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How does Tariff-rate quota modelling affect CGE results? an application for MIRAGE

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How does Tariff-rate quota modeling affect CGE results? an application for MIRAGE*

Yvan Decreux †and Maria Priscila RAMOS‡

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Abstract

Since the Uruguay Round Agricultural Agreement (URAA) entered into force in 1994, tariff-rate quotas (TRQs) have become the most widely used trade policy instrument to improve agricultural market access while at the same time controlling import volumes. Such is the case in many agricultural markets in which protection level is very high, such as the beef and sugar markets in the European Union or in the United States. Until now, the MIRAGE CGE model only takes into account the exogenous quota rents (MAcMap-HS6 database) allocated entirely to exporters. Unfortunately, this methodology does not authorise any regime when trade policy changes (e.g. a quota-volume increase for very sensitive agricultural products or a tariff reduction). In order to improve the treatment of TRQs in MIRAGE we model them as bilateral TRQs at the 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 modeling and we compare its results to the present version of MIRAGE (aggregation biases and TRQ modeling). The macroeconomic and trade results give us an idea of the biases introduced by the negligence of TRQ modeling.

Keywords: Tariff-rate quota, TRQ, TRQ administration methods, CGE model, MIRAGE.
JEL Classification: F13, F15, F17, Q17.

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1 INTRODUCTION

The Uruguay Round Agreement on Agriculture (URAA) introduces tariff-rate quotas (TRQs) in order to improve market access of commodities that were subject to prohibite tariffs or Non-Tariff Barriers (NTBs) such as simple quotas. The purpose of implementing TRQs on highly protected agricultural products was to guarantee a minimum level of market access (established first at 3% of domestic consumption, then expanded to 5%), to safeguard current levels of access ("current-access quotas"). In addition, another reason for implementing TRQs was to maintain existing market access conditions, in particular those granted to developing by developed countries, such as the European Union, Japan and the United States, for historical reasons.

This policy instrument is defined as followed: "Tariff-rate quotas 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 three possibles regimes: the *in-quota* regime (quota unfilled and the in-quota tariff applied to imports), the *at-quota* regime (quota just filled and the equilibrium price includes a prime over the in-quota tariff) and the *out-of-quota* regime (imports exceed the quota and the applied tariff is the out-of-quota tariff). Most bilateral TRQs display "in-quota" and "at-quota" regimes because most out-of-quota tariffs are prohibitive. Nevertheless, some exceptions appear according to the economic conjuncture (i.e. beef TRQs allocated to Mercosur countries have been consistently exceeded over the last period in spite of the very high specific component of the out-of-quota tariff). The TRQ equilibrium regime depends on tariff and quota levels as well as import demand and export supply functions, but also on the TRQ administration methods, which affect the volume of trade and the distribution of the TRQ rent between importers and exporters. De Gorter and Kliauga (2006) introduce other intermediate TRQ regimes that may appear in the case of WTO TRQs. However, these regimes are not considered in this paper because we focus here on bilateral TRQs based on data from the MAcMapHS6 database.

Most Computable General Equilibrium (CGE) models have tried to introduce TRQ modeling, but they remain far from the true market behavior when markets are affected by TRQs. The standard version of the MIRAGE model only considers exogenous TRQ rents and their reduction under different liberalization scenarios (Decreux and Valin, 2007). Even if the TRQ rents are defined at the HS6 level, this way of modeling is quite limited, because it does not give the possibility to shift from one TRQ regime to another as a consequence of an external shock. Moreover, the assumption that the whole TRQ rent is allocated to exporters is not always accurate as such allocation depends on the TRQ administration method, the market power of traders, etc. The GTAP model (Elbehri and Pearson, 2000; Berrettoni and Cicowiez, 2002) and the LINKAGE model (van der Mensbrugghe, 2001; Van der Mensbrugghe et al., 2003) also introduce TRQ modeling at an aggregate level. The advantage of their modeling is a distribution of quota-rents between importers and exporters, based on information about quota allocation or TRQ administration methods. However, they still have some limitations as TRQs are assumed to concern entire GTAP sectors, adding up imports under TRQ regimes and imports under ordinary tariffs (introducing a possible bias due to data aggregation). Furthermore, no distinction is made between multilateral TRQs (where allocation is not always explicit) and preferential TRQs granted under preferential trade agreements (PTA) (where allocation is known); all of them are treated as bilateral TRQs. This paper does not provide any improvement on this second point.

The purpose of this paper is to examine the implications of different TRQ modelings for macroeconomic and trade indicators. We compare different versions of the MIRAGE model:
(i) without any consideration of TRQs,
(ii) with exogenous TRQ rent and
(iii) with explicit TRQ modeling at a very detailed level.

Section 2 discusses the literature about the economics of TRQs and TRQ modeling in partial and general equilibrium frameworks. Section 3 presents the new specification of TRQ modeling in the MIRAGE model. Section 4 presents an application case (EU-Mercosur PTA) in order to compare the results of the different MIRAGE versions. The EU-Mercosur PTA example has been chosen because TRQs are the most useful and controversial trade policy instrument in agriculture liberalization between these economic blocs. The final Section concludes about the relevance of TRQ modeling in a CGE framework and also some forthcoming extensions in TRQ modeling.

2 Tariff-Rate Quotas: Economics and modeling

The impact of a quota-volume expansion critically depends on the initial effective protection, the import elasticity and the TRQ administration methods. First, the TRQ equilibrium regime determines the TRQ component (tariff or quota) that constrains imports. In this model we distinguish three basic regimes: the *in-quota regime* (the quota is not filled and the tariff is the in-quota tariff, τ_{in}); the *at-quota regime* (the quota is binding and the applied tariff-equivalent, τ_m, is endogenously determined, with $\tau_{in} \leq \tau_m \leq \tau_{out}$); and the *out-of-quota regime* (imports exceed the quota level and the out-of-quota tariff, τ_{out}, is the effective trade policy instrument).

Second, the import elasticity determines how quickly one regime shifts to another when trade policy changes.

Finally, TRQ administration methods also affect the quota fill. They not only affect the volume and distribution of trade between partners, but they also have a considerable impact on the distribution of TRQ rents. 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 is applied on almost half of TRQs, but the *License-on-demand* (allowing the possibility to resale licenses) and *Auction* methods are the most efficient ones because they reduce allocative inefficiencies in products markets and political discretion (and thus rents) in trade allocation (Abbott, 2002; Bureau and Tangermann, 2000; Skully, 1999).

The capture of the TRQ rent is also explained by the presence of an importer (or exporter)'s market power (Olarreaga and Ozden, 2005). The quality composition of exports, the changes in world prices (or import prices) after the agreement, and the differentiation of imports across origins also explain who captures the TRQ rent. This aspect of TRQs is an important question by its welfare and trade implications, and it deserves to be addressed in detail; however, it is not the purpose of this paper.

The modeling of TRQs in a CGE framework has been implemented by several authors. Elbehri and Pearson (2000) have introduced them in the GTAP model (Hertel, 1997) using the GEMPACK code from Harrison and Pearson (1996) and they use it to study bilateral TRQs in the sugar sector. Berrettoni and Cicowiez (2002) from the Centro de Economia International (CEI) run the GTAP model to simulate the EU-Mercosur PTA by comparing two different scenarios: a quota enlargement and a reduction in the out-of-quota tariff. All scenarios are welfare-improving for both regions but gains come from different sources depending on the scenario (i.e. in the case of Argentina, a quota enlargement leads to a greater quota rent while an out-of-quota tariff reduction increases trade, therefore reducing quota rents.)

