

# **OTDS Reductions in the GTAP Database/Model:**

## **What can be done and how?**

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## Contents

1	Introduction.....	3
2	Domestic support in the WTO negotiations.....	4
2.1	Concepts of domestic support measurement .....	4
2.2	How to model domestic support in simulation models? .....	10
3	GTAP Framework and Extensions .....	11
3.1	The GTAP database and agricultural domestic support .....	11
3.2	The GTAP model .....	16
3.3	Limitations.....	19
4	Illustrative scenarios .....	20
4.1	Baseline 2020 .....	20
4.2	Doha scenario 2020 .....	23
5	Conclusion .....	28

## 1 Introduction

The WTO introduced a new round of negotiations in 2000. A central theme is the liberalization of the agricultural sector and specifically the substantial improvement of market access, the elimination of export subsidies, and a significant reduction of overall trade-distorting domestic support (OTDS). So far, analyses of the WTO negotiations mainly center on the effects of an increased market access and an elimination of export subsidies. Domestic support issues, however, have only received minor attention. The main reason for this is the difference in national domestic support programs, which can vary widely between countries. Hence, a country-specific coverage of domestic support in the model's data base and a corresponding country-specific modeling of domestic support issues would be required.

Domestic support is incorporated into the GTAP database in the form of price wedges. The underlying data is taken from the OECD's PSE tables where no distinction is made between the different WTO types of domestic support (AMS, blue box and green box). This in itself makes it difficult to model a reduction of OTDS which encompasses a total reduction in the sum of the final bound total AMS (Aggregate Measurement of Support) plus *de minimis* payments and blue box payments. Besides this overall reduction in domestic support, specific restrictions are also placed individually on the amount of support given as AMS, *de minimis* and blue box which complicates modeling WTO domestic support reductions in the GTAP database/model even further. Finally of course the WTO reductions in domestic support are reductions in bound levels of support which in many cases are higher than the actual support given in a country. This of course means that in some countries the reduction in bound WTO domestic support will not necessitate any change in domestic support.

Given this background, the first goal of this paper is a detailed representation of domestic support in the WTO negotiations (Chapter 2). Here, different approaches to measure domestic support are compared with the help of most recent available data. A brief literature overview additionally presents how other authors handle the analysis of domestic support in the analysis of WTO negotiations. Secondly, this study is aimed to extend the GTAP model with both a simple, but more explicit approach of modeling domestic support based on the WTO proposal. This procedure entails detangling the domestic support found in the GTAP V7 database. This part of the paper involves an extension to the GTAP model and the GTAP database (Chapter 3). The extended GTAP model is then employed to run a baseline and simulations on the WTO negotiation utilizing the proposal of December 2008 (Chapter 4). Here, the reduction of domestic support is based on the MTR reform of the CAP. Additionally, the analysis is enriched with tariff cuts implemented at the HS6 tariff line taking bound and applied rates into account. The results are used to evaluate the performance of the differentiated representation of domestic support in the GTAP framework (Chapter 5). A final Chapter will conclude the paper.

## 2 Domestic support in the WTO negotiations

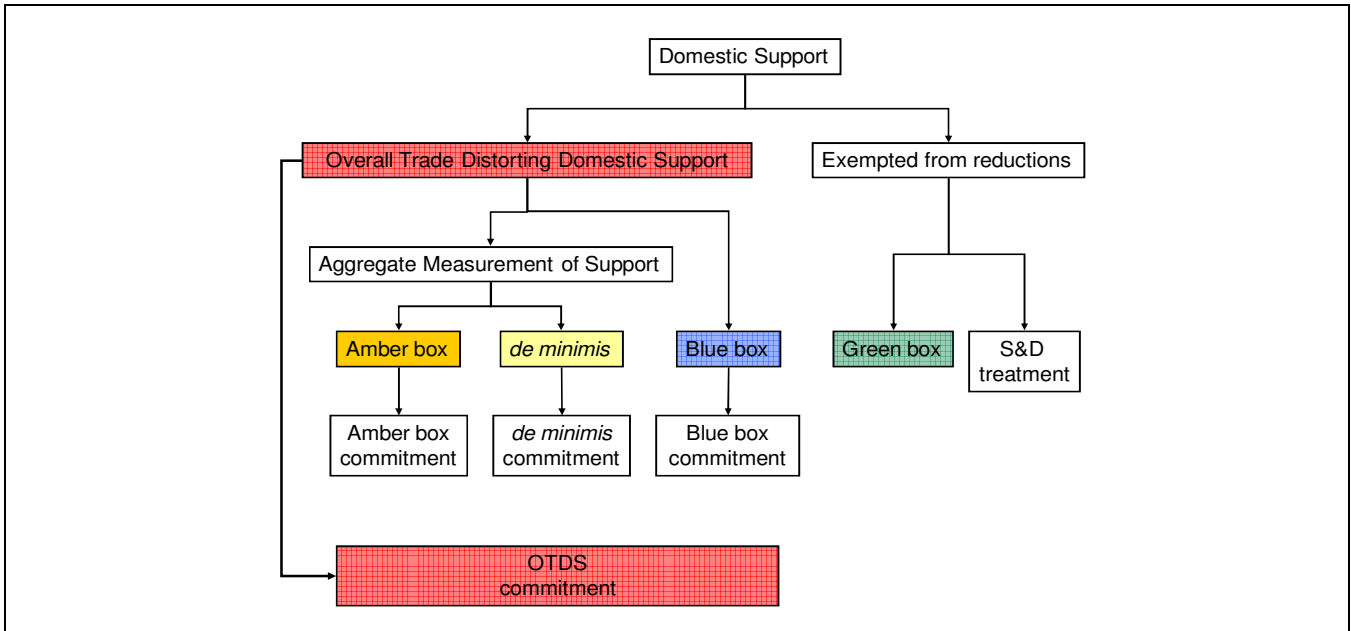
### 2.1 Concepts of domestic support measurement

Domestic support of the WTO negotiations refers to the annual level of support in monetary terms provided to agricultural production. The Uruguay Round of the previous WTO negotiations was the first serious attempt to impose disciplines on this domestic support provided to agriculture. The incorporated Agreement on Agriculture (AoA) embodies as a central concept the Aggregate Measurement of Support (AMS). In the current WTO negotiations this concept is refined and strengthened. The Ministerial Declaration of the Doha Development Agenda accordingly calls for "substantial reductions in trade distorting domestic support". These reductions in domestic support are further specified in the 2004 framework document for the negotiations together with several new ideas of great significance. In **Figure 1** the new categorization of WTO domestic support in the Doha Round is shown. A new measure for overall trade distorting support (OTDS) is introduced. It comprises amber box support plus blue box support plus *de minimis* payments and is bound by a commitment, which has not to be exceeded. Amber box support has to be further reduced in the WTO negotiations, and caps for the blue box and *de minimis* payments have to be observed. Only green box support and the support falling in the category of special and differential treatment are still exempted from reduction.

Not only the amount spent for domestic support issues differs a lot between countries, the grade of trade distortion of the measures used also varies significantly. Therefore, the proposals for the required reductions in the Doha Round are controversially discussed between the WTO members. Figure 2 depicts the AMS development in million US\$ for the years 2000 to 2006. Here, it becomes obvious that the EU has by far the highest support allocated to the amber box followed by the US and Japan. By contrast, Australia and New Zealand have only allocated a very small amount to trade distorting agricultural support that belongs to the amber box.

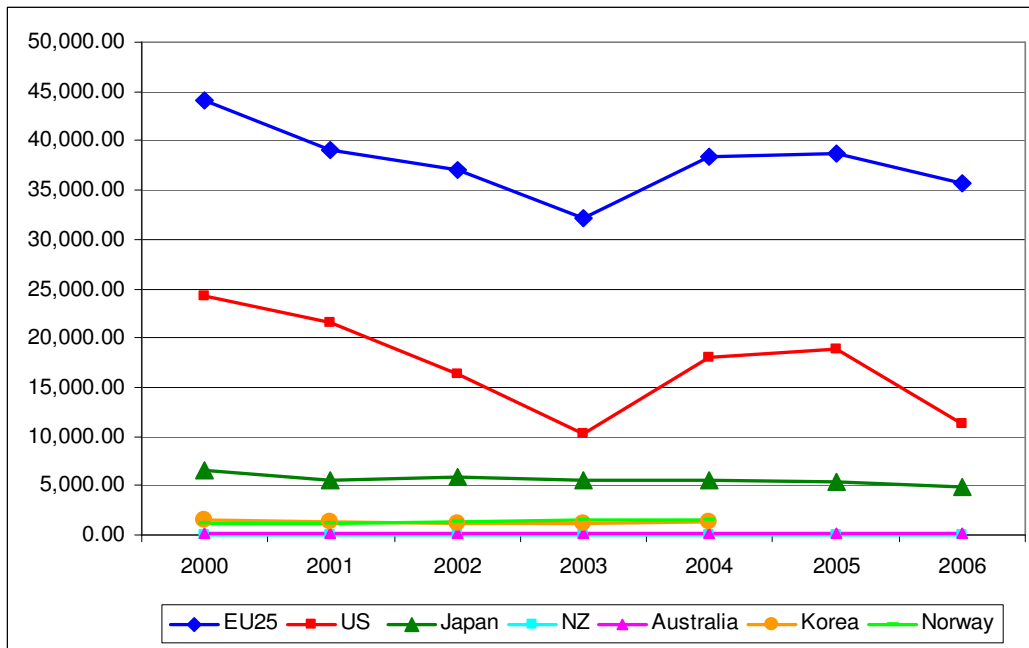
The structure of domestic support of the EU25 and the US is further compared in Figure 3. Remarkable is the very high green box support of the US which is in sharp contrast to the blue box support and less, but increasing green box support of the EU25. The US does not provide any blue box support and has more or less no *de minimis* payments (WTO, diverse years).

