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THE IMPACTS OF THE DOHA ROUND. WHAT´S IN IT FOR SPAIN?

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Documento de Trabajo 05/08

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1. Introduction

Prior to the Uruguay Round (UR), agricultural trade had been largely exempt from the trade laws applicable to other sectors. For example, export subsidies employed prolifically by the European Union (EU) faced no disciplines, whilst the ubiquity of non-tariff barriers had, hitherto, been untouched. Furthermore, whilst manufacturing tariffs declined from highs of 30% to 5% in the three decades leading up to 1985, agricultural support prices, whilst declining in real terms, appreciated relative to world prices leading to raised levels of protection.

With the power of hindsight, the UR came up short in its attempts to radically liberalise agricultural trade, however, the agreement can be earmarked as a success in that it set up a firm platform for future trade rounds. For example, as a forum of debate, the three pillar framework (i.e., market access, export subsidies, domestic support) greatly improved the degree of transparency through both 'tariffication' and the introduction of the Amber, Blue and Green box measures. Moreover, the dispute settlement procedure has been used effectively to bring many countries' policies into compliance with new disciplines. Notwithstanding, in the wake of the UR a number of unresolved issues persisted.

Firstly, average tariff rates in agricultural trade remained some way above non-agricultural tariffs. This is because 'tariffication' permitted WTO members significant latitude in establishing tariff-equivalents,[2] whilst allowing average tariff reductions to apply across all agricultural products. Secondly, the administration of Tariff Rate Quotas (TRQs) gave countries considerable flexibility in allocating their market access quantities at the in-quota tariff. Accordingly, TRQs lock in preferential access to traditional trading partners thereby limiting access by other WTO member countries. Expanding TRQ levels or reducing high over-quota tariffs would further open markets and new rules could reduce or eliminate unfair practices associated with administering TRQs.

Thirdly, though outlawed in principle, non-tariff barriers remain through the TRQ schemes and through, *inter* alia, technical barriers (e.g., labelling, size, quality),

[1] The author would like to thank the Department of Environment, Food and Rural Affairs (DEFRA), Government of the UK, for sponsoring this research.

[2] Subsequently known as 'dirty tariffication'.

health and safety requirements, sanitary and phytosanitary standards and red tape. Fourthly, the rules regarding the use of export credit system favoured by the USA and other forms of marketing assistance for exports remained unresolved. Finally, commitments on domestic support only applied to aggregate support categories rather than individual commodities, thus allowing high support to continue for more sensitive products. In addition, member countries have strategically employed exemptions on the 'blue box' (Peace Clause) and 'green box' due to the lack of clarity on what exactly constitutes minimally trade distorting trade programmes.

2. The Harbinson Proposals and the August 2004 Framework

Following the submission of proposals by WTO member countries in February 2003, the Chairman of the Agriculture Negotiating Committee (Stuart Harbinson) produced his *Negotiations on Agriculture: First Draft of Modalities for the Further Commitments* (WTO, 2003), subsequently revised in March 2003 (WTO, 2003), which aimed to bridge the gaps in the negotiation positions of various countries. The 'Harbinson Proposal' was not the result of negotiations and as such countries were under no obligation to accept it. Indeed, Japan and several other countries rejected this document as a basis for negotiations. However, the document carried considerable weight owing to the lack of alternatives; and reflected a mix of negotiating countries' various positions.

In *market access*, it was proposed that tariffs, except in-quota tariffs, shall be reduced by a simple average for all agricultural products subject to a minimum reduction per tariff line. The base for the reductions shall be the final 'bound' rather than 'applied' tariffs. The tariff reductions shall be implemented in equal annual instalments over a period of five years for developed countries, applying the formula in Table 1.

As can be seen in the table, the lower the initial tariff, the lower the tariff cut. This was seen as advantageous over the UR market access agreement in that it reduces tariff peaks, whilst 'trade-offs' between cutting higher and lower tariffs to meet the average tariff cut can only be made in the respective groups of tariffs. It should be noted that the EU proposed the same UR formula for the current Round; that is, it did not accept this proposal from Harbinson. The Harbinson Paper also proposes increased market access through increases in tariff rate quotas to 10 % of present domestic consumption.

Existing tariff level	simple average reduction rate (%)	minimum cut per tariff line (%)
Tariffs greater than 90 per cent *ad valorem*	60	45
Tariffs lower than or equal to 90 per cent *ad valorem* and greater than 15 per cent *ad valorem*	50	35
Tariffs lower than or equal to 15 per cent *ad valorem*	40	25

Table 1 – Illustration of the Harbinson Formula for tariff reductions
Adapted from: WTO (2003)

Export subsidy reduction commitments will use the final bound levels from 2000 as their starting point. Harbinson proposed that export subsidies will be eliminated entirely over a nine year time frame with a heavy 'front-loading' emphasis on the first five years. Finally, under *domestic support*, the proposals suggested a 60 per cent reduction in Amber Box commitments, whilst minimum spending (*de minimis*) is to be reduced from 5 per cent of the value of agricultural production to 2.5 per cent over 5 years. Blue box spending is to be bound at 1999-2001 (average) levels and reduced by 50 per cent over 5 years, or included in the amber box and effectively cut by 60 per cent. Green box exemptions shall be maintained with a general tightening of certain criteria for program inclusion. However, one green box category, 'environmental programs', is expanded to permit payments for animal welfare programs (as a legitimate non-trade concern).

Given the large discrepancies between the negotiating positions of the member countries to the Harbinson proposals, the decisions reached in the *August 2004 Framework* (WTO, 2004) could be criticised for being somewhat nebulous. Proponents of the August 2004 Framework, however, point out that it provides firm commitments across all three agricultural pillars and that, while it does not prescribe the exact nature of the cuts, it provides a platform for the next stage of negotiations (due to take place in Hong Kong in December 2005). Indeed, further issues arose from the August Framework pertaining to market access for 'sensitive products' and the extension of export subsidisation to include export credit programmes, state trading enterprises and food aid that does not conform with various disciplines, although special considerations would be given to poorer trading nations.

In terms of domestic support, the consensus was to allow gentler cuts over longer periods for the developing countries, whilst a 'tiered formula' is under consideration such that higher levels of support (those in higher 'tiers') will have

steeper cuts. Moreover, the *de minimis* level of support is to be discussed whilst product-specific Amber support will be capped in order to avoid shifting support between different products. Since the tiered formula applies to the total of support on all products, the text also says that the result will be cuts in support specified for some products. Blue Box support, previously protected by the 'Peace Clause' is facing a cap of no more than 5% of agricultural production, although flexibility will be allowed for countries (i.e., EU) whose Blue Box supports are an exceptionally large proportion of their trade distorting subsidies. Moreover, the definition of the Blue Box will be re-examined to ensure that this class of payments (linked to fixed production limits – acreages, yields, livestock head or historical production limits) are genuinely less trade-distorting than Amber Box measures.

