# Assessing the Economic Impacts of Incorporating Romania's Agricultural and Food Sectors into EU's Customs Union: an Applied General Equilibrium Approach[1]

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**Abstract:** Joining the European Union club implies, among many other policy changes, full integration of Romania's economy into EU's customs union. This is expected to have significant implications for domestic farmers and food processors. The paper constructs a single-country Applied General Equilibrium (AGE) model to investigate the impact of tariff border adjustments on changes in relative prices, production and trade patterns associated with fifteen local agro-food activities. Moreover, the modelling work identifies those agro-food sectors that have the potential to benefit the most from EU enlargement in terms of output effects given that Romanian producers are capable of fully responding to the incentives provided with integration. These mainly include ruminant live animals and meat products, sugar, and cereal grains. Agro-food trade with EU intensifies in particular for those commodities for which trade restrictions are still substantial prior to accession. However, the magnitude of changes is relatively small due to the weak integration of domestic agro-food sectors into international trade structures. The AGE model also predicts static welfare gains of 0.65 percent of GDP equivalent variation. These seem to be more associated with better access to EU markets and increased export prices, and less with the preferential unilateral elimination of tariffs or their adjustment to EU's external levels. The model assumptions are highly theoretical and the model structure does not reflect with fidelity the workings of an economy in transition. Nonetheless, it does represent a solid base upon which further improvements could be added and structural transitional issues could be attached to more accurately predict potential outcomes.

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## 1. Introduction

European Union (EU) accession negotiations with Romania officially started in February 2000 following Romania's submission for EU membership in 1995. It is evident that successful restructuring towards a market-oriented economy and rapid economic development are key issues for the prospects of Romania joining the EU in 2007. By the end of 2004 accession negotiations on all 31 chapters have been opened, out of which 26 chapters have been provisionally closed. Agriculture, which is the largest chapter, was opened in November 2002 and by September 2004 was concluded.

Because of the high importance and huge potential of agriculture in the Romanian economy,[3] it is interesting and appealing from a policy analysis stand to investigate the impact that EU enlargement has on the sector's performance. The paper focuses only on trade integration aspects, *i.e.* the extension of EU's customs union in terms of tariff barriers to include Romanian agriculture and food processing industries. The process of incorporating Romanian agro-food trade into the respective regional integration agreement is analysed from a general equilibrium point of view. This is because such exogenous changes in trade measures are likely to have significant implications for the agro-food sectors not only directly through changes in agricultural trade policies but also indirectly through the interactions and feedback effects that agriculture experiences with other sectors of the economy. For this purpose, a single-country static applied general equilibrium model (AGE, also known under the label of Computable General Equilibrium - CGE models)[4] is developed to investigate likely changes in domestic relative prices, and production and trade patterns associated with fifteen agro-food activities. Static welfare effects are also computed.

The AGE model serves to simulate within a comparative static multi-sector framework based upon a consistent economic theoretical stand the response of Romanian consumers and agro-food producers to external trade policy shocks. Thus, it is a powerful tool for predicting the likely effects of future regional enlargement. In addition, simulation modelling represents a useful analytical device for separating the expected policy changes of interest from other numerous factors that may be at work with EU integration (FAO, 2003). The model is based upon 1997 data with 2003 updates for the MFN import tariffs applied by Romania. The baseline scenario accounts for the reciprocal removal of tariff barriers to trade in all products except agro-foods, and the inclusion of the ten Central and Eastern

[3] Romania is the second biggest agricultural producer in CEE after Poland (OECD, 2000). However, the agrarian sector is the most important in the region in terms of contribution to GDP (14%) and to employment (40%).

[4] In this paper the term AGE rather than CGE is employed following Shoven and Whalley (1984) and Hertel (1999). This is because the aim of such models is to turn the Walrasian GE theoretical structures "from an abstract representation of an economy into realistic models of actual economies" (Shoven and Whalley, 1984).

European countries that have already joined in 2004 in an enlarged EU25. This is because trade in manufactures has already been liberalised due to the conclusion of preferential trade agreements on one hand between Romania and EU, and on the other hand between Romania and other CEE countries. The liberalisation of bilateral trade in agro-foods has also been recently initiated through the conclusion of so-called "double-zero" agreements between EU and Romania. Nevertheless, even though preferential agricultural trade liberalisation is a continuous gradual adjustment process that is currently occurring, the paper treats the event as a one-time exogenous shock applied to an economy initially assumed to be in equilibrium and looks at the medium to long run trends associated with the system reaching a new equilibrium. This is likely to be the case in particular for sensitive products for which tariffs will be applied on both sides until the moment of accession. Built upon the baseline scenario, three alternative simulations are undertaken: unilateral trade liberalisation, formation of a free trade area with the EU (unilateral liberalisation plus the elimination by EU of tariffs on imports from Romania), and integration into EU's customs union (formation of a free trade area plus the adoption of EU's Common External Tariff vis-à-vis non-member trading partners). This stepwise approach helps disentangle and explain the final outcomes associated with the latter scenario.

The results rendered by the AGE model are partially influenced by three crucial elements: the assumption that the economy is in equilibrium, the functional forms describing producers and consumers' optimising behaviour, and the chosen model parameters, in particular the assumed elasticities of substitution between domestic and foreign products. Regarding the first issue, the AGE modelling assumes that the 1997 benchmark data represents an economy in equilibrium and any shock to the system moves the economy to another point where all good and factor markets reach a new equilibrium. However, after only seven years of transition, Romania was not yet fully operating as a market economy. In other words, producers are far from their production possibility frontiers and factor markets are far from being in equilibrium. The data, hence, represents a country in transition rather than a stable economy. Still, the 1997 SAM is the only data matrix so far developed, and research can be reasonably undertaken by making use of what is made available and acknowledging the shortcomings associated with an AGE approach to transition economies. With reference to the model structure, this is constructed according to standard procedures mainly described by perfect competition, the small open economy assumption, nested production functions that exhibit constant returns to scale technologies, full employment of resources and perfect mobility of labour and capital, and national product differentiation. It should be noted that more complex issues such as imperfect competition, economies of scale and increasing returns to scale technologies, and also dynamic aspects have not been incorporated into the model. In addition, the model does not capture the specific issues and structural constraints characteristic of an economy in transition, such as market power in processing and marketing, poor infrastructure, high transaction costs, and the existence of a large agrarian subsistence sector. However, the objective of the model is solely to identify those agro-food

sectors that might benefit from EU enlargement provided that producers are able to fully exploit expected opportunities. Hence, the modelling work attempts only to tell a story regarding possible shifts in production across agro-food sectors and the overall economy, rather than precise predictions of likely outcomes. It constitutes a reliable starting point from which further work could be undertaken by gradually inserting into the model more realistic issues characteristic to a country in transition. Finally, in what regards the assumed elasticities of import substitution and export transformation, ad-hoc sensitivity tests were undertaken that confer the model a fair robustness with reference to the respective structural parameters.

The paper is structured into five sections. Section 2 presents a short summary of some AGE studies related to the specific issue of the economic effects of extending EU's customs union to include agro-food goods produced and traded by candidate countries. Section 3 briefly displays the structure of the AGE model applied to the Romanian case, while section 4 puts forward and attempts to explain the main modelling results. Section 5 concludes.

## 2. Brief literature review

There is an increasing stream of literature that employs AGE techniques to deal with issues of EU eastward enlargement and its impact on agriculture activities in transition economies (Liapis and Tsigas, 1998, Acar, 1999, Herok and Lotze, 2000, Kuhn and Wehrheim, 2002, Maliszewska, 2002, Frandsen *et al.,* 2002). The studies discuss the resulting effects of EU integration primarily with respect to new members, and generally do not look closely at the consequences for present members. This is because it has been estimated that EU enlargement has relatively small effects on the price, quantity and welfare changes in current member countries, since the EU's market regime is transferred to the accession countries and not vice-versa. Furthermore, the share of the Central and Eastern European countries (CEECs) in the GDP and total trade of the EU-15 is too small to significantly affect current EU members (Herok and Lotze, 2000).[5] In other words, different attempts to capture EU enlargement effects reach the conclusion that significant welfare gains might arise for the acceding countries, whilst modest gains or insignificant losses are attributed to the current EU members.

In addition, most of the studies that make use of AGE modelling and undertake the analysis at a multi-country level treat the CEECs as a single entity and do not single out the effects for particular countries within the respective region (Jensen *et al*., 1998, Herok and Lotze, 2000). Furthermore, as far as the author is aware of, there are no studies that specifically address the effects of EU integration

[5] The share of seven CEECs in overall trade of EU-15 is about 4 percent, and their GDP represents only 3 percent of the EU15 (Herok and Lotze, 2000).

on the Romanian agro-food sector within a single-country AGE framework.[6] And moreover, the majority of studies that model EU integration investigates the resulting impacts on agriculture by simultaneously considering the effects of several policy changes, without decomposing the set of applied exogenous shocks. In other words, it is generally the case that studies that evaluate the economy wide-effects of EU enlargement simultaneously assume the abolition of all tariffs and export subsidies as well as non-tariff barriers between the EU and the CEECs, the adoption by all sectors in the CEECs of the same EU level of protection against third parties, and, finally, the inclusion of (reformed) CAP elements into the candidate transition economies (Frandsen *et al*., 2002, Fuller *et al*., 1999, Jensen *et al*., 1998, Liapis and Tsigas, 1998). The "black-box" critique might be applied here to the AGE analysis as it is difficult to trace the resulting final effects when a multitude of policy changes are simultaneously simulated.