**Figure 1:** Classification of domestic support in the WTO negotiation



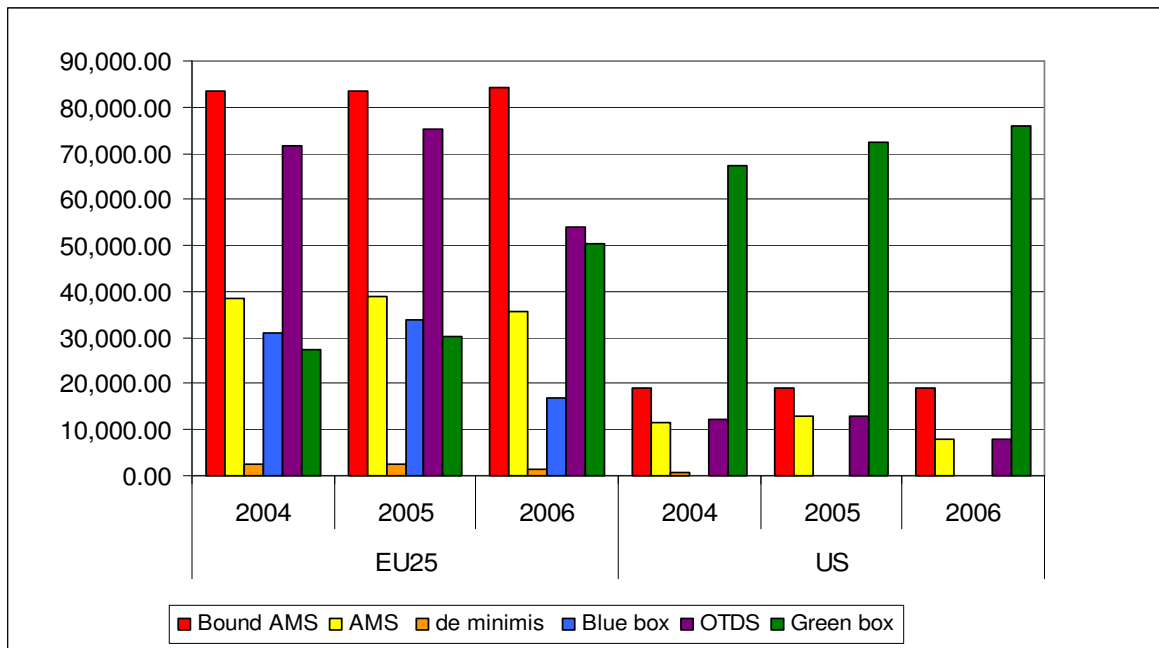
Source: Own illustration, 2009

**Figure 2:** AMS development (million US\$)



Source: Own calculation, 2009 based on the WTO notifications retrieved from [www.wto.org](http://www.wto.org).

**Figure 3:** Domestic support in the EU25 and the US (million US\$)



**Source:** Own calculation, 2009 based on the WTO notifications retrieved from [www.wto.org](http://www.wto.org).

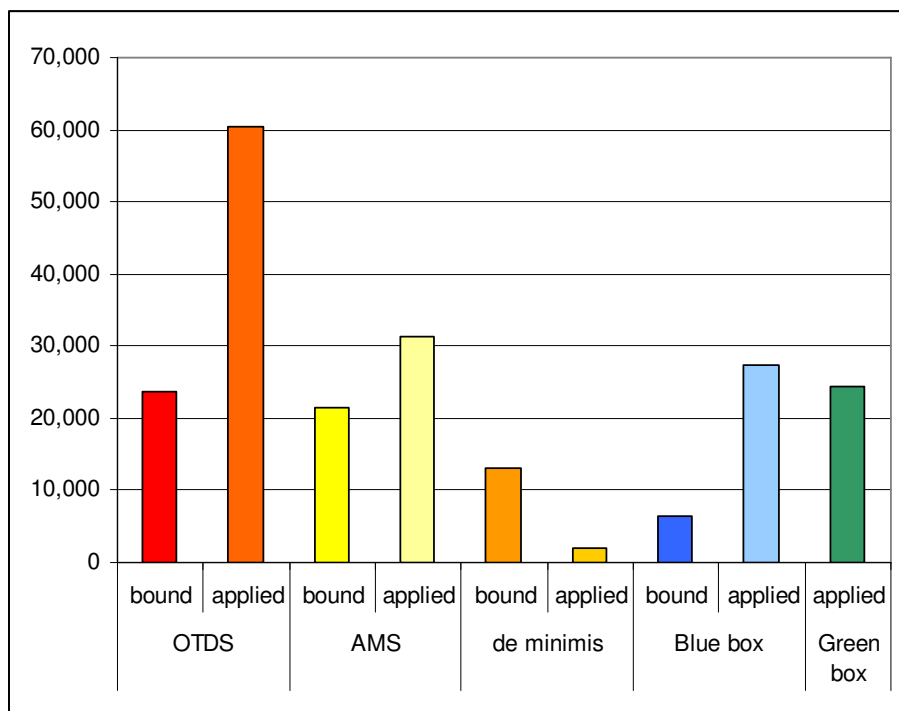
The WTO proposal on the draft modalities for agriculture from December 2008 (WTO, 2008) defines the bound OTDS. For developed countries<sup>1</sup> it has to be calculated by summing up the final bound total AMS of the Uruguay Round plus 10% of the average value of agricultural production in the 1995-2000 base period (referring to *de minimis* payments). In the case of EU25 the higher of average blue box payments as notified to the Committee on Agriculture has to be added. Other member states as for instance the US are allowed to use the option 5% of the average total value of agricultural production in the 1995-2000 base period<sup>2</sup>. The bound OTDS of the EU25 is higher than 60 billion USD and has therefore to be reduced by 80%. The new ceiling amount for the EU25 blue box payments are 2.5% of the average value of agricultural production in the period 1995 to 2000. The bound amount for *de minimis* payments is 10% of the average value of agricultural production in the period 1995-2000. It has to be cut down by 50% on the first day of implementation. The EU25 AMS ceiling from the UR has to be further reduced by 70%.

1 For developing country members it is 20% of the average total value of agricultural production in the 1995 to 2000 or 1995 to 2004 base period (WTO, 2008).

2 For developing country members the base period is 1995 to 2000 or 1995 to 2005.

In **Figure 4** domestic support values of the latest EU25 notification are compared to the new calculated ceiling amounts which are based on the draft modalities from December 2008.

**Figure 4:** Domestic support of the EU25 in the reporting period 2004/05 (million €)



Source: Own calculation, 2009

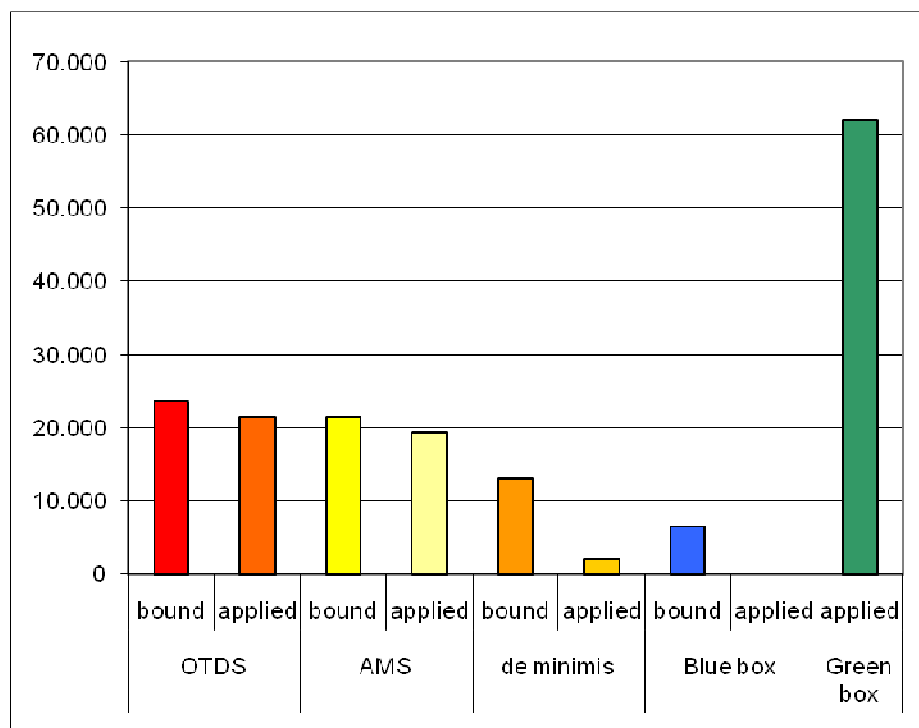
**Figure 5** gives a first impression of the effects that the recent reforms of the EU common agricultural policy (CAP) entail. The implementation of the mid term review (MTR) and the health check lead to a decoupling of the direct payments from production. This goes along with a shifting from initial blue box to the green box payments, which are exempted from reduction requirements.

