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Market Access Maps: A Bilateral and Disaggregated Measure of Market Access

Antoine Bouët
Lionel Fontagné
Mondher Mimouni
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SUMMARY

Do significant barriers to trade still exist? What are the protected sectors and countries? What are the instruments of protection? This paper aims at answering precisely to these questions. While dealing with traditional problems encountered in this kind of work, this study integrates two fundamental elements: discrimination in trade regimes (we consider that the estimation of trade policy is a four-dimensional issue - products * importing countries * exporting countries* instruments of protection-), and maximal disaggregation of data.

MAcMaps (Market Access Maps) has thus been constructed to integrate the major instruments of protection (ad valorem and specific duties, prohibitions, tariff quotas, anti-dumping duties, norms) at the most detailed level (tariff lines), as well as all discriminatory regimes. It is derived from TRAINS (UNCTAD) source files, and AMAD (the Agricultural Market Access Database results from a co-operative effort by Agriculture and AgriFood – Canada - , the EU Commission - Agriculture Direction-, the FAO, the OECD, the World Bank, the UNCTAD, and the United States Department of Agriculture - Economic Research Service) databases, and integrating notifications obtained from member countries of the WTO regarding their anti-dumping regimes. Lastly these files are combined with data from the COMTRADE (UN) database. MAcMaps measures the market access for 223 exporting countries into 137 countries at the level of the tariff lines for the year 1999. It can be applied to any geographic or sectoral breakdown using a procedure that minimises the endogeneity bias while accounting for the importance of products in international trade: in MAcMaps, the protection of an importing country is weighted by the imports of the reference group this country belongs to, the grouping criteria being GDP per capita. We present four case studies:

- The first one is a presentation of general results; we group all the instruments of protection and adopt the following grouping: we consider 8 countries (European Union, USA, Japan, Australia, Morocco, Brazil, Switzerland and China) and 6 sectors (Cereals, Other agricultural and food products, Other primary products, Textiles and clothing, Other manufacturers, Services). Our results underscore that protection of agriculture, food industry, textile and clothing sectors is still high in all countries (except agriculture in Australia), that market access may be more difficult for developing countries due to the application of specific tariffs (trade preference is thus reversed), and that comparing MAcMaps estimation with other protection data (GTAP5, OECD...) points out big discrepancies.
- The second case study is an original measurement of tariff peaks. In order to avoid traditional criticisms, tariffs peaks are replaced by a 15% duty in source files. After a usual aggregation we compare the final matrix to the previous one.
- Identifying the most protected countries is the third case study. European Union is less protected than United States, due to preferential trade regimes. In turn, the EU trade regime might however be distorsive too.

- The last case study is a measurement of the importance of technical barriers and standards. We define four different categories of affected products, according to the number of countries notifying technical norms and the part of affected trade. It appears that in the database on the 4,917 products considered, only 1,171 products are not faced with any barrier limiting their trade. On the other hand, the remaining 3,746 products are subjected to at least one environment-related import barrier in at least one importing country. These 3,746 products represent 88 per cent of the global trade of goods in 1999.

ABSTRACT

MAcMaps (Market Access Maps) is a bilateral and disaggregated measure of market access which has been constructed to integrate the major instruments of protection (ad valorem and specific duties, prohibitions, tariff quotas, anti-dumping duties, norms) at the most detailed level (tariff lines), as well as all discriminatory regimes. It is derived from TRAINS (UNCTAD) source files, and AMAD (the Agricultural Market Access Database results from a co-operative effort by Agriculture and AgriFood – Canada - , the EU Commission - Agriculture Direction-, the FAO, the OECD, the World Bank, the UNCTAD, and the United States Department of Agriculture - Economic Research Service) databases, and integrating notifications obtained from member countries of the WTO regarding their anti-dumping regimes. Lastly these files are combined with data from the COMTRADE (UN) database. MAcMaps measures the market access for 223 exporting countries into 137 countries at the level of the tariff lines for the year 1999. It can be applied to any geographic or sectoral breakdown using a procedure that minimises the endogeneity bias while accounting for the importance of products in international trade: in MAcMaps, the protection of an importing country is weighted by the imports of the reference group this country belongs to, the grouping criteria being GDP per capita. We present four case studies: the first one is a general estimation of protectionism for 8 countries (European Union, USA, Japan, Australia, Morocco, Brazil, Switzerland and China) and 6 sectors (Cereals, Other agricultural and food products, Other primary products, Textiles and clothing, Other manufacturers, Services). The second case study is an original measurement of tariff peaks. Identifying the most protected countries is the third case study and the last one is a measurement of the importance of technical barriers and standards.

Keywords: protectionism, market access, custom duties, tariff quotas, technical norms, environmental norms, anti-dumping duties, tariff peaks.

JEL Classification: F02, F13, F15, F18

RÉSUMÉ

Existe-t-il encore des barrières significatives à l'échange international ? Quels sont les secteurs et les pays protégés ? Cette étude a pour objectif de répondre de façon précise à ces interrogations. Tout en traitant les difficultés techniques traditionnelles (homogénéisation des instruments pris en compte, agrégation), nous mettons l'accent sur deux éléments fondamentaux : d'une part la prise en compte de toutes les discriminations commerciales (nous considérons que l'estimation de la politique commerciale est un problème de dimension 4 - produits * pays importateur * pays exportateur * instruments de protection), d'autre part, nous travaillons à un niveau de désagrégation maximale.

MAcMaps a ainsi été construit pour intégrer les instruments majeurs de protection (droits ad valorem et spécifiques, droits anti-dumping, prohibitions, quotas tarifaires, normes) au niveau le plus détaillé (lignes tarifaires) et en tenant compte de tous les régimes discriminatoires. MAcMaps est construit sur la base des fichiers source des bases TRAINS (CNUCED) et AMAD (AMAD pour Agricultural Market Access Database résulte de la coopération de Agriculture and AgriFood – Canada - , de la Commission européenne – Direction de l'Agriculture -, de la FAO, de l'OCDE, de la Banque Mondiale, de la CNUCED, et de l'USDA ERS -United States Department of Agriculture Economic Research Service). On intègre les notifications des pays membres de l'OMC concernant leurs droits anti-dumping. Finalement, ces fichiers sont croisés avec la base COMTRADE des Nations-Unies. MAcMaps mesure ainsi l'accès au marché pour 223 pays exportateurs sur 137 marchés importateurs, au niveau des lignes tarifaires et pour l'année 1999. A partir de cette information très détaillée, on peut procéder à n'importe quelle agrégation sectorielle et géographique selon une procédure qui minimise les biais d'endogénéité tout en tenant compte de l'importance des produits dans le commerce international. Pour cela nous pondérons la protection d'un pays importateur par les importations d'un groupe de référence auquel ce pays appartient. Le critère de regroupement est le PIB par tête.

Nous présentons quatre études de cas :

- la première est une présentation générale de la base selon une désagrégation sectorielle et géographique standard : 8 pays (Union européenne, Etats-Unis, Japon, Australie, Maroc, Brésil, Suisse et Chine) et six secteurs (céréales, autres produits agricoles et industrie agro-alimentaire, autres produits primaires, textile-habillement, autres produits manufacturés, services). L'accès aux secteurs agricoles et textile-habillement est toujours très difficile dans tous les pays étudiés ; d'autre part, l'accès au marché peut être plus difficile pour les pays en voie de développement du fait de l'application de tarifs spécifiques (la préférence commerciale est ainsi inversée). Enfin, la comparaison de MAcMaps avec d'autres bases de données – GTAP5, OCDE - indique de fortes différences.

- La deuxième étude de cas est une mesure originale de l'importance des pics tarifaires selon une méthode qui veut éviter les pièges traditionnels de ce type de travail. Nous substituons un tarif de 15% à tous les pics tarifaires dans les fichiers source, puis nous agrégeons de façon à comparer la matrice finale de protection à celle estimée au point précédent.

- La mesure des pays les plus protégés est la troisième étude de cas ; à cette fin, nous gardons tous les instruments de protection, agrégeons tous les pays exportateurs et tous les produits. L'Union européenne est moins protégée que les Etats-Unis, du fait de ses régimes de préférence commerciale. Toutefois, ces préférences sont à leur tour source de distorsions.

- Enfin, nous mesurons l'importance des barrières techniques en distinguant quatre différents niveaux de produits affectés par ces barrières, selon le nombre de pays notifiant des normes techniques et la part du commerce affecté. Nous démontrons ainsi que sur 4917 produits considérés, seulement 1171 produits ne sont font face à aucune barrière technique limitant leur commerce. D'un autre côté, les autres 3746 produits sont assujettis à au moins une barrière technique dans au moins un pays. Ces 3746 produits représentent 88% du commerce mondial.

RÉSUMÉ COURT

MAcMaps est une mesure bilatérale et désagrégée de l'accès au marché qui a été construite pour intégrer les instruments majeurs de protection (droits ad valorem et spécifiques, droits anti-dumping, prohibitions, quotas tarifaires, normes) au niveau le plus détaillé (SH 10) et en tenant compte de tous les régimes discriminatoires. MAcMaps est construit sur la base des fichiers source des bases TRAINS (CNUCED) et AMAD (AMAD pour Agricultural Market Access Database résulte de la coopération de Agriculture and AgriFood – Canada - , de la Commission européenne – Direction de l'Agriculture -, de la FAO, de l'OCDE, de la Banque Mondiale, de la CNUCED, et de l'USDA ERS -United States Department of Agriculture Economic Research Service). On intègre les notifications des pays membres de l'OMC concernant leurs droits anti-dumping. Finalement, ces fichiers sont croisés avec la base COMTRADE des Nations-Unies. MAcMaps mesure ainsi l'accès au marché pour 223 pays exportateurs sur 137 marchés importateurs, au niveau des lignes tarifaires et pour l'année 1999. A partir de cette information très détaillée, on peut procéder à n'importe quelle agrégation sectorielle et géographique selon une procédure qui minimise les biais d'endogénéité tout en tenant compte de l'importance des produits dans le commerce international. Pour cela nous pondérons la protection d'un pays importateur par les importations d'un groupe de référence auquel ce pays appartient. Le critère de regroupement est le PIB par tête.

Nous présentons quatre études de cas : la première est une présentation générale de la base selon une désagrégation sectorielle et géographique standard : 8 pays (Union européenne, Etats-Unis, Japon, Australie, Maroc, Brésil, Suisse et Chine) et six secteurs (céréales, autres produits agricoles et industrie agro-alimentaire, autres produits primaires, textile-habillement, autres produits manufacturés, services). La deuxième étude de cas est une mesure originale de l'importance des pics tarifaires. La mesure des pays les plus protégés est la troisième étude de cas. Enfin, nous mesurons l'importance des barrières techniques et environnementales.

Mots-clé : protectionnisme, accès au marché, droits de douane, quotas tarifaires, normes techniques, droits anti-dumping, pics tarifaires, normes environnementales.

JEL Classification: F02, F13, F15, F18

MARKET ACCESS MAPS : A BILATERAL AND DISAGGREGATED MEASURE OF MARKET ACCESS

Antoine Bouët¹
Lionel Fontagné²
Mondher Mimouni³
Xavier Pichot⁴

INTRODUCTION

Do significant barriers to trade still exist? What are the protected sectors and countries? What are the instruments of protection? It is difficult to give precise answers to these questions. Regional groups and trade preferences have spread in a general context of multilateral tariff dismantling. Thus the policies of industrialised countries often appear to be discriminating, e.g. MFN (Most Favoured Nation) system, Free Trade Areas, Customs Unions, as well as Generalised Systems of Preferences (GSP) for developing countries. While tariffs have been decreasing for forty years, other trade barriers, such as tariff quotas, and technical and sanitary norms are increasingly enforced. Lastly, protectionism is often opaque, as a result of a lack of information and/or adoption of arbitrary and non-transparent procedures such as anti-dumping measures.

A full understanding of the different mechanisms of market access is a fundamental yet extremely difficult task.

- (i) At first, it is essential to take into account all the instruments that create artificial obstacles to international trade, e.g. customs duties, quotas, prohibitions, norms, etc.
- (ii) These heterogeneous instruments then need to be homogenised, e.g. ‘ad valorem’ duties vs. specific duties. In addition to quotas and bans in the textile and clothing sector, tariff quotas were introduced in agriculture in 1995. These are combination of quantitative restrictions and ad valorem duties. Finally, the protectionist aspect of some interventions is uncertain, such as those related to food security. These problems are partly solved by the calculation of ‘ad valorem’ equivalents.

¹ Antoine Bouët is Scientific Counsellor at CEPII, Professor at Pau University.

² Lionel Fontagné is Director at CEPII.

³ Mondher Mimouni is Market Analyst at ITC.

⁴ Xavier Pichot is preparing a PhD at Pau University.