Amongst the AGE studies that examine the economic consequences for the agro-food sectors of incorporating accession countries into EU's customs union one could mention Maliszewska (2002), Vanags (2002), Lejour *et al*. (2001), and Acar (1999). Studies that deal with the extension of the CAP are not presented here as the paper looks only at the aspect of preferentially liberalising EU-Romanian agro-food trade within the context of a customs union. Maliszewska (2002) employs a standard multi-country AGE model also based on 1997 GTAP data to assess the impact of accession to the Single Market on the Polish and Hungarian economies. Amongst other scenarios such as the elimination of border and standard costs and steady state simulations, the author investigates the comparative static implications of the formation of a free trade area (in particular amongst CAP goods) and the adoption of the CET by the respective countries. Her model predicts welfare gains for both economies and more substantial agro-food output changes in the case of Hungary. In other words, Poland experiences with EU integration a higher magnitude of tariff reduction on agro-food goods that induces higher imports and a slight increase in agro-food production with basically no expansion to foreign markets due to the sectors' low share of exports in production, while Hungary that had initially lower import tariffs and exports a large share of its output to the EU members, experiences with a better access to EU markets a more substantial increase in the production of both agricultural and food products. Vanags (2002) employs a single-country AGE model and focuses on the Latvian economic impacts of EU accession, investigating amongst other scenarios, the implications of agricultural liberalisation in terms of mutual removal of import tariffs under the Europe Agreement. The author concludes that this would produce a

[6] Ciupagea (2001) mentions a CGE model for the Romanian economy but with a focus on energy related issues developed by Ciupagea *et al*. (1996) and a macro-econometric model that includes only one aggregated sector formulated by Dobrescu (1998). The author also develops a model for the Romanian economy (Hermin-LINK). However, it focuses rather on manufacturing, mining, private services, utilities, and the constructions sector, and only models agriculture as an exogenous sector.

small but positive welfare gain for the Latvian economy with the agricultural sector recording a small decline in total production. Lejour *et al*. (2001) also consider the macroeconomic sectoral effects of a customs union but within a dynamic AGE framework. They model the adoption of a CET and a removal of bilateral import tariffs in agriculture and food processing for Poland, Hungary and five CEECs (Czech Republic, Slovakia, Slovenia, Bulgaria and Romania). The authors note large changes in the agriculture and food processing activities mainly because tariffs change the most in these sectors. The results indicate that Poland experiences a slight decrease in agricultural production generally due to its initial higher external tariffs that make imports from EU and third world countries much cheaper, whereas Hungary and the CEEC5 increase their agrarian output due to the positive dominance of the better access to EU market effect. In the food sector, all CEECs increase their production due to cheaper agricultural intermediary inputs and a boost in exports towards the EU. Nevertheless, these three studies aggregate agriculture and food processing each into one sector, and therefore do not consider the distribution of economic impacts across main agro-food producers.

Finally, another relevant study is that undertaken by Acar (1999) who investigates the economic impacts of incorporating Turkey's agriculture into the EU within the context of a customs union. The author finds that Turkey would benefit more in terms of equivalent variation when agriculture is included in the respective trade agreements and that, besides textiles, five agro-food sectors are likely to expand their production. The results provided by these studies are to be further discussed within the context of the outcomes rendered by the AGE model applied below to the Romanian case.

## 3. An applied general equilibrium model for the Romanian economy

The Social Accounting Matrix (SAM) employed in the model is based on 1997 data and is derived from a SAM for Romania developed for the EU-Commission by a team coordinated by Martin Banse (2001).[7] The team employed the GTAP database format using information based upon input-output tables, trade data and other national statistics. The economy is decomposed into twenty-one sectors that produce goods by employing three primary factors of production (land, capital and labour) and intermediate inputs (Table A1). All commodities are used both in production and consumption. The Romanian economy has been further stylised for modelling purposes according to the following characteristics that are more or less standardised in the AGE-modelling literature:

[7] The SAM employed in this paper is derived by reducing and aggregating the initial 56 sectors into 21 sectors with a focus on agro-food activities, introducing land as a primary factor of production besides labour and capital, and disaggregating the one rest of the world trading region block into European Union (EU), the ten Central and Eastern European Countries (CEECs) that are to join EU in 2004, and the Rest of the World (RoW). Such modifications to the initial SAM reflect the scope of the modelling exercise to analyse the impact of EU enlargement on Romanian main agro-food sectors.

- Each production sector displays a nested (hierarchical) production function structure exhibiting CRS technologies in a perfect competition environment. The technology in value added and intermediate aggregate inputs, is of Leontief type, meaning that the top-level elasticity of substitution between primary factors of production and intermediate inputs is assumed to be zero. The aggregator function for land, labour, and capital is of a linear-homogeneous Constant Elasticity of Substitution (CES) nature allowing a certain degree of substitution between the respective primary factors of production, while intermediate inputs are aggregated using a Leontief function. CES values are lower for primaries than for processed goods meaning that factors of production in agriculture are less responsive to changes in relative returns as compared to those employed in manufactures (Table A2). Each activity produces one type of commodity meaning that no joint production is assumed.
- Land enters as a primary factor of production only in agriculture, whilst labour and capital are mobile across sectors and their total endowments are exogenously fixed. The assumption that production factors are allowed to reallocate between alternative uses as a response to some exogenous events corresponds to a medium-term analysis (van Tongeren *et al*., 2001).[8] In addition, it is assumed that all resources are fully employed.
- Foreign prices are exogenously set, reflecting the inability of Romania to influence world prices by altering its trading position (the small open economy assumption). Hence, the terms of trade faced by the small country do not change (Södersten and Reed, 1994).
- The Armington assumption is employed meaning that first imports and domestically produced goods are nationally differentiated, and second that imported commodities are also imperfect substitutes across the three trading partner regions.[9] Thus, consumers first allocate their resources among domestic and imported products and afterwards opt for specific imported varieties. The respective national differentiation assumption is built into the model by means of a CES function (Table A3 for CES values). In other words, a low (high) elasticity of substitution implies a more (less) significant differentiation between imports and domestic products. A high elasticity of substitution between imported and domestic goods is also associated with a smoother transmission of changes in import prices to changes in prices of domestically produced goods. Furthermore, production is supplied to the domestic market and / or sold abroad according to the optimising behaviour of the producer that maximises her revenue from supplying to the domestic and foreign

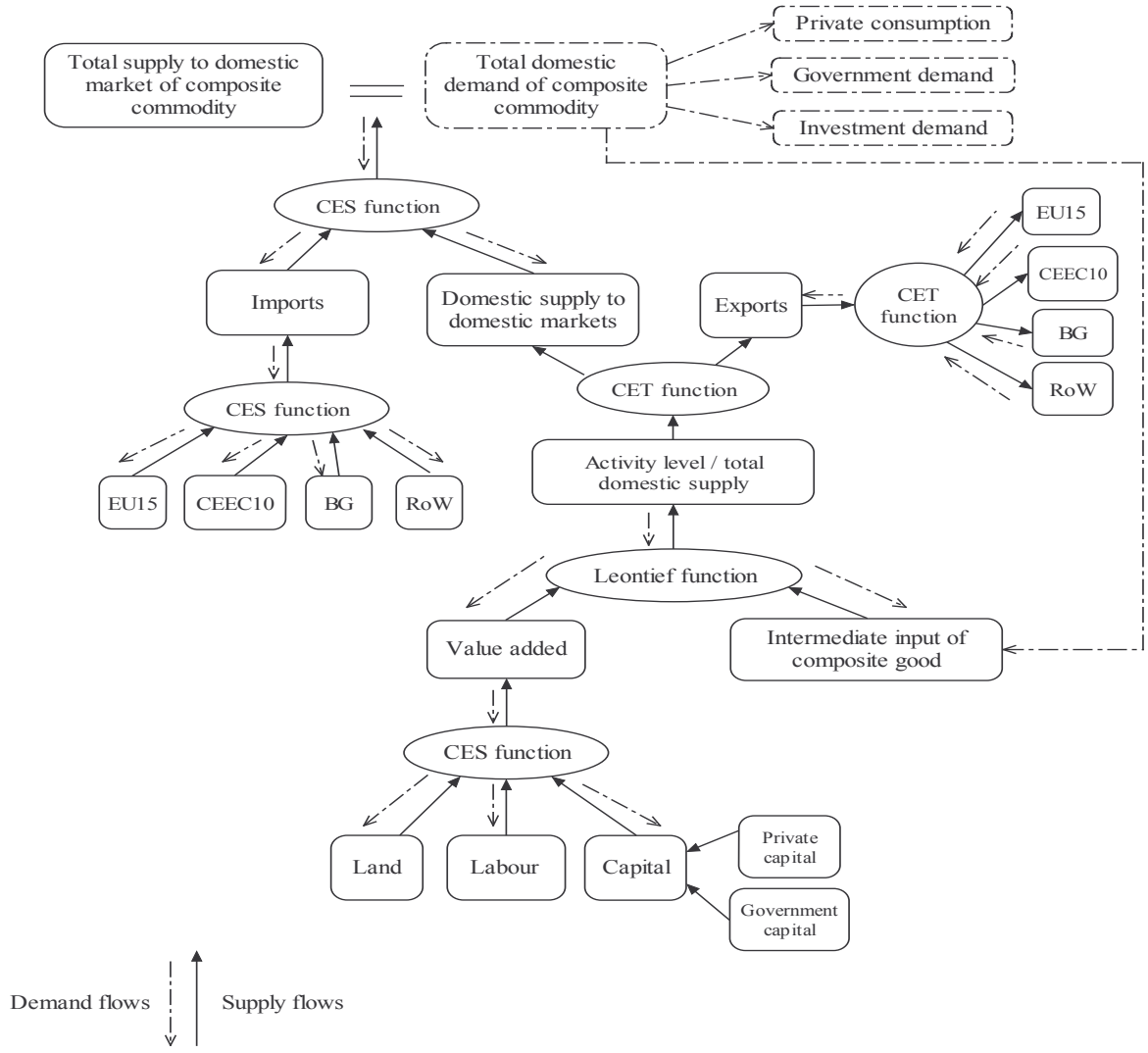
[8] Van Tongeren *et al*. (2001) associate the short-term analysis with fixed resources, and the long term with fully mobile factors of production and endogenous capital accumulation.