Different measures are developed to quantify domestic support. One approach is the method of Producer Support Estimate (PSE) developed by the OECD. Another option is the WTO's Aggregate Measurement of Support (AMS), which was derived from the Producer Subsidy Equivalent<sup>3</sup>. Both concepts of measurement are indeed built on the same basis, but are differently extended afterwards. Hence, they are not comparable. The price gaps of the PSE calculation are estimated with reference to current domestic prices, while the AMS method uses a fixed reference to domestic administered prices of the year

3 The Producer Support Equivalent developed by the OECD was the first measure to quantify a countries domestic support. The Producer Support Estimate is based on this concept.

1986 to 1988. Furthermore, the PSE concept includes all direct payments, whereas the AMS excludes some of these and allocates them to green and blue box support. The PSE includes implicit monetary transfers from consumers resulting from import barriers. However, in the AMS calculation market price support is only defined, when an official administered price exists.

**Figure 5:** Domestic support of the EU25 after box shifting (million €)



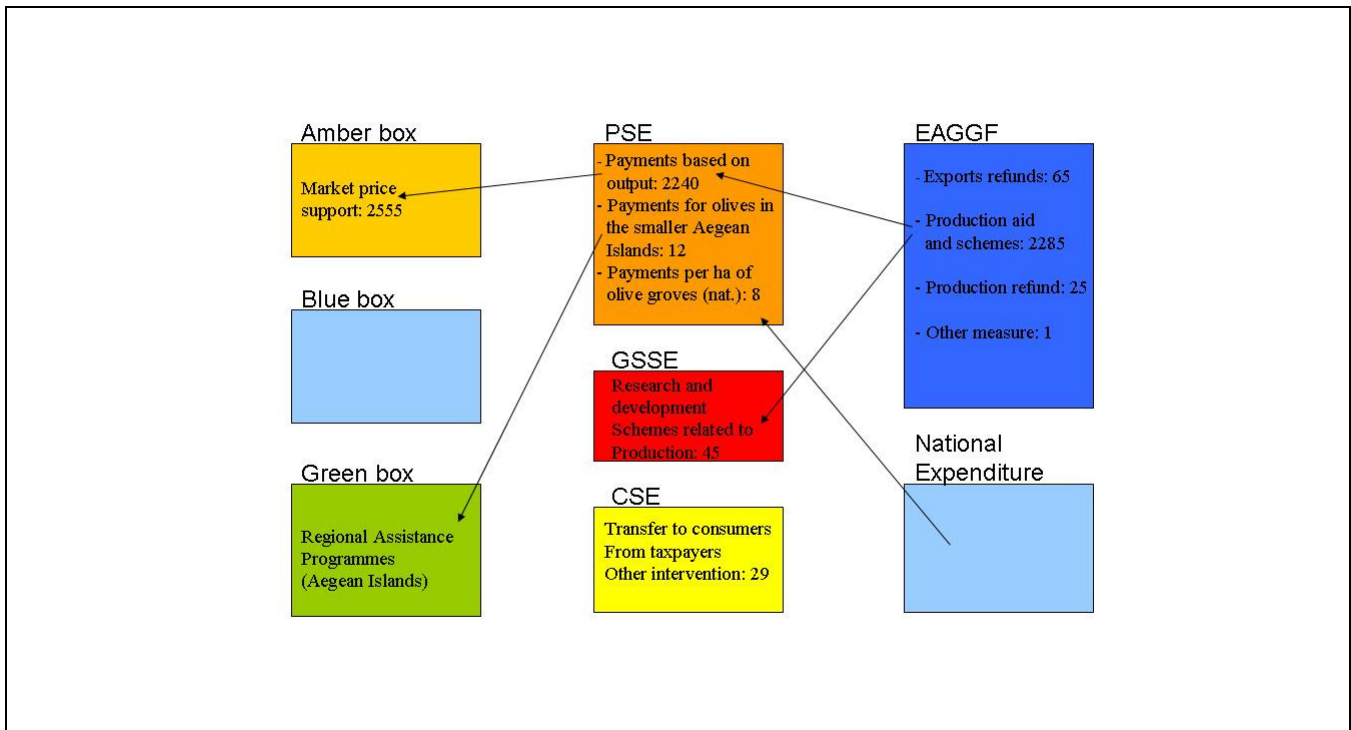
**Source:** Own calculation, 2009

Data from the yearly EU's financial reports are used officially to calculate both the PSE and AMS of the EU. But the case example of olive oil shows, that the support from the former EAGGF-fonds to the PSE and even more to the WTO concept is not easily retraced. In 1998 the number of policy instruments has already been reduced in the olive oil sector, and thus, production aid is left as the principal measure of assistance. This production aid was granted to all producers on the basis of the actual quantity produced. Public storage (intervention) was replaced by a system of private storage, while consumption aid was abolished. Within the scope of the MTR in 2003 the production aid was decoupled



from production and allocated to the single farm payment, except for support to less favored areas and the Aegean Islands. Furthermore, a share of the former production aid is to be used to maintain the local culture and tradition of olive groves.

**Figure 6:** Allocation problems between PSE and AMS concepts in 2004



**Source:** Own graphic, 2009

The allocation problems become visible in Figure 6. The different measures from the EAGGF can be related to the different categories of the PSE, GSSE and CSE of the OECD method, while the whole support to the olive oil sector is declared as market price support in the WTO concept and refers consequently to the amber box. This is induced by the calculation method of the AMS. As mentioned earlier, market price support is calculated using the gap between a fixed external reference price and the applied administered price multiplied by the quantity of production. Budgetary payments like storage costs, which are established to maintain this gap, are not included in the AMS. Moreover, non-exempt direct payments depending on a price wedge are calculated using the price gap between fixed reference and applied administered price, even if an administered price does not exist as in the case of the production aid for olive oil.

## 2.2 How to model domestic support in simulation models?

Particularly WTO member countries with high domestic support show huge differences in domestic support programs. Reforms of agricultural policies, like for instance of the EU CAP (AGENDA 2000, MTR and Health Check) or the US Farm bill increased the variation of agricultural instruments used to domestically support farmers. Hence, a more accurate representation of domestic support in simulation models needs a country specific modeling.

The standard GTAP model is not well-suited to analyze domestic support issues. Here, domestic support is incorporated in form of price wedges taken from the OECD PSE database, so that no distinction is made between the amber, blue and green boxes of the WTO. Additionally, market price support is only implicitly represented via border protection in the GTAP model. This alone makes it difficult to model the reduction in the OTDS, but the specific restrictions on domestic support make it even more complicated.

How can domestic support issues be implemented into the GTAP model in an appropriate way? Is it possible to model the OTDS defined in the framework document of the WTO, which needs a precise modeling of the different WTO boxes? How can we allocate the different kind of domestic support measures from the PSE tables to the WTO boxes and implement the policy changes like for instance a decoupling of direct payments correctly?

In the literature there are only a few examples on how domestic support issues can be modeled in GTAP. Most of them are built upon the already incorporated PSE data from the OECD. RAE and STRUTT (2003) for instance employed the standard GTAP model. The GTAP database covers the different components of the OECD PSE data except for market price support. Domestic support payments and the value of production, by commodity, are aggregated to map the GTAP agricultural commodities. They are then distributed into four classifications of domestic support (output subsidies, intermediate input subsidies, land-based payments and capital-based payments). The share of the total value of domestic support payments in the total value of production is calculated and the power of support is then applied to the value of output at market prices to determine the GTAP value of domestic support payments.

Furthermore, JENSEN and YU (2005) used the domestic support data from the OECD PSE tables. Contrary, WALSH, BROCKMEIER and MATTHEWS (2007) constructed a domestic support database, which consists of a detailed dataset for each country based on WTO notifications. They focused on the overhang in domestic support, the distinction of the boxes and the treatment of market price support in the amber box. Therefore, they extended the standard GTAP model with an explicit representation of the

market price support element of the AMS. The applied administered and external reference prices are exogenously read into the model. The linkage between domestic market and applied administered price is ensured by a complementary function. AMS is calculated as the value of market price support plus non-exempt direct payments, and the model is adapted to take the decoupling of direct payments in the EU into account.

BOUET et al. (2003) used the GTAP 5.2 database to model domestic support issues in the MIRAGE model. They updated the GTAP database with information about agricultural support from MACMaps. BOUET et al. (2005) further developed this approach with the help of the OECD PSE data. They represented domestic support in the EU and the US through a variety of instruments using original and very detailed data on the various policy tools. The data developed by BOUET ET AL. (2005) was made available for the GTAP 6 database. JENSEN and YU (2005) follow a similar approach. They however, specified the allocation of the EU domestic support from the OECD PSE database to the boxes. Particularly, blue box payments are modeled as input subsidies to agricultural land and output subsidies. For the MTR reform of the CAP they included an additional policy instrument that enables to pay a uniform land-based payment to the farmer.

