Impact assessment of trade liberalisation between EU and Mercosur countries

Lucie Weissleder, Marcel Adenäuer and Thomas Heckelei

Institute for Food and Resource Economics, University of Bonn
Contact: lucie.weissleder@ilr.uni-bonn.de

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Lucie Weissleder, Marcel Adenäuer and Thomas Heckelei, Institute for Food and Resource Economics, University of Bonn, D

Abstract

Ongoing bilateral trade negotiations between the Mercosur group and the EU since 2000 on agricultural products served as incitement to analyse the impacts of possible outcomes. The objective of this paper is to quantitatively assess impacts of bilateral liberalisation scenarios on EU25 and Mercosur markets as well as their bilateral trade flows. For this purpose, the CAPRI model, which has already been applied to several multi- and bilateral trade liberalisation scenarios in the past, has been adopted in several ways.

(1) Trading blocks in CAPRI have been expanded so that the Mercosur countries are now represented with country specific behavioural functions and explicit trade flows.
(2) The parameters of these behavioural functions have been calibrated using recently estimated supply and demand elasticities (CAP, E. ET AL., 2006) as prior information in a constrained Bayesian framework (HECKELEI, T. ET AL., 2005).
(3) Two different baselines scenarios varying in the assumed production potential of the Mercosur countries were defined with experts from these countries. This approach reflects that developments in Mercosur countries are very dynamic with lots of uncertainties. It also provides analysis of results dependent on baselines which is an innovation in CAPRI (technically and qualitatively).

In this paper three selected scenarios are analysed. The first scenario reflects an unilateral partial liberalisation between the EU25 and the Mercosur countries by allocating additional Tariff Rate Quotas (TRQs) to the Mercosur countries for certain products based on an official EU proposal (USDA, 2005). The second scenario combines the partial unilateral liberalisation with the multilateral WTO G20 proposal. Sensitive products are defined according to JEAN, S. et al. (2006). The third comprises a bilateral full liberalisation between the EU25 and the Mercosur countries by allowing quota and duty free access in both directions for all agricultural products. The results focus on welfare effects and the market balances of seven key commodities (wheat, maize, rice, soybeans, bovine meat, chicken and pork).

Furthermore, a sensitivity analysis on the elasticities of substitution between foreign and domestic produced goods that drive demand of trade flows is provided and shows that the choice of those elasticities is very crucial with respect to model results.

Key words: Trade liberalisation, Mercosur, CAPRI, Armington.

1 Introduction

The Regional Trade Agreement “Mercosur” was founded in 1991 among Argentina, Brazil, Paraguay and Uruguay. Venezuela signed the membership agreement in 2006. Bolivia and Chile are currently associated member states.

In 2004 up to 35% of the world agricultural exports of the Mercosur countries were exported into the EU25 (JANK, M. ET AL., 2004). In the same year, only 0.96% of the total value of agricultural exports of the EU25 was exported to the Mercosur countries (COMEXT, 2005). Ongoing bilateral trade negotiations since 2000 focus largely on agricultural products because of their economic relevance to Mercosur countries and the potentially significant competition for EU producers arising from liberalised EU-market access. Up to now Mercosur countries have preferential access according to the tariff-rate quotas defined under the Agriculture Agreement of the Uruguay Round (LABORDE, D. AND RAMOS, M., 2006).

The objective of this paper is to quantitatively assess impacts of bilateral liberalisation scenarios on EU25 and Mercosur markets as well as their bilateral trade flows. For this purpose, the CAPRI model, which has already been applied to several multi- and bilateral trade liberalisation scenarios in the past, has been adopted in several ways. As model results, especially for a complex model as CAPRI, are influenced by the parameters that drive the model, a sensitivity analysis on Armington elasticities is provided to give an insight on the degree of uncertainty in the analysed scenarios.

The structure of the paper is as follows: in *section two* the methodology used in the analysis is stated. Appearing problems with the used methodology will be pointed out. The *third section* includes the definition of scenarios and the analysis of results received though the simulation. A sensitivity analysis on model uncertainty will be done in the *fourth section*, while the *fifth section* concludes by summarising the results of the econometric analysis.

2 Methodology

In this section an overview on the agricultural sector model CAPRI is given and it is shown how the model was adjusted to analyse liberalisation scenarios between the EU and the Mercosur countries. Further, some uncertainty issues will be discussed with respect to parameters used in the global market module of CAPRI.