- (iii) Then the issue of the aggregation of these tariff equivalents remains. Economic literature in this regard (Balassa, 1965; Laird, 1996; Bouët, 2000) acknowledges this difficult issue. Some methods fail to take into account the importance of products in international trade, while others face an endogeneity bias. It is nevertheless possible to establish an aggregation method that minimises these biases and at the same time acknowledges the importance of products in international trade.
- (iv) The integration of technical, sanitary and phyto-sanitary norms also needs to be addressed. According to Beghin and Bureau (2001) it is impossible to estimate ad valorem equivalents for these barriers. Hence alternative options need to be considered.
- (v) While dealing with the problems cited above, this study aims at finding a satisfactory solution to two fundamental elements:

- Trade regimes of countries engaged in international trade are usually very *discriminatory*. Among the different systems of customs duties the MFN reference is the most common, which applies to products originating in WTO-member states. Others include duties with respect to the Generalised System of Preferences, those determined by regional trade agreements, and specific measures, such as the anti-dumping measures, which are bilateral duties by nature.

European Union countries, for example, levy an MFN tariff (for non European WTO-members), a GSP tariff (Generalised System of Preferences), an ACP tariff (Africa – Caribbean - Pacific) until the Cotonou 2001 agreements, a LDC tariff (Least Developed Countries), recently lowered to 0 per cent, a tariff for countries fighting against drug traffic, and a tariff for Euro-Mediterranean agreements. On the other hand, they impose anti-dumping measures on a bilateral basis.

Consequently, it is impossible to estimate a level of protection for a particular product from a particular country or geographic zone vis-à-vis the rest of the world. For each importing zone, supplying countries often face specific trade barriers. When contemplating the multiplicity of instruments of protection, the problem is not two-dimensional (products*importing country), as it is referred to in several databases (see for example, OECD, 1997 or Messerlin, 2001, or even Francois, McDonald & Nordström, 1995). **It is therefore a four-dimensional issue: products * importing countries *exporting countries* instruments of protection.**

- It is also important to record the data at as *disaggregated* a level as possible (HS 10, HS 8 or HS 6). Take the example of a World Trade Computable General Equilibrium Model, with ten countries and ten sectors: a liberalisation shock should be applied to the detailed information source and not to the final aggregate protection data of the ten zones vis-à-vis the nine suppliers of the ten products. Liberalisation often concerns MFN tariffs and not other instruments, like anti-dumping, prohibitions, or other trade regimes, such as GSP or ACP. Another reason to work with disaggregated data is that the liberalisation shock may be

stronger when it applies to tariff peaks, since these peaks have disappeared in the final aggregate protection matrix. Thus a simulated liberalisation shock on the final tariff matrix is a significantly biased method.

MACMaps (Market Access Maps) has thus been constructed to integrate the major instruments of protection at the most detailed level (tariff lines), as well as all discriminatory regimes. It is derived from TRAINS (UNCTAD) source files, and AMAD (the Agricultural Market Access Database results from a co-operative effort by Agriculture and AgriFood – Canada -, the EU Commission - Agriculture Direction-, the FAO, the OECD, the World Bank, the UNCTAD, and the United States Department of Agriculture - Economic Research Service) databases, and integrating notifications obtained from member countries of the WTO regarding their anti-dumping regimes. Lastly these files are combined with data from the COMTRADE (UN) database. MACMaps measures the market access for 223 exporting countries into 137 countries at the level of the tariff lines for the year 1999. It can be applied to any geographic or sectoral breakdown using a procedure that minimises the endogeneity bias while accounting for the importance of products in international trade: in MACMaps, the protection of an importing country is weighted by the imports of the reference group this country belongs to, the grouping criteria being GDP per capita. (⁵).

I - METHODOLOGICAL ISSUES

The two underlying elements in the construction of MACMaps are to record market access data at a bilateral level and for a very disaggregated nomenclature.

A – Discrimination and disaggregated information

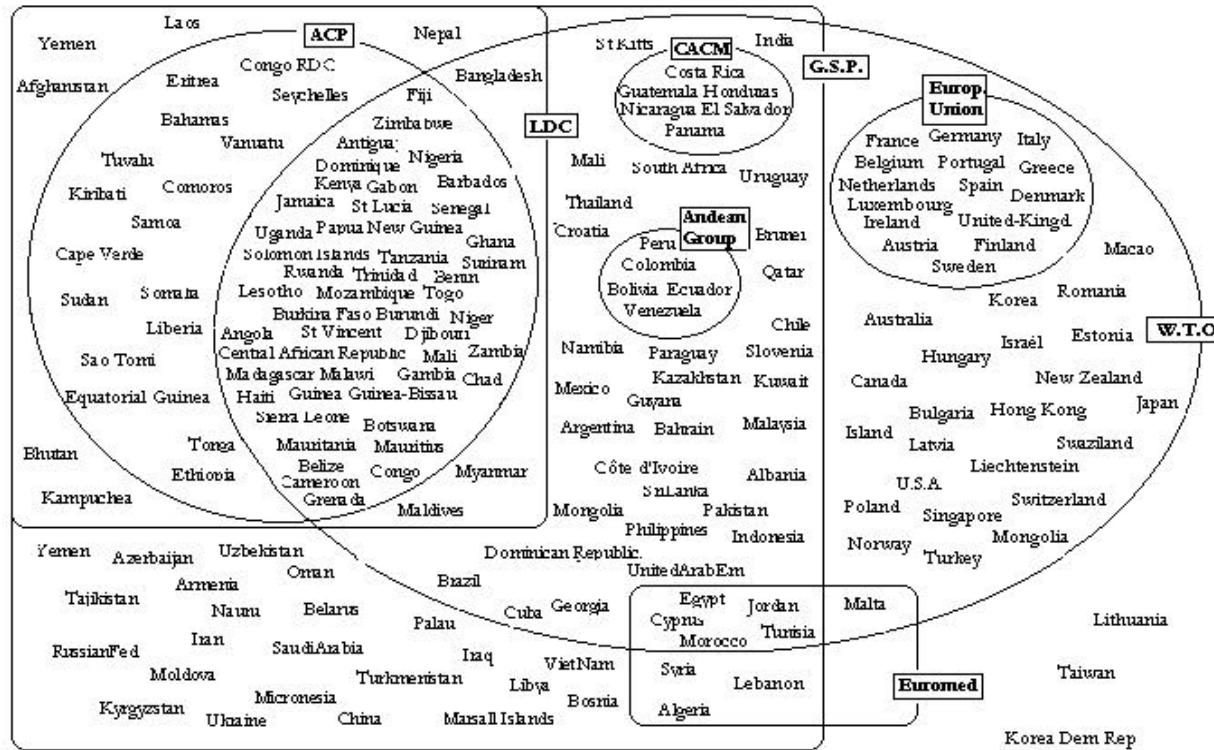
⁵ The construction of MACMaps is the result of a co-operative agreement between the International Trade Centre (ITC – Geneva) and the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII, Paris). CATT (University of Pau) has also been actively taking part in this work.

Market Access Maps: A bilateral and disaggregated measure of market access

1 – Bilateral data on protection

We measure the protection applied by each country against every supplier, not only with respect to WTO membership, but also with respect to all other discriminatory trade regimes, regional agreements notably.

Figure 1: Discriminatory regimes of the EU – 1999



Source: Authors' construction - Note: It is still a simplified version of reality

Is it possible to characterise a country trade policy vis-à-vis all its suppliers by a single tariff? Take the case of the European Union and its different customs regimes. Figure 1 attempts to highlight the complexity of its trade policy by drawing a simplified map of EU discriminatory regimes. The EU is a member of the WTO and applies an MFN tariff to all other member states. It has also negotiated the GSP (Generalised System of Preferences) agreement that grants a lower tariff rate than the MFN status to member countries of the WTO (Albania, India, Zimbabwe) and non-members such as China, Iran or Iraq.

On the other hand, the European Union has signed agreements with LDCs (Least Developed Countries in Figure 1) and has granted them an even lower tariff than the GSP. Some of them are members of the WTO (Myanmar, Tanzania) while others are not (Nepal, Vanuatu). Among these LDCs, some will benefit until the end of 2001 from the lowest tariff rates, being countries having already signed the ACP agreement. The Cotonou agreements in 2001 suspended the ACP scheme and replaced it with bilateral agreements. In the case of ACP countries, some are WTO members (Tanzania, Sierra Leone) and others are not (Tuvalu, Kiribati).

Then European Union has for many years negotiated asymmetric agreements with some Mediterranean countries. These agreements are going to be progressively transformed into free trade area agreements. Among these Mediterranean countries, some are WTO members and have also signed the GSP agreement (such as Egypt and Tunisia), others are not WTO members but are GSP countries (such as Syria and Algeria), and others are WTO members but not GSP countries (Malta).

Some countries negotiated a free trade agreement with the EU on industry and agriculture to fight against drug trafficking (countries from the Andean Pact). For the same reasons, the European Union signed the same kind of agreement, but only for agriculture with countries from the CACM (Central America Common Market). All are WTO members and also signed the GSP accord.

Some countries such as North Korea are neither members of the WTO, nor have they entered into any agreement with Europe.

This classification of supplier countries is not the same for all products. In fact, a Harmonised System (HS) position may be characterised by a unique tariff for all WTO members, or by a WTO tariff and a GSP tariff, or by five different trade regimes. It is necessary to create many partitions of supplier countries (*infra*). Lastly the list of GSP countries changes from one nation to the other: Poland has signed GSP agreements with 41 countries, New Zealand with 85 countries and Japan with 120 countries.

The European case is not representative of all situations. Among the 137 countries studied, the vast majority (between 90 and 100 countries) conduct a single trade regime. These are generally the smaller countries. But Europe is not an isolated case either. The USA, Japan, and Switzerland, as well as Romania and other nations have extremely complex trade policy regimes. All the big trading nations, representing a large share of world imports, have very

discriminatory regimes. To sum up the argument, it is not consistent to summarise the trade policy of these countries by one single tariff.

2 – Disaggregated information

MACMaps contains very disaggregated information. For each importing country, MACMaps records all the groups of countries that enforce the same trade policy, and for every trade regime the existence or absence of various barriers to trade (ad valorem tax, special tariffs, quotas, etc.). It therefore acts as a four-dimensional matrix (products*importing countries*exporting countries*instruments of protection). For the time being, there is no time-based dimension, however 2000 data will be included in July 2002.

Table 1 portrays the tariff structure of imports of white chocolate (HS10 code: 1704903000) in the European Union. Twelve trade regimes are set according to the product's origins: Israel (ISR), Algeria (DZA), Tunisia (TUN), Syria (SYR), Morocco (MAR), Jordan (JOR), Egypt (EGY), Poland (POL), Hungary (HUN), the ACP countries (ACP group in the partner column), other signatory countries of the GSP (GS3) and finally other members of the WTO (WT5).

Four ad valorem taxes (0, 10.4%, 7.2% and 2% in the column « Tariff ad val ») and five specific tariffs (0, 0.515, 0.36, 0.205 and 0.338 USD thousands per ton of white chocolate in the column « tarif1 ») are imposed depending on the supplier country. No prohibition or anti-dumping duty is levied. To estimate the ad valorem equivalent (AVE) of specific tariffs, bilateral trade statistics in value (column « trade value » in USD thousands) and quantity (column « Trade quantity» in tons) have been extracted from the COMTRADE database. They allow for the estimation of the unit value of imports. The column « Global ad valorem equivalent» adds all the AVEs of the various instruments of protection recorded. Here the specific tariff and international trade statistics are defined in the same physical unit (W for ton). On this HS position, discrimination is very strong, with protection rates ranging from 0 % to 30.1 %.

Table 1: Extracted from MACMaps - European protection of white chocolate (HS10 position 1704903000) in 1999

Reporting country	Tariff ad valorem	HS6	HS10	Partner	Prohibition	Anti-dumping	Specific tariff unity	Specific tariff	Trade flow unity	Trade value	Trade quantity	Ad valorem equivalent	Global ad valorem equivalent
EU	0.104	170490	1704903000	WT5	0	0	W	0.515	W	150308	43158	14.79%	25.2%
EU	0.072	170490	1704903000	GS3	0	0	W	0.515	W	25601	7262	14.61%	21.8%
EU		170490	1704903000	ACP	0	0	W	0	W	162	37	0.00%	0.0%
EU	0.02	170490	1704903000	HUN	0	0	W	0.36	W	2686	938	12.57%	14.5%
EU		170490	1704903000	POL	0	0	W	0.205	W	11078	5252	9.72%	9.72%
EU		170490	1704903000	EGY	0	0	W	0.515	W	89	50	28.93%	28.9%
EU		170490	1704903000	JOR	0	0	W	0.515	W	4	1	12.88%	12.9%
EU		170490	1704903000	MAR	0	0	W	0.515	W	81	47	29.88%	29.9%
EU		170490	1704903000	SYR	0	0	W	0.515	W	149	87	30.07%	30.1%
EU		170490	1704903000	TUN	0	0	W	0.515	W	264	97	18.92%	18.9%
EU		170490	1704903000	DZA	0	0	W	0.515	W	35	7	10.30%	10.3%
EU		170490	1704903000	ISR	0	0	W	0.338	W	865	187	7.31%	7.3%

Source: MAcMaps, Market Access Maps developed by ITC and CEPII on the basis of UNCTAD TRAINS, AMAD, UNSD COMTRADE and WTO notifications.