In our paper we use the values of domestic support found in the OECD's PSE tables and add additional information to the GTAP data base, classifying payments by WTO boxes for the EU25. In addition we also make a simple extension of the standard GTAP model.

### **3 GTAP Framework and Extensions**

#### **3.1 The GTAP database and agricultural domestic support**

The starting point for this simulation is the GTAP version 7 database (Narayanan and Walmsley, 2008), which we have aggregated to 16 regions and 25 commodities. The focus in this initial paper is on agricultural domestic support in the European Union (EU), for which reason we have aggregated the individual 25 EU member countries into one region in the database and kept the primary and secondary agricultural commodities as disaggregated as possible (see aggregation template in the appendix).

As it is well known in GTAP circles, the agricultural domestic support found in the GTAP version 7 data base originates from the OECD's producer support estimate (PSE) tables for the year 2004. In the present version of the data base (April 2009), two versions of the OECD PSE tables have been used to calculate domestic support rates in the database, which is unfortunate. In all OECD countries, with the exception of the EU, the new 2007 revised PSE categories (OECD 2008) were used to calculate support levels for GTAP agricultural sectors. In particular, the new PSE categories of support are specified

into four types of support given to primary agricultural production, which in the GTAP database are allocated to primary agricultural commodities (pdy, wht, gro, vfn, osd, c\_b, pfb, ocr, ctl, oap, rmk, wol) in the following manner:

- Activity-specific payments: payments given to specific primary agricultural commodities.
- Group-specific payments: payments given to a group of primary agricultural commodities.
- Activity-generic payments: payments given to all primary agricultural commodities.
- Other transfers: payments given to all primary agricultural commodities as a homogenous rate of support to land capital and labor.

In the present version 7 GTAP database, the EU domestic support is calculated using the old 1999 PSE categories, which does not specify the four groups of support and, in particular, does not include “other transfers.” This last type of support is allocated in the GTAP database, as a homogenous rate of support to factor endowments (land, capital, and unskilled, skilled labor force) employed in all primary agricultural GTAP sectors. This relatively new OECD PSE classification of support, “other transfers,” is important in our representation of domestic support in the GTAP database since it is here that the OECD places the Common Agricultural Policies (CAP's) new decoupled single farm payment (SFP).

Because the domestic support for the EU in the GTAP database is based on the old PSE categories and does not include “other transfers,” we start by updating the domestic support for the EU 25 found in our aggregation of the database.

#### *Updating EU25 Domestic Support*

The starting point of this exercise is the OECD's dataset of PSE tables for the EU25, which can be downloaded from the OECD web site ([www.oecd.org/tad/support/psecse](http://www.oecd.org/tad/support/psecse)). This dataset is a complement to the report “Agricultural Policies in OECD Countries: Monitoring and Evaluation - At a Glance 2008,” published by the OECD.

Using this source data, and some time, it is possible to compile Table 1 below, which shows the values of support in the four groups of support for the EU25.

First, the single commodity transfers (SCT) are allocated to GTAP commodities in the table, where after the different support categories (B, C, D) are allocated to output, input, land-based or capital-based support payments in the GTAP database. Group commodity transfers (GCT) and all commodity transfers (ACT) are once again allocated to either input, land-based, capital-based, or labor-based domestic support payments in the GTAP database. Other transfer payments (OTP) are allocated to all endowments employed in the agricultural sector.

Table 2 shows the total value of production and support by GTAP commodity and the relative distribution of support in the GTAP database, compiled from the OECD's PSE tables. The ACT support payments are allocated to all 12 primary agricultural commodities found in the GTAP database, using their relative share of the total value of agricultural production in the EU25. GCT support payments are allocated to the primary agricultural GTAP commodities, in which the individual groups of commodities defined by the OECD in the PSE tables are associated. Last but not least, we have the other transfer payments (OTP) which, as mentioned before, are allocated in the GTAP database as a homogenous rate of support to all factor endowments employed in primary agricultural GTAP sectors. Finally, the total value of support for each primary agricultural commodity is simply found by adding up the support allocated to each commodity in the four types of support (SCT, GCT, ACT, OPT). We can now use this information to calculate the relative power of support by commodity and the share of support going to output, input, land, capital and labor-based payments.

This information is then used to update the version 7 database's domestic support representation to the new method. This is done by using a specially tailored version of the *Altax* program (GERARD 1998) that allows us to change the power of support by commodity and the relative shares of support allocated to output, input, land-based, capital-based and labor-based subsidies in the database.

When working with the OECD PSE data to calculate the new power of support and the allocation of support payments in the GTAP database it becomes easier to take the next step and try to group payments into WTO boxes (amber, blue, and green). The result of this exercise can be seen at the bottom of Table 2 where we have used the EU's notifications of domestic support to the WTO as guideline for the allocation of payments (WTO 2009).

Of course, there are problems when trying to allocate payments to these three boxes. It is easy to find the blue box payments in the OECD PSE tables but problematic with the amber box. This is highlighted with the example of olive oil (compare chapter 2.1) where the WTO amber box only includes the price wedge between the administered and external reference price, but the PSE table includes direct aid payments, which are not specified in the WTO amber box. This is because budgetary payments made to maintain the price gap are not included in the amber box, as mentioned earlier.

This additional information of green, blue and amber support is then also added to the GTAP database in the form of new headers and to the GTAP model as new coefficients.

Table 1. EU25: PSE Payments, by Type of Support, 2004 (EURO million)

SINGLE COMMODITY TRANSFERS (SCT)			PDY	WHT	GRO	VFN	OSD	C_B	PFB	OCR	CTL	OAP	RMK	WOL
Value of production, OECD		Total 278696	643	16,581	14,531		5,029	5,934			24,218	46,597	41,292	
Value of production, EUROSTAT		Total 280241	667	14,737	15,601	51,196	9,563	5,708	1,179	59,739	29,338	50,734	41,709	71
Output	Output payments	A2	11	1	1	365	2,245	6	0	1,106	0	61	1,745	0
Input	Variable inputs	B1	0	0	0	0	0	0	0	0	0	0	0	0
	On-farm services	B3	0	0	0	0	0	0	0	4	239	0	0	0
Land	current A/An/R/I, prod req	C	427	1,110	0	207	20	1	0	296	0	0	0	0
	non-current A/An/R/I, prod req	D	0	0	0	0	0	0	0	0	0	0	0	0
Capital	Fixed capital formation	B2	0	0	0	0	0	0	0	254	0	1	0	0
	current A/An/R/I, prod req	C	0	0	0	0	0	0	0	0	9,880	0	31	0
	non-current A/An/R/I, prod req	D	0	0	0	0	0	0	0	0	0	0	0	0

ALL (ACT), GROUP (GCT) AND OTHER TRANSFERS (OTP)			ALL	GROUP												Other
				GCT1	GCT2	GCT3	GCT4	GCT5	GCT6	GCT7	GCT8	GCT9	GCT10	GCT11	GCT12	
Input	Variable inputs	B1	3,460	131	0	0	0	0	0	226	223	0	0	0	0	
	On-farm services	B3	1,093	342	0	0	0	0	0	382	0	0	0	0	0	
Land	current area, production required	C	7,731	614	43	66	0	650	6	0	0	0	70	16,030	0	
	non-current area, production req'd	D	1	0	0	0	0	0	0	0	0	0	0	0	0	
Capital	Fixed capital formation	B2	3,263	105	0	0	0	3	0	157	0	0	0	0	1	
	current animal, production required	C	0	0	0	0	0	0	0	213	2	0	0	0	0	
	non-current animal, production req'd	D	0	0	0	0	0	0	0	0	0	0	0	0	0	
Labor	current revenue/income, prod req'd	C	237	22	0	0	0	0	0	31	13	0	0	0	0	
	non-current revenue/income, prod req'd	D	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total			15,785	1,214	43	66	0	653	6	1,009	239	0	70	16,030	1	
Factors	non-current A/An/R/I, prod not req	E														1,455

Source OECD PSE Tables and own calculations.

Table 2. Power of Support in the EU25 and Distribution of Support into WTO Boxes.