2.1 Model overview

The regionalised agricultural sector modelling system "CAPRI" (**C**ommon **A**gricultural **P**olicy **R**egional **I**mpact) was developed in the context of the Fourth Framework Project (FAIR3-CT96-

1849)[1] from 1997 until end of 1999. It has been developed further under the "CAPSTRAT" (2001-2004) and in the "CAPRI-DYNASPAT" project (2004-2007). Over the whole time period a lot of applications of the modelling system have provided quantitative analysis of special agricultural policy reform proposals.[2]

The model is generally designed as a projection and simulation tool for the agricultural sector: It is known to be very detailed on EU level, where supply is modelled with aggregate programming models at NUTS 2 level, working with exogenous prices defined at Member State level. One of the most recent features also allows for a spatial disaggregation of those results using statistical procedures. This regional differentiation is commonly seen as the strength of CAPRI because there are not many models competing on that level. To get rid of exogenous prices in the model, the European supply part is coupled with a global spatial market module (a Multy Commodity Model based on the Armington Approach in Armington, P, 1969). In this paper the focus on this part of CAPRI. The module features flexible and regular systems of supply, human consumption, feed, and processing functions, thus allowing for the calculation of welfare changes for producers, consumers, the processing industry, and the public sector. It contains 28 trading blocks partly further disaggregated to single countries. The parameters of the behavioural functions are taken from literature, but calibrated in a way that homogeneity, curvature, symmetry, and adding-up restrictions are fulfilled globally. Policy instruments for all regional aggregates in market model include bilateral tariffs (specific and ad valorem) and price wedges are based on OECD's producer and consumer support estimates. Border protection measures are aggregated from AMAD. Bi-lateral agreements for the EU are added according to the EU legislation. In both, future changes as defined in legislation are implemented in the Baseline. For the EU25, a more explicit representation of intervention sales and subsidised exports under WTO commitments is realised.

The model captures several dozen TRQs worldwide, covering all important ones for EU's agricultural markets. TRQs in the model are either allocated to specific trading partners or open to any imports. Tariffs and imports under TRQs in the model are endogenous, so that the regime switches from under filled, to binding and to over-quota imports and vice-versa. Resulting changes in tariffs are modelled endogenously. Equally, the model captures the remaining flexible levies in cereal markets and safeguards for sugar and rice for the EU.

2.2 Model adjustments

In order to be able to analyse liberalisation scenarios between the EU25 and the Mercosur countries, several adjustments were applied to CAPRI listed in the following:

[1] Final consolidated report with a detailed model description is available on the project web site: http://www.agp.uni-bonn.de/agpo/rsrch/capri/finrep.pdf .
[2] A more detailed description of the model and its applications can be found on the web page http://www.agp.uni-bonn.de/agpo/rsrch/capri/capri_e.htm and in Britz et al (2005).

(1) Trading blocks in CAPRI have been expanded so that the Mercosur countries are now represented with country specific behavioural functions and explicit trade flows. Formerly there was only on Mercosur trading block.
(2) The parameters of these behavioural functions have been calibrated using recently estimated supply and demand elasticities (CAP, E. ET AL., 2006) as prior information in a constrained Bayesian framework (HECKELEI, T. ET AL., 2005). The selected demand and supply elasticities are shown in Table 1 and Table 2. In the calibration process the estimated elasticities are taken to create the implicit supply elasticities in the global market model of CAPRI. Since the data on which the estimated elasticities are based is not the same than applied in the model and furthermore some restrictions applied in the CAPRI calibration process where not applied in the original estimation, calibrated elasticities can differ from the estimated ones. Therefore, in both tables the fit between the estimated and calibrated elasticities is pointed out in percentage terms.