In the definition of tariff structures for white chocolate in the European Union, there is a need to group countries that will benefit from these different regimes: remove GSP countries from the list of WTO members, along with ACP nations and those benefiting from bilateral agreements; remove ACP nations and countries benefiting from bilateral regimes from the list of GSP countries.

Table 2: Classification according to discriminatory trade regimes

Trade regimes	Classification of countries
WTO	WTO = {USA, Japan, Australia, Tunisia, Argentina, Albania, Afghanistan, Angola, Benin}
WTO and GSP	WTO = {USA, Japan, Australia} GSP={Tunisia, Argentina, Albania, Afghanistan, Angola, Benin}
WTO and LDC	WTO = {USA, Japan, Australia, Tunisia, Argentina, Albania} LDC = {Afghanistan, Angola, Benin}
WTO, GSP and LDC	WTO={USA, Japan, Australia} GSP={Tunisia, Argentina, Albania} LDC={Afghanistan, Angola, Benin}

To illustrate this point and the underlying difficulties, let us assume that there are ten countries in the world: the European Union, USA, Japan, Australia, Tunisia, Argentina, Albania, Afghanistan, Angola and Benin. We study the trade policy of the European Union. For simplicity we further assume that all countries in the group are WTO members, and that the EU only has two discriminatory regimes: GSP towards Tunisia, Argentina, Albania, Afghanistan, Angola, Benin, and an LDC policy for Afghanistan, Angola, and Benin. Assuming that there exists a WTO regime for all HS positions, each HS position can be characterised according to four different clustering as illustrated in Table 2.

Hence, if for an HS position there is a WTO and an LDC tax, the three least advanced countries will support the LDC tariff and not the WTO tariff, and we therefore remove these three LDCs from the WTO tariff group. If on the contrary, only the WTO tariff exists, all supplier countries would be taxed accordingly.

If the European Union signs a bilateral treaty with a country such as Tunisia, the number of possibilities exceeds 8 in this illustrative example: (WTO), (WTO, Tunisia), (WTO, GSP), (WTO, GSP, Tunisia)...

Starting from these data, an aggregation method will permit the establishment of an information base in accordance with the following four options:

- (i) Integration or non-integration of all the trade barriers
- (ii) Sectoral aggregation
- (iii) Geographical aggregation of exporting countries
- (iv) Geographical aggregation of importing countries

The database is maintained in its detailed version, i.e. 10,000 products (HS10)*137 importing countries* 220 supplier countries*5 instruments of protection. Why is it essential to maintain the data in such detail?

The key feature here is to apply shocks at the source of the information and not at the final level. The price to pay is to work with a mega-database (about 33 Gigabytes).

To illustrate the necessity of this approach let us take an example. We assume that according to a World Trade Computable General Equilibrium Model, the world is divided into 5 zones and 10 products. We aim at simulating a liberalisation shock (MFN tariffs higher than 15 per cent are reduced by 50 per cent – tariffs lower than 15 per cent, specific tariffs, inside and outside quotas tariff rates are reduced by 25 per cent – and quotas have a growth of 25 per cent – other instruments are not modified).

Usually, the shock is applied to an information level that is not greatly disaggregated; in the worst case, it is applied to the final protection matrix: 5 importing countries*4 supplier countries*10 products. It results in some considerable bias.

- If the only information about protection is a 5*4*10 matrix, tariff peaks (duties greater than 15%) have disappeared for the most part. Thus it is impossible to simulate the progressive aspect of liberalisation.

- A liberalisation shock may be applied to an aggregated measure of all instruments, but a number of protection instruments are not affected by liberalisation, such as anti-dumping measures and prohibitions. Trade negotiation may also concern MFN duties and not regional or preferential agreements. Liberalisation concerning tariff quotas must be applied at a very detailed level.

Maintaining the data source allows the user to be precise and selective in the application of shocks. A simulated shock may be the suppression of anti-dumping measures or the conversion of a tariff quota into a simple ad valorem equal to the Inside Quota Tariff Rate. This simulation is impossible if the database has not recorded all the different instruments used by a country to protect itself.

B – MAcMaps – general properties

1 – Geographical coverage

MAcMaps accesses source files from the COMTRADE database of UNCTAD and from the TRAINs database, therefore analysing the trade policy of 137 countries. It finally establishes the trade policy applied by these 137 countries on 220 suppliers (the list of these 220 countries is presented in Annex 1).

Table 3: Countries whose trade policy regimes are evaluated by MAcMaps

ANTIGUA BARB	ECUADOR	ST.LUCIA	ROMANIA
ALBANIA	ESTONIA	SRI LANKA	RUSSIAN FED
ARGENTINA	EGYPT	LITHUANIA	RWANDA
AUSTRALIA	ETHIOPIA	LATVIA	SAUDI ARABIA
BARBADOS	EUROPE (15)	LIBYA	SOLOMON ISLS
BANGLADESH	GABON	MOROCCO	SEYCHELLES
BURKINA FASO	GRENADA	REP.MOLDOVA	SUDAN
BAHRAIN	GEORGIA	MADAGASCAR	SINGAPORE
BRUNEI DAR.	GHANA	MALI	SLOVENIA
BOLIVIA	EQ.GUINEA	MONTSERRAT	SURINAME
BRAZIL	GUATEMALA	MALTA	EL SALVADOR
BAHAMAS	GUYANA	MAURITIUS	CHAD
BHUTAN	HONG KONG	MALDIVES	THAILAND
BELARUS	HONDURAS	MALAWI	TURKMENISTAN
BELIZE	HUNGARY	MEXICO	TUNISIA
CANADA	INDONESIA	MALAYSIA	TURKEY
CENT.AF.REP	ISRAEL	MOZAMBIOUE	TRINIDAD TBG
CONGO	INDIA	NIGERIA	TAIWAN
SWITZ.LIECHT	IRAN (ISLM.R)	NICARAGUA	UNTD.RP.TANZ
CÔTE D'IVOIRE	ICELAND	NORWAY	UKRAINE
CHILE	JAMAICA	NEPAL	UGANDA
CAMEROON	JORDAN	NEW ZEALAND	USA
CHINA	JAPAN	OMAN	URUGUAY
COLOMBIA	KENYA	PANAMA	S.VINCENT-GR
COSTA RICA	KYRGYZSTAN	PERU	VENEZUELA
CUBA	ST.KITTS NEV	PAPUA N.GUIN	VIET NAM
CZECH REP	KOREA REP.	PHILIPPINES	S.AFR.CUS.UN
DOMINICA	KAZAKSTAN	PAKISTAN	ZAMBIA
DOMINICAN RP	LAO P.DEM.R	POLAND	ZIMBABWE
ALGERIA	LEBANON	PARAGUAY	

The information used for the construction of MAcMaps is: (i) TRAINS source code files; (ii) the COMTRADE database for the estimation of import unit value and for the sectoral and geographic aggregation (ibid); (iii) the AMAD database to evaluate tariff quotas; (iv) national notifications made to the WTO for anti-dumping duties (files G\ADP\N\ on the WTO website) and for the method of administering tariff quotas.

2 – Sectoral coverage

MAcMaps preserves the information at the most disaggregated level possible: HS10, HS8 or HS6. Thus for some countries it is an estimation of trade policy on 10,000 products.

3 – Instruments of protection

The database integrates the following instruments of protection: ad valorem duties, specific duties, prohibitions, tariff quotas, anti-dumping duties, and sanitary, environmental and technical norms.

MAcMaps does not have information on quotas in the textile and clothing sector. An evaluation of ad valorem equivalents using the price differences method is a difficult task given the number of HS positions and countries involved. Nevertheless, it is clear that to estimate market access into industrialised countries, quotas in the textile and clothing sectors need to be taken into account. For this, since we have to measure the protection level for an industrialised country, globally or in these two sectors, we integrate the information obtained from the GTAP5 database (see Annex 3) to add it to the corresponding one in MAcMaps and then measure market access.

Table 4: Ad Valorem Taxes in the Quad

	Canada	USA	Japan	EU
<i>No. of ad valorem duties</i>	7970	8593	7589	10248
<i>Average duty</i>	7.10%	4.87%	6.55%	5.88%
<i>Maximum duty</i>	331.50%	350%	60%	88.90%
<i>Duties > 15% (number)</i>	835	467	870	771
<i>Duty > 15% (freq)</i>	10.47%	5.43%	11.46%	7.52%
<i>Duty > 3*average (freq)</i>	1.4%	6.5%	6.8%	4.1%
<i>Duty > 2*average (freq)</i>	10.62%	14.39%	14.19%	17.64%

Source: MAcMaps, see Table 1.

a) Ad valorem tariffs

Ad valorem tariffs are obtained from the source files of the TRAINS database of UNCTAD. Information on these duties is maintained at the most disaggregated level possible: HS10, HS8 or HS6.

Table 4 recapitulates some characteristics of ad valorem customs duties. The United States set the lowest average tariff and the lowest part of tariff peaks (international definition). For the European Union, the average tariff is low, North American maximum tariffs being much higher than in Europe.

b) Specific duties

Specific duties are derived from the source files of the TRAINS database. A specific duty has particular properties as compared to an ad valorem duty, such as the impact on quality of domestically produced goods, since the degree of protection varies with the price of the good, and variations in the degree of protection itself occur when world prices vary. Nevertheless in MACMaps, an ad valorem equivalent has been calculated for every specific duty, by dividing the tariff by the unit value of bilateral imports.

If it is impossible to calculate a unit value for the countries in question, it is estimated at a group level representative of this country (ibid). This group consists of a set of countries similar to the country under review, in terms of GDP per capita. We thus avoid any reference to a world unit value that could be vastly different from the unit value of this importing country.

It has often been argued that countries use specific tariffs to secretly set high protection barriers. MACMaps confirms this opinion since all countries' average ad valorem equivalent (AVE - see table 5) is higher than the average ad valorem tariff. It is especially true for the European Union of which the average AVE is greater than 50%.

Table 5: Specific Duties in the Quad

	Canada	USA	Japan	EU
<i>No. of specific duties</i>	203	1148	418	1059
<i>Average AVE</i>	7.97%	12.75%	7.37%	50.04%
<i>Maximum AVE</i>	346%	310%	171%	326%
<i>Number AVE > 15%</i>	22	170	34	679
<i>Freq AVE > 15%</i>	10.83%	14.80%	8.13%	64.11%
<i>Number AVE > 2* aver.</i>	22	140	34	107
<i>Freq AVE > 2* average</i>	10.83%	12.19%	8.13%	10.10%

Source: MACMaps, see Table 1.

c) Prohibitions

How are prohibitions included in the computations? Excluding them tends to under-estimate the protection of an economy (it would be equivalent to a 0% ad valorem import duty). Thus we add a tariff of 200 per cent on the corresponding HS position. Sensitivity tests will complete the integration of this instrument. To recall, the highest level of tariffs in the 4 countries in the agricultural, as well as in other sectors is indicated in table 6 along with the number of prohibitions worldwide. The number of prohibitions is very high in Europe but it is zero in Canada, the United States and Japan.

Table 6: Maximum number of prohibitions and ad valorem taxes in the Quadrilateral

	Canada	USA	Japan	EU
<i>No. of prohibitions.</i>	0	0	0	881
<i>Agriculture – maximum tax</i>	331.5%	350%	55%	88.90%
<i>Other sectors – Maximum tax</i>	25%	48%	60%	22%

Source: MAcMaps, see Table 1.

d) Tariff quotas

The Uruguay Round Agricultural Agreement attempted to normalise the agricultural sector by asking each country to convert all their existing instruments of protection into customs ad valorem duties before proceeding to lower the tax rate. Faced with resistance from the countries, tariff quotas were negotiated, i.e. the combination of quantitative restrictions and classic taxes. A tariff quota is defined as an annual import volume quota and two taxes. The smallest tariff referred to as the Inside Quota Tariff Rate (IQTR) places a tax on the first set of imports. When the quota has reached its limit, it is possible to further import more goods, but these are charged at a higher tax called the Outside Quota Tariff Rate (OQTR).

Industrialised countries are the main users of these tariff quotas. Table 7 presents the number of such quotas, average IQTR and OQTR rates, and finally the average utilisation ratio (real imports over quotas) for the four countries.

The quotas are generally not fully utilised. For the four countries, the utilisation ratio lies between 66 per cent and 85 per cent. IQTR are low for Canada and the USA. OQTR are “prohibitive” in the case of Canada and Japan.

Table 7: Number of tariff quotas (1999), average IQTR and OQTR in the Quad

	Canada	USA	Japan	EU
<i>No. of tariff quotas</i>	87	21	20	54
<i>Average IQTR</i>	3.5%	8.7%	17.28%	15.17%
<i>Average OQTR</i>	169.12%	41.83%	234.83%	60.19%
<i>Utilisation ratio</i>	85%	66%	67%	69%

Source: MAcMaps, see Table 1.

