tons. Argentina's production capacity is even higher: multinationals, benefiting from their experiences gained in other countries, have invested, together with local actors, in large factories. Figure 1 shows the respective evolution of production capacities and actual production volumes. The gap between these two series demonstrates the potential development of production in future years. This potential can be exploited, since only 40% of Argentinean production of soybean oil is used for biodiesel plants and the main part of production is exported. This expansion of production has led to the fact that, in 2010, Argentina has generated nearly half of the world exports of biodiesel (more than 1.5 million tons out of total world exports of 3.1 million tons).

These changes in production capacity, production volume and export are partly explained by the policy measures implemented in recent years. In 2006, Argentina adopted a regulatory framework to promote the production and consumption of biofuels. The stated objectives were to diversify energy sources to more environment-friendly sources and to promote the development of traditional rural areas composed of small and medium producers. Biodiesel made from soybean oil is particularly relevant because soybean acreages and production are growing fast. The bioethanol produced from sugar cane and cereals is also promoted officially, but to a lesser extent. Indeed, the

Figure 1. Evolution of Argentinean production capacities and effective productions of biodiesel (million liters)



Source: USDA (2015)

production of these raw materials is relatively less abundant and, more importantly, Argentina is structurally a net importer of diesel and a net exporter of gasoline (TIMILSINA et al., 2013).

More specifically, the 2006 biofuel policy defined a mandatory incorporation of biodiesel of 5% in 2010. This mandate has since been increased to 7%. To achieve this target, companies enjoy tax benefits (such as the absence of taxes on the value added when investing in biofuel plants, reduced taxes on production, etc). These tax rules are targeted at firms that produce for their own consumption or for the domestic market (MATHEWS and GOLDSZTEIN, 2009). Another important policy instrument explaining the strong development of the Argentinean biodiesel sector is the lower export tax on biodiesel compared to the tax on soybean oil exports. Table 1 provides the ad valorem export taxes for different products for 2011. Soybean oil is used to produce biodiesel, but it appears that biodiesel exports face much lower taxes (roughly half) than do exports of soybean oil. The table also shows that exports of oilseed products are more highly taxed than exports of other agricultural products (cereals in particular).

The taxation of agricultural exports in Argentina officially pursues both environmental and budgetary objectives. Following the financial default in 2001, Argentina faced some difficulties in gaining access to world financial markets. The adoption of protectionist tax measures helps ensure financial independence. Export taxation is widely used; the average receipt of these taxes on agricultural products providing nearly 10% of the total federal budget of Argentina. Taxation on products from soybeans (seed, oil and meal) is particularly strong because Argentina is a major player on the world market of soybean (50% of world exports of soybean oil and meal). This taxation allows Argentina to benefit from a terms-of-trade effect. The relatively higher taxation of soybean is also explained by the federal government's desire to limit the current expansion of the soybean acreages (TIMILSINA et al., 2013). Soybean acreages more than doubled in 10 years with development of monoculture leading to new environmental challenges. Taxation is also viewed as limiting this issue. Finally, we underline that these ad valorem export taxes vary depending on the year. Taxes on exports of soybean oil temporarily reached 50% in 2008 because the government wanted to increase the public budget devoted to smoothing the impacts of the economic crisis on the poorest (TOMEI and UPHAM, 2009). In 2012, Argentina faced some difficulties in supplying its oilseed processing plants due to drought resulting in poor soybean harvests. From a crushing capacity of 50 million tons of soybeans, only 37 million tons were used. Hence, the government facilitated the import of soybeans in order to increase the domestic crushing of soybeans. It also tried to curb the demand pressure by raising temporarily the nominal tax on biodiesel exports from 20 to 32% (in August 2012). More recently, nominal export taxes on biodiesel have varied in response to volatile world market prices between 10% and 20%.

2.2 The Trade Disputes on the Argentinean Biodiesel Exports

The Argentinean increase in biodiesel production was not accompanied by the same increase in consumption. Indeed, Argentinean biodiesel consumption only started in 2010 and represented just 0.7 million tons in 2011. The bulk of the production is thus exported, the EU being in the first years the main destination followed by Argentina's neighboring countries of South America (Peru and Chile) (Figure 2).

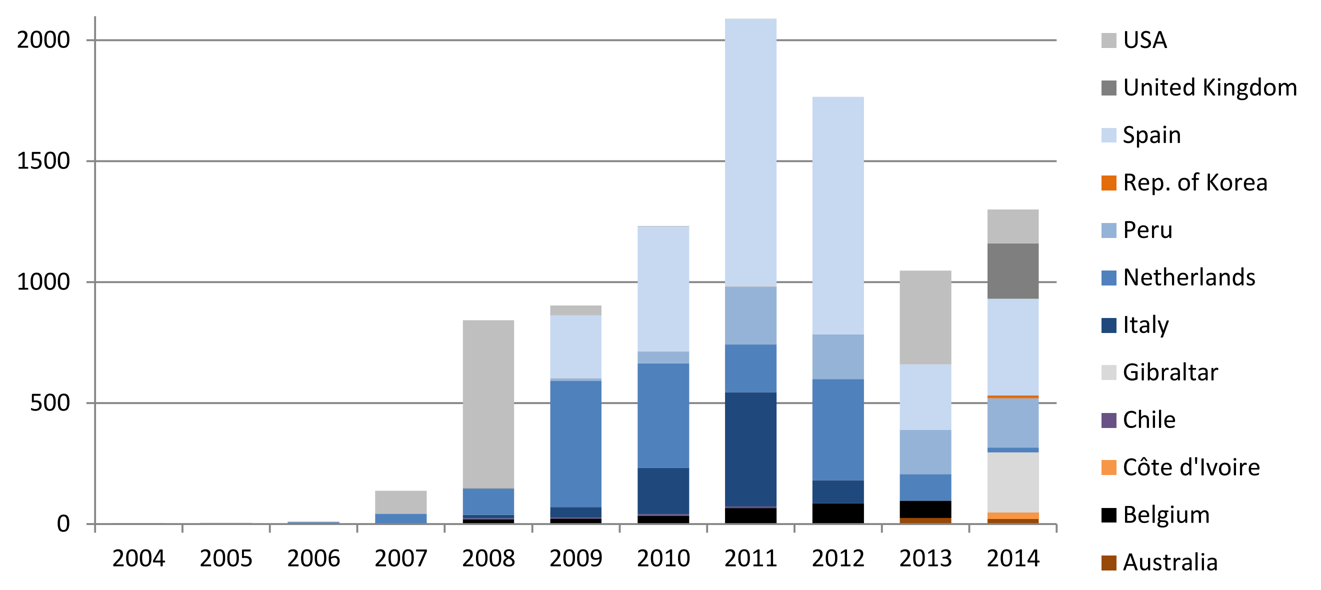
Exports began in 2007 and reached 2.1 billion US dollars in 2011. For comparison, in 2011 exports of soybean oil and meal amounted to 5.0 and 9.9 billion US dollars, respectively. Up to 2008, exports of Argentinean biodiesel to the EU mainly transited via

