# How does Tariff-rate quota modelling affect CGE results?: an application for MIRAGE*
# Preliminary Version - DO NOT QUOTE

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**Abstract**

Since the Uruguay Round Agricultural Agreement (URAA), tariff-rate quotas (TRQ's) have become the most useful trade policy instrument to improve agricultural market access by controlling at the same time import volumes. This is the case of many agricultural markets where the level of protection is very high, such as for beef or sugar in the European Union or in the United States.

Until now, MIRAGE CGE model only take into account the exogenous quota rents calculated at HS6 level using MAcMap database. The detailed information about TRQ's rents is then aggregated to the chosen level of GTAP data aggregation. Moreover, the model assumes that the quota rents are allocated entirely to exporters, this is a strong hypotheses because the quota rent allocation changes, not only from one country to another, but also between products according to different TRQ administration methods.

Unfortunately, this methodology does not lead to shift from one TRQ regime to another when trade policy changes (i.e. a quota volume increase for very sensitive agricultural products or a tariff reduction.)

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In order to improve the TRQ treatment in MIRAGE we model them as bilateral TRQ at HS6 level using MAcMapHS6-v2 database. Assuming a simple scenario of bilateral trade agreement between the European Union and MERCOSUR, we test the previous TRQ modelling and we compare its results with the present versions of MIRAGE. The welfare and trade results will give us an idea of the biases introduced by the negligence of TRQ modelling.

**Keywords:** Tariff-rate quota; TRQ; TRQ administration methods ; CGE model; MIRAGE.

**JEL Classification:** F13, F15, F17, Q17.

# INTRODUCTION

The Uruguay Round Agreement on Agriculture (URAA) leads to introduce tariff-rate quotas (TRQ's) in order to improve market access of commodities which were subjected to Non-Tariff Barriers (NTBs), such as simple quotas. The purpose to implement TRQs on most protected agricultural products was to guarantee minimum level of market access (at the beginning was 3% of domestic consumption and then it was gradually expanded to 5%) on a side and on the other, to safeguard current levels of access ("current access quotas"). Moreover, the particular interest to implement TRQ's was to maintain or improve market access conditions for developing countries on developed markets, such as in the European Union, Japan and the United States.

This policy instrument is defined as followed: "Tariff rate quotas (TRQ's) are two-level tariffs, with a limited volume of imports permitted at the lower *in-quota* tariff and all subsequent imports charged the (often much) higher *out-of-quota* tariff" (Ingco, 1996; Diakosavvas, 2001; De Gorter and Kliauga, 2006). This instrument combines tariff (tariffs in and over the quota) and non-tariff (quota volume) measures which determines 3 possibles regimes: the *in-quota* regime (quota unfilled and the inside tariff is applied to imports), the *at-quota* regime (quota just filled and the equilibrium price include a prime over the inside tariff) and the *over-quota* regime (imports exceed the quota and the applied tariff is the over-quota tariff). Most part of bilateral TRQ displays "in-quota" and "at-quota" regimes (MAcMapHS6-v2) since most out-of-quota tariff are prohibited. Nevertheless, some exceptions appears according to the economic conjuncture of each different year, i.e. beef TRQs allocated to MERCOSUR countries were filed in 2005 in spite of the very high specific tariff over the quota. The TRQ equilibrium regime also depends on the import demand elasticity, on the supply response and also on TRQ administration methods, which not only affect the volume of trade, but also the allocation of the TRQ rent between importers and exporters. The equilibrium TRQ regime determines the effective protection on the market. De Gorter and Kliauga (2006) introduces other intermediate TRQ regimes that may appears in the case of WTO TRQs and not on bilateral TRQs.

Most of Computable General Equilibrium (CGE) models have tried to introduce TRQ modelling, but they remain far from the true market behaviour when markets are affected

by TRQ's. Most standard version of the MIRAGE model only considers exogenous TRQ rents and their reduction under different liberalisation scenarios (Bchir et al., 2002). Even if the TRQ rents are defined at HS6 level (MAcMap database), this way of modelling TRQ's in a CGE model is quite limited, because it does not lead to shift from one TRQ regime to another as a consequence of an external shock. Moreover,the hypothesis about the TRQ-rent allocation considers that the whole of rent is captured by exporters, which is not always true because the allocation rent would be influenced by different TRQ administration methods, market power between traders, etc. GTAP (Elbehri and Pearson, 2000; Berrettoni and Cicowiez, 2002) and LINKAGES (van der Mensbrugghe, 2001; Van der Mensbrugghe et al., 2003) models also introduced TRQ modelling at aggregated level. The advantages of this kind of modelling is the distribution of the quota rent between importer and exporter based on information about the quota rent allocation or TRQ administration methods; however, they assume that TRQs concern the whole of GTAP sectors and they do not distinguish between imports under TRQ regimes and imports under ordinary tariffs (possible bias due to data aggregation). A weak point of this three models is that they treat all TRQs as bilateral TRQs and they do not distinguish between multilateral TRQ's, where allocation is not usually explicit, and preferential TRQ's, granted under preferential trade agreements (PTA), where allocation is known.

The purpose of this paper is to study the consequences of different TRQ modelling in terms of welfare and trade. We compare different versions of the MIRAGE model:
(i) without any consideration of TRQs,
(ii) with exogenous TRQ rent from MAcMapHS6-v2 database and
(iii) with explicit TRQ modelling at a very detailed level.
Section 1 presents the state of art about the economics of TRQ's and TRQ modellings under partial and general equilibrium frameworks. Section 2 presents the MIRAGE model and the new specification about TRQ modelling. Section 3 presents an application case (EU-Mercosur trade agreement) in order to compare the results of different MIRAGE versions. The EU-MERCOSUR PTA has been chosen for this example because TRQs are the most useful and controversial trade policy instrument in agriculture liberalisation between these economic blocs. Final Section displays our concluding remarks.

# 1 Tariff Rate Quotas: state of art

## 1.1 The Economics of TRQs

The impact of a quota volume expansion depends critically on various initial hypothesis. The first one concerns the instrument which is initially binding, that means under which TRQ regime we are. In this model we distinguish three basic regimes: the *in-quota regime*, when the in-quota tariff ($\tau_{in}$) is binding due to market conditions or by government decree; the *at-quota regime*, when the quota is binding and the applied tariff-equivalent($\tau_m$) is endogenously determined ($\tau_{in} \leq \tau_m \leq \tau_{out}$); and the *out-of-quota regime*, when the out-of-quota tariff ($\tau_{out}$) is the effective instrument. The second reason is the import demand elasticity, which determines how soon one regime shifts to another when trade policy changes. The latter and the TRQ administration methods also constraint import to fill in the quota.

The administration methods not only affect the volume and the distribution of trade between partners but also they have an essential impact on the distribution of TRQ rents (Skully, 1999). The WTO identifies seven methods of TRQ administration: *Applied-tariff*, *License-on-demand*, *First-come/First-serve*, *Historical*, *Auction*, *State-trader/Producer-group* and a combination of the six previous methods. The *Applied-tariff method* is the most common form and almost half of TRQ use it. This administration method permits unlimited imports at or below the in-quota tariff rate and so it does not introduce any particular way to allocate rents (Abbott, 2002).

The *License-on-demand (LD) method* is considered a quasi-market allocation method because all potential importers are invited to apply for import licenses specifying their wants. Skully (1999) presents two possible reasons which explain a quota unfilled under this administration method. The gap between the real number of licenses and importers' wants [1] motivates importers to overstate licenses requests. Under uncertainty, the licenses may be reallocated in a wrong way if the degree of overstatement is not uniform between importers, leading to a quota unfilled. The shipments of goods in full containers mays also lead to a quota unfilled. Sometimes the licenses of each importer do not fill a container

[1] If the sum of demanded licenses exceeds the TRQ level, the authority reduces proportionally the level of each license (Bureau and Tangermann, 2000)

and, with no tradable licenses, the quota may remain unfilled. Moreover, the LD method introduces a greater welfare loss because of displacement of most efficient suppliers by less one. Finally, concerning the capture of the rents, importers who benefit from licenses will also benefit from rents when the quota is binding.

