How to Calculate and Implement Import Tariff Cuts?

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1 Introduction

WTO scenarios for simulations with general or partial equilibrium models can be built on the basis of several different approaches. A very detailed method builds scenarios from the most disaggregated bound and applied tariff line levels used, for example by JEAN et al., 2005 and ANDERSON et al., 2005. In so doing, it is necessary to implement the tariff cuts at a disaggregated applied and bound tariff line level (e.g., the 6-digit level of the harmonized system 96 (HS96)) with the help of statistical programs. Thus, water in the tariffs (compare PODBURY and ROBERTS, 2003) or binding overhang (compare FRANCOIS and MARTIN, 2003), is taken into account. Thereafter, the new applied tariff rate is aggregated to the sectoral and regional aggregation of the model, and a shock is calculated to move the applied tariff rate to the new level (e.g., after implementation of the WTO decisions). This procedure has the advantage of being as close as possible to the negotiation process. Additionally, it takes account of the tariff peaks that are most clearly identifiable at the detailed tariff line level. To build scenarios from the most detailed tariff line level, however, requires a huge amount of resources in the form of access to the prevailing data bases (e.g., TRAINS, AMAD, COMTRADE etc.) and labor inputs. Additionally, this work needs to be done for each WTO scenario.

Market Access is the key question in the current WTO negotiations. To open market access, a tiered formula for tariff reduction is proposed. Using this kind of formula involves sharp reductions of higher tariffs and small reductions of lower tariffs. While WTO negotiations and the implementation of the agreed tariff cuts take place on the 6-digit level of the bound tariffs, most partial or general equilibrium models only allow for tariff cuts on a highly aggregated level of applied tariffs. Thus, to operate large scale models it is necessary to aggregate detailed tariff information of thousands of applied and bound tariff lines to a manageable size.

Another, less resource-consuming method would be to aggregate the bound tariff rates from the 6-digit tariff line level to the prevailing model aggregation. Applying this approach, all kind of shocks for different formulas can easily be calculated using the aggregated applied and bound rates. However, this approach underestimates the prevailing protection because it smooths out the tariff peaks which might most likely result in lower tariff cuts.

Given these two approaches to implement tariff cuts, the most crucial question is: Do these two approaches differ so much that the higher costs of the detailed method are justified? To answer this question, we first developed a two tariff line example which we use to illustrate the two options for the calculation of tariff cuts in Chapter 2. In Chapter 3 we introduce the methodological instrument, the Global Trade Analysis Project (GTAP), together with its theoretical extensions, employed in the calculations. In Chapter 4, model design and scenarios are described. For this paper, we build scenarios in which the tiered formula is applied on the 6-digit tariff line and the aggregated model level, respectively, and compare the results. The differences in simulation results are described and analyzed in Chapter 5. Finally, the main findings and conclusions are summarized in Chapter 6.

2 Calculating Tariff Cuts at Different Aggregation Levels: An Example

Most partial and general equilibrium models operate on a highly aggregated country and sectoral level. Before running such a model it is therefore necessary to aggregate the available detailed tariff data to

a manageable size, e.g., to the model's country and sectoral level. With this approach, the tariff peak of one sector might be mixed with lower tariffs of other sectors, and might thereby be evened out. Thus, if a tiered tariff reduction formula is implemented after the aggregation of tariff lines, the balancing might already be completed, even before the model is run (BOUËT, 2003).

Aggregation of reduced tariff data or the cut of tariffs before aggregation might lead to highly deviating results if the dispersion of tariffs cuts is based on a tiered formula. In the following, the procedure to implement tariff cuts at different levels, as well as the deviation of the results due to these different methods, is illustrated by an example (compare Table 1). For purposes of simplification, we assume a world with only two countries (A and B) which are both WTO member countries. Trade between the countries is based on applied tariffs (AT), while WTO tariff cuts are established on bound tariffs (BT).

In the example, we use two 6-digit tariff lines (111111 and 222222) for each country. Table 1 shows the assumed data for the example. For each single 6-digit tariff (t_i), the corresponding import value (w_i) is displayed to calculate the trade weighted average tariff (t_{agg}) according to the following formula:

$$t_{agg} = \frac{1}{\sum_{i=1}^{n} w_i} \cdot \sum_{i=1}^{n} t_i \cdot w_i \qquad (1)$$

Table 1: Tariff Rates and Import Values for Country A and B in the Initial Situation[1)]

	Country A			**Country B**		
	Tariff (%)			Tariff (%)		
	BT^0_{6HS}	AT^0_{6HS}	Import value (US $)	BT^0_{6HS}	AT^0_{6HS}	Import value (US $)
Tariff line (6 digit HS)						
111111	100	50	300	10	5	20
222222	300	280	700	20	15	7000

1) BT = Bound tariff; AT= Applied tariff; Superscript 0 = Initial; Subscript 6HS = 6-digit HS level

This protection data information is aggregated to mimic the information given at the model level. Accordingly, the two tariff lines are aggregated to the Region AB and a combined sector S12 using import values as weights (compare Table 2). In so doing, we reduce the initial tariff information for two countries and two tariff lines into a single tariff rate for one sector and one region of the model level for the prevailing bound rate (47.41 %) and applied rate (39.41 %). We then apply the tariff cuts of the tiered formula to the initial bound rate. Here, a simplified tiered formula is used. Initial tariffs that are greater than 50 % are reduced by 70 %, whereas tariffs that are less or equal to 50 % are cut by 20 %. Accordingly, the bound rate is reduced by 20 % to 37.93 %. The resulting new bound tariff (37.93 %) is less than the aggregated old applied tariff (39.41 %). Thus, the aggregated applied tariff has to be decreased to that amount.

Table 2: Calculating Tariffs Cuts at the Model Level[1), 2)]

	Region AB				
	Initial situation			Situation after tariff cuts	
	Tariff (%)			Tariff (%)	
	BT^0_{ML}	AT^0_{ML}	Import value (US $)	BT^1_{ML}	AT^1_{ML}
Model level					
S12	47.41	39.41	8020	37.93	37.93

1) A simplified tiered formula is applied. If the initial bound or applied tariff is greater (less) than 50%, the tariff is cut by 70% (30%). 2) BT = Bound tariff; AT= Applied tariff; Superscript 0 / 1 = Initial / new situation; Subscript ML = model level

Source: Own Calculations.

In a second step, the tariff cuts are also implemented on the 6-digit tariff line level (compare Table 3). According to the simplified tiered formula, we reduce some of the bound tariffs by 20 %, while others are lowered by 70 %. Thereby, the binding overhang is considered at the 6-digit level:

- If the new bound tariff rate is higher than or equal to the applied tariff, no tariff cuts are implemented on applied tariffs. The new applied rate is equal to the old applied rate.
- If the new bound tariff is less than the applied tariff, the applied tariff will be lowered to the new reduced bound tariff.

Thus, we always chose the lower value of the new reduced bound rate and the old applied rate as the new applied rate. Finally, we aggregated the new applied and bound rate to Region AB and Sector S12. The resulting final applied tariff amounts to 22.95 %.

This example clearly shows that the results of different methods to implement tariff cuts could differ by a large amount. But the level at which the tariff cut is employed is not the only factor that distorts the results. The implemented aggregation scheme influences the outcome as well. However, the impacts of different weighting schemes or tariff aggregators (e.g., trade weighted, trade restrictiveness index, etc.) are extensively analyzed in the literature (compare ANDERSON and NEARY, 2005; BACH and MARTIN, 2001; BUREAU and SALVATICI, 2004; MARTIN et al. 2003) and will therefore not be considered here.

The import weighting aggregation scheme was chosen for the empirical analysis of this paper. The main reason for this is the data availability of imports up to the 6-digit level. The import weighting aggregation scheme is most commonly used for modeling (compare MANOLE and MARTIN, 2005) and has the advantage of taking the relative importance of trade flows into account. If a product is important in trading, it has a high import value and thus, also receives a high weight. The problem of this method is, however, the endogenous bias. When a tariff increases, the import value most likely also decreases, so that the weight of the tariff in the import weighting aggregation scheme decreases as well. Accordingly, prohibitive tariffs have a trade weight of zero, but their welfare costs are at maximum. Although we intend to capture tariff peaks in our analysis by implementing tariff cuts at the 6-digit level, we are only able to apply the lowered import weights. Thus, the final applied tariff is still underestimated.

