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What's the big deal? Estimates of agricultural trade benefits to the Spanish economy from a potential Doha agreement

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Abstract

In the context of the Doha Development Round, the vast majority of computable general equilibrium studies examine agricultural trade led gains to developing countries, whilst European Union based studies are scarce and only one assessment exists in the case of Spain. This study also focuses on Spain, whilst developing the literature in two ways. Firstly, a more realistic representation of the agriculture sector is undertaken through modelling improvements to agricultural factor-, input- and product markets. Secondly, the policy scenarios now account for tariff «binding overhangs», thereby better reflecting the true level of market access from a potential agreement, whilst the trade led impacts are examined from the inclusion of «sensitive» product lines within the harmonised tariff formula. Through careful scenario design, protection and support reforms are implemented in three «Doha» experiments to reflect the current negotiations, each with different levels of tariff reductions (i.e., market access). Spain experiences equivalent variation (EV) losses in *all* scenarios reflecting shallower tariff reductions from the tariff binding overhangs, whilst EV losses are minimised when agro-food market access is increased due to allocative efficiency improvements. The size of the predicted EV losses are «broadly» in line with the literature, although specified modelling changes to the agricultural sectors result in a different set of conclusions with respect to price, output and trade balance trends. Finally, in our «likely» Doha scenario including sensitive tariff lines, potential global trade gains are severely limited whilst Spanish welfare losses are maximised.

Additional key words: computable general equilibrium, GTAP model.

Resumen

Estimaciones de los beneficios para la economía española de un potencial acuerdo en la Ronda de Doha sobre comercio agrario

En el contexto de la Ronda de Doha, la mayoría de estudios se concentra en los beneficios derivados del comercio agrario para los países en desarrollo. Los estudios sobre la Unión Europea son escasos, y el único artículo existente sobre España es el que intentamos mejorar en el presente estudio. Primero, mejoramos la modelización de los mercados de inputs, factores y productos, para representar el sector agrario de forma más realista. Segundo, los escenarios contemplan el excedente de consolidación de arancel aduanero para aproximar mejor el nivel real de apertura de los mercados. Además, también examinamos los efectos derivados de la inclusión de los productos «sensibles» dentro de la fórmula arancelaria. Mediante un diseño cuidadoso, aplicamos las reformas sobre protección y apoyo en tres experimentos que reflejan las negociaciones en curso. España experimenta pérdidas en variación equivalente (EV) en todos los escenarios, como resultado del escaso impacto de la apertura de mercados a consecuencia del elevado excedente de consolidación de arancel aduanero. Las pérdidas se minimizan cuando se incrementa la apertura de los mercados gracias a mejoras en la eficiencia asignativa. La magnitud de las pérdidas en EV se aproxima, en general, a la literatura existente, aunque los cambios en la caracterización de los mercados agrícolas en nuestro modelo revelan tendencias distintas por lo que respecta a precios, producciones y balanzas comerciales. Por último, en el escenario en el que se incluyen aranceles de productos «sensibles», el potencial de beneficios globales se ve seriamente limitado, mientras que las pérdidas de bienestar en España se maximizan.

Palabras clave adicionales: equilibrio general computable, modelo GTAP.

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Introduction[1]

Ever since its inception in the Qatari capital of Doha, the Doha Development Round (DDR) has been fraught with difficulty resulting in stop-start negotiations. At the fifth Ministerial World Trade Organisation (WTO) Meeting in Cancún, 2003, the collapse of the talks was due to strong objections by developing nations on the agricultural elements of the proposals. Indeed, with the developing countries now organised into two negotiating blocs[2], this show of strength marked something of a departure from the Uruguay Round. In Geneva, 2004, the DDR appeared to have regained momentum, with a broad commitment from all WTO members toward a general framework on the modalities of export competition, domestic support and market access (the July Framework Agreement) as a basis of negotiation. In principle, the EU, USA, Japan and Brazil agreed to eliminate agricultural export subsidies and reduce trade-distorting subsidies, whilst the developing countries consented to greater market access in manufacturing industries, with exceptions for «key» industries. At the sixth Ministerial WTO Meeting in Hong Kong, 2005, it was agreed to totally eliminate export subsidies in cotton and agriculture by the end of 2006 and 2013 respectively. However, the talks had languished over the «modalities» of *market access* (i.e., tariff reductions) and *domestic support*, whilst last ditch attempts in Geneva, 2006, to salvage an agreement from the DDR broke down, leading WTO chief Pascal Lamy to formally suspend negotiations.

In January 2007, in Davos, negotiations resumed, but once again the talks have been turbulent. In April, discussions between the G4[3] of Brazil, India, the EU and the USA stalled when the former two left the negotiating table. The success of the round was further jeopardised with the expiration in July of the US' Trade Promotion Act. From now on, the US Congress resumes its right to make amendments to any WTO trade deal, which in turn compromises the authority of the US trade representatives to make real concessions. As a result, it appears unlikely that potentially «unpopular» concessions will be made so close to the US presidential elections in November 2008.

Current issues

With a consensus already reached on the abolition of agricultural export subsidies, there is much needed progress on the «modalities» for agricultural market access and domestic support. In July, the current Chairman of the Agricultural Negotiating Committee, Crawford Falconer, tabled a draft agricultural modalities text (WTO, 2007) to kick start the negotiations. As with the *July 2004 Framework* (WTO, 2004), the document is necessarily devoid of specifics in certain areas since it represents a negotiating «middle-ground» between all WTO members, although it does appear to be asking for greater concessions from developed countries.

In terms of *market access*, there is renewed commitment toward a banded harmonisation formula, proposing average tariff reductions in *bound* or ceiling rates for each tariff rate tier, subject to a minimum tariff cut per tariff line, although the exact reductions are still under negotiation. In the document, developed countries are being asked to cut tariffs by up to 73% (which is above the EU's original offer of 60%). As before, there are *three* exceptions to the application of the reduction formula: sensitive products, special products and the special safeguard mechanism.

In the first category, *all* countries may specify an «appropriate» number of sensitive products which in turn will face lesser tariff cuts and tariff quota increases. In the Falconer document, it suggests that countries may declare 4-6% of tariff lines as «sensitive» (below the EU's position of 8% and above the US' position of 1%). In the second category developing countries have recourse, subject to food security, livelihood and rural development criteria, to a certain number of «special products», although the criteria for what these special products are remains nebulous. Finally, a special safe-

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[1] Abbreviations used: AMS (aggregate measure of support), CAP (Common Agricultural Policy), CD (Cobb Douglas), CDE (Constant Difference of Elasticity), CES (Constant Elasticity of Substitution), CET (Constant Elasticity of Transformation), CGE (Computable General Equilibrium), c.i.f. (cost, insurance and and freight), DDR (Doha Development Round), EU (European Union), EV (equivalent variation), f.o.b. (free on board), GTAP (Global Trade Analysis Project), LDC (Least Developed Country), OECD (Organisation for Economic Co-operation and Development), TRQ (Tariff Rate Quota), WTO (World Trade Organisation), €m (million euros).

[2] The G-20: middle-income developing countries; and the G-90: poorer developing countries.

[3] The key players in the negotiations, known as the G6, are Brazil and India (representing the G20 group), the EU, the USA, Australia (representing the Cairns group of agricultural exporters) and Japan (representing the G10 group of net agricultural importers).

guard mechanism will be established to protect developing countries against, for example, import surges or large drops in prices, however, again, the precise scope and application of this scheme has yet to be clearly defined.