The *First-come/First-served method* allows imports under the in-quota regime; however, it raises difficulties with rent allocation under at-quota and out-of-quota regimes. On one side, exporters may anticipate when the quota will be filled and create rents. On the other side, importers are motivated to import early to avoid the extra costs (in terms of tariff) at the $N$ unity shipped. In order to minimize transaction costs, importers are motivated to fulfill the containers, but it would be possible that in the last container only half of imports enters at the in-quota tariff and the rest enters at the out-of-quota tariff. If the container is not filled the transport cost per unit increase or if the container is filled some of import become more expensive due to the higher tariff rate out of the quota. Under these two possibilities importer will prefer to not ship the last container and so the quota remains unfilled (risk-aversion behaviour). This administration method may present some other extra cost, such as increase in domestic prices, storage costs,etc. and it also encourages to concentration and seasonality of imports (Bureau and Tangermann, 2000).

The *Historical administration method* is very used in bilateral TRQ and maintains the concessions under PTA's, getting in conflict with the WTO MFN-principle because of the discrimination in favour of historical partners. Moreover, it becomes more costly and less efficient than other methods (Abbott, 2002).

*Trader-state/Producer-groups methods* including licenses are not transparent, because the allocation of licenses is not explicit and it could become discriminatory and costly for exporters. Moreover, if the reallocation of licenses is not permitted we may have an unfilled quota; however, the empirical evidence confirms that this kind of methods is the best in terms of fill rates performance (Abbott, 2002).

Since *Auction* reproduces the market functioning, it are considered as the most economically efficient TRQ administration method. Auction is economically preferred to other TRQ administration method when markets are perfectly competitive. Otherwise, the LD method will be preferable. In order to avoid too few traders in a market under

auction, some TRQ allocation methods impose a maximum market share by trader. Auction neutralises quota rents and the domestic economy benefits from trade gains which are equivalent to the auction revenue (equal to tariff revenue with a tariff-equivalent) plus consumer surplus. The preference of governments about discretionary through other administration methods also makes that auction is not very used (Skully, 1999).

The previous tariff quotas administration methods are one of the factors which influences the allocation of the TRQ rent between importer and exporters. However, the capture of the rent is sometimes explained by the presence of importer (or exporter)'s market power. This situation is illustrated by the AGOA agreement between the USA and some African countries, where larger and established exporters countries capture a greater percentage of the rent than newest and smallest ones (Olarreaga and Ozden, 2005). Others possibilities to explain the capture of the rent between countries under the same preferential agreement are the quality composition of exports, the changes in world prices (or import prices) after the agreement, and the differentiation of imports across origins.

## 1.2 TRQ modelling

Elbehri and Pearson (2000) introduce the TRQ modelling in the GTAP model (Hertel, 1997) using the GEMPACK code from Harrison and Pearson (1996). They model bilateral TRQs on sugar sector linearising the equations which describe the TRQ mechanism as the rest of GTAP model. Berrettoni and Cicowiez (2002) from the Centro de Economia International (CEI) run the GTAP model to simulate the EU-MERCOSUR PTA comparing two different scenarios: a quota enlargement and a reduction in the over-quota tariff. All scenarios are welfare improvement for both regions but the welfare sources are different depending on the scenario (i.e. in the case of Argentina, a quota enlargement leads to a greater quota rent but an over-quota tariff reduction increases trade but reduces the quota rent.)

LINKAGE CGE model from the World Bank uses mixed-complementarity-problem (MPC) programming to implement TRQs (van der Mensbrugghe, 2001). MCP is based on ortogonality conditions. The first one states that in-quota imports cannot exceed the

quota level. It is associated with a constraint on the quota premium rate, whose low bound is zero. Two regimes, in-quota and at-quota, may be deduced from this condition. The second ortogonality condition says the quota premium rate is capped by the difference between the over-quota and the in-quota tariffs and it is associated with the low bound of the out-of-quota imports. Van der Mensbrugghe et al. (2003) test the LINKAGE TRQ modelling in the case of TRQ reforms in sugar market by the most important OECD countries, such as the European Union, the Unites States and Japan. Their conclusions highlight trade diversion effects induced by TRQs and also welfare gains for countries benefiting from TRQs bilateral allocations (least-developed countries).

The originality of the previous models is the consideration of the TRQ rent sharing between importers (government) and exporters, [2] which is crucial for welfare implications and export incentives, such as we have noticed in the previous discussion about TRQ economics. The disadvantages of modelling TRQs in these ways is that all large sectors, such as Meat or Sugar (from GTAP database), are under TRQ regimes which is not necessarily true[3]. Using aggregated data at GTAP sector level may lead to biased results, and our proposition of TRQ modelling looks at minimize these aggregation biases.

The consideration of administration methods of each TRQ would help to improve the quota rent allocation between importers and exporters. For example, when the administration methods is *First-come, first-served* we would expect a sharing of the rent between exporters and importers, but if the licenses are given to the importers (exporters) then rent would be allocated entirely to them Elbehri and Pearson (2000). Even if the TRQ administration methods are only one of the causes of the quota-rent allocation, the knowledge of TRQs under PTAs and the mechanisms of TRQ administration would get closer to the reality.

[2]Van der Mensbrugghe et al. (2003) calibrated the rent-share parameter keeping consistency with the prime bounds and Elbehri and Pearson (2000) and Berrettoni and Cicowiez (2002) assume the quota rent is allocated in the same proportion between importers and exporters

[3]Elbehri and Pearson (2000) and Berrettoni and Cicowiez (2002) aggregate in-quota and the over-quota tariffs weighting them by trade and the fill rate helps to determine the initial TRQ regime for each GTAP sector

# 2 Modeling Tariff-Rate Quotas in MIRAGE

## 2.1 The MIRAGE model

The MIRAGE model from CEPII is multi-sectoral and multi-regional CGE model Bchir et al. (2002). It is a dynamic model fitted with imperfect competition in the manufacture and service sectors, in order to give a more realistic representation of the world economy. MIRAGE describes imperfect competition in an oligopolistic framework "à la Cournot".

The demand side is modelled in each region through the Eepresentative Agent Assumption. Domestic products are assumed to benefit from a specific status for consumers, making them less substitutable for foreign products than foreign products between each other. Secondly, products originating in developing countries and in developed countries are assumed to belong to different quality ranges. This assumption is motivated by the fact that several empirical works have shown that unit value differences are able to reveal quality differences even at the most detailed level of product classification. This hypothesis about qulity differentiation is likely to have direct consequences on the transmission of liberalization shocks since the elasticity of substitution is lower across different qualities than across products within a given quality. Hence, the competition between products of different qualities is less substantial than between products of a similar quality. In the absence of systematic information suitable for the incorporation of vertical differentiation in a worldwide modelling exercise, such as the one undertaken here, differentiation is modelled in an *ad hoc* fashion: developed countries and developing countries are assumed to produce goods belonging to two different quality ranges; substitutability is assumed to be weaker across these two quality ranges than between products belonging to the same quality range.

Regarding the supply side of the model, producers use five factors: capital, labour (skilled and unskilled), land and natural resources. The structure of added value is intended to take into account the well-documented relative skill-capital complementarity. These two factors are thus bundled separately, with a lower elasticity of substitution, while a higher substitutability is assumed between this bundle and other factors.

The production function assumes perfect complementarity between added value and intermediate consumption. The sectoral composition of the intermediate consumption

aggregate stems from a CES function. For each sector of origin, the nesting is the same as for final consumption, meaning that the sector bundle has the same structure for final and intermediate consumption.