[9] The Armington assumption solves the problem of cross-hauling encountered in trade data, which under perfect competition is inconsistent with traditional Hecksher-Ohlin trade theory (Petersen, 1997).

markets subject to a constant elasticity of transformation (CET) function.[10] Again exported commodities are differentiated depending on the market destination according to a CET function.[11] In other words, a double Armington approach is deployed in the model as products are differentiated not only according to their source of origin (domestic/imports) but also to their market destination (domestic/exports). Interactions between supply, demand and foreign trade are displayed in Figure 1.

**Figure 1**

Supply, demand and foreign trade inter -linkages captured in the model




Source: Own diagram

[10] The CET values employed in the model are the same as those taken for CES as reported in Hertel (1997).

[11] The CES and CET values across the trading regions (sourcing of imports and foreign market destination) were assumed to be double the values of substitution between domestic and foreign products, and, respectively, domestically-targeted and export-oriented goods (Hertel, 1997).

- The government gains its revenue from applying taxes (import tariffs and production taxes), from transfers from households, and from the profits that state-owned entities eventually make, and spends this revenue for government consumption purposes (public expenditures) and transfers to households (in a lump-sum manner). Any positive government savings reflect a budget surplus, whilst any negative government savings indicate the existence of a budget deficit (the latter being the case of Romania for which the SAM displays minus 13250 billion lei of government savings). The budget deficit is kept constant for model closure purposes. No export subsidies are assumed. For government closure purposes and for welfare implications that consider only private gains accruing to consumers and producers (*i.e.* private welfare effect), government (public) expenditures are held fixed. The adoption of this closure rule is also supported by the fact that government consumption is usually taken to reflect mostly decisions of policy makers rather than any specific economic mechanism (Zalai, 1998). Hence, any change in government revenue is matched by a proportionate increase in transfers to households.
- There is one representative household that receives income from its land, labour, and capital endowments, supplemented by transfers from abroad and by transfers from the government. Household income is then used for transfers to the government (payment of lump-sum taxes), for consumption, and the remainder is saved. In order to achieve this, the household maximises a Cobb-Douglas utility function subject to its characteristic budget constraint. The consumption of imports and domestic goods is again differentiated according to the Armington assumption.
- Savings and investments are endogenous, but the difference between them, representing net foreign savings that explains the trade deficit is kept constant for model closure purposes, implying that the foreign value of exports can only change if matched by changes in the foreign value of imports. In other words, the fundamental indeterminacy of investments in the comparative static model is dealt with by applying a macroeconomic neo-classical closure where investments are endogenous and adjust to accommodate changes in savings.

Thus, the AGE model includes the main classical assumptions belonging to trade theory and outlined in Robson (1998): perfect competition in commodity and factor markets, perfect mobility of factors within the country (except land which is an input only into agriculture), full employment of resources, accurate reflection of prices by opportunity costs, ignorance of transport costs, and the fact that tariffs are the only form of trade restriction considered in the model. Nevertheless, the model does include crucial elements not considered in the orthodox theory such as national differentiation of products, intra-industry trade, intermediate consumption and the existence of a trade deficit. In addition and most importantly, the general equilibrium modelling accounts for the generality of the economic analysis by simultaneously looking at the markets for many different products in contrast with trade and customs union theory that investigates the effects on resource allocation, specialisation and

welfare mainly in terms of partial equilibrium by considering the market for a single commodity. Hence, the AGE model is able to indicate the likely directions of economic changes that may result from changes in trade measures and quantify them within the specific context of the Romanian economy, as opposed to customs union theory that cannot determine "a-priori" resource allocation and welfare effects.[12]

## 4. Modelling results

The paper further quantifies the impact of tariff border adjustments on domestic resource allocation and relative prices with repercussion on trade flows and production and consumption patterns, in particular with reference to the agro-food sectors, and on aggregate economic welfare.

Formulation of scenarios

Three counterfactuals are undertaken to trace down and explain the mechanisms triggered by the process of the joining EU's customs union, namely the elimination by Romania of tariffs on imports from EU25,[13] the formation of a free trade area between EU and Romania, and, finally, the main scenario of extending the customs union to include the home country. This is illustrated in Figure 2, where the first scenario is associated with flow (a) of goods from EU25 to Romania, the second scenario with flows (a) and (b) corresponding to the mutual abolition of import tariffs on bilateral trade, and the third scenario with flows (a), (b) and (c) corresponding to the reciprocal removal of trade barriers and the implementation of the Common External Tariff on imports from non-members.[14]

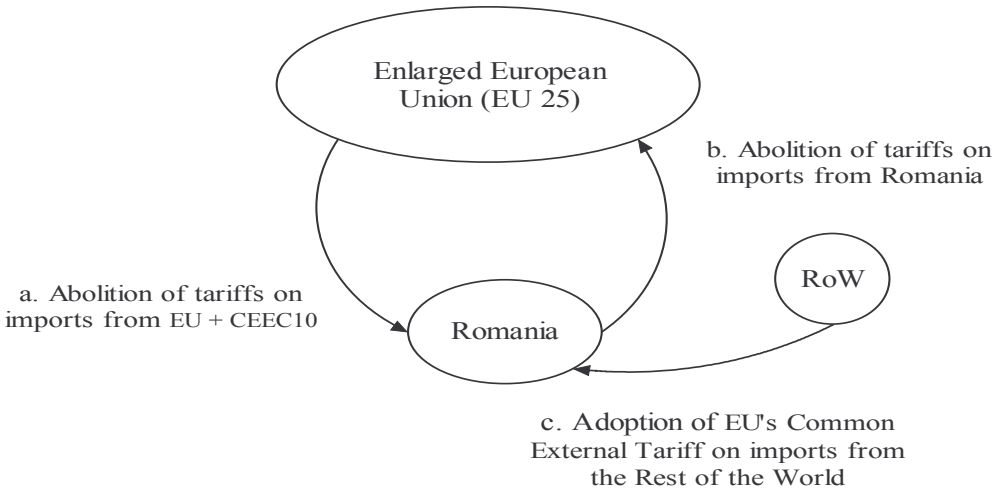
[12] Customs union theory emphasises that "a-priori" resource allocation and welfare effects depend on case-specific circumstances. This follows from the "theory of second best" according to which "if an economy is prevented from attaining all the conditions for maximum welfare simultaneously, the fulfilment of one of these conditions will not necessarily make the country better off than would its non-fulfilment" (Johnson, 1960).

[13] EU25 represents the enlarged EU (current EU-15 plus the 10 candidate countries to join in May 2004).

[14] To be more rigorous, five scenarios were undertaken to better understand the source of the final results, including besides the three mentioned in the text, a simulation where only EU applied tariffs on imports of agro-foods from Romania are reduced to zero, and a counterfactual when only the CET is implemented.

**Figure 2**

Simulations considered in the set-up of scenarios




Source: Own diagram

All simulations are run with reference to the baseline scenario that accounts for the reciprocal removal of tariff barriers to trade in all products except agro-foods. Hence, the reported results are associated with a further preferential liberalisation of trade in agro-food commodities.

Scenario 1: Unilateral elimination of tariff barriers on agro-food imports from EU25

Economic intuition tells us that if tariffs are unilaterally and discriminatory removed on imports from a partner country then imports with that partner country increase replacing to a certain extent imports with other trading partners for which tariffs remain the same. Furthermore, domestic-competing industries face fiercer competition from cheaper partner imports, as tariffs are preferentially removed, inducing domestic producers to shift their resources towards export-oriented production activities. Nonetheless, it is difficult to theoretically predict the likely sectoral resource allocation effects induced by a preferential unilateral trade liberalisation within an economy with a multitude of interdependent sectors. The numerical AGE model employed herein is capable, using a sound theoretical framework, of overcoming such ambiguities and indicating likely sectoral changes that one can reasonably expect.[15] Table A4 provides a list of computed import tariff rates for each sector, whereas Table A5 displays the importance of each sector in production and trade that help to explain the results obtained.