3. Review of Empirical Studies of the Doha Round

The recent trade policy literature examining the impacts of the Doha Round has been dominated by the usage of computable general equilibrium (CGE) analysis. Indeed, the Global Trade Analysis Project (GTAP) database has become something of a standard workhorse in multilateral trade reform analysis. In Table 2, a number of CGE studies have been employed to analyse the costs of the Doha Proposals. An important point to note is that even given the usage of a single data source, the outcomes for global real income changes (i.e., equivalent variation) differ quite substantially between studies.

One explanation for these differences is the variation in model assumptions employed which have the effect of boosting the welfare estimates. For example in dynamic model variants, capital accumulation over successive time periods can greatly increase household incomes compared with the comparative static model counterparts.[3] The assumption of imperfect competition also raises the welfare estimates through introduction of additional non-standard market distortions (i.e., price mark-ups, increasing returns to scale) which via liberalisation release additional welfare gains in comparison with the standard model estimates. Additionally, further welfare magnification effects in developing countries occur through the imposition of trade-productivity linkages as productivity improvements in developing countries are greatly enhanced through assumptions of technology transfer. The results of these studies,

[3] In CGE models, it is normally assumed that the household(s) own the factors of production.

whilst more striking are based on tentative estimates which introduces some degree of uncertainty as to their validity.[4]

Study	Model	Liberalisation Scenario	Notes	Welfare (US$bill)		
				Ag	Other	Total
ABARE 2000	GTEM Dynamic GTAP Data	50% liberalisation, all sectors, all policies, all regions	Base scenario	53	41	94
			base + productivity gains			123
Anderson et al. (2000)	GTAP	100% Liberalisation, all sectors, all tariffs all regions		165	90	254
Beghin et al. (2001)	LINKAGE Dynamic GTAP data	100% Liberalisation, agriculture only, all policies high income countries only	Dynamic model	82		
USDA (2001)	CGE Dynamic	100% Liberalisation, agriculture only, all policies	Standard version	31	na	na
OECD (2003)	GTAP	100% Liberalisation, all sectors, all tariffs		34	63	97
Francois et al. (2003)	GTAP	100% Liberalisation, all sectors, all tariffs all regions	Increasing returns to scale	109	257	366
		50% Liberalisation, all sectors, all tariffs all regions	Standard version	28	104	132
Brockmeier et al. (2003)	GTAP	Harbinson Proposals (includes CAP modelling)	Standard version	na	na	na
World Bank 2004	LINKAGE Dynamic GTAP v6 data	100% Liberalisation, all sectors, all policies all regions	Standard version	193	98	291
Beghin & Van Mensbrugge (2004)	LINKAGE Dynamic GTAP v6 data	100% Liberalisation, all sectors, all tariffs all regions	Dynamic model	120	264	384
Francois et al (2005)	GTAP v6	50% Liberalisation, all sectors, all tariffs all regions	Increasing returns to scale	30	138	168 (b)
World Bank 2005	LINKAGE Dynamic GTAP v6 data	100% Liberalisation, all sectors, all policies all regions	Dynamic model			263 (b)

Table 2 – Previous trade liberalisation estimates

Source: Van Tongeren (2005), Osbourne (2005) and Renwick *et al.* (2005)

Notes a) includes services, b) in US$ 2001

Other sources of variation stem from the benchmark year of the GTAP data. Version 5 employed in a number of studies is benchmarked to 1997, which implies greater tariff peaks than included in version 6 (2001 benchmark year) of the GTAP data. Thus under tariff reform scenarios, this may imply greater welfare impacts in the former data version.[5] Moreover, version 6 is based on applied tariff rates only, whilst version 5

[4] For example, in imperfectly competitive industries, we are unsure of the concentration ratios and ensuing price markup effects in sectors for each region. In the dynamic model, the degree of capital accumulation is calibrated to baseline shocks, although the extent of dynamic accumulation itself is entirely determined by the parameters of the model. Finally, trade productivity growth is determined by an arbitrary technology transfer function which is not based on empirical robustness.

[5] Although this depends on how the remaining developed country Uruguay Round commitments to 2001 are dealt with in version 5.

used both applied and bound rates (where applied rates were unavailable). This has implications for the treatment of the binding overhang (difference between bound and applied rates), such that when the scenarios reduce applied levels of tariffs, they may overstate the true effect on market access. Finally, a further cause of variation occurs from the 'scenario design' where the *degree* of reform in tariffs, export subsidies and amber box and the choice of reforming regions in the aggregation varies between studies.

All of the studies reviewed present results for broad regional aggregates (i.e., EU), focusing more on the impacts of specific policy instruments (i.e, market access, export subsidies, Amber Box support) whilst in this study an explicit aim is to examine the potential welfare impacts of the Doha Round proposals in their current form on Spain from a 'likely scenario' and contrast these where appropriate with other select EU members and the European Union average. Accordingly, as well as incorporating a fully inclusive baseline scenario including long run 'background' trade policy shocks, we also explicitly model CAP support mechanisms (i.e., quotas, set-aside, EU budget contributions, single farm payment) to give greater depth to the asymmetric effects the Doha Round may have on different EU member states.[6]

4. Modelling and Scenarios

4.1 GTAP Data and Aggregation

This study employs the Global Trade Analysis Project (GTAP) CGE model Hertel (1997) and accompanying version 6 database (Dimaranan and McDougall, 2005).[7] Version 6 data represents a significant advance on version 5 in terms of (*inter alia*) broader regional coverage (87 regions), improved trade and demand elasticity estimates and perhaps most importantly, significant refinements to the tariff protection data.[8] To examine the long run impacts of the current Doha Round proposals from the perspective of Spain, the Spanish economy and the 'big three' (Germany, the UK and France) are disaggregated from the rest of the EU15 region (REU15). The aggregation also covers the 'new' members of the EU (EU10) and a number of key players on world

[6] To the author's knowledge, only the Brockmeier *et al.* (2003) study explicitly incorporates modelling of the CAP in the policy scenarios.

[7] The standard GTAP model and accompanying database have been used in numerous studies. For this reason, we do not provide a detailed explanation of the model framework. For further information consult Hertel (1997).

[8] The improvements in the collection, reconciliation and application of the tariff data sources are documented in chapter 16.D of Dimaranan and McDougall (2005).

agricultural markets (USA, Brazil, China, India, Japan). The Rest of the World (ROW) region captures 'residual' production and trade flows in our chosen model aggregation.