In terms of *domestic support*, a tiered formula is proposed based on the level of aggregate measure of support (AMS) over a base period, where those negotiating members in the top band (i.e., EU) are being asked to reduce support by 70%[4]. The Falconer document also maintains the strategy of imposing gentler cuts for developing countries over a longer time period. The Falconer document also maintains its commitment to ensure that Blue Box payments (linked to fixed production limits) are genuinely less trade-distorting than Amber Box measures, whilst the text reduces the cap on the value of Blue Box support as a percentage of agricultural production (i.e., *de minimis*) from 5% to 2.5%. The treatment of Green Box also remains controversial, with specific wording in the text to ensure that the basic principle of non- or minimal trade distortion is respected. However, opinions still differ on disciplines to prevent Green Box supports from distorting trade, although it is looking more likely that income supports that are separated (decoupled) from production will be broadly based on «fixed and unchanging» base periods.

Literature review and aims

Quantitative impact assessment of the ongoing DDR of trade negotiations has almost exclusively been within the domain of global computable general equilibrium (CGE) analysis. All almost in cases, CGE studies use the Global Trade Analysis Project (GTAP) database with its detailed input-output, trade and final demand accounts, support and protection data across 87 regions and 57 sectors. Given the explicit mandate of the DDR, to extend «aid-through-trade» opportunities to developing and least developed countries, the vast majority of DDR CGE applications focus on the distributive gains to «poorer» WTO members (*inter alia*, Anderson *et al.*, 2005; Bouet *et al.*, 2005; Francois *et al.*, 2005)[5], whilst there is a paucity of EU focused DDR studies. In the case of Spain, there are recent studies examining the implications of multilateral trade agreements on the CAP (Atance-Muñiz *et al*., 2007), with some relevant discussion for the Spanish economy (Álvarez-Coque and Atance-Muñiz, 2007). Notwithstanding, there is only one quantitative impact study (Philippidis, 2005) examining the implications of a DDR agreement for Spain.

The aim of this paper was to consolidate and significantly improve this study. Firstly, wholesale changes were made to more realistically characterise the vagaries of agricultural factor (land, labour and capital) and intermediate input (particularly feed inputs) markets, whilst the model code to capture the common agricultural policy (CAP) is developed further, employing improved secondary data estimates and expert advice. Secondly, the import demand structure in the EU regions of the GTAP model was modified to differentiate between intra-EU and extra-EU trade flows, thereby capturing greater product harmonisation within the single market. Finally, and most importantly, the recent work from Jean *et al.* (2005) was adapted to include a treatment of «sensitive» product tariff lines whilst also accounting for the «binding overhangs»[6] in both the areas of market access and domestic support.

Material and Methods

Modified GTAP model description[7]

To ensure a general equilibrium, a large system of market clearing equations were implemented to guarantee that all factor, input and commodity markets clear (i.e., demand equals supply). Moreover, accounting identities ensure that regional households and producers remain on their budget and cost constraints respectively, household expenditures equal household incomes (i.e., tax/tariff revenues and ownership of factors of production), and that long-run zero profits prevail in all production sectors.

To characterise consumer demands, neoclassical utility maximisation was employed to determine three types of «regional household»[8]. Thus, in the model, a

[4] Once again, this proposal exceeds the 60% upper limit cut proposed by the (then) Chairperson of the Agricultural Negotiating Committee, Stuart Harbinson (WTO, 2003).

[5] For an updated discussion and comparison of DDR impact studies within the CGE literature, see Philippidis (2005).

[6] See later for further discussion.

[7] For a full description of the standard GTAP model, see Hertel (1997).

[8] The regional household is a «representative» accounting entity designed to encompass the activities of all individuals in each region [i.e., consumers, businessmen (investors and ownership of factors), government activity (tax and spend) etc.].

Cobb-Douglas (CD) utility function for region «r» consists of private consumer demands (UP_r), government (or public) consumer demands (UG_r) and savings (investment demands) ($USAVE_r$), where α, β and δ are elasticities:

$$U_r = UP_r^{\alpha} UG_r^{\beta} USAVE_r^{\delta} \qquad [1]$$

Maximising [1] subject to the regional budget constraint, yields CD Marshallian aggregate demands in each region «r» by each agent:

$$UP_r = \frac{Y_r}{PPRIV_r}\alpha \quad UG_r = \frac{Y_r}{PGOV_r}\beta \qquad [2]$$

$$USAVE_r = \frac{Y_r}{PSAVE_r}\delta$$

Weak homothetic separability assumptions were employed to further partition aggregate private and public consumer decisions into «nests» (multi-stage budgeting) based on conventional neo-classical behaviour (cost minimisation). Thus, at the second level of the nest, *private* expenditures were minimised subject to a non-homothetic constant difference in elasticities (CDE) function[9] to derive Hicksian demands for each commodity «i». At the third layer of the nest, private expenditure on each commodity «i» is minimised subject to a constant elasticity of substitution (CES) function to yield Hicksian commodity demands by origin (i.e., domestic *vs.* «composite» import demands). Finally, CES expenditure minimisation yielded bilateral import demands by region of origin at the fourth level of the nest[10]. Public expenditure had the same nesting structure, although in the second level of the nest, the CDE function was substituted for a simpler CD treatment.

In this model variant, the third and fourth level nests in the EU regions were modified to account for differences in intra-EU and extra-EU trade demands[11]. More specifically, increased harmonisation of EU product standards were captured resulting in greater product substitution in the model (Harrison *et al.,* 1996; Herok *et al*., 2002). Indeed, Herok *et al*. (2002) note that with «deep» integration, «price differentials become smaller as buyers more easily substitute among the products from different member states» (p. 2). Consequently, it was assumed that the (Armington) substitution elasticities on intra-EU trade were double the «standard» elasticities (Herok *et al*., 2002).

The production structure was also nested, were in this study a number of improvements were made on the «standard» treatment. Following the work of Keeney and Hertel (2005), Hicksian cost minimising demands for composite value added (primary factors) and intermediate inputs in the top nest now exhibit CES substitution possibilities[12]. In the second level of the production structure, primary factors are CES substitutable within a separate nest. The derivation of intermediate input demands into domestic and composite imports (nest level 2), and imports by region of origin (nest level 3) followed the same (modified) CES treatment as the consumption nested structure[13]. Furthermore, in the livestock sectors, intermediate feed inputs now have a separate sub-nest and were also price sensitive, subject to a CES technology[14].

Production activities are characterised as perfectly competitive and constant returns to scale, whilst supply by each sector is «demand driven» employing zero profit equations (i.e., supply equals final demand)[15]. Thus, value of production of good «j» in region «r» ($VOA_{j,r}$) was determined by total primary factor and intermediate input demand costs by using sector «j» in region «r» ($VFA_{i,j,r}$).

$$VOA_{j,r} = \sum_{i \in fact} VFA_{i,j,r} + \sum_{i \in \text{int}} VFA_{i,j,r} \qquad [3]$$

The model incorporates five primary factors[16], where once again, we improved the standard treatment of agricultural factor markets following the work of Keeney and Hertel (2005). To capture the observed

[9] The CDE function allows the modeller to calibrate differing price and income elasticities which offer a much richer characterisation of final demands than the standard Cobb-Douglas (CD) or CES functions.