Table 1. Argentinean ad valorem export taxes for selected agricultural products in 2011 (%)

	Observed export taxes	Increased biodiesel export tax scenario	Reduced soybean export tax scenario	Uniform export tax scenario
Soybeans	35	35	16.5	28.3
Soybean oil and meal	32	32	16.5	28.3
Sunflower seeds, oil and meal	30	30	30	28.3
Peanuts	23.5	23.5	23.5	28.3
Peanut oil	5	5	5	28.3
Wheat	23	23	23	28.3
Corn, barley, sorghum	20	20	20	28.3
Rice	5-10	5-10	5-10	28.3
Biodiesel	16.5	32	16.5	28.3

Source: USDA (2015)

Figure 2. Main destination of Argentinean biodiesel exports (million US dollars)



Source: UN COMTRADE DATABASE (2015)

the US. The US traders took advantage of a US tax provision that allowed them to receive 1 US dollar per gallon of renewable diesel fuel when mixed with fossil diesel. So the US traders imported biodiesel from Argentina, blended it with a very limited amount of diesel and then shipped the resulting mix to the EU. Following a complaint from European producers against this mechanism (the so-called splash and dash), the US government put an end to this dumping practice which was quite expensive for the US public budget. Since 2009, Argentina exports biodiesel directly to the EU member states.

The main European importers are the Netherlands, Italy and, most importantly, Spain. Spain alone accounted for more than half of all biodiesel exports from Argentina. This situation changed because Spain decided in August 2012 to stop its imports of biodiesel produced outside Europe. This decision was made in retaliation for the Argentinean President Kirschner's decision to nationalize the oil company YPF that was previously controlled by the Spanish company Repsol. The Argentinean Foreign Ministry immediately announced that it had begun the process of filing a complaint to the World Trade Organization (WTO). The argument used is that Spain actually prevents the import of non-EU biodiesel, including that from Argentina which is the most competitive in the world.

EU imports of biodiesel are taxed at 6.5%, but Argentinean biodiesel was not taxed until the beginning of 2014 since Argentina was among the countries benefiting from the Generalized System of Preferences (GSP) of the EU. Regarding potential non-tariff barriers, such as the environmental sustainability of biodiesel, Argentina does not impose its own criteria on its producers but closely follows the criteria of partner countries in order to avoid any export restrictions. In addition to US standards, European standards defined in the EU Energy and Climate Framework are the most stringent. In particular, it is required that the biodiesel produced from soybeans must reach a minimum emission reduction of GHGs (Greenhouse Gases) compared to fossil diesel. According to currently available estimates in the literature, biodiesel production is generally recognized as emitting more GHGs than bio-ethanol production. The biodiesels produced from rapeseeds and soybeans have relatively similar levels of GHG emissions. According to computations made by LABORDE (2011), biodiesel production releases more CO_2 into the atmosphere per unit of net energy than fossil diesel when the induced land use change is taken into account.

Since 2013, the Argentinean biodiesel exports to the EU are facing antidumping duties of around 25%. It follows from the complaint led by European biodiesel producers concerning the distortions induced by the system of differential export taxes. The European Biodiesel Board (EBB) argued that Argentinean biodiesel exports were being dumped and were thereby causing material injury to the EU industry. According to estimates by the EBB, the European biodiesel production declined from 9.57 million tons in 2010 to 8.8 million tons in 2011 (while consumption increased slightly), the utilization rate of European biodiesel plants dropped below 40% and some European firms (especially Spanish ones) were forced to close plants. These European antidumping duties are defined for a five-year period.

As a result, the Argentinean biodiesel exports to the EU dramatically decreased in 2013. Argentina contested the European decision at the WTO and first requested consultations with the EU and then the establishment of a panel early in 2014. The panel released mixed and incomplete conclusions in early 2016: it mainly contests the levels of EU antidumping duties, not their existence. More precisely, the panel concluded that when assessing the dumping margins, the EU failed to "legally" compute the production costs incurred by Argentinean producers by not using their records. Instead the EU used the international price of soybean oils, assuming that it represents the price that would prevail without the export tax system. This method was considered as an unfair price comparison by the Argentinean producers. The panel acknowledged that it cannot infer the exact dumping margins that would have been established using legal procedures. It only stated that the provisional duties imposed in early 2013 provide a reasonable approximation. With our model detailed in the following section, we are able to compute the counterfactual situation without the Argentinean differential export tax system. In particular, we are able to compute the price effects and the economic losses suffered by the producers in different countries, directly or indirectly involved in this trade dispute.

In the meantime, the Argentinean producers started reducing their production level in 2013 and look for new markets. They greatly expanded their exports to the USA as they qualify for the US biofuel policy (the Renewable Fuel Standard, RFS defined by the Environmental Protection Agency, EPA). These additional imports put pressure on the US soybean processors and biodiesel producers because they are no longer able to re-export these quantities to the EU. This has led the American crushers to challenge the Argentinean export policy and the qualification of Argentinean production in the RFS. They urge the US Trade Representative to take action in order to eliminate the Argentinean system of differential export taxes.

2.3 Literature Review

The development of the biodiesel production in Argentina, the complaint of the EU producers about the Argentinean biodiesel exports leading to antidumping duties and the current US investigation are relatively recent. We are aware of only one very recent study examining the impacts of the biodiesel export tax imposed by Argentina. However, Argentina has a long tradition of taxing agricultural exports, with several analyses offering useful assessments (for instance DEESE and REEDER, 2007; NOGUES, 2008; CICOWIEZ et al., 2010; TIMILSINA et al., 2013). All these studies confirm that the Argentinean policy of differentiated export taxes has significant effects on the production structure, mainly in favor of processed products to the detriment of raw material production. But these studies do not address the export taxes on biodiesel, neither do they provide impacts on foreign countries. BOUET et al. (2014) offer such assessment developing a static Partial Equilibrium (PE) model calibrated on 2007 data. They find as expected that a removal of Argentinean export taxes on biodiesel will increase Argentina's production to the detriment of the US production. However, these impacts are quite low, with less than 10% for the Argentinean biodiesel production compared to an observed increase of 1,000% from 2007 to 2011. This result tends to suggest that the differential export taxes were not the main drivers of Argentinean productions and exports. Consequently, the injury on European producers is assessed as being small. In fact, these authors find to the contrary that the EU as a whole would slightly benefit from a removal of Argentinean biodiesel export tax (by 10 million US dollars, as reported in the supplementary materials). This result calls into question the current imposition by the EU of antidumping duties.