Table 3: Calculating Tariff Cuts at 6-Digit HS Level[1), 2)]

	Country A			Country B					
	Initial Situation								
	Tariff (%)			Tariff (%)					
	BT^0_{6HS}	AT^0_{6HS}	Import value (US $)	BT^0_{6HS}	AT^0_{6HS}	Import value (US $)			
Tariff line (6 digit HS)									
111111	100	50	300	10	5	20			
222222	300	280	700	20	15	7000			
	Situation after tariff cuts						Aggregation to Region AB		
	Tariff (%)			Tariff (%)			Tariff (%)		
	BT^1_{6HS}	AT^1_{6HS}	Import value (US $)	BT^1_{6HS}	AT^1_{6HS}	Imports (US $)	BT^1_{6HS}	AT^1_{6HS}	Import value (US $)
Tariff line (6 digit HS)									
111111	30	30	300	16	5	20	29.13	28.44	320
222222	90	90	700	16	15	7000	22.73	21.82	7700
Model level									
S12							22.98	22.08	8020

1) A simplified tiered formula is applied. If the initial bound or applied tariff is greater (less) than 50%, the tariff is cut by 70% (30%). 2) BT = Bound tariff; AT= Applied tariff; Superscript 0 / 1 = Initial / new situation; Subscript 6HS = 6 Digit HS level

Source: Own Calculations.

3 The Model

The analyses in this paper are based on the comparative static standard multi-regional general equilibrium Global Trade Analysis Project (GTAP) model. This model provides an elaborate representation of the economy, including the linkages between farming, agribusiness, industry, 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 trade matrices based on the Armington assumption. 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 the GTAP book (HERTEL, 1997) and available on the Internet[1].

Agricultural policy instruments are represented via price wedges in the standard GTAP model. Therefore, the standard GTAP model is complemented with an explicit modeling of the instruments related to the Mid Term Review (MTR) of the EU. Following the approach of FRANDSEN, GERSFELD and JENSEN (2002), we introduce an additional land subsidy rate into the model that is equalized across all sectors entitled to direct payments.[2] With the implementation of the MTR, the existing domestic support measures are converted into a region-specific fully decoupled land area payment, while budgetary

1 compare www.gtap.agecon.purdue.edu/products/gtap_book/default.asp
2 We are grateful to Hans JENSEN for his support in implementing the decoupling.

outlays for total domestic support are held constant. We deliberately did not model the EU sugar policy, as this would require resources that go far beyond the scope of this paper (compare BROCKMEIER, SOMMER and THOMSEN, 2005).

The EU budget is introduced in the GTAP model using a Social Accounting Matrix (SAM). This SAM not only covers the expenditures and revenues of already existing agents (e.g., producers, government, private household, etc.), but also of the European Agricultural Guidance and Guarantee Fund (EAGGF). This EU budget receives 75% of the import duties for agricultural and non-agricultural products from producers, private household, the government and the capital account. Additional revenues result from an endogenously calculated GDP related tax which flows from the regional household to the EU budget. Here, all EU member countries face an equal GDP tax rate. Revenues of the EU budget are used to cover agricultural output and export subsidies as well as direct payments. In contrast to these product specific instruments, expenditures for structural policies are not covered within the EU budget module. Due to their characteristics and specific aims, structural funds can not be allocated to certain commodities. This strongly hampers their implementation into a product specific model like GTAP.

Obviously, revenues of the EU budget from one member country are not identical with the expenditures of the EU budget for the same member country. A comparison of revenues and expenditures of each member state therefore shows the net transfer that takes place within the EU financial system. Analogous to capital transfer, the net transfer within the EU is part of the current account balance which makes up the difference between exports and imports of goods and services. However, the sum of net transfers of all member countries equals zero, since the EU budget is balanced via the endogenous GDP tax rate.

In the standard GTAP model, EAGGF revenues and expenditures are organized through the regional household. All components of the EU budget are therefore introduced with the help of dummy variables allowing an easy shift from regional household to EU budget and vice versa. Consequently, a preliminary simulation is employed to move the GTAP data base from the initial situation without EU budget to a new equilibrium where the EU budget is in charge of the EAGGF (BROCKMEIER, 2003, pp. 100 - 112).

Besides changes in the political environment of an economy, macroeconomic developments like technical progress are of great importance for the growth of an economy. In order to take these changes into account, corresponding trends are incorporated in the analyses at hand. For this purpose we include exogenous projections based on data from WALMSLEY et al. (2000) for regional GDP and factor endowment into the extended GTAP model. In the simulations, technical progress is generated endogenously by the model, enabling the projected growth pattern.

4 Simulations

4.1 Aggregation of the GTAP Data Base

The simulations are based on the GTAP data base Version 6 with 2001 as base year. This data base consists of bilateral trade, transport, and protection matrices that link 57 sectors in 87 countries and/or regions. The data base is aggregated into 14 regions and 16 sectors (compare Tables A1 and A2,

appendix) to keep the calculation efforts within a reasonable scope. The regional sets are put together with regard to the development status and the membership of countries or regions in a certain regional or multilateral agreement. For the sector aggregation, a distinction is made between primary and processed agricultural production sectors, manufacturers and services.

4.2 WTO Scenarios

It is necessary to conduct some pre-simulations before the actual simulations are carried out to implement the extended model structure and to update the protection rates. Therefore a base run of the simulations updates population, GDP and factor endowment to the year 2014 is conducted. Additionally, the AGENDA 2000 and the EU enlargement are implemented in 2004 and 2010, respectively. The EBA agreement is also introduced in 2010 without a transition period through a 100 % elimination of tariffs for LDCs from 2010 onwards. With the implementation of the MTR in 2014, the existing domestic support measures are converted into a region-specific fully decoupled land area payment, while budgetary outlays for total domestic support are held constant. This base run only considers political intervention in the EU-15 and in the new member countries. Developments in other regions, like the USA Farm Bill, are not taken into account. A scenario is implemented parallel to the base run as well. The same projections and policy shocks (Agenda 2000, EU enlargement, EBA agreement and MTR) are taken into account, but this run additionally includes simulations related to the latest proposal of the WTO round for the time period 2010 to 2014.

In the preparations for the WTO ministerial conference in Hong Kong, many proposals concerning agricultural market access have been made by different negotiation groups. However, their concepts differ strongly, and no concrete agreement on agricultural market access has been reached up to now. Therefore, we chose to implement tariff cuts of the EU and US proposals (EUROPEAN COMMISSION, 2005; USTR, 2005) in our simulations (compare Table 4). This approach has the additional advantage that we are most likely capture the lower (EU proposal) and higher end (US proposal) of the tariff cuts, and in so doing, will be able to analyse the impact of calculating tariff cuts at different levels of aggregations within a broader variety of market access options.

Table 4: The EU and the US Proposals on agricultural market access

Industrialized countries					**Developing countries**				
EU proposal		**US proposal**			**EU proposal**		**US proposal**		
Tariff rate (%)	**Tariff cut (%)**	**Tariff rate (%)**	**Tariff cut (%)**		**Tariff rate (%)**	**Tariff cut (%)**	**Tariff rate (%)**	**Tariff cut (%)**	
			initial	**final**				**initial**	**final**
> 90	60.00	≥ 60	85.00	90.00	> 130	40.00	≥ 60	56.67[a]	60.0 [a]
> 60 ≤ 90	50.00	40 - 60	75.00	85.00	> 80 ≤ 130	35.00	40 - 60	50.00[a]	56.67[a]
> 30 ≤ 60	45.00	20 - 40	65.00	75.00	> 30 ≤ 80	30.00	20 - 40	43.33[a]	50.00[a]
0 ≤ 30	35.00	0 - 20	55.00	65.00	0 ≤ 30	25.00	0 - 20	36.67[a]	43.33[a]
Cap at 100%		Cap at 75%			Cap at 150%		Cap at 112.5%[a]		

a) The US-proposal gives no information about the magnitude of tariff cuts for DCs. Analogous to a study of FAPRI (2005) these cuts are assumed to be two thirds of the cuts for ICs.