Power of support EU25	EU25	PDY	WHT	GRO	VFN	OSD	C_B	PFB	OCR	CTL	OAP	RMK	WOL
Value of production	280,242	667	14,737	15,601	51,196	9,563	5,708	1,179	59,739	29,338	50,734	41,709	70.9
Value of payments	54,581	486	8,866	8,211	4,421	4,887	407	83	6,520	12,264	3,604	4,827	5
<b>Power of domestic support</b>	<b>1.1948</b>	<b>1.7290</b>	<b>1.6016</b>	<b>1.5263</b>	<b>1.0864</b>	<b>1.5110</b>	<b>1.0712</b>	<b>1.0701</b>	<b>1.1091</b>	<b>1.4180</b>	<b>1.0710</b>	<b>1.1157</b>	<b>1.0731</b>
% output subsidy	10.2	2.2	0.0	0.0	8.3	45.9	1.4	0.0	17.0	0.0	1.7	36.2	0.0
% intermediate input subsidy	11.2	2.6	3.2	3.7	22.3	3.8	27.0	27.4	17.7	7.8	29.9	21.1	33.3
% land-based subsidy	50.7	92.8	94.0	93.1	49.7	47.0	47.7	48.3	45.9	7.0	40.9	25.1	39.8
% capital-based subsidy	26.2	1.9	2.3	2.6	16.0	2.7	19.4	19.7	16.6	84.4	22.8	14.6	22.1
% labor-based subsidy	1.7	0.4	0.5	0.6	3.7	0.6	4.5	4.6	2.9	0.8	4.7	3.0	4.8
<b>Total support (EURO million)</b>	<b>54,581</b>	<b>486</b>	<b>8,866</b>	<b>8,211</b>	<b>4,421</b>	<b>4,887</b>	<b>407</b>	<b>83</b>	<b>6,520</b>	<b>12,264</b>	<b>3,604</b>	<b>4,827</b>	<b>5</b>
Value of output subsidy	5,542	11	1	1	365	2,245	6	0	1,106	0	61	1,745	0
Value intermediate input subsidy	6,101	13	283	300	985	184	110	23	1,153	954	1,078	1,017	2
Value land-based subsidy	27,686	451	8,331	7,645	2,199	2,295	194	40	2,989	853	1,475	1,212	2
Value capital-based subsidy	14,327	9	203	215	708	132	79	16	1,080	10,354	822	706	1
Value labor-based subsidy	925	2	47	50	164	31	18	4	192	103	168	146	0

		PDY	WHT	GRO	VFN	OSD	C_B	PFB	OCR	CTL	OAP	RMK	WOL
Value of output subsidy	amber	0	0	0	365	2,240	6	0	944	0	61	27	0
	blue	11	1	1	0	6	0	0	162	0	0	1,719	0
	green	0	0	0	0	0	0	0	0	0	0	0	0
Value intermediate input subsidy	amber	9	191	203	665	124	74	15	780	742	711	715	1
	blue	0	0	0	0	0	0	0	0	0	0	0	0
	green	4	92	97	320	60	36	7	377	212	367	301	1
Value land-based subsidy	amber	0	1	0	207	20	1	0	64	0	0	0	0
	blue	427	7,800	7,083	0	1,951	0	0	388	0	0	0	0
	green	24	531	562	1,992	324	193	40	2,537	853	1,475	1,212	2
Value capital-based subsidy	amber	1	24	26	84	16	9	2	98	48	83	68	0
	blue	0	0	0	0	0	0	0	0	8,719	0	0	0
	green	8	179	190	624	116	69	14	982	1,588	739	638	1
Value labor-based subsidy	amber	0	0	0	0	0	0	0	0	0	0	0	0
	blue	0	0	0	0	0	0	0	0	0	0	0	0
	green	2	47	50	164	31	18	4	192	103	168	146	0

### 3.2 The GTAP model

The analyses in this paper are based on the comparative static multi regional general equilibrium GTAP model that provides a detailed representation of the economy including the linkages between farming, agribusiness, industrial and service sectors of the economy. The use of the non-homothetic constant difference of elasticity (CDE) functional form to handle private household preferences, the explicit treatment of international trade and transport margins and a global banking sector which links global savings and consumption are innovative in GTAP. Trade is represented by bilateral matrices based on the Armington assumption. In this analysis we assume the top level Armington elasticities between domestic goods and the import composite to be equal to lower-level Armington elasticities between imports from different countries. In so doing we allow for a direct substitution between import and domestic produced intermediate and consumed goods (compare FRANCOIS and ROLAND-HOLST, 1997)<sup>4</sup>. Further features of the standard model are perfect competition in all markets as well as a profit and utility maximizing behavior of producers and consumers. All policy interventions are represented by price wedges. The framework of the standard GTAP model is well documented in HERTEL (1997) and available on the Internet ([www.gtap.agecon.purdue.edu](http://www.gtap.agecon.purdue.edu)).

Domestic support is provided to agricultural producers through various agricultural policy instruments. The GTAP data base mirrors these different kinds of support in form of five price wedges evaluating transactions of producers at agent's and market prices for output, intermediate inputs, land, capital and labor. Almost each of these price wedges however include domestic support payments that belongs to the green, blue and amber box. Thus, the initial breakdown of policy instruments in the GTAP model is too coarse to capture the diversity of the WTO domestic support categories.

To implement the agricultural policy instruments of the EU into the GTAP model we added three policy instruments (variables) representing the amber, blue and green box payments in each of the price wedges listed above.

This simple approach is briefly illustrated in the following with the help of domestic support in form of output subsidies. The standard GTAP model allows for a differentiation between the value of output at agents' prices ( $VOA_{ir}$ ) and the value of output at market prices ( $VOM_{ir}$ ) for commodity  $i$  in region  $r$ . These values are based on the linear price equation

$$ps(i,r) = to(i,r) + pm(i,r); \tag{1}$$

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<sup>4</sup> We set the Armington elasticity for paddy rice to be equal to 2 in this simulation, due to an aggregation problem in the GTAP trade data.



that establishes the link between agents' ( $ps_{ir}$ ) and market prices ( $pm_{ir}$ ) using the percentage change of the policy variable  $to_{ir}$ . Adding the percentage change of the output quantity ( $qo_{ir}$ ) to the respective prices yields the corresponding percentage change of the values, while the difference between  $pm_{ir}$  and  $ps_{ir}$  is equal to the percentage change of the power of the ad valorem tax and subsidy, respectively.

To account for a detailed representation of the WTO's domestic support in the output subsidy we added the percentage change variable  $tog_{ir}$ ,  $tob_{ir}$  and  $toa_{ir}$  as new policy instruments representing the green, blue and amber box, respectively. These policy instruments are then used to establish three new price equations for output subsidies which are linked to two new value flows,  $VOAg_{ir}$  and  $VOAb_{ir}$  in the database.

$$ps(i,r) = tog(i,r) + psg(i,r) \quad (2)$$

$$psg(i,r) = tob(i,r) + psb(i,r) \quad (3)$$

$$psb(i,r) = toa(i,r) + pm(i,r) \quad (4)$$

Accordingly,  $psg_{ir}$  is the price of commodity  $i$  in region  $r$  including green box payments,  $psb_{ir}$  includes green and blue box payments, whereas  $pm_{ir}$  includes green, blue and amber box payments. The corresponding percentage changes of the values are obtained by adding the percentage change of the output quantity  $qo_{ir}$  to the respective prices. Although not explicitly defined in the model, we thereby established that the percentage change in  $to_{ir}$  is equal to the sum over  $tog_{ir}$ ,  $tob_{ir}$  and  $toa_{ir}$ . In the standard closure  $to_{ir}$  is endogenous, while  $tog_{ir}$ ,  $tob_{ir}$  and  $toa_{ir}$  are defined as exogenous.

To allow for a variation of this standard closure we add change variables ( $del\_OGREEN_{ir}$ ,  $del\_OBLUE_{ir}$  and  $del\_OAMBER_{ir}$ ) to the GTAP model that accounts for the payments of the green, blue and amber box. For example, the change of the blue box payments is calculated according to the following equation:

$$100*del\_OBLUE(i,r) = VOAg(i,r)*[qo(i,r)+psg(i,r)] - VOAb(i,r)*[qo(i,r)+psb(i,r)] \quad (5)$$

Using this equation it is possible to swap  $tob_{ir}$  with  $del\_OBLUE_{ir}$  to keep the part of the blue box payments included in the output subsidies constant. It also makes it easy to shift payments from for example the blue box to the green box to model the MTR reform of the CAP.

Similar extensions have been included for intermediate inputs, land, capital and labor to represent the WTO's domestic support in the GTAP model. In Table 3, the new value flows and policy variables, which have been added to the database and model, are shown.

Lastly, we add another new variable and equation to the model so that we can change the value of other transfer to producers (OTP). As mentioned above it is in this category of support payments the OECD places the single farm payment, which the EU declares as green box payments in its WTO notification.

**Table 3:** New values flows and policy variables added to the database and model.

<i>Output subsidies</i>					
Values Flows		VOA	VOAg	VOAb	VOM
Prices		ps	psg	psb	pm
Policy Variables		tog	tob	toa	
<i>Land, labor and capital input subsidies</i>					
Values Flows	VFM	VFMt	VFMg	VFMb	VFA
Prices	pmes pm	pmest	pmesg	pmesb	pfe
Policy Variables	tax	tfg tfofp	tfb	tfa	
<i>Intermediate input subsidies(domestic)</i>					
Values Flows		VDFM	VDFMg	VDFMb	V DFA
Prices		pm	pmg	pmb	pdf
Policy Variables		tfdg	tfdb	tfda	
<i>Intermediate input subsidies(imported)</i>					
Values Flows		VIFM	VIFMg	VIFMb	VIFA
Prices		pim	pimg	pimb	pfm
Policy Variables		tfmg	tfmb	tfma	

**Source:** Own illustration.

Therefore, we categories these payments as green box and model the OTP payments as a homogenous factor input subsidy rate given to land, capital and labor, employed in the primary agricultural sectors.

