Assessing the impact of multilateral agricultural liberalization: the contrasted fortunes of developing countries in the Doha Round

Antoine BOUET (CEPII and CATT/UPPA)
Jean-Christophe BUREAU (INRA and CEPII)
Yvan DECREUX (CEPII)
Sébastien JEAN (CEPII)

Revised version – May 2004
(still preliminary – please do not quote)

Abstract:
Using an adapted version of the MIRAGE model, this paper aims at assessing the impact of a widespread liberalization in agriculture, as proposed in the revised Harbinson proposal. The CGE model includes imperfect competition and increasing returns to scale in industry and services. It assumes land and labor mobility to be imperfect across sectors, and developing countries have a dual labor market.
Special emphasis is put on measuring properly protection and domestic support. Domestic support data is updated to 2001 for the EU and the US, and accounts for the Agenda 2000 reform and the New Farm Bill. Protection data, from the MAcMap-HS6 database, describes bound and applied tariffs, taking preferential agreements exhaustively into account. The liberalization hypotheses used in each scenario are applied at the HS-6 level.
The results provide a downward appreciation of multilateral agricultural liberalization and a contrasted picture of the benefits developing countries may draw from this process.

Key words: CGE model, Doha Round, agriculture, tariff preferences, domestic support.
J.E.L. Classification: F12, F13, D58, Q17.

1 Introduction

The agricultural sector has played a special role in the multilateral trade negotiations that have been taking place since 1999. It has been the major obstacle to the conclusion of the round of negotiations under the auspices of the World Trade Organization, launched by the 2001 Doha Ministerial Declaration. After 13 major meetings, some 45 proposals and submissions from 127 countries in 2000 and 2001, member countries have failed to agree on numerical targets, formulas and other "modalities" on the agricultural sector before the scheduled 2003 deadline. The draft compromise proposal on agriculture, elaborated by the Chairman of the agricultural Committee, S. Harbinson in February 2003 did not meet a consensus. Nor did the draft ministerial declaration submitted to the August 2003 Cancún conference by General Council chairman Pérez del Castillo[1].

One of the main causes for the collapse of the discussions in Cancun was the opposition between a group of developing countries and several developed countries on key issues such as agricultural support (in particular the US cotton subsidies), export subsidies (in particular the EU export refunds) and tariffs. Nevertheless, the various proposals and submissions suggest that developing countries only share a few common interests. On issues such as tariffs, the interest of Korea, Senegal, Mauritius and Brazil have little in common.

The consequences of multilateral liberalization for developing countries are uncertain. Many economic studies have concluded that "developing countries would reap most of the gains of trade liberalization" (Hertel, Hoekman and Martin 2002). However, drawing conclusions for the developing countries as a group can be misleading, since the consequences of a trade liberalization in the agricultural sector are likely to be contrasted between countries.

Several studies based on Computable General Equilibrium models, have stressed that, with the ending of export subsidies and a decrease in production enhancing subsidies, world agricultural prices are likely to increase. This should benefit developing countries, whose comparative advantages often lie in the agricultural and textile sectors. In addition, developing countries would finally access some important export markets in developed countries that have so far protected their farm sector with very high tariffs.

However, developing countries vary by their trade specialisations. Not all developing countries are net exporters of agricultural products, and some depend on the world market for their food supply. For example, the ratio of food exports to food imports was around 30% for the Least Developed Countries (LDCs) in 2001. Even if, in some cases, their farm sector was hit by the unfair competition of subsidized production and exports in OECD countries, it is unlikely that net food importing countries would recover and be able to match domestic demand, should

[1] After the failure of the Cancun meeting, discussions led to a revised version of the Castillo draft, including new annexes, compiled by the conference chairman Derbez (circulated on 13 September 2003). During the year 2004, some attempts were made to revive discussions on the basis of the Derbez draft, which, however, contains no precise quantification of the commitments for each country. So far, although it is no longer a formal basis for discussion, the revised version of the Harbinson draft (18 March 2003 , TN/AG/W/1/Rev.1) remains the only negotiation basis that contains quantified proposals.

world price increase. In such cases, trade liberalization would mainly increase the bill of food imports.

In addition, the preferential treatment granted under specific agreements, on a general (e.g. the General System of Preferences) or a geographical basis (e.g. the EU Lomé/Cotonou agreements, the US Africa Growth Opportunity Act, and Caribean Basin Economic Recovery Act) is of considerable importance for some countries. This is particularly the case for some small and highly specialized economies, which have developed an important agricultural sector under a preferential access to the EU or US market. The ending of these preferences, or even only the erosion of these preferences that would follow a multilateral decrease in tariffs may have a significant negative impact (the case of the Windward Islands, whose banana exports to the EU under the ACP agreement represent up to 50% of their national exports, or Mauritius, which has developed a sugar industry thanks to preferential EU import quotas, are obvious cases). Some developing countries might lose some markets to the benefit of competitive developed countries such as Australia or New Zealand, or other developing countries such as Brazil.

More generally, a multilateral agreement on agriculture would be contrasted, simply because some developing countries export products whose production is subject to a high level of distortive support or is protected by tariff peaks in developed countries. Other developing countries export products whose markets are much less distorted. Typically, trade liberalization would have very different impacts on those developing countries that are major players on the world market such as Argentina and Brazil and on the LDCs. In the present effort, we establish a distinction between developing countries, with a particular attention paid to African countries and LDCs on the one hand, and to the major agricultural exporters (Cairns group members) on the other hand.

Many AGE models rely on crude assumptions on the level of protection and domestic support. It is often ignored that many countries apply tariffs that were only a fraction of their bound tariffs, and that preferential agreements play a major role, accounting for one third of agricultural and food imports in the EU, for example. The Uruguay Round showed that there is a large difference between the expected and actual impact of the commitments on tariff reductions, with the "dirty tariffication" (Ingco 1995) and the "dilution of reduction commitments" (Bureau, Fulponi and Salvatici 2000). Behind large cuts in the official measures of domestic support in the present negotiations, the actual commitments sometimes correspond to cosmetic changes, in order to make existing support eligible to the "green box" or exempted by the "de minimis clause" (Watkins, 2003). An accurate representation of the effects of trade liberalization on developing countries requires a precise measurement of applied tariffs and of domestic support.

In the present paper, we address this issues by including the applied tariffs and tariff rate quotas in the model. The detailed trade liberalization proposals are considered as changes in tariffs at the 6 digit level of the Harmonized system of classification of the United Nations. This makes it possible to consider some particular issues such as the elimination of tariff peaks, with complex tariff reduction formulas, minimizing the aggregation bias.

We also model in a precise way the impact of the various forms of support under the (complex) US and EU agricultural policies and the impact of the ongoing changing nature of these policies. Trade liberalization proposals are treated through the actual impacts on prices, payments production of the reduction in the Aggregate measures of support notified to the WTO. This makes it possible to account for the fact that, for example, the US and EU original proposals for Cancun appeared very ambitious when expressed in terms of reduction of the official Aggregate Measure of Support, but in fact have zero or minimal consequences, given the changes that have

already taken place in their policies, and the gap that already exists between their WTO commitments and their actual support.

The Doha Round has already been subject to various assessments using a computable general equilibrium (CGE) model; it includes Hertel et al., 2000; Diao et al., 2001; Beghin et al., 2002; Elbehri and Leetmaa, 2002; van Meijl and van Tongeren, 2001; Rae and Strutt, 2002; Dimaranan et al., 2003; Francois et al., 2003 (this list does not intend to be exhaustive). Although they all conclude that a liberalization of border protection and internal support would increase world prices and world trade, and would have a positive impact on global welfare, the results of the existing studies are rather contrasted. In particular, the outcome for developing countries is found to be uniformly positive in some studies, while some countries are found to suffer a loss in other assessments.
Carrying out a prospective assessment of the consequences of a widespread liberalisation of agricultural trade usually requires using complex models, and large databases. Numerous differences thus arise across studies. The most relevant points which explain those differences, are the following:

1. *Initial trade patterns*. For any country or region, the terms-of-trade impact of a given variation in world prices depends on its initial trade patterns. In particular, an increase in the world price of agricultural commodities is good news for countries that are (or are in a position to be) net exporters in such commodities. Very few studies consider separately LDCs or sub-Saharan African countries part of the Cotonou agreement (this region gathers the bulk of LDCs, with the notable exception of Bangladesh) in a CGE analysis. When this is done (as e.g. in Francois et al., 2003, or in Dimaranan et al., 2003), the outcome generally turns out to be negative for this region.