[10] This level is also known as the Armington specification which permits two-way trade in otherwise homogeneous products through use of the elasticity of substitution between competing products.

[11] See Figure 1 in the appendix for a full description of the nesting structure.

[12] In the GTAP model, a Leontief function characterises the combination of intermediate inputs and primary factors. This implies that, for example, the intensiveness of fertiliser application on land cannot alter with a policy change. In the current study, this unrealistic restriction is removed. For further discussion of the nesting structure, see Keeney and Hertel (2005).

[13] Intermediate input demands also distinguish between intra-EU and extra-EU import sources (see appendix).

[14] In the GTAP model, intermediate input substitution is subject to a simplistic Leontief technology.

[15] In GTAP there are no explicit supply functions for goods and services.

[16] Land, skilled labour, unskilled labour, capital and natural resources.

rigidity between agricultural/non-agricultural markets leading to wage and rent differentials, labour and capital allocation was controlled through a constant elasticity of transformation (CET) function[17]:

$$QO_{i,r} =$$

$$= A_{i,r}\left[\delta_{i,j,r} QOAGR_{i,r}^{\rho_i} + (1-\delta_{i,j,r}) QONAGR_{i,r}^{\rho_i}\right]^{\frac{1}{\rho_i}} \quad [4]$$

$$\sigma_i = \frac{\rho_i}{1-\rho_i}$$

where $\delta_{i,r}$ is a CET share parameter; $A_{i,r}$ is a scale parameter; and ρ_i is an elasticity parameter. Maximising revenue subject to the CET function [4], yields the allocation of capital and labour factor «i» to the agricultural (QOAGR) and non-agricultural (QONAGR) sectors, where the elasticity of transformation (σ_i) determines the degree of labour/capital supply responsiveness to relative price changes between using subsectors.

In the standard GTAP model, land is exclusively employed in the primary agricultural sectors, and is «sluggishly» allocated across all using sectors «j», by a single CET elasticity. This implies that land is «homogeneous» in that it is equally substitutable between agricultural activities. In this study, we removed this restrictive assumption by following a similar treatment to the OECD's policy evaluation model (OECD, 2003). Thus, employing a three-stage weakly separable CET revenue maximisation problem, agricultural sectors were grouped into nests according to the ease of substitutability of land. Descending down the nest, the CET elasticity doubles, implying easier substitution of land between competing agricultural uses[18]. To maintain equilibrium, market clearing equations between sluggish primary factor demands ($QFE_{i,j,r}$) and supplies ($QOES_{i,j,r}$) were implemented for each using sector «j»:

$$QFE_{i,j,r} = QOES_{i,j,r} \quad [5]$$

To apportion investment demands (i.e., regional savings) across regions, GTAP employs a fictitious agent, known as the «global bank», which collects global investment funds (all regions' savings) and disburses them to each region based on fixed regional investment shares. Assuming all domestic and trade markets clear, the supply of global capital/investment goods (WALRAS_SUP) must be equal to the sum of all savings demands (WALRAS_DEM), thereby satisfying Walras' law.

Once the model structure was formalised and calibrated to the chosen data aggregation, specific macroeconomic or trade policy scenario questions can be addressed by imposing exogenous shocks to key policy variables (i.e., changes to tax/subsidy rates, primary factor supplies, technical change variables etc.). The model responds with the interaction of economic agents within each market, where an outcome is characterised by a new series of equilibrium conditions.

Common agricultural policy and trade policy modelling improvements

A necessary pre-requisite for a credible analysis of trade reform on EU agricultural product markets requires an explicit representation of the CAP and trade policy mechanisms. Once again, improvements have been made to the modelling of the CAP[19]. Firstly, detailed GTAP support data from Dimaranan (2006) were employed to remove all sub-national and national payments from the CAP budget[20]. Since these payments account for approximately 20% of domestic support, they will lead to a misspecification of the impact of CAP budget changes in each region.

In addition, based on detailed consultation with Defra (2007), only coupled support is removed from those sectors which are inserted in the single farm payment (SFP). Previously, when implementing the SFP, all domestic support was removed. This incorrectly implies that *all* current Blue Box support is transferred to the Green Box, thereby escaping the disciplines of Blue Box support reductions. Elsewhere, agricultural intervention purchases were explicitly incorporated, whilst the benchmark estimates of the milk quota and sugar quota rents were improved to account for the competitive efficiency of the downstream processing sectors, based on a broader array of literature sources (Frandsen *et al*., 2003; Jensen and Frandsen, 2003; European Commission, 2005; Lips and Rieder, 2005; Moro *et al*., 2005) and expert opinion from within Defra (2007).

[17] For a fuller description, see Keeney and Hertel (2005).

[18] See Figure 2 in the technical appendix for a description of the nesting structure.

[19] The CAP modelling module is similar to Philippidis (2005), and follows the description in the appendix to that article. Notwithstanding, important changes have been made, which are discussed in the main text.

[20] These payments are not part of EU common funds but rather are funded nationally by member states.

In the DDR, the negotiations are centred on the reduction of bound (or ceiling) tariff rates, whilst in the GTAP database, applied tariff rates are employed, which may be equal to or less than the bound rate[21]. Consequently, a reduction in the bound rate could conceivably have little or no impact on real market access due to the «binding overhang»[22]. From Spain's perspective, there are no studies in the literature which deal with this important effect (i.e., it has been simply assumed that bound and applied rates are equal). This implies that the market access potential of the DDR simulations is overstated, which in turn exaggerates the estimated gains from trade to all member countries. In this study, we employ recent work (Jean *et al.*, 2005) on Doha tariff reductions accounting for the binding overhang, which is publicly available to subscribers of the GTAP 6 Data. More specifically, a series of scenarios have been provided, with accompanying tariff shocks, to explore and enumerate a range of possible alternatives that are currently on the negotiating table.

The same line of reasoning applies to negotiated cuts in domestic support, which are based on AMS «ceiling limits», rather than (lower) «applied» levels of AMS expenditures. We employ secondary data sources (WTO, 2006) to ascertain the AMS expenditure overhang when implementing Amber Box and Blue Box support reductions to applied expenditure levels.

GTAP database

The GTAP version 6 database is benchmarked to the year 2001, covering 87 regions and 57 commodities, and combines secondary data sources of regional input-output tables, bilateral trade data, protection and support data and transport margin data. From an EU perspective, the database includes all of the 27 members states, although to maintain the model at manageable proportions, the regional aggregation incorporates the «big three» EU economies (France, Germany, UK) and Spain, whilst the remaining EU members, now including the 2007 EU accession members, were grouped into composite regions (see Table 1). Given the focus on agriculture and food, all major EU crops and livestock sectors were disaggregated from the GTAP database, with remaining non-agricultural regions aggregated into «raw materials», «manufacturing» and «services» (see Table 1).

Scenario design

In this study the standard GTAP framework was extended to include a plausible long run baseline scenario projected from the benchmark year (2001) to 2020 against which we compared our Doha Round Scenario. The baseline scenario is described in Table 2.