Source: EUROPEAN COMMISSION (2005), USTR (2005) und FAPRI (2005).

Furthermore, tariff cuts for non-agricultural commodities of 50 % and 33 % are implemented in industrialized countries (ICs) and in developed countries (DCs), respectively. Thereby, bound and applied tariff rates are also considered for non-agricultural commodities. In accordance with the already decided parts of the WTO negotiations, we eliminate export subsidies in all experiments, while it is assumed that EU direct payments qualify for the green box and are therefore kept unchanged. According to the Doha Work Programme (WTO, 2004) the EBA initiative is extended to all ICs. Therefore all tariffs on LDC-imports are eliminated in ICs, while LDCs are exempted from tariff reductions.

4.3 Aggregation of Protection Data

Version 6 of the GTAP data base utilizes the protection data of the Market Access Map Version 2001 (MAcMaps). Accordingly, the GTAP data base includes applied protection data that are aggregated from the 6-digit applied tariff line level to the GTAP level with the help of trade weights. In order to compare the two approaches (compare Chapter 2), we supplement the GTAP data base with bound tariff rates that are aggregated from the corresponding 6 digit-level to the GTAP level using trade weights. The bound tariffs are also provided by MAcMaps.

MAcMaps offers applied protection data on a bilateral basis. Thus preferential trading agreements are considered. The source files of applied tariff data in MAcMaps come from the TRAINS, the WTO and the AMAD data base. They take preferences, ad valorem equivalents (AVEs) and tariff rate quotas (TRQs) into account. Information on preferences is taken from the TRAINS data base and is augmented with data from national sources. AVEs are calculated on the basis of the median unit value of world-wide exports originating from the reference group to which the exporter belongs. The value data are computed using an average flow of the years 2000 to 2003. Finally, TRQs are taken into account utilizing the filled rate from the AMAD data base. If the filled rate is less than 90 %, the in-quota tariff is used. The out-of-quota rate is employed if the filled rate is higher than 100 %. If the filled rate is higher than 90 %, but less than 100 %, a simple average of the in-quota and out-of-quota rate is applied (BOUËT et al, 2003). Bound tariff data are based on WTO's Consolidated Tariff Schedules (CTS) data base and national sources. AVEs of bound tariffs are computed using world-wide unit values (compare Bchir et al., 2005).

In our analysis, the 6-digit tariffs are aggregated to the GTAP level using import trade weights. The aggregation of bound tariff data to the GTAP level is done with the help of generic world import values. We employ bilateral import values for the aggregation of all reduced applied tariff data. Import values are taken from the COMTRADE data base of the year 2001. However, intra EU trade is excluded from the COMTRADE data.

Four scenarios (compare Table 5) are implemented with the help of this data base. First, the EU-proposal on market access is implemented at the GTAP level. Therefore, the aggregated bound tariff data are added to the existing applied tariffs in the model. The same data base is used to implement the second scenario. Here, the tariff cuts as proposed by the USA are applied. In the third and fourth scenarios, the EU and US tariff cuts are also implemented, but here we use the 6-digit tariff line level as a starting point (compare Chapter 2). Consequently, bound and applied tariffs are considered at the detailed level and cut according to the prevailing proposals. The new applied tariffs are then aggre-

gated to the GTAP regional and sectoral level (87 regions and 57 commodities) and further to the level of our specific aggregation (14 regions and 16 commodities).

Table 5: Implemented scenarios

	EU proposal for market access	**US proposal for market access**
Tariff cuts calculated at GTAP level	Scenario 1 (EU_ML)	Scenario 2 (US_ML)
Tariff cuts calculated at 6-digit level	Scenario 3 (EU_6D)	Scenario 4 (US_6D)

5 Results

This section discusses the results of the four experiments analyzing the impact of calculating tariff cuts at different levels of aggregation. The results are presented in millions of US $ for the year 2001 of the GTAP data base. The calculations are based on the software GEMPACK (Version 8.0), RunGTAP and AnalyseGE (HARRISON and PEARSON, 1996).

In the following, we will mainly focus on the trade balance. Changes in the output of production are mainly induced by the changes in the trade regime. Thus, the output results show a pattern that is similar to the changes in the trade balance and will therefore only be discussed rudimentarily. Nevertheless, the appendixes provide detailed results for the output of production and prices (A3 to A4) on a disaggregated country level.

5.1 Difference between the EU and US Proposal

This chapter first describes the change in the trade balance in Scenario 3 and 4. Accordingly, Table 6 presents the change of the trade balance induced by the tariff cuts envisaged in the EU and US proposal, when tariff cuts are calculated at the 6-digit HS level. The presented change in trade balance represents the change in the value of fob exports minus the value of cif imports in millions of US $.[3]

An examination of the entries in Table 6 shows that the results for *cereals* do not differ very much between the two experiments. The EU's negative change of the trade balance of around -400 million US $ is accompanied by an even negative change in developing WTO member countries (WTO DCs) which amounts to around -4.3 billion US $. Most of the additional cereal imports into these two regions come from the USA and Brazil whose trade balances increase significantly. A similar situation is given for the *oilseed* sector. However, here the EU can realize a slight increase of exports due to lower initial protection of this sector. The Japanese rice farmer can clearly be identified as the main loser due to

3 When summed across regions, this provides the change in international trade margin supplied for each product. In contrast, a summation across commodities will yield a trade balance of zero for the region. This is a result of the macro closure which assumes that all changes in investments are financed by domestic savings. As a consequence, any changes in imports are constrained to be offset by an equal change in aggregated exports.

the implementation of the WTO round. The negative development of the Japanese trade balance of *paddy rice* is almost completely absorbed by the other WTO DCs and partly also by the EU.

Table 6: Change in Trade Balance in Scenario 3 and 4 (million US $)[1), 2)]

	EU27	USA	Japan	Oceania	WTO IC	Brazil	India	Zimbab-we	Bangla-desh	Rest of ACP	Rest of LDC	WTO DC	ROW
	EU proposal (EU_6D)												
cereals	-388	3284	37	3	290	743	-59	-1	11	-50	71	-4307	-58
oilseeds	181	1363	137	-133	-785	2461	21	-7	2	-80	22	-3368	-150
paddy rice	-4624	-92	-4588	46	-81	-195	357	0	4	-41	-1130	9288	-128
vegetables and fruits	-214	-939	-102	-102	229	-129	-172	-7	-17	-123	-100	1466	-117
cattle	176	-632	27	-323	205	-12	1	0	0	-36	-18	730	-37
other animal	-130	-1098	26	-200	33	-55	28	-2	-2	-39	-44	1674	-137
beef	-8053	1857	-1189	648	117	3756	-1172	91	2	106	70	1554	2246
other meat	-2168	1352	-3351	-142	-907	-2078	10	-4	-39	-58	222	7182	-70
milk	-8232	992	-406	2162	630	24	364	16	31	400	557	2838	1037
sugar	-1708	-185	-383	353	-8	106	-14	19	-5	868	-950	1947	43
other food	-7127	-4448	-6146	181	-592	-1393	-1191	-10	-317	-112	-291	21116	-888
other primary	3397	1619	595	-43	473	-221	-890	362	-394	-55	-1081	-5321	-826
manufactures	6542	-15515	15765	-2243	-2251	-1390	3176	-543	1002	-740	3705	-23519	1944
services	22305	12449	-421	-203	2674	-1612	-540	85	-279	-26	-1026	-11307	-2750
	US proposal (US_6D)												
cereals	-39	3505	-28	39	724	848	-133	-5	18	-291	120	-5596	140
oilseeds	289	1786	155	-155	-752	1894	52	-10	4	-149	101	-3429	-131
paddy rice	-5797	115	-4003	77	-99	-259	617	0	5	-74	-1351	9530	-130
vegetables and fruits	-401	-960	-213	-103	572	-276	-994	-13	-16	-107	-80	1828	-55
cattle	332	-901	49	-437	362	-50	3	-1	0	-50	-14	880	-38
other animal	-81	-957	95	-196	110	-142	75	-3	-2	-43	-46	1342	-117
beef	-14466	2987	-2882	1291	781	12455	-4830	279	2	18	84	1639	2255
other meat	2985	3783	-6901	-303	-679	-3435	-187	-9	-43	-202	309	4235	-82
milk	-7863	1833	-1646	4571	-1922	-70	324	19	43	164	600	2189	1793
sugar	-4499	-934	-1439	1044	3	429	-5	99	2	3242	-2338	3977	102
other food	-7234	-4139	-7044	411	-490	-1416	-1746	-22	-338	-379	-107	21160	-737
other primary	3876	1148	1290	-590	613	-1433	-143	214	-388	-244	-752	-4924	-859
manufactures	8461	-19493	21773	-4665	-2277	-5948	6817	-610	988	-1680	4325	-22441	637
services	24417	12220	794	-976	3071	-2590	27	64	-276	-172	-856	-10353	-2665

1) For the composition of regions and sectors see Table A1 and A2 in the appendix. 2) WTO IC: other developing WTO member countries, ACP: African, Caribbean and Pacific countries; LDC: Least Developed countries; WTO DC: other developing WTO member countries; ROW: Rest of the world

Source: Own Calculations.