2. *Initial protection patterns*. To the best of our knowledge, no CGE modelling analysis dealing with multilateral liberalisation in agriculture has so far taken into account preferential agreements in measuring protection.[2] Noticeably, any multilateral liberalisation involves erosion of the preference margin, granted by the richest economies to developing countries, especially LDCs. The stiffer competition this implies for exports coming from those countries might lead to reduced exports.

3. *Protection pattern after liberalisation*. The main scenarios considered in the present multilateral negotiations rely on non-linear reduction of tariffs, in order to even out their structure. This is important, since the impact of tariffs is non-linear, and tariff peaks are recognised to be widespread in agriculture.
   A second problem is that negotiations focus on bound tariffs or tariffs under the Most Favoured Nation (MFN) regime, not on applied tariffs. In principle, the applied tariff will be lowered if it exceeds the lowered level of the bound tariff. This implies that the level of effective liberalisation of market access may vary widely across countries, given that the level of "binding overhang" is very contrasted, and in general far higher in developing countries than in developed countries. Another consequence is that the preference margins will be more than proportionately eroded: the higher the initial preference margin, the lower the rate of reduction in the applied tariff. However, treating these issues correctly would require combining information about bound tariffs, MFN tariffs, and preferential treatments.

---

[2] The GTAP version 5 database incorporates a handful of preferential agreements: ANZCERTA, EU, EU-EFTA, NAFTA and SACU. Data on agricultural protection stem from the AMAD database, of the ERS-USDA, year 1998. It also basically deals with MFN tariffs. Noticeably, Cotonou agreements (or, at that time, Lomé convention) are not accounted for.

4. *Domestic support level*. Measuring domestic support is obviously important in dealing with agricultural liberalisation, but it is problematic for several reasons. The WTO Aggregate measures of support (AMS), for instance, are computed on the basis of 1986-88 prices. The AMS figures include only a part of the actual support. Although far from perfect, the Organisation of Economic Co-operation and Development (OECD) Producer support estimates (PSE) data seem to be a more reliable source, but they do not match WTO boxes, and they only cover OECD countries. Their product coverage is not complete either. In any case, these data are lagging far behind the reality of the negotiations: the latter deal with domestic support in 2005 and afterwards; hence the need to incorporate recent important changes.

This paper aims at evaluating the impact of the proposal made by chairman Harbinson in March 2003, for a compromise on market access, domestic support and export subsidies in the agricultural sector, with a methodology which takes into account three priorities:

(i) measuring accurately policy variables, with chiefly a complete integration of trade preferences and regional agreements, and of bound duties, with data on domestic support including recent policy developments.

(ii) Modelling adequately economic responses; for the supply response we suppose an endogenous land supply (with the opposition of land-constrained and land-unconstrained countries), an imperfect labour mobility between agriculture and other sectors and an imperfect land mobility.

(iii) Specifying a consistent geographical breakdown of developing countries, which tackles the hierarchy of trade preferences and the distinction between net food importers and exporters.

Section 2 exposes the model and the data which are utilized for this assessment. Section 3 comments results obtained in the base case simulation and proceeds to a sensibility analysis. Section 4 concludes.

2 The model and the data

2.1 *Brief description of MIRAGE-ag*

The model used in this study stems from the MIRAGE model, described in Bchir et al. (2002a, b), with several modifications in order to tackle agricultural issues more properly.

MIRAGE is a multi-sector, multi-region computable general equilibrium (CGE) model, devoted to trade policy analysis. Agricultural sectors are perfectly competitive, but industry and market services are not. Imperfect competition is described in an oligopolistic framework *à la Cournot*. It accounts for horizontal product differentiation linked to varieties, but also to geographical origin (nested Armington – Dixit-Stiglitz utility function). A new calibration procedure allows the available information on these aspects to be used efficiently. A notion of vertical product differentiation is introduced in industrial sectors, by distinguishing two quality ranges, according to the country of origin of the product. This is not the case, however, for agriculture goods and processed food.

Although MIRAGE is a dynamic, sequential model, it is used here, for the sake of simplicity, only for static comparative simulations. The modeling of capital is accordingly simplified, assuming capital stock to be perfectly mobile across sectors. FDI is not accounted for either, in contrast to the standard version of MIRAGE. In terms of macro-economic closure, investment is savings-driven, and the current balance is assumed to be exogenous.

The main other modifications introduced to the model are described below.

(i) - Factor endowments and factor mobility

Trade policy can modify the capital stock in the economy, through its impact on income or on the savings rate. This is not taken into account here, since we assume capital stock to be constant. CGE models generally assume land endowment to be constant for each region. However, land in such models shall be understood as land used for culture or cattle. As such, its surface may evolve when there are incentives for it, and omitting this is likely to induce an understatement of the supply response. This is why land supply is assumed to be endogenous, behaving as an isoelastic function of the real return to land (as in the LINKAGE model, see van der Mensbrugghe, 2001). Regions are accordingly classified either as land-constrained (supply elasticity is then equal to 0.25), or not (elasticity equal to 1).[3] This is intended to reflect the fact that the potential for agricultural output can vary widely across countries, notably depending on their capacity to increase their surface of arable land.

Developing countries are assumed to have dual economies. The modern sector (industry and services) pays an efficiency wage to unskilled workers, above their marginal productivity. It is thus faced with an infinitely elastic supply of unskilled labor. The primary sector (i.e., agriculture), in contrast, pays a competitive wage, and the supply of unskilled labor it is faced with is set as a residual, once the modern sector has set its unskilled labor employment level.

Land mobility across agricultural sector is assumed to be imperfect, with transformation elasticity equal to 0.5.

(ii) - Protection and domestic support data

The model uses GTAP 5.2 database (see Dimaranan and Mac Dougall, 2002), but specific data are used to describe tariff barriers as well as agricultural domestic support.

Trade barriers are described by the *MAcMaps* database (see Bouët et al., 2001, 2002), that provides with a measure of ad-valorem tariffs, and of the ad-valorem equivalent of specific tariffs, tariff quotas, prohibitions and anti-dumping duties, at the bilateral level, for 137 countries with 220 partners. Preferential agreements are taken into account in a quasi-exhaustive way. This information is available at the HS6 or tariff line level, according to the country (i.e. at least for 5 000 products).[4] This description of trade barriers, besides its precision, preserves the bilateral dimension of the information, contrarily to what is commonly done in applied modeling. This information refers to applied protection in 2001, and it replaces the information given in the GTAP database. It takes into account the effect of a full implementation of the Uruguay Round Agreements.

The GTAP database includes data on agricultural support for OECD countries in 1997. This information is most valuable but, as outlined before, it lags far behind the reality of negotiations. This is why we have built an original dataset on agricultural domestic support in the EU and in the US, mainly based on OECD PSE dataset for the year 2001, (including unpublished data for non standard PSE commodities). In addition, we take into account the effect of the EU enlargement, of a full implementation of the Agenda 2000 reform in the EU, and of the 2002 US Farm Security and Rural Investment (FSRI) Act in the US (see the Appendix for details).

Commentaire : = choc. + eu enlarg't

This information about agricultural support is considered through a pre-experiment simulation: from the GTAP dataset, with MAcMaps protection, a new equilibrium is computed, assuming that domestic support is shifted to its new level. The resulting equilibrium corresponds to a notional world economy, based on 1997 data, but incorporating (in addition to 2001 data on market access) the above mentioned changes in agricultural policies.

---

[3] These values are the same as in the Linkage model. We thank Dominique van der Mensbrugghe for providing us information and advice on this point.

[4] In a future draft, scenarios of border protection liberalization will be computed at the HS6 level.