The previous definition of a tariff quota is theoretical. Different methods of administrating quotas exist around the world. There are four principles ⁽⁶⁾:

- « levied duties »: products are imported without any quantitative restriction and the duty is always the IQTR.
- « Order of presentation of requests »: until the quota is reached, the first imports are taxed by the IQTR, the others by the OQTR.

⁶ See corresponding section on the WTO website located at G/AG/NG/S/8/ or OECD 1999a.

- « Licences on request »: after examination, licences are delivered or not, according to the quantities asked at the inside quota.
- « Traditional importers »: Import licences are shared among the previous period suppliers and the tax paid is the IQTR.

It means that a major part of these methods (actually more than 90 per cent of tariff quotas) use the IQTR for all imports, except in the case of the second method. Since we have access to all the information stored on the AMAD database, and to the information made available on the WTO web site, (notably concerning the management methods), we have calculated an ad valorem equivalent for each tariff quota, either by using the inside rate in the case of methods 1, 3 and 4, or by using a weighted average when the quota is administered on the basis of the second method (the inside tariff is weighted by the quota, the outside tariff by imports outside the quota). This method suffers from an endogeneity bias, since we use the imports of the country in question as weights. To consider weighting by a group of countries would necessitate the availability of homogenous information on the quantities imported by the countries in each group.

e) Anti-dumping duties

The Marrakech agreement clearly reinforced the proliferation of anti-dumping duties. The WTO has authorised each member nation to adopt a national anti-dumping legislation. The number of applied anti-dumping duties had thus gone beyond 1,121 on 30th June 2000, of which 330 belonged to the USA and 190 to the EU. The most targeted countries are China, Korea, and Indonesia. But what is really new is that developing countries are now using this form of protection in greater measure. Since 30 June 2000 onwards, South Africa has imposed 104 anti-dumping duties, India 90, and Mexico 80 (WTO, 2001 Report).

MAcMaps incorporates anti-dumping duties, following national notifications sent to the WTO, in the form of bi-annual notices that are available on the WTO web site (document G/ADP/N) and more precisely on the 30 June 1999 (notification 53). This document indicates the effective anti-dumping duties, identifies the partners, the date the duty was imposed and the name of the product. Two difficulties arise:

- Since the oldest notification goes back only to 1995, it is impossible to know the level of all applied duties since many of them have been adopted before this date (unless the first notification received by the WTO contains this information). As the WTO indicated, since 1,097 anti-dumping measures were in practice until 30 June 1999, (WTO, 2000 Report), this means that we were able to recover two thirds of the total information, as MAcMaps can only integrate 725 anti-dumping measures. Hence there is a loss of information.

Table 8: Number of anti-dumping cases in the Quad, average duty, and most affected country

	Canada	USA	Japan	EU
<i>Number of HS positions</i>	339	566	42	260
<i>Average duty</i>	35.6%	22.2%	9.9%	29.1%
<i>Most taxed partner</i>	USA	Japan	Pakistan	Chine

Source: MAcMaps, see Table 1.

- On the other hand, notifications cite the name of incriminated products, but do not cite a reference to any international nomenclature. The code of the targeted product must therefore be retrieved from the HS6 or HS10 classification.

MAcMaps therefore integrates 725 anti-dumping practices and recovers them on 2,283 position lines of HS6 or HS10. The average applied ad valorem tax is 82.4 per cent and the maximum tax levied is 691 per cent (India's duty on industrial sewing needles of Chinese origin). Protection adopted through these procedures is thus extremely high. Table 8 gives the number of HS positions for the four countries, as well as the average ad valorem taxes and the exporting country that is most affected by these duties. These four industrialised nations apply lower duties on average as compared to world rates. If the USA is the country that most frequently uses these anti-dumping measures, then the duties it applies are relatively moderate.

f) Technical barriers to trade, sanitary, phytosanitary and environmental standards

While the number of traditional tariff and non-tariff barriers to trade has decreased in the past years (custom duties, quotas, voluntary export restraints), new obstacles, such as Technical barriers to Trade (TBT), and sanitary and phytosanitary rules, notified by WTO members have been increasingly used since 1995. The integration of these barriers is an extremely delicate task. From the national notifications sent to the WTO, MAcMaps integrates 7 types of non-tariff measures, adopted for technical, sanitary, phytosanitary or environmental reasons:

- (i) Authorisations
- (ii) Prohibitions
- (iii) Prior surveillance
- (iv) Quota
- (v) Financial measures
- (vi) Monopolistic measures
- (vii) Technical measures (marketing, labelling, packaging, inspection, quarantine)

In what measure are sanitary, phytosanitary and environmental issues the main determinants of this increase in barriers to trade? It is difficult to obtain an answer, due to several elements in the analysis:

- (i) Collective preferences are linked to the level of development of a particular country: see the protection of reptiles - HS 410320 -, applied by only 20 countries, but which affects 96 per cent of corresponding world imports.
- (ii) Collective preferences can differ between countries, even when they equally wealthy (hormone-treated beef).
- (iii) Sanitary pre-requisites on some food products can be numerous, e.g. in the case of refrigerated or frozen fresh fish fillets, HS 030410 and HS 030420, it represents world imports of only US\$ 6 billion.
- (iv) It is difficult to distinguish the protection of domestic species from foreign species from the protection of domestic producers (unrooted bulbs and tubers - HS060210- are frequently forbidden from being imported to avoid interbreedings of species while the imports of cut flowers and flower buds are often free - HS06010).

Adding to the difficulties, distinctions between fair quality standards or norms and those of a protectionist nature, requires the estimation of an ad valorem equivalent of a norm, which poses a problem in itself. Indeed standards do not work like customs duties, either banning the access of a product into a market or asking for an adaptation of the production process. A tariff is identical to an increase in the marginal cost of the foreign firm. Adapting a product to foreign technical norms is either an increase in the marginal cost of production, or a fixed cost, or both. It therefore appears to be inappropriate to attempt to calculate the ad valorem equivalent of a norm.

MAcMaps proposes an original solution to integrate technical, sanitary and environmental barriers that avoids a frequency or coverage index (see below) which contains poor informative value.

C – Aggregation method

Economic literature has always presented evidence of the difficulties encountered in the construction of a sectoral aggregation of tariffs (see a recent article by Bach and Martin « Would the right tariff aggregator please stand up? »). Effectively, since we have to aggregate different tariffs to measure the global protection of a sector or an economy, we would first use national imports as weights. Since these imports depend on the tariff, there is an endogeneity bias: a high (low) tariff generates limited (large) imports and its contribution to the overall protection is then reduced (increased). Using imports as weights leads to an under-valuation of the protection level of a country. The same problem arises while aggregating importing and exporting countries.

- Let us consider two countries, New Zealand and Australia, importing product X, New Zealand has a tariff rate of 50 per cent and Australia 5 per cent. If we have to measure the protection rate of the group (New Zealand and Australia) for this position, using the imports of each country as weights will reduce the weight of the high tariff, since the result of such a high tariff is low imports.

- The same problem arises while aggregating EU tariffs vis-à-vis two exporting countries subjected to discrimination. European imports originating from New Zealand taxed at 50 per cent will be weak while imports originating from Australia taxed at 5 per cent will be more important, the EU tariff vis-à-vis the group (New Zealand and Australia) will be under-estimated by this method.

In short, sectoral as well as geographical aggregation of importers and exporters using this method of weights systematically under-estimates the rates of protection levied. Global imports can be used as weights, but they may constitute import structures that are radically different from those of the region considered. A value-added weight, or even a simple average, have little chance too of being representative of the potential imports of the countries in question. Hence, we have retained the option of weighing the imports of a country by those of a reference group the country belongs to, the assembling criteria being GDP per capita. We shall now describe this method in a detailed manner.

For every importer and every supplier, on every HS position, we add 5 ad valorem equivalents corresponding to 5 instruments integrated in MACMaps (it is possible to have substitution and not addition, notably for anti-dumping duties and prohibitions vis-à-vis WTO tariffs). Once we have for every importing country vis-à-vis every supplier nation on each position of the HS, an ad valorem equivalent representing all the instruments of protection, we aggregate by transforming a matrix $137 \times 220 \times 10,000$ into a matrix $r \times r \times n$ where 'r' is the number of global regions and 'n' the number of sectors: e.g. we consider on $r=8$ and $n=6$.

We define an invariant world classification of countries, which have about the same level of GDP per capita. An average is fixed for 1981-2000 (column Aver. in table 9) and two thresholds are fixed: 25 per cent and 50 per cent of the average of the OECD countries over these 20 years. These thresholds define the three reference groups in table 9. Each country or trading zone (EU or SACU – Southern African Custom Union) 'i' thus belongs to a reference zone $ZR(i)$.

Table 9: Reference Groups of MACMaps

Group 1	GDP per capita (volume PPP –USD)		Group 2	2000	Aver.	Group 3	2000	Aver.	Group 3	2000	Aver.
	2000	Aver..									
Luxembourg	35300	23760	Czech Rep.	8467	7765	Vanuatu	4200	4001	Benin	1511	1403
United States	28159	22407	Venezuela	7076	7562	Peru	4136	4000	Nicaragua	1200	1312
Kuwait	21463	21150	Mexico	8359	7287	Bulgaria	3957	3971	Kenya	1265	1268
Switzerland	21687	19997	Uruguay	8301	7126	Equator	3582	3955	Nigeria	1235	1192
Norway	24343	19452	Argentina	7971	6956	Egypt	4636	3894	Iran	1334	1184
Qatar	17325	18560	Malaysia	9352	6696	Saint-Lucia	4724	3715	Indochine	1729	1169
Canada	21628	18425	Barbados	7620	6560	Swaziland	4075	3641	Viet Nam	1697	1131
Bermuda	20016	18309	Gabon	7144	6301	Dominica	4597	3624	India	1568	1099
Singapore	26424	18162	Libya	4643	6170	Jamaica	3528	3575	Liberia	497	1046
Denmark	21774	17939	Hungary	7171	6136	Romania	2830	3506	Maurit.	1067	1033
Island	21656	17911	Tri and Tob.	7158	6073	Saint-Vinc.	4405	3430	Congo, R. D.	408	1016
						Grenadines					
Japan	20562	17770	Turkey	7178	5914	Dominic Rep	4476	3425	Angola	1041	1010
Hong Kong	21616	17486	Saint-Kitts	9103	5910	Grenada	4517	3288	Zambia	913	993
France	20192	17296	Poland	7276	5392	Algeria	3194	3263	Uganda	1242	974
Sweden	20122	17162	Brazil	5866	5350	Morocco	3364	3227	Bangladesh	1207	925
Germany	18409	16931	Syria	5648	5288	Paraguay	2853	3221	Somalia	707	915
Virgin islands	19455	16870	Fiji	5174	5223	Salomon (îles)	3032	2980	Guinea	1029	884
Australia	20871	16579	Jordan	4431	5005	El Salvador	3310	2924	Bhutan	1250	882
Netherlands	20776	16570	Lebanon	6067	4908	Papua	2955	2809	Honduras	891	869
Belgium	20072	16547	Costa Rica	5846	4822	Nouvelle-Guinea			Madagascar	802	860
						Guatemala	2900	2769	Nepal	1010	834
Austria	19692	16479	Surinam	5787	4715	Myanmar	3496	2702	Rwanda	819	818
Italy	18892	16235	Thailand	6432	4705	Indonesia	3093	2601	Haiti	691	801
United King.	19271	15835	Colombia	4866	4541	Iraq	1198	2548	Sao Tome et Principe	706	779
Finland	19782	15711	Seychelles	6089	4505	Sri Lanka	3314	2531	Gambia	736	754
French Guyana	16127	15655	Tunisia	5751	4476	Congo	2169	2413	Lesotho	956	739
New Zealand	15923	14343	South Africa	4455	4458	China	4172	2317	Togo	657	719
Unit Arab Em	12766	13251	Botswana	5880	4375	Samoa	2606	2192	Guinea-Bis	476	716
Oman	13790	12979	Panama	4991	4335	occidentales					
Israel	15309	12766	Belize	4932	4100	Bolivia	2386	2186	Malawi	811	700
Taiwan	19387	12182				Cameroon	1848	2181	Cent Afr	648	667
Ireland	20573	12012				Philippines	2211	2147	Sierra Leo	351	653
Spain	15107	11773				Kiribati	2087	2088	Niger	579	611
New Caledonia	14391	11715				Yemen	1919	1966	Burundi	474	557
French Polyn.	13779	11697				Pakistan	2116	1790	Chad	541	555
Gibraltar	14571	11491				Zimbabwe	1768	1752	Mali	603	551
Cyprus	14809	10785				Cape Verde	2332	1749	Ethiopia	538	543
Maurice	15564	10505				Guyana	2393	1746	Burkina Faso	600	537
						Djibouti	1310	1736	Tanzania	544	519
Bahamas	10522	10399				Ghana	1850	1657	Sudan	435	349
Brunei Dar	9116	10360				Côte d'Ivoire	1495	1635	Mozambique	231	169
Portugal	13374	10270				Maldives	2344	1621			
Saudi Arabia.	8803	10115				Eq Guinea	3979	1558			
Greece	11834	9874				Senegal	1611	1548			
Malta	13288	9596				Afghanistan	977	1542			
Bahrain	10382	9556									
Puerto Rico	11339	9297									
Chile	13486	9219									
South Korea	13567	8573									
Antig. and Bar	11149	8244									

Source: Chelem and authors' estimates – missing countries are in group 3

(i) *Aggregation of the suppliers of a particular country.*

Assume that a country 'i' on an HS position 's' imposes different tariffs $t_{i,j}^s$ on every potential supplier 'j' (220 suppliers). We have to aggregate these 220 tariffs into 8 tariffs.

$$\forall k = 1, 2, \dots, r, \quad t_{i,k}^s = \frac{\sum_{l \in k} m_{ZR(i),l}^s \times t_{i,l}^s}{\sum_{l \in k} m_{ZR(i),l}^s} \quad (1)$$

'l' is a supplier country that belongs to one of the eight trading zones (zone k). The tariff $t_{i,l}^s$ levied by 'i' on imports originating from 'l' is weighted by the imports of i's reference zone (and not by imports of country 'i') originating from 'l' i.e. $m_{ZR(i),l}^s$, this is to avoid the traditional endogeneity bias.