Table 1: Estimated supply elasticities and the calibrated fit

		MAIZ	SOYA	APPL	BEEF	POUM	RICE	SUGA	WHEA
ARG	MAIZ	1.3	-0.53						
		100%	81%						
ARG	SOYA	-0.8	0.58						-0.26
		108%	100%						88%
ARG	APPL			0.46					
				100%					
ARG	BEEF				0.52				-0.37
					100%				76%
ARG	WHEA								0.43
									100%
BRA	MAIZ	0.28							
		107%							
BRA	SOYA	-0.45	1.08						-0.9
		29%	101%						98%
BRA	BEEF		-0.97		1		-0.43		
			63%		101%	0%	93%		
BRA	POUM					1.38			
						100%			
BRA	RICE						0.44		
							100%		
BRA	SUGA							1.85	
								93%	
BRA	WHEA								0.86
									100%

Source: CAP ET AL. (2006), CAPRI model

It becomes clear that the estimated supply elasticities are fit properly, while the demand elasticities deviate stronger from the original estimates. As indicated above, this is mainly due to different data sets and the applied restrictions. For example curvature was not imposed in the original estimation as well as some homogeneity restrictions.

Table 2: Estimated demand elasticities and the calibrated fit

		MAIZ	APPL	BEEF	POUM	RICE	SUGA	SOYA	WHEA
ARG	APPL		0.74		0	0.06	0		0.01
			-7%		0%	0%	0%		0%
ARG	POUM		0.01		-0.09	0.01	-0.04		0
			0%		111%	0%	0%		0%
ARG	RICE		0.05		0	0.36	-0.06		0.02
			0%		0%	-14%	0%		0%
ARG	SUGA		0		-0.01	-0.05	-0.19		0
			0%		0%	0%	116%		0%
ARG	WHEA		0.05		0.01	0.11	-0.03		-0.06
			0%		0%	0%	0%		167%
BRA	MAIZ	-0.73		0.05	-0.1	0.04		-0.14	
		100%		120%	0%	0%		0%	0%
BRA	BEEF			-1.03	-0.88				
				101%	-26%				0%
BRA	POUM				-0.88				
					101%				0%
BRA	RICE			0.19	0	-1.35		0.65	
				126%	0%	100%		46%	0%
BRA	SUGA	-0.03		0.31	0.2	-0.05	-0.73	-0.2	-0.75
		0%		3%	40%	0%	115%	0%	0%
BRA	SOYA			0.16	0.17			-1.05	
				0%	12%			101%	0%
BRA	WHEA	-1.63		-0.39	0.16	0.97		0.29	-0.51
		-5%		0%	38%	0%		90%	106%

Source: CAP ET AL (2006), CAPRI model

(3) Two different baselines varying in the assumed production potential of the Mercosur countries were defined with experts from these countries. This approach reflects that developments in Mercosur countries are very dynamic with lots of uncertainties. It was decided on including two baselines, as the development of the production potential of the different Mercosur countries is difficult to forecast. Changes appearing through the baseline definition and ones appearing through the scenario definition can therefore be outlined clearly. Such analysis of results dependent on baselines is an innovation in CAPRI (technically and qualitatively).

The production potential of certain commodities in the different Mercosur countries was projected for 2013. Baseline 1 is the conservative one meaning that normal technologically development is assumed which could therefore be also called the baseline with business as usual. The second Baseline assumes a dynamic development in the Mercosur countries. Table 3 shows the projections taken out of a report written by Cap et al. (2006). Different production quantities would also imply differences in the degree of competitiveness on world markets. Therefore, parts of the production increase, compared to baseline 1, are also transferred into higher export quantities or – when TRQs exist – a higher applied tariff.[3]

[3] The applied tariff in CAPRI is the difference between the price for which a country offers his goods on the world market and the import price of the importing countries. Higher applied tariffs mean therefore more competitiveness of the exporting country

Table 3: Production projection

Country	Commodity	Unit	Conservative	Dynamic
Argentina	Dairy	M liters	13533	18026
	Maize	000 tons	21054	25723
	Soybeans	000 tons	47275	53736
	Wheat	000 tons	15222	17788
	Beef	000 tons	4730	6183
Bolivia	Maize	000 tons	928	1969
	Soybeans	000 tons	1842	2622
Brazil	Maize	000 tons	53609	112185
	Rice	000 tons	13827	19115
	Sugar Cane	000 tons	399258	438936
	Soybeans	000 tons	58685	83248
	Wheat	000 tons	6437	7559
Paraguay	Maize	000 tons	1274	2655
	Soybeans	000 tons	3870	5509
Uruguay	Dairy	M liters	3074	4000
	Rice	000 tons	1488	1600
	Soybeans	000 tons	814	1000
	Wheat	000 tons	586	656
	Beef	000 tons	703	1200

