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Implications of Domestic Support Disciplines for Further Agricultural Trade Liberalisation [†]

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Abstract: This paper employs the GTAP computable general equilibrium model and dataset to analyse the implications of domestic support reductions in the context of agricultural trade liberalisation. Three specific issues are addressed: overhang in domestic support, the accurate distinction of the boxes in the GTAP dataset and the treatment of market price support in the amber box. An extensive domestic support database is used to calculate the change in applied domestic support rates from a specified cut in bound rates, and to identify the impact on the different domestic support boxes and the required reductions in each support category. The GTAP model is extended to incorporate an explicit representation of the market price support element of the AMS. The results from these extensions of the standard database and model support the view that the impact of an agreement to reduce domestic support will be limited and lower than conventionally estimated. Results of simulations combining domestic support cuts with market access and export competition disciplines show that the effect of import tariff reductions dominate the gains from domestic support cuts once full account is taken of the issues addressed in this paper.

Keywords: WTO agricultural negotiations, domestic support, agricultural protection, Aggregate Measure of Support

JEL Classification: C68, F13, Q17, Q18.

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1. Introduction

The aim of this paper is to assess the implications of accurately modelling domestic support in the simulation of further agricultural trade liberalisation using the Global Trade Analysis Project (GTAP) computable general equilibrium (CGE) model and database.

Keeney and Hertel (2005) show the importance of correctly modelling agricultural policies if CGE estimates of the impacts of agricultural trade liberalisation are to be considered accurate and realistic. In this paper, three issues related to the modelling of domestic support are addressed: the issue of overhang in domestic support; the distinction between the different domestic support boxes in GTAP; and the representation of the market price support component of domestic support in the model.

Domestic support is disciplined under the WTO Agriculture Agreement by setting an upper limit on each country's Aggregate Measure of Support (AMS) or amber box. For many WTO members, their applied level of total AMS is considerably lower than their total commitment level. Thus simulating further domestic support reduction by cutting applied rates by the headline reduction in bound rates leads to unrealistic and disproportionate results.

Analysis of domestic support reductions is further complicated by the different categorisation of support (boxes) in the Uruguay Round Agreement on Agriculture. Cuts in domestic support are often simulated as reductions of all direct payment measures in GTAP, whereas green or blue box payments were not cut in the Uruguay Round (the Doha Round agreement will see the blue box disciplined for the first time).

The third issue addressed is the modelling of reductions in trade distorting support in the amber box. Protection measures allocated to this box include market price support and direct payments coupled to production. Cutting market price support contributes to reducing AMS and, consequently, reduces the need to cut non-exempt direct payments as a way of meeting AMS disciplines. Most studies ignore the fact that the AMS can be lowered by reducing the administered price, in part because market price support measures are only implicitly represented via border protection in the standard GTAP model.

A series of experiments is run to demonstrate the impact of the three identified issues on the simulation results. A second set of agricultural trade liberalisation scenarios is also explored, encompassing the three pillars of the Agreement on Agriculture (market access, export competition and domestic support). This allows the interaction between tariff reductions and AMS reductions to be explored. One of the lessons from these simulations is that there is considerable flexibility in the way countries can decide to meet stricter domestic support disciplines in an eventual Doha Round agreement. Any simulated liberalisation is sensitive to the specific assumptions made regarding how countries will strike the balance between market price support and direct payment reductions, between reductions in the different components of overall trade-distorting support, as well as distribute the support reductions across commodities.

The next section outlines the representation of domestic support in the standard GTAP model and briefly reviews the current literature on modelling domestic support in the context of further agricultural trade liberalisation. Section three outlines the construction of a domestic support dataset and assesses its implications. The extension of the standard GTAP model to incorporate the improved treatment of domestic support is described. Simulations and results are discussed in sections four and five, respectively. Section six reflects on the implications of the results.

2. Domestic Support and Trade Liberalisation

2.1 Agriculture and the Uruguay Round

Following the conclusion of the Uruguay Round Agreement on Agriculture (URAA)¹ in 1994, member countries of the World Trade Organisation (WTO) entered into effective commitments in the area of agricultural trade for the first time. One element of this Agreement was the commitment to bind and reduce domestic support measures. This is one of the three pillars of the URAA, the others being market access and export competition.

Under this agreement, agricultural domestic support measures are assigned to different categories depending on the type of measure and the nature of the commitment. These categories are referred to as “boxes”. The colour of a box indicates the fate of the subsidies allocated to it. Red box subsidies are forbidden, amber are to be reduced and green are permitted.

The definition of the boxes for agriculture and the eligibility criteria are set out in the URAA (WTO, 2005). To qualify for the green box, support measures must have little or no impact on trade and production and must meet specific criteria defined in Annex 2 of the Agreement. Measures that distort trade and production are assigned to the amber box (Article 6). These include market price support, coupled direct payments and other budgetary outlays on production distorting policies. The value of market price support is calculated as the difference between an applied administered price per tonne and an external reference price per tonne,² multiplied by the eligible tonnage.³ The Aggregate Measure of Support (AMS) measures the value of support included in this box. Current total AMS is measured as the sum of distorting support in the amber box (both product specific and non-product specific) that exceeds the *de minimis* threshold level (5 per cent of the value of production⁴).

There are some distorting payments that are exempt from the amber box. First, some programmes in developing countries are exempted if they conform to the criteria in Article 6.2 (sometimes referred to as a development box). Second, at the end of the negotiations, a separate blue box category was introduced at the instigation of the EU and the US. Distorting payments may be placed in the blue box if they are conditional on limiting production (the criteria are defined in Article 6.5 of the Agreement). As countries transfer more support to the blue and green boxes, the importance of accurately analysing these boxes increases (FAO, 2004).

Under the URAA, members committed to bind and reduce their amber box supports in percentage terms over a period of six years from 1995 (ten years for developing countries). Industrialised countries agreed to cuts of 20 per cent, with special and differential treatment applied to developing countries (13.3 per cent) and least-developed regions (no cuts). Countries without AMS are only allowed *de minimis* levels in future. There are no limits on the value of other boxes other than the need to meet the eligibility requirements laid out in the Agreement.

¹ For more details on the URAA, see http://www.wto.org/english/tratop_e/agric_e/ag_intro00_contents_e.htm.

² The external reference price is fixed at the historical base period 1986-88. FAO (2004) notes that world prices were particularly low during this year. Were the reference prices higher, this would have reduced the bound AMS commitments of member countries.

³ This methodology differs from the OECD’s calculation of the value of market price support measures in their Producer Support Estimates (OECD, 2002b). The PSE market price support is measured as the difference between domestic market prices and border prices. The PSE definition of market price support is based on market price data, it measures the actual value of support, rather than the WTO definition based on the applied administered price and fixed external reference price.

⁴ 10 per cent for developing countries.