In a similar manor as we did for the output subsidies above, we defining a change variable for factor input subsidies. In the standard database the values of factor input subsidies can be found as the difference between the values of purchases of factor endowment commodity  $i$  by firms in sector  $j$  of region  $r$  evaluated at market prices  $VFM_{ijr}$  and the values of

purchases of factor endowment evaluated at agents' prices  $VFA_{ijr}$ . These values are based on the linear price equation

$$pfe(i,j,r) = tf(i,j,r) + pmes(i,j,r) \quad (6)$$

$$pfe(i,j,r) = tf(i,j,r) + pm(i,r) \quad (7)$$

that establishes the link between agents' ( $pfe_{ijr}$ ) and market prices ( $pm_{ir}$  and  $pmes_{ijr}$  distinguishing between mobile and sluggish factor endowments) using the percentage change of the policy variable  $tf_{ijr}$ .

In Table 3 it can be seen that we have added three new value flows to the two already existing enabling us to distinguishing between factor taxes, and green, blue and amber factor subsidies. We also introduce three new prices and four new policy variables into the GTAP model together with new change variables  $del\_FGREEN_{ijr}$   $del\_FBLUE_{ijr}$  and  $del\_FAMBER_{ijr}$

To model the green OTP payments we simply introduce a factor and primary agricultural specific policy variable  $tfotp_r$  into the price equations.

$$pmesg(i,j,r) = tfg(i,j,r) + tfotp(r) + pmest(i,j,r) \quad (8)$$

where  $i$  are the factor endowments land, capital and labour,  $j$  the 12 primary agricultural sectors, in region  $r$ . We then introduce a new change variable  $del\_OTP_r$  into the model which can be made exogenous and  $tfotp_r$  endogenous

$$del\_OTP(r) = \text{Sum}\{i,\text{factors},\text{sum}\{j,p\_agri, del\_FGREEN(i,j,r)\}\} \quad (9)$$

where

$$100*del\_FGREEN(i,j,r) = VFMt(i,j,r)*[qfe(i,j,r)+pmest(i,j,r)] - VFMg(i,j,r)*[qfe(i,j,r)+pmesg(i,j,r)] \quad (10)$$

and  $i$  is equal to land capital labor,  $j$  primary agricultural sectors in region  $r$ . This new policy variable enables us to move amber and blue box payments into the green box, modeled as OTP.

### 3.3 Limitations

This simple modeling approach does raise some questions. The OECD defines OTP as payments which do not require the farmer to produce anything and in the GTAP database these payments are included as both activity-generic and factor-generic payments. In other words this type of support in the database should be less trade distorting than other types of

support. OTP (ACT, GCT, SCT) payments amount to 1.5 (11.9, 2.7, 1.7) billion € out of a total green box payments of 17.7 billion € in the initial 2004 database. This raises the question as to how decoupled the green payments are in the GTAP database and are they implemented correctly in the database. In this initial paper we do not address this issue, but simply follow the standard approach used in the database to allocate OECD PSE categories of support.

Furthermore, we can not model the aggregate measurement of support and the associated *de minimis* payments. The amber box evaluates the level of domestic support through historical world market prices relative to administered prices or through the equivalent measurement of support which also relies on applied administered prices. If the price gap cannot be calculated then budgetary outlays, which are used to maintain the producer price are included in the amber box. In some instances the amber box includes payments given to agricultural processors. The PSE payments, found in the GTAP database, do not include this historical price gap mythology, but rely on budgetary payments given to farmers (no payments to agricultural processors). Therefore, modeling the amber box within the GTAP framework is impossible. Any estimation of the changes in amber box support payments has to be made outside the model using changes in administered prices and changes in eligible production. Once again this is not a trivial task and there are problems in mapping GTAP production changes to the very detailed commodity specific amber box calculation. This of course means that any post simulations estimation of the amber box can only be considered a rough estimate.

## **4 Illustrative scenarios**

In this paper we make some simple illustrative scenarios focusing on domestic support in the GTAP model/database. First, we make two baseline projections of the GTAP data to the year 2020 comparing the standard GTAP model with our modified model. Secondly, we implement a multilateral trade agreement in the year 2020 based on the WTO revised draft modalities in the so called Doha round of negotiations, where we focus on the EU reform of the common agricultural policy (CAP).

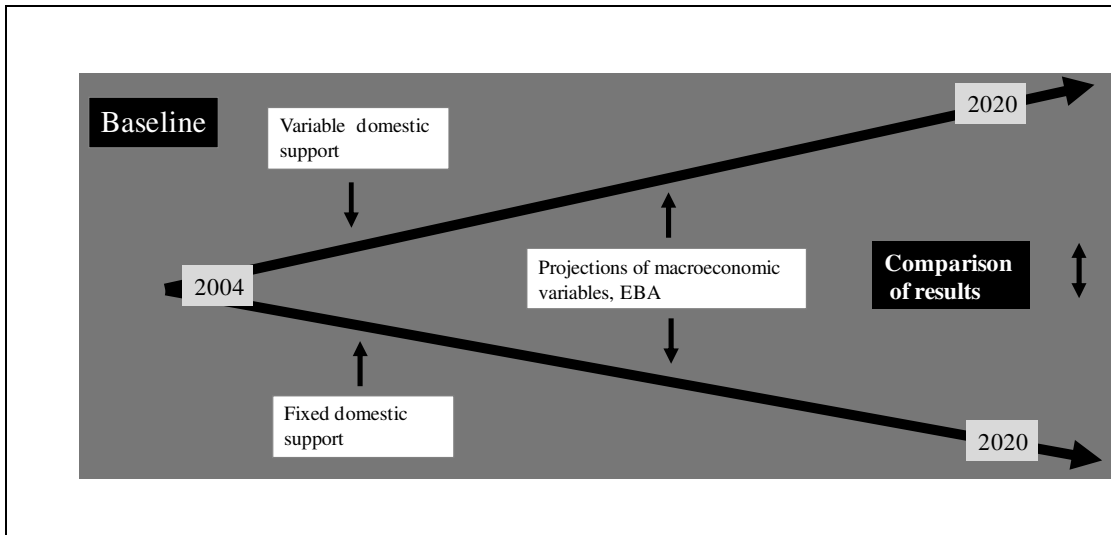
### **4.1 Baseline 2020**

We assume that the WTO negotiation will not be implemented before the year 2020. Accordingly, a baseline has to be established to move the GTAP data base from the year 2004 to the year 2020. Within this time period we update GDP, population and factor endowment thereby leading to the corresponding shifts in world-wide supply and demand. Additionally, the EBA agreement is introduced through a 100% elimination of tariffs for LDCs.

In the base line we do not model any changes in domestic support policies (OECD 2004 PSE values) but simply just project the database to the year 2020.

How does domestic support develop during the period from 2004 to 2020? To answer this question we establish two parallel baselines. In the first one we kept domestic support variable, i.e., the newly introduced policy instrument (e.g.,  $tob_{ir}$ ) representing domestic support according to the WTO boxes are exogenous, while the newly introduced change variables (e.g.,  $del\_OBLUE_{ir}$ ) are endogenous (compare Figure 7). As a result, it is possible that the value of domestic support increases or decreases over the considered time period. This is the standard closure of the GTAP model. In a second baseline, we fixed domestic support by swapping the newly introduced policy variables with the corresponding change variables.

**Figure 7:** Domestic support in the Baseline EU25



**Source:** Own illustration, 2009

Table 4 gives an overview of the development of domestic support values in the two baselines for the EU.

Clearly just projecting the database without thinking about domestic support in the base line expands the budgetary expenditure in the EU from 0.58 to 1.83 percent of GDP. This expenditure level is of course unrealistic given the fact that the whole of the EU own financing cannot be higher the 1.12 percent of GDP and the expenditure to the CAP within the EU has been declining relative to GDP. In the new closure, we make the change variables exogenous ( $del\_OBLUE(i,r)$   $del\_.....$  etc.) so that we can control the budgetary expenditure of the EU. In Table 4 the value of domestic support in the EU now declines both

in value terms and as a percent of GDP. This is because we have not only made the change variables exogenous but we have also reduced the real value of domestic support in the EU. We have done this because the CAP payments are to a great extent fixed in nominal terms as direct aid given to a fixed reference area or head of livestock. Given that the GTAP model represents the real economy of countries, without inflation, any fixed nominal payments have to be deflated with an assumed inflation rate when projecting the database. This is of course a very simplistic approach to deflate all payments in the EU. But just running the database without giving domestic support any thought would in the case of the EU be an even bigger assumption and would for example overstate the real economic effects of abolishing the CAP if modelled on the updated GTAP database projected to the year 2020.