The LINKAGE CGE model from the World Bank relies on the Mixed Complementarity Problem (MPC) methodology to implement TRQs (van der Mensbrugghe, 2001). MCP is based on orthogonality 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, which lower bound is zero. Two regimes, in-quota and at-quota, may be deduced from this condition. The second orthogonality condition states that the quota premium-rate is capped at the difference between the out-of-quota and the in-quota tariffs and it is associated with a lower bound for the out-of-quota imports (also equal to zero). Van der Mensbrugghe et al. (2003) test the LINKAGE TRQ modeling in the case of TRQ reforms in the sugar market by the most important OECD countries, such as the EU, the Unites States and Japan. Their conclusions highlight the trade-diversion effects induced by TRQs as well as welfare gains for countries benefiting from TRQ bilateral allocations (least-developed countries).

The originality of these previous models is the consideration of the TRQ rent-sharing between importers (government) and exporters,[1] which is crucial for welfare implications and export incentives. Their disadvantage lies in the fact that entire sectors, such as Meat or Sugar (identified in the GTAP database), are assumed to be under TRQ regimes which is not necessarily true.[2] Using aggregated data at the GTAP sector level may lead to biased results. Our proposed TRQ modeling aims at minimizing these aggregation biases.

When all individual quotas are aggregated into large quotas at the sector level, several possibilities appear to compute their parameters and to define the equilibrium regimes. Van der Mensbrugghe et al. (2003) assume that the aggregate sector is in an at-quota regime as soon as some individual quotas are binding. Therefore the size of the quota has to be equal to actual trade, while the premium is computed based on individual rents. By contrast, Lips and Rieder (2002) assume that a sector is in an out-of-quota regime as soon as one product exceeds its quota. It allows them to keep the actual size of the quota, but then, several options appear to compute inside and outside tariffs. They analyze two different methods for the GTAP model. The first method is based on the aggregation of in and out-of-quota tariffs using trade as a weighting scheme (the second one being provided by the GTAP database); the second method starts from the actual quota rent as the sum of all individual rents and from a trade-weighted outside tariff, which leads to the endogenous determination of the inside average tariff. When the sector is in-quota and out-of-quota regime but some individual quotas are not, tariff aggregation leads to an overestimation of the quota rent at the GTAP sector level, while keeping the actual rent as the base for the tariff gap leads to an overestimation of the inside tariff. They use both methods as a sensitivity analysis for their estimations.

[1] Van der Mensbrugghe et al. (2003) assume that the quota rents are shared in exogenous proportions that depend on importers and exporters, while Elbehri and Pearson (2000) and Berrettoni and Cicowiez (2002) assume them to be allocated equally between importers and exporters.

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

3 Modeling Tariff-Rate Quotas in MIRAGE

3.1 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 manufacturing 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 modeled in each region through the representative agent assumption. Firstly, domestic products are assumed to be less substitutable to foreign products than foreign products are to each other. Secondly, products originating in developing countries and in developed countries are assumed to belong to different quality ranges. This assumption is based on empirical evidence of quality differences even at the most detailed level of product classification, and on the idea that the composition of identical aggregate sectors may be actually quite different between a developing country and an industrialized one. This assumption is likely to have direct consequences on the transmission of liberalization shocks, as 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 modeling exercise, such as the one undertaken here, differentiation is modeled 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 the value-added production function 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 value-added 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 the industrial and service sectors (through a constant marginal cost and a fixed cost, expressed in output units). In those sectors, competition is imperfect. This modeling allows the pro-competitive effect of trade liberalization to be captured.

Capital good has the same composition regardless of the sector; it cannot change its 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 result of investments in the most profitable sectors. Natural resources are considered to be perfectly immobile and may not be accumulated. Both types of labor (skilled and unskilled) are assumed to be perfectly mobile across sectors, whereas imperfect land mobility is modeled 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. In the baseline, TFP is determined endogenously but under the simulation scenarios it becomes fixed, while GDP is calculated endogenously.

The model uses the GTAP database 6.1. However, instead of relying on modeling tariff cuts at the sector level, we use a detailed database (MAcMapHS6) at the HS6 level (5,113 products) for border protection. TRQ data (in, at and out-of-quota tariffs, quota levels and imports under TRQs) are also provided at the HS6 level. This allows analysis to be based on actual applied tariffs, including preferential provisions (e.g. GSP, FTAs, etc.), and to build scenarios based on the sensitivity of products as revealed by actual trade policy. In the simulation presented later, tariff databases used to describe the initial situation and construct scenarios of trade liberalization are MAcMapHS6-v2, corresponding to year 2004, for TRQs applied by the EU to Mercosur, and MAcMapHS6-v1, which describes market access in 2001, for the remaining information (Bouët et al., 2004).

3.2 TRQ modeling in MIRAGE

Our improvement of TRQ modeling for MIRAGE aims at avoiding aggregation biases discussed above, and thus TRQs are introduced at a more detailed level (bilateral TRQs at the HS6 level) than GTAP data. This implies to modify the demand tree and include new branches (see Figure 1). A further CES nesting level is added to the sub-utility function in order to distinguish between imports under TRQs and imports under ordinary tariffs.

[INSERT Figure 1]

For imports under TRQs the information is disaggregated (bilateral TRQs at the HS6 level) and each GTAP sector may contain one or more TRQs (Equations 1 and 3); however, for non-TRQ imports, data remains aggregated at the GTAP-sector level (Equations 2 and 4).

$$TRQ_{id,i,r,s,,t,sim} = \alpha^{TRQ}_{id,i,r,s} DEM_{i,r,s,t,sim} \left(\frac{PDEM_{i,r,s,t,sim}}{P^{TRQ}_{id,i,r,s,t,sim}} \right)^{\sigma}_{IMP} \tag{1}$$

$$NTRQ_{i,r,s,t,sim} = \alpha^{NTRQ}_{i,r,s} DEM_{i,r,s,t,sim} \left(\frac{PDEM_{i,r,s,t,sim}}{P^{NTRQ}_{i,r,s,t,sim}} \right)^{\sigma}_{IMP} \tag{2}$$

$$P^{TRQ}_{id,i,r,s,t,sim} = PCIF_{i,r,s,t,sim} \left(1 + \tau^{TRQ}_{id,i,r,s,,t,sim} \right) \tag{3}$$

$$P^{NTRQ}_{i,r,s,t,sim} = PCIF_{i,r,s,t,sim} \left(1 + \tau^{NTRQ}_{i,r,s,t,sim} \right) \tag{4}$$

Within a sector containing TRQs, individual products are assumed to be imperfectly substitutable to each other. The elasticity has been assumed to be the same as the elasticity between products originating from different countries belonging to the same quality group.