2.2 Domestic Support in the Standard GTAP Model and Database

The Global Trade Analysis Project (GTAP) model is a static, one period, computable general equilibrium model of the world economy. In the standard version of the model over eighty regions and fifty sectors / commodities are separately distinguished. These are connected via demand and production linkages within countries / regions and bilateral trade data between them. All markets in the model are perfectly competitive and exhibit constant returns to scale. The Armington assumption is used to distinguish between homogenous goods from different sources.⁵ The GTAP database is composed of three integrated components: input-output data for each region in the model, bilateral trade data linking all regions and trade protection data. The base year of the most recent version of the database (Version 6) is 2001. Hertel (1997) and Dimaranan and McDougall (2005) provide detailed descriptions of the model and database respectively.⁶

In the standard model, agricultural support is represented in two ways. First, market price support is modelled implicitly via border protection rates with tariff data taken from the MAcMaps dataset.⁷ The applied administered prices are not represented directly. Second, non-market price support is represented by various kinds of subsidy wedge. The source of the agricultural support data for non-market price support protection in industrialised countries is the Producer Support Estimates (PSE) produced by the Organisation for Economic Cooperation and Development (OECD, 2002a).⁸ To incorporate the direct payments reported in the PSE data into the GTAP model, they are allocated to four different categories of support for each commodity: output subsidies, intermediate input subsidies, land-based payments and capital-based payments. These PSE categories include direct payments corresponding to both the blue and green boxes of the WTO classification of agricultural subsidies as well as *de minimis* payments. This issue is raised again in Section 3.

2.3 Review of the Literature on Modelling Liberalisation and Domestic Support

The literature assessing the implications of agricultural trade liberalisation is growing rapidly. Many applications use the GTAP model for this purpose. While much of this research fails to account for the issues at the heart of this paper, some more recent work has begun to consider their implications.

In a non-CGE context, several papers assess the effects on agricultural support of various proposed reforms. Hart and Beghin (2005) focus on calculating the impact of redefining AMS and the blue and green boxes. Noting the importance of market price support in total AMS in the US and the EU, among others, they demonstrate the impact of using different applied and external reference prices in the calculation of AMS. They also highlight the option for WTO members to reduce their notified levels of domestic support via cuts in market price support, without actual reductions in support provided to producers.

Brink (2005) looks at the July 2004 Framework Agreement and its consequences for domestic support. Based on projections of agricultural production to 2014 and the positions outlined in the various draft texts, he calculates future levels of domestic support commitments. Brink concludes that there is substantial potential for the EU, the US and other producers to reduce their commitment levels (i.e. their bound ceilings) in line with the July 2004 Framework, without

⁵ This assumes that products are differentiated by source following the Armington assumption (Armington, 1969). Imports and domestic production, as well as imports from different sources, are treated as imperfect substitutes.

⁶ For more detailed information on the model and its database, see www.gtap.org.

⁷ More detail is available at <http://www.cepii.fr/anglaisgraph/bdd/macmap.htm>.

⁸ For the EU, the source the OECD database is the EAGGF disbursements for 2001.

implementing any major reform of agricultural policies. Calculations by Jensen and Zobbe (2005), which take into account reforms of agricultural policy such as the Mid-Term Review in the EU and the 2002 US Farm Bill, confirm the findings of Brink, but they also show that many other countries, even those with relatively low domestic support ceilings, have high levels of overhang in their AMS.

Francois *et al.* (2005) point out that, while tax/subsidy equivalents have become the accepted measure of policy instruments in this area, the OECD PSE data used in the construction of domestic support data in GTAP do not correspond to the WTO boxes. Their agricultural liberalisation scenarios are implemented as cuts to overall domestic support, with no attempt to distinguish between allowed and disciplined subsidies nor between the direct payment and market price support elements of the AMS.

Dimaranan *et al.* (2003) adapt the standard GTAP model to better represent and model reforms to domestic support in OECD countries. They incorporate new substitution and factor supply elasticities into the model and modify the factor supply and demand structures. They simulate several stylised reforms, focussing on the responsiveness of farm incomes to the choice of domestic support instrument targeted.

Rae and Strutt (2003) consider land- and capital-based payments to be proxies for the blue and green boxes and output and intermediate subsidies as approximating amber box payments. The remaining element of AMS support, market price support, is accounted for via trade policy instruments implicitly based on border protection. However, as Jensen (2005) indicates and is discussed in the next section, in GTAP approximately half of green box support is modelled as output and intermediate input subsidies. The approach of Rae and Strutt therefore overestimates the size of amber box support in the GTAP database.

Bouet *et al.* (2003) update the GTAP version 5 database with data from MAcMaps but they do not take account of the WTO boxes in their treatment of domestic support. To model the Harbinson proposal of a 60 per cent cut to the amber box and a 50 per cent cut to the blue box, they implement a 55 per cent reduction to all subsidy rates in agricultural commodities.

To address some of the disadvantages of this approach, in a later paper Bouet *et al.* (2004) construct an extensive domestic support database based on OECD PSE estimates. This allows them to take into account both domestic support overhang and to distinguish between the boxes. Anderson *et al.* (2005) and Jensen and Yu (2005) follow similar approaches. Anderson *et al.* (2005) employ the World Bank's LINKAGE model. Only trade distorting support is reduced and, based on calculations by Jensen and Zobbe (2005), they take account of the degree of domestic support overhang and reduce trade-distorting support only. Using the GTAP model and database, Jensen and Yu (2005) calculate the level of overhang and distinguish between the boxes for the EU as they model different options for reforming EU agricultural policies in the context of the July Framework Agreement.

Hertel and Keeney (2005) employ an extended version of the GTAP model, combined with updated data on the initial levels of domestic support data and an improved representation of payments that are partially decoupled from production.⁹ However, as they simulate a complete elimination of current agricultural support, the degree of overhang and different boxes are not taken into consideration. They find the contribution of domestic support to the total welfare

⁹ The GTAP-AGR model features a more detailed representation of agricultural production and farm households. It is documented in Keeney and Hertel (2005).

change from liberalisation to be 5 per cent (removing agricultural tariffs and the elimination of export subsidies contribute 93 per cent and 2 per cent respectively).

Another issue that needs careful consideration in liberalisation scenarios is the modelling of decoupled payments. Even decoupled payments are likely to affect production decisions, although the magnitude of this effect is uncertain (FAO, 2004). To the extent that countries change explicitly trade-distorting payments into decoupled payments in response to future WTO disciplines rather than eliminate them, the simulated impact of the policy change will depend on how these green box payments are modelled. Jensen and Frandsen (2003) implement the decoupling of direct payments in the EU by transferring direct payments into a uniform payment to agricultural land. Because land has no other use outside of agriculture, this treatment implies no production response. Bouet *et al.* (2004) model decoupled payments as a payment to self-employed labour. They argue that, although this may result in some other resources being pulled into agriculture as the sector is still subsidised, this is realistic as no payments can be completely decoupled from production. The impact of simulating a reduction in domestic support which is brought about by 'box shifting' and an increase in green box payments will thus depend on the way these payments are modelled.

3. Construction of a Domestic Support Dataset and its Implications

3.1 Construction of the Domestic Support Dataset

Members must annually notify the WTO of their current levels of domestic support. These notifications are the primary data source used in this study, other than the GTAP database itself. They are used to assemble a domestic support dataset for the five countries providing the highest levels of support to their agricultural producers in absolute terms: the European Union (EU),¹⁰ the United States of America, Japan, Canada and Brazil. Although for some of these countries more recent figures are available, notifications for the year 2001 are used to enable better comparison with the current GTAP database.¹¹

Based on these notifications, a detailed dataset of the domestic support for each country is constructed. Table 1 summarises the total value of current domestic support in each of these regions, broken down into amber, blue and green boxes as well as de minimis. The amber box is further disaggregated to show the separate contributions of market price support and direct payments. Not included in this Table are Brazilian payments to development programmes, which are excluded from reduction commitments under special and differential treatment for developing countries under Article 6.2. These payments were valued at \$375 million in 1998.

