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EU Trade Policies: Benchmarking Protection in a General Equilibrium Framework

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ABSTRACT

This paper deals with the EU's trade policy with two objectives: on the one hand, we study the performance of EU's preferential agreements in granting their partners improved market access; on the other hand, we assess the extent to which domestic sectors are effectively protected. As far as the first objective is concerned, we construct bilateral indicators of protection based on the applied tariffs faced by each exporter. In order to do this, an index of trade policy restrictiveness is computed, using the *Mercantilistic Trade Restrictiveness Index* as the tariff aggregator. We also analyze the protection granted to each sector by the existing tariff structure. In this respect, we compute effective rates of protection that overcome the well-known theoretical shortcomings of the traditional definition (*Output Effective Rate of Protection*).

The analysis is based on a comparative static applied general equilibrium model (Global Trade Analysis Project) and on the most recent version (release 6) of the related database. Results are obtained with reference to the situation existing in 2001, but the assessment of protection is carried out for the enlarged EU. Overall, it appears that notwithstanding the rhetoric about preferential access, several developing countries are the ones facing the highest hurdles in getting into the EU markets. Both bilateral protection and effective protection rates are broadly consistent with the evolution of the WTO negotiations: the strongest demands from developing countries in terms of market access in the EU have less to do with the overall applied MFN tariffs on industrial products than the reduction of distortions affecting trade in agriculture.

Keywords: Protection, Commercial policy, GTAP model, International trade,

JEL classification: F13, Q17, F17

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Europe's Trade Policies: Benchmarking Protectionism in a General Equilibrium Framework

Alessandro Antimiani – Luca Salvatici[*]

1. INTRODUCTION

Even after the implementation of the Uruguay Round, trade peaks are still numerous and the number of preferential trade arrangements (PTAs) surged during the nineties. Tariff escalation, i.e. higher import duties on processed products than on their input commodities, is one of the objects of controversy between developed and developing countries. Moreover, access of developing countries to the markets of developed ones, and particularly of the EU, mostly occurs through preferential agreements. In this context, we want to provide an assessment of access to the European market by taking into account both tariff escalation and preferential agreements.

The evaluation of the levels of protection is a challenging task. International trade policies are often compared across countries and over time, using such measures as arithmetic or trade-weighted average tariffs, price wedges and measures of tariff dispersion. But all such measures are without theoretical foundation. In this paper we assess EU's trade stance using two theoretically-based index numbers of trade policy, which provides a true benchmark against which all these ad hoc measures can be evaluated.

The first one – the *Mercantilistic Trade Restrictiveness Index* (MTRI) – focuses on the distortions imposed on the import bundle, using the aggregate import value as the relevant equivalence criteria. The second one – the *Output Effective Rate of Protection* (OERP) – looks at the effects on the production structure, using the sectoral output as benchmark. We are not aware of any empirical applications of the latter index, originally proposed by Anderson (1998). As far as the MTRI is concerned, Kee, Nicita and Olarreaga (2005) compute the index at the bilateral level, but in a partial equilibrium framework. Another partial equilibrium implementation of the MTRI is provided by Bureau and Salvatici (2005). The original application by Anderson and Neary (2003) is based on a CGE, but it does not include the EU. We calculate the MTRI for a cross section of the main EU trading partners

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using the Global Trade Analysis Project model (Hertel, 1997); the same model and data is used to calculate the OERP for a cross section of EU economic sectors.

The outline of the paper is as follows. Section 2 provides some background on the EU trade policy. Section 3 introduces the indices that are going to be used for the assessment of the EU policy – MTRI and OERP. Section 4 details the specification of the model. Section 5 presents the results, while Section 6 concludes.

2. EU'S "SPAGHETTI BOWL" OF TRADE AGREEMENTS

Economic and trade cooperation have played an integral part of the European policy towards developing countries since the establishment of the European Community. The EU is presently engaged in a web of cooperative relations with other countries or regional groupings, based upon either formal, institutional dialogue or more informal agreements. Inter-regional cooperation has increased in both the scope and density of the agreements. Although often controversial, the Euro-Mediterranean process, the EU-Mercosur negotiations and the Cotonou Agreements constitute examples of this type of attitude.

The EU's categorization of partners establishes 'concentric circles', each circle having a different intensity of preferences, reciprocity and co-operation instruments. These circles range from the core integration among the 25 members until the most distant circle where most-favoured-nation (MFN) treatment is applied according to the WTO.[1] Between these two extremes there are the trade regimes applied to the European Economic Area (Norway, Iceland and Liechtenstein)[2] and Switzerland; the Mediterranean partners (the Euro-Med agreements); the Africa, Caribbean and Pacific (ACP – formerly the Lomè Convention, now the Cotonou Agreement) regime; the Everything But Arms (EBA) preferences for least-developed countries (LDCs); the bilateral free trade areas with Mexico, South Africa and Chile, plus the ongoing negotiations with Mercosur; the Generalyzed System of Preferences (GSP) for all developing countries.

The Euro-Mediterranean Agreements: the current set of policies applied to 10 Mediterranean partners was agreed at the 1995 Barcelona Conference, which launched the Euro-Mediterranean partnership. The goal is to establish a Free Trade Area by 2010. The Bilateral

[1] Between the EU major trading partners, the MFN clause is only applied to USA, Canada, Australia, New Zealand and Japan.

Euro-Mediterranean Association Agreements are a first step in this direction. Some of these agreements provide for non-reciprocal free access for non-sensitive products into the EU market and progressive liberalization for other products.

Cotonou Partnership: Cotonou Partnership Agreements include preferences and linkages between trade and financial assistance to ACP countries. It covers over 70 countries, which were mostly former colonies of the EU members. The agreements follow a series of Lomé Convention arrangements which provide non-reciprocal trade benefits in 99 percent of the industrial goods and some agricultural products, where political and colonial ties appear as the major motivation. Under the Cotonou Agreement current non-reciprocal "Lomè" preferences will be maintained temporarily up 2008 and new reciprocal Economic Partnership Agreements will be negotiated and implemented gradually.

Bilateral Agreements: agreements with Mexico, Chile, and South Africa provide for progressive mutual liberalisation of goods and services, although free trade in agriculture and fisheries is not fully reciprocal and it is limited to lists of products. In the case of South Africa, for example, EU must give duty-free access to 95 percent (only 62 percent in the case of agriculture) of products by 2010.

GSP Scheme: in 1968, UNCTAD recommended the creation of a GSP and the waiver to allow such preferences was granted in 1971. The GSP preference scheme provides nonreciprocal preferences with lower tariffs or completely duty-free access for imports from 178 developing countries and territories into the EU market. The EU's revamped GSP, implemented since April 2005, includes 3 categories of benefits

1. the General Scheme for all developing countries (with 40 percent of products receiving duty-free access, but with ceilings and graduation criteria that eliminate largest exporters);
2. the EBA initiative for Least Developed Countries grants duty-free access on all products – with the exception of imports of fresh bananas, rice, and sugar – to a set of the poorest nations in the world;
3. the 'GSP plus', which provides duty-free access for all products from 'countries with special development needs' that implement international conventions on the environment, as well as on human and labour rights.