Compared with the baseline, a series of «plausible» Doha scenarios were examined, which are described in Table 3. Leaving the tariff cuts to one side, the «Doha scenarios» include reductions on Blue Box payments to fulfil the *de minimis* ceiling criteria of 2.5% and reductions of 70% (50%) in Amber Box support for the developed (developing) countries. In the EU, what is not transferred into the Green Box under the SFP is treated as a Blue Box payment.

Whilst the original Harbinson tiered tariff proposals were not accepted, they still reflect the basis of the negotiating positions between WTO members (Jean *et al.*, 2005). Indeed, the Falconer document (WTO, 2007), specifies that the reductions should still be undertaken using a tiered formula, in which larger cuts are made on higher tariffs. Thus, in scenarios 1 and 2 and 3, a *«harmonising»* or *tiered* tariff reduction formula is employed in the agro-food products where greater tariff cuts are applicable on higher bound tariff rates[23].

In Table 4, the scale of the bound tariff cuts are detailed for each of the three policy scenarios. In the lower part of Table 4 are shown the bound tariff reductions for the «light» harmonising formula, which implements cuts 10% points weaker than the equivalent harmonisation formula in scenarios one and two. On tariff rate quota (TRQ) bilateral routes, both in- and over-quota rates were reduced by the prescribed percentage cuts, whilst the quota was increased to 5% of present

[21] Member countries exaggerated their base period protection and support levels to protect themselves against making significant «real» cuts.

[22] Thus, an overhang of 50% would suggest that a reduction of at least 51% would be required in the bound rate before real inroads into market access will be achieved.

[23] Given the broad disaggregation of the sectors in the GTAP database, only «average» tariff reductions are applied to commodities which fall within each band. Thus, there is no account for the possibility of strategically higher reductions in some tariffs within a tier, to compensate for smaller reductions elsewhere, such that averages are met.

Table 1. Model aggregation

I. Chosen Sectoral Aggregation (24 GTAP Sectors in bold)

Rice (rice) – paddy rice; **Wheat** (wheat) – soft and durum wheat; **Other Grains** (ograins) – rye, sorghum, barley, oats, maize, millet, other cereals; **Vegetables, Fruit and Nuts** (vegfrunuts)– all vegetables, fruits and nuts; **Oilseeds** (oilseeds) – oilseeds and oleaginous fruits; **Sugar** (sugar) – sugar cane and beet; **Plant Based Fibers** (Plants) – raw vegetable materials used in textiles; **Other Crops** (ocrops) – seeds, live plants, flowers, beverage and spice crops, unmanufactured tobacco, plants used in perfumery, pharmacy, insecticidal, fungicidal or similar purposes; cereal straw and husks, fodder and forage crops; other raw vegetable materials; **Cattle and Sheep** (catshp) – live bovine cattle, sheep and goats for fattening, horses, asses, mules; **Pigs and Poultry** (pigspoultry) – live swine and poultry for fattening, other animals; eggs, honey, snails and frogs legs; **Raw Milk** (milk) – dairy and other cows; **Wool** (wool) – animal materials used in textiles; **Fishing** (Fishing) – All fishing activities including fish farms and hatcheries; **Meat processing** (meatpro) – red meat products (bovine, sheep and goat); edible offals and animal oils and fats; **Other meat processing** (omeatpro) – white meat products, edible offals and animal oils and fats; **Vegetable oils and fats** (vegoilsfats) – Oils of: Coconuts, cottonseeds, groundnuts, oilseeds, olives, palmkernels, rice brans, rape and mustard, soyabeans, sunflower seeds; and fats; **Dairy** (dairy) – all dairy products; **Rice processing** (ricepro) – milled rice; **Sugar processing** (sugarpro) – Refined sugar, sweeteners; **Other Food Processing** (ofoodpro) – prepared and preserved sea food products, vegetables and fruits, bakery and confectionary products, pastas and flours; **Beverages and Tobacco** (bevstobac) – Cigarettes, Cigars etc., Wines and Spirits, Beer; **Raw materials** (NaturalRes) – Coal, oil, gas, minerals, Petroleum and coal products; **Manufacturing** (mnfcs) – Textiles; wearing apparel; leather, wood and 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 (9 Regions)

Spain, France, Germany, UK, EU3 (Austria, Netherlands, Sweden), **EU8** (Belgium, Denmark, Finland, Greece, Ireland, Italy, Luxembourg, Portugal); **AC10** (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia); **AC2** (Bulgaria, Romania), **Rest of the World** (ROW).

Table 2. Description of the baseline

Baseline scenario assumptions: 2001-2020

1. *Projections*

— Productivity, population change, real growth, skilled and unskilled labour changes.

2. *Uruguay round commitments*

— Enforce developed country commitments on tariffs and export subsidies.
— Complete developing country commitments on tariffs and export subsidies.

3. *EU enlargement to 27 members*

— Remove all border protection (i.e., export subsidies, import tariffs) between all 27 member states.
— Impose common external tariff for the new EU members of the customs union.

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

— Modelling of CAP (CAP budget, modulation, quotas, set-aside, intervention prices, stockpurchases).
— 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.
— Removal of coupled support components from the domestic support.
— Implementation of Modulation and abolition of the UK Rebate (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 EBA.

Table 3. Doha round tariff elimination scenarios

Scenario	Description
S1	Agro-food: harmonising tariff reduction formula; Non agri-food: 50% cut for developed, 33% cut for developing, 0% cut for LDCs; Import quota increased to 5% of present consumption; Blue Box «de minimis» cap of 2.5%; 70% (50%) Amber Box reduction for developed (developing) countries; Eliminate export subsidies.
S2	Agro-food: harmonising tariff reduction formula + 5% of sensitive product tariff lines; Non Agri-food: 50% cut for developed, 33% cut for developing, 0% cut for LDCs[a]; Import quota increased to 5% of present consumption; Blue Box «de minimis» cap of 2.5%; 70% (50%) Amber Box reduction for developed (developing) countries; Eliminate export subsidies.
S3	Agro-food: «Light» harmonising tariff reduction formula (10% points weaker); Non agro-food: 50% cut for developed, 33% cut for developing, 0% cut for LDCs; Import quota increased to 5% of present consumption; Blue Box «de minimis» cap of 2.5%; 70% (50%) Amber Box reduction for developed (developing) countries; eliminate export subsidies.

[a] LDC: less developed country.

consumption[24]. In the framework document (WTO, 2004), countries are also allowed to choose a list of «sensitive» products, which will receive special treatment (i.e., lower tariff cuts). This important policy initiative was implemented into scenario 2.