The values in the table are the total values for each country. The figures can be further broken down to indicate the total for each commodity reported, distinguishing between product specific and non-product specific support. For the EU, product specific EMS¹² is considered equivalent to AMS, hence all figures for AMS are in the sum of EMS and AMS. The table shows the sum of

¹⁰ We consider an EU of twenty seven members in this paper – the current EU25 plus Bulgaria and Romania. Figures for the EU27 are based on the assumption that commitments for the enlarged EU are the sum of those for the old EU15 and the twelve new members.

¹¹ The most recent notifications available for Brazil and Canada are 1998 and 1999 respectively. For 2001, the EU15 reports as a single entity. Those countries that acceded to the EU in 2004 reported separately. Among EU countries, the most recently available year for Malta and Latvia is 2000. No figures are available for Lithuania. WTO (2005) is also used in case of missing data for some regions.

¹² The equivalent measure of support (EMS) measures the value of policies extended to producers that cannot be calculated based on the method used for AMS (Goode, 2003). Of the five countries examined in this paper, only the EU makes use of this measure.

total AMS across all commodities. In the calculation of current total AMS, some support is excluded if it falls below the *de minimis* threshold level.

The calculation of the threshold level requires data on the value of production for each commodity. This data is also included in the dataset, taken from EAGGF reports (EC, 2003) and the OECD (2002a) in addition to the notifications.

As was noted in section 2.2, the direct payments component of domestic support in the GTAP database is allocated to four categories of subsidies: output, intermediate input, land-based and capital-based. Table 1 also shows the total value of domestic support in the GTAP database and the breakdown into those four subsidy categories.

A comparison of data from the WTO notifications and the GTAP database in Table 1 shows considerable differences. The main source of the differences in trade distorting support arises from the exclusion of the AMS market price support component in GTAP.¹³ In addition, whilst a substantial share of green box measures is represented in the database, others are excluded leading to another source of the differences between the figures.¹⁴

To enable a better comparison and to be able to run simulations on this data, the domestic support data in GTAP are allocated to amber, green and blue boxes supports for each region in the construction of the domestic support dataset, based on Jensen (2005) and Young *et al.* (2002). Jensen provides the allocation of PSE commodities to the GTAP subsidy categories used in the construction of the database for EU members. Given this, it is possible to allocate the output, export, intermediate and land and capital based subsidies to the boxes. For the other regions examined here, this process is simplified as they did not make use of the blue box in 2001 (with the exception of payments to rice producers in Japan). Young *et al.* provide a classification of subsidies that further aids this process. The resulting allocation is shown at the end of Table 1.

3.2 Differences between Bound and Applied Levels of Domestic Support

Following the URAA, WTO members agreed to bind and cut their levels of trade distorting support to agriculture. For industrialised countries, the final phase of those reductions was implemented in 2001. The bindings act as a ceiling that members may not breach. For many countries, the level of their actual amber box payments is lower than their bound commitments. Table 1 shows the extent of this binding overhang in the countries examined in this paper.

As Table 1 indicates, there is clearly substantial scope for Canada, Japan and, to a lesser extent, the US and EU to cut bound levels of support without the need to reform current agricultural policies. It should be noted that, as Brazil is a developing country, its bound level for 2001 is not final and will be reduced further to \$912mn by 2004. At 2001 levels of actual protection, this still implies a 90% degree of overhang.

3.3 The July 2004 Framework

The agreement reached by ministers in July 2004 provides the framework for negotiations towards a final agreement on agricultural trade in the Doha Round. Although containing few

¹³ Domestic support in the model and database is based on the OECD's PSE categories B to H. Market price support (category A) is not included in GTAP, other than an implicit representation through border protection.

¹⁴ For example, a measure excluded as it is classified in category R in the OECD database is domestic food aid and assistance programmes in the US which are valued at over \$10bn in 2001.

specific figures, the Framework¹⁵ lays out the broad structure of such an agreement. Its domestic support proposals are outlined here and are assessed in the context of the current levels of domestic support as discussed in the previous section.

The Framework envisages substantial cuts in overall distorting support (ODS – measured as the sum of amber box supports, *de minimis* and blue box payments). These reductions will be based on a tiered formula such that those members with higher levels of support will implement the largest cuts.¹⁶ This is to be achieved via a reduction in bound commitments and by cuts in two of the components of ODS – current AMS and *de minimis*. There will be a downpayment reduction of 20% in the first year of implementation.

The amber box (bound total AMS) is also to be cut based on a tiered formula. Product specific support to individual commodities is to be capped to prevent shifting support between commodities. In addition, there may also be product specific cuts agreed for some commodities (WTO, 2004). The *de minimis* threshold is also to be reduced. We interpret this to imply a linear cut.

Blue box support, the final part of ODS, is to be capped at 5 per cent of the value of total agricultural production. The contribution of the reduction of blue box payments to the overall reduction target is to be measured against the higher of the existing level of payments or the 5 per cent cap.

The reductions in amber box, *de minimis* and blue box must sum to equal the target reduction in ODS. If this overall target is not achieved, deeper cuts in one or more of the components of ODS are required.

Table 1 indicates the levels of ODS in 2001 for the countries in this paper. The most significant difference between bound and actual ODS is due to differences between bound and actual total AMS. The use of *de minimis* also creates some divergence between the two.

As Table 1 shows, there is considerable scope for countries to cut bound commitments with little or no impact on actual levels of support. Blue box payments are under the 5 per cent threshold in all regions except for the EU. The USA notified no support measures under the blue box to the WTO in 2001. Roberts (2005) calculates that countercyclical payments, the most likely source of future blue box provisions under new farm legislation, would not exceed the 5 per cent limit. In the case of the EU, the majority of current blue box support is due to be decoupled from production and transferred to the green box (therefore excluded from ODS). If we assume that the EU implements 100 per cent decoupling and the pre-decoupling level of support is used as the base against which to measure reductions, not only does the blue box no longer exceed the 5 per cent cap, it also further reduces actual ODS to \$38bn. In this scenario, the EU's degree of overhang is increased to 56 per cent.

4. Methodology

4.1 Aggregation and Closure

The GTAP aggregation used in this paper is shown in Table 2. The regional aggregation focuses on the five countries discussed in the previous section: EU, US, Canada, Japan and Brazil. Other

¹⁵ Available online at: http://www.wto.org/english/tratop_e/dda_e/draft_text_gc_dg_31july04_e.htm.

¹⁶ It is not clear from the text whether higher support levels refers to AMS in absolute or relative terms.

major agricultural producers identified are Australia-New Zealand and Rest of Mercosur. China and the Everything But Arms (EBA) group of countries are also separately distinguished. At the sector level, all twelve primary agricultural commodities in GTAP are kept separate, as well as the six food-processing sectors such as beef and sheepmeat and dairy. Manufacturing and services are aggregated into one consolidated sector each.

A standard medium-term, general equilibrium closure is assumed. All prices (except the numeraire), regional incomes and quantities of producible commodities are endogenously determined. Tax and subsidy rates, regional trade balances, technology and factor endowments are fixed exogenously. Labour and capital are perfectly mobile within regions, whilst land and natural resources are sluggish (imperfectly mobile). No factor endowments are mobile between regions and all are fully employed within regions. Investment is assumed to be savings-driven.

4.2 Extension of the Standard GTAP Model

The standard GTAP model is extended to incorporate an explicit representation of the market price support element of the AMS. The calculation of the value of market price support, summed together with the appropriate, non-exempt direct payments, enables the calculation of AMS in the model. *De minimis* thresholds are also modelled for each commodity. Combined with data from the domestic support dataset described in the previous section, the amber, blue and green boxes can now be accurately represented and distinguished at the GTAP aggregation level.