Subsidies are directly introduced in the model as price wedges, either on output, on variables inputs, on land or on capital. In addition, market price support is modeled through the combination of tariffs and of export subsidies. [5]
Set aside is taken into account in the US and the EU, and modeled as a negative shock on the productivity of land (see Bach and Frandsen, 1998).
(iii) - Geographical and sectoral breakdown
From the geographical point of view, priority is given to estimating impact of liberalising agricultural policies in the two highly interventionist zones (USA and EU) which have huge trade preferences, on differentiated groups of developing countries. We concentrate attention to the impact on African Cotonou countries on the one hand, and on the Cairns group on the other hand.
As a matter of fact, the world is divided into 11 regions:
1 - the European Union, enlarged to 25 countries (EU 25;
2 – the United States of America, with American Samoa, Guam and Northern Mariana Islands (USA);
3 – the Cotonou countries (SS Africa);
4 – developed countries of the Cairns group, Australia, Canada, New Zealand (Cairns Dd);
5 – developing countries of the Cairns group, noticeably Brazil, Argentina, Chile (Cairns Dg);
6 – China (Hong Kong included);
7 – the former Soviet Union (called FSU);
8 – Developed Asia, called Asia Dd, including Japan and South Korea;
9 – the EFTA, including Switzerland, Norway and Iceland;
10 – the Mediterranean countries with Romania, Bulgaria, Croatia, Turkey and the Maghreb countries;
11 – the Rest of the World.

From the sectoral point of view, economic activity is shared between 30 sectors with a pre-eminence of agricultural and agro-food sectors (23 – see Table 1).

Table 1: Sectoral decomposition

Sector	Label	Type of competition	Category	Subsidized exports	Traditional /modern
PadRice	Paddy rice	Perfect	Agriculture	EU	Traditional
ProcRice	Proc rice	Perfect	Food products		Modern
Cereals	Cereals	Perfect	Agriculture	EU	Traditional
Wheat	Wheat	Perfect	Agriculture	EU	Traditional
SugarCB	Raw sugar	Perfect	Agriculture		Traditional
Sugar	Sugar	Perfect	Food products	EU	Modern
Oilseeds	Oil seeds	Perfect	Agriculture		Traditional
LivAnimals	Liv Animals	Perfect	Agriculture		Traditional
Animprod	Anim Prod	Perfect	Agriculture		Traditional
Meat	Meat	Perfect	Food products	EU	Traditional
Meatprod	Meat prod	Perfect	Food products	EU / US	Modern
Dairy	Dairy prod	Perfect	Food products	EU / US	Traditional
Fibers	Fibers	Perfect	Agriculture		Traditional
Vegfruits	Veg & Fruits	Perfect	Agriculture	EU	Traditional
Crops	Oth_crops	Perfect	Agriculture		Traditional

Fats	Fats	Perfect	Food products		Traditional
BevTobacco	Bev&Tob	Perfect	Food products	EU	Modern
Food	Food	Perfect	Food products	EU	Modern
Forestry	Forestry	Perfect	Agriculture		Traditional
Fishing	Fishing	Perfect	Agriculture		Traditional
Primary	Oth primary	Perfect	Other Primary		Modern
Woodprod	Wood prod	Imperfect	Industry		Modern
Wool	Wool	Perfect	Agriculture		Traditional
Textile	Textile	Imperfect	Industry		Modern
Clothing	Clothing	Imperfect	Industry		Modern
Leather	Leather	Imperfect	Industry		Modern
Equipment	Equipment	Imperfect	Industry		Modern
Chemicals	Chemicals	Imperfect	Industry		Modern
AutreIndus	Other Ind	Imperfect	Industry		Modern
AutreSer	Other Serv	Imperfect	Services		Modern

2.2 Experiment design

The experiments simulated follow the March 2003 revised Harbinson proposal ("Harbinson 1 ½"), that has by now become the main negotiation basis (WTO 2003).
Harbinson proposed a differentiated reduction in border protection, taking into account Special and Differentiated Treatment. For industrial countries, the reduction is very progressive:

- if tariffs are greater than 90%, a reduction of 60%;
- if tariffs are equal to or less than 90% and greater than 15%, a reduction of 50%;
- if tariffs are equal to or less than 15%, a reduction of 40%.

The reduction is much less severe for developing countries (the definition of developing countries is the one adopted by the WTO):

- if tariffs are greater than 120%, a reduction of 40%;
- if tariffs are equal to or less than 120% and greater than 60%, a reduction of 35%;
- if tariffs are equal to or less than 60% and greater than 20%, a reduction of 30%;
- if tariffs are equal to or less than 20%, a reduction of 25%.

As far as domestic support is concerned, there is no point about special and differential treatment, since, in our data, only OECD countries have domestic support policies (i.e. other than through border protection). The distinction between blue and amber boxes cannot be made either, since our data do not match this typology. As a consequence, a cut of 55% is applied to domestic support (instead of 60% for the amber box, and 50% for the blue box in the Harbinson proposal).
As far as border protection is concerned, the average cuts mentioned in the Harbinson proposal are applied to the bound duties. The new applied ad valorem equivalent is equal to the minimum of the previous one and the new bound rate. The calculation is first made for each product, at the HS-6 level (5,000 products approximately). The liberalized ad valorem equivalent tariffs, obtained as a result of these calculations, are then aggregated in the model's classification, in order to make it possible to carry out simulations.
The special and differential treatment is applied to the regions classified as developing economies, that is to every region, except the EU, the US, Cairns_Dd, the EFTA and developed Asia.

2.2.1 Initial trade patterns: illustration

Needless to say, trade specialisation is among the main determinants of the impact of any trade liberalisation on a given country. However, global assessments of multilateral trade liberalisation often involve aggregating countries, in a way that blur the specific nature of their trade specialisation. Table 1 displays the trade balance by sector, as a percent of output, for each of the regions considered here. The most uniformly net importers of agricultural products appear to be the developed Asia zone. Although agriculture is commonly thought to be a comparative advantage of developing countries, they exhibit rather contrasted positions. Sub-Saharan Africa China, the "Rest of the World" region and especially Mediterranean countries appear as net importers of numerous agricultural products.

Table 1: Net trade balance by sector, as a % of output

Zone	Cereals	Crops	Dairy	Fibers	LivAnimals	Meat	MeatProd	OilSeeds	ProcRice	Sugar	VegFruits	Wheat
EU 25	-7.6	-19.3	4.9	2.4	-1.2	-2.3	4.1	-151.4	-12.6	0.7	-16.0	-3.9
USA	12.6	-18.8	-0.8	43.3	-1.7	2.4	6.3	40.4	17.7	-15.4	-3.6	31.5
Asia Dd	-389.5	-23.8	-11.9	-2627.3	-2.4	-23.3	-37.3	-888.4	-2.0	-15.3	-9.3	-286.7
EFTA	-5.8	-58.1	4.7	-162.0	-0.3	-3.4	-8.3	-114.2	-118.0	-28.0	-53.6	-4.6
Cairns Dd	22.2	-8.6	30.2	36.1	17.0	35.2	11.0	27.6	1.6	15.3	-1.8	78.7
Mediter'n	-6.2	-6.1	-8.3	-45.0	0.5	-12.2	-2.1	-15.4	-9.0	-11.0	5.7	-12.5
FSU	14.8	-81.4	-40.0	48.4	0.4	-15.6	-96.7	6.9	-2.9	-141.9	-12.7	0.0
SS Africa	-2.5	36.8	-85.5	39.6	0.1	1.7	-10.1	10.2	-2.6	0.5	7.0	-36.1
Cairns Dg	5.7	39.0	-7.4	-97.6	-1.4	2.0	7.3	5.6	2.9	12.9	3.9	-10.5
China	4.6	21.6	-26.8	-52.5	1.1	-11.3	2.0	-13.2	0.4	-23.1	0.7	-3.3
RoW	-9.5	18.3	-25.5	-13.9	-0.4	-5.1	-7.7	-9.5	1.5	1.1	7.8	-12.0

Source: Authors' calculations, based on GTAP 5.3 database (year 1997), and pre-experiment simulations.
Note: Large negative numbers refer to sectors where the country's output is very small. Comparing their absolute values is not necessarily meaningful.

On the contrary, developing regions or countries belonging to the Cairns group are regular net food exporters.

2.2.2 Initial protection patterns: illustration

Table 3 illustrates the average protection (MacMap methodology – see Bouët et alii, 2004) imposed by each importer on each supplier. It reveals that market access is still restricted in developing countries, especially in Sub - Saharan Africa. This table also highlights the degree of discrimination in some trade policies: European Union has granted large preferences to Sub - Saharan Africa, EFTA and Mediterranean countries. Preferences are smaller in the case of the USA: for example, in 2001, AGOA was already applied, but eligible countries were few. Thus these figures point out the potential cases of erosion of trade preferences, due to multilateral liberalization.