Table 4. Revised tariff reduction formula: Scenarios 1, 2 and 3

Harmonising tariff reduction formula			
Developed countries		**Developing countries**	
Existing binding tariff	**Tariff cut**	**Existing binding tariff**	**Tariff cut**
> 90%	75%	> 120%	60%
> 15 and ≤ 90%	70%	> 60 ≤ 120%	50%
≤ 15%	45%	> 20 ≤ 60%	40%
		≤ 20%	35%
«Light» harmonising tariff reduction formula			
Developed countries		**Developing countries**	
Existing binding tariff	**Tariff cut**	**Existing binding tariff**	**Tariff cut**
> 90%	65%	> 120%	50%
> 15 and ≤ 90%	60%	> 60 ≤ 120%	40%
≤ 15%	35%	> 20 ≤ 60%	30%
		≤ 20%	25%

A review of the Falconer document (WTO, 2007) reveals that considerable uncertainty remains about which products are to be bestowed with «sensitive» status. In Jean *et al.* (2005), sensitive products are determined on the basis of the tariff revenue forgone in the benchmark period from implementation of the formula being used (i.e., harmonised, light harmonised, proportional). A limitation of this approach is that it assumes that the value of imports remains unchanged, although it is certainly more reliable than only using the tariff rate as a guide[25]. Moreover, this measurement concept does implicitly take account of the (political) importance of the commodity (i.e., size of the tariff revenue), the height of the applied tariff compared with the c.i.f. import price, and the distance between the binding and applied tariff rates (i.e. the revenue fall under each formula is a function of this «distance»). In scenario 2, it is assumed that 5% of the most sensitive tariff lines are given special treatment, whilst it is assumed that the tariff lines under sensitive status will experience a liberalisation equivalent to a 15% reduction from their initial binding tariff levels.

In remaining (manufacturing) sectors, considerable uncertainty remains regarding the format of the final tariff reduction formula. As the focus of this paper is on agro-food market access issues, a simpler treatment is applied to the manufacturing sector by assuming that

[24] The Falconer document details a more complex treatment of TRQ increases. However, given the sectoral aggregation in GTAP, it was decided not to apply «blanket» quota increases on aggregate agro-food sectors, which may only apply to specific commodities. Furthermore, a sensitivity analysis of the model suggests that TRQ increases of between 3% of consumption to 8% have relatively small impacts on the model results.

[25] Jean *et al*. (2005) note that it is highly unlikely that a member country would designate «sensitive status» to products with high tariffs and yet small levels of trade (and therefore tariff revenue).

binding tariff rates are reduced 50% in the developed countries, 33% in the developing countries, and zero % in the least developed countries.

Results

Trade, output, market and world prices

Table 5 shows changes in Spanish trade balances, market prices and output compared with the baseline for each of the sectors of the model. In most agro-food sectors, market prices fall, resulting in aggregate agriculture and food sector price falls. The variance in price falls across Spanish agro-food sectors reflects the differing levels of sectoral trade protection (export subsidies and import tariffs) and support (Amber and Blue Boxes), the tariff binding overhang, the pattern of Spanish trade and the size of the Armington substitution elasticities. In the database, the majority of agro-food trade occurs in the downstream food sectors, where market price falls are motivated by cheaper imports of intermediate inputs and the elimination of the subsidy wedge between internal export prices and free on board (f.o.b.) export prices. In primary agricultural sectors, market prices are also influenced, albeit to a lesser extent, by trade policy changes, but also by reduced demand from contracting downstream sectors and the relative levels of support in competing industries.

In raw milk and primary sugar sectors, a quota is modelled, although in the latter case, the quota rent is zero, implying a non-binding status[26]. Thus, in raw

Table 5. Spanish trade balances, market pices and output[1]

vs. Baseline	Trade balance (€m)			Market prices (%)			Output(%)		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
Rice	–26.2	–6.4	–20.8	–1.46	–	–1.29	–36.20	–8.57	–29.09
Wheat	19.9	3.3	13.7	–1.37	–	–1.28	3.13	1.28	2.37
Ograins	3.7	1.2	2.8	–1.51	–	–1.38	+	1.21	+
Vegfrunuts	–186.7	–76.8	–157.9	–1.33	–	–1.13	–1.53	–	–1.31
Oilseeds	34.4	8.2	25.9	–	–	–	4.08	3.64	3.99
Sugar[2]	–0.2	–0.1	–0.2	–1.72	–1.16	–1.57	–3.72	–2.05	–3.35
Plants	–0.1	–0.3	–0.1	7.60	8.01	7.72	–4.52	–4.08	–4.39
Ocrops	25.3	15.7	21.1	–	–	–	–	–	–
Catshp	–18.0	–7.3	–14.6	–2.23	–1.21	–1.93	–7.80	–3.43	–6.43
Pigspoultry	6.0	2.0	3.7	–1.58	–1.11	–1.44	–	–	–
Raw milk[2]	1.7	1.6	1.7	–9.55	–8.25	–9.20	0.00	0.00	0.00
Wool	–0.2	0.3	0.0	–1.07	–	–	+	+	+
Fishing	–78.2	–83.8	–80.0	4.97	5.19	5.04	–4.14	–4.04	–4.10
Meatpro	–252.8	–100.1	–194.7	–	–	–	–8.19	–3.55	–6.74
Omeatpro	–26.4	13.5	–18.9	–	–	–	–	–	–
Vegoilsfats	–140.3	–73.6	–117.3	–	–	–	–4.04	–2.23	–3.43
Dairy	–89.3	–99.7	–92.9	–3.08	–2.73	–2.98	–1.29	–1.05	–1.25
Ricepro	–42.5	–8.7	–34.9	–2.35	–0.89	–1.69	–22.20	–5.18	–18.53
Sugarpro	–45.2	–22.0	–40.0	–	–	–	–7.17	–3.96	–6.44
Ofoodpro	–227.9	–141.8	–188.8	–	–	–	–1.90	–1.19	–1.65
Bevstobac	4.1	3.0	–0.6	–	–	–	–	–	–
NaturalRes	–15.4	–6.5	–12.4	+	+	+	+	+	+
Manu	1,103.8	771.2	1,004.8	–	–	–	+	+	+
Svces	452.3	290.6	399.6	–	–	–	+	+	+
AGRIC	**–104.3**	**–44.3**	**–95.7**	**–2.06**	**–1.37**	**–1.87**	**–1.38**	**–**	**–1.13**
FOOD	**–820.3**	**–429.3**	**–688.1**	**–**	**–**	**–**	**–2.12**	**–1.13**	**–1.82**
AGFOOD	**–924.7**	**–473.6**	**–783.8**	**–1.09**	**–**	**–**	**–1.89**	**–**	**–1.61**
Total	**537.8**	**497.9**	**528.2**						

[1] +/– indicates a change of less than 1%. [2] Quota constrained sector. €m: million euros.

[26] The sugar quota rent estimate for Spain is taken from Frandsen *et al.* (2003) and European Commission (2005).

milk, larger market price reductions reflect the decline in calibrated quota rents[27] due to reduced demand from the downstream dairy sector. Since market access in processed sugar is greatly reduced (due to the tariff binding overhang), the demand for primary sugar is not significantly affected, resulting in small market price falls. In contrast, in the plant fibres and fishing sectors, the reduction of output subsidies (Amber box) payments results in price increases in both sectors[28].

Comparing between scenarios one to three, the market price falls (rises) across all sectors are largest (smallest) in scenario one, because this scenario contains the largest tariff cuts. Interestingly, market price reductions in scenario 3 (light harmonising formula) are greater than in scenario 2 (scenario one plus 5% sensitive product lines), which suggests greater market access in the former.

In the non-food manufacturing and services sectors, market prices fall slightly relative to the baseline. As noted earlier, in this study labour and capital factor transfer is modelled as «sluggish» between agricultural/non-agricultural uses in order to capture differing wage rates between agricultural and non agricultural labour and capital. As a result, with trade liberalisation and reduced agricultural support, factors are sectorally trapped within the agriculture sector, whilst the uptake of factors into expanding non-food activities is also muted. Accordingly, the greater is the contraction in agriculture the more factor prices fall compared with the baseline. In Spain, the regional index of factor prices falls 0.40%, 0.34% and 0.39% in scenarios one, two and three respectively (not shown). This has implications for the terms of trade discussed later.