For the calculation of market price support, applied administered prices and external reference prices are exogenously read into the model. As all prices in the model are initially equal to one, the applied and external reference prices are adjusted relative to those prices.¹⁷ The domestic market price received by producers in the model is assumed to be equivalent to the producer price as reported by the OECD.¹⁸

The linkage between domestic market prices and applied administered prices is introduced to the model via a complementarity function (Harrison *et al.*, 2002). The complementarity function is a recently developed feature of the GEMPACK (Harrison and Pearson, 1994), the software that is used to implement the GTAP model.¹⁹ It allows CGE models containing inequality constraints or non-differentiable functions to be solved.

The use of the complementarity function ensures that, if the market price of a commodity falls sufficiently, this will result in a cut in the commodity's applied administered price for the purposes of the AMS calculation, thus endogenously reducing the level of total AMS. This approach makes an explicit assumption about the reaction function of policy makers. To take the EU as an example, if the market price falls below the administered price (which is the intervention price), this would lead to a build up of stocks to unsustainable levels. Policy makers are then assumed to react by lowering the intervention price.²⁰

¹⁷ Consider an example of common wheat in the EU. The producer or farm gate price is €118/t and the applied price is €101/t (these are post-Agenda 2000 reform prices). If the initial market in the model is 1, the adjusted relative applied price is 0.85. The same calculation is made for the external reference price.

¹⁸ For refined sugar in the EU, the applied price exceeds the domestic market price due to levies on A and B sugar (EC, 2004). We assume the applied administered price to be equal to one.

¹⁹ This method is not the same as the complementarity algorithms used in GAMS (Harrison *et al.*, 2002).

²⁰ Alternatively, export subsidies may be used to dispose of surpluses. In the case of the EU, van Meijl and van Tongeren (2002) model the price transmission between market and intervention prices and the gap between them as a function of the EU's net exports.

In addition to these modifications made to the model to represent the amber box, the model is also adapted to take account of decoupling of direct payments in the European Union, as foreseen under the Mid-Term Review (MTR) of the CAP. Following the approach of Jensen and Frandsen (2003) and Conforti and Salvatici (2004), decoupled direct payments are modelled as uniform payments to agricultural land across all sectors in the EU – “the single farm payment”. The justification for this approach is that land must be kept in good agricultural condition to receive the payment and that land has no other use outside of agriculture in GTAP.

4.3 Baseline Pre-Experiment

A detailed pre-simulation experiment is implemented to construct a baseline against which to compare the results of the simulations in the paper. The baseline introduces changes to the policy landscape that have already taken place since 2001 (the base year of the Version 6 GTAP database) or that are expected to occur during the following years. The baseline focuses on policy changes; changes in household preferences, technology or macroeconomic conditions are not included. The policy changes included in the baseline are: the accession of the People’s Republic of China to the WTO in 2001; the completion of the Agenda 2000 Reform of the CAP; the eastern enlargement of the European Union; the Mid-Term Review of the CAP reform (including decoupling of direct payments from production); the complete implementation of the EU’s Everything-But-Arms (EBA) agreement and the elimination of MFA textile quotas.

5. Simulations and Results

Two sets of simulations are implemented. The first set of simulations focuses on the domestic support pillar of the URAA only (referred to as Single-Pillar Simulations hereafter). These simulations focus on methodology, they identify and illustrate the three issues in modelling domestic support addressed in this paper. The second set of simulations is composed of two experiments that model the interaction between domestic support reductions and liberalisation of the other two pillars, i.e. market access and export competition (referred to hereafter as Three-Pillar Simulations).

5.1 Single-Pillar Simulations

5.1.1 Experiment Design

There are four single-pillar simulations as summarised in Box 1. Beginning with a simple domestic support reduction based on the standard GTAP dataset, successive simulations build on this to illustrate the importance of domestic support overhang, the accurate distinction of the boxes and modelling both the direct payment and market price support elements of the amber box.

These experiments do not focus on simulating particular policy scenarios. They draw inspiration from the July 2004 Framework as discussed in the previous section. Cuts are implemented based on tiered reductions in ODS. However, there is no consideration of the different elements of the ODS, all regions are assumed to reduce overall domestic support by the headline ODS rates. Nor is the sensitivity of products considered, all reductions are linear across commodities within each region.

The first simulation is implemented with the standard GTAP dataset. All domestic support measures in the GTAP database, the direct payments modelled as output subsidies, intermediate input subsidies and land- and capital-based subsidies, are reduced by the headline reduction

targets assumed for ODS. The assumed cut is 90 per cent for the EU, 80 per cent for the US and Japan, and 70 per cent for Canada and Brazil. This simulation acts as a base case, illustrating cuts in bound rates implemented on domestic support as represented in the standard GTAP database, against which to compare the results of the following experiments.

Simulation 2 also employs the standard version of the dataset, however, in this case the degree of domestic support overhang is taken into account. The reduction in actual ODS required to meet the cut in bound level of ODS is calculated. As indicated in Table 1, the levels of actual and bound ODS vary widely between countries. For example, in the case of the US, the 80 per cent cut in the bound level requires a 76 per cent reduction in actual ODS, while for Japan and Brazil the degree of overhang is such that they do not make any cuts in actual domestic support to achieve the target reductions. A comparison of the results from simulation 1 illustrates the relative importance of the issue of overhang in modelling domestic support.

In the first two simulations, all measures of domestic support in the GTAP database are reduced by the target amounts. In simulation 3, we distinguish the different boxes in the database based on the classification of subsidies in the domestic support dataset described in section 3.1. For all regions, green box measures notified to the WTO account for 50 per cent or more of total notified domestic support. Only two regions (Japan and the EU) make use of the blue box in 2001.²¹ The same applied cuts as in simulation 2 are implemented, but only amber box and blue box direct payments are cut by the target percentage (the market price support element of the amber box is not cut). Thus, green box supports are excluded from reduction.

Box 1: Summary of Single-Pillar Simulations

Simulation 1:	Headline cuts in bound ODS . Applied to all domestic support in the standard GTAP model .
Simulation 2:	Degree of domestic support overhang taken into account. All domestic support in the standard GTAP model is cut by the applied rates.
Simulation 3:	Domestic support reduced by applied rates . Only amber box (coupled) direct payments and blue box are reduced. Standard GTAP model employed.
Simulation 4:	Domestic support reduced by applied rates . GTAP model extended to incorporate market price support . Only amber box supports reduced , by the same rate as Simulation 3. Coupled direct payments and market price support cut equally .
Domestic support reductions in Simulations 1-4 are linear cuts across all products. Regions are placed in tiers depending their relative levels of protection: 90% (EU) / 80 % (USA and Japan) / 70% (Canada and Brazil)	

Simulation 4 employs the extended GTAP model described in section 4.2. This allows market price support changes to be modelled. In this simulation, domestic support is reduced by the applied rates, taking into account the degree of overhang, and the cut only targets the amber box. The reductions in the amber box are the same as those in simulation 3. However, these cuts are now applied equally to the market price support and non-exempt direct payment elements of the

²¹ The simulation is based on post-baseline data. It incorporates the transfer of decoupled direct payments in the EU from the green to the blue box and increases the degree of overhang for the region.