Thus the tariff imposed by country 'i' on supplier 'l' is not weighted by imports of 'i' originating from 'l', but by the imports of the group of countries whose GDP per head is closer to 'i', originating from 'l'.

(ii) *Tariff aggregation of importing countries*

The 220 potential suppliers have been aggregated into 8 groups of suppliers. We have now a 137*8*10,000 matrix. To obtain a new matrix having the form 8*8*10,000, we use the same method of aggregation, which is as follows:

$$\forall k = 1, 2, \dots, r, \forall u = 1, 2, \dots, r, \quad t_{k,u}^s = \frac{\sum_{l \in k} m_{ZR(l),u}^s \times t_{l,u}^s}{\sum_{l \in k} m_{ZR(l),u}^s} \quad (2)$$

The tariff levied by the group of countries 'k' on the imports originating from group 'u' is thus weighted, not by the imports of countries 'k' originating from 'u', but by the imports of the reference groups of each country that belongs to 'k', originating from 'u'.

(iii) *Tariff aggregation on products*

We have therefore aggregated the 137*220*10,000 matrix into an 8*8*10,000 matrix. Finally, to aggregate the 10,000 products into 6 sectors, we use the same procedure, which is:

$$\forall k = 1, 2, \dots, r, \forall u = 1, 2, \dots, r, \forall z = 1, 2, \dots, n, \quad t_{k,u}^z = \frac{\sum_{s \in z} m_{ZR(k),u}^s \times t_{k,u}^s}{\sum_{s \in z} m_{ZR(k),u}^s} \quad (3)$$

where ‘s’ is the index that defines the HS positions that make up sector ‘z’. The tariff on product ‘s’ of group ‘k’ originating from ‘u’ is thus weighted by the imports of ‘s’ made by the reference group of ‘k’ originating from ‘u’.

II - FOUR CASE STUDIES BASED ON MACMAPS

A – General results

We present the general results obtained by using MACMaps. To do so, we group all the instruments of protection and adopt the following classification: on the geographic level, we choose 8 countries (European Union, USA, Japan, Australia, Morocco, Brazil, Switzerland and China) and we adopt 6 sectors (Cereals, Other agricultural and food products, Other primary products, Textiles and clothing, Other manufacturers, Services).

Table 10: Market access in the cereal sector

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		20.9%	18.6%	20.6%	1.6%	7.7%	61.9%	89.3%
<i>Japan</i>	0.0%		18.6%	25.0%	1.1%	7.7%	85.6%	89.3%
<i>Moro.</i>	0.0%	20.9%		27.6%	1.6%	7.7%	94.7%	89.3%
<i>Eur. U.</i>	0.0%	20.9%	18.6%		1.2%	7.7%	67.3%	89.3%
<i>USA</i>	0.0%	20.9%	18.6%	20.4%		7.7%	43.8%	89.3%
<i>Brazil</i>	0.0%	20.9%	18.6%	21.1%	1.6%		93.9%	89.3%
<i>Switz.</i>	0.0%	20.9%	18.6%	25.5%	1.6%	7.7%		89.3%
<i>China</i>	0.0%	20.8%	18.6%	24.1%	4.3%	7.7%	93.7%	

Source: MACMaps, see Table 1.

Table 11: Market access in other agric. products and food industry

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		17.4%	45.8%	20.7%	16.3%	14.7%	50.2%	38.0%
<i>Japan</i>	1.2%		45.8%	17.2%	11.6%	14.7%	45.4%	37.9%
<i>Moro.</i>	1.4%	17.2%		23.3%	17.7%	14.7%	52.5%	38.1%
<i>Eur. U.</i>	1.3%	16.3%	45.8%		11.4%	14.7%	38.8%	38.0%
<i>USA</i>	1.2%	16.8%	45.8%	19.9%		14.7%	30.7%	38.0%
<i>Brazil</i>	1.4%	18.1%	45.8%	18.3%	18.2%		48.4%	38.1%
<i>Switz.</i>	1.4%	16.7%	45.8%	17.5%	11.8%	14.7%		38.1%
<i>China</i>	1.2%	18.8%	45.8%	18.8%	18.4%	14.6%	50.7%	

Source: MACMaps, see Table 1.

Table 12: Market access in other primary products

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		0.3%	6.8%	0.0%	1.3%	5.6%	0.8%	2.6%
<i>Japan</i>	0.3%		6.8%	0.0%	1.0%	5.6%	0.8%	1.9%
<i>Moro.</i>	0.3%	0.3%		0.0%	1.0%	5.6%	0.7%	9.5%
<i>Eur. U.</i>	0.3%	0.3%	6.8%		1.1%	5.6%	0.3%	3.2%
<i>USA</i>	0.3%	0.3%	6.8%	0.1%		5.6%	0.1%	2.8%
<i>Brazil</i>	0.3%	0.3%	6.8%	0.0%	1.1%		0.7%	9.5%
<i>Switz.</i>	0.3%	0.3%	6.8%	0.1%	1.0%	5.6%		9.5%
<i>China</i>	0.3%	0.3%	6.8%	0.0%	1.5%	5.6%	0.7%	

Source: MAcMaps, see Table 1.

Table 13: Market access in the textile and clothing sector

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		20.7%	28.7%	10.9%	12.8%	19.7%	13.7%	24.8%
<i>Japan</i>	17.8%		28.7%	10.9%	12.8%	19.7%	12.2%	24.8%
<i>Moro.</i>	17.8%	20.7%		0.0%	12.8%	19.7%	5.8%	24.8%
<i>Eur. U.</i>	17.8%	20.7%	28.7%		12.9%	19.7%	2.2%	24.8%
<i>USA</i>	17.8%	20.7%	28.7%	10.9%		19.7%	8.0%	24.8%
<i>Brazil</i>	17.8%	20.7%	28.7%	6.2%	13.1%		5.8%	24.8%
<i>Switz.</i>	17.8%	20.7%	28.7%	10.9%	13.1%	19.7%		24.8%
<i>China</i>	17.8%	20.7%	28.7%	31.0%	41.3%	19.7%	5.2%	

Source: MAcMaps, see Table 1.

Table 14: Market access in other manufactured products

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		1.8%	15.2%	3.6%	3.0%	13.6%	2.0%	15.4%
<i>Japan</i>	11.7%		15.2%	4.0%	4.0%	13.6%	1.3%	15.4%
<i>Moro.</i>	9.2%	1.8%		0.0%	3.0%	13.6%	1.4%	15.4%
<i>Eur. U.</i>	10.1%	1.8%	15.2%		5.0%	13.6%	0.7%	15.4%
<i>USA</i>	10.9%	1.8%	15.2%	3.6%		13.6%	1.0%	15.4%
<i>Brazil</i>	9.2%	1.8%	15.2%	2.6%	3.2%		1.2%	15.4%
<i>Switz.</i>	9.3%	1.8%	15.2%	3.6%	3.0%	13.6%		15.4%
<i>China</i>	11.5%	1.8%	15.2%	2.9%	29.0%	13.6%	1.4%	

Source: MAcMaps, see Table 1.

Table 15: Market access in services

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		0.0%	10.0%	0.0%	0.0%	0.0%	6.0%	5.0%
<i>Japan</i>	2.5%		10.0%	0.0%	0.0%	0.0%	6.0%	5.0%
<i>Moro.</i>	2.5%	0.0%		0.0%	0.0%	0.0%	0.0%	5.0%
<i>Eur. U.</i>	2.5%	0.0%	10.0%		0.0%	0.0%	0.0%	5.0%
<i>USA</i>	2.5%	0.0%	10.0%	0.0%		0.0%	6.0%	5.0%
<i>Brazil</i>	2.5%	0.0%	10.0%	0.0%	0.0%		0.0%	5.0%
<i>Switz.</i>	2.5%	0.0%	10.0%	0.0%	0.0%	0.0%		5.0%
<i>China</i>	2.5%	0.0%	10.0%	0.0%	0.0%	0.0%	0.0%	

Source: MAcMaps, see Table 1.

Tables 10 to 15 point out that trade globalisation has not been achieved. Importing countries are in columns, thus table 10, for example, shows that in Switzerland cereals imports from Japan are taxed by a duty of 85.6%.

- (i) Agricultural and food protection is high in all countries except Australia. It is especially high in China and Switzerland.
- (ii) Market access in developing countries is generally difficult, as in Morocco or China, whereas the level of protection is intermediate in Brazil.
- (iii) In the textile and clothing sector, market access is difficult in the eight countries, but information brought by table 13 is incomplete because it does not integrate ad valorem equivalent of MFA quotas. This information is available in the GTAP5 database, hence we add estimations of market access from MAcMaps and the ad valorem equivalent of MFA quotas from GTAP5 in table 16. Only the industrialised countries' protection on Moroccan and Chinese products are modified. Chinese exports are still heavily taxed worldwide even after a liberalisation period (initial dismantling of quotas during 1995-1999).
- (iv) Finally, Morocco benefits from a strong trade preference with the European Union in the industrial sector, due to bilateral treaties. Moroccan exports to Europe in the textile and clothing sector, and in other manufactured products are duty-free, but it is not the case in the cereals sector and in the agri-food sector. Through bilateral treaties, the European Union and Morocco negotiated partial preferences, but not free trade in the agri-food sector. For example, in table 1, white chocolate from WTO countries is taxed by an ad valorem duty of 10.4%, plus a specific tariff of 515 Euro per ton, while white chocolate from Morocco is only taxed by the same specific tariff. But as the unit value of European imports from Morocco is much lower than imports from WTO countries, the ad valorem equivalent of the same specific tariff is greater on Moroccan imports than on world imports, such that the global European protection is higher on Moroccan imports than on world imports. On average, the ad valorem equivalent of European specific tariffs is 58.6% on Moroccan products and 43.8% on products from the USA. This element explains why in tables 10 (cereals) and 11 (other agri-food products), the global rate of protection of the European Union is higher on Morocco (27.6% and 23.3%) than on

other Northern countries (20.4% and 19.9% on the United States for example). This is not a statistical artefact: Moroccan producers are effectively at a disadvantage in European market access compared to exporters from other industrialised countries. In this case, the trade preference is reversed.

Table 16: global protection in the textile and clothing sectors in eight countries

	Austral.	Japan	Moro.	Eur. U.	USA	Brazil	Switz.	China
<i>Austral.</i>		20.7%	28.7%	10.9%	12.8%	19.7%	13.7%	24.8%
<i>Japan</i>	17.8%		28.7%	10.9%	12.8%	19.7%	12.2%	24.8%
<i>Moro.</i>	17.8%	20.7%		0.0%	13.2%	19.7%	5.9%	24.8%
<i>Eur. U.</i>	17.8%	20.7%	28.7%		12.9%	19.7%	2.2%	24.8%
<i>USA</i>	17.8%	20.7%	28.7%	10.9%		19.7%	8.0%	24.8%
<i>Brazil</i>	17.8%	20.7%	28.7%	6.9%	14.1%		8.4%	24.8%
<i>Switz.</i>	17.8%	20.7%	28.7%	10.9%	13.1%	19.7%		24.8%
<i>China</i>	17.8%	20.7%	28.7%	38.6%	51.3%	19.7%	15.7%	

Source: MAcMaps (see Table 1) and GTAP5

Comparing MAcMaps estimation of market access to GTAP5 protection data according to the same geographical and sectoral classification, points out significant differences (GTAP5 protection data are presented in Annex 4). Absolute differences are not great in weakly protected sectors (services), but are great in the textile and clothing sector and are huge in cereals and agri-food sectors. For example, Japanese imports of cereals from Australia are taxed by a 195.8% ad valorem equivalent according to the GTAP5 database, while they are taxed by a 20.9% ad valorem equivalent according to MAcMaps! Why such a discrepancy? This is due to considerably different methodologies. MAcMaps is a direct measurement of market access, which integrates the main instruments of protection and estimates ad valorem equivalents. GTAP5 is a macroeconomic and multinational database, of which the main objective is utilisation by the Computable General Equilibrium Model. GTAP5 protection data are based on the estimation of price differentials.