As expected greater EU agro-food market access and reduced agricultural support leads to deteriorating trade balances and supply responsiveness in the Spanish food sectors in comparison with the baseline. In primary agriculture, contractions in «paddy rice», «vegetables fruits and nuts», «sugar cane/beet» and «cattle and sheep» are largely motivated by reduced demand from downstream food sectors, whilst «plant fibre» output falls due to the reduction in considerable Amber Box support. In contrast, «wheat», «other grains» and «oilseeds» have very little (or zero) tariff protection, whilst the majority of support is already transferred into the SFP in the baseline. Consequently, there is land reallocation into these activities resulting in output and trade balance gains. Examining tariff concessions on sensitive products (scenario 2), the impacts on output and trade balances are moderated. In particular, on Mediterranean sensitive crops such as «vegetables fruits and nuts», output and trade balance impacts are approximately halved. Overall, the agro-food trade balance deteriorates between €474 m (scenario two) and €925 m (scenario one).

Table 6 shows that percentage changes in world prices relative to the baseline are negligible in many cases due to opposing forces. On the one hand, the

Table 6. Percentage changes in world prices in all three scenarios relative to the baseline[1]

	S1	S2	S3		S1	S2	S3
Rice	–2.88	1.25	–1.53	Fishing	+	+	+
Wheat	+	1.29	+	Meatpro	+	+	+
Ograins	1.24	1.72	1.38	Omeatpro	–	+	–
Vegfrunuts	–	+	–	Vegoilsfats	+	1.02	+
Oilseeds	3.16	3.36	3.23	Dairy	3.36	3.65	3.45
Sugar	–1.25	–	–1.00	Ricepro	–2.76	+	–1.56
Plants	+	1.28	1.10	Sugarpro	–	+	–
Ocrops	–	+	–	Ofoodpro	–	+	–
Catshp	–	–	–	Bevstobac	–	+	–
Pigspoultry	–	–	–	NaturalRes	+	+	+
Milk	–2.31	–1.37	–1.99	Manu	–	–	–
Wool	–	+	–	Svces	–	–	–

[1] +/– indicates a change of less than 1%.

[27] This follows, since producers get the quota rent in the form of a higher producer price rather than as a transfer payment.

[28] Under the Common Fisheries Policy, a considerable proportion of support is classified as production distorting (i.e., Amber Box). Moreover, Spain receives approximately 45% of the EU's financial instrument for fisheries guidance. In the case of the plant fibres sector, production aids on fibre flax and hemp constitute approximately 13% of the sectors output.

reduction of domestic support and elimination of export subsidies reduce (developed country) excess supply on world markets. This has the effect of increasing world prices for many agro-food commodities relative to the baseline. This trend is observed in scenario 2, where tariff cuts are weakest given the inclusion of «sensitive» product exceptions, and export subsidy and domestic support reforms dominate. On the other hand, when tariff cuts are deeper in scenarios 1 and 3, (developed country) imports rise, whilst (developing country) exports increase in response through domestic resource reallocations into agro-food sectors. In Table 6, (developing country) export increases dominate, such that relative to scenario 2, world prices fall in scenarios 1 and 3.

Real income changes

To measure the macro impact of the Doha scenarios, an equivalent variation (EV) measure of real income changes is reported for Spain, France, Germany, the UK, EU15 and EU27 (Table 7). The EV measure is decomposed into terms of trade effects, efficiency effects, CAP Budget effects and «other». The terms of trade measures changes in the rate of exchange between export and import prices. In the context of a CGE model, import tariff and export subsidy changes (i.e., relative trade competitiveness) affect trade prices directly, whilst «second round» resource reallocation impacts on factor prices also influence export prices. Allocative efficiency is a measure of resource usage measured by changes in «marginal social values» (Huff and Hertel, 2001). More specifically, a subsidised activity is considered wasteful in that in incurs more resources than under free market conditions. Thus, policies which promote less resource usage in subsidised activities, or reductions in the subsidies themselves, are considered as efficient (i.e., less resource wastage). The opposite logic applies in the case of a tax. The «CAP» budget effect measures changes from each EU member's contributory positions with respect to the agricultural

Table 7. Aggregate EU welfare effects

	Spain	France	Germany	UK	EU15	EU27
S1 (Tiered harmonised tariff cuts)						
Equivalent variation (€m)	–98.1	462.1	1,321.1	1,118.5	4,833.8	5,003.8
Per capita utility (%)	–0.02	0.04	0.09	0.10	0.08	0.08
Of which:						
— Terms of trade (€m)	–109.5	75.1	155.4	–230.0	291.8	9.9
— Allocative efficiency (€m)	348.4	477.5	852.0	1,329.4	5,266.8	5,442.1
— CAP budget (€m)	–333.8	–73.9	331.8	28.2	–663.3	–386.3
— Other (€m)	–3.2	–16.6	–18.1	–9.0	–61.5	–61.9
S2 (S1 + sensitive product tariff cuts)						
Equivalent variation (€m)	–283.8	430.4	1,086.1	386.3	2,687.9	2,823.7
Per capita utility (%)	–0.06	0.04	0.08	0.03	0.04	0.04
Of which:						
— Terms of trade (€m)	–35.5	121.7	168.0	–115.9	634.7	443.4
— Allocative efficiency (€m)	60.1	298.1	541.5	374.4	2,543.6	2,603.4
— CAP budget (€m)	–307.6	22.9	388.9	134.1	–451.9	–184.6
— Other (€m)	–0.8	–12.4	–12.2	–6.3	–38.4	–38.6
S3 («lighter» harmonisation tariff cuts)						
Equivalent variation (€m)	–116.7	473.8	1,245.8	946.7	4,302.0	4,457.0
Per capita utility (%)	–0.03	0.05	0.09	0.08	0.07	0.07
Of which:						
— Terms of trade (€m)	–89.1	76.2	148.9	–201.3	327.4	62.3
— Allocative efficiency (€m)	301.1	436.4	776.5	1,128.4	4,652.1	4,797.3
— CAP budget (€m)	–326.1	–22.9	337.1	27.8	–620.4	–345.2
— Other (€m)	–2.6	–15.9	–16.7	–8.3	–57.1	–57.4

€m: million euros.

component of the EU budget, and unlike the former study, also includes the impacts of stock purchases, which are modelled as withdrawals of real income from the circular flow[29]. The «other» category is an EV (money metric) measure of changes in: (i) household incomes from exogenous endowment shocks, (ii) values of production and demands from exogenous productivity shocks and (iii) population impacts on per capita welfare. The residual impact from these elements is small, given that the same shocks also appear in the baseline scenario.

Unlike France, Germany and the UK, Spain exhibits welfare losses in *all* of the Doha scenarios (Table 7), although in each case, these losses are moderate. In scenario 2 where tariff cuts are the lowest, the Spanish economy loses by €284m or 0.06% of per capita income. In contrast, in scenario one, where tariff cuts are deepest, this loss is reduced to €98m or 0.02% of per capita income. Decomposing this result, Spanish allocative efficiency increases due to the reduction in both subsidies and agricultural activity, and greater non-food specialisation.