The import price for GTAP sectors containing TRQs is a CES index price composed by TRQ and Non-TRQ prices (Equation 5). It depends on non-TRQ tariffs and TRQ-regimes changes.

$$\begin{aligned} PDEM_{i,r,s,t,sim} DEM_{i,r,s,t,sim} = & \sum_{id\$(id,i,r,s)} P^{TRQ}_{id,i,r,s,t,sim} TRQ_{id,i,r,s,t,sim} + \\ & + P^{NTRQ}_{i,r,s,t,sim} NTRQ_{i,r,s,t,sim} \end{aligned} \tag{5}$$

In order to model the possibility of TRQ-regime changes, we need to introduce some extra conditions. We define three TRQ-regimes: *in-quota*, *at-quota* and *out-of-quota regimes.*

In-quota regime	if $TRQ_{id,i,r,s,t,sim} < \bar{Q}_{id,i,r,s,t,sim}$	$\tau^{TRQ}_{id,i,r,s,t,sim} = \tau^{in}_{id,i,r,s,t,sim}$
At-quota regime	if $TRQ_{id,i,r,s,t,sim} = \bar{Q}_{id,i,r,s,t,sim}$	$\tau^{in}_{id,i,r,s,t,sim} < \tau^{TRQ}_{id,i,r,s,t,sim} < \tau^{out}_{id,i,r,s,t,sim}$
Out-of-quota regime	if $TRQ_{id,i,r,s,t,sim} > \bar{Q}_{id,i,r,s,t,sim}$	$\tau^{TRQ}_{id,i,r,s,t,sim} = \tau^{out}_{id,i,r,s,t,sim}$

The equilibrium under the first regime is characterized by imports lower than the quota level, the in-quota tariff being the effective protection. Under the second regime, the quota is binding and the prime over the in-quota tariff is endogenously determined. The out-of-quota regime considers an equilibrium in which the out-of-quota tariff is the effective protection because imports exceed the quota level.

[INSERT Figure 2]

The conditions which lead to TRQ-regime shifting (Table 1) are the following: if a TRQ is initially under the in-quota regime but imports exceed the quota level, then the TRQ-regime shifts to the at-quota regime. Conversely, if a TRQ is under an at-quota regime and the endogenous tariff-equivalent is lower than the in-quota tariff, then the TRQ-regime shifts to the in-quota regime. For all other TRQ-regime changes the mechanisms are similar.

[INSERT Table 1]

TRQ rents depend on the premium-rate over the in-quota tariff and the quota volume, as described in Equation 6. All TRQ rents at the detailed level are added to obtain the rent at the GTAP sector level. These rents increase exporters' revenues and may become an important source of welfare gain, as it is assumed in the standard version of MIRAGE: the full rent is captured by exporters.

$$QR_{id,i,r,s,t,sim} = (\tau^{TRQ}_{id,i,r,s,t,sim} - \tau^{in}_{id,i,r,s,t,sim})\bar{Q}_{id,i,r,s,t,sim} \quad (6)$$

In order to match TRQ information at the HS6 level and GTAP data, a multi-dimension mapping has been defined to show which TRQ (bilateral and at the HS6 level) belongs to each particular import demand (bilateral trade and at GTAP-sector aggregation).

As we have seen in the TRQ literature this way of modeling is supposed to avoid some aggregation biases affecting welfare and trade results; however, computational difficulties are likely to emerge at high levels of region and sector disaggregation. Forthcoming researches about TRQ modeling in MIRAGE will examine an aggregated TRQ model (minimizing aggregation biases) to address this difficulty.

4 The EU-Mercosur PTA: an example of TRQ modeling

Mercosur (Argentina, Brazil, Paraguay, Uruguay and Venezuela) is the most important EU partner in Latin America (50% of EU exports to the region) and inversely the EU is the destination market of more than 30% of Mercosur agricultural and food exports.

Mercosur countries are developing countries, which are therefore eligible for the EU Generalized System of Preferences (GSP), and some of them, such as Venezuela, benefit from the GSP+ with a duty exemption over approximately 85% of their exports. However, their access to the EU market is constrained by the limited GSP coverage for agricultural products and by the GSP graduation for the largest Mercosur countries (Argentina and Brazil).

TRQs defined under the Uruguay Round Agriculture Agreement (URAA) allow Mercosur countries to benefit from preferential tariffs for some of their agricultural exports. These are either current-access TRQs, opened to ensure persistence of historical preferential trade flows, or minimum-access TRQs, granted to open 5% of the domestic consumption to international competition (all WTO members).

The EU has opened more than 80 TRQs on agricultural products under either current or minimum access. Most of them are administered according to the License-on-Demand, Historical-trade and First-come/First-served methods. Mercosur benefits 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 benefit from large quotas of food (Argentina) and meat (Brazil and Argentina), and fruits and vegetables (Brazil), while Uruguay and Paraguay only have a smaller (bovine) meat quota and a tiny quota for dairy products (Uruguay). Venezuela does not use TRQs because it faces more duty free tariff lines given by the GSP+.

Under the EU current-access TRQs, Argentina and Uruguay benefit from a preferential access with a limit of 23,000 tons and 5,800 tons for sheep and goat respectively, and under minimum access these counties benefit from TRQs for beef and nutritional remainders (Argentina). Argentina also benefits from a WTO quota for garlic, which is not fulfilled as is the case for beef TRQs (Bureau et al., 2006).

Mercosur countries also benefit from the "Hilton" TRQ for (fresh) meat (28,000 tons for Argentina, 6,300 tons for Uruguay, 5,000 tons for Brazil and 1,000 tons for Paraguay), whose licenses are managed by the exporter countries. This aspect explains Mercosur's producers interests in keeping TRQs instead of negotiating MFN tariff reductions. The only country that does not fulfill its quota is Paraguay due to sanitary problems. The Hilton in-quota tariff is 20% and the out-of-quota tariff is a mixed tariff (12.8% plus a specific tariff between 140 and 300 €per 100kg depending to the HS tariff line). 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. In the beef case, 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). For instance in 2003, Brazil exported out of quota some 80,000 tons of frozen meat and 41,000 tons of Hilton meat. In this last case, outside exports represented eight times Brazil's quota. Brazil also benefits from the TRQs opened under minimum-access for poultry (not allocated to a particular country) and 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).

The accession of some EU members also leads to improve Mercosur access to the European market. Since the adhesion of Spain and Portugal to the EU, Mercosur countries have also benefited from a corn TRQ (2,5 million tons). This quota no longer exist because the tariff for seeds is duty-free and non-tariff barriers (OGM restrictions) protect the EU market from Mercosur's maize. Since 2006 and for a few tariff lines, the EU has opened a 244,000-ton WTO TRQ for flint maize from which Argentina and Brazil benefit. Brazil also benefited from a 82,000-ton sugar TRQ granted by Finland before it became an EU member, but recently Brazil's possibilities to export sugar to the EU have been enlarged.

In order to improve the EU-Mercosur relations, in 1995 both regions agreed on the negotiations' take-off; however, after more than 10 years and several negotiation rounds, no agreement was signed. According to the proposals exchanged, the EU would only open its agricultural market to Mercosur through the enlargement of the present TRQs and the opening of some new quotas for specific products (sugar, tobacco and ethanol).

The predominance of TRQs as proposed measures in the EU-Mercosur negotiation has motivated our decision to take it as an illustration of some different TRQ modeling possibilities in a CGE framework.

4.1 TRQ Data description

According to the new TRQ database from MAcMapHS6-v2, 32 countries have opened TRQs under the rules of the WTO as well as under some PTAs. All WTO members benefit from these TRQs but they are not equally allocated between partners. The allocation is sometimes determined by importers. Agricultural products are most affected by this trade policy instrument, since more than 450 agricultural products and only 24 non-agricultural products are constrained 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, the United States, Korea and the EU generate the greatest rents with their TRQs, while the most concerned products are meat (chapter 02), cereals (chapter 10), oilseeds (chapter 12) and beverages and tobacco (chapter 24). Because most of these TRQs are allocated to a few partners and TRQ rents are assumed to be entirely captured by exporters (MIRAGE model assumption), rents would be concentrated on a few countries (i.e. the United States, Brazil, Australia, Argentina and the European Union). This geographical distribution of quota rents is also the consequence of the choice of sensitive products by major importers, combined to the sectoral specialization of major exporters.