Table 6 also uncovers negative changes of the trade balance of the EU, Japan and India for *beef*, while all other countries are show a positive development. This negative change of the trade balances are particularly pronounced in simulation US_6D (-14.4 billion US $, -2.9 billion US $, -4.8 billion US $) revealing the fact that EU's and Japan's beef sectors are highly protected and accordingly very sensitive to tariff cuts. Most of the EU's negative trade balance change is captured by developing countries where particularly Brazil (12.5 billion US $) is able to increase relative exports. In contrast, industrialized countries like the USA and Oceania show only minor improvement of the trade balances. Comparing simulations EU_6D and US_6D it can clearly be shown that the higher cuts under the US proposal effect EU, Japanese and Indian farmers more. Further examination of the results based on subtotals[4] show that the abolishment of EU export subsidies apparently plays only a secondary role.

4 A more detailed analysis can be conducted based on the decomposition which splits the total change in its single components. These represent the so called subtotals that are attributable to changes in individual exogenous variables, e.g., bilateral tariff cuts, export subsidies.

A slightly different situation is given for *other meat*. Here, the EU, and particularly the US and other WTO DCs, experience a relative increase of exports of other meat if the higher tariff cuts of the US proposal are applied to open market access in Japan, other WTO ICs and Brazil. This result diminishes, if the lower tariff cuts of EU_6D scenario are implemented. The now reduced EU export possibilities even lead to a negative development of the EU trade balance for other meat as can be derived from a detailed analysis via subtotals.

The implementation of the proposed tariff cuts of the WTO round also implies high relative increases of EU *milk* imports. However, higher cuts under the US proposal even reduce this negative development for the EU. The reason for this development is the high dependency of the EU exporters on export subsidies to dampen the milk products' surplus to the world market, while high tariff cuts only slightly increase the imports from third countries. The EU's negative change of the trade balance is mirrored by the relative increase of exports in most of the other regions. Particularly high increases are given in competitive regions like Oceania and the WTO DCs.

High tariff cuts lead to a decrease of trade balance for *sugar* in the EU, the USA, Japan and the LDCs. The industrialized countries' negative change of the trade balance can clearly be attributed to the high protection of these sectors, while LDCs suffer from preference erosion. The relative increase of imports under the implementation of the US proposal for market access also reveals the sensitivity of the sugar sector to tariff cuts in industrialized countries. Also, the elimination of EU export subsidies contributes to the negative change of the trade balance. In contrast, other WTO DCs, the African, Caribbean and Pacific Countries (ACPs) and Oceania are able to realize a high relative increase of exports.

In the case of the *other food* sector, WTO DCs also realize a significant increase of relative exports by 21.1 billion US $. The implementation of higher tariff cuts in scenario US_6D does not lead to a change of the trade balance for WTO DCs, while all other countries and regions, with the exception of Oceania, experience a relative increase of imports.

5.2 Impact of Simulating Tariff Cuts in the Tariff Data Base

How do these results differ if tariff cuts are calculated at the model level? Tables 7 and 8 show the results for the four simulations, but also the differences between Simulations 1 and 3 and 2 and 4. From the differences in Tables 7 and 8 it can clearly be seen that there is a significant difference between the results obtained with tariff cuts calculated at model level and the 6-digit HS level. These differences are particularly pronounced for cereals, paddy rice, beef, other meat, sugar and other food sector.

In general, the difference between simulation results obtained by calculating tariff cuts at different levels of aggregation does not follow a systematic pattern. Thus, it seems almost impossible to approximate the results obtained with tariff cuts calculated at the 6-digit HS level by the results obtained with tariff cuts calculated at the model level.

It can clearly be shown that the deviations between Scenarios 1 and 3 or 2 and 4 are mainly high for sectors exhibiting numerous tariff peaks and show high standard deviations at the 6-digit HS level data base (compare Table A5). The simulation of tariff cuts in the 6-digit HS data base is better able to capture these peaks. However, the endogenous bias leads to lower import weights for the tariff with tariff

peaks. The aggregation the model level therefore still leads to underestimated tariff cuts although they are calculated at the detailed 6-digit HS level.

Table 7: Change in the Trade Balance in Scenario 1 and 3 (Million US $)[1)]

	EU27	USA	Japan	Oceania	IC WTO	Brazil	India	Zimbab-we	Bangla-desh	Rest of ACP	Rest of LDC	WTO DC	ROW
	EU proposal (EU_ML)												
cereals	-589	-1632	97	40	556	560	-29	-2	-11	-258	-98	1302	13
oilseeds	211	1094	22	-77	-374	256	-3	-3	-9	-57	-26	-1016	-104
paddy rice	-3965	476	4475	117	-74	-33	316	0	-2	-20	-442	-990	-25
vegetables and fruits	10	-154	-61	-176	75	-103	90	-7	-41	-128	-90	712	-120
cattle	207	-198	29	-76	85	-11	1	0	0	-24	-5	32	-31
other animal	176	-109	43	-63	108	-49	7	-1	-4	-20	-22	8	-74
beef	-6685	1947	-1300	283	809	4096	-2202	72	0	111	79	607	2269
other meat	-1115	2813	-3100	-38	-447	-935	-200	-3	-13	-51	164	2667	169
milk	-9063	848	-191	1820	-150	69	379	7	19	448	528	4587	1279
sugar	-1679	-86	-363	487	-13	196	-55	52	-13	976	-970	1481	76
other food	-1173	221	-687	351	163	-474	-20	-8	-186	-208	-66	2716	-540
other primary	2959	2441	320	-363	282	-364	456	70	-437	-278	-1370	-3749	-167
manufactures	7954	-13569	408	-1931	-1914	-1418	1075	-125	1002	306	3630	2354	-1740
services	12616	5901	312	-372	912	-1789	163	-52	-307	-783	-1294	-10663	-927
	EU proposal (EU_6D)												
cereals	-388	3284	37	3	290	743	-59	-1	11	-50	71	-4307	-58
oilseeds	181	1363	137	-133	-785	2461	21	-7	2	-80	22	-3368	-150
paddy rice	-4624	-92	-4588	46	-81	-195	357	0	4	-41	-1130	9288	-128
vegetables and fruits	-214	-939	-102	-102	229	-129	-172	-7	-17	-123	-100	1466	-117
cattle	176	-632	27	-323	205	-12	1	0	0	-36	-18	730	-37
other animal	-130	-1098	26	-200	33	-55	28	-2	-2	-39	-44	1674	-137
beef	-8053	1857	-1189	648	117	3756	-1172	91	2	106	70	1554	2246
other meat	-2168	1352	-3351	-142	-907	-2078	10	-4	-39	-58	222	7182	-70
milk	-8232	992	-406	2162	630	24	364	16	31	400	557	2838	1037
sugar	-1708	-185	-383	353	-8	106	-14	19	-5	868	-950	1947	43
other food	-7127	-4448	-6146	181	-592	-1393	-1191	-10	-317	-112	-291	21116	-888
other primary	3397	1619	595	-43	473	-221	-890	362	-394	-55	-1081	-5321	-826
manufactures	6542	-15515	15765	-2243	-2251	-1390	3176	-543	1002	-740	3705	-23519	1944
services	22305	12449	-421	-203	2674	-1612	-540	85	-279	-26	-1026	-11307	-2750
	Difference between Scenario EU_ML and EU_6D (EU_ML - EU_6D)												
cereals	-201	-4916	60	37	265	-182	30	-1	-22	-208	-170	5609	71
oilseeds	30	-269	-115	56	411	-2205	-24	3	-10	23	-48	2352	46
paddy rice	659	568	9063	71	7	162	-41	0	-6	21	689	-10278	103
vegetables and fruits	225	786	41	-75	-154	26	262	0	-25	-5	10	-754	-3
cattle	31	434	2	247	-120	1	0	0	0	11	13	-698	6
other animal	305	989	18	138	75	6	-21	1	-2	19	22	-1666	64
beef	1368	91	-111	-365	692	340	-1030	-19	-1	5	10	-947	23
other meat	1053	1461	251	104	461	1143	-210	0	26	7	-57	-4515	239
milk	-832	-144	215	-341	-780	45	15	-9	-12	49	-30	1749	243
sugar	29	99	20	134	-5	90	-41	33	-8	108	-20	-466	33
other food	5954	4669	5460	170	755	919	1171	3	131	-96	225	-18400	348
other primary	-438	822	-274	-320	-191	-143	1346	-292	-43	-223	-289	1571	659
manufactures	1412	1946	-15357	313	336	-28	-2101	418	0	1046	-75	25873	-3685
services	-9689	-6548	733	-170	-1762	-176	703	-137	-28	-757	-268	643	1822