[15] It is important to emphasise that the model takes as a "numeraire" the price of foreign exchange. In other words, all price changes are analysed relative to a fixed price of foreign exchange. This is because AGE models in general deal with changes in relative prices and do not refer to changes in absolute price levels.

The main results associated with the first scenario are summarised in Table 1. A unilateral elimination of tariffs translates into cheaper import prices and a increase in the quantity of imports from the EU depending upon the assumed tariff cut and the elasticity of substitution between domestic and foreign goods, *i.e.* the higher the elasticity the more similar foreign and domestic products are and the more substantial is the resulting increase in imports.

**Table 1**

Sectoral effects of a unilateral tariff removal on ago-food imports from EU25 (percentage changes from the baseline scenario)

**- percentage changes relative to the baseline scenario -**

| Sector | Production | Producer prices | Exports to EU25 | Imports from EU25 | Exports to RoW | Imports from RoW |
|---|---|---|---|---|---|---|
| Wheat | -0.66 | -0.45 | 0.32 | 204.32 | 0.32 | 0.00 |
| Other cereal grains | -0.56 | -0.42 | 0.35 | 70.12 | 0.35 | -21.36 |
| Vegetables, fruits and nuts | -0.50 | -0.41 | 0.38 | 82.78 | 0.38 | -12.96 |
| Oil seeds | -0.82 | -0.43 | 0.11 | 164.46 | 0.11 | -13.57 |
| Sugar cane, sugar beet | 0.06 | -0.42 | Not externally traded | | | |
| Other crops | -1.20 | -0.48 | -0.16 | 78.51 | -0.16 | -14.55 |
| Cattle, sheep, goats, horses | -0.84 | -0.58 | 0.77 | 266.99 | 0.77 | -69.71 |
| Other animal products | -0.20 | -0.64 | 1.39 | 194.85 | 1.39 | -23.64 |
| Raw milk | -0.30 | -0.55 | 0.90 | 267.67 | 0.90 | -71.15 |
| Meat products | -1.78 | -0.48 | -0.74 | 107.71 | -0.74 | -36.75 |
| Vegetable oils and fats | -2.20 | -0.34 | -1.46 | 38.94 | -1.46 | -22.33 |
| Dairy products | -2.87 | -0.63 | -1.51 | 125.77 | -1.51 | -56.07 |
| Sugar | -0.59 | -0.57 | 0.66 | 118.03 | 0.66 | -4.29 |
| Other food products | -1.88 | -0.55 | -0.68 | 63.05 | -0.68 | -18.62 |
| Beverages and tobacco | -1.70 | -0.43 | -0.41 | 154.76 | -0.41 | -30.08 |
| Other primary products | 0.40 | -0.16 | 0.82 | -0.05 | 0.82 | -0.04 |
| Textiles, wearing apparel & leather | 6.58 | -0.15 | 7.79 | 1.67 | 7.79 | 1.07 |
| Petroleum, coal and chemicals | 0.31 | -0.20 | 0.69 | -0.29 | 0.69 | -0.25 |
| Machinery, equipment & transport means | 0.42 | -0.13 | 0.92 | -0.43 | 0.92 | -0.30 |
| Other manufacturing | 0.55 | -0.16 | 0.97 | -0.35 | 0.97 | -0.27 |
| Services | -0.01 | -0.15 | 0.30 | -0.34 | 0.30 | -0.34 |
| Welfare effects - Equivalent variation (% of GDP): | | | | | 0.05 | |

Source: Own AGE modelling results

The AGE model indicates a large increase in the quantity of imports from EU25, in particular amongst those products that experience the largest tariff cuts, namely agricultural commodities and amongst these, raw milk and ruminant livestock (rise by roughly 250%), and wheat (rises threefold). The

induced surge in imports increases the competition that domestic producers face due to lower relative domestic producer and consumer prices depending upon the extent to which import prices are transmitted throughout the economy. This in turn partially depends again upon Armington elasticities: the higher the elasticity the smoother import prices are translated into the domestic economy and the larger the decline in producer and consumer prices. The low share of EU25 imports in domestic demand (Table A5) represents another factor that explains the small decline in domestic agro-food prices (less than one percent), and the reduced ability of changes in import prices to influence domestic prices.[16]

From a partial equilibrium point of view, cheaper imports brought about by unilateral tariff removal are likely to induce two main production effects. On the demand side, consumers substitute away from domestic production towards imported goods depending on Armington elasticities, namely the higher the elasticity the less differentiated the products, the smaller the demand for domestic products and the bigger the drop in domestic prices and production depending on the price responsiveness of supply. On the supply side, the decrease in the price of imports used for intermediate consumption combined with increased competition fostered by the tariff cuts leads to a positive supply response resulting again in a fall in domestic prices, but this time with a positive impact on production. Again, the net effect on production is ambiguous depending amongst other factors upon the initial tariff rate level, the amount of imported intermediate inputs used in production, and the ability of producers to respond to the supply incentives provided under the umbrella of cheaper inputs. Moreover, a decrease in producer price relative to export price is likely to foster an increase in export-oriented production depending on the sector's share of output being exported.

A theoretical two-good general equilibrium model would predict that unilateral trade liberalisation leads to an expansion of export-oriented activities and a contraction of import-competing sectors. However, when several industries that simultaneously supply domestic and export markets are included in a model characterised by a given set of factor endowments, not all sectors will be able to expand their exports. Some activities witness a contraction in their exports as resources flow into other more promising sectors. The net effect on sectoral production is theoretically ambiguous and depends amongst many other factors on the share of exports in total output associated with each activity. The AGE model is able to solve for such ambiguities and to indicate likely directions of change for each sectoral output and exports. The results reveal a contraction in all agro-food sectors and a slight increase in manufactures, as the latter (in particular the textiles, wearing apparel and leather sector)

[16] To note that the AGE model is able to provide a story with regard to the distribution of relative price reductions across each sector and commodity, whereas theory generally predicts an aggregate fall in relative domestic prices associated with import tariff removal.

attract resources away from previously distorted activities. Within the agro-food sector, food products register the highest decline with diary production falling by around three percent, followed by vegetable oils and fats, meat and other food products by one-two percent. In agriculture, bigger declines in production are attributed to other crops, ruminant live animals, oilseeds, vegetables, fruits and nuts, and cereal grains that fall by roughly one percent. The increase in textiles, wearing apparel and leather exports (+8%) is associated both with the rise in the production of such goods (7%) and with the largest share of exports in production (67%) that the sector enjoys (Table A5). For agricultural activities, even though these record a decline in production, the AGE results show a slight increase in exports for most agro-foods (by less than 1%), whilst most of the food-producing sector (with the exception of sugar) experience an incremental decline in export volumes to EU25 (again by less than 1%). Consequently, agro-food producers are not provided with strong enough incentives to expand their total output with unilateral trade liberalisation even though some slightly increase their supply to foreign markets. They are likely to get hurt by the surge in imports and the increase in the consumption of foreign goods induced by the respective preferential tariff removals. Hence, one could expect that granting European agro-food products enhanced access to domestic markets would force some local producers to adjust their production methods and structures to face harsher competition pressures.

Finally, the AGE model renders almost no welfare changes or very small gains due to unilateral trade liberalisation with the EU25 region, measured by the equivalent variation as a percentage of GDP, of only 0.05 percent.[17] From a theoretical stand, the welfare effects of an outsider joining a particular customs union within a static, perfect competition and constant returns to scale framework may be positive or negative depending upon the balance between trade creation and trade diversion impacts. In a Vinerian sense regional integration reflected by the removal of import tariffs "creates" trade when more expensive domestic production is substituted by cheaper products from bloc members, and "diverts" trade when cheaper imports from outside the union are substituted by more expensive intra-bloc imports (assuming both initially faced equal tariffs) (Schiff and Winters, 2003). Both trade creation and trade diversion, induce two main shifts within the domestic economy: a production effect and a consumption effect. The production effect is reflected in the case of trade creation by the saving in the real cost of goods previously produced domestically but after integration imported from partner countries, and in the case of trade diversion by an increase in the cost of goods previously imported from non-members but currently imported from partner sources; the consumption effect is reflected for trade creation by a gain in consumers' surplus as consumer substitute lower cost partner-country for higher cost domestic goods, and for trade diversion by a loss in such surplus as this time

[17] The equivalent variation measures the change in the original amount of income that would generate the same level of household utility as that obtained in the new equilibrium (Vanags, 2002).

consumers substitute high-cost member partner goods for low-cost non-member partner goods (Robson, 1998). Thus, trade diversion and trade creation do not refer to the volume of trade before and after the respective policy change but to the induced welfare increase or welfare loss (Liapis and Tsigas, 1998). In addition, trade diversion not only induces extra inefficiencies but it also generates significant government revenue losses with negative repercussions for private welfare. This is due to both the elimination of duties on imports from member countries and the reduction in tariff revenue collected on imports from non-member countries. Yet again, the AGE model helps to clarify the respective ambiguous theoretical outcome and based upon a consistent theoretical framework and microeconomic detail supplemented by real data indicates towards an almost no welfare change once Romania unilaterally liberalises trade with the EU25. Hence, trade creation effects are almost cancelled out by trade diversion effects.[18] Moreover, when the tariff elimination is simulated only for manufactures, the AGE reports incremental welfare losses (-0.01% of GDP) suggesting that the abolition of barriers in this case tends to induce higher trade deflection effects than is the case for agro-food imports. This could imply that agro-foods have a higher potential for trade creating effects than manufactures. Thus, the higher (lower) the tariffs applied before membership on the former (latter trade diverting) goods the higher (lower) will be the gains (losses) from trade creation (trade diversion) (Södersten and Reed, 1994).