For the EU-Mercosur PTA example, we only consider EU TRQs. Large number of TRQs have been opened by the EU for particular sectors, such as Food products, Dairy products, Meat and Meat products, and Vegetables and Fruits. For some of these sectors (Dairy products, Meat, Cattle, and Fruits and Vegetables) more than 20% of EU imports enters under TRQ regimes, this is particularly true for imports originating in Mercosur. For instance, more than 60% of dairy imported products and almost 30% of imported meat coming from Argentina enter in th European market under TRQ regimes (Figure 3).

[INSERT Figure 3]

Concerning this model and the GTAP data, we have defined a specific aggregation in 7 regions and 25 sectors, using all the sectoral detail available in the GTAP database for agricultural products (see Table 2).

[INSERT Table 2]

4.2 Pre-experiment

Before simulating the bi-regional agreement scenario, we carried out a traditional pre-experiment in MIRAGE which takes into account the end of the Multi-Fibers agreement, the United States' farm bill and China as a WTO member. In addition, we added some assumptions specific to this paper.

For this particular simulation, we consider Venezuela as a Mercosur member since 2006, and thus we have replaced Venezuela's tariff by those of Argentina. In order to modify Venezuela's tariffs, we distinguish two cases: if Venezuela's tariffs are higher than those of Argentina, they are replaced by the latter, but if Venezuela's tariffs are lower than Argentina's tariffs, we keep the original Venezuela's tariff to acknowledge the bilateral trade agreements between Venezuela and other countries or regions. For instance, as a preferential partner of the Andean Community, Venezuela applies lower (generally zero) tariffs to the members of this customs union than the Mercosur Common External Tariffs (CET).

In computing the baseline, we assume that the Doha Round will be successful. Therefore industrialized 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% => 40% reduction

20% $<$ BTE $\leq$ 50% => 45% reduction

50% $<$ BTE $\leq$ 75% => 50% reduction

BTE $>$ 75% => 60% reduction, with a tariff cap at 100%

The BTE is reduced by a Swiss formula with a coefficient of 10 in non-agricultural products.

For developing countries tariffs in agricultural sectors are cut according to the following schedule based on the initial level of the BTE:

BTE $\leq$ 30% => 25% reduction

30% $<$ BTE $\leq$ 80% => 30% reduction

80% $<$ BTE $\leq$ 130% => 35% reduction

BTE $>$ 130% => 40% reduction, with a tariff cap at 150%

For non-agricultural products, bound tariffs are reduced according to a Swiss formula with a coefficient of 18. We also consider the possibility of non-agricultural sensitive products for developing countries by allowing them to implement a tariff cut corresponding to only half of what it should be according to the formula, for 10% of the total number of HS6 lines in industrial sectors. The tariff lines are chosen within some specific sectors. The automobile sector is considered 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 developing country.

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 considers a linear dismantling of export subsidies between 2007 and 2013.

The horizon of tariff cuts for industrialized countries is 3 years while it is 6 years for developing countries.

No commitment is taken into account for the least-developed countries.

Multilateral liberalization at the WTO is computed based on bound tariffs, whereas the bilateral agreement described later in the paper, will cut bilateral applied tariffs.

4.3 Bilateral liberalization scenario

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 scenario, we assume a successful multilateral trade agreement before the signature of the bi-regional EU-Mercosur agreement. This assumption also affects the choice of sensitive products for the bilateral negotiation, this is the second reason which justifies our scenario and pre-experiments.

The criterion to determine sensitive products for both regions is the level of protection. For the EU, sensitive products concern tariff lines for which applied tariffs exceed 40% as well as tariff lines where TRQs have been opened. In the case of Mercosur sensitive products, we consider all tariff lines which level of applied protection exceeds 15%. Otherwise, products are not sensitive and they will be immediately liberalized. EU sensitive-products' list is mainly composed by agricultural and food products while Mercosur sensitive products are mostly manufactured goods. Since October 2004 there has been no new proposal exchanged. Therefore we simulate an agreement that correspond to the average between EU and Mercosur October 2004 proposals, also including some new EU TRQs for some particular products. For Mercosur sensitive products, tariffs are cut 5 years after the beginning of the agreement whereas for the EU sensitive products, no tariff cut is assumed but quotas will be expanded (i.e. meat, cereals, dairy products and food) and some new TRQs will be created (i.e. some sugar products, ethanol, cacao and tobacco).

For products under WTO TRQs we simulate a quota enlargement without any change in tariffs (in-quota and out-of-quota). From the initial volume as measured by the present utilization of the WTO TRQs by Mercosur countries, an increase of the TRQ volumes is implemented based on the average between the EU and Mercosur proposals (see Table 3).

[INSERT Table 3]

As for new bilateral TRQs opened for Mercosur countries, we consider two cases. For some products we follow the EU proposal in which new quotas are only opened for some particular tariff lines at the 6-digit and 8-digit levels. The new TRQ 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 Cocoa and Tobacco all products under the following HS4 codes: 1803, 1804, 1805 for Cocoa, and 2402, 2403 for Tobacco. For the other sensitive products, new TRQ volumes correspond to 150% of the current observed imports of the EU from Mercosur countries.

All scenarios of trade liberalization (the WTO agreement in the baseline and the EU-Mercosur agreement in the simulation) were constructed using the MAcMapHS6 database at the product level (HS6 level) before aggregating the data toward the sectors used in the CGE model. The advantage of such a strategy is to take into account exceptions and the non-linearity of the applied tariff reduction formula, such as the Swiss formula for the pre-experiment scenario.

The EU-Mercosur agreement assumed in the liberalization scenario starts after the beginning of the implementation of the WTO agreement (most ambitious proposal) in 2007, and is assumed to be completely achieved by 2014.

This EU-Mercosur PTA scenario is run under different TRQ modeling hypotheses. The first version (V1) of the model does not consider any TRQ treatment so that only tariff reductions are implemented. The second version (V2) of MIRAGE introduces exogenous TRQ-rents, calculated according to the PTA scenario using the MAcMapHS6-v2 database. The third version (V3) of the model displays an explicit modeling of TRQ (HS6, partner, reporter) allowing TRQ-regimes shifting. Finally, we use the same disaggregated variant of Mirage as the one used for V3 but without any TRQ changes (V3nq standing for V3 no quota).

The aim of this example is to highlight modeling biases linked to data aggregation and the lack of TRQ modeling with TRQ-regime shifting. In order to isolate data aggregation biases, we will compare V1 and V3nq. No TRQ shocks are assumed in these versions and they only differ in terms of the degree of data aggregation (V1 at GTAP sectors/regions aggregation and V3nq at the HS6 level for some trade and protection data). As tariffs may vary strongly within those sensitive sectors, the aggregation bias may be not negligible, and should not be confused with the impact of modeling quotas at the detailed level with the possibility of regime changes. Therefore, what matters is the difference brought by V2 as compared to V1, which is compared to the difference of V3 as compared to V3nq. The first difference tells what quota changes imply in an aggregated framework with no regime change, while the second difference tells us the same thing in the disaggregated version with regime changes. All results are detailed in the following subsection.

4.4 Simulation results

Welfare, welfare decomposition and other macroeconomic impacts:

In this subsection we will analyze the impact of the EU-Mercosur PTA in terms of welfare and other macroeconomic indicators. The idea is to elucidate the relevance of the TRQ modeling in welfare and macroeconomic results, isolating them from data aggregation biases.