In this article, we propose a new evaluation of Argentinean differential export taxes on biodiesel and related feedstock markets with a static PE model that differs from the BOUET et al.'s one on two main respects. First we introduce all arable crop markets and not only the biodiesel and oilseed markets. This allows us to better take into account the linkage with oilseeds, cereals and sugar crops as well the export taxes imposed on these products. By contrast, the supply side approach developed by BOUET et al. ignores the land competition across arable crops by omitting cross price effects. Our structural approach of our farm supply specification allows this important feature to be taken into account. Second we calibrate our model with 2009 data that are more relevant to analyze this trade issue. EBB computations were not based on the 2007 data where trade was also distorted by the US splash and dash mentioned above. They cover the 2009-2011 period where Argentinean exports to the EU dramatically expanded. In addition to methodological contributions, another contribution of this paper is to provide results for main countries (only Argentina and the US results are detailed in the study by BOUET et al.), obviously including the EU, as well as a full analysis of welfare effects. We also simulate different policy scenarios that better tailor the trade disputes (we do not consider the extreme scenario of export taxes' removal).

3 Modeling Framework

In this second section, we first present the general features of our model. Then we detail the programs of producers who are directly involved in the trade disputes. We conclude with the data and the parameters used to implement it.

3.1 General Features

Our model is a PE displacement model of agricultural markets, focusing on main arable crops and covering the major producing countries in the world. It allows for the quantification of the effects of the Argentinean policy on producers in other countries. The general concept of the model is similar to other PE models in agricultural economics, such as the PEATSIM model developed by the US Department of Agriculture (SOMWARU and DIRKSE, 2012) or the recent SIMPLE model (BALDOS and HERTEL, 2012). Beyond the number of products, sectors, regions and years, the main originality of our model lies in the representation of supply, particularly in the representation of production technologies (of agricultural production, animal feed, oilseed crushing, biofuel production) and the representation of the primary factor markets (the land market in particular). Instead of reduced-form supply functions, our aim is to explicitly model variable inputs and primary factors of production, production technologies and therefore production costs. This allows the effects on the value added for each industry to be computed. In fact, our model seeks the best compromise between agricultural PE models and CGE ones. The latter are more difficult to implement because the construction of the social accounting matrix is particularly tedious (CASTIBLANCO et al., 2015).

Our model considers the main arable crops produced and traded worldwide (cereals, oilseeds, protein crops, sugar crops). Biofuels and their co-products are also considered. In total, the model distinguishes 35 products in 17 geographic regions in the world.

We explicitly model the food demand by households and the feed demand by livestock sectors. For the latter, we explicitly take into account the substitution between different raw materials using various Constant Elasticity of Substitution (CES) functions. The separability structure imposed with nested CES functions gives us the possibility of better control over cross price elasticities (in addition to own price elasticities). The food demands of commodities are also specified with CES-type functions to account for substitution between cereals or between vegetable oils. These demand functions depend on the prices of various raw materials and take into account expansion effects. Other market variables (industrial demand, seeds, losses, biofuel use in transport) as well as initial and final stocks are considered exogenously.

Regarding trade modeling, we first recall that there are currently two main approaches in the agricultural economics literature. One is the Integrated World Market (IWM) approach where products are assumed homogeneous. The other is the so-called Armington approach where products are differentiated by their place of origin. There are still controversies on the empirical relevance of these two approaches for modeling agricultural trade. With different products, periods and specifications, the econometric results of VILLORIA and HERTEL (2011) and of REIMER et al. (2012) make clear that the most relevant trade modeling depends on the countries and products. The authors of these two studies also agree that in the medium run to the long run, the IWM is more relevant. Accordingly, we follow the medium/long run trade specifications of many non-spatial agricultural economic models (such as SIMPLE, PEATSIM, FAPRI). We assume that the products considered in our model are homogenous. We prefer to explicitly model trade policies when the information is available. In addition, the choice of the IWM approach allows us to explicitly tackle new trade flows. As we mentioned earlier, the Argentinean biodiesel exports equaled zero in 2006 and were significant four years later. They first transit by the US (due to the splash and dash) and then go directly to the EU markets. These features are more difficult to capture in the CES-based Armington approach. Finally, we note that the choice of one trade specification inevitably influences the simulation results. However, GOLUB and HERTEL (2012) find that the trade specification has lesser impacts on the land-use effects of biofuel policy than the crop supply specification. Accordingly, we devote more specification efforts on the supply side of our model.

To sum up the trade specification, we adopt the homogeneous good approach with the world prices being endogenously determined to ensure world market equilibrium. We underline that main agricultural policies are taken into account in the model. The Argentinean export taxes are represented in the equation of transmission of world prices to domestic prices. This transmission is thus imperfect in the case of Argentina by the deduction of the export tax rates.

3.2 The Supply Side

The production of commodities is provided by the agricultural, oilseed crushing, sugar and biofuel sectors. They are assumed to maximize their profits that depend on market prices and subsidies. The latter can be coupled to production, land or capital stocks (as in Argentina/EU countries for biodiesel plants). The production responses of these sectors mainly depend on their technologies and the availability of the primary factor of productions.

Technologies in these sectors are represented in the following way. The agricultural sectors are mono-product (so the number of agricultural sectors equals the number of agricultural commodities). These sectors combine land and an aggregate composed of other primary factors of production and inputs (labor, capital, variable inputs) to produce the corresponding agricultural commodity. The agricultural production technologies are specified by a CES function. The derived demands of land and of the aggregate of other factors are obtained from the profit maximizing program.

The oilseed crushing sectors have multiple-product technologies. We assume fixed coefficients technologies, i.e. each ton of crushed oilseed always gives the same amount of oil and meal. The aggregate of the other factors of production required for the crushing sectors (capital, labor and other intermediate inputs) is also used in fixed proportions. Furthermore, we assume that the oilseed crushing plants can process different types of oilseed. A Constant Elasticity of Transformation (CET) approach governs the allocation of these plants across the different crushing activities.

We also assume fixed coefficients technologies in the sugar sectors. Only the sugar beet processing produces a coproduct usable as feed (beet pulp). Finally, the bio-ethanol and biodiesel sectors combine raw material (such as cereals or vegetable oils) in fixed proportions with an aggregate of other factors of production. They deliver biofuel production as well as co-products in fixed proportions (such as DDGS or beet pulp). Biodiesel made from used vegetable oils or animal fats are considered exogenously.

In each country distinguished in our model, the productive sectors use land (agricultural sectors) and/or an aggregate of other factors (labor, capital, other variable inputs). It is difficult to determine the exact composition of this aggregate in each sector. Similar to BALDOS and HERTEL (2012) for instance, we only model the supply of these aggregates of other factors.