AMS, whereas in the previous simulation the reduction in amber box support is achieved by cutting coupled direct payments alone. The exact contribution of each component to the total AMS cut will depend on their share of total amber box support in each region. The distribution of amber box support between market price support and direct payments in each region is shown in Table 1.

5.1.2 Results

The first set of single-pillar simulations examine the impact of domestic support reductions alone. As the focus of these simulations is on the techniques used in modelling domestic support, we do not dwell on the interpretation of the figures; rather we focus on comparisons of the change in welfare across the four simulations that allow an analysis of the three issues (Table 3). For this purpose, the results of simulation one provide a benchmark against which to compare the other experiments.

In simulation 1, all domestic support in the standard database is reduced by the headline rate. The world economy achieves welfare gains of almost \$6bn overall. This is driven by gains in the EU and US as these regions reduce their levels of distorting support (Figure 1). Most of this increase comes from improved allocative efficiency, allowing for a more efficient allocation of resources within countries. The EU enjoys the greatest allocative efficiency gain, as a result of being the region with the highest level of support and being placed in the top tier of domestic support cuts. The allocative efficiency gain for the Japanese economy is relatively smaller.

There is also a terms of trade effect from the liberalisation scenario, with mixed impacts across regions. In the EU, this effect makes a small negative contribution to welfare change. In Japan, the effect is also negative, but much larger. This drives the welfare loss for Japan from domestic support liberalisation in this simulation (Figure 1). The US enjoys a strongly positive terms of trade effect, even greater than the allocative efficiency effect in that country. These effects reflect the net trade position of the various regions, particularly for those commodities in receipt of domestic support.

For the other five regions disaggregated in this paper which do not implement any domestic support reductions, the terms of trade effect generally dominates their welfare changes.

In simulation 2, the degree of overhang in domestic support is taken into account in the calculation of the shocks to be implemented in the model. The domestic support reductions implemented are lower in this simulation compared to the first, and the total gain to global welfare is reduced to \$5bn (Table 3). This result holds across all regions except Japan (whose welfare loss increases) and the EBA group of countries (almost no change). If the headline reduction was any lower (and we have chosen figures at the high end of the likely range), the disparity between this result and Simulation 1 would be even greater.

As Figure 1 illustrates, the results in the EU and the US are again driven by allocative efficiency gains and a positive terms of trade effect in the US case, as in simulation 1. The increase in welfare loss for Japan is caused by a substantial decrease in allocative efficiency, from a small gain to large loss. As Japan has a high degree of overhang in domestic support, once this is taken into account in simulation 2, it can implement the bound cuts with no reductions in applied domestic support (the same is true for Brazil). Cuts in bound rates in simulation 1 generated small allocative efficiency gains. The elimination of these gains leads to an overall loss in allocative efficiency terms.

In the third simulation, only coupled (amber box) direct payments and the blue box are reduced by the applied rates. Because a substantial share of the blue box in the EU has been decoupled and transferred to the green box in the baseline experiment, this further reduces the amount of support cut in this simulation.

The overall welfare change is valued at \$3.3bn, lower than in the first two simulations, and the magnitude of the results for each individual region is also lower compared to simulation 2. Figure 1 shows that the decomposition of the welfare changes for the EU, the US and Japan remains the same as simulation 2 (as with the previous experiment, the degree of overhang in Japan and Brazil allows them to achieve the bound cuts without any reductions in applied rates).

Simulation 4 employs the extended model to reduce the amber box by same amount as the previous simulation. However, in this experiment the market price support and direct payments components of the amber box are cut equally (in simulation 3 the same cut is achieved by reducing direct payments only). The results show smaller impacts compared to simulation 3 (Table 3). The total welfare change to the world economy is \$1.6bn, approximately half the figure from simulation 3. This is because reducing the market price support component by reducing the applied administered price does not directly impact on production. The result is consistent across all regions and in the welfare decompositions (Figure 1).

A comparison across the four single-pillar simulations illustrates the impact on the simulation results of taking into account the issues of domestic support overhang, the distinction between the boxes and a more complete representation of the amber box instruments. The welfare gains are reduced overall, but the effects for individual regions are determined by the interaction of allocative efficiency and terms of trade effects.

5.2 Three-Pillar Simulations

The second set of simulations combine domestic support reductions with improvements in market access and export competition. In addition, the modelling of the reductions in domestic support is more detailed than in the single-pillar simulations. The July 2004 Framework Agreement provides the structure used to model the domestic support disciplines, although many assumptions must be made in order to generate a series of implementable shocks.

5.2.1 Assumed Structure of the July Framework

We follow the assumptions of Brink (2005) for the headline cuts based on the July 2004 Framework. Three tiers are assumed in the implementation of cuts in overall distorting support cuts, with reductions of 90, 80 and 70 per cent respectively. We assume that member countries are assigned to tiers based on their absolute levels of protection measured by their current level of bound ODS as shown in Table 1. On this basis, the EU is assigned to the top tier, the USA and Japan to tier two, and Canada and Brazil to the lowest tier.

The amber box is also to be reduced based upon a tiered formula. Although not specified in the text, the placement of tiers for cuts in AMS in this paper is assumed to be same for overall distorting support. The reductions assumed are 80, 70 and 60 per cent respectively for the three tiers. Blue box supports are reduced and capped at 5% of total agricultural production in 2001. A linear 60 per cent cut is imposed on *de minimis* support, the final component of ODS. The threshold is therefore reduced to 2 per cent for industrialised countries, and to 6 per cent for developing countries, based on the assumption of special and differential treatment.

Box 2: Summary of July 2004 Framework Assumptions on Domestic Support Reductions

Overall Distorting Support (ODS): reduction in tiers: -90% EU;
 -80% USA & Japan;
 -70% Canada & Brazil.

Current Total Aggregate Measure of Support (AMS): reduction in tiers: -80% EU;
 -70% USA & Japan;
 -60% Canada & Brazil.

Blue Box: capped at 5% of value of total agricultural production in 2001.

De minimis: linear 50% cut: threshold is reduced to: 2% for industrialised countries;
 6% for developing countries.

Green Box: no change.

5.2.2 Implications of this Framework

Given the reductions assumed in the headline cuts in ODS and AMS in the above section, members must then decide how to implement these cuts.

For the reduction in AMS, an initial comparison between the bound commitment and the current total level identifies the degree of overhang and actual cut necessary to achieve the target reduction. For the EU the implementation of CAP reform implemented in the baseline further increases the AMS overhang to 47 per cent compared to Table 1. The degree of overhang is sufficient for Japan, Canada and Brazil to implement the cuts to their bound AMS levels without reducing current total AMS.

Once the level of reduction required in AMS is calculated, countries face a choice in distributing the cuts across commodities. Reductions may be proportionate for all commodities (i.e. cut support to each product by the same percentage) or certain sensitive commodities may face less than proportionate cuts. We consider a scenario based on the latter option. Relative levels of current domestic support compared to total output value are used as a proxy for the sensitivity of each commodity. Products are placed in tiers depending on their level of sensitivity and deeper cuts are implemented for those commodities deemed less sensitive. In addition, product specific supports are capped at their 2001 levels to prevent shifting of support between commodities.

The countries also face a choice of how to implement this reduction. AMS can be cut by reducing non-exempt direct payments or by cutting market price support, or both. Under the assumptions made here, the USA and the EU must reduce current AMS by 60 and 62 per cent respectively, but their distribution of AMS between market price support and direct payments is markedly different (Table 1).