Source: CAP ET AL (2006)

2.3 Parameter uncertainty

Naturally a simulation model contains a lot of uncertainty in its parameters. It is almost impossible to provide a sensitivity analysis on all parameters used in CAPRI. Especially substitution elasticities between imported and domestic produced goods in Armington based models are often criticised for having poor econometric foundation. In CAPRI, the substitution between import flows is nested into the substitution of domestic production and imports using "Constant Elasticity of Substitution" functions (CES). Substitution elasticities as seen from Table 4 are in many cases set to rather high values. It is assumed that substitution between imports from different origins is generally stronger than substitution between imports and domestically produced goods. This is rationalized on the basis that consumers are more indifferent toward the different sources of imported goods compared to the choice between imported or domestic products. The below presented substitution elasticities are synthetic and therefore highly uncertain.

Table 4: Substitution elasticities for the CES-nesting in the Armington approach

Product	**Substitution elasticity between import flows**	**Substitution elasticity between imports and domestic sales**
Generally	10	5
Meats, Butter	6	4 (beef for the EU15: 2)
Cheese, Fresh milk products	4	2
Japan, all products	5	2.5
Fruits and vegetables for Mediterranean countries, rice for the EU	0.8	0.5

Source: CAPRI model

In order to shed light on how those parameters impact on scenario results, a sensitivity analyses will be given in terms of Monte Carlo simulations in the last section of this paper.

3 Scenario Analysis

The scenario analysis gives an insight into the impact of trade liberalisation on the agricultural sectors in the EU25 and the Mercosur countries. For a better comparison three different scenarios are defined featuring different levels of liberalisation.

3.1 Scenario Description

Scenario 1: Bilateral Partial Liberalisation

In scenario 1 a differentiation between three different product groups is done. Each group receives different grades of liberalisation. Products not mentioned in these groups will not experience any changes in their grade of liberalisation regarding the definition of the Baseline.

Table 5 : Product classification

	Measure	**Products**
Group I	Full liberalisation within ten years	Eggs Barley
Group II	50 % reduction in import tariffs over ten years	Olive oil Broken rice
Group III	Additional TRQs, tariff 50 % of WTO bound in-quota tariff	Maize Wheat Rice Cheese Butter SMIP & WMIP Beef Poultry Pork meat

Source: USDA, 2005

For the third product group the problem of distribution of the additional quota quantities among the Mercosur countries appears. It was decided to distribute the additional quota amounts according to the share of exports into the rest of the world (of a certain product) taken by each Mercosur country in total exports of all Mercosur countries, because this indicator is seen to reflect the export potential of the single Mercosur countries best.

Bolivia and Chile are not included in the distribution of the additional quota among the countries as they are not full members of the Mercosur free trade agreement. Hence, they are not considered in the EU-Mercosur negotiations.
Given that the Armington assumptions used in the model allow only exports in the EU25 if exports are observed in the base year, quotas are also only allocated to Mercosur countries where such trade flows are observed. The resulting additional quotas as well as in and out quotas tariffs are given in Table 6.

Table 6: Quota quantities and tariffs for the Mercosur countries

European Union proposal		MAIZ	BEEF	PORK	POUM	RICE	WHEA
ARG	ATRQ	341.59	11.06	~	0.90	~	99.48
	TSPREF	~	~	~	51.25	~	3.00
	TAPREF	~	~	~	~	~	~
	TAMFN	0.40	10.27	~	2.42	~	12.80
	TSMFN	79.13	3316.55	~	694.52	~	118.21
BRA	ATRQ	47.28	25.65	6.00	36.60	~	0.52
	TSPREF	~	~	152.00	51.25	~	3.00
	TAPREF	~	~	~	~	~	~
	TAMFN	0.40	10.27	~	2.42	~	12.80
	TSMFN	79.13	3316.55	578.65	694.52	~	118.21
URU	ATRQ	0.21	10.40	~	~	20.00	~
	TSPREF	~	~	~	~	7.00	~
	TAPREF	~	~	~	~	~	~
	TAMFN	0.40	10.27	~	~	~	~
	TSMFN	79.13	3316.55	~	~	183.52	~
PAR	ATRQ	10.91	2.89	~	~	~	~
	TSPREF	~	~	~	~	~	~
	TAPREF	~	~	~	~	~	~
	TAMFN	0.40	10.27	~	~	~	~
	TSMFN	79.13	3316.55	~	~	~	~
Total	ATRQ	400.00	50.00	6.00	37.50	20.00	100.00