Our modeling of the land supply of each agricultural sector follows the approach developed in the Mirage model (VALIN et al., 2010; LABORDE, 2011). For each country, we initially specify one CET function that allocates the total arable land among the different agricultural sectors. This approach is widely used in CGE models and tries to recognize the heterogeneous quality of land. It has, however, a disadvantage when presenting results. The sum of the individual acreages is not equal to the aggregate of the total arable land. Also, as in the Mirage model, we replace one equation of land supply in one agricultural sector for each country. Instead of the CET-derived land supply, the land supply in this sector is determined by the difference between the total arable land and the sum of land allocated to other agricultural sectors. We end up with migration functions similar to those specified by ABLER and SHORTLE (1992) for instance. In our PE model, we do not explicitly specify non-agricultural uses of land, nor the acreage devoted to pasture for livestock sectors. Accordingly, the supply of the total arable land is specified with a reduced form function (an iso-elastic supply function).

As regards the aggregates of other factors, we adopt the usual specification of CGE models. We assume an imperfect mobility of these aggregates across relevant sectors with CET functions. The total supply of these aggregates is again specified with reduced form, iso-elastic, functions.

3.3 Data

In order to implement our model, two types of data are necessary: the initial values of variables observed with the present Argentinean policy; and the different elasticities (substitution, transformation/mobility and expansion). The initial values of variables were gathered for the 2009 marketing year (last available year with definitive data when we started this research). Most of these values were obtained from the Production, Supply & Demand (PSD) database maintained

Table 2a. Initial market data

	Biodiesel	Soybean oil	Rape oil	Soybean	Rapeseed	Corn
World Price (US $/t)	1274	924	927	429	419	179
Production (Mt)						
Argentina	1.2	6.5	0.0	54.5	0.0	23.3
Europe	8.9	2.3	9.4	0.8	21.6	56.9
US	1.9	8.9	0.5	91.4	0.7	332.5
Brazil	1.4	6.5	0.0	69.0	0.0	56.1
China	0.2	9.1	5.2	15.0	13.7	164.0
Net trade (Mt)						
Argentina	1.2	4.5	0.0	13.1	0.0	16.5
Europe	-1.8	-0.2	-0.3	-12.4	-1.9	-1.4
US	0.5	1.5	-0.8	40.4	-0.4	50.1
Brazil	0.0	1.4	0.0	28.4	0.0	11.2
China	0.0	-1.4	-0.8	-52.6	-2.2	-5.7

Source: the authors

Table 2b. Price elasticities of arable crop productions in Argentina

	Wheat	Corn	Soybean
Wheat	0.847	-0.071	-0.376
Corn	-0.041	0.923	-0.371
Soybean	-0.042	-0.079	0.610

Source: the authors

by the US Department of Agriculture. Biofuel data were obtained from F.O. LICHT. The world prices of commodities were obtained from OILWORLD (2011) and domestic prices from the Producer Support Estimates (PSE) database of the Organisation for Economic Cooperation and Development (OECD). Cost shares (land shares in agricultural sectors) were retrieved from the GTAP 7 database. Main market data for the present analysis are reported in Table 2.

Elasticities obviously have great impacts on simulation results. Results previously identified in the literature vary greatly between studies due to the choice of different elasticities. Some controversies remain on the true values of some elasticities at some given horizons (such as the price elasticity of arable crop productions in many regions in the short and long run). We even have no econometric estimates for others. We adopt the medium run (five years) elasticities of BALDOS and HERTEL (2012) to calibrate our arable crop supply responses. For example, we assume that the elasticity of substitution between land and the aggregate of other factors equals 0.5 in each agricultural sector and in each country. The land supply elasticity varies between 0.1 and 0.2 depending on the country. For the aggregate of other factors, the own price elasticity is fixed at 0.5. The elasticity of the mobility of land and the aggregate of other factors between the different agricultural sectors are fixed at 0.5. With these different elasticities and the initial values of variables, we are able to compute the price elasticities of arable crop productions. The results for Argentina are provided in Table 2.

These calibrated elasticities fit relatively well with those estimated by BRESCIA and LEMA (2007) for the period 1961 to 2004. For instance, their own price elasticity of soybean production equals 0.582. We recognize here that a few other recent estimates for Argentinean agriculture are available in the literature. These provide less support for our calibration. For instance, REIMER et al. (2012) obtain an own price elasticity of soybean production as low as 0.026 with data covering 1991 to 2011. On the other hand, BERRY and SCHLENKER'S (2011) result for the same elasticity is greater than 1.3 with data covering 1965 to 2010. Our purpose in this paper is certainly not to discern the best estimate, but we want to underline that our calibration does not lead to extreme values of production elasticities.

On the demand side, we assume significant substitution elasticities between commodities in the feed demand component (between 0.9 and 2) and also between vegetable oils for the food demand (3). Finally, we are not aware of any econometric study measuring the own price elasticity of the supply of the other factors to the processing industries (the crushing or biofuel industries). These elasticities measure the production response of the industry following a change at its margin (or value added). In the previously identified CGE studies, quite high elasticities are implicitly assumed in the long run when primary factors are perfectly mobile (and very limited elasticities are assumed in the short run when capital is fixed). In their PE model, DEESE and REEDER (2007) also assume a high elasticity (20). To be consistent with our previous calibration choices on the arable crop supply and our medium term horizon, we assume that these elasticities equal one (hence, the double the supply elasticity of the agricultural sectors). A sensitivity analysis of results due to this unknown elasticity is offered below.

4 Simulations

We test three policy scenarios with our model. In the first, we concentrate on the export tax applied to biodiesel and thus concentrate on the EBB complaint. Since the export tax is lower than the export tax on soybean oil, we simply increase it to the same level (32%). In the second scenario, we simulate one opposite scenario: we decrease the Argentinean export taxes on soybean products (seeds, oils and meals). When defining these two first scenarios, we do not consider the budget implications for the Argentinean government. In the third scenario we simulate a more comprehensive experiment where we apply the same export tax rate to all agricultural commodities included in our model. The uniform export tax rate is fixed such that, ex ante, the tax receipts for the Argentinean government remain unchanged: it amounts to 28.3%. It thus increases the export tax rate on biodiesel and decreases it on soybean oil (see Table 1). Our third scenario fits the recent suggestion of the US stakeholders.

4.1 Impacts of an Increase of the Argentinean Biodiesel Export Tax

Consistent with previous studies, we find that removing the export tax advantage enjoyed by the biodiesel sector leads to a decline of the Argentinean production of biodiesel. This reduction translates into a supply deficit at the world level, compared to the initial point. At the end of the simulation, we find an increase in the world price of biodiesel of 1.4% (see Table 3) and a decrease in the price of Argentinean biodiesel. This effect stimulates the production of biodiesel in other countries. We observe relatively similar increases in other countries (between 3 and 7.4%, China was not initially producing biodiesel). These increases in other countries just compensate for the sharp reduction in Argentinean production (43.5% reduction). The Argentinean net exports of biodiesel significantly decreases, European imports as well. On the other hand, US export expands.