I. Chosen Sectoral Aggregation (22 GTAP Sectors in **bold**)

Wheat (wheat) – Soft Wheat, Durum Wheat; **Other Grains** (ograins) – Rye, sorghum, barley, oats, maize, millet, other cereals; **Oilseeds** (oilseeds) - Rape and mustard seed, sunflower seed, soyabeans, olives for oil, cotton seed, sesame seed; **Other Crops** (ocrops) - Plant-based fibers, flax and hemp, coffee, cocoa beans, tea, coconuts, spices, tobacco, table grapes, table olives, table wine, other wine nursery plants, flowers, ornamental plants, other final crop products; **Vegetables, Fruit and Nuts** (vegfruitnuts)– Potato, peas, cauliflower, tomato, pulses, other vegetables, nuts, olives, onions, apple, pears and peaches, bananas, other fruits, citrus fruits; **Sugar** (sugar) – Sugar cane, sugar beet; **Milk** (milk) – Dairy cows and other cows; **Cattle and Sheep** (catshp) – Male adult cattle for fattening, calves for fattening, calves, rearing, heifers, sheep and goats for fattening; **Pigs and Poultry** (pigspoultry) – Pigs for fattening, pig breeding, laying hens, poultry for fattening, other animals; **Fishing** (fishing) – All fishing activities; **Other Agriculture** (oagric) – Paddy rice, wool, silk-worm cocoons; **Forestry** (forestry) – Forestry; **Meat processing** (meatpro) – Meat products (bovine, sheep and goat); **Other meat processing** (omeatpro) – Eggs and egg products, meat products (pigs, poultry); **Vegetable oils and fats** (vegoilsfats) – Coconut oil, cottonseed oil, groundnut oils, oilseed oils, olive oil, palmkernel oils, rice bran oils, rape and mustard oils, soyabean oil, sunflower seed oils, animal fats; **Dairy** (dairy) – Butter, cheese, cream, whey and products, skimmed milk; **Sugar processing** (sugarpro) – Refined sugar, sweeteners; **Beverages and Tobacco** (bevstobac) – Cigarettes, Cigars etc., Wines and Spirits, Beer; **Other Food Processing** (ofoodpro) – Processed rice, sea food products, hides and skins, meat and blood meal, edible offals; **Raw materials** (rawmat) – Coal, oil, gas, minerals, Petroleum and coal products; **Manufacturing** (mnfcs) – Textiles; wearing apparel; leather products; wood products; paper products and publishing; chemical, rubber and plastic products; ferrous metals; Other metal products; motor vehicles and parts; transport equipment; electronic equipment; machinery and parts.

Services (svces) – Utilities (Gas, water, electricity); construction; trade services; transport (air, sea, road); communications; financial services; insurance; other business services; recreation and other services; dwellings; public administration/defence/health, education.

II. Chosen Regional Aggregation (12 Regions)

Spain; UK, France, Germany, REU15; EU10; USA; Brazil; China; India; Japan; Rest of the World (ROW).

Figure 1: Aggregation of Regions and Sectors.

As noted at the beginning of this paper, tariff peaks in agri-food trade are considerably greater than in non-food sectors, whilst a key focus of the round has been the improvement of market access in agricultural markets to facilitate trade led growth

in developing countries. For these underlying reasons, the choice of sectoral aggregation (see Figure 1) is biased toward the agricultural and food processing sectors, whilst non-food sectors are captured through composite sector aggregates.

4.1.1 Spanish Agriculture and GTAP data

Whilst the CAP has been reformed, it still favours larger farming units since payments are indirectly awarded on the basis of production levels (i.e., the amount of inputs used). This has resulted in considerable restructuring of farming in many EU partners including Spain, with many smaller farmers being left marginalised or forced to leave the land and the emergence of a rationalisation of the agricultural sector into fewer large-scale farming units.[9] Indeed, on the one hand the real value of agricultural output in Spain between 1990 and 2003 has been steadily increasing (MAPA, 2004), particularly in cereals, fruit, olive oil, cattle and pork production. This is largely in response to the European reforms introduced during the 1990s. On the other hand, the industry has seen a continuing exodus of farmers where MAPA (2002a) figures suggest that the reduction in agricultural labour between 1990 and 2001 could be a large as 36 per cent.

Notwithstanding, compared with fellow EU members, the commission's figures for 2002 (EC, 2002) suggest that primary agriculture in Spain is still relatively important accounting for 3% of national GDP compared with a corresponding EU15 average of 2%, whilst approximately 14% of EU15 agricultural production comes from Spain. Equally, processed food production is also important to the Spanish economy accounting for 16% of total industry revenue, and 10% of EU15 output, whilst between 1995 and 2000 food processing growth was 20% with accompanying employment growth of 6% (MAPA, 2002a). These figures concur with the descriptive statistics from the GTAP data in Table 3 which compares the Spanish economy with the big three and the EU averages.

[9] However, Spanish farming still remains largely fragmented relative to the EU*15* average.

(%)	France	Germany	Spain	UK	EU15	EU10
1. Share of EU15 GDP	16.7	23.4	7.4	18.0	100.0	n.a.
2. Share of EU25 GDP	15.9	22.4	7.0	17.2	95.6	4.4
3. Agric. share of national GDP	2.2	1.3	3.4	0.9	1.9	3.7
4. Food share of national GDP	5.0	4.5	6.2	5.3	5.1	9.3
5. Agro-food share of nat. GDP (3+4)	7.2	5.8	9.6	6.2	7.0	13.0
6. Agric. share of EU15 production	18.3	16.8	12.3	8.3	100.0	n.a.
7. Agric. share of EU25 production	16.5	15.2	11.1	7.5	90.2	9.8
8. Food share of EU15 production	15.6	21.3	8.5	18.8	100.0	n.a.
9. Food share of EU25 production	14.1	19.3	7.7	17.1	90.8	9.2
10. Agri-food share of EU15 production	16.3	20.1	9.5	16.0	100.0	n.a.
11. Agri-food share of EU25 production	14.8	18.2	8.6	14.5	90.6	9.4

Table 3: Comparative descriptive statistics for agriculture and food – GTAP v6 database
Source: Dimaranan and McDougall (2005)

Examining the GTAP 2001 domestic support data for Spain reveals much about the sectoral allocation of the CAP payments. Spain is the biggest recipient in the EU of production related (i.e., Amber Box) payments[10] (€1.365bn in 2001) largely through payments on production of olive oil (€0.999bn.), bananas (€0.167bn.) and tobacco (€0.116bn) in the 'oilseeds', 'ocrops' and 'vegfruitnuts' aggregate sectors respectively. Spain is also the fourth largest recipient of decoupled payments (area and set-aside payments) to the cereals sector (after France, Germany and Italy) and the third largest recipient of CAP funding in the cattle and sheep sector (cow, ewe and goat premia, extensification premia) after France and the UK. Of the €45bn. spent on agricultural support, Spain received €5.872bn., third after France (€9.978bn.) and Germany (€6.908bn.). Indeed, given the relative size of the Spanish economy, this explains why Spain is consistently the largest net beneficiary from the CAP budget in nominal terms (whilst the largest gainers as a percentage of GDP are Portugal and Greece). Interestingly, the allocation of support in Spain reveals that (in order) the five regions of Andalucía, Castilla-León, Castilla-La Mancha, Extremadura and Aragón received approximately 70% of CAP support in 2000 (MAPA, 2002b).