Constant returns to scale and perfect competition are assumed to prevail in agricultural sectors. In contrast, firms are assumed to face increasing returns to scale in industry and services (through a constant marginal cost and a fixed cost, expressed in output units). In those sectors, competition is imperfect. This modelling allows the pro-competitive effect of trade liberalization to be captured.

Capital goods have the same composition regardless of the sector; they cannot change their sector affectation once it has been installed, thus introducing a rigidity in the economy suggested by empirical evidence. Capital is accumulated every year as the results of investments in the most profitable sectors. Natural resources are considered to be perfectly immobile and may not be accumulated. Both types of labor are assumed to be perfectly mobile across sectors, whereas imperfect land mobility is modelled with a constant elasticity of transformation function. Production factors are assumed to be fully employed; accordingly, negative shocks are absorbed by changes in prices (factor rewards) rather than in quantities. All production factors are internationally immobile. With respect to macroeconomic closure, the current balance is assumed to be exogenous (and equal to its initial value in real terms), while real exchange rates are endogenous.

The calculation of the dynamic baseline has been recently improved in order to have an endogenous total factor productivity (TFP). This improvement is based on a more elaborate demographic and macroeconomic forecast in which the labor and GDP growth rates until 2015 are taken from the World Bank database. At the baseline, the TFP is calculated endogenously but under the simulation scenarios it becomes fixed and the GDP is calculated endogenously.

Because protection in services takes the form of regulatory measures leading to no tariff revenue for the importing country, the most appropriate way to introduce their protection is to translate these estimates into export taxes, as has been done for import quotas when they exist (multi-fibre agreement for instance). Liberalizing services is therefore expected to lead to large gains for the liberalizing countries, whereas gains for the exporting countries are second order ones.

The model uses the GTAP database 6.1. However, instead of relying on modelling tariff cuts at the sector level, we use a detailed database (MAcMap) at the HS6 level (5,113 products); this permits a better handling of the tariff dispersion (which matters as far as the gains of tariff removal will depend on such dispersion) as well as introducing sensitive products. TRQ data (in, at and out-of-quota tariffs, quota levels and imports under TRQs) is also provided at HS6 level, leading to state realistic scenarios about very sensitive products. This also allows analysis to be based on actual applied tariffs, including preferential provisions (e.g. GSP, FTAs, etc.). Regarding border protection, the database used to construct the scenarios of trade liberalization at the product level is MAcMapHS6v2, base year 2004, and MAcMapHS6v1, base year 2001 Bouët et al. (2004).

## 2.2 TRQ modelling in MIRAGE

Aggregating TRQ at the GTAP sector level leads to some aggregation biases and some author have studied different TRQ aggregation methods and their consequences.

Lips and Rieder (2002) have analysed two methods of TRQ aggregation for the GTAP model. The first aggregation method is based on tariff aggregation by a trade weighted tariff averages and the second method considers the quota rent of all TRQ under the same GTAP sector. Tariff aggregation leads to an overestimation of the quota rent at the GTAP sector level, while keeping the real quota rent leads to an overestimation of tariffs when TRQ's are not all under an out-of-quota regime. The authors propose to used both aggregation methods regarding as kind of sensitivity analysis of aggregation process.

Our proposition of TRQ modelling tries to avoid these aggregation biases and thus TRQ's are introduced at a greater detailed level compared to the GTAP data. This kind of TRQ modelling needs to modify the Demand tree including new branches (see Figure 1). A further CES nesting level is added to the subutility function in order to distinguish between imports under TRQs and imports under ordinary tariffs. For imports under TRQ's the information is disaggregated (bilateral TRQ at HS6 level) and each GTAP sector may concern one or more TRQs; however, for non-TRQ imports data remains at the GTAP sector level of aggregation. Within a given GTAP sector, when a TRQ concerns two or more tariffs lines, these goods compete more between them than with

similar products only affected by higher tariffs.

[INSERT Figure 1]

In order to model the possibility to shift from one TRQ regime to another we need to introduce some extra conditions. We define three TRQ regimes: *in-quota regime*, *at-quota regime* and *out-of-quota regime*. The equilibrium under the first regime is characterised by imports lower than the quota level, where the in-quota tariff is the effective protection. Under the second regime, the quota is binding and it determines endogenously the prime over the in-quota tariff. The out-of-quota regime considers an equilibrium where the out-of-quota tariff is the effective protection because the level of import is above the quota level. The conditions which leads to TRQ regime changes describes the following mechanisms: if a TRQ is initially under the in-quota regime but imports exceed the quota level then the TRQ shifts to the at-quota regime. Inversely, if a TRQ is under an at-quota regime and the endogenous tariff-equivalent is lower than the in-quota tariff then the TRQ shifts to the in-quota regime. For the rest of regime changes the mechanisms are similar.

In order to become compatible the TRQ information at HS6 level and GTAP data, a multi-dimension mapping has been defined in order to describe TRQ's (bilateral and at HS6 level) which belong to import demand (bilateral trade and at GTAP sector aggregation).

The new bloc of equations introduced in Mirage is presented in the model annexes.

This king of modelling may become difficult to be tractable when models are large (high level of disaggregation by regions and sectors). Forthcoming researches about TRQ modelling in MIRAGE look at an aggregated TRQ model (like Lips and Rieder (2002)'s) minimising aggregation biases when models are too large and introducing the coexistence of tariff lines under TRQs and other tariff lines only affected by tariffs inside the same GTAP sector.

Our idea tries to combine a tariff aggregation under the real quota rent constraint. We assume there exists a positive relationship between the prime over the in-quota tariff and the imports. In order to estimate the parameters from this function, assumed linear, we calibrate the in-quota tariff at the GTAP sector level knowing that the sum of the quota rents of all TRQs under the same GTAP sector. The in-quota tariff at the GTAP

sector level is a average tariff of in-quota tariffs weighted by the share of imports in-quota (for imports under TRQs) and the tariff weighted by the share of imports under simple tariffs.

This last proposition of aggregated TRQ modelling is not detailed and tested in this version of the paper.

# 3 The EU-MERCOSUR trade agreement: an example of TRQ modeling

Bilateral trade negotiations between the European Union (EU) and MERCOSUR (i.e. Argentina, Brazil, Paraguay, Uruguay) started at the end of 1999 when ministers set the structure, the methodology and the calendar for negotiations. The first phase concluded with the political and cooperation dialogue and then in 2001 they exchanged the first texts on goods, services and government procurement in order to improve market access between regions. In the Presidential Summit in Madrid in 2002 the countries reiterated their political commitments in order to reach the largest bi-regional trade agreement Giordano (2003). Several rounds of negotiations followed the previous commitments. In the 9th round, the first list of most sensitive products under negotiation was exchanged and it has constraint the progresses in negotiations because MERCOSUR countries insisting on a much larger access to the EU market. In the most recent proposals (October 2004), the EU offered concessions under several TRQs for these sensitive products. MERCOSUR countries considered that the European proposal on market access issues is unsatisfactory and the EU also found the MERCOSUR concessions in services and government procurement quite limited. Moreover, the EU fears that a more generous European proposal on agriculture would allow MERCOSUR countries to capture an extremely large market share in the EU Bureau et al. (2006). After this disagreement on proposals the dialogue have been interrupted until the Ministerial Meeting in Brussels on September 2005 when it has restarted Ramos et al. (2006).

Even if the MERCOSUR is a minor EU partner, it is the most important partner in Latin America, representing near from 50% of the EU exports to this region. Nevertheless,

the EU is an important partner of MERCOSUR countries specially for their agricultural and food exports (more than 30% of total non-MERCOSUR exports).

Therefore, during the period 1998-2004 MERCOSUR economies have suffered from important changes due to currency devaluation, social and macroeconomic crises and recent economic growth, which have affected their trade relations with the rest of the world and specially, with the European Union.