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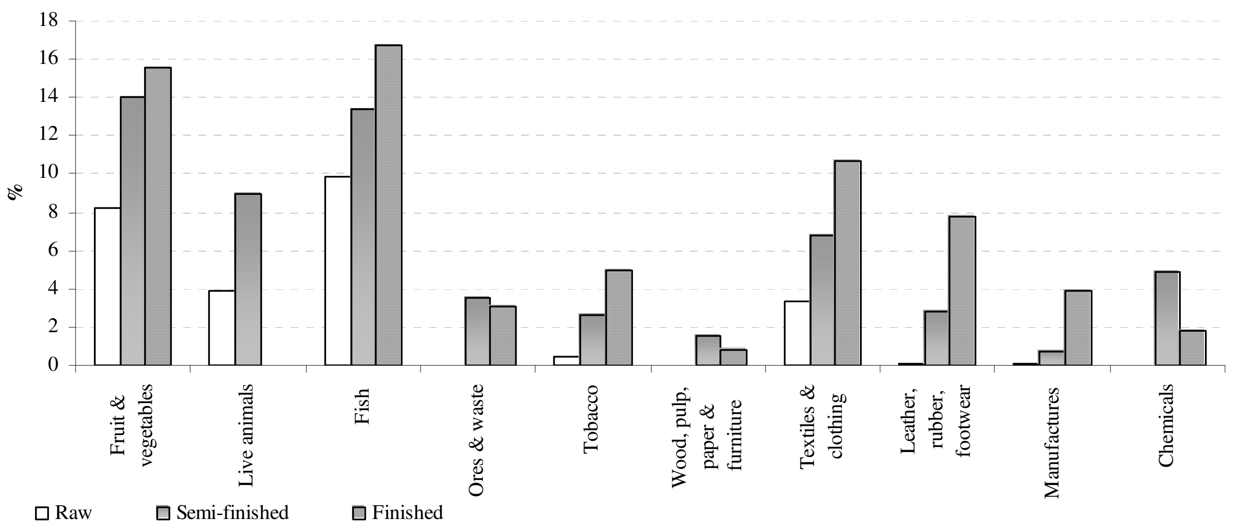
[2] The European Economic Area was created in 1994 to integrate those western European countries that wished to benefit from the Single Market while remaining outside the EU, although implementation was largely overtaken by the 1995 enlargement.

The complexity in EU trade policy comes not only from different regimes but from heterogeneous tariffs across commodities. One consequences of the dispersion of the tariffs is the presence of tariff escalation that consists in protecting processed products at higher level than primary products.

Figure 1 - Tariffs escalation in EU: some sectors by MTN classification (2003, MFN, weighetd average)



Source: COMTRADE.

In Figure 1 we used the Trains data base and the MTN classification[3] to show how tariff escalation affects EU trade policy.

3. MEASURING TRADE DISTORTION: MARKET ACCESS AND EFFECTIVE PROTECTION

Measures of trade restrictiveness have long been of interest to international economists. Some of the literature relies on trade intensity measures, e.g., estimating the volume of trade in the distorted equilibrium relative to that in free trade. The rationale is that such a ratio summarizes the impact of all trade policy instruments. The problem is that import volume could be much lower than in free trade either because tariffs are high on inelastic goods or because though low they are imposed on highly elastic good.

To measure the protection granted by a country's trade policy regime, one needs to overcome two important aggregation hurdles: aggregation of different forms of trade policies and

[3] MTN classification aggregates products of a single chapter (2 HS digit) by their level of processing stage: raw, semi-finished and finished or semi-processed and processed.

aggregation across goods with very different economic importance. Regarding the first aggregation problem, one needs to bring all types of trade policy instruments into a common metric, in most cases an *ad valorem* equivalent.

In order to solve the second problem using theoretically sound aggregation procedures, it is necessary to specify the type of information we want to maintain, so that the final number is *equivalent* to the original multiple data in the dimension we are interested in. According to Anderson and Neary (1996), a general definition of a policy index is as follows: depending on a pre-determined reference concept, any aggregate measure is a function mapping from a vector of independent variables – defined according to the policy coverage – into a scalar aggregate. The greatest advantage of this approach is that it is theoretically consistent, since the equivalence is determined according to a fundamental economic structure. Secondly, it provides unequivocal interpretation of the results, since the definition and properties of these "equivalence-based" indicators are predetermined .

3.1 Mercantilistic trade restrictiveness index

The MTRI relies on the idea of evaluating trade policy using trade volume as the reference standard. The interest is in the extent to which trade distortions limit imports from the rest of the world, so that the aggregation procedure answers the following question: *what is the equivalent uniform tariff that if imposed to home imports would leave aggregate imports unchanged*?

The MTRI is defined by Anderson and Neary (2003) in terms of the uniform tariff τ^{μ} that yields the same volume (at world prices) of tariff-restricted imports as the initial vector of (non-uniform) tariffs. This can be expressed with import demand functions *M*, while holding constant the balance of trade function at level B^0:

$$(1) \qquad \tau^{\mu} : M\left[p^{\mu}, p^0, B^0\right] = M^0\left(p^0, p^*, B^0\right), \text{ with } p^{\mu} \equiv p^*\left(1+\tau^{\mu}\right).$$

where p^* denotes the international prices (p_k^*) vector of the *N* goods $k = (1,\ldots,N)$, M^0 is the value of aggregate imports (at world prices) in the reference period, and p^0 is the initially distorted price vector.

Define the scalar import demand as

$$(2) \qquad M\left(p, p^*, B\right) \equiv \sum_{c=1}^{r}\sum_{k=1}^{N} p_{c,k}^* I_{c,k}^m\left(p, B\right)$$

where $I^{m}_{c,k}$ denotes the uncompensated (Marshallian) import demand function of good *k* from country *c*. Accordingly, the MTRI uniform tariff τ^{μ} would lead to the same volume of imports (at world prices) as the one resulting from the uneven tariff structure, denoted by the *N*x*r* bilateral tariffs matrix *T* whose elements are $t_{c,k}$:

$$(3) \qquad \sum_{c=1}^{r}\sum_{k=1}^{N} p^{*}_{c,k} I^{m}_{c,k}\left[p^{\mu}, B^{0}\right] = \sum_{c=1}^{r}\sum_{k=1}^{N} p^{*}_{c,k} I^{m}_{c,k}\left[p^{0}, B^{0}\right]$$

The previous definition focuses on the overall distortions imposed by a country's trade policies on its import bundle. In the case of bilateral protection indexes, trade restrictiveness is the product of the structure of protection and the trade flows product specialization. Even if the EU applied MFN bound tariffs to all exporters, the impact would be differentiated: trade would be more restricted in the case of countries exporting products facing the highest tariffs. In order to take into account the trade impact of protection, one could think of using a bilateral trade-weighted average. As it is well-known, though, this would underestimate the protection effect, because of the endogeneity bias: actual trade is much lower with high tariffs than it would be with lower tariffs. On the other hand, using an "equivalence-based" index with a behavioural underpinning such as the MTRI, the weights depend on import volumes evaluated at world prices.