[10] Represented in the GTAP database as output subsidies.

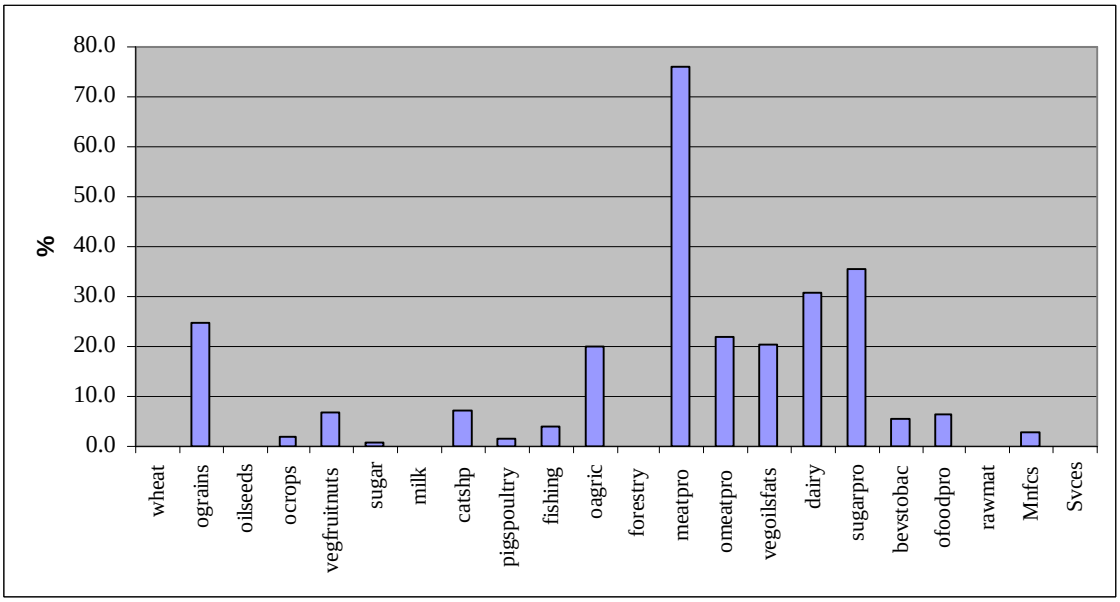

Figure 2: Average *ad valorem* tariff rates on Spanish imports by sector.
Source: Dimaranan and McDougall (2005)

In terms of trade protection, the largest export subsidies across the EU regions appear in the aggregate 'meatpro', 'sugarpro', 'ograins' and 'dairy' sectors.[11] Finally, aggregate *ad valorem* tariff protection in Spain is skewed heavily toward the agro-food sectors, whilst tariff peaks appear for 'meatpro' (76%), 'sugarpro' (35.8%), 'dairy' (30.9%), 'ograins' (24.7%), 'omeatpro' (22.1%), 'vegoilsfats' (20.6%) and 'oagric' (19.8%) (see Figure 2).

4.2 GTAP Model

In the standard comparative static GTAP framework, the model framework is based on market clearing equations (e.g., supply equals demands) for each sector and accounting conventions (e.g., income equals expenditure equals output, zero long run profits). Weak separability assumptions are employed to partition consumer and producer decisions into 'nests' (multi-stage budgeting) based on conventional neo-classical behaviour (utility maximisation, cost minimisation), whilst regional utility is aggregated over private demands (non-homothetic), public demands and savings (investment demand). Production is characterised employing a perfectly competitive, constant-returns-to-scale technology and bilateral imports are differentiated by region of origin using the Armington (1969) specification. The model incorporates five factors of production, where skilled/unskilled labour and capital are perfectly mobile, whilst land

[11] See figure 1 for a detailed composition of the aggregate sectors.

and natural resources are both sector specific with the former moving 'sluggishly' between productive sectors. Given the long run nature of the experiments (see next section), in all factors markets, full employment is assumed. Finally, investment behaviour is characterised by a fictitious 'global bank' which collects investment funds (savings) from each region and disburses them across regions according to a rate of return *or* a fixed investment share mechanism.

5. Model Extensions, Scenario Design and Results

In this study we develop a plausible long run baseline scenario projected from the benchmark year (2001) to 2020 against which we compare our Doha Round Scenarios. The composition of the baseline scenario is presented in Figure 3, whilst details of the modelling of the baseline are presented in Appendix 1. In comparison with the baseline we examine 3 alternative scenarios. In Scenario 2, we include the baseline shocks and in addition examine a 'likely' outcome based on the Harbinson proposal and the subsequent August 2004 framework.

Baseline Scenario Assumptions: 2001 - 2020

1. Projections
Productivity, population change, growth, skilled and unskilled labour.
2. Uruguay Round Commitments
Enforce developed country commitments
Complete developing country commitments
3. EU Enlargement
Remove all border protection (i.e., export subsidies, import tariffs) between existing and 'new' member states.
Impose common external tariff for all new EU members of the customs union.
4. Agenda 2000 (A2000) commitments and the Mid Term Review (MTR)
Modelling of CAP mechanisms (CAP budget, modulation, quotas, set-aside, intervention prices)
Reduction of intervention prices under A2000 and MTR reforms
Imposition of set-aside for the 'new' EU member states
Milk quota adjustments under the MTR. Sugar quota unchanged.
Full implementation of the single farm payment (i.e., total decoupling) under the MTR
Additional compensation for milk and proposed sugar reforms.
Full decoupling of direct support to tobacco and partial decoupling of direct support for olive oil.
CAP budget including the implementation of Modulation funding and the UK Rebate mechanism (which is abolished by 2020).
5. Chinese Accession
Unilateral tariff reductions by China
6. Everything But Arms (EBA) deal
Developing country trade weighted tariff rate eliminations by the EU25 on imports from the ROW.

Figure 3: Assumptions shaping the baseline scenario

Thus, 'average' *ad valorem* tariffs in scenario 2 are reduced in accordance with Table 4.[12] In the case of the tariff rate quota routes, we reduce the over-quota tariff rates by the same percentages, whilst increasing the quota to 10% of present consumption**.** Moreover, it is assumed that the non-agricultural sectors also have the same average tariff rates reductions as suggested by Harbinson for the agricultural sectors. Furthermore, we follow the current Doha proposals by abolishing all export subsidies, whilst reducing Amber Box (output subsidies) support by 60 (40) percent for developed (developing) countries. In the EU, since the SFP effectively transfers payments out of the Blue Box (as argued by the EU) no expenditure limits are implemented. Scenarios 1 and 3 are identical to scenario 2, except that we introduce a sensitivity analysis of the degree of market access (see Table 4).