Table 3: bilateral market access, aggregated on all sectors, 2001

	Reporter										
Partner	EU 25	USA	Asia Dd	EFTA	Cairns Dd	Mediter'n	FSU	SS Africa	Cairns Dg	China	RoW
EU 25		2.8%	5.4%	5.4%	6.2%	10.0%	9.3%	15.2%	11.5%	12.2%	13.7
USA	4.0%		4.8%	7.0%	1.5%	11.5%	10.0%	15.1%	10.6%	8.3%	6.0
Asia Dd	4.1%	2.6%		2.8%	4.3%	11.6%	8.1%	13.8%	10.3%	11.1%	13.2
EFTA	0.4%	1.5%	2.2%		4.6%	7.6%	9.5%	12.1%	6.6%	8.6%	12.7
Cairns Dd	6.5%	0.5%	5.1%	11.2%		17.9%	10.3%	12.4%	10.7%	7.4%	12.0
Mediter'n	0.7%	4.4%	4.5%	7.5%	9.3%		9.8%	18.2%	10.1%	12.1%	14.3

FSU	1.2%	0.7%	2.8%	2.4%	5.7%	9.5%		12.2%	7.6%	8.0%	13.5
SS Africa	0.1%	1.7%	3.6%	2.0%	7.3%	7.5%	5.3%		6.8%	4.9%	15.3
Cairns Dg	3.6%	2.4%	5.2%	5.5%	3.5%	15.3%	10.6%	20.5%		13.8%	17.1
China	4.2%	5.0%	4.2%	1.9%	5.6%	21.1%	12.3%	21.6%	12.7%		18.7
RoW	1.5%	1.7%	3.9%	3.6%	7.3%	12.1%	8.2%	17.5%	7.8%	9.2%	

(Source: Macmap_HS6 and authors' calculation)

Table 4 reveals the average level of protection by sector imposed by each importing zone. It confirms that market access is more restricted in developing countries and that in developed countries, protection is concentrated in the agricultural sectors: especially cereals, sugar, dairy products and meat.

Table 4: Protection by reporter and by sector, 2001

	Reporter										
	EU 25	USA	Asia Dd	EFTA	Cairns Dd	Mediter'n	FSU	SS Africa	Cairns Dg	China	RoW
Paddy rice	4.4%	4.5%	35.1%	13.8%	0.0%	26.3%	7.9%	17.8%	12.3%	78.6%	46.5%
Proc rice	3.8%	3.6%	20.6%	10.7%	0.0%	32.4%	9.2%	31.0%	13.7%	53.8%	36.6%
Cereals	2.5%	1.2%	79.3%	70.2%	8.2%	27.5%	7.8%	25.2%	14.3%	8.7%	31.6%
Wheat	11.0%	2.8%	107.8%	138.6%	5.7%	25.3%	13.5%	10.4%	9.0%	28.0%	29.1%
Raw sugar	98.4%	0.4%	52.6%	26.7%	0.0%	24.7%	18.8%	13.0%	15.3%	19.3%	10.4%
Sugar	85.1%	7.1%	123.8%	40.6%	4.3%	51.3%	31.8%	24.9%	28.1%	28.5%	29.0%
Oil seeds	0.0%	3.3%	77.1%	46.3%	0.1%	5.3%	4.9%	6.1%	7.1%	1.4%	10.3%
Liv Animals	41.9%	0.1%	29.5%	97.8%	0.0%	66.6%	5.1%	9.8%	3.4%	8.3%	5.5%
Anim Prod	7.7%	1.3%	11.3%	44.3%	12.0%	13.5%	7.6%	15.6%	5.1%	9.6%	14.1%
Meat	97.1%	6.1%	23.4%	197.1%	6.9%	85.9%	16.8%	17.5%	11.2%	20.2%	22.4%
Meat prod	23.2%	1.2%	33.8%	134.0%	8.0%	74.6%	16.5%	36.4%	13.1%	15.8%	16.1%
Dairy prod	36.1%	14.5%	20.7%	80.6%	130.3%	65.3%	16.2%	21.1%	13.8%	18.1%	41.5%
Fibers	0.0%	0.6%	0.2%	0.0%	0.0%	1.2%	1.8%	6.3%	4.9%	8.3%	4.7%
Veg & Fruits	10.3%	2.9%	21.5%	39.7%	2.0%	40.4%	22.9%	32.0%	15.2%	14.8%	23.9%
Oth_crops	2.2%	8.6%	4.8%	25.2%	1.5%	22.4%	6.1%	19.3%	35.8%	13.9%	26.7%
Fats	4.3%	3.9%	5.1%	44.7%	2.7%	15.1%	15.9%	27.7%	8.4%	19.5%	32.7%
Bev&Tob	14.3%	3.0%	13.3%	15.1%	24.8%	33.9%	31.8%	47.7%	38.4%	33.3%	47.5%
Food	10.6%	4.6%	12.5%	23.1%	8.9%	28.1%	15.2%	25.1%	12.6%	17.8%	17.9%
Forestry	0.1%	0.1%	0.8%	1.2%	0.2%	4.6%	7.6%	11.5%	2.3%	1.2%	6.3%
Fishing	5.6%	0.3%	7.6%	0.2%	0.2%	28.7%	11.6%	16.7%	14.9%	12.6%	17.5%
Oth primary	0.6%	0.6%	1.4%	0.2%	5.3%	6.6%	6.3%	12.2%	4.9%	4.1%	11.7%
Wood prod	0.6%	0.5%	1.7%	0.6%	3.5%	13.0%	16.0%	33.1%	12.1%	7.6%	11.4%
Wool	0.0%	1.3%	0.6%	0.0%	0.0%	5.1%	6.3%	8.8%	5.0%	1.9%	5.8%
Textile	6.1%	9.4%	5.3%	2.6%	11.2%	17.1%	10.0%	29.7%	15.0%	16.4%	14.8%
Clothing	7.2%	11.2%	7.3%	2.8%	17.2%	54.8%	17.2%	39.4%	22.4%	21.4%	19.6%
Leather	7.2%	10.2%	8.4%	0.8%	9.5%	15.2%	15.5%	30.8%	11.7%	12.2%	15.5%
Equipment	1.2%	1.5%	1.7%	0.2%	2.1%	6.2%	7.1%	11.4%	7.6%	8.9%	10.2%
Chemicals	2.8%	2.6%	2.4%	0.3%	3.1%	8.4%	8.1%	13.4%	8.7%	9.4%	10.6%
Other Ind	2.9%	1.9%	3.4%	1.1%	3.6%	8.8%	9.5%	14.2%	12.7%	12.6%	11.2%
Other Serv	0.0%	0.0%	0.8%	0.0%	0.0%	3.2%	4.1%	7.5%	0.3%	0.0%	6.9%

(Source: Macmap_HS6 and authors' calculation)

2.2.3 Domestic support, measure and modeling: illustration

Data for farm support include various policy instruments, that are are converted into different types of taxes and subsidies for modeling purposes. We distinguish market price support, output

subsidies, capital subsidies, variable input subsidies, land subsidies, and decoupled subsidies to a particular agricultural sector.

For OECD countries, a detailed dataset that rely on primary information from the OECD on the PSEs was constructed so as to model the farm policies. For non PSE commodities data, some was provided by the OECD secretariat, and other data from national sources have been used (e.g. budget data for subsidies to cotton, tobacco, olive oil in the EU; data provided by the Economic Research Service of the USDA for US programs). In the case of the EU and the United States, the data on farm support was amended so as to reflect the full implementation of major ongoing reforms, i.e. the 2002 agricultural legislation in the US and the 1999 Agenda 2000 in the EU. For non-OECD countries such as China and the former Soviet Union, the data that has been used for domestic agricultural policies have been limited to the instruments available in the standard 5.3 version of the GTAP dataset.