The impacts on other markets are much more modest. For example, we get a small decrease in the world price of soybean oil (0.5%) and an even more modest increase in the price of rape oil (0.3%). These results are explained by the fact that less soybean oil is used to make biodiesel. By contrast, more rape oil is used for biodiesel production. We find that the production of these vegetable oils is not significantly impacted: the world production of soybean oil decreases by 0.1% and the world production of rape oil increases by 0.2%. We mainly obtain a reallocation in their uses, from biodiesel to food demand in the case of the soybean oil and the opposite for the rape oil.

Table 3. Market impacts of the increase of the Argentinean biodiesel export tax

	Biodiesel	Soybean oil	Rape oil	Soybean	Rapeseed	Corn
World Price (%)	1.4	-0.5	0.3	-0.1	0.2	0.0
Production (%)						
Argentina	-43.5	-0.1	0.0	-0.1	0.0	0.0
Europe	3.0	-0.5	0.3	-0.1	0.2	0.0
US	3.4	-0.2	1.2	-0.1	0.2	0.0
Brazil	7.4	-0.1	0.0	-0.1	0.0	0.0
China	0.0	-0.1	0.1	-0.1	0.2	0.0
Net trade (%)						
Argentina	-44.5	11.7	0.0	-0.1	0.0	0.0
Europe	-14.6	60.0	38.6	-0.5	1.4	1.1
US	12.4	-8.2	-2.9	0.1	3.0	0.1
Brazil	0.0	-6.7	0.0	-0.1	0.0	0.1
China	0.0	8.9	-10.0	-0.1	-0.5	0.3

Source: the authors

More surprisingly, the effects on the world market of palm oil are minimal (price and quantity effects are less than 0.05%), while palm oil is also used for biodiesel production. Two distinct reasons can explain this non-intuitive result. On the one hand, the margin for the biodiesel derived from rape oil is initially lower than that from palm oil because the price of the latter is initially lower. Therefore, the increase in the price of biodiesel, all other things being equal, has a much greater impact at the margin on the biodiesel activity made from rape oil. The additional volumes of biodiesel from rape oil are economically justified without taking into account technical constraints on the incorporation of different vegetable oils. On the other hand, the production of palm oil does not generate significant amounts of meal. On the contrary, the production of soybean oil is accompanied technically by a strong joint production of soybean meal while the production of rape oil is accompanied technically by a moderate joint production of rape meal. Accordingly, the decline in the world production of soybean oil induces a decrease in the world production of soybean meal (by the same amount, 0.1%). The result is a meal market imbalance that promotes an increase in the price of soybean meal (0.2%) and in the production of other cakes, including those from rapeseed.

The high meal content of soybean explains the modest decline in the world price of soybeans (0.1%). Similarly, the relatively high oil content of rapeseed explains the greater effect on the world price of the rapeseed (by 0.2%). The nature of the cross-market and by product effects was already obtained by DRABIK et al. (2014) who examine different biofuel policy issues at the global level.

Regarding agricultural supply, impacts are barely discernible. We can just highlight a very modest increase in the cereal acreages (wheat and corn) in Argentina. This offsets the decline in Argentinean soybean acreage.

In terms of welfare, we find, not surprisingly, that the Argentinean biodiesel sector suffers from this policy experiment as its output has been sizably reduced (Table 4). Impacts on other sectors in Argentina are marginal and essentially correspond to the volume effects explained above. It is more interesting to note that all European producers (biodiesel producers, crushers, farmers) are those who benefit the most at the end of this simulation (when we sum over all activities). This is explained by the decline in the world price of soybean oil while the world price of rape oil increases.

In addition, there is an increase in the profit generated by the European crushing industry, which is mainly based on rapeseed. Conversely, the profit generated by the crushing industry decreases in other foreign countries. These two activities are often performed by the same companies (multinationals or not, see TOMEI and UPHAM, 2009, for Argentina). So it is relevant to analyze the sum of the values added. However, before we do so, we note that the relative effects are extremely modest in the sugar, bio-ethanol and agricultural sectors. In total, it appears that the European producers benefit most from our first scenario as the biodiesel sector is more important in the EU than in other foreign countries. By contrast, US producers as a whole slightly loose from this scenario, mostly due to the decline of the soybean world price.

While most foreign producers would benefit from this first scenario, this is not the case for foreign consumers. In particular, they would suffer from higher world prices of biodiesel or oilmeals. We compute the consumer surplus' variation for the different types of consumers (feed, food and biofuel). As expected we find that European biodiesel consumers suffer the most in absolute terms (by 194 million US dollars). Feed products also become more expensive and this

Table 4. Welfare impacts of the increase of the Argentinean biodiesel export tax

Millions US $	Argentina	Europe	US	Brazil	China	RoW	Total
Biodiesel industry	-167	138	29	28	0	32	61
Crushing industry	-1	4	-6	-1	-1	1	-3
Sugar and bioethanol	0	0	2	0	-1	0	0
Farming	-13	24	-29	-28	12	19	-15
Total producers	**-180**	**166**	**-4**	**0**	**10**	**52**	**43**
Food consumers	1	0	34	16	47	29	127
Feed consumers	-1	-28	-28	-10	-32	-40	-138
Other consumers	1	-194	-14	-19	-3	-25	-254
Total consumers	**2**	**-221**	**-7**	**-13**	**11**	**-36**	**-265**
Tax receipts	169	-49	0	-1	3	-1	122
Total	**-10**	**-104**	**-11**	**-14**	**25**	**14**	**-101**

Source: the authors

penalizes all feed consumers. On the other hand, the situation is contrasted as regards food consumption. As indicated earlier, the world price of rape oil slightly increases while the world price of soybean oil decreases. Thus, food consumers using larger quantities of soybean oil may benefit from this first scenario and conversely. We find that the US food consumer surplus increases by 34 million US dollars and that the European food consumer surplus is unchanged. Summing over all consumers (feed, food, others) in all regions, we find that their welfare decreases by 265 million US dollars. Again the European consumers are the most impacted economic agents in absolute terms (by 221 million US dollars).

Table 4 also reports the impacts on tax revenues. They significantly increase in Argentina (by 169 million US dollars), partly because the impact of the reduction of biodiesel exports is lower than the impact of the increase of the ad valorem export tax. More precisely, biodiesel export tax receipts increase from 243 to 263 million US dollars. More importantly, export tax receipts on soybean oil increase from 1316 to 1462 million US dollars thanks to the greater exports. Tax receipts marginally change in the other countries (for instance by 49 million US dollars in Europe) due to changes in trade flows and domestic coupled subsidies to biofuel productions.