A comparison between MAcMaps and the OECD database (table 17) is difficult because the OECD records only MFN ad valorem duties, preferential agreements and other instruments like specific tariffs and tariff quotas are not included. It means that multilateral protection databases provide significantly biased information.

Table 17 : simple mean of NPF bound rates for 5 sectors and 6 countries- 1996

	Australia	Japan	Eur. Union	USA	Brazil	Switz.
<i>Agric</i>	3.1	9.3	17.8	5.0	35.6	30.1
<i>Other primary prod.</i>	1.7	0.8	1.0	0.6	34.4	4.9
<i>Textile and clothing</i>	16.4	14.3	6.2	8.8	34.9	3.4
<i>Other manuf.</i>	6.1	1.6	2.0	2.3	31.2	1.7
<i>Serv.</i>	Nd	Nd	Nd	Nd	Nd	Nd

Source : OCDE, 1999

B – Measurement of tariff peaks

The information about tariff means is not sufficient. Let us consider two tariff structures with the same mean (weighted or not). These two trade policies do not have the same economic impact on trade flows and collective utility, if they do not have the same dispersion. A partial equilibrium analysis points out that economic distortions are proportional to the square of a tariff. This means that when the tariff's standard error is higher, economic distortion is greater.

Precise information about the dispersion of tariffs is crucial. According to the international definition (OECD), a tariff peak is an ad valorem duty greater than 15%. The importance of tariff peaks is traditionally estimated by a frequency coverage ratio (percentage of HS positions taxed by a peak) or a trade coverage ratio (part of imports taxed by a peak). Thus according to the OECD, the frequency coverage ratio of tariff peaks is 2.2% in the USA, 2.8% in Japan, 5.1% in the European Union and 6.5% in Canada. This methodology is subject to numerous criticisms:

- (i) It does not include specific tariffs, prohibitions, or tariff quotas.
- (ii) It does not take into account preferential agreements or bilateral treaties. If the European Union sets an 18% duty on an HS position, it may be an MFN tariff, which does not concern GSP countries or ACP countries.
- (iii) A frequency coverage ratio gives two peaks the same weight, even if on these two HS positions, trade flows are extremely different.
- (iv) A trade coverage ratio contains an endogeneity bias since a “prohibitive” tariff is not included.
- (v) A frequency coverage ratio and a trade coverage ratio will give two very different peaks (15.5% and 400% for example) the same importance.

In order to estimate the precise importance of tariff peaks, MAcMaps adopts the following methodology. It evaluates the level of protection with the same method as in part A (including all protection instruments, eight countries, and six sectors), but it substitutes a tariff of 15% for tariff peaks (tariffs greater than 15%) in all source files. We then compare the two levels of protection.

Table 18: Tariff peaks in the cereal sector

	Austr.	Japan	Moro.	Eu. U.	USA	Brazil	Switz.	China
<i>Australia</i>		7.1%	7.9%	11.2%	1.6%	7.7%	9.5%	14.0%
		-66%	-58%	-46%	0%	0%	-85%	-84%
<i>Japan</i>	0.0%		7.9%	11.3%	1.1%	7.7%	9.9%	14.0%
	0%		-58%	-55%	0%	0%	-88%	-84%
<i>Morocco</i>	0.0%	7.2%		10.6%	1.6%	7.7%	9.5%	14.0%
	0%	-66%		-62%	0%	0%	-90%	-84%
<i>Eur. U.</i>	0.0%	7.1%	7.9%		1.2%	7.7%	9.6%	14.0%
	0%	-66%	-58%		-2%	0%	-86%	-84%
<i>USA</i>	0.0%	7.1%	7.9%	11.2%		7.7%	8.8%	14.0%
	0%	-66%	-58%	-45%		0%	-80%	-84%
<i>Brazil</i>	0.0%	7.1%	7.9%	11.2%	1.6%		9.5%	14.0%
	0%	-66%	-58%	-47%	0%		-90%	-84%
<i>Switzerl</i>	0.0%	7.2%	7.9%	11.1%	1.6%	7.7%		14.0%
	0%	-66%	-58%	-57%	0%	0%		-84%
<i>China</i>	0.0%	7.0%	7.9%	11.2%	3.7%	7.7%	9.5%	
	0%	-66%	-58%	-54%	-13%	0%	-90%	

Source: MAcMaps, see Table 1.

Note: italics: rate of reduction in the level of protection with a standardisation of tariff peaks to 15%.

Table 19 : Tariff peaks for other agricultural products and for the food industry

	Austr.	Japan	Moro.	Eu. U.	USA	Brazil	Switz.	China
<i>Australia</i>		10.8%	11.0%	10.1%	8.1%	12.3%	9.9%	13.1%
		-38%	-76%	-51%	-50%	-16%	-80%	-66%
<i>Japan</i>	1.2%		11.0%	9.9%	7.8%	12.3%	9.1%	13.1%
	0%		-76%	-43%	-33%	-16%	-80%	-65%
<i>Morocco</i>	1.4%	10.6%		9.3%	9.0%	12.3%	8.9%	13.1%
	0%	-38%		-60%	-49%	-16%	-83%	-66%
<i>Eur. U.</i>	1.3%	10.3%	11.0%		7.9%	12.3%	8.4%	13.1%
	0%	-36%	-76%		-30%	-16%	-78%	-65%
<i>USA</i>	1.2%	10.5%	11.0%	10.1%		12.3%	7.8%	13.1%
	0%	-38%	-76%	-49%		-16%	-75%	-65%
<i>Brazil</i>	1.4%	10.5%	11.0%	9.7%	9.1%		9.6%	13.1%
	0%	-42%	-76%	-47%	-50%		-80%	-66%
<i>Switzerl</i>	1.4%	10.3%	11.0%	10.0%	7.9%	12.3%		13.1%
	0%	-38%	-76%	-43%	-33%	-16%		-66%
<i>China</i>	1.2%	10.8%	11.0%	9.6%	11.0%	12.3%	9.1%	
	0%	-42%	-76%	-49%	-40%	-16%	-82%	

Source: MAcMaps, see Table 1. Note: see Table 18.

Table 20: Tariff peaks for other primary products

	Austr.	Japan	Moro.	Eu. U.	USA	Brazil	Switz.	China
<i>Australia</i>		0.3%	5.6%	0.0%	0.8%	5.3%	0.3%	2.6%
		0%	-18%	0%	-40%	-5%	-61%	0%
<i>Japan</i>	0.3%		5.6%	0.0%	0.7%	5.3%	0.3%	1.9%
	-7%		-18%	0%	-29%	-5%	-62%	0%
<i>Morocco</i>	0.3%	0.3%		0.0%	0.7%	5.3%	0.2%	9.5%
	-7%	0%		0%	-29%	-5%	-72%	0%
<i>Eur. U.</i>	0.3%	0.3%	5.6%		0.8%	5.3%	0.2%	3.2%
	-7%	0%	-18%		-28%	-5%	-24%	0%
<i>USA</i>	0.3%	0.3%	5.6%	0.0%		5.3%	0.1%	2.8%
	-7%	0%	-18%	-78%		-5%	-1%	0%
<i>Brazil</i>	0.3%	0.3%	5.6%	0.1%	0.8%		0.2%	9.5%
	-7%	0%	-18%	0%	-28%		-71%	0%
<i>Switzerl</i>	0.3%	0.3%	5.6%	0.0%	0.7%	5.3%		9.5%
	-7%	0%	-18%	-79%	-29%	-5%		0%
<i>China</i>	0.3%	0.3%	5.6%	0.1%	1.2%	5.3%	0.2%	
	-7%	0%	-18%	195%	-19%	-5%	-73%	

Source: MAcMaps, see Table 1. Note: see Table 18.

Table 21: Tariff peaks in the textile and clothing sector

	Austr.	Japan	Moro.	Eu. U.	USA	Brazil	Switz.	China
<i>Australia</i>		12.2%	13.5%	10.5%	10.0%	14.2%	10.2%	14.3%
		-41%	-53%	-4%	-22%	-28%	-25%	-42%
<i>Japan</i>	11.6%		13.5%	10.5%	10.1%	14.2%	9.2%	14.3%
	-35%		-53%	-4%	-22%	-28%	-25%	-42%
<i>Morocco</i>	11.6%	12.2%		0.0%	10.1%	14.2%	5.5%	14.3%
	-35%	-41%		0%	-21%	-28%	-7%	-42%
<i>Eur. U.</i>	11.5%	12.2%	13.5%		10.0%	14.2%	2.1%	14.3%
	-35%	-41%	-53%		-22%	-28%	-6%	-42%
<i>USA</i>	11.5%	12.2%	13.5%	10.5%		14.2%	6.4%	14.3%
	-35%	-41%	-53%	-4%		-28%	-20%	-42%
<i>Brazil</i>	11.6%	12.2%	13.5%	5.8%	10.3%		5.4%	14.3%
	-35%	-41%	-53%	-6%	-21%		-7%	-42%
<i>Switzerl</i>	11.6%	12.2%	13.5%	10.5%	10.2%	14.2%		0.143
	-35%	-41%	-53%	-4%	-22%	-28%		-42%
<i>China</i>	11.6%	12.2%	13.5%	7.1%	17.0%	14.2%	5.0%	
	-35%	-41%	-53%	-77%	-59%	-28%	-5%	

Source: MAcMaps, see Table 1. Note: see Table 18.

Table 22: Tariff peaks for other manufactured products

	Austr.	Japan	Moro.	Eu. U.	USA	Brazil	Switz.	China
<i>Australia</i>		1.8%	9.7%	3.5%	2.9%	10.8%	1.9%	11.3%
		-1%	-36%	-2%	-6%	-20%	-5%	-27%
<i>Japan</i>	6.4%		9.7%	3.5%	2.9%	10.8%	1.3%	11.3%
	-45%		-36%	-10%	-29%	-20%	-4%	-27%
<i>Morocco</i>	6.4%	1.8%		0.0%	2.9%	10.8%	1.3%	11.3%
	-31%	-1%		0%	-4%	-20%	-4%	-27%
<i>Eur. U.</i>	6.4%	1.8%	9.7%		3.3%	10.8%	0.7%	11.3%
	-36%	-1%	-36%		-35%	-20%	-2%	-27%
<i>USA</i>	6.5%	1.8%	9.7%	3.5%		10.8%	0.9%	11.3%
	-41%	-1%	-36%	-2%		-20%	-3%	-27%
<i>Brazil</i>	6.4%	1.8%	9.7%	2.6%	2.9%		1.2%	11.3%
	-31%	-1%	-36%	-3%	-11%		-4%	-27%
<i>Switzerl</i>	6.4%	1.8%	9.7%	3.5%	2.9%	10.8%		0.113
	-31%	-1%	-36%	-2%	-3%	-20%		-27%
<i>China</i>	6.4%	1.8%	9.7%	2.6%	12.2%	10.8%	1.3%	
	-45%	-1%	-36%	-11%	-58%	-20%	-5%	

Source: MAcMaps, see Table 1. Note: see Table 18.

Services are omitted because there is no tariff peak in this sector. Tables 18 to 22 provide two figures for each case: the standard figure is the level of protection with substitution of 15% for any tariff peak, the italicised figure is the rate of reduction in the level of protection due to this substitution.

Tariff peaks are concentrated in agriculture, especially in Japan, Morocco, Switzerland, China and the European Union. This “disappearance” of tariff peaks would cause an 85% reduction (approximately) in Swiss agricultural protection. To put it differently, simply using a frequency coverage ratio of Swiss tariff peaks would strongly undermine the true level of protection in this sector. Tariff peaks also have an important impact in the textile and clothing sector, except in Europe.

This method of tariff peak measurement avoids all the previous criticisms, taking into account all protective instruments, discriminatory regimes, and the importance of trade flows. It does not have an endogeneity bias and gives higher tariffs a greater weight.

C – Identifying the most protected countries

It is interesting to rank countries by their level of overall protection, even if this kind of information is restrictive. This ranking is possible with MAcMaps. It is then necessary to integrate all the protective instruments and aggregate all exporting countries and all products. Table 23 provides this ranking and compares it with the index of economic freedom (Fraser Institute) and an OECD mean of applied ad valorem MFN tariffs. In the case of the index of economic freedom, the higher the figure is, the less protected the country.

Comparing MACMaps and OECD estimations of average protection, points out that the omission of some protective instruments like specific tariffs is misleading. The MACMaps tariff mean can be about five times bigger as in the case of Switzerland. The most interesting elements are the rankings of the United States and the European Union. Tables 4 to 7 show that MFN instruments, ad valorem and specific duties, tariff quotas and prohibitions, are more protective in Europe. Thus the aggregate level of protection should be higher in the European Union, but it is not the case due to discriminatory regimes and preferential agreements. Europe has negotiated these kinds of accords more extensively than the United States. This means that if the protection is higher in the USA, it is more discriminatory in Europe and discrimination causes another kind of economic distortion.