Looking at welfare and GDP at world level, we find that data aggregation (V1 vs. V3nq) does not introduce any bias in the results; however, major differences appear when we compare V2 to V3. TRQ modeling in V3 permits a market access improvement, leading to a greater GDP and thus a greater welfare at the world level. By contrast, the simplification of just increasing rents based on exogenous TRQ rents from MAcMapHS6-v2 in V2 does not lead to these gains and thus underestimates welfare improvement at the world level.

Focusing on countries' welfare and their welfare decomposition gains, we also find that there is no bias explained by data aggregation. Welfare variations between V1 and V3nq do not differ for any country; however, welfare decomposition shows that allocation efficiency gains are greater when using disaggregated data (V3nq) rather than using all data at the GTAP level (V1). Protection data at a more detailed level leads to attribute an important part of welfare gains to the improvement of resource allocation.

The biases in countries' welfare are, however, explained by TRQ modeling. We find that the TRQ simplification through exogenous TRQ rents overestimates welfare gains, because no TRQ regime change is allowed. The lack of TRQ modeling do not consider the possibility that a quota expansion may reduce the marginal tariff leading to smaller (or even zero) rents. This fact is observed in the case of Argentina, Brazil and Uruguay welfare. Conversely, for the other regions, V2 displays welfare losses that are not confirmed by V3 results. Liberalizing trade through TRQs also lead to increased welfare for the rest of the world and for the EU25 according to V3, as compared to the baseline scenario. The EU benefits from a better allocation of resources since market access has been improved instead of just creating rents for Mercosur countries as in V2. As for the rest of the world, they actually benefit from the increase in agricultural exports by Mercosur countries, which leads them into specializing more in industrialized sectors, characterized by increasing returns to scale at the industry level through the imperfect competition mechanism. By contrast, welfare loss for the rest of the World in the V2 simulation is the logical consequence of the trade diversion implied by the bilateral agreement between Mercosur and the EU, without any positive mechanism to compensate it like the one mentioned. The overestimation of Mercosur gains under V2 is due to the opposite mechanism. While Mercosur countries benefit from rent increases, they still do not export more agricultural products, so that they continue to benefit from economies of scale in the industrial sectors.

Welfare gain composition is also affected by the TRQ modeling. Under V3, most welfare gains are explained by mechanisms other than TRQ rent increases (more efficient allocation of resources, capital accumulation and terms of trade improvement), while unsurprisingly under V2 they are mainly composed by capital accumulation and the exogenous strong increase of TRQ rents.

Regarding other macroeconomic indicators at the country level, such as employment (agricultural and non-agricultural), real wages and GDP, the consequences on most of them (especially on GDP) does not differ between V1 and V3nq. However, taking into account only exogenous TRQ-rents leads to some biases. Argentina, Brazil and Uruguay GDP growths are overestimated, while GDP is reduced in the rest of the world.

Employment and reals wages display the same trend. Agricultural employment is slightly affected by data aggregation (only for Argentina and Brazil) but TRQ modeling is more relevant to explain differences in results. TRQ modeling leads to greater variations in agricultural employment for most developing countries (Argentina, Brazil, Uruguay, Dping) but at the same time, it shows that the rest of the world, especially the EU25, would be more affected by the agricultural unemployment. For non-agricultural employment, data aggregation does not seems to have any consequence as dramatic as those which result from the specification of TRQs into the model. Unemployment is greater for developing counties while employment increases for developed countries under V3. However, their differences under V2 and V3 are not as large as for agricultural employment.

Variations in real returns for factors are also mainly affected by the TRQ modeling. Variation between the results of V1 and V3nq is negligible but differences between V2 and V3 are crucial. The increase in real wages is underestimated for unskilled agricultural labor when we consider exogenous TRQ-rents, and vice versa for unskilled non-agricultural labor. In the case of capital and land returns, the TRQ-regime shifting leads to higher returns in some countries, such as Argentina and Brazil, but to more dramatic decreases in their returns for the rest of the world.

In short, we can say that data aggregation marginally affects macroeconomic results compared to the influence of TRQ modeling. The possibility to switch from one TRQ regime to another allows to greater welfare gains, mainly explained by other sources than TRQ gains (overestimated in V2), such as allocative efficiencies, terms of trade or capital accumulation. All other macroeconomic indicators, such as GDP, employment and factor's returns follow the same trend as countries' welfare.

Trade impact:

Trade indicators are sensitive to both data aggregation and TRQ modeling; however, the latter always remains more significant to explain differences between results. World trade displays slight differences between V1 and V3nq while the largest part of world trade increase is due to the TRQ modeling. The simplification assumption of using exogenous TRQ-rents, instead of modeling TRQ mechanisms, does not allow to improve market access for sensitive products, and thus trade gains are lower. When quotas are expanded, TRQ-regimes may shift, and thus the effective protection decreases leading to an increase for trade.

The previous result is confirmed when we consider individual countries' trade. Total trade variations do not differ much from V1 to V3nq; however, TRQ modeling becomes crucial for trade results. The consideration of V3 to simulate the EU-Mercosur PTA allows to increase the overall trade of Mercosur countries and the EU25.

At a more detailed level, such as bilateral trade, data aggregation matters more than in the previous cases. Nevertheless, once more TRQ modeling is the source of results' differences between versions. More dramatic bilateral trade variations are observed under V3. This result is clearer for bilateral trade between Mercosur countries and the EU25, in which TRQs are really important. Looking at the scenario impact, the bilateral trade between the EU25 and each Mercosur country increases much more under V3, especially for Brazilian (27.7% under V3, 5.5% under V2 and 7% under V3nq) and Uruguayan (20.6% under V3, 4.4% under V2 and 5.4% under V3nq) exports to the EU, than under V2.

Decomposing trade in agricultural and non-agricultural trade, we find that the largest part of trade gains for Mercosur countries is found in agricultural sectors. As we explained in the scenario description, most of this products are sensitive and liberalized only through TRQs. By comparing V1 and V3nq, there is small differences due to data aggregation and thus the increase in agricultural trade is mostly explained by TRQ modeling. Looking at V3 results, the increase in exports for Argentina is mainly explained by Meat (37%) and Paddyrice (2.6%) exports, remembering that both sectors are under TRQs. In the case of Brazil 10% of the agricultural exports increase is also explained by Meat (121%) exports.[3] The explanation of the increase in the Uruguay agricultural exports (7.9%) is deversified among the following sectors: Cattle (7.9%), Cereals (1.4%), Diary products (8.6%) and Meat (19.8%) exports. European imports also increase for agricultural products, especially for Meat (217%) and Meat products (2.2%) which are both under TRQs.

In short, we can say that TRQ modeling matters more than data aggregation to explain biases in trade results. In addition, TRQ modeling leads to more dramatic trade variations (negative and positive) compared to the use of exogenous TRQ-rents, which does not allow to trade increases. TRQs are the source of agricultural market access improvement, especially for sectors which benefit from larger quota increase (Meat). However, in other sectors, for which out-of-quota tariffs remain prohibitive, a small quota increase is not enough to change the TRQ-regime, and thus protection (out of quota) remains unchanged.

[3] For other sensitive sectors, like Sugar, a small quota expansion is not enough to increase trade and an out-of-quota tariff reduction would be surely preferred.

5 CONCLUSION and EXTENSIONS

Tariff-rate quotas have become a very significant trade policy instrument in agricultural liberalization, especially in sensitive sectors where industrialized countries want to keep a close control on trade. In these sectors, TRQs are presently the main way offered to developing countries like Mercosur to increase their exports to developed countries (notably the EU).