In our application, we are interested in calculating the MTRI uniform tariff bilaterally, to obtain the level of trade restrictiveness that the EU imposes on exports of each country *c*. Accordingly, in equation (3), instead of summing over *k* and *c*, one would only sum over *k* to obtain a bilateral uniform tariff MTRI (τ^{μ}_{c}) defined as follows:

$$(4) \qquad \tau^{\mu}_{c} : M_{c}\left[p^{*}\left(1+\tau^{\mu}_{c}\right), B^{0}\right] = M^{0}_{c} \, ,$$

where M^{0}_{c} is the value of aggregate imports (at world prices) from country *c* in the reference period.

Finally, in the standard definition prices are assumed fixed on world markets. Anderson and Neary (2003), argue (footnote 8) that "there is a rationale for a ceteris paribus trade restrictiveness index that fixes world prices even when these prices are in fact endogenous". Such a rationale may be represented by the fact that, by keeping world prices constant, we focus on the component of protection explained by national policies, and not by the degree of market power of the country.

Nonetheless, we need to recast the definition of the MTRI in order to make it consistent with the model used for the assessment of the EU trade policy. Since the GTAP model is a global one with endogenous world prices, the terms of trade impact needs to be considered. In order to compute the MTRI with the GTAP model, we redefine the uniform tariff equivalent relaxing the small country assumption. The vector of world prices p^* is a function of tariffs T. To accommodate this, the definition of the MTRI [see equation (4)] is modified as follows

$$(5) \qquad \tau_c^w : M_c\left[\left(1+\tau_c^w\right)p^*(T), B^0\right] = M_c^0,$$

where (τ_c^w) is the bilateral MTRI uniform tariff with endogenous world prices.

In the case of τ^μ, totally differentiating (1) to derive the effects of tariff changes, holding p^* and B^0 fixed, gives:

$$(6) \qquad \frac{d\tau^\mu}{1+\tau^\mu} = \frac{M_p^0 dp^0}{M_p^\mu p^\mu}.$$

With endogenous world prices ($dp = p^* dt + t dp^*$), we get

$$(7) \qquad \frac{d\tau^w}{1+\tau^w} = \frac{M_p^0 p^* dt^0}{M_p^w p^w} + \frac{M_p^0 dp^*}{M_p^w p^w}\left(t^0 - \Phi\tau^w\right), \text{ where } \Phi \equiv \frac{M_p^w dp^*}{M_p^0 dp^*}.$$

ϕ is a correction factor, which is needed because the import volume function is evaluated at two different points (denoted by superscripts): the initial tariff-distorted price vector p^0 and the uniform-tariff-equivalent price vector $p^w \equiv p^*\left(1+\tau^w\right)$. Comparing (6) and (7) it appears that τ^w could be either larger or smaller than τ^μ.

3.2 Output effective rate of protection

The EU tariff structure, as well as that of many other developed countries, not only presents a large dispersion of tariffs across commodities, but it is also characterized by tariff escalation since tariffs are generally higher on processed products than on inputs (see section 2). Tariff escalation refers to the wedge between tariffs on processed commodities and those levied on the inputs used in the production process. Tariff wedges can be readily computed only if we do not face production functions with multiple inputs and/or outputs. More generally, in order to compare the protection given to different sectors of the economy, we cannot rely on 'nominal wedges' (Lindland, 1997). We need to compute an effective rate of protection, that is an index which, focusing on gross (rather than net) output, is able to take into account the role of the protection provided to the intermediate inputs.

Similarly to the measurement of nominal protection, effective protection can be defined as the proportional increase in the price of a sector's gross output relative to free trade. Since the total value of gross output priced at value added per unit equals the total value of net output valued at equilibrium prices, an appropriate price for gross output is the *value-added* per unit (Corden, 1971). Accordingly, the effective rate of protection (ERP) of industry j (E_j) measures the increase in industry's value added per unit of output under protection (V_j') as a percentage of the free trade value added per unit (V_j):

$$(8) \qquad E_j = \frac{V_j^{'} - V_j}{V_j}.$$

Assuming that one unit of output j necessitates the use of a_{ij} quantity of inputs i, we can write:

$$(9) \qquad \begin{aligned} V_j &= p_j^* - \sum_i a_{ij} p_i^* \\ V_j^{'} &= p_j^* (1 + t_j) - \sum_i a_{ij} p_i^* (1 + t_i) \end{aligned}$$

If $c_{ij} = a_{ij} p_i^* \big/ p_j^*$ is the cost share of input i in output j, after simplification we get:

$$(10) \quad E_j = \frac{V_j^{'} - V_j}{V_j} = \frac{t_j - \sum_i c_{ij} t_i}{1 - \sum_i c_{ij}}.$$

The traditional definition of the ERP is based on restrictive assumptions (fixed coefficient and/or separability) regarding the production functions (Anderson and Naya, 1969). If the assumption of fixed physical input coefficients does not hold, free trade input-output coefficients must be inferred from the observed distorted coefficients (Bureau and Kalaitzandonakes, 1995).

The fundamental theoretical critique moved to the effective protection concept stems largely from concerns about drawing general equilibrium inferences from a partial equilibrium measure (Ethier, 1971, 1977; Bhagwati and Srinivasan, 1973; Davis, 1998). The development of the concept of effective protection, as a matter of fact, may be seen as an attempt to define the index as a pure production concept – expressed in terms of nominal prices and input coefficient – making enough assumptions so that demand might be ignored: "Effective protection is the ranch house of trade policy construction – ugly but apparently too useful to disappear" (Anderson, 1998).

Also in terms of the possibility for the ERP to be a good predictors of gross outputs change, effective protection is a partial equilibrium index, since in reality the prices of primary (non-produced) factors are endogenous, and the prices of (internationally) non-traded goods may change as well. As a consequence, even if the fixed coefficient assumption is met, ranking effective rates may not allow ranking percentage output changes: a non-prohibitive import tariff or export tax in partial equilibrium might become prohibitive in general equilibrium (Anderson, 1970).

Nowadays, the development of computable general equilibrium models implies that ERPs can be computed as a general equilibrium index summarising all the model information (Stevens, 1996). In this perspective, Anderson (1998) suggested an interesting new definition of the index: the *distributional effective rate of protection*, based on the uniform tariff which is equivalent to the actual differentiated tariff structure in its effects on the rents to residual claimants in a given sector.

The same approach can be used to define an index which is able to measure the impact of protection on the ability of sectors to compete with other industries in factor markets: the *Output Effective Rate of Protection* (OERP). This index is based on the uniform tariff on all distorted sectors which produces the same level of output, sector by sector, as does the initial differentiated tariff structure (Anderson, 1998). Output variations across sectors reflect both the structure of protection (which the old effective protection concept tried to measure) and differences in the production structure of the economy. The two questions, 'how much protection is given' and 'how much does supply change as a result' are distinct, and the OERP gives a precise answer to the latter.