On the other hand, Spain exhibits losses in each of the terms of trade and CAP budget components. As noted earlier, given the «sluggish» transfer of factors between agriculture and non-agricultural sectors, sectorally trapped resources depress factor prices compared with the baseline. Consequently, the ratio of Spanish export prices falls by more than import prices. In other EU members (France, Germany), it appears that factor price falls from contractions in agriculture are less influential than the reduction in import prices from liberalisation, leading to terms of trade rises**.**

Decomposing the CAP budget[30] results (Table 8) the main losses in Spain are from the elimination in export subsidies and Amber Box subsidy reductions. Stocks are modelled as a withdrawal from the circular flow of income so appear as negative real income changes. In Spain, most stock purchases occur in the «other grains» and «dairy» sectors, with limited intervention purchases in «wheat». In addition, Spain (unlike France, Germany and the UK) receives a larger proportion of CAP budget funding[31] than it pays in. Accordingly, contraction in support payments will benefit net payers such as Germany and the UK, whilst in the Spanish case reductions in GDP contributions do not offset the losses in support payments.

Table 8. Equivalent variation changes (€millions) in Spanish net common agricultural policy (CAP) contributions compared with the baseline

	S1	S2	S3
CAP Budget (=1+2-3-4-5)	–333.8	–307.6	–326.1
1. CAP expenditure	–637.6	–631.4	–635.6
Of which:			
— Direct payments	0.0	0.0	0.0
— Export subsidies	–193.7	–193.6	–193.7
— Amber Box support	–433.6	–433.1	–433.4
— Intermediate input subsidies	–10.2	–4.7	–8.5
2. Stock purchases	–54.3	–52.8	–54.0
3. 75% of agricultural tariff revenues	–13.9	–6.6	–10.6
4. GDP contribution	–309.4	–334.5	–318.2
5. UK rebate payment	–34.9	–35.5	–34.7

Finally, examining the global welfare gains (not shown) under the deepest Doha tariff cuts in scenario one, the world economy is estimated to gain €23,600m. The reduction in the tariff harmonisation formula by 10% points (scenario 3) yields a smaller global gain of €18,200m, whilst the inclusion of sensitive product concessions (scenario 2) yields a paltry global gain estimate of €6,900m.

Discussion

A review of the trade literature reveals that there is still a paucity of DDR impact assessment research for the EU, and in particular for individual EU member states. In the case of Spain, only one previous study exists (Philippidis, 2005), whilst in this paper, a number of modelling and policy shortcomings in the aforementioned study are addressed employing the latest developments in the applied trade literature. From a

[29] The budget does not net to zero across the EU27 since the changes are money metric (EV), which are a function of the price index in each EU region.

[30] In the CAP budget, each region makes payments to Brussels in the form of 75% of their agricultural tariff revenues, VAT and GDP contributions. In the GTAP model, VAT data is lacking. Thus, assuming a balanced «agricultural» budget, it is assumed that the difference between what EU27 regions receive (i.e., support payments) and pay from their agricultural tariff revenues, is a «resource» cost from the CAP budget, which is covered by a flat rate GDP tax on all regions.

[31] Much of this is due to tobacco, olive oil, wine and fisheries support payments.

modelling perspective, there is greater effort to capture the rigidities apparent in agricultural factor-, input- and product-markets, whilst the quality of CAP modelling is enhanced to include intervention stock purchases, the exclusion of national payments from the CAP budget and improved estimates of quota rents and set aside changes. From a policy perspective, this study accounts for the binding overhang in the tariffs, thereby better reflecting the true level of market access from a potential agreement, whilst a further scenario examines the importance on trade and welfare from the inclusion of «sensitive» product lines within the harmonised tariff formula.

Comparing between both studies, there are considerable differences in sectoral prices, outputs and trade flows. In the highly protected downstream food sectors, market price falls are smaller, due to the tariff binding overhangs and the greater sensitivity of EU consumers to intra-EU price changes. Examining specific sectors, processed sugar (sugarpro), vegetables oils and fats (vegoilsfats) and meat processing (meatpro) sectors all have smaller price falls, whilst in paddy rice and the downstream rice sector where tariff protection is 74% and 124% respectively, Spanish market price reductions are also relatively minor. In the dairy sector, the inclusion of intervention purchases now limits the size of the market price fall in Spain.

In the primary agriculture sectors, the baseline now only includes the removal of coupled support by sector in accordance with the 2003 reforms (vis-à-vis complete removal of all domestic support). Consequently, primary agricultural price fluctuations compared with the baseline are now larger in this study with prescribed reductions in remaining EU Amber Box and Blue Box support. In the raw milk sector, the price falls (up to 10%) are considerably larger in this study due to the usage of a larger benchmark quota rent estimates in the milk sector. By contrast, in this study price falls in the primary sugar sector are much smaller due to the non-binding quota status (i.e., zero quota rent) and considerable tariff binding overhang in downstream sugar processing. In addition, in the oilseeds sector prices now *fall* slightly relative to the baseline, purely due to EU tariff reductions. In Philippidis (2005) oilseeds prices rose relative to the baseline since only part of the olive oil support payments had been included within the SFP.

Examining non agro-food sectors, market prices fall slightly relative to the baseline, which contrasts with Philippidis (2005). In that study, capital and labour types are perfectly mobile between agricultural and non-agricultural uses, with the result that expanding non-agro-food sectors bid up the price of primary factors, which is passed on as market price rises. In this study, the sluggishness of capital and labour transfer leads to factor price falls in Spain. This effect has implications for the terms of trade discussed below.

Examining the trade balances, in our scenario one, the agro-food trade balance deteriorates by €925m, which is greater than the equivalent statistic of €321m estimated in Philippidis (2005)[32]. That our agro-food trade balance deteriorations are greater, is due to the modelling of intra-EU and extra-EU trade preferences to capture increased harmonisation of EU product standards. A feature of this characterisation is that non-EU and EU imports compete at a lower Armington substitution elasticity (vis-à-vis the «standard» GTAP model)[33]. Thus, when non-EU import prices decrease in a trade liberalisation experiment, EU market penetration by non-EU countries is reduced since EU consumers' exhibit reduced price sensitivity on non-EU varieties and greater price sensitivity to EU varieties.

With no trade barriers between the EU27, changes in intra-EU relative prices (and trade) are a function of factor price movements from resource reallocations related to (i) the liberalisation of tariffs and eliminations in export subsidies on third country trade and (ii) reductions in Amber and Blue Box support. In the GTAP data, 69% (65%) of Spanish agro-food (total) trade is with EU partners, which when coupled with greater EU price sensitivity, results in considerably larger trade shifts than in the «standard» GTAP model. Spain's total trade balance improves in scenarios one, two and three by €538m, €498m and €528m respectively, implying that manufacturing and services trade balances (and output) improve compared with the baseline. This reflects a degree of resource reallocation into non-food activities as well as increased export opportunities from falling factor price costs. A similar trend also occurs in Philippidis (2005), although in our study, improvements in Spanish services and manufacturing trade balances are greater due to greater competitiveness from falling factor prices.

[32] The estimate of €321m corresponds to the «high market» access scenario which implements a «slightly» stricter, but comparable, tariff harmonisation formula than employed in our scenario 1.

[33] See the appendix for a discussion of our chosen Armington structure.