Farm support is treated as various types of price wedges and percentage subsidies, either on output, on variable inputs, on land or on capital. In addition, market price support is modelled through the combination of tariffs and of export subsidies. Output subsidies include all subsidies (limited and unlimited) that are a function of the volume of output. Capital subsidies include support of farm investment (e.g. national subsidies on interest charges given by some EU member states), and payments per head of cattle (e.g. beef premia in the EU). Variable input subsidies include tax deductions (fuel in some countries), subsidies to particular inputs (e.g. cotton seeds in the EU). Direct payments per hectare that are based on reference yields (e.g. arable crops payments in the EU) are treated as land subsidies. Decoupled payments (payments to self-employed labour) include all payments that are conditional to input constraints, agri-environmental payments, and payments that are based on reference levels and not tied to land, input use or output.

With these assumptions, it is noteworthy that most of the EU support to the beef sector is treated as a capital subsidy; most of the support to cereals in the EU is treated as land subsidy; most of the support to the dairy sector is treated as market price support in both the EU and the US; most of the support to cereals and oilseed is treated as decoupled in the US (with the exception of marketing loans, treated as output subsidies).

Table 5: Assumptions adopted on ceilings for distorsive domestic support under the various proposals, for the simulations with the MIRAGE model

	EUROPEAN UNION	UNITED STATES	CANADA	JAPAN
	mn euros	mn US$	mn C$	bn Yens
Actual data (last year available)				
Green box support	19,931	49,749	1,300	2,686
Blue box support	19,792	0	0	93
Amber box type support	47,941	24,297	790	781
Official AMS (i.e. amber box adjusted for de minimis)	47,886	16,862	790	748
AMS ceiling	69,450	19,899	4,659	4,139
Percent of ceiling filled	68.9%	84.7%	16.9%	18.1%
Last AMS notified	1999/2000	1999	1998	1999
Value of agricultural production 2001	256,300	202,800	13,258	9,122
Assumptions for ceiling under Harbinson proposal in modelling scenarios				
Harbinson proposal				
Ceiling amber box	27,780	7,960	1,864	1,655
Ceiling blue box (1)	9,896	0	0	0

Source: ERS-USDA, WTO, European Commission, author's calculations.

Figures on farm support for OECD countries refer to the year 2001. They are then expressed as a percentage of the sectoral output in 2001, and included in the original dataset. Because of the medium-run nature of the MIRAGE simulations, it has been assumed that the two major policy reforms already under way, i.e. the US Farm Security and Rural Investment (FSRI) Act of 2002 and the EU Agenda 2000, were fully implemented. That is, we amended the data on domestic policies collected for the year 2001 so as to include developments in the level of support, in the EU and the US that will be implemented over the 2002-2005 period. Nevertheless, we did not explicitly construct a baseline for the year 2005 in the sense that we left other parameters and data at their 2001 level. That is, we chose not to use forecasts of demand, supply and prices in establishing this baseline. Forecasts on changes in Central and Eastern European countries, or in China, are indeed hard to predict. Using predicted world prices for 2005 would have led to introduce in the baseline some results drawn from other models, which would have made the assumptions underlying the simulations less transparent.

Land set-aside that prevailed in the EU in 2001 is also considered in the model. It is simply supposed that only a part of total land is available for production. This part is then amended so as to take into account changes in the Agenda 2000 and the FSRI. The increase in the acreage under conservation programs caused by the FSRI is only partially taken into account (as an extra negative productivity shock on land for wheat). We consider that only a share of the increased acreage eligible will be used for conservation (Westcott et al., 2002), and that the overall effect on output will be limited, because of several arguments put forward by Gardner (2002) and Sumner (2003). In order to account for exemption of small producers and other forms of slippage, the 10% set aside on arable crops in the EU was taken into account as a 7% land set-aside only.

Relatively to the 2001 figure, the effects of the implementation of the FSRI were taken into account by an increase in the output subsidy for wheat (6%) and other cereals (3%), and a decrease in the case of soybean (4%). An output subsidy on dairy (3% of the value of production) was introduced. It has been shown that, because they affect risk and resource allocation, the

flexibility contract payments in the FAIR Act were not completely decoupled (Adams et al., 2001; Gardner 2002). In addition, the possibility to update the base for the FSRI countercyclical payments has led to a degree of "recoupling" of these payments. In order to take into account the indirect effect of these subsidies on output we considered that 30% of the amount of these payments are in fact output subsidy on the range of commodities covered by the program.
In the European Union, the implementation of the Agenda 2000 was taken into account in the data on intervention prices and support for 2001, except in the case of oilseeds (where a further 13% decrease in subsidies based on acreage was introduced) and in the case of beef (a 32% decrease of the intervention prices was applied in order to account for the July 2002 decrease in intervention price). In order to account for the final (i.e. 2002) increase in beef premia, the overall support per head of cattle (introduced in the model as a capital subsidy in the live bovines sector), the 2001 support was increased by 13%. Finally, the first step of a reform in the milk sector (supposed to take place in 2005) was introduced as a 20% decrease in intervention price for fluid milk and 976 million euros subsidy to capital in the fluid milk sector.

2.2.4 Protection pattern after liberalization: illustration

The experiments simulated follow the March 2003 revised Harbinson proposal ("Harbinson 1 ½"), that has by now become the main negotiation basis (WTO 2003). As far as border protection is concerned, the average cuts, mentioned in the Harbinson proposal, are applied to the ad valorem equivalent of ad valorem and specific bound tariffs. The new level of bound tariff becomes the applied ad valorem equivalent when it has become lower than the previous applied level. The calculation is first made for each product, at the HS-6 level (5,000 products approximately). The liberalized ad valorem equivalent tariff obtained as a result of these calculations are then aggregated in the models' classification, in order to make it possible to carry out simulations. It is obviously a procedure which minimizes loss of information (as compared to the application of Harbinson cuts to the aggregated levels of protection). The special and differential treatment is applied to the regions classified as developing economies, that is to every region, except the EU, the US, developed Asia, EFTA and developed Cairns.
Table 5 shows implied variations of average agricultural protection (change in percentage points) imposed by each reporter on each partner. Last line indicates the reduction in average protection for each reporter (also in percentage points), whilst last column reveals how this proposal improves worldwide market access for each exporting zone.
As the utilized formula is progressive, agricultural protection is especially reduced in importing countries where it is initially high (compare for example last line figures for EU 25, USA and EFTA). For developing countries, special and differential treatment implies that border reduction is reduced to a lesser extent.
The erosion of preferential margins is highlighted by table 6. Last column indicates that Sub Saharan countries are the exporting zone which benefits from the smallest openness of foreign markets. By contrast developing exporters of the Cairns group are much more favored by the liberalization process. It clearly means contrasted fortunes for developing countries. Moreover the greatest beneficiaries are developed countries of the Cairns group, European Union and USA.

Table 6: impact of Harbinson proposal on bilateral market access

	Reporter											
	EU 25	USA	Asia Dd	EFTA	Cairns Dd	Mediter'n	FSU	SS Africa	Cairns Dg	China	RoW	
EU 25		-1.6%	-11.4%	-17.7%	-16.5%	-4.2%	-0.1%	-1.6%	-2.6%	-9.9%	-7.2%	**-7.4%**
USA	-7.8%		-18.2%	-17.3%	-3.5%	-2.2%	-0.1%	-0.4%	-2.2%	-2.9%	-2.0%	**-6.9%**
Asia Dd	-4.4%	-1.4%		-5.4%	-5.5%	-2.7%	-0.1%	-0.8%	-1.6%	-8.3%	-8.4%	**-4.4%**
EFTA	-2.2%	-1.9%	-1.9%		-7.2%	-2.2%	0.0%	-1.6%	-1.3%	-8.2%	-2.2%	**-2.4%**
Cairns Dd	-15.5%	-1.5%	-9.3%	-30.8%		-5.7%	-0.1%	-0.5%	-1.6%	-4.0%	-6.6%	**-11.1%**
Mediter'n	-2.4%	-2.6%	-5.5%	-6.6%	-3.2%		-0.1%	-1.3%	-2.3%	-20.6%	-3.3%	**-3.7%**

FSU	-0.9%	-0.9%	-7.3%	-10.3%	-4.4%	-3.2%		-1.0%	-1.3%	-25.3%	-5.5%	**-4.1%**
SS Africa	-0.2%	-2.4%	-5.2%	-2.7%	-0.2%	-2.4%	-0.1%		-1.3%	-9.1%	-2.4%	**-1.4%**
Cairns Dg	-5.7%	-1.8%	-12.0%	-9.6%	-1.5%	-3.9%	-0.1%	-1.1%		-13.4%	-3.2%	**-5.7%**
China	-3.5%	-2.0%	-8.6%	-8.6%	-2.4%	-6.3%	-0.1%	-1.1%	-2.2%		-5.0%	**-3.9%**
RoW	-3.5%	-1.0%	-7.2%	-8.1%	-3.1%	-5.3%	-0.1%	-1.0%	-4.1%	-12.7%		**-4.0%**
	-6.6%	**-1.6%**	**-11.2%**	**-16.6%**	**-13.1%**	**-4.0%**	**-0.1%**	**-1.3%**	**-2.4%**	**-9.8%**	**-5.5%**	

(Source: Macmap_HS6 and authors' calculation)

Table 7 indicates implied variations of protection by reporter and by sector (as a change in percentage points). Obviously a progressive cut in imports duties implies higher reduction in cereals (Asia Dd, EFTA), sugar (EU 25, Asia Dd), Meat (EU 25, EFTA) and dairy products (EFTA, Cairns Dd). Decrease of border protection in the Chinese rice sector is also significant.