The output effective rate of protection e_j of sector j in general equilibrium is defined as the uniform tariff which exert on the output of j an effect which is equivalent to the initial tariff structure. That is

$$(11) \qquad e_j : Y_j\left[p_j^e, w^e\left(p_j^e, v\right)\right] = Y_j^0\left(p^0, w^0\right), \text{ with } p_j^e \equiv p_j^*\left(1+e_j\right).$$

where Y_j is j supply function, and w is the vector of competitive factor prices (w is function of the price vector p and of the fixed factor supply v).

The previous definition is based on the "small country" assumption. If we want to allow for endogenous world prices, we need to define the vector p^* as a function of the tariff vector (t). Equation (11) becomes:

$$(12) \qquad e_j^w : Y_j\left[\left(1+e_j^w\right)p_j^*(t), w^e\left(\left(1+e_j^w\right)p_j^*(t), v\right)\right] = Y_j^0\left[\left(\left(1+t_j^0\right)p_j^*(t), w^0\left(\left(1+t_j^0\right)p_j^*(t), v\right)\right)\right],$$

where (e_j^w) is the OERP uniform tariff with endogenous world prices.

4. COMPUTATION OF THE INDICES WITH AN APPLIED GENERAL EQUILIBRIUM MODEL

4.1 GTAP model and database

We use the GTAP model of global trade (version 6.2). GTAP is a static, multi-region, general equilibrium model which includes explicit treatment of international trade and transport margins, a "global" bank designed to mediate between world savings and investment, and a consumer demand system designed to capture differential price and income responsiveness across countries. As documented in Hertel (1997) and on the GTAP web site (*www.gtap.org*), the model includes: demand for goods for final consumption (based on a Constant Difference of Elasticity functional form), intermediate use and government consumption, demands for factor inputs (based on a Constant Elasticity of Substitution functional form), supplies of factors and goods, and international trade in goods and services.

The model employs the simplistic but robust assumptions of perfect competition and constant returns to scale in production activities. Bilateral international trade flows are handled using the Armington assumption by which products are exogenously differentiated by origin (Armington, 1969). In the standard closure case, global investment adjusts to global saving, so that national balances of payments are endogenous.

The latest version of GTAP database, version 6, provides a baseline for year 2001. It includes up to a maximum of 87 regions and 57 sectors. Trade policy is set at the tariff line level, but this implies a level of detail that is not consistent with the GTAP (or any other existing) model: the EU tariff schedule, for example, includes more than 10000 tariff lines. To reach consistency between trade distortions and model aggregation, a-theoretic trade weighted average tariffs are used, losing considerable information.

On the other hand, it should be noted that the quality of the trade distortion data included in the version 6 of the GTAP database is much better than in the previous release due to the use of the MacMap-HS6 (version 1), a database at the HS-6 level intended to provide a set of consistent and exhaustive *ad valorem* equivalents (AVEs) of applied border protection across the world.[4] This resulted in considering applied/preferential tariffs rather than bound ones, and in a more accurate computation of the AVE for each trade instrument (Bouët et al., 2005). Specific tariffs were converted in AVE terms by dividing the duty by a unit value. The whole problem lies in the choice of this unit value, a rather sensitive issue both from a theoretical

[4] MAcMap-HS6 is regularly improved and updated, and the corresponding information is available on the CEPII's website (*www.cepii.fr*).

and from a political point of view (as the recent evolution of WTO negotiations shows). This has led to base AVE calculations on the median unit value of worldwide exports originating from a reference group the exporter belongs to.[5]

In the case of mixed tariffs, i.e. tariffs involving a choice (a maximum or a minimum operator) between various terms, the choice is made as follows:

- when the tariff is defined as an *ad valorem* base tariff, the base tariff is retained. If the base tariff is in specific terms and the cap and the floor are *ad valorem*, a simple average of the two bounds is retained;
- when the tariff involves choosing between two terms, priority is given to *ad valorem* tariffs.

Regarding tariff rate quotas (TRQs), three market regimes are considered, depending on the level of the fill rate:

- if the fill rate is less than 90% (quota not binding), the inside quota tariff rate is chosen as the applied rate;
- in the (90%–99%) range (quota assumed to be binding), a simple arithmetic average is used;
- if it is higher than 99% (quota binding), the applied rate is equal to the outside quota tariff rate.

Finally, the presence of prohibitive tariffs is problematic when calculating AVEs. Therefore, an upper limit to the AVE is established starting at the HS6 level: the limit is set to 1,000% for the sum of all instruments.

We use two different regional aggregations, one for the computation of MTRI and one for the OERP, while the fairly detailed sector aggregation (43 products)[6] is the same in both cases (Table 1). The difference in the regional aggregations is explained to by the different objectives of our analysis.

In the case of the MTRI, we look at the bilateral protection implied the EU trade policy. As a consequence, we singled out 18 regions (including a residual aggregate – "rest of the world") as EU trading partners. Although the database cannot take into account the 2004 EU enlargement, we consider an enlarged EU (EU25) building a counterfactual baseline where the enlargement would have taken place in 2001 (Antimiani, Conforti, Salvatici, 2003).

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[5] These groups are defined on the basis of a hierarchical clustering analysis based on GDP per capita (in terms of PPP) and trade openness.

[6] We do not exploit the maximum level of detail allowed by the database (57 sectors), since 14 sectors (services) are not associated with any protection rates.

Accordingly, we eliminated all trade barriers and export subsidies between EU members and we extended the EU trade policy to the new members.

In the case of the OERP, we want to assess the effective protection provided to different sectors. This does not require a detailed regional aggregation, so we only consider 2 regions: the EU25 and the rest of the world. Also in this case, the baseline assumes that the EU enlargement had already been implemented.

Table 1 - GTAP sectoral and regional aggregations used

Sectors	*Factors*	*MTRI regional aggregation*	*OERP regional aggregation*
Paddy rice	Land (sluggish)	Eu25	Eu25
Wheat	Unskilled labour (mobile)	Candidates (Bulgary and Romania)	Rest of the World (Row)
Other cereals	Skille labour (mobile)	Efta (European free trade area)	
Vegetables and fruit	Capital (mobile)	Balkans	
Oil seeds	Natural resources (sluggish)	ACP countries	
Sugar can and beet		USA	
Plant based fibers		Canada	
Other crops		Australia	
Livestock: cattle, sheep, goats and horses		Japan	
Other live animals		China	
Raw milk		India	
Wool and silk		Mexico	
Forestry		Argentina	
Fishing		Brazil	
Coal		Russian Federation	
Oil		Turkey	
Gas		Morocco	
Other natural resources		Tunisia	
Meat : cattle, sheep, goats and horses		Rest of the World (Row)	
Other meat			
Vegetables oils and fats			
Dairy products			
Processed rice			
Sugar			
Other food products			
Beverages and tobacco			
Textile			
Wearing products			
Leather products			
Wood products			
Paper and publishing			
Petroleum and coal products			
Chemical, rubber and plastic products			
Other minerals			
Ferrous metals			
Other metals			
Metal products			
Motor vehicles and parts			
Transport equipment			
Electronic equipment			
Other machinery and equipment			
Other manufactures			
Services			