Developed Countries	***Average* reduction rate**		
Existing tariff level	**Low (S1)**	**Harbinson's proposal (S2)**	**High (S3)**
Greater than 90 per cent	40%	60%	80%
Between 15 and 90 per cent	30%	50%	70%
Lower than or equal to 15 per cent	20%	40%	60%
Developing Countries			
Existing tariff level	**Low (S1)**	**Harbinson's proposal (S2)**	**High (S3)**
Greater than 120 per cent	20%	40%	60%
Between 60 and 120 per cent	15%	35%	55%
Between 20 and 60 per cent	10%	30%	50%
Lower than or equal to 20 per cent	5%	25%	45%

Table 4 – Illustration of the Harbinson Formula for tariff reductions
Adapted from: WTO (2003)

5.1 Results for Spain - Trade Balances, Output and Market Prices..

In Table 5, we presented the changes in Spanish market prices, trade balances and output from implementation of the Round *in comparison with the baseline scenario*.[13] The market price estimates are aggregated over domestic and import purchases. Since import tariff rate reductions reduce the 'insulation' between artificially high internal market prices and world prices, market prices fall in most sectors compared with the baseline. However, what is surprising is that the magnitude of the long run price falls appears to be fairly small. The main exceptions are 'dairy',

[12] Given broader sector aggregates in the GTAP, we do not attempt implement minimum tariff line reductions.
[13] The value estimates in the results are in 2001 prices and in millions of euro.

'sugarpro' and 'vegoilsfats' sectors[14] which have relatively significant trade activity (compared with domestic sales). In the upstream 'sugar' and 'milk' sectors, market price falls are a function of declining quota rent values (compared with the baseline) due to reduced demand from downstream 'dairy' and 'sugarpro' sectors. Successively higher foreign access to Spanish 'dairy' and 'sugarpro' markets leads to a greater drop off in intermediate demand for upstream sugar and raw milk leading greater falls in rents and market prices. In the 'oilseeds' and 'fishing' sectors, market prices are dominated by the 60% reduction in production related (Amber box) support, represented in GTAP as a production subsidy.[15]

Increased multilateral market access increases Spanish imports resulting in deteriorating sectoral trade balances (e.g., 'dairy', 'meatpro', 'oagric', 'ofoodpro', 'ograins', 'sugarpro', 'vegfruitsnuts', 'vegoilsfats') and declining domestic production. The trade balance (-€34.8m to -€127.2m) and output contractions are particularly worrying in the case of the 'vegfruitnuts'[16] sector which houses many of Spain's 'sensitive' Mediterranean crops. More encouragingly, 'wheat' and 'ocrops' sectors are comparatively competitive (low/zero benchmark tariff rates), resulting in trade balance (€4.6m to €11.5m; €30.7m to €51.1m) and output (-0.04% to 2.70%; 0.97% to 1.93%) improvements above the baseline.[17]

Furthermore, 'pigspoultry' and the 'omeatpro' sector (which encompasses pork and poultry meat production), undergo relative improvements in the trade balance and export led sectoral output. This result is largely attributed to Spain's relatively strong export trade links with the ROW region whilst both regions have similar tariff protection. 'Sugar' and 'milk' production levels are under quota, where the simulations suggest that the Spanish quota in both sectors remain binding.[18]

[14] Meatpro market price falls are relatively small despite having heavy import protection in Spain. This is because the level of import trade in the Spanish data is relatively small compared with domestic production.

[15] In the baseline, 60% of olive production subsidies are transferred to the single farm payment scheme under the CAP reforms for Mediterranean products, leaving 40% in the Amber Box. Under the Common Fisheries Policy, fishing activities receive considerable production related support. Currently Spain receives approximately 45% of the EU's Financial Instrument for Fisheries Guidance (FIFG) funds. Further discussion of this point appears in the conclusions.

[16] In value terms the 'vegfruitsnuts' sector is the largest primary agricultural sector in Spain followed by 'pigspoultry' and 'fishing'.

[17] In the case of the oilseeds sector, the 60% removal of Amber box support reduces output relative to the baseline.

[18] Examining the GTAP data, sugar cane/beet and processed sugar production are not amongst the more important agricultural activities in Spain. In the GTAP model, raw milk is a non-tradable product in GTAP, where trade occurs through the downstream 'dairy' sector.

Finally with increased market access, Spain's aggregate trade balance improves between €402.5m to €722.9m compared with the baseline through the reallocation of resources from agro-food to manufacturing and services activities. This is reflected in the increased levels of production activity in both composite manufacturing (0.33% to 0.42%) and services (0.010% to 0.014%) and their improved trade balances (€469.4m to €777.0m; €171.7m to €257.4m) compared to the baseline scenario.

	Trade Balance (€m 2001)			Market Prices (%)			Output (%)		
	S1	**S2**	**S3**	**S1**	**S2**	**S3**	**S1**	**S2**	**S3**
wheat	4.6	7.7	11.5	-	-	-	-	1.16	2.70
ograins	-	-	-1.5	-	-	-	-1.11	-	-
oilseeds	-73.6	-64.3	-54.7	1.95	1.84	1.74	-4.41	-4.69	-5.00
ocrops	30.7	40.6	51.7	-	-	-	+	1.40	1.93
vegfruitnuts	-34.8	-81.1	-127.2	-	-	-	-	-1.47	-2.22
sugar	+	+	+	-3.35	-4.69	-5.81	0.00*	0.00*	0.00*
milk	nt	nt	nt	-2.12	-2.16	-2.26	0.00*	0.00*	0.00*
catshp	1.0	+	1.0	-	-	-	-1.07	-1.10	-1.26
pigspoultry	+	2.5	4.4	-	-	-	-	+	+
fishing	-16.9	-16.7	-16.5	2.82	2.81	2.81	-1.68	-1.68	-1.69
oagric	22.0	19.3	12.0	+	+	-	3.65	2.82	1.30
forestry	-	-	-	+	+	+	+	+	+
meatpro	-20.8	-21.6	-22.3	-	-	-	-1.03	-1.05	-1.21
omeatpro	-21.6	6.5	37.8	-	-	-	-	+	+
vegoilsfats	-85.2	-131.4	-179.8	-2.07	-2.11	-2.15	-3.80	-5.37	-6.99
dairy	-8.7	-9.0	-9.5	-2.14	-2.96	-3.11	-	-	-
sugarpro	+	+	-	-4.34	-5.93	-7.39	-	-	-
bevstobac	5.2	7.0	9.0	-	-	-	+	+	+
ofoodpro	-54.0	-64.1	-74.7	-	-	-	-	-	-1.03
rawmat	12.5	29.8	48.0	+	+	+	+	1.22	1.85
Mnfcs	469.4	616.7	777.0	-	-	-	+	+	+
Svces	171.7	217.0	257.4	-	-	-	+	+	+
TOTAL	402.5	558.9	722.9						

Table 5: Spanish Trade Balances, Market Prices and Output

+/- indicates less than + or -1%; nt = non-tradable; * quota constrained output

5.2 Aggregate welfare results

Table 6 shows the aggregate equivalent variation (real income) impacts of S1-S3 in Spain relative to the three largest EU countries (i.e., France, Germany, UK), the EU15 and the EU25.[19] The values are presented in millions of euros in 2001 values. The decomposition of regional equivalent variation is divided into terms of trade effects, allocative efficiency effects, CAP budget effects and 'other'.[20]

[19] Whilst there are numerous other results for other countries in the aggregation, in this paper we choose to maintain a European focus to examine the asymmetric effects of the round on European partners.