In quota tariffs		ATRQ	Additional tariff- rate quota	(1000 t)
TSPREF	Preferential specific tariff (€/t)			
TAPREF	Preferential ad valorem tariff (%)			
Out quota tariffs				
TSMFN	Preferential specific tariff (€/t)			
TAMFN	Preferential ad valorem tariff (%)			

Source: Own illustration

Further access for the EU25 into the Mercosur countries for agricultural products is not taken into account. Hence this partial liberalisation is a unilateral one.

Scenario 2: Bilateral Partial Liberalisation + G-20 WTO-Proposal

In this scenario the assumptions of the partial liberalisation are combined with the WTO-Proposal also called the G-20 Proposal.
The G-20 Proposal contains the following assumptions: Products are differentiated in sensitive and non sensitive products depending on their origin (Developed or Developing Country). Sensitive products are declared according to the appraisal done by David Laborde, Sebastien Jean and Will Martin in their paper "Rules and Flexibility in Trade Negotiations: The Case of Sensitive Agricultural Products in the WTO" (2006). It was chosen to use sensitive products although there is not yet an agreement on them in order to reflect that some markets are likely to be exempted from liberalisations.

Table 7: List of possible sensitive products

Developed Countries	Developing Countries
Beef	Beef
Cheese	Sugar
Tomatoes	Rice
Wheat and Meslin	Wine
Sugar	Skimmed Milk Powder
Pork	
Rice	

Source: Laborde et al. (2006)

The bound tariffs (ad valorem and specific tariffs) will be cut according to the formula given in Table **8**. A cut of at least 54% on average will be undertaken for the developed countries and 36% on average for the developing countries. Treatment according to the G20 proposal of the sensitive products is for the developed countries that the maximum deviation from the Tariff Reduction Formula (TRF) shall be 30% of the cut determined therein. For developing countries the number of tariff lines designated as "sensitive" can be 50% higher than the absolute number of tariff lines designated by the developed countries. Furthermore, the maximum deviation from the TRF lies by 45%.

Table 8: WTO G20 proposal (Tariff Reduction Formula)

	Developed countries		*Developing countries*	
Thresholds	*Thresholds (in AVEs)*	*Linear Cuts*	*Thresholds (in AVEs)*	*Linear Cuts*
	0≤20	45%	0≤30	25%
	> 20≤50	55%	>30≤80	30%
	>50≤75	65%	>80≤130	35%
	>75	75%	>130	40%
High tariffs & Cap	cap:100%		cap: 150%	

Source: http://www.g-20.mre.gov.br ; G20 Proposal on Market Access

The combination of scenario 1 with the WTO proposal leads to the following measure: The specific and ad valorem in- and out-quota tariffs of TRQs will also be cut according to the applied formula. The quantity of the applied multilateral TRQs will not be expanded.
Continuative according to the WTO proposal export subsidies will be eliminated and LDC countries are exempted from tariff cuts.
It has to be declared, that this definition of the WTO proposal is very simplified in the scenario at hand. Although these modifications have been implemented, this scenario is still useful to show the proportionality between changes in a bilateral sense compared to a multilateral change in the trade policy.

Scenario 3: Bilateral Full Liberalisation

The difference of the full liberalisation in contrast to the bilateral partial liberalisation relates to the product coverage and the extent of adjustment of trade barriers. A partial liberalisation is negotiated

only for certain products or product groups and comprises limited changes in market access instruments. Bilateral full liberalisation includes a quota and duty free access for all products, not only certain products, on a bilateral basis between the EU25 and the Mercosur countries.

3.2 Results

As Bolivia and Chile have not received additional quota or tariff reduction in the defined scenarios, these two countries will not be analysed in the following.

Comparing the results of the two baselines in Table 9 it appears that the different production projections lead to an increase in the import flows into the EU25. On the other hand this does not influence the production and demand structure of the EU25 meaning that the increase in the import flows substitutes other importers. Appendix I and II show the results of all sensitive products for the EU25 and the Mercosur countries over all scenarios and baselines. Caused from the definition of the scenarios the impact on the EU25 for both baselines and all chosen indicators is low. Therefore, an analysis of the EU25 results will not be included.