**Table 4:** Value of domestic support in the EU25 by commodity and WTO box, (mill. US\$)

	PDY	WHT	GRO	VFN	OSD	C_B	PFB	OCR	CTL	OAP	RMK	WOL	Total	% of GDP
Initial domestic support														
Amber	14	279	294	2570	3114	122	113	2605	991	1076	1489	4	12672	
Blue	608	10070	9118	0	2540	0	0	761	10932	0	1758	0	35787	
Green	53	1097	1157	6031	689	430	423	5652	3455	3461	2950	19	25416	
Total	674	11447	10569	8601	6344	552	536	9017	15379	4537	6196	23	73875	0.58
Variable domestic support														
Amber	21	410	305	4261	5006	120	157	4058	1092	1298	1683	32	18444	
Blue	4426	72730	37376	0	14162	0	0	3202	12550	0	2226	0	146672	
Green	279	5599	3451	18608	2714	1085	1931	21378	7199	11016	7688	1206	82154	
Total	4726	78739	41132	22869	21882	1205	2088	28638	20842	12314	11597	1238	247270	1.83
Fixed domestic support														
Amber	9	188	198	1731	2098	82	76	1755	667	725	1003	3	8535	
Blue	409	6784	6142	0	1711	0	0	513	7364	0	1184	0	24108	
Green	36	739	779	4063	464	290	285	3807	2328	2331	1987	13	17121	
Total	454	7711	7120	5794	4273	372	361	6074	10359	3056	4174	16	49764	0.37

**Source:** Own calculation, 2009

Table 4 also presents the initial amber, blue and the green box payments of the EU25 and the resulting domestic support values of the two baselines with fixed and variable domestic support in 2020. Particularly striking is the increase of the blue box payments which increase by 111 billion US\$ (310%) when domestic support is not fixed compared to the initial database. Wheat, other grains, oilseed, other crops and paddy rice are the main sectors which take advantage of this increase of domestic support, while all the blue box pay-

ments in other sectors and especially in the animal production sectors are more or less unchanged. The increase of blue box payments within the baseline with variable domestic support is mainly driven by an increase of the price for land. For this reason direct payments modeled as a subsidy to land is already fixed in simulations found in the literature (e.g., BOUÉT et al. 2005, BROCKMEIER and PELIKAN, 2008). However, in our simulation we are able to identify and fix domestic support at a more detailed level.

By contrast, the amber box payments increase by around 6 billion UD\$ (46%), when domestic support is variable in the baseline. Again, this increase is mainly caused by an enlargement of the amber box payments in the crops sector. Green box payments also show a strong increase within the baseline with variable domestic support. Here, the increase is more evenly distributed across all sectors, although the green box payments to other crops as well as vegetable and fruits are strongly enlarged.

In the initial GTAP version 7 database the EU25 accounts for roughly 50 percent of the total value of agricultural domestic support payments found in the database, followed by: the USA with 20 percent and Japan, China and India each accounting for roughly 5 percent. Therefore, the importance of modelling domestic support is not only limited to the EU when projecting the database.

## 4.2 Doha scenario 2020

In addition to the two baselines, we also run a policy scenario, where we implement the WTO negotiations as a counterfactual scenario in 2020 using the updated database with the deflated/fixed domestic support payments. This includes the reallocation of direct aid in the EU25 to the SFP, which leads to a box shifting from amber and especially blue box payments to the green box in the WTO notifications. Table 5 highlights the direct aid payments, which are moving into the single farm payment in our Doha scenario.

The shocks to the newly introduced change variables (e.g., *del\_OBLUEir*) representing the amber, blue and green boxes are simply calculated<sup>5</sup>. This is done by reallocating the direct aid payments found in table 5, in the initial 2004 PSE table, to OTP creating a new PSE table for the EU25. This new table together with the original PSE table can then be used to calculate the deflated changes in the values of support in the EU when direct aid is reallocated to the SFP.

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5 Of course, the newly introduced policy instruments (e.g., *tob<sub>ir</sub>*) need to be endogenous in the closure of this policy scenario

In addition, tariff cuts are implemented at the HS6-digit tariff line level with the help of the program TASTE developed by Horrigde and Laborde.<sup>6</sup> TASTE takes the gap between bound and applied rates into account. This gap is firstly a consequence of the difference between the bound and the MFN rate, the so called binding overhang (Francois and Martin, 2003). Secondly, it results from the existence of preferential rates which causes a difference between MFN and applied rate (Anderson and Martin, 2006). Our calculations thus consider the difference between bound and applied rates taking MFN rates as well as preferential rates into account. The aggregation of tariffs from the HS-6 tariff lines to the aggregation of the GTAP model employs trade weights<sup>7</sup>. We also scaled these weights to sum to GTAP trade matrix.

**Table 5:** Direct aid found in the 2004 PSE table and reallocated to the SFP in EU25.

	mill €	mill US\$
Hectare premiums + energy crops	16030	19916
Protein crops	70	87
Durum wheat	1109	1378
Olive oil	2240	2783
Dried fodder	71	88
Tobacco	918	1140
Starch and banna	365	454
Rice	427	531
Sheep goat beef	8718	10832
Milk	1370	1702
Milk topup	349	434
Seed	109	135
Direct aid to SFP	31667	39345

**Source:** Own calculation, 2009

The tariff cuts are based on the Revised Draft Modalities for Agriculture from December 2008. This latest modalities paper applies four tiers for developed and developing countries. While the tiers for developed countries spread from 0 to 75%, the ones for develop-

6 The program can be retrieved from <http://www.monash.edu.au/policy/taste.htm>. For an introduction to the program compare (HORRIGDE and LABORDE, 2008).

7 Trade weights take the relative importance of trade flows into account. The import weighted aggregation scheme leads, however, to a so called endogenous bias, as the weight for every individual tariff decreases with an increase of the tariff. Accordingly, prohibitive tariffs impeding market access, and thereby, reducing the trade volumes to zero, are not taken into account by import weighting. Trade barriers and the effect of their reductions are therefore underestimated with this method. For an analysis of the impact of different tariff aggregation schemes using import weights, the trade restrictiveness index (TRI) and the mercantilistic trade restrictiveness index (MTRI) compare PELIKAN and BROCKMEIER (2008a and 2008b).



ing countries are much wider going up to 130%. Also tariff cuts for developing countries are only 2/3 of the tariff cuts applied in developed countries. Finally we also abolish all agricultural export subsidies found in the GTAP database.

The effect of this box shifting to green payments in the EU should hopefully result in improve allocation of resources in the economy changing production and trade structures. In table 6 we highlight how decoupled from production the movement of support payments are when reallocated as both activity-generic and factor-generic payments (OTP) in the GTAP model/database. We do this by decomposing the percentage change in output into three contributing factors. Namely, changes in production output due to the removal of the direct aid payments, the increase of OTP payments, and the reduction in tariffs and export subsidies.

**Table 6:** Doha scenario results for the EU25, (percentage change)

		Contributions from		
		Removal of direct aid	Increase OTP payments	Tariff and export subsidy reductions
% change in output of				
pdr	-19.6	-4.9	0.7	-15.5
wht	-6.7	-9.7	0.7	2.3
gro	-1.6	-2.7	0.6	0.5
v_f	2.7	1.7	1.9	-1.0
osd	-15.6	-15.8	2.6	-2.3
c_b	-24.8	0.0	0.3	-25.1
pfb	9.3	4.8	4.0	0.5
ocr	6.0	2.3	2.4	1.4
ctl	-14.9	-4.9	1.5	-11.5
oap	3.9	0.9	1.4	1.5
rmk	0.5	-0.2	1.4	-0.7
wol	27.6	15.9	1.1	10.6
cmt	-45.0	-4.7	1.1	-41.5
omt	4.1	0.4	0.7	2.9
vol	-19.1	-2.0	0.1	-17.3
mil	-1.6	0.0	0.1	-1.7
pcr	-27.7	-1.7	-0.2	-25.7
sgr	-72.4	0.4	0.1	-72.9
ofd	-0.2	-0.3	0.3	-0.2
b_t	1.0	0.0	0.2	0.7
MNFCS	0.3	0.1	-0.2	0.4
SVCES	0.1	0.0	0.0	0.1
Real GDP EU25	0.131	0.017	-0.010	0.123
Volunm of world trade	1.667	0.016	0.017	1.634

**Source:** Own calculation, 2009

If the OTP payments were truly decoupled from production decisions in the GTAP model then the contribution from increasing these payments should have no effect on production output. But this is not the case as can be seen in table 6 where the increased OTP payments increase production in the agricultural sectors pulling resource out of the manufacturing industries, reducing production by -0.2 percent. Nevertheless, the economy in the EU is gaining when measured in terms of real GDP. The removal of the direct aid payments increases real GDP by 0.017 percent while the increased OTP reduces this gain by -0.010. So the net gain of moving these payments is an increase of 0.010 percent of real GDP, which can be attributed to better allocation of resources (land, labor, capital) in the economy<sup>8</sup>. So in this sense the OTP payments are more decoupled from production in the EU than the direct aid payments due to the increase in real GDP. It can also be seen, in table 6, that the volume of global trade increases due to the EU's box shifting.

This Doha scenario shows that we can model the movement of specific payments found in the PSE tables/GTAP database and reallocate them in the database in a less production/trade distorting manner. This of course is not the same as modeling the OTDS in the GTAP model/database. Any calculation of the OTDS includes the aggregate measurement of support (amber box) and the associated *de minimis* payments, which we find impossible to include in the model.

The AMS for the EU25 consists of market price support, the Equivalent Measurement of Support (EMS)<sup>9</sup> and non-exempt direct payments. In our modeling only the non-exempt direct payments are implemented in the GTAP model and are linked to the amber box support. We therefore designed a GTAP sub module to quantify the changes in EU market price support and the corresponding EMS. As basis for this module we use the AMS calculation tables of the WTO notification of the EU25 for the year 2003/2004.