MERCOSUR and the European Union have a complementary trade patterns, but trade flows are specially concentrated in sectors with highest level of protection. The complementary between their patterns of trade leads us to predict important gains of this regional agreement. Moreover, the cost of this agreement would be negligible compared to the gains thanks of the high initial level of tariffs, specially on the European side De Melo and Panagariya (1993); DeRosa (1998).

The MERCOSUR countries are developing countries, which are eligible to the EU Generalized System of Preferences (GSP) and some of them, such as Venezuela benefit from the GSPplus with a duty exemption over around 85% of its exports. However, they benefit from a limited preferential market access, because the coverage of the EU GSP is very partial for agricultural products.

Tariff-rate quotas defined under the Uruguay Round Agriculture Agreement (URAA) lead MERCOSUR countries to benefit from preferential tariffs for some of their agricultural exports. These are either current access TRQs, opened so as to ensure persistence of historical preferential trade flows, or minimum access TRQ, given in order to open 5% of EU consumption market to international competition (all WTO members).

The EU has opened more than 80 TRQs on agricultural products, some of then are granted for the current access and others were introduced under the Uruguay Round minimum access to the EU market. MERCOSUR and Chile benefit from a preferential market access through TRQs for cereals (corn, wheat), meats (beef, swine and poultry), fruits and vegetables, rice, dairy products and other food products. Argentina and Brazil face a large quotas for food (Argentina) and meat (Brazil and Argentina), and fruits and vegetables (Brazil), while Uruguay and Paraguay only have smaller (bovine) meat quota (Uruguay and Paraguay) and a tiny quota for dairy products (Uruguay). Venezuela only benefits from a very large quota of fruits and vegetables.

Under the EU TRQs current access Argentina and Uruguay profit from a preferential access with a limit to 23,000 tons and 5,800 tons for sheep and goat and under minimum access these counties benefit from TRQs for beef or also of nutritional remainders (Argentina). Venezuela benefits from a large TRQ on fruits and vegetables, Argentina also benefits from a quota of garlic, which was notified to the WTO, but it is not fulfilled like in the case of beef TRQs Bureau et al. (2006).

MERCOSUR countries also benefit from 59100-ton TRQ of "Hilton" (fresh) meat (28,000-ton quota for Argentina, 6,300 tons for Uruguay, 5,000 tons for Brazil and 1,000 tons for Paraguay). The only country which does not fulfill its quota is Paraguay (due to sanitary problems). There is also a 66,000-ton frozen beef WTO TRQ (for the meat industry) of which Brazil is the main beneficiary (as it is not allocated to any specific country). The Hilton in-quota tariff is 20% and the out-of-quota tariff is a composite tariff (ad-valorem tariff of 12.8% plus specific tariff between 140 and 300 €per 100kg). In spite of the high out-of-quota tariff, MERCOSUR countries manage to fulfill their quotas and even to export small volumes out-of-quota. For instance, Brazil exported some 80,000 tons of frozen meat and 41,000 tons of Hilton meat out-of-quota in 2003. In this last case, outside exports represent eight times its quota of 5,000 tons. Brazil also benefits from the TRQ's opened under minimum-access for poultry not allocated to a particular country. Brazil fills half of the 15,500-ton poultry TRQ. Despite EU tariffs, Brazil manages to ship large quantities of poultry to the EU outside quotas Bureau et al. (2006); Ramos et al. (2006).

Since Spain and Portugal have become EU members, MERCOSUR countries have also benefited from the corn TRQ (2,500,000 tons). This quota does not exit anymore because for seams the tariff is 0% and Non-tariff barriers (OGM restrictions) protect the EU market from MERCOSUR's corn. Since 2006, the EU has opened a 244,000-ton WTO TRQ for flint maize leading to Argentina and Brazil benefit from it. Since Finland entered in the European Union, Brazil also benefits from a 82,000 tons of sugar under a TRQ because of the quota that Finland gave to before it enters in the EU.

Most TRQs from the European Union are administrated according to the License on demand, Historical trade and First-come/First-serve methods and thus they determine not only the volume of trade but also the rent allocation between importers and exporters

De Gorter and Kliauga (2006). Nevertheless, in some TRQs, such as the "Hilton" beef TRQ, MERCOSUR countries manage their licenses and capture most part of the quota rent. This aspect explains the interests from some MERCOSUR's producers to keep TRQs and not to negotiate MFN tariff reduction.

## 3.1 Data

According to the new TRQ database from MAcMapHS6-v2, there are 32 countries which have opened TRQs under the rules of the WTO and also under some FTAs. All WTO members benefit from these TRQs, but the bilateral allocation is not the same for all of them. The allocation between partner are sometimes predetermined by reporters. Agricultural products are the most affected by this trade policy instrument, since more than 450 agricultural products and only 24 non agricultural products are constraint by TRQs. Among agricultural products, bovine meat (chapter 02), roots and tubers (chapter 07), animal and vegetable oils (chapter 15) and some preparation from fruits and vegetables (chapter 20) are more frequently limited by TRQs. Countries such as Japan, United States, Korea and the European Union generate the greatest rents with their TRQs, and the products which are mainly concern are meats (chapter 02), cereals (chapter 10), oilseeds (chapter 12) and beverages and tobacco (chapter 24). Most of these TRQs are allocated to a few partners and assuming the hypothesis of exporters capture the rent (Mirage model hypothesis), the TRQ rents would be gained by very few countries, such as the United States, Brazil, Australia, Argentina and the European Union.

Concerning the model and the GTAP data, we have defined a specific aggregation between regions (7) and sectors (25) where all agricultural products are kept at GTAP original sector definition (see Table 1).

[INSERT TABLE 1]

## 3.2 Pre-experiment

Before the simulation of the biregional agreement scenario, we did the traditional pre-experiment in MIRAGE which consists to take into account the end of the Multi-Fibers

agreement, the United States' farm bill and Chine as a WTO member. However, for this paper a larger pre-experiment scenario is run.

We also consider Venezuela as a MERCOSUR member since 2006 and for that we have changed Venezuela's tariff by the Common External Tariff (CET). In order to modify Venezuela's tariffs, we distinct two cases: if Venezuela's tariffs are higher than CET, they are replaced by the Mercosur CET, but if Venezuela's tariffs are smaller than the CET (we know that there exists a bilateral trade agreement between Venezuela and other country or region), we keep the Venezuela's tariff. This is the case of the bilateral trade agreement between Venezuela and the Andean Community where all applied tariffs are smaller than the MERCOSUR CET. Since Venezuela is a preferential partner of this custom union, we kept the preferential tariffs between the Andean Community members and Venezuela (most of them are equal to zero).

Then, assuming the success of the WTO trade agreement before the EU-MERCOSUR agreement we determine the list of sensitive products in the EU-MERCOSUR trade agreement.

For the WTO agreement we consider the optimistic outcome of the Doha Round. Industrialised countries will reduce agricultural products' tariffs according to the following schedule based on the initial level of the Bound ad valorem Tariff Equivalent (BTE).

$BTE \leq 20\% \Rightarrow$ reduction by 40%

$20\% < BTE \leq 50\% \Rightarrow$ reduction by 45%

$50\% < BTE \leq 75\% \Rightarrow$ reduction by 50%

$BTE > 75\% \Rightarrow$ reduction by 60%, with a tariff cap at 100%

For tariff reduction in non agricultural products, the BTE is reduced by a Swiss formula with a coefficient of 10.