Scenario 2: Extension of EU-25 – Romania bilateral free trade area to include agro-foods

Compared to the first scenario, the second counterfactual considers in addition the removal by EU25 of tariffs on agro-food imports from Romania. This represents "de facto" an extension of the reciprocal trade liberalisation currently occurring under the auspices of the Europe Association agreement. As the AGE model takes a single-country, small-open economy approach and import tariffs applied by other countries are not explicitly included in the modelling structure, the abolition of EU custom duties on agro-food Romanian trade is simulated by a change in prices that Romanian exporters receive proportional to the cut in the EU MFN applied tariff rates for Romanian imports. In other words, an elimination of EU tariffs on Romanian agro-food imports does not affect the price that EU consumers pay for the respective products and is translated on one-to-one basis into an increase in the border price of exports received by Romanian exporters / producers (Romanian exporters appropriate the whole amount of tariff cut and rise their prices accordingly).

[18] Even though, the misallocation of resources is to some extent eliminated, it is also however to another extent merely shifted across trading partners. If Romania were to eliminate tariffs on all imports from all regions, welfare gains would in this case amount to 0.14 percent of GDP equivalent variation.

The results associated with second scenario are displayed in Table 2. The most substantial increases in exports to EU25 are witnessed by sectors for which foreign import tariff cuts and the corresponding increases in prices that Romanian exporters receive are the most significant, *i.e.* wheat (exports increase sixfold), dairies, meat products and sugar (roughly fourfold), live cattle and sheep, other food products and other cereal grains (around threefold).[19]

**Table 2**

Sectoral effects of including agro-foods into the bilateral EU25-Romania free trade area – table 1 plus elimination by EU25 of tariffs on agro-food imports from Romania

**- percentage changes relative to the baseline scenario -**

| Sector | Production | Producer prices | Exports to EU25 | Imports from EU25 | Exports to RoW | Imports from RoW |
|---|---|---|---|---|---|---|
| Wheat | 1.13 | 0.93 | 510.02 | 214.50 | -24.08 | 0.00 |
| Other cereal grains | 2.15 | 1.10 | 209.29 | 75.99 | -24.64 | -19.11 |
| Vegetables, fruits and nuts | 0.45 | 0.99 | 45.78 | 89.25 | -18.60 | -10.32 |
| Oil seeds | -1.59 | 0.91 | -3.46 | 172.61 | -3.46 | -11.41 |
| Sugar cane, sugar beet | 0.02 | 0.49 | Not externally traded | | | |
| Other crops | -0.01 | 0.17 | 70.54 | 82.52 | -31.57 | -12.99 |
| Cattle, sheep, goats, horses | 8.01 | 0.33 | 249.79 | 260.54 | -37.23 | -71.28 |
| Other animal products | 0.19 | 0.22 | 10.53 | 203.98 | -6.13 | -22.00 |
| Raw milk | -0.11 | 0.49 | -1.14 | 279.13 | -1.14 | -71.02 |
| Meat products | 10.94 | -0.84 | 325.02 | 104.98 | -43.12 | -38.23 |
| Vegetable oils and fats | 0.13 | 0.02 | 51.97 | 40.86 | -4.37 | -21.65 |
| Dairy products | 1.54 | -0.52 | 341.10 | 127.06 | -69.55 | -56.55 |
| Sugar | 5.24 | -0.73 | 299.21 | 118.09 | -64.73 | -4.67 |
| Other food products | 4.38 | -0.42 | 238.94 | 63.24 | -52.34 | -18.92 |
| Beverages and tobacco | -1.25 | -0.15 | 49.62 | 159.51 | -6.94 | -29.66 |
| Other primary products | -0.67 | 0.23 | -1.26 | -0.03 | -1.25 | -0.03 |
| Textiles, wearing apparel & leather | -11.40 | 0.27 | -14.40 | -3.10 | -13.08 | -1.98 |
| Petroleum, coal and chemicals | -0.57 | 0.16 | -0.86 | -0.14 | -0.85 | -0.12 |
| Machinery, equipment & transport means | -0.87 | 0.22 | -1.74 | 0.53 | -1.66 | 0.37 |
| Other manufacturing | -0.91 | 0.21 | -1.45 | 0.20 | -1.41 | 0.15 |
| Services | -0.16 | 0.22 | -0.61 | 0.35 | -0.61 | 0.35 |
| Welfare effects - Equivalent variation (% of GDP): | | | | | 0.52 | |

Source: Own AGE modelling results

[19] Even though agro-food sectors massively increase their exports to the EU25 relative to the base year, the actual quantities are still low due to their very small share in total exports to the respective region.

The boost in export prospects and earnings induces output increases that outweigh the declines fostered by cheaper imports from the EU25 member-partners. This is in principle because changes in import prices indirectly affect producers, whereas changes in export prices directly and positively influence producer earnings causing a bigger impact upon output expansion. Hence, Romanian agro-food producers increase their total supply, in particular in sectors such as meat (11%), live cattle and sheep (8%), and sugar (5%). Production of other food products, dairies, and cereal grains also increases, but to a smaller extent. The further liberalisation of bilateral trade between EU and Romania by including agro-foods results in further welfare gains amounting to 0.5 percentage of GDP.[20] This is in particular attributed to EU opening up its markets for Romanian exporters of agro-food stuff. This is in line with the analysis undertaken by Wonnacott and Wonnacott (1981), who show that in a tariff-ridden world, gains for a country joining a customs union could be attained not only through unilateral tariff reductions but also and mostly through the removal of foreign tariffs, improved terms of trade, and better access to the partners' foreign markets. Moreover, as discussed below, the elasticity of transformation is a crucial factor that influences changes in production patterns and welfare effects. That is, the higher the elasticity of transformation the greater the response of local producers to export incentives and the higher the expected welfare gains.[21]

Scenario 3: The incorporation of Romania into EU's customs union

The third counterfactual represents the main scenario of the paper and investigates the economic impacts on the agro-food sector once Romania joins EU's customs union. Hence, this modelling exercise includes in addition to the second scenario, the simulation of the economy adopting the common external tariff with respect to imports originating from non-members. Furthermore, the simulation involves an updated account (2003) of Romanian MFN applied tariff rates.

The AGE results show that if agro-food trade barriers are to be eradicated between Romania and EU25 countries and a CET is to be installed against non-member trading partners, the changes in relative prices are most likely to result in an intensification of the sectors' trade (exports and imports) with union members, a fall in exports with non-members, and a decrease and/or increase in imports with non-members depending on the extent to which these are diverted across countries and sectors (Table 3). The difference between the updated Romanian MFN applied tariff rates and EU CET rates (Table A6) contributes to the final outcome in terms of changes in production and trade patterns, and in terms

[20] Nevertheless, the bulk of welfare gains have and will continue to occur due to the elimination in 1996 of EU custom duties on manufactures imported from Romania. The AGE model associates static welfare gains of around 2.3 percent to increased market access to European markets for Romanian manufactures.

[21] The welfare gains double to 1 percent of GDP when CET values are doubled across all sectors.

of expected welfare impacts. In other words, if overall the latter dominate the former, then the implementation of EU's CET would tend to introduce new trade distortions and inefficiencies in the Romanian economy, as import flows from other trading regions are taxed higher rates.