In the case of market price support, the applied administered prices and the external reference prices as well as the eligible quantity are given in the notification tables. After the

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8 If we wanted to include 100 percent decoupled payments in the GTAP model we would have to model new support payments as a homogenous rate of support to all land in a given region/country.

9 WTO, Agreement on Agriculture, Annex 4: Domestic support – Calculation of Equivalent Measurement of Support: Subject to the provisions of Article 6, equivalent measurements of support shall be calculated in respect of all basic agricultural products where market price support as defined in Annex 3 exists but for which calculation of this component of the AMS is not practicable. For such products the base level for implementation of the domestic support reduction commitments shall consist of a market price support component expressed in terms of equivalent measurements of support under paragraph 2 below, as well as any non-exempt direct payments and other non-exempt support, which shall be evaluated as provided for under paragraph 3 below. Support at both national and sub-national level shall be included.

implementation of the MTR there are also several policy changes to be taken into account, e.g., for a few products the intervention is abolished altogether, for other products the intervention prices are lowered and for some products the intervention is interrupted for a defined period. We implemented these changes of EU intervention prices into the sub module of the AMS.

The EMS is calculated for the products where the calculation of the market price support component of the AMS is not practicable. For those products equivalent measurements of market price support are quantified using the applied administered price and the quantity of production eligible to receive that price or on budgetary outlays used to maintain the producer price.

To calculate the change in AMS we use the quantities obtained in the GTAP simulation. Due to the higher aggregation of GTAP we are of course not able to differentiate these quantity changes according to the WTO notification tables, where market price support for products like common wheat, durum wheat or skimmed milk powder is given. Instead, we employ the aggregated quantity change for wheat (capturing common wheat as well as durum wheat) or milk (capturing all milk products) which we received from the GTAP model's result.

Based on these assumptions, the new AMS is calculated by multiplying the GTAP percentage change in quantity with the quantity given in the EU notification tables of 2003/2004. The resulting quantity change is then multiplied by the difference between applied administered and reference prices for the market price support of the EU's WTO notification. This procedure is also used to quantify the change in EMS. Afterwards we add the change in the amber box support calculated by the GTAP model to the difference between new and old AMS and receive the change in AMS.

**Table 7:** AMS calculation module, million US\$

AMS 2004							Change in AMS
Total		MPS	EMS	Non-product specific	Non-exempt payments	Total	
26,661	Baseline	19,381	9,824	847	2,946	31,598	5,490
26,661	WTO sim	6,107	10,092	847	1,230	17,227	-9,232

**Source:** Own calculation, 2009

In **Table 7** the calculated changes in AMS in USD are shown for our baseline and the WTO simulations. Although the calculation can only be regarded as a rough estimate, the results deliver a clear and acceptable tendency of AMS development. The results for the baseline, where no policy changes are considered, depict an increasing AMS. In the WTO simulation based on the draft modalities for agriculture from December 2008 (see chapter 4.2) leads to a decreasing AMS (9,232 million USD).

## 5 Conclusion

WTO negotiations are a common topic in the general equilibrium modeler's community. However, the detailed implementation of domestic support has yet received too little attention. This can be traced back to the fact that domestic support is in many cases a country specific issue that needs elaborate work to specify the domestically used agricultural instruments and the according underlying data base. Additionally, the recent WTO modalities paper defines not only commitments to reduce the OTDS, but also puts reduction requirements on AMS and the blue box.

For a sophisticated WTO analysis of agricultural domestic support it would therefore be essential to correctly single out the WTO boxes in the model's data base. Most standard CGE models however do not evaluate the level of domestic support through the AMS concept and its historical world market prices relative to administered prices, but uses the OECD's PSE to represent domestic support. This is also given for the standard GTAP framework which constitutes the starting point of our analysis. Adapting the model to analyze domestic support issues we have taken the version 7 GTAP database and updated the representation of the EU domestic support payments to the latest OECD's mythology. At the same time we add supplemented information about WTO's green, blue and amber box support to the GTAP database in the form of new headers and to the GTAP model as new coefficients.

We use this updated GTAP database and modified GTAP model to run two illustrative scenarios. In the first scenario we simply run two baselines where we kept domestic support endogenous on the one hand and fixed (deflated) on the other hand. The results clearly show that you have to take the development of domestic support payments over time into account when projecting the GTAP database. A second simulation includes a Doha scenario based on the latest modalities paper. Employing the extended GTAP framework we are able to model the movement of specific payments found in the PSE tables/GTAP database and reallocate them in the database in a less production and trade distorting manor.

This of course is not the same as modeling the OTDS in the GTAP model and database. Any calculation of the OTDS includes the AMS and the associated *de minimis* payments, which we find impossible to include in the model.

We therefore add a side calculation of AMS that is based on administered prices from the notification of the EU to the WTO and the changes in eligible production mapped from the results of the GTAP model. Due to the higher aggregation of the GTAP framework the therewith obtained post simulation estimate of the AMS can of course only be a rough estimate. However, it delivers a first insight into the post WTO domestic support payments.

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**Table A1:** Aggregation of Countries and Regions

Countries and Regions	Abbreviation
<p><b>1. European Union 25</b> Austria, Belgium, Denmark, Finland, France, Germany, Ireland, United Kingdom, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Czech Republic, Hungary, Malta, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Cyprus</p>	<p><b>EU25</b></p>
<p><b>2. Central and Eastern European Countries</b> Bulgaria, Romania</p>	<p><b>CEEC2</b></p>
<p><b>3. United States</b></p>	<p><b>usa</b></p>
<p><b>4. Canada</b></p>	<p><b>can</b></p>
<p><b>5. Japan</b></p>	<p><b>jpn</b></p>
<p><b>6. Oceania</b> Australia, New Zealand</p>	<p><b>OCEA</b></p>
<p><b>7. Other WTO – members (industrialized countries)</b> Switzerland, Norway, Rest of EFTA, Albania, Croatia</p>	<p><b>rWTOIC</b></p>
<p><b>8. China</b></p>	<p><b>chn</b></p>
<p><b>9. India</b></p>	<p><b>ind</b></p>
<p><b>10. Brazil</b></p>	<p><b>bra</b></p>
<p><b>11. Other WTO – members (developing countries, South America)</b> Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Panama, Rest of South America</p>	<p><b>rWTODCSA</b></p>
<p><b>12. African - Caribbean –Pacific - Countries</b> Rest of Oceania, Rest of Caribbean, Mauritius, Zimbabwe, Botswana, South Africa</p>	<p><b>ACP</b></p>
<p><b>13. Other WTO – members (developing countries)</b> Hong Kong, Korea, Rest of East Asia, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Pakistan, Sri Lanka, Mexico, Costa Rica, Guatemala, Nicaragua, Rest of Central America, Belarus, Rest of Eastern Europe, Kyrgyzstan, Armenia, Georgia, Turkey, Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa, Rest of South African CU</p>	<p><b>rWTODC</b></p>
<p><b>14. Least Developed - Countries</b> Cambodia, Lao People’s Democratic Republic, Myanmar, Rest of Southeast Asia, Bangladesh, Rest of South Asia, Nigeria, Senegal, Rest of Western Africa, Rest of Central Africa, Rest of South Central Africa, Ethiopia, Madagascar, Malawi, Mozambique, Tanzania, Uganda, Zambia, Other Eastern Africa</p>	<p><b>LDC</b></p>
<p><b>15. Rest Of The World</b> Taiwan, Rest of North America, Russian Federation, Rest of Europe, Kazakhstan, Rest of FSU, Azerbaijan, Iran Islamic Republic</p>	<p><b>ROW</b></p>
<p><b>16. Ukraine</b></p>	<p><b>ukr</b></p>



**Table A2:** Aggregation of Sectors

Sectors	Abbreviation
1. Wheat	wht
2. Cereal grains nec	gro
3. Oil seeds	osd
4. Sugar cane, sugar beet	c_b
5. Plant-based fibres	pfb
6. Paddy rice	pdr
7. Vegetables, fruits, nuts	v_f
8. Cattle, sheep, goats, horses	ctl
9. Animal products nec	oap
10. Raw milk	rmk
11. Wool, silk-worm cocoons	wol
12. Processed rice	per
13. Sugar	sgr
14. Meat: cattle, sheep, goats, horses	cmt
15. Meat products nec	omt
16. Dairy products	mil
17. Crops nec	ocr
18. Beverages and tobacco products	b_t
19. Vegetable oils and fats	vol
20. Other Food	ofd
21. Other Primary Sectors	OPRI
Coal, oil, gas, petroleum, coal products	
22. Natural Resources	NARE
Forestry, fishing, minerals	
23. Industry	MNFCS
Textiles, wearing apparel, leather products, wood products, paper products, publishing, chemical, rubber, plastic prods, mineral products nec, ferrous metals, metals nec, metal products, motor vehicles and parts, transport equipment, electronic equipment, machinery and equipment, manufactures nec	
24. Services	SVCES
Water, construction, trade, transport nec, sea transport, air transport, communication, financial services nec, insurance, business services nec, recreation and other services, PubAdmin/Defence/Health/Educat, dwellings	
25. Gas and Electricity	GasE
Electricity, gas manufacture, distribution	