For developing countries tariff in agricultural sectors are cut following the next schedule based on the initial level of the BTE:

$BTE \leq 30\% \Rightarrow$ reduction by 25%

$30\% < BTE \leq 80\% \Rightarrow$ reduction by 30%

$80\% < \text{BTE} \leq 130\% \Rightarrow$ reduction by 35%

$\text{BTE} > 130\% \Rightarrow$ reduction by 40%, with a tariff cap at 150%

For non agricultural products, tariffs are reduced according to a Swiss formula with a coefficient of 18. We also consider non agricultural sensitive products for developing countries with a tariff cut halved represent 10% of the total number of HS6 lines in the industrial sectors. They are chosen in some specific sectors. The automobile sector is considered as totally sensitive for all countries. The remaining HS6 sensitive lines are spread among some sensitive sectors so as to represent an identical share of each of them. The list of sensitive sectors varies with the developing country. For India, the ASEAN countries and the Rest of South Asia, there is no cut at all in sensitive products but they account for only 5% of the total number of HS6 lines in the industrial sectors.

For industrialized and developing countries we also consider sensitive products with reduction rates halved, cap unchanged, accounting for 5% of the tariff lines spread equally among the tiers (except if the highest ones are empty; unused sensitive lines are then used in the next tier), and selected so as to reduce tariff rates as little as possible. This pre-experiment also consider a linear dismantling of export subsidies between 2007 and 2013.

The horizon of tariffs cut for industrialized countries is the 3 years and for developing countries is the 6 years.

No commitment is taken into account for the least developing countries.

All elements related to the WTO are computed based on bound tariffs, whereas bilateral agreements cut bilateral applied tariffs.

## 3.3 Scenarios

The accomplishment of the EU-MERCOSUR trade agreement is subordinated to the multilateral negotiations at the WTO. This is the reason why in our pre-experiment scenarios we assume a successful the multilateral trade agreement before the signature of the bilateral EU-MERCOSUR agreement. The fact that we consider a WTO trade agreement before the EU-MERCOSUR agreement also affect the choice of sensitive products for the bilateral negotiation, this is the second reason which justifies our scenario and pre-experiments.

The horizon of the EU-MERCOSUR agreement is 10 years. For the scenario, the EU-MERCOSUR agreement starts in 2010 with WTO agreement in 2008.

Since October 2004 there would be no new proposal exchanged, we simulate an average agreement between EU and MERCOSUR proposals (October 2004), also including some new TRQs open by the EU for some particular products.

Trade liberalization for this bilateral trade agreement is total and reciprocal for all products except for sensitive and very sensitive products. Sensitive products will be liberalized on 5 years. For the EU, sensitive products are basically agricultural products and they represent 5% of HS6 lines for each agricultural sector. In contrast, for MERCOSUR countries sensitive products are manufacture products and they represent 10% of HS6 lines of each industrial sector. Very sensitive products only exits in the case of the EU. These very sensitive products are products under WTO TRQs such as meats, cereals and some dairy products and other products for which the EU has the intention to open new bilateral TRQs (ethanol, sugar, cacao and tobacco) for the MERCOSUR countries.

Considering the very sensitive products we assume two hypotheses for the scenario. For products under WTO TRQs we simulate a quota enlargement without any change in tariffs (in-quota and out-of-quota). The quota enlargement for these products is based on the comparison of the present utilization of the WTO TRQs of MERCOSUR countries and the new quota volume (average between EU and MERCOSUR proposals, See Table 2). Since in MIRAGE there isn't an explicit modeling of TRQs, the quota enlargement doesn't affect the TRQ regimes (in, at or out-of-quota). The quota enlargement simulated in MAcMaps database only leads to a larger quota rent.

[INSERT Table 2]

For the new bilateral TRQs open to MERCOSUR countries we consider some special tariff lines at 8 and 4 digits level. The new quota for Ethanol would concern only 4 product lines (22071000, 22072000, 22089091, 22089099), for Sugar only 7 products (17025050, ex17499099 (17499080), 18061090, ex18062080 (18069080), ex18062095 (18069080), ex18069090 (18061980), ex18069090 (18069980)), for Cacao and Tobacco all products under the following HS4 codes: 1803, 1804, 1805 for Cacao and 2402, 2403 for Tobacco. The new TRQs will concern 1.5 of traditional bilateral trade between regions.

All the scenarios of trade liberalization (WTO agreement and EU-MERCOSUR agreement) were constructed using MAcMap database at the product level (HS6 level) before aggregating the data towards the sectors used in the CGE model. The advantage of such a strategy is to fully take into account tariff peaks, exceptions and the possible non linearity of the applied tariff reduction formula, such as the Swiss formula for the pre-experiment scenario. Moreover, the quota rents' evolution is extracted from the scenarios and used in the modelling.

This EU-MERCOSUR Agreement will be simulated by considering that the WTO trade agreement was previous signed (2008) according to the most ambitious proposal detailed in the previous subsection.

This EU-MERCOSUR FTA scenario is run under different TRQ modelling hypotheses. The first version of the model does not consider any TRQ treatment. The second version of MIRAGE introduces exogenous TRQ rents from MAcMapHS6-v2 database, which where calculated according to the scenario of tariff reduction. The third version of MIRAGE displays an explicit modelling of TRQ at a detailed level (HS6, partner, reporter).

The idea is to compared with ancient version of MIRAGE but also to compared with aggregated ways to modelling TRQ by other CGE models (GTAP and LINKAGE) in the next version of this paper.

## 3.4 Simulation's Results

*Welfare impact and welfare decomposition:*

Comparing the three different version of the MIRAGE model we find that countries which are not affected by European TRQs, such the EU25 itself and other developed countries, overall welfare changes are not affected by TRQ modeling or not. However, for developing countries and specially for MERCOSUR countries welfare changes seems to be over-estimated if we only consider exogenous TRQ rents from MAcMap database without allowing any TRQ regime change (V2). Its is important to highlight some results, such as for Argentina and Uruguay, because when TRQ rents increases exogenously (V2) they would display welfare gains but if we lead

to shift in TRQ regimes with endogenous rents (V3) they lose in terms of welfare. In the case of Uruguay, we can infer that welfare gains comes from tariff reduction and not from the quota enlargement, because when we do not consider any TRQ treatment (V1) Uruguay welfare also increase (as under V2) but if most sensitive product in the agreement are subjected to a quota enlargement, its welfare decreases because initial (exogenous) quota rents disappear.

[INSERT TABLE 3]

As regards the welfare decomposition, we may better demonstrate previous results on the overall welfare. In the case of all MERCOSUR countries we can see that all Tariff-rate quota gains are over-estimated if rents are exogenous (V2) with respect to endogenous rents (V3). Since most of TRQs are initially just binding (or under the *in-quota regime*), a quota expansion only lead to trade increase with a at-quota prime reduction thus reducing the quota rent. Modeling TRQ regimes also lead to a better explanation of the welfare gains sources. For instance, in the case of Argentina and Brazil, this new TRQ modeling lead to explain welfare gain through efficiency gains of a better resources allocation and also due to land supply gains. For Uruguay, V1 and V2 explain most of its welfare gains by Terms of Trade (TOT) improvement, but it becomes false since TRQ are explicitly modelled because its TOT deteriorates. The decomposition of the EU25 welfare gain does not change from one version to another, because the EU25 seems not to be affected by TRQ modeling.

[INSERT TABLE 4]

[INSERT TABLE 5]

[INSERT TABLE 6]

In short we can say that welfare gains are overestimated if we do not consider the possibility to change from one TRQ regime to another.

*GDP and Trade impact:*

GDP variation display the same tendency as welfare variations. TRQ modelling leads observe one of the characteristic of TRQs: they maintain certain level of protection. In the case of EU27, GDP increase more if TRQs are explicitly modelled than if TRQ rents are exogenous. Moreover for MERCOSUR countries, GDP does not really increase as shown under version 2 but it decreases in some cases, such as for Brazil,Uruguay and Venezuela.

[INSERT TABLE 7]

Considering exogenous TRQ rents, the model does not really affect trade but only welfare results. However, TRQ modelling leads to increase in EU27 imports keeping a certain level of protection for local production (two typical consequences of TRQs). MERCOSUR exports increase under all versions of MIRAGE, but an explicit TRQ modelling avoid to overestimate gains of trade.