Assuming a unitary marginal cost of public fund, we find that the Argentinean economic welfare slightly decreases by 10 million US dollars: the negative allocative effect due to the increase export tax on biodiesel is partly compensated by positive terms of trade effects (on biodiesel and soymeal). The economic welfare also decreases in the EU, US and Brazil, mostly due to negative term of trade effects (and in the case of EU, to an increase of biofuel coupled subsidies). At the world level, we obtain a negative welfare effect as it only remains negative allocative effects.

4.2 Impacts of a Decrease of Soybean Export Taxes

Another way to assess the impacts of the Argentinean differential export taxes on the biodiesel complex is to reduce the export taxes on soybean products. Results of this second scenario are reported in Table 5 (market impacts) and 6 (welfare impacts). If the main market results are qualitatively similar to the previous ones, they are quantitatively much larger because the shock is also much greater. In particular, we now find that the world price of soybean oil decreases by 1.7%, which is three times greater than the previous result. Indirect effects on other markets (other oilseeds, cereals) are also modified.

We again find a significant reduction of the Argentinean biodiesel production but now also significant effects on soybeans and soya oil/meal productions. The former increases and the latter decreases by roughly the same percentage, partly as the exports of soybeans initially face higher taxes. As a result, the Argentinean exports of soybeans dramatically increase, leading to a significant decrease of the world soybean price (by 3.3%).

The higher negative price effects on soybean products now lead to negative price effects on other oilseed products. In particular, the world price of rapeseed decreases by 1% in this scenario. Accordingly, the European production of this oilseed slightly decreases. We also find a decrease in the world corn price because corn production expands both in the US and Brazil in response to the decrease in their soybean acreages.

Table 5. Market impacts of a reduction of Argentinean export taxes on soybean products

	Biodiesel	Soybean oil	Rape oil	Soybean	Rapeseed	Corn
World price (%)	0.6	-1.7	-0.1	-3.3	-1.0	-0.3
Production (%)						
Argentina	-30.7	-15.8	0.0	13.7	0.0	-8.5
Europe	2.1	6.2	0.8	-2.9	-0.8	-0.1
US	3.7	0.3	1.4	-2.5	-0.2	0.5
Brazil	7.2	3.3	0.0	-2.3	0.0	0.6
China	0.0	6.5	-3.1	-2.6	-0.6	-0.1
Net trade (%)						
Argentina	-31.4	-12.1	0.0	98.1	0.0	-12.1
Europe	-9.9	2.8	0.5	6.5	17.4	6.7
US	13.2	-9.3	-5.8	-6.2	4.3	3.8
Brazil	0.0	7.4	0.0	-9.3	0.0	3.3
China	0.0	-21.4	5.4	7.1	-17.1	1.0

Source: the authors

Table 6. Welfare impacts of a reduction of Argentinean export taxes on soybean products

Millions US $	Argentina	Europe	US	Brazil	China	RoW	Total
Biodiesel industry	-127	93	29	29	0	13	37
Crushing industry	-153	26	14	39	87	39	51
Sugar and bioethanol	-21	-3	-42	50	-3	-17	-36
Farming	3952	-233	-1429	-1087	-675	-1133	-604
Total producers	**3651**	**-117**	**-1428**	**-968**	**-592**	**-1097**	**-550**
Food consumers	-36	82	178	93	659	819	1795
Feed consumers	-25	554	556	192	682	792	2751
Other consumers	-44	-76	-12	-1	20	151	38
Total consumers	**-105**	**560**	**722**	**283**	**1361**	**1762**	**4584**
Tax peceipts	-2992	-34	37	-11	10	-26	-3018
Total	**554**	**409**	**-669**	**-696**	**779**	**639**	**1016**

Source: the authors

Most of the welfare impacts in this second scenario are more massive. We find that the profits of European, US and Brazilian biodiesel producers increase by similar amounts. However, the impacts on farmers' profits are much more different. Argentinean farmers now significantly benefit from this scenario and the opposite for farmers in all other regions. The welfare impacts on consumers also change dramatically. For instance, both European and US consumers now benefit from this scenario, due to lower world prices of vegetable oils and meals. As expected the Argentinean tax receipts decrease considerably (by nearly 3 billion US dollars). The Argentinean total welfare increases due to reduced trade distortions. The European economy gains due to positive terms of trade effects. This is the opposite for the US and Brazilian economy. Finally, the world welfare increases by 1 billion US dollars, thanks to positive allocative effects.

4.3 Impacts of the Uniform Export Tax Scenario

Like the first scenario, our third scenario again imposes an increase in the Argentinean export tax on biodiesel (from 16.5% to 28.3%). It also includes a decrease in the export taxes on soybean products and an increase in the export taxes on cereals.

The impacts on the world prices are now more numerous (Table 5). We find a modest increase of the cereal prices (by 0.1 and 0.2% for wheat and corn). Indeed, the Argentinean production of these cereals decreases (by 7.8 and 11.9%, respectively) as they face greater export taxes. The reduction of the export taxes on soybean also contributes to these results. The Argentinean soybean acreage and production now increase (by 6.5%). By contrast the production of soybean oil declines as the soybean crushing plants face higher domestic prices for soybeans (as of lower export taxes). We find that the Argentinean biodiesel production still decreases considerably (by 40.3%). Argentinean exports of soybean dramatically increase (by 92.7%) to the detriment of Brazilian and US exports. The trade flows of soybean oils for these countries move in the opposite direction.

We also find a more significant impact on the world price of soybean (by 1.6% compared to 0.1% in the previous policy scenario). This is explained mainly by the reduced Argentinean export tax on soybean meal. The world price of soybean meal now decreases by 0.1% (compared to an increase of 0.2% in the first scenario).

The production impacts in other countries are all of the same nature: positive for soybean oil production, positive but smaller impacts for other vegetable oils and cereals (except for rape oil production in China). Some impacts are no longer trivial, such as on the Brazilian corn production (0.5%).

As regards the welfare impacts, we underline that the total effects are positive for biodiesel producers in all countries reported for here (except for Argentina), in particular in the EU (Table 6). In Argentina, the profit loss is smaller for biodiesel plants than in the previous scenario because the tax increases less. The Argentinean crushing industries suffer from the higher increase in the price of soybean compared to that in the price of soybean oil. We also note that the Argentinean sugar industry now suffer from lower sugar price which was previously untaxed. Argentinean farmers benefit from higher soybean prices, that is partially compensated by lower cereals prices. Farm profits decrease in the US and in Brazil, as they suffer from the lower world price of soybean. It is interesting to note that all EU producers as a whole (farmers and processors) benefit in this scenario due to a reduction of the soybean complex and an increase of the cereal complex.