4.2 MTRI

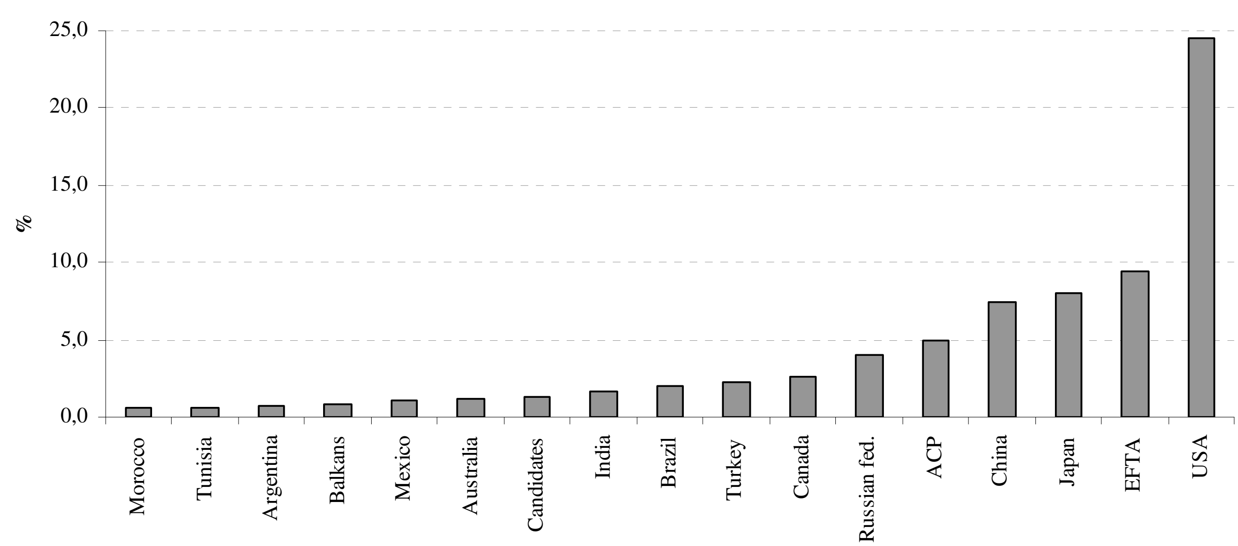
As far as the regional aggregation is concerned, our choice was obviously driven by the geographical focus of the EU trade policies presented in Section 2 (Table 2).

Table 2: EU trade policy and model regional aggregation

REGIONAL AGREEMENTS	
Turkey	Customs union (industrial products)
Bulgaria, **Romania**	Candidates to accession
Efta (Iceland, Norway, Liechtenstein and **Switzerland**)	Free trade area
PREFERENTIAL AGREEMENTS	
Acp (Angola, Antigua and Barbuda, Bahamas, Barbados, Belize, Benin, **Botswana**, Burkina Faso, Burundi, Cameroon, Capo Verde, Central African Republic, Comoros, Congo, Cook Islands, Djibouti, Dominica, Dominican Republic, Equatorial Guinea, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Granada, Guinea, Guinea Bissau, Guyana, Haiti, Ivory Cost, Jamaica, Kenya, Lesotho, Liberia, **Madagascar**, **Malawi**, Mali, Mauritania, Mauritius, **Mozambique**, Namibia, Niger, Nigeria, Papua, Rwanda, Senegal, Seychelles, Sierra Leone, Solomon Islands, Sao Tomè, Somalia, **South Africa**, Sudan, Surinam, Swaziland, **Tanzania**, Togo, Tonga, Trinidad and Tobago, **Uganda,** Zaire, **Zambia, Zimbabwe**)	Cotonou Partnership
Morocco, **Tunisia**, Algeria, Egypt, Israel, Jordan, Lebanon, Syria and Palestinian Authority	Euro-Mediterranean Agreements
Balkans (Croatia, Albania, Rep. Of Macedonia and Former Yugoslav)	Stability and Association Agreements
India, **China**	GSP
TO BE IMPLEMENTED	
Argentina, **Brazil**	Mercosur negotiations
Mexico, **Chile**	Bilateral agreements
MFN	
Usa, **Canada**, **Australia**, **Japan**	WTO membership
OTHER	
Russia	Cooperation Agreements

It is worth recalling that many regional and preferential agreements allow for long implementation periods and were not in place in 2001: this explains, for example, why there is not an "EBA group" and South-Africa is not singled out as a free-trade partner. Moreover, the choice of the countries to be included in our analysis takes into account the relevance of EU bilateral trade flows (Figure 2).

Figure 2 - Import shares into the EU (extra-EU trade, 2001)



Source: GTAP database.

The computation of τ_c^w is performed defining a new variable *tr(r,s)* as the product-generic tariff levied on imports from region *r* into region *s* (EU25 in our case). Then we run the model, starting from our counterfactual baseline, assuming that all EU trade policies (i.e., tariffs and export subsidies) with respect to a specific region *s* are removed. In the closure, *tr(r,s)* is 'swapped' with the normally endogenous aggregate imports (at world prices) from region *s* into the EU. In other words, we ask the model to compute the uniform tariff that would eliminate any incentives to increase or decrease the volume of imports from the region/country under consideration.

4.3 OERP

In the computation of the levels of effective protection provided by the EU trade policy, we firstly drop some sectors which were built as "residual" (*not elsewhere classified*) in the original database. Then, we exclude sectors that are not traded (such as raw milk), and that are freely imported by the EU as in the case of natural resources. Finally, we eliminate those agricultural sectors (rice, dairy, cereals) where export subsidies are granted in addition to import protection, since in these cases there may be not a uniform tariff high enough to keep the level of output unchanged.

Table 3 - Sectors for the OERP calculation
Vegetables and fruit
Oil seeds
Sugar can and beet
Livestock: cattle, sheep, goats and horses
Forestry
Fishing
Vegetables oil and fats
Other food products
Beverages and tobacco
Textile
Wearing products
Leather products
Wood products
Paper and publishing
Petroleum and coal products
Chemical, rubber and plastic products
Ferrous metals
Metal products
Motor vehicles and parts
Transport equipment
Electronic equipment
Other machinery and equipment
Other manufactures

We are left with a subset of 23 sectors (Table 3) for which we compute the ERP and the OERP. The traditional index is computed according to equation (10), recalling that the cost shares are to be evaluated at world prices, and that when some intermediate inputs are not distorted, the denominator in (10) must be calculated as 'value added by undistorted inputs'.

The computation of e_j^w is performed definining a new variable *te(s)* as the product and source-generic tariff levied on imports into region *s* (EU25 in our case). Then, we run the model, starting from our counterfactual baseline, assuming that all EU trade policies (i.e., tariffs and export subsidies) are removed. In the closure, *te(s)* is 'swapped' with the normally endogenous output supply of sector *j* of the EU. In other words, we ask the model to compute the uniform tariff that would eliminate any incentives to increase or decrease the output of the sector under consideration.