[INSERT TABLE 8]

[INSERT TABLE 9]

Because inside each GTAP sector we consider a combination of imports under TRQs and imports under ordinary tariff, trade results display may widely differ from one model version to another. Sensitive sectors in which imports under TRQs have a great importance, a TRQ enlargement leads to higher trade variation, such as for Meat and Meatprod, Agrofood, Sugar and Crops. Different supply elasticities and the fact that TRQs which belong to the same GTAP sector may initially be under different TRQ regimes, also constraint the consequences of a quota enlargement.

[INSERT Table 10

[INSERT Table 11

[INSERT Table 12

[INSERT Table 13

[INSERT Table 14

# 4 CONCLUSION

Simulation results display similar results between version 1 and 2 from MIRAGE. MIRAGE wit exogenous TRQ rents from MAcMap database leads to very similar results to no quota at all. Taking into account the possibility that regimes may shift is therefore very important if one wants to talk about TRQs, as soon as regime changes are expected.

No TRQ regimes and no TRQ regime shifting lead to overestimate welfare variations. The reduction in the out-of-quota tariff leads to more welfare gains for Mercosur (version 1) than increasing the size of a quota (version 2 and 3), but this may depend on which country we consider.

Some possible extension to this work are to distinct WTO and preferential TRQs, because of their differences on allocation and possibility of reallocation between partners. In the case of WTO TRQs without explicit licenses allocation would be interesting to allow a (free) market mechanism to allocate them according to the efficiency criterion. Another possibility and considering TRQ administration methods and market power, it would be interesting to model strategic behaviours between importers and exporters as criterion of import licenses allocation.

Another interesting extension, would be to consider intermediate TRQ regimes defined by De Gorter and Kliauga (2006). These intermediate TRQ regimes are typically observed in the case of WTO TRQs, when for instance on of the importer fill its part of the WTO quota but the rest of partners do not. Under this situation the WTO quota is not filled but the prime over the in-quota tariff would be positive.

Similar situation of unfilled TRQs would be observed due to the restriction of HS6 products that enter under a TRQ regime.

All these and other specifications of TRQ modelling merits more to be study.

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# Model Annexes

Prices equations:

$$P^{TRQ}_{id,i,r,s,t,sim} = PCIF_{i,r,s,t,sim}(1 + \tau^{TRQ}_{id,i,r,s,,t,sim}) \tag{1}$$

$$P^{NTRQ}_{i,r,s,t,sim} = PCIF_{i,r,s,t,sim}(1 + \tau^{NTRQ}_{i,r,s,t,sim}) \tag{2}$$

$$PDEM_{i,r,s,t,sim}DEM_{i,r,s,t,sim} = \sum_{id} P^{TRQ}_{id,i,r,s,t,sim}TRQ_{id,i,r,s,,t,sim} + P^{NTRQ}_{i,r,s,t,sim}NTRQ_{i,r,s,t,sim} \tag{3}$$

Import demand equations:

$$TRQ_{id,i,r,s,,t,sim} = \alpha^{TRQ}_{id,i,r,s}DEM_{i,r,s,t,sim}(\frac{PDEM_{i,r,s,t,sim}}{P^{TRQ}_{id,i,r,s,t,sim}})^{\sigma}_{IMP} \tag{4}$$

$$NTRQ_{i,r,s,t,sim} = \alpha^{NTRQ}_{i,r,s}DEM_{i,r,s,t,sim}(\frac{PDEM_{i,r,s,t,sim}}{P^{NTRQ}_{i,r,s,t,sim}})^{\sigma}_{IMP} \tag{5}$$

TRQ constraints:

$$\tau^{TRQ}_{id,i,r,s,t,sim} = \tau^{in}_{id,i,r,s,t,sim} \qquad if \quad regime \quad 1 \tag{6}$$

$$TRQ_{id,i,r,s,t,sim} = \bar{Q}_{id,i,r,s,t,sim} \qquad if \quad regime \quad 2 \tag{7}$$

$$\tau^{TRQ}_{id,i,r,s,t,sim} = \tau^{out}_{id,i,r,s,t,sim} \qquad if \quad regime \quad 3 \tag{8}$$

TRQ rent equation:

$$QR_{id,i,r,s,t,sim} = (\tau^{TRQ}_{id,i,r,s,t,sim} - \tau^{in}_{id,i,r,s,t,sim})\bar{Q}_{id,i,r,s,t,sim} \tag{9}$$