Main changes between the two baselines appear for the sensitive products beef, maize and soybeans when considering the production and export structure into the EU25 of the Mercosur countries. Production increases highly following the projection. As the demand structure remains nearly unchanged most of the additional production is exported mainly into the EU25. Demand of the Mercosur countries is not included in the table as it remains stable over the different scenarios. Using the example of beef exports into the EU25 it becomes apparent that in case of Brazil the exports are the same in both baselines and equal to the TRQ. In case of Argentina it was assumed that the dynamic baseline would lead to the possibility to export beef at MFN tariffs, so that the TRQ is overshoot here.

Regarding the Mercosur countries Brazil and Argentina are the two countries that experience the highest changes when comparing the baselines and the different scenarios. For a better comparison of the changes over the scenarios two main countries of the Mercosur countries (Brazil, Argentina) and the two main products (beef, maize) that receive changes are taken out for analysis in the following.

Table 9: Results of the two baselines

		Welfare Mn €			Market balance 1000 t														Import flows into EU25 1000 t						
					Net production							Demand													
		Total welfare	Money metric	Agri. income	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy bean	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy bean	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy bean	Rice milled
EU25	B1	9094614	9005085	189539	128564	51871	7907	21707	11803	612	2696	111986	53636	8403	20930	11474	24510	3220							
	B2	9093587	9005088	189068	128561	51871	7907	21707	11803	612	2696	116844	54230	8403	20930	11474	24510	3220							
Venezuela	B1	95618	93355	2311	99	1929	469	120	1177	13	816								0.00	2.88	0.00	0.00	0.00	0.00	0.00
	B2	95598	93355	2278	99	1929	469	120	1177	13	816								0.00	2.89	0.00	0.00	0.00	0.00	0.00
Brazil	B1	554786344	554733990	84829	6437	53608	9124	3306	8236	58692	13827								0.03	1127.77	134.77	7.84	348.02	12384.58	0.00
	B2	554796228	554733991	96546	7559	112183	9124	3306	8237	83248	19115								0.04	1555.91	135.50	7.87	349.41	14665.46	0.00
Paraguay	B1	9381368	9381728	982	463	1274	230	153	98	3870	135								0.00	49.88	3.28	0.00	0.00	88.92	0.00
	B2	9381505	9381728	1123	461	2655	230	153	98	5509	70								0.00	71.68	3.29	0.00	0.00	114.04	0.00
Argentina	B1	235182055	235170176	14367	15224	21053	4730	183	1240	47275	592								28.99	1569.84	33.84	0.00	4.74	907.39	0.12
	B2	235183612	235170176	15992	17788	25722	6183	183	1240	53736	405								29.25	1783.79	45.87	0.00	4.76	989.71	0.12
Uruguay	B1	14856707	14855578	1310	586	199	703	19	63	814	1488								0.01	2.05	32.66	0.00	0.00	8.46	21.54
	B2	14856744	14855578	1351	656	199	1200	19	63	1000	1600								0.01	2.06	45.62	0.00	0.00	10.08	28.51

Source: CARPI model

For Brazil and Argentina changes over the two baselines and the three scenarios are shown in Table 10. Major differences between the two baselines for the two countries are the starting points. For example, the agricultural income is already higher in the baseline 2 but the increase over the scenarios is quite similar between the two baselines. The same appears for the welfare and the money metric.

Comparing the net production a similar picture can be drawn. The initial production level of maize, beef and soybean is higher for baseline 2 than for baseline 1. Starting from this, even reductions over the scenarios can appear as the scenarios change the competitiveness of the countries and the products. Regarding the net production of maize in Brazil it appears that under the baseline 1 the production increases over the three scenarios. Hence, the competitiveness of maize with this production level is not fully utilised. Through the higher production level in baseline 2 a reduction appears when the three different scenarios are simulated. This is due to two effects. Firstly, it is more costly to expand maize production on the already high level of baseline 2 and secondly, Argentina seems to be more competitive in producing maize and exporting it to the EU25. Hence, Brazilian exports are partly displaced by Argentinien. In the full bilateral liberalisation scenario (S3), exports of grain maize into the EU are increasing strongly for both, Brazil and Argentina. These additional exports can be explained through substitutional effects of other Mercosur export flows, which are now less attractive.