All feed consumers enjoy an increase of their surplus despite higher cereal prices. Indeed, these consumers benefit from higher price decrease of meals. Impacts on food consumers depend on their regions. The main impact is observed for Argentinean food consumers who enjoy a decrease of their cereal prices.

We find larger total welfare. For instance, it now increases by roughly 100 million US dollars in both Argentina and Europe. By contrast, the economic welfare in the US and in Brazil decreases by roughly 300 million US dollars, again mostly due to negative terms of trade effects. At the world level, the global welfare slightly increases, due to compensating trade distortions.

4.4 Sensitivity Analysis

The results obtained so far, in relative and absolute values, depend on our calibrated elasticities. We have already recognized that we have no real information for calibrating expansion elasticities for the processing industries while econometric values on agricultural supply elasticities are diverse. We, therefore, first test our main results on the first scenario to these two sets of elasticities. We cut by half and double the substitution elasticities in the agricultural production technologies in Argentina (and in the other regions). We find no effects on results. This is not surprising because the world agricultural prices do not significantly change in this first scenario (at most 0.2%). Turning to the expansion elasticities for the processing industries, we have up to now fixed the own price elasticity of supply of other factors at one. In this sensitivity analysis, we increase this elasticity to five in all countries. As indicated in the first section, we observe that there is unused processing capacity in many regions. This suggests that some significant production responses are possible in the short to medium run. The strong development of the Argentinean capacity for biodiesel production also suggests significant supply responses.

We now find that the market impacts depend on these elasticities (compare Table 7 with Table 3). For instance, the world price of biodiesel increases now by 0.6% (compared to 1.4% in the standard calibration). Biodiesel production responses are larger in all regions: in Argentina, the production almost ends (reduced by 94.8%) and it increases much more in the US and Brazil as they are more able to expand their biodiesel production from soybean oil. Some impacts on vegetable oils markets are also more important, in particular trade flows. For instance European imports of soybean oil nearly double, partly for European biodiesel production.

We also find that the welfare impacts depend on these elasticities. For instance, the impact on the European producers remains positive but are reduced by half. The welfare impacts on consumers become less negative. Interestingly the total welfare on the global economy decreases by the same amount (100 million US dollars).

Table 7. Market impacts of the Argentinean uniform export tax

	Biodiesel	Soybean oil	Rape oil	Soybean	Rapeseed	Corn
World price (%)	1.3	-0.7	0.3	-1.6	-0.3	0.2
Production (%)						
Argentina	-40.3	-25.2	0.0	6.5	0.0	-11.9
Europe	2.7	8.2	1.0	-1.5	-0.3	0.1
US	3.5	1.6	0.7	-1.3	0.0	0.4
Brazil	7.4	4.4	0.0	-1.2	0.0	0.5
China	0.0	7.2	-2.0	-1.4	-0.3	0.2
Net trade (%)						
Argentina	-41.3	-25.2	0.0	92.7	0.0	-17.8
Europe	-12.9	-50.6	7.1	8.4	14.5	-9.0
US	12.6	1.4	-3.7	-4.9	2.1	3.3
Brazil	0.0	13.2	0.0	-8.0	0.0	2.9
China	0.0	-33.8	0.8	7.3	-11.6	-6.9

Source: the authors

Table 8. Welfare impacts of the uniform export tax

Millions US $	Argentina	Europe	US	Brazil	China	RoW	Total
Biodiesel industry	-158	122	29	29	0	29	51
Crushing industry	-326	61	63	56	127	96	76
Sugar and bioethanol	-142	-4	-3	68	56	82	57
Farming	721	31	-470	-435	4	-41	-190
Total producers	**95**	**209**	**-381**	**-282**	**187**	**166**	**-7**
Food consumers	308	-19	2	-8	-20	-213	51
Feed consumers	102	156	151	56	170	201	836
Other consumers	-10	-181	-69	-39	1	26	-271
Total consumers	**400**	**-44**	**85**	**9**	**150**	**15**	**616**
Tax peceipts	-399	-52	-15	-7	-103	36	-540
Total	**97**	**113**	**-311**	**-280**	**234**	**217**	**70**

Source: the authors

Table 9. Market impacts of the increase of the biodiesel export tax: sensitivity to the expansion elasticity at the processing levels

	Biodiesel	Soybean oil	Rape oil	Soybean	Rapeseed	Corn
World price (%)	0.6	-1.0	0.4	-0.2	0.4	0.0
Production (%)						
Argentina	-94.8	-0.1	0.0	-0.1	0.0	0.1
Europe	4.9	0.0	0.8	-0.2	0.3	0.0
US	10.4	-1.2	0.8	-0.1	0.4	0.0
Brazil	24.6	-0.1	0.0	-0.1	0.0	0.0
China	0.0	0.0	-0.3	-0.1	0.3	0.0
Net trade (%)						
Argentina	-97.1	25.6	0.0	-0.1	0.0	0.1
Europe	-23.5	88.5	50.6	0.0	5.5	1.7
US	37.6	-22.2	-0.8	1.1	1.6	0.1
Brazil	0.0	-25.1	0.0	-0.1	0.0	0.2
China	0.0	14.1	-13.4	0.1	-4.3	0.4

Source: the authors

Table 10. Welfare impacts of the increase of the biodiesel export tax: sensitivity to the expansion elasticity at the processing levels

Millions US $	Argentina	Europe	US	Brazil	China	RoW	Total
Biodiesel industry	-79	44	19	22	0	13	19
Crushing industry	0	4	-9	0	0	2	-4
Sugar and bioethanol	0	0	1	0	-1	-1	0
Farming	-24	36	-56	-52	5	20	-72
Total producers	**-104**	**85**	**-44**	**-31**	**4**	**33**	**-57**
Food consumers	3	5	64	30	101	69	272
Feed consumers	-1	-51	-48	-18	-61	-74	-254
Other consumers	2	-78	1	0	-2	-1	-78
Total consumers	**4**	**-125**	**16**	**12**	**39**	**-6**	**-60**
Tax peceipts	95	-82	-6	-1	8	2	16
Total	**-5**	**-122**	**-34**	**-20**	**51**	**29**	**-101**