# Tables and Figures

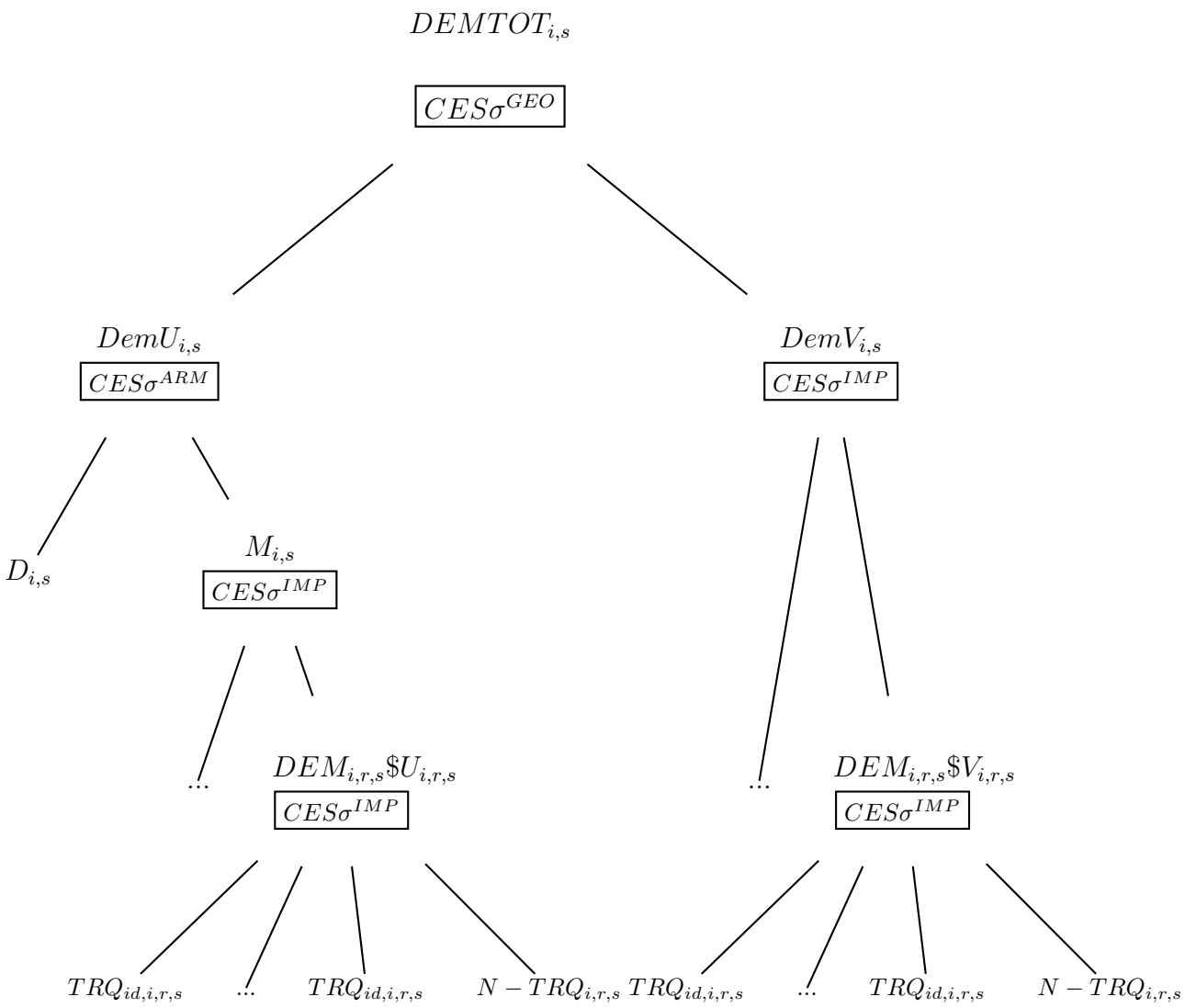


Figure 1: Demand tree with TRQ and non-TRQ imports

Table 1: Sectoral and geographical data aggregation

| Regions | Sectors | |
|---|---|---|
| EU25 | Animalprod | Plantsbf |
| Argentina | Bevandtob | Procrice |
| Brazil | Cattle | Rawmilk |
| Uruguay | Cereal | Sugar |
| Venezuela | Crops | Sugarcb |
| Dped | Dairyprod | VegFruit |
| Dping | Fishing | Vegoils |
| | Foodprod | Wheat |
| | Forestry | Woolsilk |
| | Meat | Primary |
| | Meatprod | Manuf |
| | Oilseeds | Services |
| | Paddyrice | |

Table 2: TRQ enlargement scenario for the EU-MERCOSUR agreement

| Products | EU proposal (TN) | MERCOSUR proposal (TN) | Average Scenario (TN) |
|---|---|---|---|
| Bovine meat | 160000 | 315000 | 237500 |
| Poultry meat | 27500 | 250000 | 138750 |
| Swine meat | 15000 | 40000 | 27500 |
| Wheat | 200000 | 1000000 | 600000 |
| Corn | 200000 | 4000000 | 2100000 |
| Cheese | 20000 | 60000 | 40000 |
| Milk | 13000 | 34000 | 23500 |
| Butter | 4000 | 10000 | 7000 |

Table 3: Welfare results in % variation

| Welfare | Scenario | | |
|---|---|---|---|
| Regions | V1 | V2 | V3 |
| **EU25** | **0.05** | **0.05** | **0.05** |
| Argentina | -0.03 | 0.07 | -0.03 |
| Brazil | -0.10 | -0.06 | -0.13 |
| Uruguay | 0.57 | 0.65 | -0.18 |
| Venezuela | -0.22 | -0.20 | -0.22 |
| **Mercosur** | **-0.08** | **-0.02** | **-0.11** |
| Dped | -0.00 | -0.00 | -0.00 |
| Dping | -0.02 | -0.02 | -0.01 |

Table 4: Welfare decomposition for big countries of MERCOSUR in % variation

| Welfare Decomposition | Argentina | | | Brazil | | |
|---|---|---|---|---|---|---|
| Variables | V1 | V2 | V3 | V1 | V2 | V3 |
| **Allocation efficiency gains** | **-0.06** | **-0.06** | **0.02** | **-0.14** | **-0.14** | **0.00** |
| **Capital accumulation gains** | **0.01** | **0.04** | **0.01** | **0.00** | **0.01** | **-0.01** |
| **Land supply gains** | **0.02** | **0.02** | **0.02** | **0.02** | **0.02** | **0.02** |
| Other gains | -0.00 | 0.01 | -0.08 | 0.05 | 0.05 | -0.09 |
| **Tariff-quota gains** | **0.00** | **0.06** | **-0.00** | **0.00** | **0.02** | **-0.00** |
| **Terms of trade gains** | **-0.01** | **0.00** | **-0.01** | **-0.02** | **-0.02** | **-0.05** |
| Welfare | -0.03 | 0.07 | -0.03 | -0.10 | -0.06 | -0.13 |

Table 5: Welfare decomposition for small countries of MERCOSUR in % variation

| Welfare Decomposition | Uruguay | | | Venezuela | | |
|---|---|---|---|---|---|---|
| Variables | V1 | V2 | V3 | V1 | V2 | V3 |
| **Allocation efficiency gains** | **-0.03** | **-0.02** | **-0.00** | **-0.00** | **-0.00** | **-0.00** |
| **Capital accumulation gains** | **0.16** | **0.18** | **-0.03** | **-0.08** | **-0.08** | **-0.08** |
| **Land supply gains** | **0.16** | **0.16** | **0.01** | **-0.01** | **-0.00** | **-0.01** |
| Other gains | -0.05 | -0.04 | -0.04 | -0.07 | -0.07 | -0.07 |
| **Tariff-quota gains** | **0.00** | **0.04** | **0.01** | **0.00** | **0.01** | **0.00** |
| **Terms of trade gains** | **0.32** | **0.33** | **-0.13** | **-0.06** | **-0.06** | **-0.06** |
| Welfare | 0.57 | 0.65 | -0.18 | -0.22 | -0.20 | -0.22 |

Table 6: Welfare decomposition EU in % variation

| Welfare Decomposition | EU25 | | |
|---|---|---|---|
| Variables | V1 | V2 | V3 |
| **Allocation efficiency gains** | **0.01** | **0.01** | **0.01** |
| **Capital accumulation gains** | **0.01** | **0.01** | **0.01** |
| **Land supply gains** | **-0.00** | **-0.00** | **-0.00** |
| Other gains | 0.01 | 0.01 | 0.02 |
| **Tariff-quota gains** | **0.00** | **-0.00** | **0.00** |
| **Terms of trade gains** | **0.02** | **0.02** | **0.02** |
| Welfare | 0.05 | 0.05 | 0.05 |

Table 7: GDP results in % variation

| GDP volume | Scenario | | |
|---|---|---|---|
| Region | Simasr | Simacr | Simdesag |
| **EU25** | **0.03** | **0.02** | **0.03** |
| **Argentina** | **0.02** | **0.12** | **0.02** |
| **Brazil** | **-0.02** | **0.02** | **-0.03** |
| **Uruguay** | **0.39** | **0.47** | **-0.06** |
| **Venezuela** | **-0.12** | **-0.11** | **-0.12** |
| Dped | -0.00 | -0.00 | -0.00 |
| Dping | -0.01 | -0.01 | -0.01 |

Table 8: Imports results in volume (% variation)

| Imports in value (not intra) | Scenario | | |
|---|---|---|---|
| Region | V1 | V2 | V3 |
| **EU25** | **0.76** | **0.76** | **0.87** |
| **Argentina** | **7.12** | **7.43** | **7.08** |
| **Brazil** | **6.73** | **6.82** | **6.11** |
| **Uruguay** | **6.85** | **6.95** | **2.71** |
| **Venezuela** | **3.07** | **3.09** | **2.96** |
| Dped | -0.11 | -0.11 | -0.08 |
| Dping | -0.05 | -0.06 | 0.04 |

Table 9: Exports results in volume (% variation)

| Exports in value (not intra) | Scenario | | |
|---|---|---|---|
| Regions | V1 | V2 | V3 |
| **EU25** | **0.76** | **0.76** | **0.86** |
| **Argentina** | **6.18** | **5.93** | **6.16** |
| **Brazil** | **7.28** | **7.20** | **6.63** |
| **Uruguay** | **9.91** | **9.82** | **3.81** |
| **Venezuela** | **2.63** | **2.61** | **2.51** |
| Dped | -0.16 | -0.16 | -0.12 |
| Dping | -0.06 | -0.05 | 0.02 |