1) For the composition of regions and sectors see Table A1 and A2 in the appendix. 2) WTO IC: other developing WTO member countries, ACP: African, Caribbean and Pacific countries; LDC: Least Developed countries; WTO DC: other developing WTO member countries; ROW: Rest of the world

Source: Own Calculations.

Table 8: Change in the Trade Balance in Scenario 2 and 4 (Million US $)[1)]

	EU27	USA	Japan	Oceania	IC WTO	Brazil	India	Zimbab-we	Bangla-desh	Rest of ACP	Rest of LDC	WTO DC	ROW
	US proposal (US_ML)												
cereals	-113	483	-109	-446	382	629	-79	-6	-6	-428	-57	-688	84
oilseeds	250	1888	77	-123	-531	345	31	-6	-6	-125	25	-1902	-91
paddy rice	-5281	562	3367	153	-86	-100	530	0	-1	-66	-896	1468	-49
vegetables and fruits	-320	-997	-235	-308	421	-262	-335	-15	-42	-168	-49	2203	-84
cattle	364	-551	56	-190	285	-50	3	-1	0	-57	-2	224	-34
other animal	98	-460	81	-146	205	-144	40	-2	-3	-40	-23	502	-92
beef	-13525	1906	-2665	444	1289	13250	-5805	263	1	231	94	1908	2276
other meat	1746	3706	-6898	-238	-1028	-2794	-322	-10	-24	-215	320	5166	152
milk	-9339	1375	-2119	4744	-3074	18	299	8	32	393	582	5392	1933
sugar	-4505	-707	-1410	1051	-4	459	-58	133	-4	3218	-2319	3754	142
other food	-1977	-901	-3208	618	337	-1262	-229	-22	-211	-356	34	7770	-830
other primary	3730	1631	1401	-750	651	-1600	1085	-67	-426	-497	-962	-4107	-121
manufactures	12919	-14301	9809	-3814	-693	-5771	4146	-195	991	-895	4377	-8173	-2349
services	15857	6349	1849	-992	1832	-2712	653	-79	-299	-954	-1114	-13448	-850
	US proposal (US_6D)												
cereals	-39	3505	-28	39	724	848	-133	-5	18	-291	120	-5596	140
oilseeds	289	1786	155	-155	-752	1894	52	-10	4	-149	101	-3429	-131
paddy rice	-5797	115	-4003	77	-99	-259	617	0	5	-74	-1351	9530	-130
vegetables and fruits	-401	-960	-213	-103	572	-276	-994	-13	-16	-107	-80	1828	-55
cattle	332	-901	49	-437	362	-50	3	-1	0	-50	-14	880	-38
other animal	-81	-957	95	-196	110	-142	75	-3	-2	-43	-46	1342	-117
beef	-14466	2987	-2882	1291	781	12455	-4830	279	2	18	84	1639	2255
other meat	2985	3783	-6901	-303	-679	-3435	-187	-9	-43	-202	309	4235	-82
milk	-7863	1833	-1646	4571	-1922	-70	324	19	43	164	600	2189	1793
sugar	-4499	-934	-1439	1044	3	429	-5	99	2	3242	-2338	3977	102
other food	-7234	-4139	-7044	411	-490	-1416	-1746	-22	-338	-379	-107	21160	-737
other primary	3876	1148	1290	-590	613	-1433	-143	214	-388	-244	-752	-4924	-859
manufactures	8461	-19493	21773	-4665	-2277	-5948	6817	-610	988	-1680	4325	-22441	637
services	24417	12220	794	-976	3071	-2590	27	64	-276	-172	-856	-10353	-2665
	Difference between Scenario US_ML and US_6D (US_ML - US_6D)												
cereals	-75	-3022	-81	-484	-342	-219	53	-1	-25	-136	-176	4908	-56
oilseeds	-38	102	-77	32	222	-1549	-21	3	-10	24	-76	1528	40
paddy rice	516	447	7371	76	13	159	-87	0	-6	8	455	-8063	81
vegetables and fruits	81	-37	-21	-204	-150	14	660	-2	-27	-62	31	376	-29
cattle	32	350	7	248	-77	0	0	0	0	-7	12	-656	5
other animal	179	497	-14	50	95	-2	-35	1	-2	3	22	-839	25
beef	941	-1081	217	-847	509	796	-975	-16	-1	213	10	269	21
other meat	-1238	-77	3	65	-349	641	-135	-1	18	-13	12	931	234
milk	-1476	-458	-473	172	-1152	88	-25	-11	-12	229	-18	3203	140
sugar	-6	228	28	8	-7	30	-53	34	-6	-24	20	-223	39
other food	5257	3238	3837	207	826	153	1517	0	127	23	141	-13391	-92
other primary	-147	482	111	-160	38	-167	1228	-280	-38	-253	-210	816	739
manufactures	4458	5192	-11964	852	1585	177	-2670	416	3	785	51	14267	-2986
services	-8560	-5871	1055	-16	-1239	-121	626	-142	-23	-782	-259	-3096	1815

1) For the composition of regions and sectors see Table A1 and A2 in the appendix. 2) WTO IC: other developing WTO member countries, ACP: African, Caribbean and Pacific countries; LDC: Least Developed countries; WTO DC: other developing WTO member countries; ROW: Rest of the world

Source: Own Calculations.

The differences of the two different approaches to obtain tariff cuts are not so pronounced between Simulations 2 and 4. Apparently, it is easier to approximate the results of a detailed 6-digit HS level calculation of tariff cuts with a calculation of tariff cuts at the model level when the widths of the bands are smaller and the tariff cuts are higher, e.g., with the US proposal.

The differences are also present for single countries like the USA, Japan, Brazil and India. Thus, it seems as if the smoothing out of tariff peaks due to aggregation across sectors is much more distinct

than the one due to aggregation across regions. However, it would be interesting to analyze whether the calculation of tariff cuts at the 6-digit HS level leads to different results compared to those obtained at the model level due to an underestimation of the country's own tariff cuts or other country's tariff cuts. Thus, we also decomposed the total change of the trade balance into subtotals (compare Table 9).