Countries are assumed to implement AMS cuts by reducing coupled direct payments initially. For some commodities, depending on the distribution of amber box support between coupled direct payments and market price support, even reducing direct payments to zero is not sufficient to achieve the target AMS cut. In such cases, it is assumed that the remainder of the cut is achieved by reducing the market price support element of the amber box. We chose this assumption on the basis that it reduces the interaction between the domestic support discipline and the market

access discipline in the simulation, but it is only one out of a number of strategies that affected countries might pursue. It also maximises the likely impact of domestic support reduction commitments.

The other components of ODS are also considered. As Table 1 showed, for all countries except the EU, blue payments were already less than the 5 per cent cap in 2001. For the EU, assuming decoupled support is classified in the green box, blue box payments will also fall below the new 5% cap with ease. This effectively becomes another source of overhang and therefore assists the EU in achieving its overall target commitment.

The effectiveness of a reduction in *de minimis* support is felt differently across regions. The reduction is particularly large in the US, owing to the fact that non-product specific support now exceeds the new threshold level. The interaction of reducing *de minimis* with the levels of current AMS is also modelled. For those countries with AMS commitments, any reduction in the threshold level results in an equivalent increase in current AMS as support payments, which previously fell below the *de minimis* level, now exceed the new threshold.

The sum of the reductions of the individual components of ODS are then compared to the overall reduction target (which depends on the tier in which the country is placed). If the overall target is not achieved, members must implement deeper cuts to some element or elements of ODS. Whether they choose to reduce AMS or blue box or *de minimis* further is at their discretion.

In the simulation described above, the only country of the five modelled here to achieve the final ODS target reduction is Japan. Further cuts are required for the US, the EU, Canada and Brazil. These countries are assumed to further reduce their amber box supports as a result, with the cuts applied equally to market price support and direct payments. For Canada and Brazil, linear 20 and 10 per cent cuts are implemented across all commodities respectively. For the EU and the US, the reduction is again implemented based on the sensitivity of the commodities. The US achieves the target by increasing the cut applied to non-sensitive products. The average cut to these products is now 85 per cent, compared to 80 per cent previously. For the EU, the depth of cuts to both sensitive and non-sensitive products is increased (average cuts are now 75 per cent and 90 per cent).

These assumptions can be altered, but they illustrate the extent to which any ex-ante assessment will have to make assumptions about how cuts in ODS and its components are implemented even when the headline reductions are known. The calculations are made outside of the model to avoid an aggregation bias,²² and the data are then aggregated to the level of the agricultural sectors in GTAP to produce estimates of total AMS for each sector (12 sectors). For the calculation of applied prices and external reference prices for GTAP sectors, production tonnages are used as weights to calculate average prices. As part of this aggregation process, non-product specific support for a country is distributed across the agricultural sectors of each region based on value of production. It is modelled as direct payments in the form of output subsidies to each commodity.

²² Consider a simple example in the cereal sector:

Barley: AMS = €8; Production = €100. AMS exceeds the *de minimis* threshold (5%) and is included in total AMS.

Rye: AMS = €1; Production = €100. AMS falls below the threshold (5%) and is therefore excluded from total AMS. When these are treated as separate commodities, total AMS is equal to €8. However, if aggregated barley and rye are aggregated to create a new sector ("Other Cereals"): AMS = €8+€1; Production = €200. AMS now falls below the *de minimis* threshold and therefore total AMS will be €0.

Further information on the data and assumptions can be downloaded from www.tcd.ie/economics/staff/kwalsh2/domesticsupport.php.

5.2.3 Three-Pillar Simulations

Simulations 5 and 6 implement reductions in domestic support combined with disciplines on market access and export competition for agricultural goods (summarised in Box 3). In both simulations, these are modelled as a linear 50 per cent reduction of global agricultural import tariffs and the elimination of export subsidies on agricultural goods by all countries. This is an illustrative cut in applied tariff rates and the degree of tariff overhang is not explicitly considered, nor is any special and differential treatment for developing countries implemented. The only difference between the two simulations is the treatment of domestic support.

Box 3: Summary of Three-Pillar Simulations

<p>Simulation 5:</p>	<p>Standard GTAP model</p> <p>Market access: 50% linear cut in global agricultural import tariffs.</p> <p>Export competition: Elimination of export subsidies on agricultural products.</p> <p>Domestic support: All support in the standard model cut by headline bound ODS rates. Regions placed in tiers based on level of current protection. Reductions are linear across commodities.</p>
<p>Simulation 6:</p>	<p>Extended GTAP model incorporating market price support.</p> <p>Market access: 50% linear cut in global agricultural import tariffs.</p> <p>Export competition: Elimination of export subsidies on agricultural products.</p> <p>Domestic support: Reductions based on the July 2004 Framework. All components of ODS considered. Regions placed in tiers based on level of current protection. Degree of overhang and necessary applied cuts calculated. Blue box capped, only amber box reduced. Cuts for individual products depend on product sensitivity.</p>

In simulation 5, the standard database is employed and domestic support is reduced by the headline bound ODS rates (90, 80 or 70 per cent cuts for the three tiers).²³ Domestic support cuts are the same as the first simulation described above, with all direct payments in the model being reduced and linear cuts implemented across commodities. The degree of domestic support overhang, the distinction between the boxes and the market price support component of the AMS are not considered.

Simulation 6 employs the extended GTAP model and database to implement a reduction in domestic support combined with the disciplines on market access and export competition in agricultural markets. The domestic support element of the simulation is structured on the July 2004 Framework, based on the assumptions outlined in section 5.2.1. Of particular interest in simulation 6 is the interaction between the AMS and import tariff reductions. Should improved market access for agricultural goods lead to domestic market prices falling below the applied

²³ Note that the EU, USA, Canada, Japan and Brazil liberalise all three pillars. Other regions only implement market access and export competition liberalisation as their domestic support policies are not modelled explicitly in this paper.

administered prices used to calculate the market price support component of AMS, we assume that this will lead to a further reduction in AMS by endogenously lowering the level of market price support.

5.2.4 Results

The results from the two Three-Pillar Simulations are shown in Table 4. In simulation 5, the gains to the world economy in welfare terms are valued at \$30bn. Allocative efficiency improvements are the main sources of welfare gain for the EU, Japan and Canada while, for the US and Brazil welfare gains are driven by improvements in their terms of trade. The latter two are net-exporters of many agricultural commodities and benefit from higher world prices received for their goods.

In simulation 6 the global welfare gain is reduced to \$24bn. With the degree of domestic support overhang and the exclusion of green box measures from reduction, the size of the cuts is considerably reduced. In addition, the option for countries to implement lower cuts on commodities deemed to be sensitive further shields sometimes high levels of support from deep cuts. Comparison across regions shows that this change is not uniform. The difference can be seen in the decrease in allocative efficiency gains between simulations for the EU and US. The terms of trade benefit to the US, as a net-exporter of many agricultural products, is also reduced, which contributes to the welfare change of the US decreasing by two-thirds in simulation 6 compared to simulation 5.

For the EU, the reduction in welfare from simulation 5 to 6 is only approximately 30 per cent. Aside from the reduced gains from improved allocative efficiency, there is also a reduction in the EU's terms of trade loss, which is mainly driven by the manufactured goods sector. This sector benefits from liberalisation as resources are reallocated from agricultural sectors and its output expands. The increased supply of manufactured goods reduces the price received by EU exporters on world markets. However, the fall in price is less in simulation 6 compared to simulation 5, contributing to the reduction in the welfare loss between simulations.