[20] 'Other' consists of income changes from the exogenous baseline assumptions (i.e., endowment increases, technological improvements, population changes).

S1 (Low market access)	Spain	France	Germany	UK	EU15	EU25
Real Income (€m)	-156.6	410.0	1078.5	665.9	2486.3	2633.2
Real income (%)	-0.03	0.04	0.07	0.06	0.04	0.04
Of which:						
Terms of Trade (€m)	-19.8	276.9	586.8	274.2	1579.0	1675.5
Allocative efficieny (€m)	149.4	120.3	248.3	118.0	1258.6	1223.7
CAP budget (€m)	-263.0	50.7	298.8	283.8	-72.2	0.0
Other (€m)	-23.2	-37.9	-55.5	-10.1	-279.2	-266.0
S2 (Harbinson)	**Spain**	**France**	**Germany**	**UK**	**EU15**	**EU25**
Real Income (€m)	-32.2	407.9	1092.2	681.2	3009.4	3110.6
Real income (%)	-0.01	0.04	0.08	0.06	0.05	0.05
Of which:						
Terms of Trade (€m)	93.9	395.0	698.3	265.7	2310.6	2399.2
Allocative efficieny (€m)	135.0	13.2	170.2	128.6	1008.2	936.7
CAP budget (€m)	-267.3	48.3	302.0	291.0	-71.1	0.0
Other (€m)	6.1	-48.6	-78.2	-4.1	-238.4	-225.4
S3 (High market access)	**Spain**	**France**	**Germany**	**UK**	**EU15**	**EU25**
Real Income (€m)	102.3	374.4	1131.4	690.4	3437.5	3493.2
Real income (%)	0.02	0.04	0.08	0.06	0.05	0.05
Of which:						
Terms of Trade (€m)	215.5	512.5	810.7	256.9	3062.4	3147.3
Allocative efficieny (€m)	121.7	-121.6	113.9	136.9	652.2	532.8
CAP budget (€m)	-270.9	43.5	307.8	298.3	-77.4	0.0
Other (€m)	35.9	-59.9	-101.0	-1.7	-199.6	-186.8

Table 6: Aggregate EU welfare effects.

Perhaps the most important result is that from a European perspective, the current Doha proposals have a very minor impact on real income gains. Even under the high market access scenario, estimates suggest EU15 (EU25) average gains of around 0.04% of real income. Indeed, at the global level, the EV gains are estimated at €12.8bn (S1), €23.4bn (S2) and €32.5bn (S3) respectively. Compared with the range of estimates from section 3, this would appear at the lower end of the estimates in the literature. There are a number of reasons to explain this result. Firstly, we are using GTAP version 6 data benchmarked to 2001 (rather than 1997 in GTAP version 5) resulting in lower tariff and subsidy rates. Secondly, we have not incorporated additional modelling features such as imperfect competition which can magnify welfare estimates considerably through 'pro-competitive' effects (Hertel 1994) or 'love of variety' effects **(**Spence, 1976; Dixit and Stiglitz, 1977) on the consumer side. Due to the data difficulties of accurately calibrating concentration ratios and 'love of variety' scaling effects for a broad number of sectors and regions, the results themselves whilst larger are also more subjective. Thirdly, we have completely isolated the impacts of the Doha proposals, whilst all remaining long run trade policy changes (i.e. Chinese accession, Everything but Arms, CAP reforms) are all characterised in the baseline scenario. Finally, given the large country assumption of the EU on agricultural markets, the

explicit representation of EU agricultural market rigidities (quotas, set-aside, single farm payment) restricts the responsiveness of resource shifts from the agricultural sectors to non- agricultural uses from to policy change. Accordingly, the allocative effects reported in Table 6 are likely to be muted.

Examining the results from the Spanish perspective reveals that under S1 and S2, Spain loses real income (-€156.6m and -€32.2m respectively) compared with small estimated gains for France, Germany and the UK. Under 'high' market access (S3), terms of trade effects improve sufficiently to yield a gain of €102.3m to Spain, although this is tempered by continued net losses on the CAP budget, which are not apparent in France, Germany and the UK.

	S1	S2	S3
CAP Budget	-263.0	-267.3	-270.9
CAP expenditure	-475.2	-475.1	-475.2
Of which:			
Direct Payments	0.0	0.0	0.0
Export Subsidies	-94.2	-94.2	-94.2
Amber Support	-378.8	-378.6	-378.4
Intermediate input subsidies	-2.1	-2.3	-2.6
Tariff Revenues	-5.6	-10.3	-16.0
GDP contribution	-206.4	-197.3	-188.1

Table 7: Changes (€millions) in Spanish net CAP contributions compared with the baseline.

A breakdown of the CAP budget for Spain is shown in Table 7,[21] which reveals that Spain's CAP receipts fall by €475 million compared with the baseline. Further decomposition of this result reveals that Spain's principle losses partly come from the removal of export subsidies (-€94.2m) and most importantly Amber box support reductions (-€379m). Unlike France, Germany and the UK, Spain receives 45% of the production related support from the Common Fisheries Policy (CFP) and still has production aids on 'sensitive' products (i.e., olive production, bananas etc.). Furthermore, Spain contributes a smaller share to the own resources of the CAP budget rendering it a net beneficiary. Thus, contractions in the EU25 CAP budget from Amber box and export subsidy reductions benefit net contributors (i.e., Germany, the UK and to a lesser extent France) through compensating falls in GDP contributions, whilst Spain's GDP falls do not offset the losses in support.

[21] Note that decoupled payments do not change as the single farm payment under the mid term review of the CAP is already incorporated in the baseline already.

6. Conclusions

Whilst there is a growing literature examining the impacts of the current Doha Proposals for a number of broad regional aggregates, in this paper we attempt to examine the proposals more closely from the EU perspective, more specifically for the Spanish economy. The distinguishing features of this paper are (i) that we employ an all inclusive baseline scenario including the key long term global developments including the latest CAP reforms (mid term review, Mediterranean products reforms), thereby allowing us to isolate and evaluate the long term costs of the Doha proposals and (ii) we employing explicit CAP modelling (i.e., set-aside, CAP budget, sugar and milk quotas, single farm payment etc.), which provides greater credibility in assessing the long run asymmetric budgetary and welfare impacts from the proposals on EU member states.[22]

The sectoral results for Spain suggest that there is substitution in arable activities from 'vegetable, fruits and nuts', 'oilseeds' (including olive production) and 'other grains' into 'wheat', 'other crops' and 'oagric' production. Livestock production appears to focus slightly more on white meat production, with small concurrent declines in red meat output. In broader terms, there is an expected shift from agro-food activities into manufacturing and services production. The analysis suggests that the regional real income effects are likely to be small, where in the case of Spain the economy will make a slight loss from the Doha proposals in the 'low' (S1) and 'Harbinson' (S2) market access scenarios, whilst terms of trade improvements in the 'high' (S3) access scenario result in a welfare gain of €102.3m (0.02% GDP). In the case of France, Germany and the UK, welfare is set to rise marginally in each region, largely due to favourable changes in the CAP budget (which do not occur in Spain). As noted above, this is in part due to Spain's relatively smaller GDP contribution and considerably larger amber support payment, particularly in the fishing sector.