**Table 3**

Sectoral effects of incorporating Romania into EU's customs union – table 7 plus the adoption of EU's Common External Tariff

**- percentage changes from the baseline scenario -**

| Sector | Production | Producer prices | Exports to EU25 | Imports from EU25 | Exports to RoW | Imports from RoW |
|---|---|---|---|---|---|---|
| Wheat | 1.07 | 0.91 | 511.09 | 214.25 | -24.14 | 0.00 |
| Other cereal grains | 2.28 | 1.16 | 210.15 | 89.40 | -24.74 | -39.42 |
| Vegetables, fruits and nuts | 0.24 | 0.95 | 45.84 | 58.66 | -18.80 | 31.31 |
| Oil seeds | -4.05 | 0.84 | -5.66 | 83.26 | -5.66 | 51.10 |
| Sugar cane, sugar beet | 0.59 | 0.09 | Not externally traded | | | |
| Other crops | 0.62 | -0.49 | 72.97 | 88.00 | -29.71 | -19.34 |
| Cattle, sheep, goats, horses | 8.35 | 0.20 | 249.98 | 291.73 | -36.44 | -739.38 |
| Other animal products | -0.23 | 0.30 | 9.84 | 119.28 | -6.70 | 62.98 |
| Raw milk | -0.07 | 0.38 | -0.87 | 269.29 | -0.87 | 45.56 |
| Meat products | 10.63 | -0.75 | 324.04 | 114.10 | -43.58 | -51.61 |
| Vegetable oils and fats | -0.08 | -0.24 | 52.51 | 32.74 | -4.03 | 15.47 |
| Dairy products | 1.32 | -0.47 | 340.51 | 129.41 | -69.81 | -86.26 |
| Sugar | 8.90 | -0.39 | 289.41 | 337.63 | -66.72 | -29.18 |
| Other food products | 5.98 | -0.17 | 242.71 | 104.31 | -52.05 | -66.72 |
| Beverages and tobacco | -4.53 | -0.21 | 45.73 | 52.75 | -9.77 | 114.90 |
| Other primary products | -9.31 | -0.48 | -7.73 | -43.37 | -7.67 | 13.32 |
| Textiles, wearing apparel & leather | -1.46 | -0.02 | -1.57 | -3.59 | -1.43 | 27.23 |
| Petroleum, coal and chemicals | 1.08 | -1.44 | 3.69 | -6.58 | 3.63 | 4.04 |
| Machinery, equipment & transport means | -1.97 | -0.46 | -0.20 | -17.10 | -0.19 | 40.86 |
| Other manufacturing | -0.43 | -0.71 | 1.38 | -13.73 | 1.35 | 37.94 |
| Services | -0.13 | -0.18 | 0.24 | -0.56 | 0.24 | -0.56 |
| Welfare effects - Equivalent variation (% of GDP): | | | | | 0.65 | |

Source: Own AGE modelling results

Nevertheless, the post-union tariff level applied to non-members is higher than the pre-union level especially in the case of some sensitive sectors for which EU still maintains high protection rates. Hence, sectors, such as sugar, ruminant live animals, and cereal grains, that with the policy change enjoy higher tariffs and protection rates on imports from the rest of the world tend to experience an expansion in production. In addition, the commodity's share in total imports from RoW (Table A5)

also influences the magnitude of changes in production patterns, i.e. the higher the share the bigger the impact upon domestic producers.

Consequently, agro-food producers of meat, sugar, live cattle and sheep, and cereal grains are likely to benefit the most from integrating agriculture and food processing activities into EU's customs union. The (ruminant) livestock sector is predicted to record the highest output increase amongst agricultural stuff due to export expansion to European markets, high share of exports to EU25 in output disposition compared to other agrarian products, and higher external tariffs on imports from non-members.

From a theoretical standpoint, "a-priori" welfare effects of a customs union formation are ambiguous within the general equilibrium context of a multi-market economy and depend on the interactions between trade diverting, trade creation, and terms of trade effects. This is because general equilibrium theory is only capable of analytically explaining regional integration effects within a rather simple and general framework, usually under the form of a standard two-good model. Even when three products are considered the GE analysis becomes highly intricate and the features of customs union are inadequately allowed for (Kreinin and Plummer, 2002). In this case of twenty-one sectors, the static welfare gains reported by the applied GE model are predicted to amount to 0.65 percentage of GDP. Hence, the trade deflection effects reflected by the cost of buying from higher-cost producers are more than offset by real income gains determined mostly by increased access to European markets but also by more intensive competition and enhanced consumer choice within the domestic economy. Moreover, the lower (higher) the CET than the pre-union tariffs especially for goods that contribute with a large share to foreign trade the larger (smaller) the welfare gains are likely to be. This is in particular the case for manufactures that enjoy the lion's share in Romania's external trade but currently face on average ten percent higher MFN custom duties than EU's external tariff rates.

Nevertheless, efficiency gains predicted by the model are rather small in magnitude.[22] This is mainly because the bulk of bilateral trade has already been liberalised with the implementation of the Europe Association Agreement. In other words, as Vanags (2002) emphasises, in terms of aggregate welfare effects it seems that the trade benefits stemming from EU integration are "front-loaded", meaning that most of the gains induced by the preferential trade liberalisation have already been triggered.

A simple sensitivity analysis

[22] Another factor influencing welfare effects is the level of aggregation in the sense that the higher the aggregation level the more likely that the model downplays any potential welfare gains. This is because the cost of protection in an economy-wide context depends not only on the average tariff levels but also on the extent of tariff dispersion across sectors (Johnson, 1960). However, our AGE model is fairly disaggregated avoiding to certain extent biases stemming from aggregation across sectors.

A significant assumption that the model makes with important impacts upon AGE results is that of product differentiation, namely products display different degrees of heterogeneity depending upon their source of provenance and market destination. Hence, a simple ad-hoc sensitivity analysis was carried out with regard to the elasticities of import substitution and export transformation used in the import demand and export supply functions. This was mainly done to check for the robustness of the model with regard to the respective structural parameters. It implied halving and doubling all CES and CET values between imported and domestic varieties, between imported varieties, between exported and domestic varieties targeting the domestic market, and, finally, between exported varieties. It is observed that after undertaking the respective simulations, halving the elasticities of substitution and transformation translates into a smaller impact on output, whereas doubling the respective values leads to greater changes in production (Table 4).

**Table 4**

Sensitivity analysis with regard to Armington CES and CET parameter values

| Sector | Output effects (% changes) | | | Welfare effects (% of GDP) | | |
|---|---|---|---|---|---|---|
| | Elasticities are halved | Elasticities take initial values | Elasticities are doubled | Elasticities are halved | Elasticities take initial values | Elasticities are doubled |
| Wheat | 0.17 | 1.07 | 6.08 | | | |
| Other cereal grains | 0.82 | 2.28 | 7.78 | 0.37 | 0.65 | 1.46 |
| Vegetables, fruits and nuts | 0.09 | 0.24 | 0.71 | | | |
| Oil seeds | -1.56 | -4.05 | -13.06 | | | |
| Sugar cane, sugar beet | 0.37 | 0.59 | 0.95 | | | |
| Other crops | 0.36 | 0.62 | 0.98 | | | |
| Cattle, sheep, goats, horses | 3.34 | 8.35 | 33.02 | | | |
| Other animal products | -0.21 | -0.23 | -0.64 | | | |
| Raw milk | -0.11 | -0.07 | -0.51 | | | |
| Meat products | 4.21 | 10.63 | 63.91 | | | |
| Vegetable oils and fats | 0.40 | -0.08 | -1.04 | | | |
| Dairy products | 0.76 | 1.32 | 11.15 | | | |
| Sugar | 3.53 | 8.90 | 28.73 | | | |
| Other food products | 2.49 | 5.98 | 21.24 | | | |
| Beverages and tobacco | -2.16 | -4.53 | -10.05 | | | |
| Other primary products | -4.55 | -9.31 | -19.88 | | | |
| Textiles, wearing apparel & leather | 0.84 | -1.46 | -48.01 | | | |
| Petroleum, coal and chemicals | 0.85 | 1.08 | -0.29 | | | |
| Machinery, equipment & transport means | -0.89 | -1.97 | -3.84 | | | |
| Other manufacturing | -0.02 | -0.43 | -2.51 | | | |
| Services | -0.09 | -0.13 | -0.50 | | | |

Source: Own AGE modelling results

A similar pattern arises when one looks at the welfare effects of varying the respective model parameters. Smaller changes in sectoral output are associated with lower welfare gains, while larger

variations across sectors (in particular higher increases) in output cause higher welfare gains. In other words, if there is substantial overlap between bundles of goods that the home and trading partner countries produce before joining the union then there is considerable scope for resource reallocation and inter-industry and intra-industry trade creation (Södersten and Reed, 1994, Robson, 1998).

Therefore, the values that are assumed for the respective elasticities of substitution and transformation greatly influence the model's quantitative results. This confirms the statement that general equilibrium models that employ Armington structures tend to be universally sensitive to these parameters (McDaniel and Balistreri, 2002). Nonetheless, because no econometric estimates are available for the EE countries,[23] the values taken from Hertel (1997) seem to represent the most appropriate alternative for the level of disaggregation employed in the model. In addition, although changes in elasticity values bring about changes in the magnitude of simulated effects, the patterns across sectors in terms of direction and order of change remains relatively the same conferring the model with fair robustness.

Discussion of the results with reference to other studies

The results of the AGE model employed herein are not directly comparable with most other studies dealing with EU enlargement. This is attributed mainly to the application of the modelling framework only to one CEE country, the 21 sector aggregation level employed with a focus on agro-food activities, the case of running the simulations with respect to an enlarged EU25, and the nature of the simulation scenarios that refer only to customs union and tariff barriers issues. In addition, the fact that different AGE studies apply different modelling assumptions makes it difficult to compare outcomes.