That the Japanese figure remains almost unchanged confirms the relative importance of tariff cuts compared to domestic support reductions for that country. Canada's levels of domestic support are low and few products have high levels of protection. Despite a relatively high degree of overhang there is little change between simulations. Most other regions see their welfare gains increasing (or losses decreasing) in simulation 6 compared to simulation 5.

Table 4 also shows an alternative decomposition of the welfare changes.²⁴ In place of decomposing the welfare results in terms of allocative efficiency, terms of trade and investment-saving effects, the results can be linked back to the initial shocks implemented in the experiment. In this case, the welfare change is decomposed into the effects of liberalising market access, domestic support and export subsidies.

As would be expected, the domestic support subtotal accounts for most changes between simulations 5 and 6. In the former, reductions in domestic support account for 20 per cent of the total welfare gains from liberalisation. This figure falls to 3 per cent in simulation 6. The

²⁴ A feature of GTAP / GEMPACK allows for the results of any particular shock in a simulation to be decomposed into parts known as "subtotals". The sum of subtotals need not necessarily equal the total result, as will be the case if all component parts of a shock are not specified. The result of a shock specified as a subtotal as part of larger simulation is equivalent to the result of implementing the same shock individually. See Harrison *et al.* (1999) for more detailed discussion.

improvements in market access remain almost unchanged in absolute terms at \$24bn, or 78 and 94 per cent of the total gains in simulations 5 and 6 respectively. The contribution of the elimination of agricultural export subsidies increases from \$440mn to \$713mn from simulation 5 to 6 (with its contribution to total welfare increasing from 1.4 to 2.9 per cent). This decomposition also confirms the importance of the contribution of improved market access towards welfare gains in Japan and the EU (and export subsidy elimination in the latter's case)

The final aim of simulation 6 is to observe the interaction between domestic support liberalisation and improved market access via the reduction in import tariffs. It is possible for a reduction in the tariff or export subsidy to reduce the domestic market price of a commodity to a level below its applied administered price. This would have the result of further reducing the value of market price support in the country in question, and thus also requiring a smaller reduction in the DP element of the AMS. However, this has not occurred in this simulation. The changes in market prices are not sufficient to reduce market prices below the applied intervention prices for any of the market price supported commodities in any region. The full effect of a 50 per cent reduction in import tariffs is not transmitted to the market price. For most commodities the change in price is less than 1 per cent in the EU and the US. This suggests that these tariffs contain a good amount of water, and that the effect of even a significant reduction in applied tariffs may have a relatively limited effect on producer prices in these regions.

6. Conclusion

This paper provides an analysis of the implications of domestic support disciplines as part of further agricultural trade liberalisation. Three major issues are addressed, the degree of domestic support overhang, the distinction between the agricultural boxes and the incorporation of the market price support component of the AMS. Two series of experiments are run using the GTAP model, one to illustrate the effect of accurately incorporating these issues into liberalisation simulations, and the second to examine the interactions between stricter disciplines on domestic support and market access and export competition.

The results suggest that accurate modelling of domestic support reduces the impact of likely disciplines. Comparing simulations 5 and 6, the gain in total global welfare is reduced by 20 per cent between the simulations, with even larger reductions for some regions such as the US or EU. The contribution of domestic support reductions to global welfare change from agricultural liberalisation is reduced from 20 per cent to 3 per cent. These results, although based on illustrative improvements in market access, show that the impact of trade liberalisation from stricter WTO disciplines on domestic support measures is likely to be quite small. This confirms the finding of papers, such as Burfisher (2001), Hoekman *et al.* (2004) and Hertel and Keeney (2005), that the major gains from further agricultural liberalisation are expected to come from reductions in agricultural tariffs and other measures to improve market access. This paper shows that the effect of domestic support reductions is likely to be even smaller than previous research suggests.

Three further points can be made about this conclusion. First, treating direct payments as a policy wedge ignores any eligibility criteria which may influence the production response to the payments (e.g. land set-aside for arable payments or stocking rate restrictions for animal premia in the EU). To the extent that these eligibility criteria dampen the production response to amber or blue box payments, this reinforces the conclusion that their reduction will have only limited effects on world markets. Second, the simulations assume that decoupled payments are treated as green box measures and thus exempt from further reduction. Our simulations treat these payments as fully decoupled. To the extent that decoupled payments are assumed to have an

output response, this would further dampen the output, price and welfare effects of tightening domestic support disciplines. Third, developing countries, in particular, have been critical of the possibility of 'box shifting', arguing that giving farmers money, even if unrelated to production, will influence the amount produced. If the classification of decoupled measures as green box was challenged, or the criteria for green box measures strengthened, then this would increase the importance of domestic support disciplines beyond that set out in this paper.

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8. Tables

Table 1: Levels of Domestic Support in 2001
(Pre-Baseline Experiment - Millions of US dollars)

Domestic Support	EU	USA	Canada	Japan	Brazil	
Amber Box						
Bound AMS	65,383	19,103	2,893	32,691	997	
Market Price Support	25,085	5,826	284	3,235	15	
Direct Payments ¹	12,117	15,630	1,034	2,540	392	
<i>De Minimis</i>	411	7,043	846	555	379	
Current AMS ²	36,791	14,413	472	5,220	27	
Degree of AMS Overhang ³	44%	25%	84%	84%	97%	
Blue Box						
\$ Millions	21,262	0	0	749	0	
% Value of Agricultural Production	7%	0	0	1%	0	
Green Box						
	19,452	50,672	1,129	21,023	2,422	
Overall Distorting Support (ODS)						
Bound ODS ⁴	87,056	26,146	3,739	33,995	1,376	
Current ODS ⁵	58,464	21,456	1,318	6,524	406	
Degree of ODS Overhang ³	33%	18%	65%	81%	70%	
Domestic Support in GTAP						
Total	39,981	26,714	2,296	3,908	496	
<i>Output Subsidies</i>	3,800	9,537	263	1,465	496	
<i>Intermediate Subsidies</i>	1,227	1,161	80	300	0	
<i>Land-based Payments</i>	20,955	15,588	1,863	974	0	
<i>Capital-based Payments</i>	13,999	428	90	1,169	0	
Classification of GTAP Support to Boxes						
Amber Box	<i>Output Subsidies</i>	3,653	8,859	249	667	481
	<i>Intermediate Subsidies</i>	1,101	1,051	67	223	0
	<i>Land-based Subsidies</i>	103	486	403	907	0
	<i>Capital-based Subsidies</i>	905	392	84	989	0
Blue Box	<i>Output Subsidies</i>	0	0	0	750	0
	<i>Intermediate Subsidies</i>	22	0	0	0	0
	<i>Land-based Subsidies</i>	16,715	0	0	0	0
	<i>Capital-based Subsidies</i>	7,144	0	0	0	0
Green Box	<i>Output Subsidies</i>	147	678	14	798	15
	<i>Intermediate Subsidies</i>	104	110	13	77	0
	<i>Land-based Subsidies</i>	4,137	15,102	1,460	67	0
	<i>Capital-based Subsidies</i>	5,950	36	6	180	0

Source: GTAP Database, Domestic Support Notifications to the WTO (Various) and own calculations.

Note 1: Non-product specific support included in the direct payments category.

Note 2: Current AMS is the sum of market price support and direct payments less *de minimis* support.

Note 3: Overhang is the difference between applied and bound levels, expressed as a percentage of the bound total.

Note 4: Bound ODS is the sum of bound total AMS, *de minimis* and blue box payments.