Source: the authors

5 Conclusions

Argentina has a long record of taxing agricultural exports. In 2013, the EC imposed antidumping duties on exports of Argentinean biodiesel following the complaint by the European producers that this product was being dumped due to reduced export taxes compared to those applied to soybean oil exports. A WTO panel is currently investigating the legacy of these duties. In 2014, the US stakeholders also raised the same concerns on this policy as they faced more competition from the Argentinean exports. In this context, the main objective of this paper is to analyze the consequences of these Argentinean differential taxes on world agricultural markets, on the European/American sectors of biodiesel and related feedstock markets and more generally on economic welfare. To do this, we develop an original PE model simulating the world markets of the main arable crops. This model has a distinctive representation of the supply side that allows welfare impacts to be computed. To add to the debate on these Argentinean export taxes, we examine three policy scenarios. First, we analyze the results of an increase of the export tax on biodiesel only. Then we simulate a reduction of the export taxes on soybean products. Finally, we assess the impacts of the overall Argentinean policy of differentiated taxation of agricultural exports. The results confirm that the differential Argentinean export taxes in favor of biodiesel promote this sector. One important conclusion is that European biodiesel producers are relatively more highly penalized by the existing export tax system than biodiesel producers in other countries. US and Brazilian producers, in contrast, benefit from the existing system: they would suffer from welfare losses in all counterfactual scenarios due to the effects on soybean markets. The welfare impacts on consumers and taxpayers are often opposite to the welfare impacts on producers, leading to small global welfare effects. The global welfare increases most with the second scenario of reduced taxes on soybean products. It decreases with the first scenario of increased tax on biodiesel exports. Our sensitivity analysis of the supply elasticity at the processing level shows that these welfare impacts remain valid.

Our article focuses on an applied research issue by developing an original model built on well-known economic mechanisms. As in other modeling exercises, several hypotheses are made in the analysis and alternative assumptions could be explored. We mention two possible extensions. First, we adopt the usual assumption that representative agents in each sector and country aim to maximize their profits. But the biodiesel sector is made up of multinational firms that might have more complex objective functions. Secondly, we assume that these economic agents are risk neutral. However, the Argentinean policy (as, indeed, world commodity prices, agricultural yields) appears uncertain (considering, for example, the evolution of export taxes or the recent nationalization of private companies). Modeling the attitudes of investors towards such policy risks remains largely ignored in the economic literature. Our sensitivity analysis on the industry expansion elasticity indicates that these two directions of research are certainly worthwhile to pursue.

References

ABLER, D.G and J.D. SHORTLE (1992): Environmental and farm commodity policy linkages in the US and the EC. In: European Review of Agricultural Economics 19 (2): 197-217.

BALDOS, U.L.C. and T.W. HERTEL (2012): SIMPLE : a Simplified International Model of Agricultural Prices, Land use and the Environment. GTAP Working Paper 70. Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University, West Lafayette.

BERRY, S. and W. SCHLENKER (2011): Empirical Evidence on Crop Yield Elasticities. Technical Report for the ICCT. International Council on Clean Transportation, Washington, DC.

BRESCIA, V. and D. LEMA (2007): Supply elasticities for selected commodities in Mercosur and Bolivia. EC Project EUMercoPol. Instituto de Economica y Sociologia, INTA, Argentina.

BOUET, A., C. ESTRADES and D. LABORDE (2014): Differential Export Taxes along the Oilseeds Value Chain: A Partial Equilibrium Analysis. In: American Journal of Agricultural Economics 63 (3): 924-938.

CASTIBLANCO, C., A. MORENO and A. ETTER (2015): Impact of policies and subsidies in agribusiness: The case of oil palm and biofuels in Colombia. In: Energy Economics 49 (May 2015): 676-686.

CICOWIEZ, M., J. ALEJO, L. DI GRESIA, S. OLIVIERI and A. PACHECO (2010): Export Taxes, World Prices, and Poverty in Argentina: A Dynamic CGE-Microsimulation Analysis. MPIA working paper 2010-13. Poverty & Economic Research Network, Argentina.

DEESE, W. and J. REEDER (2007): Export Taxes on Agricultural Products: Recent History and Economic Modeling of Soybean Export Taxes in Argentina. United States International Trade Commission. In: US International Trade Commission Journal of International Commerce and Economics.

DRABIK D., H. DE GORTER and G.R. TIMILSINA (2014): The effect of biodiesel policies on world biodiesel and oilseed prices. In: Energy Economics 44 (July 2014): 80-88.

EUROPEAN COMMISSION (2012): Notice of initiation of an anti-dumping proceeding concerning imports of biodiesel originating in Argentina and Indonesia. Official Journal of the European Union, 2012/C 260/8, Bruxelles.

F.O. LICHT (2012): World Ethanol & Biofuel Report 11 (3), October 8, 2012. Informa UK Ltd, London.

GOLUB, A. and T. HERTEL (2012): Modeling Land Use Change Impacts of Biofuels in the GTAP-BIO Framework. In: Climate Change Economics 3 (3).

LABORDE, D. (2011): Assessing the Land Use Change Consequences of European Biofuel Policies. IFPRI, Washington, DC, USA.

MATHEWS, J.A. and H. GOLDSZTEIN (2009): Capturing latecomer advantages in the adoption of biofuels: The case of Argentina. In: Energy Policy 37 (1): 326-337.

NOGUÉS, J.J. (2008): The Domestic Impact of Export Restrictions: The Case of Argentina. IPC Position Paper. International Food & Agricultural Trade Policy Council, Washington, DC

OILWORLD (2011): Oil world annual 2011. ISTA Mielke GmbH, Hamburg.

REIMER, J.J., X. ZHENG and M.J. GEHLHAR (2012): Export Demand Elasticity Estimation for Major U.S. Crops. In: Journal of Agricultural and Applied Economics 44 (4): 501-515.

SOMWARU, A. and D. DIRKSE (2012): Dynamic PEATSim Model – Documenting its Use in Analyzing Global Markets. USDA-ERS Technical Bulletin Number 1933, Washington, DC.

TIMILSINA, G.R., O.O. CHISARI and C. ROMERO (2013): Economy-wide impacts of biofuels in Argentina. In: Energy Policy 55 (April 2013): 636-647.

TOMEI, J. and P. UPHAM (2009): Argentinean soy-based biodiesel: An introduction to production and impacts. In: Energy Policy 37 (10): 3890-3898.

UN COMTRADE DATABASE (2015): In: http.//comtrade.un.org.

USDA (2015): FAS Gain Report - Argentina - Biofuels Annual 2015– 7/1/2015. Washington, DC.

VALIN, H., B. DIMARANAN and A. BOUET (2010): Evaluating the Environmental Cost of Biofuels Policy: an Illustration with Bioethanol. In: Economie Internationale 122 (February 2010): 89-120.

VILLORIA, N.B. and T.W. HERTEL (2011): Geography Matters: International Trade Patterns and the Indirect Land Use Effects of Biofuels. In: American Journal of Agricultural Economics 93 (4): 919-935.

Contact author:
ALEXANDRE GOHIN
UMR SMART Agrocampus Ouest INRA
4 Allée Adolphe Bobierre, CS61103, 35000 Rennes, France
e-mail: alexandre.gohin@inra.fr