Table 7: impact of Harbinson proposal on protection by reporter and by sector

	EU 25	USA	Asia Dd	EFTA	Cairns Dd	Mediter'n	FSU	SS Africa	Cairns Dg	China	RoW
Paddy rice	-2.4%	-1.8%	-16.0%	-4.3%	0.0%	-1.4%	-0.2%	0.0%	-0.5%	-47.3%	-20.2%
Proc rice	-1.3%	-0.4%	-10.5%	0.0%	0.0%	-4.5%	0.0%	0.0%	-0.4%	-32.2%	-13.9%
Cereals	-0.7%	-0.5%	-45.2%	-20.3%	-6.1%	-0.4%	0.0%	-0.3%	-5.3%	-4.8%	-5.4%
Wheat	-1.9%	-1.1%	-65.9%	-37.3%	-3.5%	-0.9%	-0.1%	-0.1%	-0.1%	-17.2%	-12.6%
Raw sugar	-54.3%	-0.2%	0.0%	-3.5%	0.0%	-3.4%	-0.1%	0.0%	-4.7%	-12.3%	-1.0%
Sugar	-44.1%	-3.1%	-62.9%	-17.6%	-1.3%	-6.0%	-0.2%	-0.6%	-0.9%	-6.8%	-1.4%
Oil seeds	0.0%	-1.5%	-59.1%	-13.1%	0.0%	-0.3%	-0.2%	0.0%	-1.0%	-0.2%	-0.1%
Liv Animals	-19.5%	0.0%	-15.7%	-40.0%	0.0%	-13.9%	0.0%	-0.1%	-0.4%	-2.1%	-0.1%
Anim Prod	-4.1%	-0.4%	-5.5%	-18.2%	-7.5%	-0.6%	0.0%	-0.1%	-1.0%	-2.8%	-2.6%
Meat	-52.7%	-3.0%	-8.8%	-63.2%	-2.8%	-26.9%	0.0%	-0.2%	-1.9%	-11.0%	-4.3%
Meat prod	-10.0%	-0.6%	-17.7%	-58.0%	-4.2%	-20.6%	0.0%	-1.8%	-3.0%	-6.2%	-0.6%
Dairy prod	-10.5%	-3.2%	-5.1%	-29.5%	-97.5%	-9.3%	-0.1%	-0.8%	-1.2%	-10.2%	-15.8%
Fibers	0.0%	-0.2%	0.0%	0.0%	0.0%	-0.2%	-0.1%	-0.1%	-0.5%	-5.0%	0.0%
Veg & Fruits	-3.5%	-1.2%	-9.8%	-13.2%	-0.6%	-9.3%	-0.1%	-2.0%	-5.8%	-6.6%	-4.6%
Oth_crops	-0.7%	-4.5%	-1.6%	-12.1%	-0.4%	-2.5%	-0.1%	-0.2%	-0.8%	-7.8%	-3.0%
Fats	-1.1%	-1.6%	-1.5%	-12.5%	-0.7%	-0.6%	-0.3%	-0.3%	-0.8%	-12.0%	-2.3%
Bev&Tob	-6.6%	-1.2%	-4.8%	-6.8%	-14.4%	-3.1%	-0.1%	-7.6%	-9.6%	-17.6%	-9.6%
Food	-2.6%	-1.6%	-2.9%	-5.9%	-3.8%	-2.8%	0.0%	-0.9%	-1.1%	-6.2%	-2.0%

(Source: Macmap_HS6 and authors' calculation)

3 Results

Translating each pillar of the Harbinson proposal in terms of changes in applied protection and subsidies has already allowed gaining a better understanding of their possible consequences. It has shown, in particular, how contrasted the impact on market access should be, not only in average, but also partner by partner. This section aims at making the picture clearer and more complete, by introducing the corresponding scenarios (that is, the corresponding exogenous shocks on market access and on domestic support) in the above-described model. These simulations will provide with a large-scale, exhaustive and coherent assessment of the consequences of such proposals. The interest of this exercise of course lies in the resulting assessed impact for each country, but most of all in their comparison across countries and scenarios.

The first expected impact of a multilateral liberalization is the increase of world prices: since protection reduces the demand for imported products, removing it, *ceteris paribus*, increases the worldwide demand for imports, thus putting an upward pressure on their price. The same is true

of domestic support and of export subsidies. Increased world prices are indeed observed for all agrofood products as a consequence of the removal of domestic support, with especially large impacts for paddy rice, plant-based fibers and oilseeds (table 8). Most of all, removing export subsidies raises world import prices of sugar, and to a lesser extent of meat, dairy products and food products. Cutting tariff duties also induces an increase in the price of most agrofood products, but this increase is small, and sugar and fats stand as clear exceptions. The significant price decline for these two products is due to the steep decline in quota rents associated with the lowering of outside quota tariff rates.

Commentaire : Interpretation à vérifier

Table 8: World import price changes (in %)

	Initial share in world agrofood exports	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
Paddy rice	0.5	11.95	0.06	0.22	12.27
Proc rice	1.0	0.78	0.05	0.11	0.96
Cereals	3.5	2.24	0.06	0.21	2.52
Wheat	3.9	0.98	0.16	0.19	1.34
Sugar	2.8	0.30	8.44	-3.33	8.18
Oil seeds	5.7	7.39	0.07	0.33	7.87
Liv Animals	1.2	0.49	0.15	0.25	0.89
Anim Prod	3.3	0.43	0.11	-0.03	0.51
Meat	4.1	0.40	2.76	0.12	3.30
Meat prod	4.8	0.31	1.71	0.00	2.02
Dairy prod	3.9	0.15	3.02	-0.11	3.10
Fibers	3.6	10.73	0.08	0.02	10.85
Veg & Fruits	8.2	0.14	0.23	0.18	0.56
Oth_crops	9.2	0.98	0.02	0.09	1.10
Fats	7.1	2.46	0.03	-0.74	1.75
Bev&Tob	10.9	0.09	0.31	-0.07	0.30
Food	26.0	0.32	3.21	-0.17	3.37
Total agrofood	**100.0**	**1.44**	**1.46**	**-0.13**	**2.85**

Source: Authors' simulations.
(*) World imports here refer to imports between the regions considered in the model. Imports between countries within the same region are not considered.

In terms of agrofood exports, cutting domestic support and export subsidies do not induce a worldwide increase (Table 8). Still, a significant reshuffling takes place, with in particular a strong decline of US exports as a result of domestic support liberalization, and of EU's exports following the removal of export subsidies. The bulk of created exports originates from FSU and Cairns countries.
Cutting border protection increases world exports in volume by almost 7%. This increase is rather well distributed among exporters, with two remarkable exceptions: the FSU and sub-

Saharan African countries, the exports of which decline. As far as sub-Saharan Africa is concerned, this results mainly from the erosion of preferences experienced on the EU's market.