Presently, the WTO does not have specific provisions dealing with fisheries subsidies. Instead fishing subsidies are disciplined by the general subsidies rules found in the current WTO Subsidies and Countervailing Measures (SCM) agreement. Thus, at the time of writing, there are no special safeguards linking fisheries support with

[22] It should, however, be noted that since the model simulations take a long run view, they have nothing to say about the short to medium term frictional costs of resource reallocation, particularly labour (i.e., unemployment).

environmental considerations relating to depleted fish stocks and pollution.[23] Whilst there is much debate on how best to reform fishing subsidies in the context of international trade law, the outcome in the current round is far from certain. Accordingly, in this paper we maintained the *status quo* assumption of treating fishing activities equal to other sectors (i.e., Amber box reductions). The results from this paper appear to indicate that not only will the outcome of this debate have clear ramifications for Spain's fishing industry, but also for Spain's net contributions to Brussels and ultimately regional welfare.

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[23] This view is held by Iceland, Australia, Chile, Ecuador, New Zealand, Peru, The Philippines, USA. However, other nations, notably Japan and South Korea maintain that there is no causal link between subsidies and the depletion of fish stocks.

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8. Appendix.

1. Projections:

To model the structure of the world economy over the implementation period of the Doha Round and beyond, projections data are implemented for each of the regions. Annual average percentage changes over the long run period are collected from other CGE studies (Frandsen and Jensen, 2001; Jensen and Frandsen, 2003) other data sources (World Bank) and the author's own calculations to reflect increases in skilled and unskilled labour endowments; population; total factor productivity (TFP) in agriculture,

industry and services sectors; and real GDP growth. Capital endowment growth is calibrated to changes in the projections shocks.

2. Uruguay Round (UR) Commitments.

Given the benchmark year for the data is 2001, developed countries (DCs) have completed their UR commitments. Thus, in the baseline we merely enforce the ceiling limits on **output and export subsidy expenditure** for the developed countries. In the latter case, we have additional WTO subsidy expenditure notifications data to calculate actual subsidy limits in 2001 as a percentage of allowable UR subsidy expenditure limits.[24] The ceiling limits are imposed employing complementary slack conditions in GEMPACK (Bach and Pearson, 1996). For the developing countries, a linear time path is assumed where in 2001 it is assumed that $7/10^{ths}$ of the UR commitments (1994 – 2004) have been met. Thus, remaining UR commitments are based on the remaining $3/10^{ths}$ of the required total tariff reduction.

Bilateral tariff rate reductions are implemented as percentage reductions in the exogenous tariff variable in the GTAP model. As in the previous section, for the developed countries it is assumed that all the tariff rate commitments of the UR have been met in 2001. For the developing countries we again assume that a linear time proportion ($7/10^{ths}$) of the commitments have been met, with a remaining $3/10^{ths}$ proportion reduction imposed. In the case of the Rest of the World (ROW) composite region, a component part consists of developing country members. Thus, a GDP share weighted reduction in the ROW's tariffs is incorporated to account for the remaining developing country UR commitments. Tariff rate quotas are included in those sectors where

On a number of bilateral routes in the model, we have included **tariff rate quotas** (TRQs), that is we have simulated an import quota with in-quota and over-quota tariff rates. In the model, TRQ's are represented by a conditional complementary slack statement pioneered by Elbehri and Pearson (2005) which is a function of the 'fill rate' of the import quota (i.e., in-quota, on-quota, or over-quota) and the tariff rate (in-quota tariff, over-quota tariff, on quota tariff).

To identify TRQ bilateral routes, we employ the Agricultural Market Access Database (AMAD), which provides necessary estimates of in-quota tariff rates, over-quota to in-quota tariff ratios and quota fill rates. However, in some cases the broad sectoral aggregation excludes the possibility of including TRQ's on narrow product definitions which will only account for a minority proportion of trade along the route. A similar argument also applies to the composite ROW region which includes a considerable number of regions which do not employ TRQs and for simplicity is excluded from the TRQ treatment. Furthermore, given the completion of the EBA deal, EU TRQs on ACP countries are also excluded.

3. Enlargement Shocks – Border Protection

All tariff rates and export subsidy expenditures are eliminated on trade between the EU15 and the accession members and on intra EU10 trade. Further tariff shocks are introduced on accession member non-EU imports in 2001 to mimic the EU15 average common external tariff (CET) in 2020.

4. Agenda 2000 (A2000) commitments and the Mid Term Review (MTR)

To characterise **sugar and milk quotas** we employ complementary slack equations (Bach and Pearson, 1996) to allow binding/non-binding status of the quota. Changes in the milk quota allocations under the

[24] In this model, we ignore the agreed quantity constraints on exports under the UR round. Rather, we focus on export expenditure since between the two constraints, this is usually the more binding (Frandsen and Jensen, 2001).

MTR are imposed as shocks to the exogenous production limit variable, whilst production may be less than or equal to this level of production. For the 'new' accession members milk quota rights in 2001 (ASEU, 2001) are compared with granted quota rights on accession (Jensen and Frandsen, 2003) to calculate quota allocation reductions. Sugar quotas remain untouched. Equally, we follow Lips and Rieder (2002) by assuming that the quota rent accruing to EU15 members is already capitalised within the value of sugar/milk production in the GTAP model. Employing estimates of milk and sugar quota rents by EU15 region from Francois *et al.*, (2005) and Frandsen *et al.*, (2003) respectively, we strip out the quota rent from the payments to the factors of production in the 2001 benchmark database such that zero profit production decisions in the model are based on shadow prices (i.e., net of quota rent values) in accordance with the microeconomic analytics of quota behaviour. The remaining quota rent is now inserted as a separate income identity in the regional household income function. Since the benchmark period is a pre-accession time point for the EU10, we assume quota rents are zero in 2001. Imposition of the quota through complementary slack conditions allows the model to calculate endogenously the level of quota rent in the 'new' member states.