In this paper, we highlight the need for a proper TRQ modeling in a CGE framework. To do so we compare three versions of the Mirage GCE model (without TRQs, with exogenous TRQ-rents and with TRQ modeling). By isolating an aggregation biases from bias induced by a lack of actual TRQ modeling, we find that data aggregation is not the most important part; on the contrary, most differences between results come from the TRQ modeling.

The simple assumption to use exogenous TRQ-rents[4] distort welfare and trade gains. The impossibility to shift from one TRQ-regime to another explains these results by two non-negligible reasons. The first important aspect, which affects essentially welfare results, is the overestimation of TRQ rents because under this assumption any quota expansion automatically increases rents. In fact, actual TRQs do not necessarily lead to greater rents when quota volumes are expanded (except when the initial equilibrium is out of quota and remains out-of-quota after the expansion). The second reason is that the protection level for products under TRQs is not reduced when only rents are accounted for. This suppresses the possibility for a market access improvement, and thus for trade volume increases. Concerning welfare composition, a market access improvement also affects terms of trade, becoming one of the most important sources of welfare gain (along with allocative efficiency gains) in our example.

Using what we consider as the best specification, the V3 model, we obtain that the EU-Mercosur PTA simulated in this paper would be welfare-improving for all concerned partners; secondly, trade gains for Mercosur countries occur in agro-food sectors (particularly in the Meat sector); and finally, the openness of the European agricultural markets through TRQs lead to welfare gains for other countries as a result of their eviction from the European agricultural market, with a reallocation of their resources towards industrial sectors. For some poor developing countries, this mechanism remains unsure however, as their capacity to reallocate resources is questionable.

The literature on TRQ modeling in a CGE framework is quite recent, and a lot of modeling improvements have to be done.

The next extension to this work is to find the way of modeling TRQs in an aggregate way (at GTAP sectors and regions levels) while minimizing data aggregation biases. Working with

[4]Exogenous TRQ-rents are pre-calculated using MAcMapHS6-v2 for each scenario

TRQ modeling at an aggregate level is necessary when models become too large (many sectors and many regions). Several ways of doing it have already been proposed in the literature for some specific sectors, which have relied on a single quota for each sector containing quotas.

Another possible extension to this work is the distinction of multilateral and preferential TRQs. Licenses allocation is different in multilateral TRQs, and the possibility of a reallocation between partners should be explicitly modeled. Another interesting question would be to model each TRQ by taking into account its TRQ administration method, and eventually by considering importer or exporter market powers and their consequences.

De Gorter and Kliauga (2006) have introduced intermediate TRQ regimes in the case of multilateral TRQs. For instance, when one of the importers fills its quota-part of the multilateral quota, but the rest of partners do not without any possibility to resale licenses, the prime over the in-quota tariff could be positive even if the quota is unfilled. The empirical evidence also highlights the possibility that TRQs remain unfilled when they are restricted to some particular HS6 products.

Some of previous TRQ specifications merit to be addressed in detail in order to improve the modeling of agricultural markets' behavior.