Table 23: ranking of countries by degree of protection

Country	Tariff MacMaps 1999	Index of economic freedom - 1997	OECD 1996
<i>Australia</i>	8.8%	8.4	6.1
<i>Japan</i>	9.0%	7.9	6.7
<i>Morocco</i>	19.4%	nd	nd
<i>Eur. U.</i>	9.7%	8.5	9.5
<i>USA</i>	11.8%	7.8	6.2
<i>Brazil</i>	13.4%	6.2	nd
<i>Switzerland</i>	15.1%	nd	3.2
<i>China</i>	18.4%	7.2	nd

Source: MACMaps, Fraser Institute and OECD

D – Measuring technical barriers and standards

To integrate technical barriers to trade, sanitary, phytosanitary and environmental standards, the first objective of MACMaps is to avoid the simple accumulation of coverage frequency and trade coverage ratios. It adopts the following methodology, identifying six different categories of justifications to environmental barriers to trade (EBT) in the notifications of the declaring countries:

- Protection of the environment
- Protection of flora and fauna
- Protection of vegetable life
- Protection of animal life
- Protection of human life
- Protection of human security

For every trade barrier, the importing country which issues a notification is identified, the affected product is classified according to its HS code and the barrier is recorded as per the type of non-tariff measure. Thus MACMaps does not estimate Ad Valorem Equivalents of norms, but it fulfills three objectives:

-
- (i) Establish a *positive list* of products that present a risk (perceived) to the environment, this risk being responsible for imposed barriers to trade.
- (ii) Quantify the value of potential trade affected by these measures (global imports from HS tariff lines subjected to notified environmental barriers) and the value of trade subsequently affected (imports of notifying countries). The ratio of the second to the first is a *subjection ratio*.
- (iii) Identify which measures are protectionist, on the grounds of how many countries have notified this kind of measure on this product.

This approach indirectly helps avoid the many susceptible traps that can be encountered while realising a classification based on the environmental impact criteria revealed by a panel of experts. But this approach may be criticised on the grounds that to justify trade barriers, governments use arguments that do not reflect their true reasons. Thus it is necessary to analyse the frequency of these barriers for each HS position.

On the basis of this argument, Fontagné, Mimouni & Von Kirchbach (2001) propose to distinguish between four different levels:

- *Products not affected*, i.e. products on which no importer has imposed any kind of environmental barrier;
- *Products affected*, i.e. products on which at least one importer has introduced an environmental obstacle;

Table 24: concentration of environmental barriers, depending on the number of notifying countries, 1999

Number of importing countries notifying ETB	Number of HS 6 positions	World imports in HS positions covered by ETB, USD billion (1)	Imports of products covered by ETB by notifying countries, USD billion (2)	% world trade potentially affected (2/1)
0	1 171	670	0	0
[1 ; 5]	1 983	2729	110	4
[6 ; 10]	521	691	75	11
[11 ; 20]	638	672	227	34
[21 ; 30]	354	289	104	36
[31 ; 40]	171	200	78	39
[41 ; 50]	68	129	68	52
[51 ; 60]	9	17	15	85
[61 ; 70]	2	4	4	91
S/Total	3 746	4732	680	14
Total	4 917	5402	680	13
> 33 countries	185	286	140	49
> 50 countries	11	21	18	86
= 1 country	529	908	11	1

Source: Estimates based on the trade database COMTRADE and on the UNCTAD database of trade barriers.

- *Products greatly affected*, i.e. products on which at least 25 per cent of global imports in value terms are directly affected by environmental obstacles.
- *Sensitive products*, i.e. products on which at least 25 per cent of notifying importers deemed it necessary to impose environmental obstacles independent of their share in the overall trade.

It appears that in the database on the 4,917 products considered, only 1,171 products are not faced with any barrier limiting their trade. The total value of the global imports of these products amounts to US\$ 669 billion. On the other hand, the remaining 3,746 products are subjected to at least one environment-related import barrier in at least one importing country. These 3,746 products represent 88 per cent of the global trade of goods in 1999. The vast majority of international trade thus comprises products that may be potentially affected by environment-related obstacles. But, do these trade barriers constitute protectionist barriers?

When a very restricted number of countries imposes at least one particular measure on a given product, the presumption of instrumentalisation of ETB to protectionist ends is strong. In table 24 it appears that 1,983 products out of 4,917 are affected by environmental protectionism: up to five countries have applied barriers, the corresponding restricted trade is about US\$ 110 billion, as compared to US\$ 2,700 billion in world imports of these products. The low coverage ratio of 4 per cent underlines the protectionist nature of these barriers, which are effective in the sense that they have a strong impact on the imports of these countries. An alternative way of presenting the facts is to emphasise that half of global trade (US\$ 2,700 billion against US\$ 5,400 billion) is potentially affected by environmental-related protectionist measures.

CONCLUSION

Understanding the mechanisms by which trade barriers have an impact on market access and trade flows, establishing a precise and exhaustive list of these barriers and of their importance, aggregating this information in a flexible and consistent way are all fundamental objectives for policy makers. This kind of database may answer a lot of questions about the level of national protectionism, the level of trade preferences for developing countries, the real impact of anti-dumping duties...

MAcMaps has been created to measure market access in a very disaggregated way. Its main feature is to take into account all discriminatory regimes, which may be aggregated quickly and consistently. It points out that globalization is not achieved and that trade discrimination is strong. Thus protection in the world is still distortive.

Annex 1: List of 220 exporting countries in MACMaps

AFGHANISTAN	GHANA	PALAU
ALBANIA	GIBRALTAR	PAKISTAN
ALGERIA	KIRIBATI	PANAMA
AMERICAN SAMOA	GREECE	PAPUA NEW GUINEA
ANDORRA	GREENLAND	PARAGUAY
ANGOLA	GRENADA	PERU
ANTIGUA AND BARB.	GUAM	PHILIPPINES
AZERBAIJAN	GUATEMALA	PITCAIRN
ARGENTINA	GUINEA	POLAND
AUSTRALIA	GUYANA	Portugal
AUSTRIA	HAITI	GUINEA-BISSAU
BAHAMAS	HONDURAS	EAST TIMOR
BAHRAIN	HONG KONG	PUERTO RICO
BANGLADESH	HUNGARY	QATAR
ARMENIA	ICELAND	ROMANIA
BARBADOS	INDIA	RUSSIAN FEDERATION
BELGIUM	INDONESIA	RWANDA
BERMUDA	IRAN	ST. HELENA
BHUTAN	IRAQ	SAINT KITTS & NEVIS
BOLIVIA	IRELAND	ANGUILLA
BOSNIA AND HERZ.	ISRAEL	SAINT LUCIA
BOTSWANA	ITALY	ST. PIERRE AND MIQU.
BRAZIL	CÔTE D'IVOIRE	SAINT VINCENT AND
BELIZE	JAMAICA	SAN MARINO
SOLOMON ISLANDS	JAPAN	SAO TOME AND PRINC.
VIRGIN ISLANDS	KAZAKHSTAN	SAUDI ARABIA
BRUNEI DAR.	JORDAN	SENEGAL
BULGARIA	KENYA	SEYCHELLES
MYANMAR	KOREA, DEM. PEOPLE'S REP.	SIERRA LEONE
BURUNDI	KOREA, REPUBLIC OF	SINGAPORE
BELARUS	KUWAIT	SLOVAKIA
CAMBODIA	KYRGYZSTAN	VIET NAM
CAMEROON	LAO PEOPLE'S DEM. REP.	SLOVENIA
CANADA	LEBANON	SOMALIA
CAPE VERDE	LESOTHO	SOUTH AFRICA
CAYMAN ISLANDS	LATVIA	ZIMBABWE
CENTRAL AFRICAN REP.	LIBERIA	SPAIN
SRI LANKA	LIBYA	SUDAN

Annex 1 (cont.): List of exporting countries in MAcMaps

CHAD	LIECHTENSTEIN	SURINAME
CHILE	LITHUANIA	SWAZILAND
CHINA	LUXEMBOURG	SWEDEN
TAIWAN	MACAU	SWITZERLAND
CHRISTMAS ISLAND	MADAGASCAR	SYRIAN ARAB REP.
COCOS ISLANDS	MALAWI	TAJIKISTAN
COLOMBIA	MALAYSIA	THAILAND
COMOROS	MALDIVES	TOGO
CONGO	MALI	TOKELAU
ZAIRE	MALTA	TONGA
COOK ISLANDS	MAURITANIA	TRINIDAD AND TOB.
COSTA RICA	MAURITIUS	UNITED ARAB EMIR.
CROATIA	MEXICO	TUNISIA
CUBA	MONGOLIA	TURKEY
CYPRUS	MOLDOVA, REPUBLIC OF	TURKMENISTAN
CZECH REPUBLIC	MONTSERRAT	TURKS AND CAICOS ISL.
BENIN	MOROCCO	TUVALU
DENMARK	MOZAMBIQUE	UGANDA
DOMINICA	OMAN	UKRAINE
DOMINICAN REP.	NAMIBIA	MACEDONIA
ECUADOR	NAURU	EGYPT
EL SALVADOR	NEPAL	UNITED KINGDOM
EQU. GUINEA	NETHERLANDS	TANZANIA, UNITED REP.
ETHIOPIA	NETH. ANTILLES	UNITED STATES
ERITREA	ARUBA	VIRGIN ISLANDS
ESTONIA	VANUATU	BURKINA FASO
FAROE ISLANDS	NEW ZEALAND	URUGUAY
FALKLAND ISLANDS	NICARAGUA	UZBEKISTAN
FIJI	NIGER	VENEZUELA
FINLAND	NIGERIA	WALLIS AND FUTUNA
FRANCE	NIUE	SAMOA
DIJIBOUTI	NORFOLK ISLAND	YEMEN
GABON	NORWAY	YUGOSLAVIA
GEORGIA	NORTHERN MARIANA ISL.	ZAMBIA
GAMBIA	MICRONESIA	
GERMANY	MARSHALL ISLANDS	

Annex 2: Multi-Fibre Agreement quotas and Ad Valorem equivalents

Imposition of import quotas is usually forbidden by international treaties (GATT or WTO). Nevertheless, developed countries have since 1973 drafted special agreements in the textiles and clothing industries (Multi-Fibre Agreements). The richest countries of the OECD have thus levied import quotas on a bilateral basis. The integration of MFA quotas into MACMaps calls for the availability of ad valorem equivalents. The only source, to our knowledge, that applies the same estimation method to each importing country for all exporting countries, simultaneously in the textile and the clothing sector, is the GTAP5 database.

Estimates by GTAP5 of protection rates from these MFA treaties are given in tables A1 and A2. These estimates have been reduced to take into account the liberalisation, which was conducted between 1997 and 1999 (16 per cent of the products affected by the quotas must be liberalised). We applied a reduction coefficient of 16 per cent. Thus we implicitly assume that eliminating quotas on x % of the products concerned, is equivalent to reducing the AVE of protection on the group of products by x %.