Table 10: EU27 imports in volume (% variation)

| Sector | V1 | V2 | V3 |
|---|---|---|---|
| **Agro-food** | **4.94** | **4.96** | **9.07** |
| Animalprod | -0.03 | -0.03 | -1.38 |
| **Bevandtob** | **0.33** | **0.33** | **1.75** |
| Cattle | 3.06 | 3.06 | -0.20 |
| Cereal | 0.02 | 0.05 | -0.52 |
| **Crops** | **7.85** | **7.87** | **9.12** |
| **Dairyprod** | **0.41** | **0.41** | **0.19** |
| Fishing | 0.24 | 0.24 | 0.00 |
| **Foodprod** | **4.47** | **4.49** | **11.09** |
| Forestry | 0.50 | 0.49 | 0.40 |
| **Meat** | **0.35** | **0.38** | **20.72** |
| **Meatprod** | **15.03** | **15.08** | **62.85** |
| Oilseeds | 0.19 | 0.21 | -0.10 |
| Paddyrice | 8.93 | 8.97 | 0.05 |
| Plantsbf | 0.09 | 0.09 | -0.02 |
| Procrice | 14.64 | 14.67 | 0.03 |
| Rawmilk | 0.41 | 0.41 | -0.25 |
| **Sugar** | **39.60** | **39.67** | **-0.01** |
| **Sugarcb** | **-3.85** | **-3.86** | **0.04** |
| VegFruit | 3.27 | 3.28 | 9.53 |
| Vegoils | 0.29 | 0.30 | 9.76 |
| **Wheat** | **0.22** | **0.22** | **-0.75** |
| Woolsilk | 0.08 | 0.08 | -0.07 |

Table 11: Argentina Exports in volume (% variation)

| Sector | V1 | V2 | V3 |
|---|---|---|---|
| **Agro-food** | **4.99** | **5.21** | **5.38** |
| Animalprod | 5.10 | 5.24 | -0.28 |
| **Bevandtob** | **2.82** | **2.96** | **1.04** |
| Cattle | 2.18 | 2.44 | -1.18 |
| Cereal | -0.20 | -0.08 | 0.05 |
| **Crops** | **19.00** | **19.29** | **42.07** |
| **Dairyprod** | **0.18** | **0.61** | **1.11** |
| Fishing | 1.80 | 1.87 | 1.45 |
| **Foodprod** | **10.84** | **11.09** | **9.53** |
| Forestry | 0.10 | 0.30 | 0.67 |
| **Meat** | **1.11** | **1.58** | **36.53** |
| **Meatprod** | **31.70** | **32.32** | **64.71** |
| Oilseeds | -0.31 | -0.15 | -0.01 |
| Paddyrice | 13.57 | 13.86 | 0.72 |
| Plantsbf | 0.93 | 1.16 | 1.47 |
| Procrice | 15.86 | 16.16 | 2.44 |
| Rawmilk | -0.76 | -0.29 | -0.25 |
| **Sugar** | **36.65** | **37.00** | **12.66** |
| **Sugarcb** | **-2.14** | **-1.85** | **-0.83** |
| VegFruit | 22.26 | 22.45 | 7.29 |
| Vegoils | 1.16 | 1.46 | 1.87 |
| **Wheat** | **-0.02** | **0.17** | **0.21** |
| Woolsilk | 0.23 | 0.63 | 0.20 |

Table 12: Brazil Exports in volume (% variation)

| Sector | V1 | V2 | V3 |
|---|---|---|---|
| **Agro-food** | **10.61** | **10.69** | **8.48** |
| Animalprod | -0.18 | -0.16 | -0.92 |
| **Bevandtob** | **0.48** | **0.50** | **1.56** |
| Cattle | -0.12 | -0.08 | -0.34 |
| Cereal | -0.26 | -0.22 | 0.33 |
| **Crops** | **14.78** | **14.86** | **16.36** |
| **Dairyprod** | **1.60** | **1.60** | **0.79** |
| Fishing | 1.00 | 1.05 | 1.89 |
| **Foodprod** | **15.28** | **15.35** | **8.46** |
| Forestry | -1.63 | -1.53 | -0.21 |
| **Meat** | **-0.37** | **-0.27** | **9.43** |
| **Meatprod** | **11.66** | **11.79** | **24.59** |
| Oilseeds | 0.06 | 0.10 | 0.88 |
| Paddyrice | 1480.00 | 1480.00 | 1.75 |
| Plantsbf | -0.11 | -0.04 | 1.00 |
| Procrice | 98.28 | 98.48 | 1.04 |
| Rawmilk | -0.89 | -0.76 | 0.98 |
| **Sugar** | **48.48** | **48.63** | **2.91** |
| **Sugarcb** | **-4.49** | **-4.42** | **1.12** |
| VegFruit | 7.53 | 7.57 | 9.58 |
| Vegoils | 1.91 | 2.01 | 3.61 |
| **Wheat** | **-0.93** | **-0.74** | **1.75** |
| Woolsilk | -0.11 | -0.05 | 0.45 |

Table 13: Uruguay Exports in volume (% variation)

| Sector | V1 | V2 | V3 |
|---|---|---|---|
| **Agro-food** | **23.07** | **23.23** | **5.87** |
| Animalprod | -0.12 | -0.05 | 0.74 |
| **Bevandtob** | **-1.08** | **-1.03** | **2.17** |
| Cattle | -1.84 | -1.78 | 1.33 |
| Cereal | -2.12 | -2.05 | 1.81 |
| **Crops** | **-1.69** | **-1.60** | **5.17** |
| **Dairyprod** | **-9.10** | **-8.97** | **1.69** |
| Fishing | -2.09 | -2.04 | 0.78 |
| **Foodprod** | **-3.08** | **-3.01** | **4.91** |
| Forestry | -3.56 | -3.46 | 2.59 |
| **Meat** | **-6.49** | **-6.35** | **10.71** |
| **Meatprod** | **44.08** | **44.35** | **-12.81** |
| Oilseeds | 0.82 | 0.83 | 1.85 |
| Paddyrice | 575.71 | 577.36 | 3.41 |
| Plantsbf | -2.53 | -2.43 | 2.19 |
| Procrice | 41.76 | 41.86 | 4.10 |
| Rawmilk | -7.63 | -7.40 | 2.33 |
| **Sugar** | **47.39** | **47.57** | **2.96** |
| **Sugarcb** | **-7.11** | **-6.92** | **4.28** |
| VegFruit | 14.41 | 14.52 | 12.20 |
| Vegoils | -5.08 | -5.04 | -0.38 |
| **Wheat** | **-9.16** | **-8.95** | **3.96** |
| Woolsilk | -11.74 | -11.37 | 8.00 |

Table 14: Paraguay Exports in volume (% variation)

| Sector | V1 | V2 | V3 |
|---|---|---|---|
| **Agro-food** | **8.88** | **8.90** | **4.16** |
| Animalprod | 1.37 | 1.39 | 0.90 |
| **Bevandtob** | **3.24** | **3.26** | **1.22** |
| Cattle | 2.93 | 2.97 | 2.67 |
| Cereal | 1.41 | 1.43 | 1.74 |
| **Crops** | **2.71** | **2.76** | **2.71** |
| **Dairyprod** | **8.17** | **8.24** | **7.08** |
| Fishing | 1.36 | 1.38 | 1.51 |
| **Foodprod** | **4.49** | **4.50** | **4.06** |
| Forestry | 2.20 | 2.23 | 2.53 |
| **Meat** | **9.11** | **9.16** | **6.32** |
| **Meatprod** | **11.96** | **12.01** | **10.61** |
| Oilseeds | 2.45 | 2.46 | 2.83 |
| Paddyrice | 6.45 | 6.55 | 9.69 |
| Plantsbf | 2.89 | 2.93 | 3.24 |
| Procrice | 8.68 | 8.71 | 8.30 |
| Rawmilk | 7.51 | 7.59 | 7.70 |
| **Sugar** | **4.14** | **4.17** | **4.66** |
| **Sugarcb** | **2.02** | **2.07** | **3.88** |
| VegFruit | 70.97 | 71.03 | 15.98 |
| Vegoils | 6.98 | 7.00 | 8.38 |
| **Wheat** | **4.40** | **4.46** | **4.89** |
| Woolsilk | 10.13 | 10.25 | 11.72 |