5. Results

5.1. Market access

Results for the MTRI bilateral uniform tariffs are presented in Table 4, with the trade-weighted average tariffs for reference.

Table 4 - EU bilateral MTRI and weighted average tariffs

	Trade-weighted average tariff	MTRI uniform tariff
EFTA	0,45	0,42
Mexico	0,49	0,95
Canada	0,90	2,09
Morocco	1,09	7,61
Turkey	1,12	2,22
Russian federation	1,29	0,73
USA	1,31	2,25
Australia	1,36	3,94
Balkans	1,49	0,07
Tunisia	1,60	1,86
Candidates	1,61	1,10
Japan	2,81	3,31
ACP	2,98	4,37
India	3,28	10,25
China	3,51	3,93
Argentina	6,56	9,06
Brazil	7,39	24,96

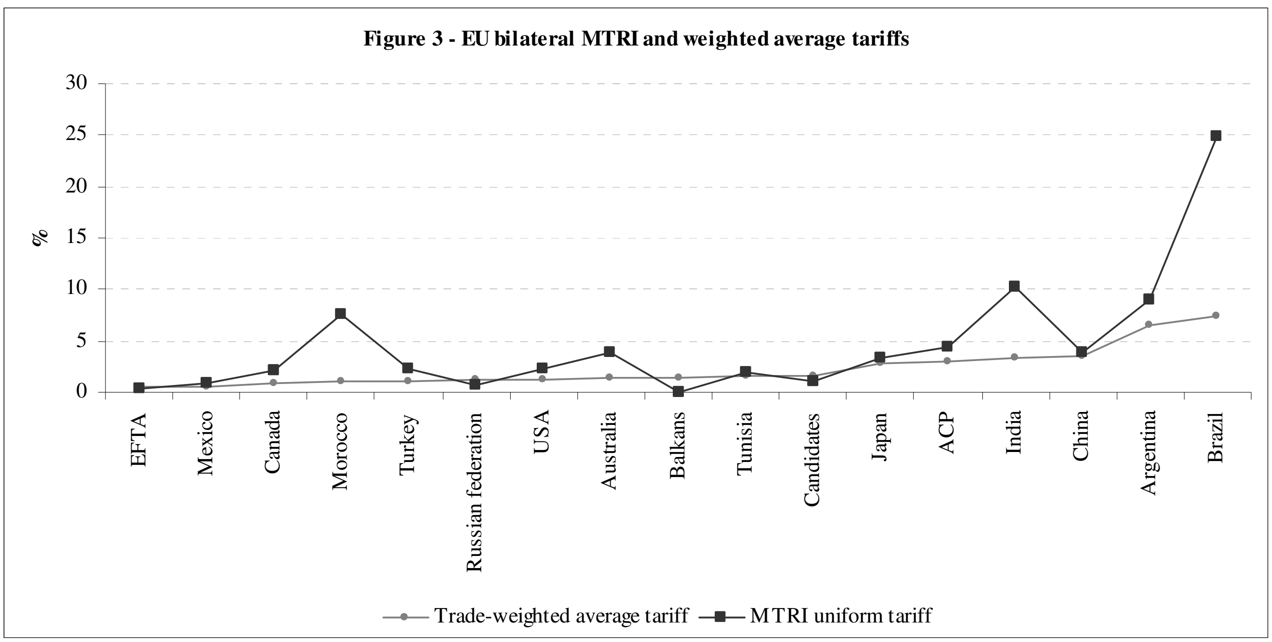
Source: Simulation results.

Table 5 presents the results of a simple regression and rank correlations between the columns in Table 4, while Figure 3 illustrates the data from Table 4 with countries ranked by their trade-weighted average tariff.

Table 5: Regression Equations Based on Columns in Table 4

Regression equation	*a*	*b*	*r*	Rank
MTRI on trade-weighted average	-1.130 (1.327)	2.506 (0.441)	0.826	0.679

Notes: *a* is the intercept and *b* the slope coefficient; standard errors are in parentheses; *r* is the correlation coefficient; and *Rank* is the rank correlation coefficient.[7]



Source: Simulation results.

Looking at the MTRI tariff values, it is striking that the most restricted countries in their trade with the EU are some developing ones. Morocco, Argentina, India present values around 10%, and Brazil even above 20%. These countries have something in common: they face an

[7] The *Rank* coefficient is calculated as follows: $Rank = 1 - 6\frac{\sum_{i=1}^{n}(Rank^{i}_{MTRI\,tariff} - Rank^{i}_{Average tariff})^2}{n(n^2-1)}$, with *n* equal to the number of countries considered (19 in our case).

EU tariff profile heavily biased against agricultural imports, as it can be seen in Table 6 ranking the ten highest bilateral tariffs reported in the GTAP database.

Table 6 - Most EU protected sectors in bilateral trade with Brazil, India, Argentina and Morocco (trade-weighted average tariffs are in parentheses)

Brazil	India	Argentina	Morocco
1) Sugar (184.5)	1) Meat (204.7)	1) Sugar (107.7)	1) Meat (136.4)
2) Meat (112.9)	2) Processed rice (106.2)	2) Dairy products (37.2)	2) Vegetable oils & fats (48.8)
3) Rice (96.4)	3) Sugar (59.7)	3) Processed rice (34.3)	3) Beverages and tobacco (14.9)
4) Sugar cane & beet (57.3)	4) Rice (49.7)	4) Meat (29.6)	4) Sugar (11.9)
5) Dairy products (35.1)	5) Beverages and tobacco (20.2)	5) Cereal grains (28.8)	5) Fruit & vegetables (11.3)
6) Meat products (29.4)	6) Dairy products (11.9)	6) Meat products (20.2)	6) Dairy products (11.3)
7) Cereal grains (27.5)	7) Cereal grains (8.8)	7) Fruit & vegetables (16.3)	7) Meat products (5.4)
8) Processed rice (19.7)	8) Leather products (8.5)	8) Animal products (10.8)	8) Other crops (1.9)
9) Food products (14.2)	9) Meat products (8.1)	9) Fishing (9.7)	9) Livestocks (1.2)
10) Beverages and tobacco (12.8)	10) Textiles (7.5)	10) Food products (9.3)	10) Food products (1.1)

Source: Simulation results.

Not surprisingly, then, Brazil, Argentina and India were between the founding members of the so-called *G-20 group*, one of the main actor in the present agricultural WTO negotiations, while Brazil and Argentina are also members of the *Cairns Group*, another coalition of countries asking for a substantial liberalization of agricultural trade. In the case of Morocco, it can be pointed out that it recently signed a free-trade agreement with the USA notwithstanding the opposition of the EU: such a move took many by surprise, but it could be explained by the disillusion for the lack of results in terms of actual access to the EU market.