However, the results reported above are relatively comparable with the estimates provided by certain studies that employ similar modelling approaches and look at similar issues for other EU accession candidate countries. For instance, Acar (1999) also predicts with his static multi-country AGE model, an output expansion mainly for those agro-food activities that benefit from increased access to EU markets and that display a relatively high share of exports in production. Maliszewska (2002) predicts that free trade in agro-food products and the adoption of the CET would lead to an increase in agro-food production in both Hungary and Poland, in particular in the former case due to its large share of agro-food products being exported. In this case, the static results obtained for Romania are more comparable to the Polish case as both countries display low shares of agro-food output that is exported

[23] One of the most comprehensive and updated studies that provide statistic estimates of Armington elasticities for U.S. industries was undertaken by Gallaway *et al*. (2001). The authors provide estimates for 311 industries that are lower than the values employed in this paper. The bulk of their estimates fall in the range of 1-2.

abroad. Hence, Maliszewska (2002) points toward a potential increase in the Polish agricultural and food production of 1.4 and 13.6 percent, respectively. This is similar to the output estimates albeit smaller reported for the Romanian case if we take weighted averages of predicted output changes across the agricultural and food sectors, i.e. 1, and respectively, 3.1 percent. The higher predicted output changes for the food sector in Maliszewska's case is mainly due to the assumption that food-processing activities are subject to increasing and not constant returns to scale. In addition, predicted welfare gains from Romanian agro-food sectors forming a customs union with the EU (+0.7 percent of GDP) are also roughly in line with Maliszeska's estimates for Hungary and Poland (1.6 and 1 percent of GDP, respectively). Vanags (2002) also predicts slight welfare gains if tariffs are mutually removed for agricultural trade between EU and Latvia. However, the author finds that Latvian agricultural output might fall by a small amount (-1.2%) due to the respective agricultural trade liberalisation. This seems to be attributed to the small increase in the price of agricultural exports (4 percent) assumed by the author once EU eliminates its tariffs on Latvian imports compared to the average export price increase (22 percent) assumed in the Romanian case. Lejour *et al.* (2001) find that an elimination of bilateral tariff barriers on trade in agriculture and food commodities and the implementation of the CET induce, besides welfare gains, a slight fall in agrarian output for Poland (-0.4 percent) and an increase in agricultural production for Hungary and five CEECs including Romania (15.7, and respectively, 0.9 percent). This is mainly due to the initially higher external tariffs for agriculture in the Polish case compared to that of other CEECs. However, Maliszewska's (2002) study seems to provide more accurate estimates when reporting a slight increase in Polish agrarian output as the author employs updated protection data in trade between EU and Poland. In the case of food-processing sector, Lejour *et al*. (2001) estimate an increase in output in all CEECs analysed, which is in line with the positive average output effect albeit smaller for Romanian food producers estimated with our AGE model.

Therefore, even though some studies mentioned above treat agriculture and food processing as being each one aggregate sector, and the modelling structures and assumptions are not identical to those employed herein, the impacts predicted in this study do display similar patterns to those reported elsewhere. This tends to give AGE modellers reassurance and increased confidence in the soundness of their work.

## 5. Conclusions

Customs union theory is indeterminate when it comes to assessing and predicting likely economic impacts in terms of resource re-allocation, specialisation and welfare changes stemming from a country joining a preferential trade agreement. In other words, though customs unions eliminate tariffs between members and introduce undistorted price relationships between the home and partner countries, they tend to establish new trade/price distortions and discriminate against non-member countries. This makes it theoretically difficult, in particular in multi-sector models, to determine "a priori" the resulting impacts that rather lend themselves to be case specific (Johnson, 1960, Kreinin and Plummer, 2002). The numerical single-country AGE model is capable of both making use of a sound theoretical framework and overcoming such difficulties. It manages to indicate likely sectoral changes that one can reasonably expect from the assumed implementation of trade policy measures with specific reference to the home country's agro-food activities.

The incorporation of Romania's agriculture and food industry induces a change in relative prices that fosters an intensification of agro-food trade with union members, a fall in exports with non-members, and a decrease and/or increase in imports with non-members depending on trade diversion effects across sectors associated with the implementation of new external tariffs. Agro-food trade with the EU25 intensifies in particular for those commodities for which trade restrictions are still substantial prior to accession. The inclusion of agro-food trade into the regional integration agreement is likely to bring benefits to Romanian producers of mainly ruminant live animals and meat products, sugar, and cereal grains. In particular for these sector, the positive trade and output effects of increased foreign market access outweigh the negative production effects of cheaper imports. In other words, changes in export prices have a stronger direct and positive impact on producer earnings in comparison with the indirect negative repercussions brought about by shifts in import prices. In addition, sectors that face higher tariffs and protection rates, from imports from the rest of the world with the implementation of EU's external tariffs, tend to experience a further expansion in production. In terms of static welfare effects, the AGE model predicts a gain 0.65 percent of GDP equivalent variation. Most of these gains are attributed to augmented access to EU markets for Romanian agro-food producers, whereas the preferential unilateral elimination of import tariffs and their adjustment to EU's external levels brings very small improvements in real incomes.

The AGE results depend mostly on four crucial factors: the level of pre-enlargement import tariff rates on reciprocal trade between Romania and EU25, the share of sectoral output being exported, the difference between the pre-union and post-union tariff rate levels applied to non-members, and the degree of product differentiation. The magnitude and direction effects of the simulated trade policy changes depend both on the size of the shocks and the behavioural relationships assumed to characterise the economy before the shocks are applied (McDaniel and Balistreri, 2002). The bigger

the tariff cut on imports from EU countries and the larger the reduction in import tariffs vis-à-vis non-members for CET alignment purposes, the fiercer the domestic competition and the more likely that import-competing industries shrink and export-oriented activities expand. Most agro-food sectors are predicted not to benefit from this type of policy change due not only to the small contribution of exports to output but also to the fact that export incentives arise in these cases indirectly through a crowding out effect of domestic supplies to domestic markets. However, the bigger the tariff cut by EU25 on imports from Romania the higher the direct incentives for domestic export and output expansion. Yet again, the increase in domestic production depends upon the sector's export share in output. The degree of overlap both between domestic and foreign goods, and between export oriented and domestically targeted products have also a significant impact on the magnitude of predicted effects. The higher the elasticities of import substitution and export transformation the larger the increase in trade with EU countries, the bigger the output expansion for those sectors that were predicted to benefit, and the higher the welfare gains. Thus, AGE models tend to emphasise trade creation over trade diversion effects due to their inbuilt assumption of product differentiation (Schiff and Winters, 2003). However, the model is fairly robust with respect to the predicted order and direction of changes across the sectors and variables under analysis.

Finally, it is worthwhile questioning the assumption that Romanian agricultural and food producers are able to fully respond to increased market access opportunities and supply incentives offered under EU umbrella. The predicted benefits might accrue to farmers only if the respective agro-food sectors are further reformed and the main structural and institutional problems are successfully overcome. Enhanced prospects brought about by EU enlargement coupled with likely increased competition should determine local producers of agricultural and food commodities to restructure, modernise, and improve their productivity. Currently underdeveloped factor markets characteristic to the agrarian sector need to be effectively addressed and the several labour mobility constraints have to be eliminated if the inefficiency burden of an over-numerous agrarian labour force is to be diminished and the vicious circle of low-risk / low-return farming strategies is to be broken. Moreover, as those positive output effects predicted by the model might occur under the provision of further liberalised trade with EU25 partners, it is important that agro-food producers achieve a higher integration with international trade structures and arouse a greater interest in their products amongst foreign consumers. Romanian consumers and agro-food producers are likely to reap more benefits from being integrated into EU's customs union if the respective products become more tradable and the sectors more open towards foreign markets.

Hence, it could be very much the case that the modelling results might be overestimating the gains, as model assumptions such as smoothly functioning markets, perfect resource mobility between sectors, and no export constraints, are currently less likely to be met on the agrarian and food processing side

of the Romanian economy. Nonetheless, the results are also likely to underestimate potential changes as increasing returns to scale and dynamic effects that have not been included in the model could increase overall benefits. All in all, the findings rendered by the theoretically articulate AGE model represent a good starting point for further research and are not to be discarded. The predicted directions and relative magnitudes of change do point towards the main domestic agro-food sectors that are likely to grow or contract with the country's integration into EU's customs union. This is of key importance for Romanian policy makers, as the findings could guide them in their efforts to identify "ex-ante" those agricultural activities that display high potentials but need support in reducing the impediments actually confronted with. In addition, sectors with low potentials are identified, for which implementation of alternative development strategies and additional social safety nets might become necessary.