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Figures and Tables

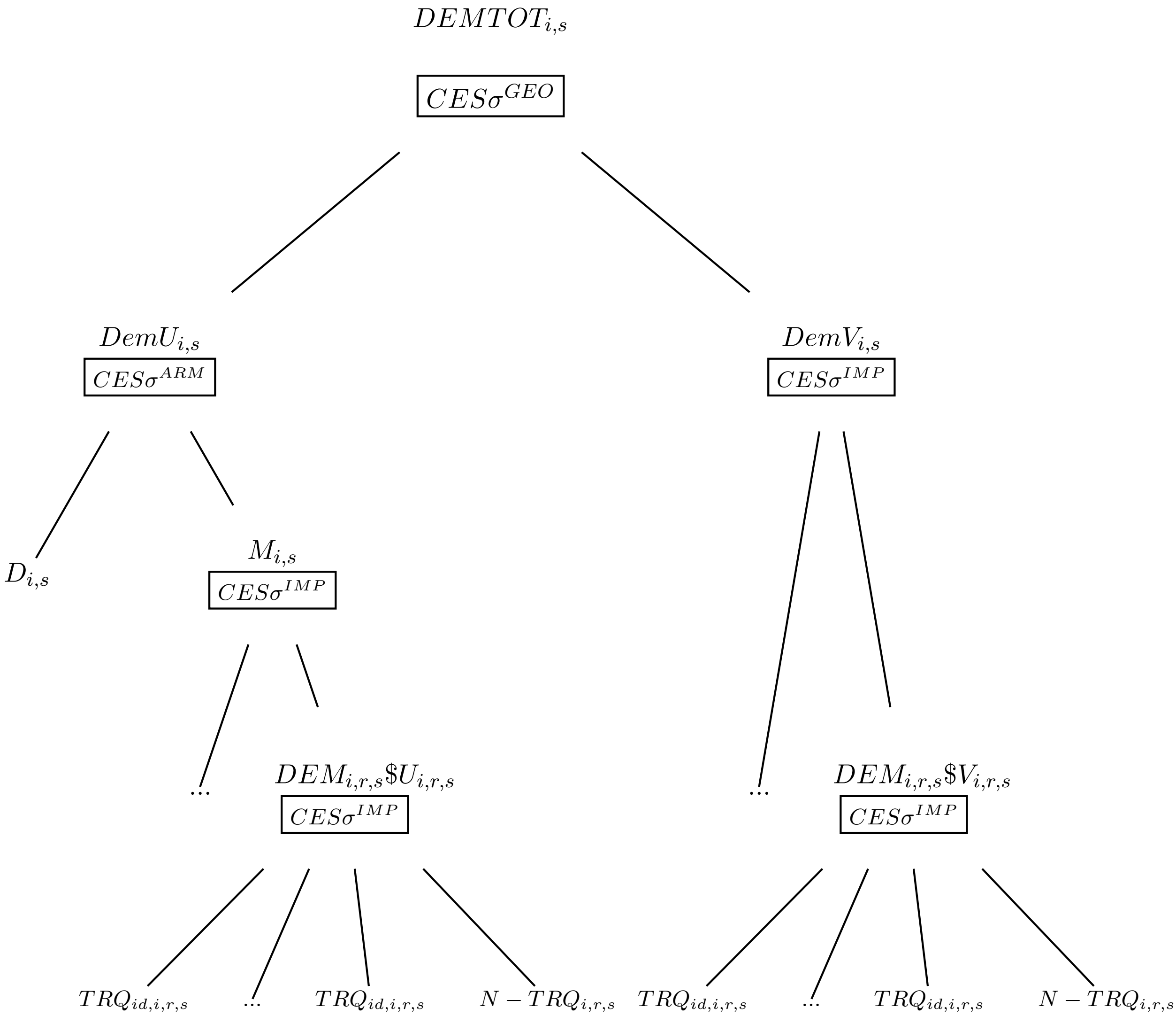

Figure 1: Demand tree with TRQ and non-TRQ imports

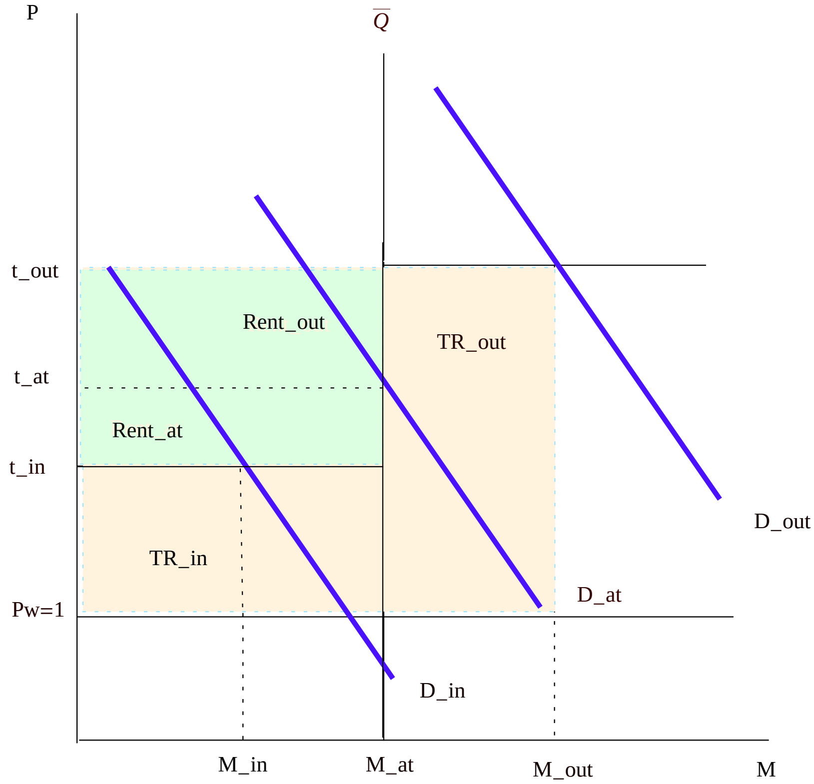

Figure 2: TRQ equilibria

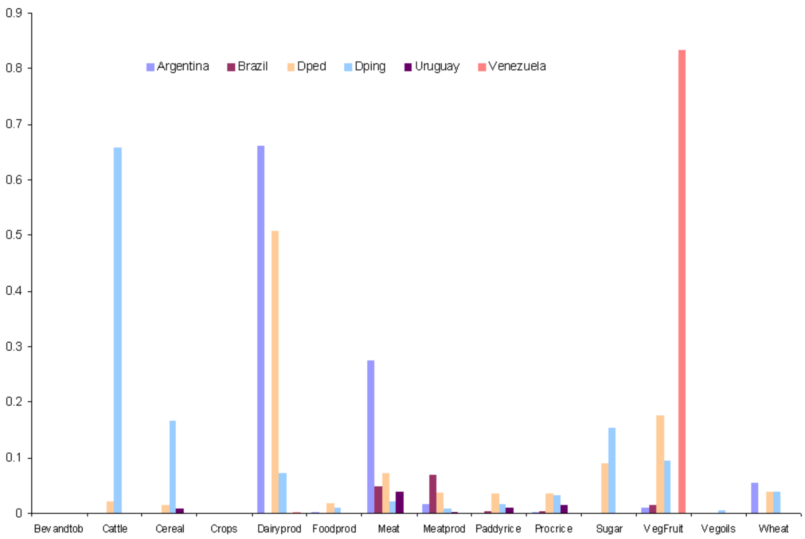

Figure 3: TRQ-imports' shares for agricultural sectors in the EU25

Source: MAcMapHS6-v2 database, CEPII

Table 1: TRQ-regime shifting

IF	AND	THEN
in-quota regime	$TRQ > \bar{Q}$	at-quota regime
at-quota regime	$\tau^{TRQ} > \tau^{out}$	out-of-quota regime
out-of-quota regime	$\tau^{TRQ} < \tau^{out}$	at-quota regime
at-quota regime	$TRQ < \bar{Q}$	in-quota regime

Table 2: 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 3: 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 4: World Results (% variation)

Variable	V1	V2	V3	V3nq
Exports (val)	0.06	0.05	0.20	0.06
Exports (vol)	0.05	0.05	0.20	0.06
Imports (val)	0.06	0.06	0.20	0.06
Imports (vol)	0.05	0.06	0.21	0.06
World GDP (volume)	0.00	0.00	0.02	0.00
World Welfare	0.00	0.00	0.02	0.00

Table 5: Welfare Results by Region (% variation)

Region	V1	V2	V3	V3nq
Argentina	0.05	0.19	0.08	0.05
Brazil	-0.00	0.39	0.08	0.00
Dped	-0.00	-0.00	0.01	-0.00
Dping	-0.01	-0.00	0.04	-0.01
EU25	0.01	-0.02	0.02	0.01
Uruguay	-0.01	0.84	0.12	-0.01
Venezuela	-0.10	-0.07	-0.08	-0.10

Table 6: Welfare decomposition for large Mercosur countries (% variation)

	Argentina				Brazil			
Variable	V1	V2	V3	V3nq	V1	V2	V3	V3nq
Allocation efficiency gains	-0.03	-0.03	0.02	0.01	-0.00	-0.02	0.04	0.02
Capital accumulation gains	0.02	0.05	0.03	0.02	0.01	0.11	0.04	0.01
Land supply gains	0.01	0.01	0.02	0.01	0.00	0.00	0.02	0.00
Other gains	0.02	0.04	-0.02	-0.02	-0.00	0.05	-0.10	-0.02
Tariff-quota gains	0.00	0.08	-0.01	0.00	0.00	0.24	-0.03	0.00
Terms of trade gains	0.03	0.04	0.04	0.03	-0.01	0.02	0.10	-0.01
Welfare	0.05	0.19	0.08	0.05	-0.00	0.39	0.08	0.00

Table 7: Welfare decomposition for small Mercosur countries (% variation)

	Uruguay				Venezuela			
Variable	V1	V2	V3	V3nq	V1	V2	V3	V3nq
Allocation efficiency gains	0.01	0.03	0.05	0.02	0.01	0.01	0.01	0.01
Capital accumulation gains	0.01	0.26	0.07	0.01	-0.03	-0.02	-0.02	-0.03
Land supply gains	0.01	0.02	0.04	0.01	-0.00	-0.00	-0.00	-0.00
Other gains	-0.01	0.05	-0.08	-0.02	-0.04	-0.04	-0.04	-0.04
Tariff-quota gains	0.00	0.44	-0.05	0.00	0.00	0.02	0.00	0.00
Terms of trade gains	-0.02	0.04	0.09	-0.02	-0.04	-0.03	-0.03	-0.04
Welfare	-0.01	0.84	0.12	-0.01	-0.10	-0.07	-0.08	-0.10

Table 8: Welfare decomposition for the EU (% variation)

Variable	V1	V2	V3	V3nq
Allocation efficiency gains	0.00	0.00	0.02	0.00
Capital accumulation gains	0.00	-0.01	-0.00	0.00
Land supply gains	-0.00	-0.00	-0.00	-0.00
Other gains	0.00	0.00	0.02	0.01
Tariff-quota gains	0.00	-0.02	0.00	0.00
Terms of trade gains	0.01	0.00	-0.01	0.01
Welfare	0.01	-0.02	0.02	0.01

Table 9: GDP results in % variation

Region	V1	V2	V3	V3nq
Argentina	0.04	0.16	0.05	0.04
Brazil	0.03	0.40	0.03	0.03
Dped	-0.00	-0.00	0.01	-0.00
Dping	-0.00	-0.00	0.03	-0.00
EU25	0.01	-0.03	0.02	0.01
Uruguay	0.02	0.88	0.10	0.02
Venezuela	-0.04	-0.01	-0.02	-0.04

Table 10: Agricultural Employment (% variation)