Developed countries facing MFN bound rates – USA, Canada, Australia, Japan – present values ranging between 2 and 4%. This means that their exports face an overall protection which is comparable to the one faced by ACP countries – a group with a long tradition of (supposedly) preferential access into the EU market –, China and Turkey. In the case of ACP, it is a generally accepted view that these countries, despite benefiting from one of the most generous trade preference scheme of the EU providing free access for 95% of their exports, have been unsuccessful in taking advantage of their preferential status (Manchin, 2005).[8] The European Commission itself expressed serious doubts on the benefits of the ACP preferential regime during the design of the Cotonou agreement (Bureau and Matthews, 2005).

The only countries that seem to enjoy a preferential margin with respect to the major world exporters are the European ones – EFTA members, candidates to the accession, Balkan

[8] Manchin (2005) reports that, despite the number of Lomè beneficiaries increasing over time, the share of EU imports from the ACP in total EU imports decreased from 6.7% in 1976 to 3.11% in 2002.

countries – together with Mexico and Russia. The latter result is particularly remarkable, since Russia is not even a WTO member yet.[9]

Comparing the columns of Table 4, the first observation is that the MTRI uniform tariff and the trade-weighted average tend to move together on average. The effect is statistically significant (as Table 5 shows), though the relation is not a very close one: correlation and rank correlation coefficients equal to 0.826 and 0.679 respectively.

This result is in line with the findings of Anderson and Neary (2003) and Bach and Martin (2001) who show that the trade-weighted average tariff is a linear approximation to the tariff aggregator based on the expenditure function. Anderson and Neary (2003) also prove that the MTRI uniform tariff is more likely to be higher than the trade-weighted average the more elastic is the demand for the tariff-constrained imports. Indeed, the trade-weighted average tariff underpredicts the MTRI uniform tariff in all but four of the seventeen cases. The difference between the two measures is significant (as Table 5 shows), and of unpredictable sign in individual cases: the relative difference between the two indexes exceeds 90% on average, reaching over 150% for India, Brazil and Morocco.

5.2. Effective protection

Results for the OERP uniform tariffs are presented in Table 7, with the ERP and the trade-weighted averages for reference.

[9] Indeed, this finding seems to confirm the doubts of those arguing that countries joining or belonging to the GATT/WTO do not show very different trade patterns than outsiders (Rose, 2004).

Table 7 - Effective protection in EU25 by two indexes, ERP and OERP, and weighted average tarif

Sectors	***Weighted average tariffs***	***ERP***	***OERP***
Vegetables and fruit	17,06	21,0	31,65
Vegetables oil and fats	11,97	11,5	93,05
Sugar cane and beet	8,69	10,7	198,78
Other food products	8,04	-2,1	40,95
Beverages and tobacco	7,34	0,8	5,19
Motor vehicles and parts	6,07	9,0	-3,62
Leather products	5,49	2,5	20,08
Wearing products	5,35	6,3	10,53
Livestock: cattle, sheep, goats and horses	4,97	1,9	132,76
Textile	4,24	4,8	13,26
Ferrous metals	3,99	5,2	0,69
Fishing	2,47	2,0	4,71
Chemical, rubber and plastic products	1,82	1,2	3,27
Metal products	1,7	1,4	6,6
Transport equipment	1,5	1,0	8,83
Petroleum and coal products	1,21	7,5	-1,91
Other machinery and equipment	1,03	0,6	7,19
Paper and publishing	0,27	0,0	32,05
Forestry	0,06	-0,9	-4,64
Oil seeds	0	-1,1	-6,07

Source: Simulation results.

Table 8 presents the results of a simple regression and rank correlations between the columns in Table 7, while Figure 4 illustrates the data from Table 7 with sectors ranked by their trade-weighted average tariff.

Table 8: Regression Equations Based on Columns in Table 7

Regression equation	*a*	*b*	*r*	Rank
OERP on ERP	17.427 (14.501)	2.939 (2.115)	0.311	0.239
OERP on average tariff	5.371 (16.182)	5.210 (2.559)	0.433	0.579

Notes: *a* is the intercept and *b* the slope coefficient; standard errors are in parentheses; *r* is the correlation coefficient; and *Rank* is the rank correlation coefficient.[10]

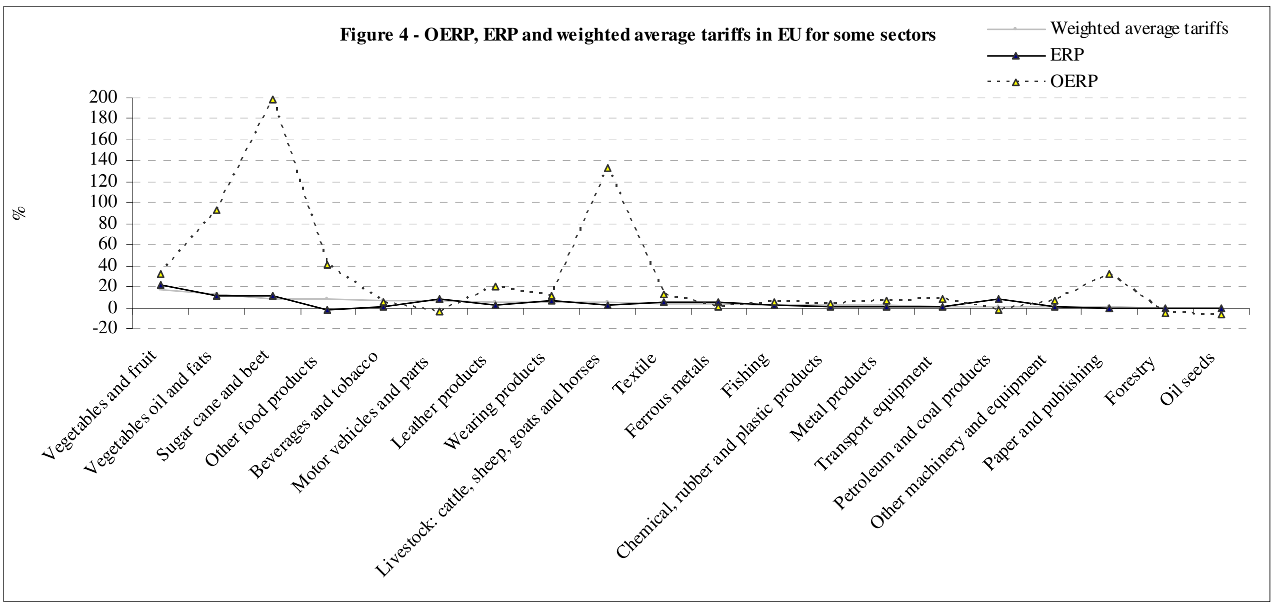


Figure 4 - OERP, ERP and weighted average tariffs in EU for some sectors

Source: Simulation results.