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# Appendices

Table A1

Commodities / activities considered in the AGE model

| No. | Code | Commodity / activity | No. | Code | Commodity / activity |
|---|---|---|---|---|---|
| 1 | WHT | Wheat | 12 | MIL | Dairy products |
| 2 | GRO | Cereal grains nec | 13 | SGR | Sugar |
| 3 | V_F | Vegetables, fruit, nuts | 14 | OFP | Other food products |
| 4 | OSD | Oil seeds | 15 | B_T | Beverages and tobacco products |
| 5 | C_B | Sugar cane, sugar beet | 16 | OPP | Other primary products |
| 6 | OCR | Other crops | 17 | TWL | Textiles, wearing apparel and leather |
| 7 | CTL | Cattle, sheep & goats, horses | 18 | PCP | Petroleum (coal) & chemicals (rubber, plastic) |
| 8 | OAP | Other animal products | 19 | MET | Machinery, equipment & transport means |
| 9 | RMK | Raw milk | 20 | OMP | Other manufacturing products |
| 10 | MTP | Meat products | 21 | SVC | Services |
| 11 | VOL | Vegetable oils and fats | | | |

Source: Own analysis based on an aggregation of 56 sectors initially displayed in Banse (2001)

Table A2

Constant elasticity of substitution values between factors of productions (ESUB-VA)

| Sector | ESUB-VA | Sector | ESUB-VA |
|---|---|---|---|
| Wheat | 0.56 | Dairy products | 1.12 |
| Cereal grains nec | 0.56 | Sugar | 1.12 |
| Vegetables, fruit, nuts | 0.56 | Other food products | 1.12 |
| Oil seeds | 0.56 | Beverages and tobacco products | 1.12 |
| Sugar cane, sugar beet | 0.56 | Other primary products | 0.93 |
| Other crops | 0.56 | Textiles, wearing apparel & leather | 1.26 |
| Cattle, sheep & goats, horses | 0.56 | Petroleum (coal) & chemicals (rubber, plastic) | 1.26 |
| Other animal products | 0.56 | Machinery, equipment & transport means | 1.26 |
| Raw milk | 0.56 | Other manufacturing products | 1.26 |
| Meat products | 1.12 | Services | 1.39 |
| Vegetable oils and fats | 1.12 | | |

Source: Jomini *et al*., table 4.3, 1991, as displayed in Hertel, table 4.1, 1997; Notes: A simple average is calculated where aggregation occurs.

Table A3

Constant elasticity of substitution values between imports and domestically produced goods (ESUBM)

| Sector | ESUBM | Sector | ESUBM |
|---|---|---|---|
| Wheat | 2.20 | Dairy products | 2.20 |
| Cereal grains nec | 2.20 | Sugar | 2.20 |
| Vegetables, fruit, nuts | 2.20 | Other food products | 2.20 |
| Oil seeds | 2.20 | Beverages and tobacco products | 3.10 |
| Sugar cane, sugar beet | 2.20 | Other primary products | 2.80 |
| Other crops | 2.20 | Textiles, wearing apparel & leather | 3.67 |
| Cattle, sheep & goats, horses | 2.80 | Petroleum (coal) & chemicals (rubber, plastic) | 1.90 |
| Other animal products | 2.50 | Machinery, equipment & transport means | 4.00 |
| Raw milk | 2.20 | Other manufacturing products | 2.66 |
| Meat products | 2.20 | Services | 2.09 |
| Vegetable oils and fats | 2.20 | | |

Source: Jomini *et al*., table 4.3, 1991, as displayed in Hertel, table 4.1, 1997; Notes: A simple average is calculated where aggregation occurs. CET figures take the same values.

Table A4

Romanian computed import tariff rates (tariff revenue divided by value of imports)

| Commodity | Tariff rate | Commodity | Tariff rate |
|---|---|---|---|
| Wheat | 66.9 % | Dairy products | 44.6 % |
| Cereal grains nec | 19.1 % | Sugar | 20.5 % |
| Vegetables, fruit, nuts | 18.3 % | Other food products | 17.0 % |
| Oil seeds | 28.9 % | Beverages and tobacco products | 22.8 % |
| Sugar cane, sugar beet | - | Other primary products | 1.9 % |
| Other crops | 18.2 % | Textiles, wearing apparel & leather | 6.2 % |
| Cattle, sheep & goats, horses | 55.8 % | Petroleum (coal) & chemicals (rubber, plastic) | 3.6 % |
| Other animal products | 30.9 % | Machinery, equipment & transport means | 4.5 % |
| Raw milk | 78.1 % | Other manufacturing products | 5.1 % |
| Meat products | 30.7 % | Services | 0.3 % |
| Vegetable oils and fats | 14.0 % | | |

Source: Derived form the data in the SAM

Table A5: The importance of each sector in trade and production (1997)

| | Sector's share in exports to EU25 | Sector's share in imports from EU25 | Sector's share in imports from RoW | Sector's share in domestic production |
|---|---|---|---|---|
| wht | 0.1% | 0.1% | 0.0% | 2.1% |
| gro | 0.2% | 0.1% | 0.1% | 1.8% |
| v_f | 0.3% | 0.1% | 0.4% | 1.6% |
| osd | 0.2% | 0.0% | 0.2% | 0.2% |
| c_b | not traded | not traded | not traded | 0.2% |
| ocr | 0.1% | 0.5% | 1.2% | 1.8% |
| ctl | 0.5% | 0.0% | 0.0% | 1.1% |
| oap | 0.5% | 0.1% | 0.3% | 3.5% |
| rmk | 0.0% | 0.0% | 0.0% | 2.4% |
| opp | 0.3% | 0.6% | 34.8% | 4.1% |
| mtp | 0.7% | 0.6% | 0.4% | 2.5% |
| vol | 0.3% | 0.5% | 0.2% | 0.6% |
| mil | 0.1% | 0.3% | 0.0% | 1.1% |
| sgr | 0.1% | 0.1% | 1.7% | 0.8% |
| ofp | 0.6% | 2.0% | 3.0% | 3.7% |
| b_t | 0.2% | 0.6% | 1.2% | 3.9% |
| twl | 34.6% | 27.6% | 3.4% | 4.4% |
| pcp | 9.3% | 12.3% | 20.4% | 8.2% |
| met | 10.8% | 30.7% | 17.6% | 7.2% |
| omp | 26.8% | 17.4% | 8.5% | 10.6% |
| svc | 14.2% | 6.3% | 6.6% | 38.0% |
| | 100.0% | 100.0% | 100.0% | 100.0% |

| | Share of imports in domestic demand M / (Q-X+M) | Share of EU25 imports in total imports $M_{EU}$ / M | Share of exports in production X / Q | Share of EU25 exports in total exports $X_{EU}$ / X |
|---|---|---|---|---|
| wht | 0.2% | 100.0% | 3.5% | 7.8% |
| gro | 1.1% | 50.8% | 4.6% | 21.3% |
| v_f | 2.5% | 27.4% | 2.4% | 56.8% |
| osd | 6.5% | 15.7% | 7.0% | 76.4% |
| c_b | not traded | not traded | not traded | not traded |
| ocr | 7.0% | 30.1% | 0.7% | 73.5% |
| ctl | 0.5% | 85.2% | 8.0% | 38.5% |
| oap | 0.8% | 25.4% | 1.6% | 71.4% |
| rmk | 0.1% | 92.0% | 0.1% | 98.3% |
| mtp | 3.7% | 62.1% | 4.8% | 41.2% |
| vol | 11.0% | 70.8% | 20.7% | 15.4% |
| mil | 2.5% | 91.1% | 0.6% | 78.3% |
| sgr | 14.6% | 4.4% | 0.9% | 79.6% |
| ofp | 10.1% | 43.4% | 2.0% | 60.8% |
| b_t | 3.7% | 37.1% | 2.0% | 21.8% |
| opp | 41.1% | 1.9% | 1.1% | 51.8% |
| twl | 65.2% | 90.0% | 67.3% | 86.1% |
| pcp | 29.3% | 40.1% | 20.4% | 40.9% |
| met | 41.7% | 65.9% | 20.8% | 53.0% |
| omp | 24.0% | 69.3% | 34.7% | 53.2% |

| | | | | |
|---|---|---|---|---|
| svc | 2.9% | 51.7% | 4.5% | 60.2% |

Source: Derived from the data in the SAM

Table A6

Updated Romanian MFN applied tariffs versus EU CET rates

Source: GTAP database for the EU average tariff rates on imports from non-members, and the DG Trade – EC Market Access Database website for current (01.2003) Romanian MFN applied rates http://mkaccdb.eu.int/

| Commodity | EU rate | RO rate | EU rate – RO rate | Commodity | EU rate | RO rate | EU rate – RO rate |
|---|---|---|---|---|---|---|---|
| wht | 61.4% | 25.0% | 36.4% | mil | 87.7% | 45.0% | 42.7% |
| gro | 38.6% | 25.0% | 13.6% | sgr | 76.4% | 45.0% | 31.4% |
| v_f | 14.5% | 35.0% | -20.5% | ofp | 58.1% | 20.0% | 38.1% |
| osd | 0.0% | 20.0% | -20.0% | b_t | 8.3% | 75.0% | -66.7% |
| c_b | 251.4% | - | - | opp | 0.9% | 10.0% | -9.1% |
| ocr | 22.7% | 20.0% | 2.7% | twl | 9.7% | 20.0% | -10.3% |
| ctl | 36.6% | 0.0% | 36.6% | pcp | 3.3% | 6.0% | -2.8% |
| oap | 3.4% | 25.0% | -21.7% | met | 4.3% | 15.0% | -10.8% |
| rmk | 0.0% | 35.0% | -35.0% | omp | 2.7% | 15.0% | -12.3% |
| mtp | 59.9% | 40.0% | 19.9% | svc | 0.0% | 0.0% | 0.0% |
| vol | 11.4% | 25.0% | -13.6% | | | | |