Table 9: Subtotals for Selected Sectors and Countries / Regions (Million US $)[1)]

		Tax of agricultural product				Tax of non-	Export subsidies		Sum
	Scenario	from IC to IC	from IC to DC	from DC to DC	from DC to IC	agricultural products	from IC to IC	from IC to DC	
USA, cereals	1	-1049	-239	-781	-8	69	26	352	-1630
	2	-1226	2835	-1705	109	70	15	387	486
	3	-357	4620	-1443	-9	49	17	409	3287
	4	-1015	6203	-2327	165	45	11	425	3507
Brazil, cereals	1	-31	25	718	-139	-3	0	-9	561
	2	-38	-11	1099	-403	-2	-1	-13	629
	3	-39	-16	931	-123	-4	0	-7	743
	4	-55	-58	1375	-401	-1	0	-12	848
Japan, paddy rice	1	3527	2363	-2022	142	57	3	356	4426
	2	4311	3993	-6010	637	59	11	370	3372
	3	3209	4000	-12468	405	-82	2	353	-4582
	4	3950	3616	-12560	715	-83	8	362	-3992
WTO DC, paddy rice	1	-112	-2870	2473	-108	-55	-11	-317	-1000
	2	-224	-4763	7128	-276	-56	-19	-332	1458
	3	-158	-5025	14891	-194	86	-8	-311	9279
	4	-249	-4606	14778	-152	88	-14	-323	9522
EU, beef	1	184	-14	3	-2029	-250	-1302	-3283	-6690
	2	188	-138	41	-8680	-199	-1444	-3298	-13530
	3	-41	-112	-52	-1998	-1288	-1215	-3360	-8066
	4	-57	-390	84	-8216	-1125	-1366	-3398	-14467
India, beef	1	-31	-43	15	-2220	374	-59	-233	-2197
	2	-38	18	96	-5969	361	-63	-205	-5800
	3	-61	-14	-3	-2370	1568	-53	-238	-1170
	4	-76	97	189	-6267	1498	-59	-208	-4824
EU, other meat products	1	2844	-195	-321	-216	271	-812	-2687	-1116
	2	6539	-225	-784	-470	273	-965	-2622	1747
	3	1902	1160	-1902	-66	231	-732	-2757	-2165
	4	5160	3919	-2435	20	235	-943	-2971	2987
WTO DC; other meat product	1	-492	720	906	852	-612	69	1221	2664
	2	-1724	1834	1748	2601	-611	101	1213	5162
	3	-701	657	5290	964	-411	79	1300	7178
	4	-1582	-2317	5354	1639	-435	79	1492	4231

1) IC: industrialized countries; DC: developing countries; WTO DC: other developing WTO member countries. 2) For the composition of regions and sectors see Table A1 and A2 in the appendix.

Source: Own Calculations.

However, with this approach it is also impossible to identify a distinctive pattern. For example, Table 9 shows that the deviation in the cereal sector of the Brazil can clearly be attributed to the higher tariff cuts between developing countries in Scenarios 3 and 4. Apparently, Brazil achieves better access to

the market of other developing countries. Similarly, the USA obtains increased export possibilities to developing countries through higher tariff cuts in Scenarios 3 and 4. But Table 9 also shows that the increase of tariffs between industrialized and between developing countries negatively influences the cereal trade balance of the USA.

That the deviation of one country's result is not in any case a consequence of the countries' own import tariff cuts can also be observed in the Japanese paddy rice sector. Japan's high deviation for paddy rice does not stem from their own tariff cuts, as a cap of 100% or rather 75% is applicable in all four experiments. It is rather a result of higher tariff cuts between developing countries in the D6-scenarios which open their markets wider for trade with each other and thereby deviate Japan's exports (compare Table 9).

The opposite is given for the beef market, where the calculation of 6-digit HS level evidently captures the high tariff peaks of the EU, and thus leads to EU higher tariff cuts in both scenarios based on tariff cut calculations at the 6-digit HS level. Analogously, the higher positive development of India in these scenarios can also be attributed to the higher EU tariff cuts implemented under Scenarios 3 and 4. The elimination of EU export subsidies, however, does only play a minor and mainly unchanged role in the negative change of the EU's trade balance for beef.

Table 9 finally reveals the decomposition of the EU's and WTO DCs' trade balance for other meat. Here, it can be seen that the simulation of tariff cuts in the tariff data base largely captures the tariff peaks in developing countries. Accordingly, the increase of relative EU exports to developing countries due to their more pronounced tariff reduction is particularly high in Scenario 4. Parallel to this, trade between developing countries is induced and thereby the EU's export of other meat products to developing countries is hampered. Interestingly, the role of the elimination of EU's export subsidies is larger when tariff cuts are calculated at the 6-digit HS level.

6 Conclusion

The simulation of WTO scenarios at the 6-digit HS level data base is a highly resource consuming issue. Therefore, this paper analyzes whether it is possible to approximate the tariff cuts obtained at the 6-digit HS level with calculations of tariff cuts at the level of models widely utilized to analyze the impact of WTO negations. These two different kinds of tariff cuts are implemented with the help of the GTAP model. The results of the simulation clearly show, that

- there is no systematic pattern between the results obtained with tariffs calculated at the 6-digit HS or the model level. Thus, it is almost impossible to approximate the results of one tariff calculation approach with the prevailing other.
- the simulation of tariff cuts at the 6-digit HS level is better able to capture tariff peaks. However, due to the endogenous bias and the resulting lower tariff weights for tariff peaks, even these tariffs are underestimated.
- the more narrow the bands and the higher the tariff cuts of the proposed tiered formula are, the smaller the deviation between the simulation results.
- the aggregation across sectors intensifies the smoothing out of tariff peaks compared to the aggregation across regions.

- the deviation of one country's result is not in any case a consequence of the country's own tariff cuts. Rather it can also be a result of higher tariff cuts between other trading partners that induces their trade.

In general it has to be stated that neither of the methods to calculate tariff cuts are completely accurate. However, the more detailed method calculating tariff cuts at the 6-digit HS level is in a better position to capture tariff peaks, particularly when tariff reduction is based on a tiered formula as it is the case in the current WTO negotiation.

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8 Appendix

Table A1: Aggregation of Countries and Regions

Countries and Regions	Abbre-viation
1. European Union 15 Austria, Belgium, Denmark, Finland, France, Germany, Ireland, United Kingdom, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden	**EU15**
2. Central and Eastern European Countries Bulgaria, Czech Republic, Hungary, Malta, Poland, Romania, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Cyprus	**CEEC**
3. United States	**usa**
4. Japan	**jpn**
5. Oceania Australia, New Zealand	**OCEA**
6. Other WTO – members (industrialized countries) Canada, Switzerland, Rest of EFTA, Albania, Croatia	**rWTOIC**
7. Brazil	**bra**
8. India	**ind**
9. Zimbabwe	**zwe**
10. Bangladesh	**bgd**
11. Other African - Caribbean –Pacific - Countries Rest of Oceania, Rest of FTAA, Rest of Caribbean, Botswana, South Africa,	**rACP**
12. Other Least Developed - Countries Rest of Southeast Asia, Rest of South Asia, Malawi, Mozambique, Tanzania, Zambia, Other Southern Africa, Madagascar, Uganda, Rest of Sub-Saharan Africa	**rLDC**
13. Other WTO – members (developed countries) China, Hong Kong, Korea, Rest of East Asia, Indonesia, Malaysia, Philippines, Singapore, Thailand, Sri Lanka, Mexico, Colombia, Peru, Venezuela, Rest of Andean Pact, Argentina, Chile, Uruguay, Rest of South America, Central America, Turkey, Rest of Middle East, Morocco, Tunisia, Rest of North Africa, Rest of South African CU	**rWTODC**
14. Rest Of The World Taiwan, Vietnam, Rest of North America, Rest of Europe, Russian Federation, Rest of FSU	**ROW**

Table A2: Aggregation of Sectors

Sectors	Abbre-viation
1. Wheat, Cereal grain nec	**CERE**
2. Oil seeds	**osd**
3. Sugar cane, sugar beet	**c_b**
4. Paddy Rice	**pdr**
5. Vegetables, fruit, nuts	**v_f**
6. Cattle, sheep, goats, horses	**ctl**
7. Animal products nec	**oap**
8. Raw milk	**rmk**
9. Meat: cattle, sheep, goats, horse	**cmt**
10. Meat Products nec	**omt**
11. Dairy products	**mil**
12. Sugar	**sgr**
13. Food products nec, Vegetables oils and fats, processed rice	**OFOOD**
14. Other Primary Sectors Plant-based fibers, crops nec, wool, silk-worm, cocoons, Forestry, Fishing Coal, Oil, Gas, Minerals nec, wood products, petroleum, coal products	**OPRI**
15. Industry Beverages and tobacco products, 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	**MNFCS**
16. Services Electricity, Gas manufacture, distribution, 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	**SVCES**