We were able to obtain results for 20 out of the 23 sectors considered: in the case of wood products, electronic equipments and other manufactures, as a matter of fact, we did not get any solutions. The most 'effectively protected' sectors are by far the agrifood ones both in

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[10] The *Rank* coefficient is calculated as follows: $Rank = 1 - 6\frac{\sum_{i=1}^{n}(Rank_{OERP}^{i} - Rank_{ERP/average}^{i})^2}{n(n^2-1)}$, with *n* equal to the number of sectors considered (20 in our case).

terms of primary (sugar, livestock, vegetables and fruit)[11] and processed products (vegetable oils and fats, food products).

The difference between nominal and OERP rates are particularly striking in the case of sugar beet and livestock. As far as the former is concerned, it should be recalled that the actual structure of protection policy is much more complex than the simple tariff-equivalent considered in the model. Regarding the latter, the high value of the OERP uniform tariff may depend on the fact that actual trade flows in this sector are quite limited, so that the link between border protection and production incentives is rather weak.

In a 'second tier' (with rates ranging between 20% and 10%) we find the garment sector – leather, textile and wearing products. Such a result is in line with the protection still granted to the sector in 2001, but they would be probably quite different today after the fading out of the *Multi-fiber Arrangement*.

Some positive, though lower, uniform rates would be needed in order to maintain the output of the remaining sectors, but there are a few cases presenting negative effective protection rates. The cases of petroleum and coal products, forestry, and oilseeds are easily explained, since these sectors do not benefit of any nominal protection. In the case of oilseeds, rates were already set to zero in the '60s (*Kennedy Round*) in exchange for the acceptance of the newly established custom union between European countries. For many years this has been the only EU agricultural sector whose tariffs were 'bound' at the multilateral level, and the absence of any protection on oilseeds inputs also explains the quite high effective protection rate enjoyed by the vegetable oils industry. Less obvious is the case of motor vehicles, since they do get a nominal protection. According to the simulation results, this sector would be fairly competitive even in the absence of any protection, so that an import subsidy would be necessary in order to maintain output unchanged.

Looking at Table 7, the correlation between ERP and OERP is low, correlation and rank correlation coefficients equal to 0.311 and 0.239 respectively, and the relation is not significantly different from zero. The correlation between nominal and OERP rates is slightly higher (correlation and rank correlation coefficients equal to 0.433 and 0.579 respectively), though not very significant either. The most apparent aspect of the difference between the two concepts of effective protection is seen in sign changes: in 3 out of 20 sectors (food, motor vehicles, petroleum and coal products), the indexes change sign with the change in concept.

[11] It is worth recalling that other agricultural products were not included in the analysis due to the presence of export subsidies in addition to rather high tariff protection rates.

Overall, these results are in line with the findings of Anderson (1998): he adopts a different benchmark (profits) for the definition of effective protection, but also in that case the correlation between the old and new effective protection concepts is not significantly different from zero. Moreover, they show that the traditional definition can be interpreted as a 'partial equilibrium component' of the new index. This is confirmed for the OERP, since the new index exceeds the ERP in most of the cases.

6. CONCLUDING REMARKS

In this paper, we provide a comprehensive assessment of the EU trade policy after the enlargement. The goal is to compare the barriers faced by different exporters into the EU market, and to rank the protection granted to each sector of the economy. To this end we use the standard GTAP model with the latest release of the associated database, where protection data (coming from the MacMap-HS6 version 1) provide a set of consistent *ad valorem* equivalents (AVEs) of applied border protection across the world.

The two indices used in order to carry out these comparisons solve the *index number problem* faced by the traditional 'fixed-weight' indicators, such as the trade-weighted average tariff, under two respects: because they are based on an optimising behaviour, they avoid the substitution bias; and because they are implemented in a general-equilibrium model, they correctly account for tariff revenue. Although the trade indexes used are not new, the present application presents some elements of originality: the MTRI is computed at the bilateral level, the effective protection rate is implemented taking output volume (rather than profits, as in Anderson, 1998) as its reference, both indexes are calculated allowing for endogenous world prices.

Our results demonstrate how recent developments in the theory of trade restrictiveness indexes could be used in order to shed some light on different impacts of the overall policy. The main limit of our calculations, is due to the use of aggregated distortion data. As a consequence, we cannot claim to have accurate measures of EU trade policy. In addition, all our estimates of the MTRI and OERP uniform tariffs are dependent on the model as well as the parameters used to calculate them. Finally, we one should refrain from unwarranted generalizations based on 'average results' regarding groups of countries. There are important differences between countries, and pointing out the limited impact of some EU preference schemes does not exclude that these schemes may be significant for several countries.

Despite the caveats mentioned above, it is worth recalling some interesting features of the EU trade policy emerging from our analysis. Looking at the ranking of the levels of protection (in terms of incentives to increase production) provided to different EU sectors, it is hardly surprising to find many agrifood products at the top, since the European agricultural policies are quite well-known for their protectionist attitude. However, the rates of nominal and effective protection are not significantly related, confirming that the impact of trade policies is the product of the level of protection given to the sector (which the old effective protection concept tried to measure) and the rate at which the level of protection is translated into sector specific incentives to increase output. Differences in production changes across sectors arise due to differences in both elements of the product, and the OERP concept gives a precise measure of the level of protection in this context.

Somewhat more surprising is the ranking of the main exporters to the EU market in terms of market access, since our results fly in the face of the rhetoric about the pro-development attitude of the EU trade policy. In point of fact, the empirical literature on preferential schemes highlights several difficulties limiting the benefits available for recipient countries. Preferences are said to be are poorly utilized, mostly because the rules of origin governing eligibility to these preferences are said to be so restrictive that they largely limit their benefits (Brenton, 2003). However, several recent studies providing exact estimates of the use of commercial preferences (OECD, 2004), show that, contrary to a widespread belief, commercial preferences granted to developing countries by the EU are indeed put to good use, at least as far as agricultural products are concerned.

The main contribution of this paper is to assess the impact of preferences on trade volumes limiting our analysis to the actual tariff structure and the related bilateral trade flows. Our results suggests the relevance of other possible factors in explaining the difficulties in getting into the EU market, such as the lack of comparative advantages in the sector where preferences are granted (so that trade mostly involves products were the MFN tariffs were already reduced to zero), as well as product exclusion or the existence of quantity ceilings. While the analysis was limited to EU preferences, we expect that similar findings may be relevant for other preferential schemes: this is an obvious extension of our work, since data are readily available in the GTAP database.

Our results do not provide conclusive evidence on the debate whether EU preferences are actually ineffective. Perhaps the situation would be much worse without preferences, and it may be the case that at least some countries will be better off in the future due to the implementation of existing bilateral agreements or the negotiations of new ones. In any case, skepticism about the benefit drawn from preferences does not imply that their removal would be harmless. According to Bouët et al (2005), 14 countries earned in 2001 tariff quota rents worth more than half a percentage point of their GDP (more than one point in 8 countries).

In the ongoing WTO negotiations, it seems quite reasonable that the strongest demands from developing countries such as Brazil or Argentina in terms of market access in the EU have more to do with the reduction of distortions affecting trade in agriculture than with the tariffs on industrial products. However, it should not be forgotten that the erosion of preferences is likely to be a major challenge for countries, whose export specialization is in large part shaped by preferences.

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