Region	V1	V2	V3	V3nq
Argentina	0.78	0.68	0.96	0.79
Brazil	0.46	0.25	2.86	0.58
Dped	-0.01	-0.00	-0.01	-0.01
Dping	-0.01	-0.00	0.10	-0.01
EU25	-0.12	-0.11	-0.89	-0.13
Uruguay	0.33	0.25	1.27	0.33
Venezuela	-0.02	-0.01	-0.02	-0.02

Table 11: Non-Agricultural Employment (% variation)

Region	V1	V2	V3	V3nq
Argentina	-0.13	-0.11	-0.16	-0.13
Brazil	-0.04	-0.02	-0.26	-0.05
Dped	0.00	0.00	0.00	0.00
Dping	0.00	0.00	-0.03	0.00
EU25	0.01	0.01	0.07	0.01
Uruguay	-0.15	-0.11	-0.56	-0.15
Venezuela	0.00	0.00	0.00	0.00

Table 12: Unkilled Real Wages in Agriculture (% variation)

Region	V1	V2	V3	V3nq
Argentina	0.47	0.49	0.64	0.49
Brazil	0.19	0.27	1.44	0.25
Dped	-0.01	-0.00	0.00	-0.01
Dping	-0.01	-0.01	0.11	-0.01
EU25	-0.04	-0.05	-0.45	-0.05
Uruguay	0.19	0.58	1.09	0.19
Venezuela	-0.21	-0.18	-0.18	-0.21

Table 13: Unkilled Real Wages in Non-Agriculture (% variation)

Region	V1	V2	V3	V3nq
Argentina	0.02	0.10	0.08	0.02
Brazil	-0.06	0.13	-0.11	-0.06
Dped	-0.00	-0.00	0.01	-0.00
Dping	-0.01	-0.00	0.04	-0.01
EU25	0.02	0.01	0.03	0.02
Uruguay	-0.05	0.40	0.17	-0.05
Venezuela	-0.20	-0.18	-0.17	-0.20

Table 14: Imports Values (% variation)

Region	V1	V2	V3	V3nq
Argentina	3.12	3.55	3.48	3.16
Brazil	2.14	3.11	4.44	2.25
Dped	-0.04	-0.04	-0.05	-0.04
Dping	-0.03	-0.04	0.17	-0.04
EU25	0.24	0.17	0.75	0.25
Uruguay	0.69	1.87	1.88	0.69
Venezuela	1.64	1.70	1.67	1.64

Table 15: Exports Values (% variation)

Region	V1	V2	V3	V3nq
Argentina	2.70	2.41	3.13	2.74
Brazil	2.32	1.42	5.02	2.44
Dped	-0.05	-0.06	-0.08	-0.05
Dping	-0.03	-0.03	0.15	-0.04
EU25	0.24	0.32	0.73	0.25
Uruguay	0.99	-0.05	2.99	0.99
Venezuela	1.39	1.35	1.41	1.39

Table 16: EU25 Exports in volume (% variation)

Importer	V1	V2	V3	V3nq
Argentina	7.45	8.05	8.56	7.53
Brazil	12.14	13.25	14.81	12.26
Dped	-0.12	-0.07	0.21	-0.12
Dping	-0.10	-0.05	0.43	-0.10
EU25	-0.02	-0.03	-0.10	-0.02
Uruguay	9.90	11.36	11.84	9.94
Venezuela	26.94	27.12	27.54	26.94

Table 17: Argentina Exports in volume (% variation)

Importer	V1	V2	V3	V3nq
Argentina	-1.30	-1.25	-0.84	-1.01
Brazil	6.09	6.52	8.18	6.23
Dped	-0.95	-1.51	-1.74	-1.03
Dping	-0.93	-1.33	-1.31	-1.00
EU25	15.11	14.61	17.62	15.62
Uruguay	-1.80	-0.85	-0.50	-1.85
Venezuela	-3.35	-3.84	-4.03	-3.44

Table 18: Brazil Exports in volume (% variation)

Importer	V1	V2	V3	V3nq
Argentina	11.52	11.06	8.86	11.44
Brazil	-0.54	-0.60	0.12	-0.81
Dped	0.34	-0.81	-3.35	0.16
Dping	0.20	-0.61	-3.08	0.04
EU25	6.45	5.49	27.71	7.06
Uruguay	-0.74	-0.27	-2.14	-0.88
Venezuela	-1.95	-3.05	-5.49	-2.13

Table 19: Uruguay Exports in volume (% variation)

Importer	V1	V2	V3	V3nq
Argentina	-0.49	-1.27	-1.96	-0.38
Brazil	-1.70	-1.91	0.12	-1.47
Dped	0.26	-0.92	-1.97	0.25
Dping	0.19	-1.06	-2.10	0.16
EU25	5.57	4.38	20.64	5.43
Uruguay	-0.39	-0.44	-0.77	-0.46
Venezuela	-2.02	-3.36	-4.94	-2.05

Table 20: Venezuela Exports in volume (% variation)

Importer	V1	V2	V3	V3nq
Argentina	0.72	1.40	1.97	0.83
Brazil	0.05	1.02	2.50	0.17
Dped	1.36	1.28	1.27	1.36
Dping	1.32	1.26	1.36	1.32
EU25	2.38	2.28	2.15	2.32
Uruguay	-1.32	-0.75	-1.26	-1.29
Venezuela	-0.63	-0.59	-0.62	-0.74

Table 21: EU25 Imports by sector (% variation)

Sector	V1	V2	V3	V3nq
1 Agro-food	1.67	1.52	13.88	1.79
2 Oth	0.16	0.08	-0.19	0.15
Meat	0.14	-0.19	217.35	0.48
Meatprod	1.27	1.00	2.19	2.42
Paddyrice	0.01	-0.00	1.67	-0.02
Primary	0.18	0.18	0.23	0.18

Table 22: Argentina Exports by sector (% variation)

Sector	V1	V2	V3	V3nq
1 Agro-food	2.93	2.59	3.52	3.00
2 Oth	1.75	1.23	1.37	1.69
Meat	-1.70	-2.31	37.79	-0.08
Paddyrice	-1.84	-1.11	2.56	-1.34

Table 23: Brazil Exports by sector (% variation)

Sector	V1	V2	V3	V3nq
1 Agro-food	2.06	1.30	10.78	2.49
2 Oth	2.66	1.26	-1.24	2.47
Meat	0.32	-0.69	121.53	0.49

Table 24: Uruguay Exports by sector (% variation)

Sector	V1	V2	V3	V3nq
1 Agro-food	2.14	0.82	7.99	2.13
2 Oth	0.23	-1.15	-1.91	0.22
Cattle	0.44	-0.26	7.91	0.51
Cereal	0.48	-0.27	1.39	0.61
Dairyprod	0.11	-1.82	8.59	0.12
Meat	0.41	-1.37	19.79	0.53
Paddyrice	0.70	-0.40	1.39	1.27

Table 25: Venezuela Exports by sector (% variation)

Sector	V1	V2	V3	V3nq
1 Agro-food	2.42	2.39	2.54	2.33
2 Oth	1.61	1.55	1.60	1.62
Bevandtob	1.94	1.89	1.94	1.94
Cereal	3.34	3.29	3.48	3.32
Foodprod	2.81	2.83	3.01	2.76
Meatprod	5.50	5.55	8.51	6.80
Primary	1.25	1.19	1.12	1.25
Sugar	1.66	1.70	2.43	1.68
VegFruit	1.70	1.60	2.74	1.10