Table A3: Change in Output in Scenario 1 and 3 (%)[1)]

	EU27	USA	Japan	Oceania	IC WTO	Brazil	India	Zimbab-we	Bangla-desh	Rest of ACP	Rest of LDC	WTO DC	ROW
	EU proposal (EU_ML)												
cereals	-3.8	-3.3	-48.3	0.1	2.8	14.7	-0.1	-0.5	-2.8	-5.0	-0.3	-1.3	1.1
oilseeds	1.8	5.1	1.1	-10.3	-10.6	0.2	-0.2	-4.7	-4.0	-2.4	-0.2	-12.2	-2.4
sugar beet & cane	-13.4	-0.2	-16.8	6.6	1.5	1.0	0.0	28.5	0.9	18.5	-2.7	3.2	0.8
paddy rice	-27.4	13.9	8.1	18.5	-24.5	-3.0	1.6	-4.9	-0.5	6.2	-2.3	-8.3	-0.4
vegetables and fruits	-0.4	-0.3	-0.4	-1.8	0.9	-4.4	0.0	-4.2	-0.7	-1.9	0.0	0.6	-0.3
cattle	-10.3	2.3	-14.6	0.3	2.6	18.4	-2.2	12.6	1.2	1.3	0.4	1.4	3.2
other animal	-1.3	1.5	-11.5	-2.6	-7.2	-2.1	-0.4	-1.3	1.4	0.0	1.1	1.3	1.9
raw milk	-6.3	1.1	-1.4	14.6	-2.0	0.7	0.3	14.4	1.0	6.8	3.4	5.7	1.3
beef	-24.8	2.9	-18.1	3.1	1.4	31.2	-10.8	90.0	-6.7	1.5	3.1	1.9	44.4
other meat	-2.0	3.5	-39.6	-0.9	-15.2	-11.4	-43.7	-1.7	-17.7	-1.8	4.7	4.2	5.3
milk	-10.9	1.3	-1.2	17.0	-2.6	1.0	5.2	32.8	16.9	16.0	71.9	16.5	19.1
sugar	-20.2	-0.3	-16.9	19.4	1.6	3.2	0.0	61.0	0.9	32.6	-8.1	5.2	2.3
other food	-1.1	0.2	0.0	2.6	0.5	-1.2	-0.3	0.1	-0.7	-0.9	0.3	1.6	-0.3
other primary	0.7	0.4	0.2	-0.8	0.2	-1.2	0.2	0.6	-2.0	-0.5	-1.1	-0.3	-0.2
manufactures	0.3	-0.3	0.1	-1.8	-0.5	-0.9	0.0	-3.1	2.1	0.0	1.9	0.0	-0.6
services	0.2	0.0	0.1	0.0	0.2	-0.1	0.0	0.0	0.1	-0.2	-0.2	0.0	-0.1
	EU proposal (EU_6D)												
cereals	-4.2	6.3	-38.6	-0.6	1.6	14.8	-0.3	-0.3	-0.5	0.3	0.8	-8.5	0.7
oilseeds	0.1	4.0	4.7	-17.0	-21.1	18.1	-0.7	-8.4	-4.4	-5.2	0.3	-24.5	-3.5
sugar beet & cane	-14.3	-1.4	-18.0	4.3	2.0	-0.1	0.2	10.2	2.0	16.6	-2.7	6.3	0.6
paddy rice	-34.7	-6.0	-86.8	6.7	-28.1	-14.7	-0.6	-10.2	-2.2	-6.5	-8.1	-45.8	-2.2
vegetables and fruits	-1.2	-3.6	-0.9	-1.2	3.9	-6.1	-0.7	-3.6	0.2	-1.8	0.2	2.8	-0.3
cattle	-12.6	0.1	-15.0	-0.7	4.5	14.0	-1.5	15.4	1.5	0.9	0.4	5.1	3.2
other animal	-2.5	-1.9	-11.6	-5.9	-11.0	-8.7	0.3	-2.3	1.9	-0.7	1.6	5.3	1.4
raw milk	-6.4	0.7	-2.7	17.5	4.0	0.5	0.9	31.6	1.3	6.1	4.1	6.6	1.1
beef	-27.6	2.0	-17.6	8.0	1.1	28.1	-3.3	113.8	-19.1	1.5	3.1	4.9	44.0
other meat	-2.9	1.4	-41.9	-3.5	-20.3	-22.5	18.1	-2.1	-55.7	-2.2	6.2	11.8	4.0
milk	-10.3	1.1	-2.7	20.4	6.9	0.3	5.5	74.7	22.9	14.5	74.7	13.3	16.4
sugar	-21.0	-1.4	-18.0	14.1	1.7	1.1	0.3	22.7	2.2	29.3	-7.6	8.5	1.6
other food	-3.3	-1.8	-3.9	1.2	-1.8	-3.6	-5.7	0.1	-2.8	-1.2	-1.2	10.2	-1.3
other primary	0.7	0.2	-0.1	-0.4	0.3	-1.1	-1.3	8.2	-1.5	-0.1	-0.7	-0.1	-0.5
manufactures	0.3	-0.4	1.1	-2.2	-0.6	-1.0	1.0	-13.8	2.2	-0.7	1.9	-0.5	-0.1
services	0.3	0.1	0.1	0.0	0.2	-0.1	0.2	1.5	0.2	0.0	0.0	0.2	-0.1
	Difference between Scenario EU_ML and EU_6D (EU_ML - EU_6D)												
cereals	0.4	-9.6	-9.8	0.7	1.1	-0.1	0.1	-0.3	-2.3	-5.3	-1.1	7.3	0.5
oilseeds	1.8	1.1	-3.6	6.6	10.5	-17.9	0.5	3.7	0.4	2.8	-0.5	12.2	1.1
sugar beet & cane	0.9	1.2	1.1	2.3	-0.4	1.1	-0.2	18.3	-1.1	1.8	0.0	-3.1	0.2
paddy rice	7.3	19.9	95.0	11.9	3.6	11.6	2.2	5.3	1.7	12.8	5.8	37.6	1.7
vegetables and fruits	0.8	3.3	0.4	-0.7	-3.0	1.7	0.7	-0.6	-0.9	0.0	-0.2	-2.1	0.0
cattle	2.3	2.2	0.4	0.9	-1.9	4.4	-0.7	-2.8	-0.3	0.4	-0.1	-3.6	0.0
other animal	1.2	3.4	0.1	3.3	3.8	6.6	-0.7	1.0	-0.5	0.7	-0.4	-4.0	0.5
raw milk	0.1	0.4	1.4	-2.9	-6.1	0.1	-0.6	-17.2	-0.3	0.7	-0.7	-0.9	0.2
beef	2.8	0.9	-0.5	-4.9	0.3	3.1	-7.5	-23.8	12.4	0.1	0.0	-3.0	0.4
other meat	0.9	2.1	2.3	2.6	5.1	11.1	-61.8	0.4	38.0	0.4	-1.5	-7.6	1.3
milk	-0.6	0.2	1.5	-3.3	-9.4	0.7	-0.3	-42.0	-6.1	1.5	-2.7	3.2	2.7
sugar	0.9	1.1	1.1	5.2	-0.1	2.2	-0.3	38.4	-1.2	3.4	-0.4	-3.3	0.7
other food	2.2	2.0	3.9	1.4	2.3	2.3	5.5	0.0	2.1	0.3	1.5	-8.7	1.0
other primary	0.0	0.2	0.3	-0.4	-0.1	-0.1	1.6	-7.7	-0.5	-0.5	-0.4	-0.2	0.4
manufactures	0.1	0.1	-1.0	0.4	0.2	0.0	-1.0	10.8	0.0	0.7	0.0	0.5	-0.5
services	-0.1	0.0	-0.1	0.0	0.0	-0.1	-0.1	-1.5	-0.2	-0.2	-0.1	-0.2	0.0

1) For the composition of regions and sectors see Tables A1 and A2 in the appendix. 2) WTO IC: other developing WTO member countries, ACP: African, Caribbean and Pacific countries; LDC: Least Developed countries; WTO DC: other developing WTO member countries; ROW: Rest of the world

Source: Own Calculations.