Examining Spanish real income changes, both studies predict welfare losses due to Spain's larger than proportional share of agricultural and fisheries support and smaller than proportional share of budget contributions. However, in this study (unlike Philippidis, 2005), Spain loses in *all* Doha scenarios since both CAP budget and terms of trade effects are negative, although these losses are mitigated by greater allocative efficiency gains under «high» market access, which suggests that Spain should be lobbying in favour of greater tariff cuts. The terms of trade are negative in this study (in contrast to Philippidis, 2005) due to the different modelling assumption regarding the treatment of capital and labour mobility between agricultural and non-agricultural sectors. The CAP budget impacts are comparable despite the inclusion in our study of stock purchase losses. This is because in our study, tariff revenue contributions to Brussels remain higher due to lower tariff cutting commitments (i.e. tariff bindings), which (at least partially) offsets necessary additional Spanish GDP contributions to finance EU stock purchases.

For the EU bloc as a whole, real income gains are larger than in Philippidis (2005) due to increased trade gains from greater substitution possibilities on intra-EU trade demands, whilst concurrently, non-EU trade gains (and consequently global gains) are tempered. As noted, with reduced price sensitivity to non-EU goods, EU market penetration is reduced. Furthermore, market access is now moderated by tariff binding overhangs. Comparing between studies, the estimate in global welfare in scenario one is approximately one-third lower than the comparable «high» (€32,500m) tariff cut scenario in Philippidis (2005).

An additional dimension of this study is the incorporation of reduced tariff liberalisation on sensitive product lines. Whilst there is much debate on which product categories and what percentage of tariff lines this will affect, it constitutes an important component of the negotiations on the agricultural market access modalities. The EU are currently lobbying for 8% of tariff lines to be included within this clause, as opposed to the US stance of 1% of tariff lines, whilst in scenario 2, a «middle ground» position of 5% is taken. In the case of Spain, the results clearly show that agricultural and food sectors (particularly red meat sectors) benefit from such reductions in market access, although this is to the detriment of the broader economy. Indeed, Spain makes a net loss of €284m (or 0.06% per capita utility) compared with the baseline. An examination of the potential gains from abolition of *all* agro-food trade protection and support shows that the global economy could gain €55,300m with respect to our baseline (compared with €6,900m in scenario 2). Given EU insistence on the inclusion of sensitive products, scenario 2 arguably represents the most «realistic» experiment, although corresponding estimates of global welfare gains expose the lack of ambition in the DDR.

As a major dependent of the construction boom, which accounts for as much as 18% of GDP (twice the share in other European countries) (Economist, 2008), the Spanish economy is now beginning to falter, whilst inflation and unemployment are rising. In addition, «uncontrolled» increases in immigration, which have undoubtedly contributed to improvements in productivity and lower real wages, have become a source of political contention. In the current global economic downturn, Spain and other developed countries must not allow protectionist sentiment (which is currently gripping the USA) to completely derail the Doha talks. Unfortunately, developed WTO members have so far demonstrated their reticence to put pragmatic economic rational before short to medium term political expediency, whilst in the context of the welfare estimates presented here, the current reality is that any hypothetical Doha deal is likely to go down in history as a missed opportunity both for Spain and the rest of the world.

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Appendix

The structure of intra-EU and extra-EU import demands in each EU region

In the upper Armington nest (Fig. 1), total demands for commodity «i» in each EU region «s» ($totdem_{i,s}$) are composed of non-EU commodity imports and EU commodity imports. The CES elasticity of substitution between these demands is σ^D, which is equal to the equivalent nest in the standard GTAP model treatment. In the second nest (left hand side), EU commodity imports are composed of domestic goods ($eudom_{i,s}$) and intra-EU imports ($euimp_{i,s}$). The CES elasticity of substitution between these demands is *double* the elasticity parameter σ^D. In the second nest (right hand side), bilateral extra-EU imports from *each* non-EU region («r») to EU region «s» compete at the standard

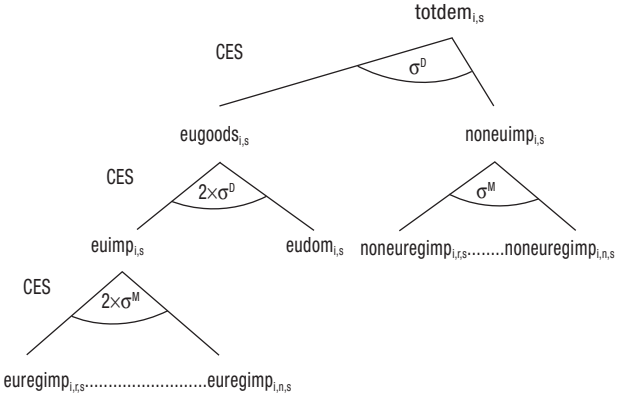

Figure 1. The Armington demand structure in the EU regions.

bilateral imports elasticity of substitution (σ^M). Finally, in the bottom nest, bilateral intra-EU imports from *each* EU region («r») to EU region «s» compete at the elasticity of substitution value which is *double* the standard substitution elasticity (σ^M). In this structure, intra- and extra-EU imports compete at the elasticity σ^D, whilst in the standard GTAP, intra- and extra-EU imports compete at the higher elasticity σ^M (= 2x σ^D). This implies that EU consumers are much less price sensitive to extra-EU imports and more price sensitive to intra-EU imports.

Three level CET land allocation nest

In Figure 2, land substitutability (bottom nest) is highest between «wheat», «other grains» and «oilseeds». Reduced land substitutability in the second nest is modelled between «cereals oilseeds and protein crops»,

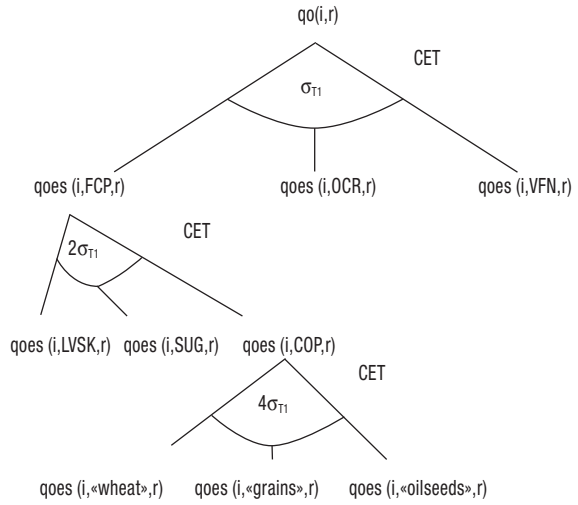

Figure 2. Three nested land allocation structure in the modified GTAP model.

COP, (i.e., composite of «wheat», «other grains» and «oilseeds»), «primary sugar» (SUG) and each of the livestock and raw milk sectors, which have been simplified in the diagram as a single sector «LVSK». In the top nest, the «low» land substitutability is between composite «field crops and pasture sectors» (FCP), «other crops» (OCR) and «vegetables fruits and nuts» (VFN) sectors. The elasticity of transformation value is taken from the GTAP-AGR model of Keeney and Hertel (= 0.25), whilst in lower nests, the elasticities are merely doubled and quadrupled, respectively. The bottom level transformation elasticity is therefore equal to the «standard» GTAP CET value (= 1), which implies that land mobility in this model variant is lower than in the standard GTAP model.