Table 9: Impacts on agrofood exports (in volume), per country (% change)

	Initial level	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
EU 25	58,186	-0.7	-11.5	9.2	-4.1
USA	58,980	-8.2	1.6	6.3	-0.1
Asia Dd	4,553	0.7	5.6	35.8	42.9
EFTA	4,978	2.3	0.0	6.8	6.5
Cairns Dd	31,723	3.0	1.6	7.5	12.1
Mediter'n	6,878	2.2	0.1	6.8	9.3
FSU	5,129	8.8	2.8	-1.5	9.8
SS Africa	9,961	6.0	-0.8	-3.1	2.4
Cairns Dg	45,466	3.2	0.1	6.4	9.7
China	10,463	1.7	0.4	8.1	10.0
RoW	29,696	1.7	-0.2	3.1	4.2
World	**266,012**	**-0.3**	**-1.8**	**6.8**	**4.4**

Source: Authors' simulations.
Note: Initial levels are expressed in millions of 1997 US dollars. The figures refer to f.o.b. values.

In terms of agrofood imports, exports subsidies removal logically entails a small decline for all regions (Table 10). For both other pillars, imports creation is concentrated in developed countries. The EU and the US experience a moderate increase in their agro-food imports following domestic support cut, and the imports creation is quite strong and evenly distributed as a result of cutting tariff duties, with strong proportional increases in developed Cairns countries and in EFTA, and large absolute import creation in the EU and Japan.

Table 10: Impacts on agro-food imports (in volume), per country (% change)

	Initial level	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
EU 25	59,182	2.2	-1.3	11.5	11.9
USA	41,586	1.7	-1.9	5.3	5.1
Asia Dd	66,407	0.6	-1.2	9.3	8.4
EFTA	6,810	-0.4	-7.3	24.0	15.8
Cairns Dd	12,067	-2.0	-2.4	18.7	13.8
Mediter'n	13,288	-2.9	-2.6	0.7	-5.0
FSU	15,273	-0.8	-5.6	0.6	-6.0
SS Africa	4,798	0.0	-4.1	0.5	-3.9
Cairns Dg	18,919	-3.1	-1.2	1.2	-3.2
China	14,969	-6.3	-0.2	1.0	-5.6
RoW	35,293	-3.9	-1.8	0.7	-5.3
World	**288,592**	**-0.5**	**-1.9**	**6.9**	**4.3**

Source: Authors' simulations.
Note: Initial levels are expressed in millions of 1997 US dollars. The subtotal "Cairns" only groups those Cairns Group's countries that are listed below this title, that is 10 out of 17. The subtotal "DCs" refer to the developing countries listed below this title. The total level and growth rate of world agrofood imports slightly differ from exports', since imports are valued c.i.f., while exports are valued f.o.b.

In terms of welfare, the impacts remain of a limited order of magnitude (see table 11) reflecting the limited weight of agriculture in many economies, at least in the industrialised ones. It is striking that several regions experience a welfare loss as a results of cutting domestic support or export subsidies. This might stem from the Armington hypothesis, and from the increase in the price of European (and to a lesser extent US) product prices on world markets. It is questionable here whether the geographical differentiation of products is not overdone.

Table 11: Impacts on welfare, per country (% change)

	Initial GDP	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
EU 25	766	-0.02	0.07	0.08	0.14
USA	794	0.09	-0.01	-0.01	0.08
Asia Dd	505	-0.08	-0.01	0.26	0.17
EFTA	39	-0.06	0.00	0.50	0.49
Cairns Dd	102	0.00	0.00	0.03	0.02
Mediter'n	45	-0.21	-0.45	0.18	-0.55
FSU	55	0.00	-0.20	-0.01	-0.22
SS Africa	20	0.19	-0.53	-0.06	-0.48
Cairns Dg	191	0.05	-0.02	0.02	0.05
China	85	-0.20	0.00	0.00	-0.20
RoW	191	-0.17	-0.18	0.10	-0.30

Source: Authors' simulations.

Among the countries enjoying significant gains, a first category gather countries reducing their domestic distortions. This is clearly the case of the US in the domestic support scenario, of the EU for export subsidies, and of developed Asia and EFTA for tariff cuts.

A second category of winners are those countries for which liberalization entails significant offensive gains. Such gains appear rather limited here, however, although terms of trade variations are not negligible, with gains in particular for the Cairns group's developing countries (from domestic support and tariff cuts) and for sub-Saharan Africa (for domestic support) (table 12).

Table 12: Impacts on terms of trade, by region (% change)

	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
EU 25	-0.08	0.23	-0.04	0.12
USA	0.13	-0.02	0.02	0.14
Asia Dd	-0.15	-0.05	-0.15	-0.36
EFTA	-0.04	0.02	-0.16	-0.21
Cairns Dd	0.04	0.00	0.00	0.04
Mediter'n	0.01	-0.22	0.15	-0.08
FSU	0.00	-0.53	0.02	-0.52
SS Africa	0.28	-0.35	-0.02	-0.12
Cairns Dg	0.13	-0.02	0.19	0.30
China	0.06	0.00	0.15	0.22
RoW	0.05	-0.13	0.11	0.00

Source: Authors' simulations.

A liberalisation of agricultural trade is likely to have a differentiated impact on production factors, and the case of agricultural workers[6] and of land is especially interesting, since both are specific to agriculture. As a matter of fact, the impacts shown in table 13 for the real return to land are high in two instances: for the EU when domestic support is cut, and for Japan as a result of border protection liberalisation.

Table 13: Impacts on the real return to agriculture's specific production factors, by region (% change)

	Dom. Support	Exp. Subsidies	Tariffs	Harbinson, whole
EU 25	-4.76	-0.02	-0.30	-5.05
USA	-1.69	-0.01	-0.06	-1.78
Asia Dd	0.97	0.07	-4.11	-3.23
EFTA	1.19	0.72	-1.48	0.74
Cairns Dd	0.96	0.01	0.15	1.11
Mediter'n	0.44	-0.21	0.02	0.22
FSU	0.52	0.10	-0.09	0.55
SS Africa	0.09	-0.20	-0.09	-0.20
Cairns Dg	0.46	-0.08	0.05	0.43
China	0.47	-0.04	0.05	0.48
RoW	0.41	-0.09	0.01	0.32

Source: Authors' simulations.

4 Conclusion

This work intends to shed some lights on the main stakes of the negotiation on agricultural trade liberalization in the Doha Development Agenda (hereafter DDA). It focuses on the so-called three pillars of the negotiation (border protection, domestic support, export subsidies), and is restrained to the proposal made by Chairman Harbinson. The assessment is made using an adapted version of the MIRAGE Computable General Equilibrium (CGE) model. Compared to similar exercises, this work has a few distinctive features worth mentioning:

- the MIRAGE model includes imperfect competition and increasing returns to scale in industry and services. It assumes land and labour mobility to be imperfect across sectors;

- protection data, from the MAcMaps database, describes bound and applied tariffs at the HS-6 digits level (5,000 products). As opposed to what has been done so far in such

[6] By agricultural workers, we refer here to unskilled workers working in the agricultural sector. This excludes skilled workers, since this type of work is assumed to be perfectly mobile across sector. The imperfect mobility (and therefore the sector specificity) thus only concerns unskilled workers, but they account for 89% of labour value added in the agricultural sector worldwide, and 83% in the EU (source: GTAP database, version 5.3).

exercises, it takes preferential agreements exhaustively into account and liberalization formulae modify bound duties and not MFN or applied duties;

- the proposed modalities for liberalisation of border protection (i.e. the various proposals for tariff reductions) are applied at the HS-6 digits level (5,000 products), making it possible to cope with the tariff-harmonising effect inherent to the non-linear formulas proposed;

- agricultural policies are modelled in a sophisticated way, reflecting the different impact of the various policy instruments. An original dataset has been gathered to update the measurement of domestic support. This effort has been focused on the EU and the US, which carried out the most noticeable reforms in this domain since 1997. As a result, our dataset takes into account the new Farm Bill in the US, the Agenda 2000 reform and the enlargement to 25 countries for the EU. There is a distinction between the various form of support regarding their actual impact on outputs and inputs. In addition, the difference between the actual support level and the level notified to the WTO (e.g. the US support under "*de minimis*" not notified to the WTO) is taken into account when modelling the proposals. The existing gap between the level of the Aggregate Measure of Support and the WTO commitments is also taken into account.

Harbinson's proposal includes tariff cuts that are high in average, and harmonising. It explicitly incorporates a special and differential treatment (SDT) for developing countries.
Its impact on world agricultural prices (+2.9%) is not very high, and it leads to an agricultural trade creation (+6.8%) which is not large either. The weakness of these results, as compared to other studies, may be explained by taking into account the interaction between bound and applied duties.
The erosion of preferences appears as an important problem. Sub-Saharan Africa suffers from market share losses, leading to a decrease in agricultural output and a real GDP loss. As expected, the Cairns Group appears as the big winner of multilateral liberalization scenario in agriculture. A progressive reduction in worldwide agricultural tariffs mainly benefits to those countries which consequently increase their world market share.