Table A4: Change in Output in Scenario 2 and 4 (%)[1)]

	EU27	USA	Japan	Oceania	IC WTO	Brazil	India	Zimbab-we	Bangla-desh	Rest of ACP	Rest of LDC	WTO DC	ROW
	US proposal (US_ML)												
cereals	-2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
oilseeds	3.0	0.8	-84.3	-9.0	1.2	15.5	-0.3	-1.7	-3.1	-6.3	0.1	-6.5	1.4
sugar beet & cane	-27.0	7.4	5.1	-16.9	-14.0	-2.9	-0.3	-9.3	-3.6	-3.9	0.8	-17.8	-1.9
paddy rice	-40.0	-2.8	-35.7	13.6	-6.7	1.3	0.0	66.5	2.2	57.3	-7.1	7.3	1.3
vegetables and fruits	-1.1	14.3	-7.9	22.7	-27.4	-8.5	2.3	-10.9	-0.8	9.7	-4.8	-18.2	-1.0
cattle	-19.8	-2.9	-1.4	-3.1	7.2	-11.2	-1.3	-8.7	-0.9	-2.6	0.3	1.6	-0.3
other animal	-0.4	1.2	-27.9	-0.7	7.4	54.5	-6.3	41.6	1.2	2.0	0.1	3.3	3.2
raw milk	-7.1	0.9	-22.0	-6.0	-11.4	-5.2	-0.8	-3.3	1.4	-1.1	1.8	2.7	1.9
beef	-38.5	1.3	-10.3	36.8	-21.2	-0.1	0.4	14.2	1.0	6.0	3.9	7.3	1.7
other meat	0.7	2.8	-34.7	4.5	2.5	92.5	-29.3	299.2	-17.8	2.4	3.5	4.7	44.6
milk	-11.2	4.3	-76.3	-5.8	-26.0	-32.0	-72.5	-5.4	-34.6	-10.0	7.4	7.9	5.3
sugar	-39.4	1.8	-14.3	43.2	-32.5	0.1	4.4	31.9	23.5	14.1	77.1	19.2	26.7
other food	-1.5	-3.4	-35.8	41.5	1.5	6.8	0.0	142.5	2.4	102.6	-19.8	11.8	3.5
other primary	0.9	-0.3	-1.5	4.7	0.9	-3.4	-1.2	0.4	-1.1	-1.9	0.4	3.8	-0.8
manufactures	0.5	0.2	0.7	-1.6	0.5	-4.9	1.2	-4.7	-1.9	-0.9	-0.6	-0.3	-0.2
services	0.2	-0.3	0.8	-3.5	-0.1	-3.8	1.2	-4.8	2.1	-0.8	2.4	-0.3	-0.7
	US proposal (US_6D)												
cereals	-3.1	6.6	-75.2	-1.3	3.3	17.7	-0.5	-1.4	1.3	-3.1	1.3	-12.3	1.5
oilseeds	2.1	5.3	8.5	-21.5	-20.7	9.5	-0.9	-13.0	-3.5	-6.8	1.8	-23.4	-2.8
sugar beet & cane	-45.5	-4.3	-36.5	12.3	-5.3	0.9	0.3	50.4	3.1	58.5	-7.3	9.0	1.2
paddy rice	-92.8	-0.6	-87.3	9.3	-35.5	-17.9	0.0	-13.7	-2.4	1.9	-9.1	-40.5	-2.0
vegetables and fruits	-1.3	-3.9	-1.5	-2.1	8.7	-12.0	-2.7	-7.5	0.1	-1.7	0.3	2.9	-0.2
cattle	-33.1	1.0	-30.0	0.1	5.9	49.7	-5.9	44.1	1.5	0.4	0.1	5.4	3.3
other animal	0.8	-0.4	-22.9	-7.3	-10.7	-9.1	0.0	-4.0	1.9	-1.3	1.9	4.6	1.6
raw milk	-10.9	1.4	-9.0	35.1	-14.8	-0.5	1.2	34.8	1.3	3.5	4.4	5.9	1.6
beef	-84.4	3.6	-36.0	14.7	-1.1	86.9	-22.5	319.8	-26.7	0.1	3.4	5.2	44.2
other meat	8.1	4.2	-76.2	-7.6	-22.3	-37.7	-29.7	-5.2	-61.3	-9.1	7.7	8.4	4.0
milk	-24.1	2.1	-11.5	41.0	-22.0	-1.0	5.4	81.6	29.6	8.5	78.7	11.8	25.2
sugar	-69.5	-4.7	-36.6	40.9	1.7	6.1	0.4	108.7	3.4	104.5	-19.9	13.8	2.9
other food	-5.7	-1.6	-4.3	3.0	-1.3	-3.8	-7.7	0.4	-3.0	-2.8	-0.9	10.4	-1.1
other primary	1.4	0.1	0.3	-1.6	0.4	-4.7	-0.1	2.5	-1.5	-0.3	-0.4	0.0	-0.6
manufactures	1.9	-0.5	1.5	-4.5	-0.6	-4.0	2.4	-15.4	2.1	-1.3	2.3	-0.5	-0.4
services	1.1	0.1	0.2	0.1	0.4	0.0	0.1	1.6	0.2	0.0	0.0	0.2	-0.1
	Difference between Scenario US_ML and US_6D (US_ML - US_6D)												
cereals	0.3	-6.6	75.2	1.3	-3.3	-17.7	0.5	1.4	-1.3	3.1	-1.3	12.3	-1.5
oilseeds	0.9	-4.5	-92.8	12.6	21.9	6.0	0.6	11.2	0.4	0.5	-1.7	16.9	4.2
sugar beet & cane	18.5	11.7	41.6	-29.2	-8.7	-3.8	-0.6	-59.8	-6.7	-62.4	8.1	-26.8	-3.0
paddy rice	52.8	-2.2	51.7	4.3	28.8	19.2	0.0	80.2	4.6	55.3	1.9	47.7	3.3
vegetables and fruits	0.3	18.2	-6.5	24.7	-36.1	3.5	5.0	-3.4	-0.9	11.4	-5.1	-21.0	-0.8
cattle	13.3	-4.0	28.6	-3.2	1.4	-60.9	4.6	-52.8	-2.4	-3.0	0.1	-3.8	-3.6
other animal	-1.2	1.5	-4.9	6.5	18.1	63.6	-6.2	45.6	-0.7	3.2	-1.8	-1.2	1.6
raw milk	3.8	-0.6	-13.0	-41.2	3.4	-4.7	-1.9	-38.0	0.1	-4.6	-2.6	-3.2	0.3
beef	46.0	-2.3	25.7	22.1	-20.0	-87.0	22.8	-305.6	27.7	5.9	0.5	2.1	-42.5
other meat	-7.5	-1.4	41.6	12.1	24.8	130.2	0.3	304.4	43.5	11.5	-4.3	-3.7	40.6
milk	12.8	2.2	-64.9	-46.9	-4.1	-31.0	-77.9	-87.0	-64.2	-18.4	-71.3	-4.0	-19.9
sugar	30.2	6.5	22.3	2.3	-34.2	-6.0	4.1	-76.8	20.2	-90.4	97.1	5.3	23.8
other food	4.2	-1.8	-31.4	38.5	2.8	10.6	7.6	142.0	5.4	105.4	-18.9	1.4	4.6
other primary	-0.5	-0.4	-1.8	6.3	0.5	1.3	-1.1	-2.2	0.4	-1.6	0.8	3.9	-0.3
manufactures	-1.4	0.8	-0.8	2.8	1.1	-0.9	-1.2	10.7	-4.0	0.5	-2.9	0.3	0.2
services	-0.9	-0.4	0.7	-3.6	-0.5	-3.9	1.1	-6.4	1.9	-0.9	2.4	-0.5	-0.6

1) For the composition of regions and sectors see Table A1 and A2 in the appendix. 2) WTO IC: other developing WTO member countries, ACP: African, Caribbean and Pacific countries; LDC: Least Developed countries; WTO DC: other developing WTO member countries; ROW: Rest of the world

Source: Own Calculations.