Note 5: Current ODS is the sum of current total AMS, *de minimis* and blue box payments.

Table 2: Regional and Sectoral Aggregation

Regions	Sectors
European Union	Rice
United States of America	Wheat
Canada	Other Cereals
Japan	Vegetables and Fruits
Brazil	Oilseeds
Australia & New Zealand	Sugar Cane and Beet
Rest of Mercosur	Plant-based Fibres
Everything But Arms Countries	Other Crops
China	Cattle, Sheep and Goats
Rest of the World	Pigs and Poultry
	Raw Milk
	Silkworm Cocoons, Wool
	Beef and Sheepmeat
	Other Meat Products
	Vegetable Oils and Fats
	Dairy Products
	Processed Rice
	Sugar
	Manufacturing
	Services

**Table 3: Welfare Change in Simulations 1-4
(Millions of US dollars)**

Region	Simulation 1	Simulation 2	Simulation 3	Simulation 4
EU	4,608	4,457	2,858	1,200
USA	2,369	2,198	1,111	787
Canada	451	323	127	73
Japan	-323	-637	-225	-149
Brazil	484	344	67	35
Australia/New Zealand	382	313	86	46
Rest of Mercosur	319	275	79	47
EBA Countries	-129	-133	-82	-47
China	-404	-355	-89	-50
Rest of the World	-1,775	-1,673	-585	-339
World Total	5,984	5,112	3,348	1,603

Source: GTAP model simulation results.

Note: Welfare is measured as equivalent variation in millions of US dollars.

Table 4: Welfare Change in Simulations 5 and 6
(Millions of US dollars)

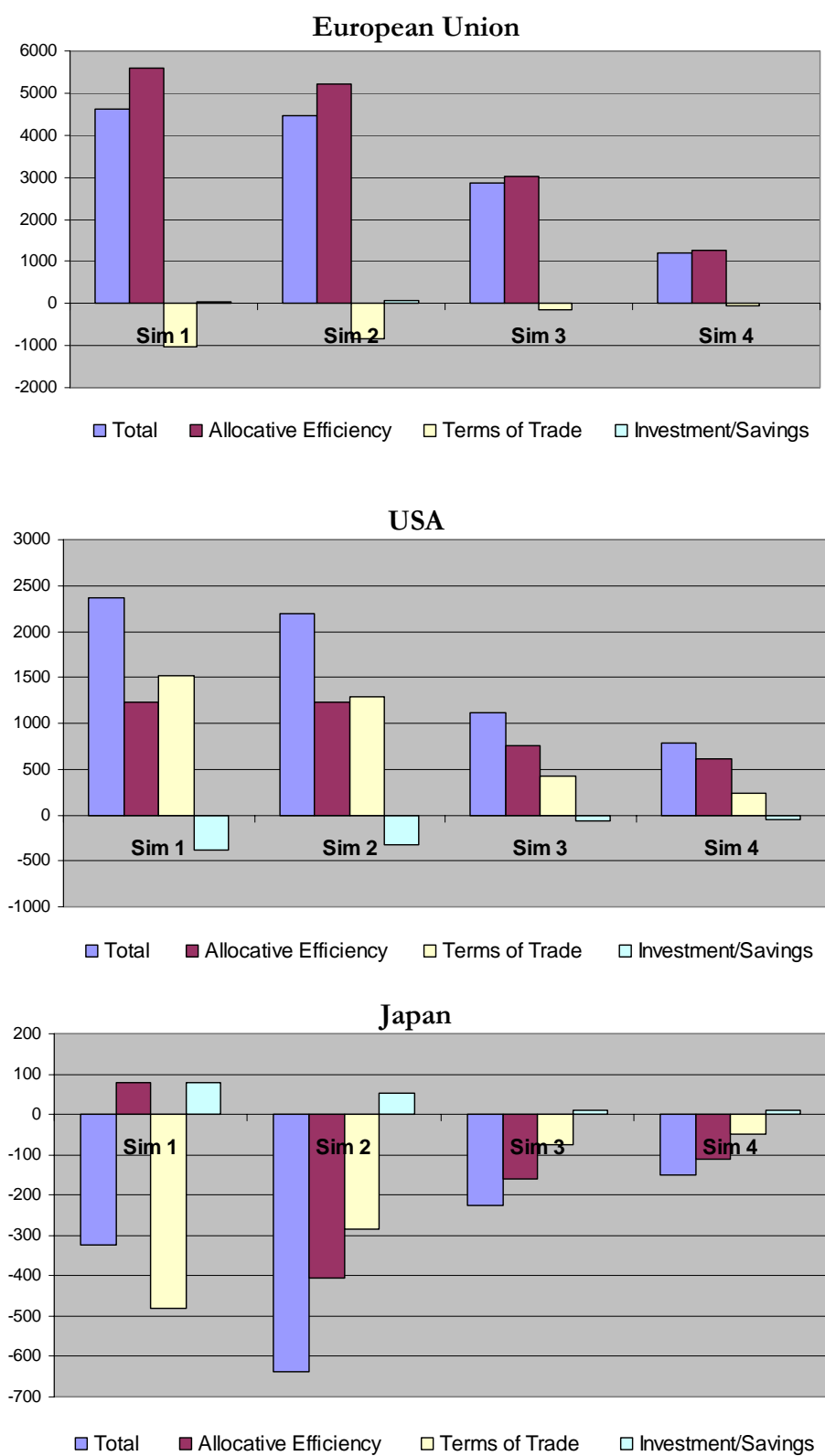
SIMULATION 5	Total	Domestic Support	Market Access	Export Competition	Allocative Efficiency	Terms of Trade	Investment-Savings
EU	11,342	4,160	4,709	2,473	12,789	-1,508	62
USA	3,333	2,421	961	-50	1,028	2,378	-74
Canada	843	391	499	-47	528	314	0
Japan	5,929	-376	6,772	-468	7,184	-1,329	73
Brazil	1,553	535	984	34	120	1,348	86
Australia/New Zealand	1,152	327	488	336	-60	1,231	-20
Rest of Mercosur	594	308	225	61	79	534	-19
EBA Countries	-243	-98	31	-176	350	-545	-48
China	287	-348	728	-93	454	-135	-32
Rest of the World	5,345	-1,231	8,206	-1,631	7,684	-2,310	-29
World Total	30,133	6,090	23,604	440	30,156	-22	0

SIMULATION 6	Total	Domestic Support	Market Access	Export Competition	Allocative Efficiency	Terms of Trade	Investment-Savings
EU	7,996	450	4,701	2,845	8,303	-351	44
USA	1,085	238	903	-56	-71	1,053	103
Canada	514	55	502	-44	512	3	-1
Japan	6,223	-124	6,823	-476	7,170	-982	35
Brazil	996	70	893	32	88	854	54
Australia/New Zealand	911	64	504	342	-58	987	-17
Rest of Mercosur	312	26	223	63	49	275	-12
EBA Countries	-116	49	21	-186	381	-459	-38
China	639	17	719	-97	586	132	-78
Rest of the World	6,335	-68	8,116	-1,714	7,946	-1,522	-89
World Total	24,895	779	23,406	710	24,906	-11	0

Source: GTAP model simulation results.
Note: Welfare is measured as equivalent variation in millions of US dollars.

9. Figures

Figure 1: Welfare Decomposition for Simulations 1-4



Source: GTAP model simulation results.

Note: Welfare is measured as equivalent variation in millions of US dollars.



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