Market Access Maps : A bilateral and disaggregated measure of market access

Table A1: AVE of the MFA quotas– textile sector – 1999

	Can	USA	Aust	Blg	Denk	Fin	Fce	Ger	UK	Grc	Irl	Ita	Lux	Neth	Por	Spain	Swed	Swit	RA	RM
China	17.4	17.4	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	0.0
H-Kong	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9	0.8	0.9	0.9	0.9	0.9	0.0
Korea	2.1	2.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	0.0
Taiwan	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Indonésia	7.1	7.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	0.0
Malaysia	7.1	7.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	0.0
Philipp.	5.7	5.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	5.0	4.9	0.2
Singapore	0.0	0.0	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.0	0.2	0.2	0.3	0.2	0.0	0.2	0.2	0.2	0.2	0.0
Thailand	7.2	7.2	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	0.0
Vietnam	6.0	6.0	6.5	6.5	6.4	6.6	6.5	6.5	6.5	6.6	6.5	6.5	6.6	6.6	6.5	6.6	6.5	6.6	6.6	0.5
Bg-Desh	13.3	13.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.4	7.3	7.3	7.3	7.3	1.0
India	8.5	8.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	0.2
Sri Lanka	13.3	13.3	4.8	4.8	4.8	4.6	4.8	4.8	4.8	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	0.9
RAS (*)	13.3	13.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	0.1
Mexico	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0
ACC(**)	6.3	6.3	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.6	2.7	2.7	2.7	2.7	2.7	2.7	0.1
Colombia	6.3	6.3	3.0	2.7	2.7	2.4	2.7	2.7	2.7	2.5	6.5	2.7	2.4	2.6	2.7	2.7	2.7	2.6	2.8	1.4
Peru	6.3	6.3	2.6	2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.7	2.7	2.9	2.7	2.7	2.7	2.7	2.7	2.7	0.1
Vénézuéla	6.3	6.3	68.4	221	2.9	18.2	2.8	2.7	2.7	37.4	29.1	2.7	0.0	2.7	2.7	2.8	27.0	63.2	2.6	2.5
RPA(***)	6.2	6.3	2.9	2.7	2.5	2.4	2.7	2.7	2.7	50.5	2.6	2.7	4.4	2.8	2.0	2.7	2.6	2.7	2.4	2.8
Argentina	6.3	6.3	2.7	2.7	2.6	2.7	2.7	2.7	2.7	2.7	6.0	2.7	3.1	2.7	2.8	2.7	2.8	2.7	2.8	2.2
Brazil	6.3	6.3	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	0.6
Chile	6.3	6.3	2.8	2.5	2.9	9.7	2.7	2.7	2.7	2.4	14.5	2.7	9.7	77.3	2.8	2.7	2.6	3.0	2.8	1.1
Uruguay	6.3	6.3	2.7	2.7	2.5	5.8	2.7	2.7	2.7	2.8	5.8	2.7	2.9	35.9	2.5	2.7	3.6	2.6	2.5	0.0
RA(****)	6.2	6.3	2.8	683	131	58.1	2.6	3.2	2.7	131	0.0	2.7	0.0	3.1	349	2.7	5.5	187	0.0	0.0
Hungary	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poland	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AP (i)	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AU S (ii)	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turkey	6.1	6.1	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	0.0
RMO(iii)	0.4	0.4	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0
Moroc	0.5	0.4	0.2	0.3	0.0	0.3	0.3	0.3	0.3	0.0	0.4	0.3	0.4	0.3	0.3	0.3	0.0	0.3	0.0	0.2
RAN(iv)	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0
Botswana	0.3	0.3	0.0	0.0	0.0	0.0	87.2	174	0.0	0.0	0.0	87.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Namibia	0.4	0.4	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.2	0.3	0.0
Malawi	29.1	0.0	0.0	43.6	0.0	0.0	0.0	149	0.3	0.0	0.0	0.0	0.0	43.6	0.0	29.1	0.0	0.0	0.0	0.0
Mozamb.	87.2	0.5	0.0	0.3	0.0	0.0	0.3	0.3	192	0.0	0.0	488	0.5	131	0.3	87.2	0.0	87.2	0.0	0.0
Tanzania	56.7	0.4	0.0	0.3	18.7	10.9	0.0	0.3	0.3	17.4	0.0	0.2	0.0	0.3	0.4	0.2	11.4	29.1	0.0	0.0
Zambia	29.1	0.5	0.0	0.3	0.0	0.0	0.3	0.3	0.3	0.2	0.0	0.3	0.0	29.1	0.3	0.3	0.0	12.5	0.0	0.0
Zimbab.	0.3	0.4	0.0	0.3	0.0	0.0	0.3	0.3	0.3	8.7	0.3	0.3	0.0	0.4	0.3	0.3	0.0	0.0	0.0	0.0
RSA (v)	0.4	0.4	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.1
Uganda	1046	6758	0.0	2791	262	0.0	0.0	5071	0.5	0.0	0.0	5117	0.0	2442	0.0	785	262	523	0.0	0.0
RASS (vi)	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.1
Rest of worl	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: GTAP5 and authors' calculations

*, rest of Southern Asia; **, Central America and Caribbean; ***, rest of Andean Pact; ****, rest of south America; i, other countries from Eastern Europe; ii, former Soviet Union; iii, rest of Middle East; iv, rest of North Africa; v, rest of South Africa; vi, rest of sub-Saharan Africa.

Table A2: AVE of the MFA quotas - clothing sector – 1999

	Can	USA	Aust	Blg	Dnk	Fin	Fce	Ger	UK	Grc	Irl	Ita	Lux	Neth	Por	Spain	Swed	Swit	RA	RM
China	28.8	28.8	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	0.1
H-Kong	8.7	8.7	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	0.3
Korea	1.7	1.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.0
Taiwan	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Indonésia	6.8	6.8	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	0.2
Malaysia	6.8	6.8	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.3	5.2	5.2	5.2	5.3	0.1
Philipp.	6.8	6.8	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.3	5.2	5.1	5.2	5.2	5.2	5.2	0.3
Singapore	0.5	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.2	0.1	0.2	0.2	0.2	0.2	0.0
Thailand	11.5	11.5	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	0.1
Vietnam	6.2	6.2	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.2	6.3	6.2	6.3	6.3	6.3	6.3	2.3
Bg-Desh	7.1	7.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.3	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	3.1
India	29.8	29.8	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.2	13.3	13.3	13.3	13.3	13.3	13.3	1.9
Sri Lanka	7.1	7.1	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.2	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	0.9
RAS (*)	7.1	7.1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	0.4
Mexico	0.0	0.0	4.1	4.1	4.1	4.2	4.1	4.1	4.1	0.9	4.0	4.1	3.9	4.1	4.1	4.1	4.1	4.0	4.1	2.7
ACC(**)	4.6	4.6	4.6	4.5	4.6	4.5	4.5	4.5	4.5	4.6	4.5	4.5	4.4	4.5	2.0	4.5	4.6	4.5	4.5	0.3
Colombia	4.6	4.6	4.6	4.5	4.5	4.3	4.6	4.5	4.5	4.9	4.6	4.5	4.6	4.6	4.7	4.5	4.6	4.4	4.6	3.5
Peru	4.6	4.6	4.5	4.5	4.5	4.4	4.5	4.5	4.5	4.4	4.5	4.5	4.6	4.5	4.6	4.5	4.5	4.5	4.5	0.1
Vénézuéla	4.6	4.6	4.5	1402	973	5.0	4.5	4.5	4.6	851	352	4.6	65.4	2301	5.0	4.6	372	4.7	4.5	3.0
RPA(***)	4.6	4.6	4.5	4.6	4.8	4.1	4.6	4.5	4.5	5.1	81.0	4.5	4.4	4.6	4.3	4.6	4.6	4.5	4.6	0.5
Argentina	4.6	4.6	4.6	4.6	4.6	4.6	4.5	4.5	4.5	4.5	4.6	4.5	4.5	4.6	4.3	4.5	4.5	4.5	4.5	3.3
Brazil	4.6	4.6	4.5	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.8	4.5	4.7	4.5	4.5	4.5	4.5	4.5	4.6	2.2
Chile	4.6	4.6	4.6	4.6	4.5	4.4	4.6	4.5	4.5	4.1	4.5	4.6	5.8	4.6	4.6	4.6	4.5	4.6	4.6	3.5
Uruguay	4.6	4.6	4.6	4.4	4.6	4.6	4.6	4.5	4.5	4.2	4.7	4.5	0.0	4.5	4.7	4.4	4.5	4.5	4.8	1.8
RA(****)	4.6	4.6	5.8	321	218	7.9	866	4.6	4.6	203	4.8	1932	0.0	5.1	461	4.7	81.8	3.1	5.1	3.8
Hungary	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poland	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AP (i)	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AU S (ii)	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turkey	4.3	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RMO(iii)	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moroc	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAN(iv)	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Botswana	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Namibia	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malawi	0.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mozamb.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tanzania	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zambia	1862	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zimbab.	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RSA (v)	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uganda	3096	16126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RASS (vi)	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest of worl	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: GTAP5 and authors' calculations

RA: rest of EFTA; RM: rest of the world; *: rest of South Asia; **: Central America and Caribbean; ***: rest of Andean Pact; ****: rest of South America; i: other countries from Eastern Europe; ii: former Soviet Union; iii: rest of Middle-East; iv: rest of North Africa; v: rest of South Africa; vi: rest of sub-Saharan Africa.

Annex 3: Rates of protection in the GTAP5 database

Levels of protection used in the GTAP5 database according to the classification indicated in the main text body are given in the 5 following tables – the importing countries are listed in the columns:

Table A3: Market access for cereals

	Austral.	Japan	Moro.	Eur. Union	USA	Brazil	Switz.	China
<i>Australia</i>		195.8%	23.1%	25.1%	21.3%	9.0%	78.2%	94.0%
<i>Japan</i>	2.7%		33.3%	3.1%	21.4%	9.4%	35.7%	2.9%
<i>Morocco</i>	1.2%	77.8%		11.3%	12.9%	7.5%	39.8%	0.0%
<i>Eur. U.</i>	2.7%	22.2%	22.2%		19.1%	8.9%	40.1%	65.7%
<i>USA</i>	2.7%	62.7%	18.1%	20.4%		8.4%	56.5%	51.0%
<i>Brazil</i>	2.7%	22.1%	19.2%	3.1%	21.5%		35.7%	39.2%
<i>Switzerland</i>	2.9%	22.7%	0.0%	3.4%	21.5%	9.4%		14.6%
<i>China</i>	2.4%	51.8%	19.3%	15.5%	19.0%	9.8%	46.3%	

Source : GTAP5

Table A4: Market access for other agricultural products and food industry

	Austral.	Japan	Moro.	Eur. union	USA	Brazil	Switz.	China
<i>Australia</i>		69.4%	72.9%	29.6%	11.4%	18.3%	168.3%	19.0%
<i>Japan</i>	5.7%		46.2%	29.0%	9.4%	16.1%	120.6%	25.6%
<i>Morocco</i>	4.7%	39.2%		20.2%	10.3%	17.9%	95.9%	18.9%
<i>Eur. U.</i>	6.4%	49.6%	67.9%		8.0%	17.4%	136.7%	48.8%
<i>USA</i>	4.9%	48.3%	64.4%	14.5%		10.8%	127.8%	54.1%
<i>Brazil</i>	5.3%	47.7%	45.1%	16.2%	15.4%		166.7%	63.6%
<i>Switzerland</i>	5.6%	53.1%	60.8%	38.7%	16.3%	16.5%		17.7%
<i>China</i>	5.1%	39.4%	36.1%	18.3%	8.3%	11.3%	202.2%	

Source : GTAP5

Table A5: Market access for other primary products

	Austral.	Japan	Moro.	Eur. union	USA	Brazil	Switz.	China
<i>Australia</i>		0.5%	0.0%	0.0%	0.4%	0.2%	0.2%	3.4%
<i>Japan</i>	0.1%		0.0%	0.0%	0.3%	0.8%	0.0%	3.9%
<i>Morocco</i>	0.0%	1.9%		0.0%	0.2%	0.1%	0.0%	0.0%
<i>Eur. U.</i>	0.5%	-0.2%	5.7%		0.4%	3.1%	0.0%	2.9%
<i>USA</i>	0.1%	-0.1%	2.5%	0.2%		1.4%	0.1%	2.6%
<i>Brazil</i>	0.2%	0.2%	2.5%	0.0%	0.5%		0.1%	0.1%
<i>Switzerland</i>	5.2%	0.0%	10.4%	0.0%	0.5%	5.7%		3.3%
<i>China</i>	0.1%	-0.9%	0.2%	0.1%	0.7%	0.8%	0.4%	

Source : GTAP5

Table A6: Market access in the textile and clothing sector

	Austral.	Japan	Moro.	Eur. union	USA	Brazil	Switz.	China
<i>Australia</i>		2.2%	16.2%	3.3%	9.0%	8.8%	1.5%	15.9%
<i>Japan</i>	15.3%		17.5%	8.7%	10.9%	16.9%	2.1%	27.9%
<i>Morocco</i>	28.4%	15.9%		12.1%	11.8%	21.4%	1.8%	0.0%
<i>Eur. U.</i>	15.5%	12.4%	30.9%		9.7%	15.4%	0.0%	19.7%
<i>USA</i>	14.4%	12.1%	22.6%	8.8%		16.3%	2.1%	17.0%
<i>Brazil</i>	18.3%	9.6%	5.3%	6.3%	8.5%		1.7%	12.0%
<i>Switzerland</i>	13.9%	13.2%	25.1%	0.0%	9.6%	15.6%		27.1%
<i>China</i>	23.6%	12.1%	33.2%	10.1%	13.4%	22.2%	2.6%	

Source : GTAP5

Table A7: Market access for other manufactured products

	Austral.	Japan	Moro.	Eur. union	USA	Brazil	Switz.	China
<i>Australia</i>		0.3%	13.3%	2.0%	1.7%	14.2%	0.3%	13.0%
<i>Japan</i>	5.7%		10.6%	5.1%	2.4%	17.5%	0.2%	14.4%
<i>Morocco</i>	1.8%	0.4%		5.6%	0.9%	4.5%	0.5%	5.5%
<i>Eur. U.</i>	4.2%	0.7%	13.9%		2.5%	14.7%	0.0%	12.6%
<i>USA</i>	3.4%	0.5%	11.4%	3.3%		13.2%	0.4%	11.1%
<i>Brazil</i>	4.6%	0.8%	11.9%	4.0%	2.5%		10.6%	10.4%
<i>Switzerland</i>	2.3%	0.8%	10.3%	0.0%	3.0%	11.2%		12.9%
<i>China</i>	4.4%	1.1%	17.7%	4.8%	2.6%	16.2%	7.7%	

Source : GTAP5

Table A8: Market access for services

	Austral.	Japan	Moro.	Eur. union	USA	Brazil	Switz.	China
<i>Australia</i>		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Japan</i>	0.1%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Morocco</i>	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%
<i>Eur. U.</i>	0.1%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%
<i>USA</i>	0.1%	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%
<i>Brazil</i>	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%
<i>Switzerland</i>	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
<i>China</i>	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Source : GTAP5

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