To characterise the **set aside** of land we employ a productivity variable (afeall), where a percentage reduction in afeall in the arable land using sectors by 10% implies that for every hectare used, only 0.9ha is productive. We assume that for the EU15, the GTAP benchmark data implicitly includes set aside reflected by the levels of production and demand for land in 2001 (benchmark year). Thus, no change to EU15 set-aside is implemented, although employing set-aside rates calculated for 2001 (ASEU, 2001) we employ reverse shocks in the EU15 to remove set-aside of land under the CAP abolition scenario. In the EU10, the Commission's "prospects for agricultural markets" document (2004-2011) suggests that due to the small farm exemption, set-aside will be some way below the mandatory 10%. Thus an arbitrary 5% set-aside is imposed. To eliminate the possibility of land reallocation from arable to non arable sectors (as in the standard GTAP specification) in response to productivity reductions in arable land, we explicitly separate the land endowment into arable and non arable components (i.e., create two land factors). In this way, the elasticity of substitution between arable and non-arable using sectors is zero. This also reflects the notion that very little arable land is used for pasture purposes. The total arable (and pasture) land endowment is held fixed to reflect a fixed base arable land area. The quasi-decoupled nature of area and set-aside payments in 2001 is characterised as an input subsidy to the land factor in the GTAP model data.

Comparative static CGE models are generally based on medium to long run model assumptions (i.e., full employment, perfect mobility of factors, long run investment behaviour). As a result, we choose not to incorporate intervention buying which is a short run market management mechanism, thereby having limited effects on long run price and output trends. Following Frandsen *et al.*, (2003), **intervention price** falls are introduced in the 'wheat', 'other grains', 'meat processing', 'dairy' and 'sugar processing' sectors as percentage reductions in export subsidy border support. In the former three sectors, intervention price reduction shocks account for the fact that the reductions began before 2001. In accordance with the Mid Term Review agreement, we reduce the dairy sector intervention price 25% (introduced from 2005 in three equal stages). Finally, the proposed reforms for the sugar sector suggest a 39% reduction in the intervention price for white sugar and a 42.6% reduction in the intervention price for

beet sugar. The GTAP data does not separate beet from cane production. Thus, we assume an aggregated 40% reduction in the sugar sector intervention price.

The benchmark year (2001) of the GTAP data falls within the reference period (2000-2002). Thus, as a starting point it is assumed that the EU15 direct payment totals[25] received in the GTAP 2001 database are indicative of the **single farm payment** (SFP) reference payment total for each EU15 region. This total is adjusted to account for the fact that the SFP only applies to 10% of the set aside area. Thus, if a farm (region) has 14% of the land area set aside in the reference period, that region will only receive $10/14^{th}$'s of the payment from set aside, and $90/86^{th}$'s of the payment from the area premium. Further adjustments to the SFP totals are also made to incorporate additional milk and sugar sector premium payments to compensate for approved and planned (respectively) and intervention price reductions. Estimates of regional milk premium totals are based on projections of output per cow per region multiplied by dairy herd projections for each region multiplied by premium per unit. For the sugar sector, the EU has set aside 1.5 billion euro to compensate all 25 member countries for the 40 per cent price cuts. Thus, each EU region's projected allocation is based on regional sugar beet area shares. Once each EU region's SFP is calculated, 5% of the total is removed as part of the modulation scheme to divert funds to rural development needs.[26] Finally, in accordance with the **CAP reforms for Mediterranean products**, all tobacco direct aids are to be included in the single farm payment, whilst the minimum 60% of olive oil direct aids will also be included into the single farm payment. In addition, the Spanish government negotiated additional compensation of €20million from the Mediterranean products reform package.

It is assumed that by 2020, all EU regions will have adopted the 'maximum decoupling scenario'. Thus, to characterise the single farm payment, all direct payments are removed from each of the regions and the net introduced as a uniform input subsidy (i.e., hectare premium) payment on the land factor (Jensen and Frandsen, 2003). In this way, all agricultural activities receive the same reward, thereby making the payment production neutral. To implement SFPs and modulation contributions for ALL 25 EU members we follow a three-stage process. Firstly, calculated net totals (after removal of modulation contributions) for the EU15 members are allocated such that land premiums are equal across all using sectors whilst respecting precalculated payment totals. Subsequently, an average EU15 land premiums are calculated and uniformly imposed in the EU10 regions. This provides an estimate of the accession members SFP totals as calculated by the model. Finally, accession member SFP totals are reduced 5% for modulation and then re-implemented ensuring that hectare premium values are equal across all agricultural sectors. In the CAP abolition scenarios, all domestic subsidy wedges (i.e., output subsidies, capital, land and intermediate input subsidies) in the GTAP database are removed.

The allocation of total **modulation** contributions from across the EU25 follows the Commission's proposals. Thus, regional allocation shares are based on the agricultural area shares (65% weighting) and agricultural employment shares (35% weighting). This weighted estimate is subsequently corrected employing a relative GDP per capita weighting. A further constraint is imposed within the model to ensure that all regions receive at least 80% (as specified by the European Commission) of their initial modulation contributions.

[25] That is, land subsidies and capital subsidies in each region.
[26] Modulation begins at a rate of 3% of direct aid payments in 2005, climbing to a ceiling limit of 5% from 2007 onwards.

In the 2001 benchmark, the **CAP budget** only applies to the EU15 regions. Thus, each EU15 regions makes contributions to Brussels in the form of 90% of agricultural tariffs and modulation funds and gains receipts on output subsidies (Amber Box), direct payments (land and capital subsidies) and intermediate input subsidies (i.e., payment aids on seeds, forage, silage, disease and pest management etc.). The difference between total receipts and total contributions by each member gives the net resource cost of the CAP which is met by uniform percentage GDP contributions by each member state such that the total CAP budget balances at zero. This implies that at the member state level, a region may be a net loser (e.g., UK, Germany) or a net gainer (e.g., France, Spain) from the budget. In the case of Spain (UK), this would imply that regional incomes exceed (are less than) regional expenditures. Thus, to restore general equilibrium, regional savings are increased (reduced) to restore parity. At the EU level, savings remain unchanged. Over the time frame of the experiment, the EU and consequently the CAP budget expands from 15 to 25 members. Thus, dummy variables are employed to introduce the accession members into the budget mechanisms. The analysis also includes the UK rebate mechanism, where 66% of the UK's net contribution is refunded, whilst the remaining EU14 (EU24) fund the bill based on GDP shares. In the case of Austria, Germany, the Netherlands and Sweden, their share of the refund bill is reduced to only one quarter of their GDP share. In each of the simulations, it is assumed that the rebate mechanism is eliminated by 2020.

5. Chinese Accession

To characterise **Chinese Accession**, we exogenously reduce unilateral tariff rates to meet target projected post accession tariff estimates from Ianchovichina and Walmsley (2003)

6. Everything But Arms

In the **Everything But Arms** (EBA) deal, we capture long run tariff eliminations by the EU25 on imports from Malawi, Mozambique, Tanzania, Zambia, Uganda and composite regions Other South Africa and Rest of Sub-Saharan Africa. Since these regions appear in the ROW composite, then a trade weighted tariff reduction by the EU25 regions is imposed on ROW imports.


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