5 References

Adams G., Westhoff P., Willott B., and Young R.E. II, (2001). "Do 'Decoupled' Payments Affect U.S. Crop Area?" Preliminary Evidence from 1997-2000, *American Journal of Agricultural Economics* 83 (2001): 1190-1195.

Bach C.F. and Frandsen S.E. (1998). "European Integration and the Common Agricultural Policy". SJFI-Working Paper No. 1, Copenhagen.

Bchir M.H., Decreux, Y., Guérin J.L. and Jean S., (2002). "MIRAGE, A CGE Model for Trade Policy Analysis", *CEPII Working paper* 2002-17*,* Centre d'Etudes Prospectives et d'Informations Internationales, Paris

Bchir M.H., Decreux, Y., Guérin J.L. and Jean S., (2002)., "MIRAGE, un modèle d'équilibre général calculable pour l'évaluation des politiques commerciales", *Economie internationale*, n° 89-90, 2002, p. 109-153.

Bchir M.H., Fontagné L, Zangheri M, (2003). CEPII working paper on EU enlargement, forthcoming. Centre d'Etudes Prospectives et d'Informations Internationales, Paris

Beghin J.C., Roland-Holst D. and van der Mensbrugghe D. (2002). "Global agricultural trade and the Doha Round: what are the implications for North and South?", Working Paper 02-WP 308, CARD, Iowa State University.

Bouët A., Fontagné L., Mimouni M. and Pichot X. (2001). "MAcMaps : a bilateral and disaggregated measure of market access", *CEPII Working Paper* 2001-18. Centre d'Etudes Prospectives et d'Informations Internationales, Paris

Bouët A., Fontagné L., Mimouni M. and Pichot X. (2002). "MAcMaps : une mesure bilatérale et désagrégée de l'accès au marché", *Economie internationale*, (89-90): 39-64

Bouët A., Fontagné L., Mimouni M. and von Kirchbach F. (2002), "Market Access Map for GTAP: A Bilateral Measure of Merchandise Trade Protection", GTAP Resource#1045, Center for Global Trade Analysis.

Bouët A., Bureau J.-C., Decreux Y. and Jean S. (2003), "Is agricultural liberalization beneficial to developing countries?", paper presented at the 5th *Global Economic Analysis* Conference, La Haye.

Brockmeier M., Herok C.A., Salamon P.B. (2001), "Technical and Institutional Changes in an Enlarged EU: Welfare Effects for Old and New Members, with a Focus on the Agri-food Chain", Paper prepared for the Forth Annual Conference on Global Economic Analysis Purdue University.

Bureau J.C. and Salvatici L. (2002). "WTO Negotiations on Market Access in Agriculture: a Comparison of Alternative Tariff Cut Proposals for the EU and the US". Paper presented at the annual IATRC meeting, Monterey, December.Burfisher M. Robinson S. and Therfielder K. (2002), "The global impact of farm policy reform in OECD countries", mimeo.

Burniaux J.-M. and van der Mensbrugghe D. (1990), "The RUNS Model: A rural-urban North-South general equilibrium model for agricultural policy analysis", OECD Development Center Technical Paper 33, OECD.

Chavas J.-P. and Holt M.T. (1990), "An Analysis of Acreage Decisions Under Risk: The Case of Corn and Soybeans," American Journal of Agricultural Economics, 72:529-538.

Diao X., Somwaru A. and Roe T. (2001). "A Global Analysis of Agricultural Trade Reform in WTO Member Countries", Economic Development Center Paper, University of Minnesota.

Dimaranan B., Hertel T. and Keeney R. (2003). "OECD Domestic Support and the Developing Countries", GTAP Working Paper 19.

Dimaranan, B.V. and McDougall, R.A. (2002). *Global Trade Assistance and Production: The GTAP 5 Data Base*. Center for Global Trade Analysis Purdue University.

Elbehri A. and Leetmaa S. (2002). "How significant are export subsidies to agricultural trade? Trade and welfare implications of global reforms", 5th Annual Conference on Global Economic Analysis, June 5-7, Taipei.

Erkel-Rousse H. and Mirza D. "Import Price Elasticities: Reconsidering the Evidence" *Canadian Journal of Economics*, Vol. 35, pp. 282-306, 2002.

FAPRI (2003). "U.S. and World Agricultural Outlook ". Food and Agriculture Policy Research Institute, Iowa State University, Ames, and University of Missouri-Columbia.

Francois J., van Meijl J. and van Tongeren F. (2003). "A Forward Looking Analysis of the Doha Round". Agriculture, Manufacturing and Services" Paper presented at the International Agricultural Consortium and University of Calabria, University of California joint meeting, Capri, June 23-27

Frandsen S. E. and Jensen H. G. (2000), "Economic impact of the enlargement of the European Union – Analysis of the importance of direct payments", SJFI Working Paper No. 15/2000.

Gardner B. (2002). "North American Agricultural Policies and Effects on Western Hemisphere Markets". Paper presented at the International Seminar "Agricultural Liberalisation and Integration: What to expect from the FTAA and the WTO?" hosted by the Special Initiative on Integration and Trade, Integration and Regional Programs Department, Inter-American Development Bank, Washington DC, 1-2 October 2002.

Gohin A., Guyomard H. and Le Mouël C. (2000): "AGE Assessment of CAP Reform: Implications of Policy modeling Choices". Paper presented at the Third Annual Conference on Global Trade Analysis, Melbourne.

Harris J. and Todaro M.P. (1970). "Migration, Unemployment and Development: a Two-sector Analysis. *American Economic Review, 60,* 126-42.

Hertel T., Anderson K., Francois J. and Martin W. (2000). "Agriculture and non-agricultural liberalisation in the Millenium round", CIES Policy Discussion Paper 0016, University of Adelaide, Australia.

Hoekman, B., Ng, F. and Olarreaga, M. (2002a). "Reducing agricultue tariffs versus domestic dupport: what's more important for developing countries?", CEPR Discussion Paper 3576.

Hoekman, B., Ng, F. and Olarreaga, M. (2002b). "Eliminating excessive tariffs on exports of least developed countries", mimeo, World Bank.

Jensen H. G., Frandsen S. E. and Bach C. F. (1998), "Agricultural and economy-wide effects of European enlargement: Modeling the Common Agricultural Policy", SJFI Working Paper No. 11/1998. Published in Journal of Agricultural Economics, Vol. 24, No. 3/4.

Lewis W A (1954). Economic development with unlimited supplies of labour. *Manchester School*, *22*, 139-191.

Josling T. (2003). "Domestic Farm Policies and the WTO negotiations on Domestic Support". Paper presented at the International Agricultural Consortium and University of Calabria, University of California joint meeting, Capri, June 23-27.

Pohl Nielsen C. (1999), "EU enlargment and the Common Agricultural Policy: Modeling issues", SJFI Working Paper No. 7.

Rae A. and Strutt A. (2002). "The current round of agricultural trade negociations: Should we bother about domestic support?", mimeo.

Romalis J. (2002), "NAFTA's and CUSTA's impact on North American trade", mimeo, U. of Chicago.

Sumner D. A. (2003). Implications of the U.S. Farm Bill of 2002 for Agricultural Trade and Trade Negotiations. (Draft version). University of California Agricultural Issues Center.

van Meijl, J. and van Tongeren, F. (2001). "Multilateral trade liberalisation and developing countries: A North-South perspective on agriculture and processing sectors. Rapport de l'Agricultural Economics Research Institute, The Hague.

Walkenhorst P. and Dihel N. (2003). Tariff Bindings, Unused Protection and Agricultural Trade Liberalisation. Forthcoming in *OECD Economic Studies.*

Westcott P.C, Young E.C., Price J.M. (2002). The 2002 Farm Act Provisions and Implications for Commodity Markets, US Department of Agriculture, Economic Research Service, Information Bulletin Number 778, November, Washington D.C.

WTO (2003). Negotiations on Agriculture. First Draft of Modalities for the further committments. TN/AG/W/1/Rev.1, Geneva.