As for Beef from Brazil no higher production is projected the differences of the net production between the two baselines over the three scenarios is marginally low. Only in scenario S3 the production increase, as well as the increase of exports to the EU25 is smaller in B2. This is again due to substitutional effects especially caused by Argentina which is assumed much more competitive in B2. As they are already able to export at MFN tariffs in the dynamic baseline, the exports into the EU increase drastically by about 2.5 Mt.

A comparison of exports into the EU of the two products in the S3 scenario shows that quite huge increases appear. Of course, the applied scenario is very strong with respect to changes to the status quo situation so that huge model response is expected. Nevertheless, those huge increases might be overestimated. It becomes further apparent that those export increases are basically due to redirection of export flows from Mercosur into the EU25 and only partly based on production increases. If beef is taken as an example and the additional exports from Brazil and Argentina into the EU25 in S3 of B2 are added up, about 3 Mt are obtained. This is transferred to a high degree to additional EU25 imports of beef (2.7 Mt). At the same time the EU25 increases exports by 1.2 Mt, reduces production by 0.9 Mt and increases human consumption by 0.6 Mt. While the demand increase due to cheaper meat and the corresponding production decrease seem to be reasonable, the additional exports might be over estimated here.

In scenario 1, exports into the EU25 are mainly bound by the TRQs applied. That is why in both baselines, the absolute amount of beef imports is from both countries almost identical. This also holds for maize from Argentina, while maize from Brazil makes here an exemption. TRQs are already overfilled in the dynamic baseline. The new TRQ in Scenario 1 is still below the baseline imports. Therefore, only the import price is relevant at the margin and this is decreasing, so that maize flows into the EU decrease as well.

A comparison of S2 and S1 shows that the additional WTO proposal leads to changes of the import flows but not so much of net production. Beef exports from Argentina are twice as high in S2 as in S1 for B1 and even higher in B2. This is caused through the cut of MFN Tariffs in the WTO proposal so

that Quotas are no longer binding. Welfare effects are generally stronger in S2 compared to S1 because more markets are affected than in a single bilateral scenario.

Generally, all scenarios lead to decreases of consumer surplus and increases of agricultural income since prices are increasing in all scenarios in the Mercosur countries. Total welfare of the agricultural sector is increasing in all scenarios for Brazil, while it is even decreasing in some scenarios in Argentina where strong losses of the processing sector (not shown here) compensate the increases of agricultural income.

Table 10: Selected country results

			Welfare Mn €			Market balance 1000 t		Import flows into EU25 1000 t	
			Total welfare	Money metric	Agri. income	Net production		Grain maize	Beef
						Grain maize	Beef		
Brazil	B1	S1	554786488	554733860	85171	53637	9143	1153.7	161.0
			143	-131	342	29	19	26.0	26.3
		S2	554786862	554733497	86207	53899	9171	1190.8	180.9
			518	-493	1378	291	47	63.0	46.1
		S3	554789959	554731256	92447	54166	9804	854.6	1115.5
			3615	-2735	7618	558	680	-273.1	980.8
	B2	S1	554796328	554733879	96812	112157	9143	1510.2	161.9
			100	-112	266	-27	19	-45.7	26.4
		S2	554796555	554733571	97637	112055	9201	1220.5	194.0
			327	-420	1092	-129	77	-335.4	58.5
		S3	554798839	554732037	102147	111934	9576	1969.7	677.6
			2611	-1954	5602	-249	452	413.8	542.1
Argentina	B1	S1	235182064	235170142	14436	21115	4734	1882.0	43.1
			10	-34	70	62	4	312.2	9.3
		S2	235182001	235170060	14576	21268	4766	2239.3	80.5
			-53	-116	209	214	36	669.5	46.6
		S3	235182090	235169433	15592	21836	5228	5057.7	926.4
			35	-744	1225	782	498	3487.9	892.6
	B2	S1	235183623	235170147	16048	25731	6181	1884.8	44.6
			10	-30	56	9	-2	101.0	-1.3
		S2	235183507	235170002	16246	25920	6299	2304.2	235.4
			-105	-174	253	198	116	520.4	189.5
		S3	235183328	235168772	17795	26467	7608	4700.2	2630.7
			-285	-1404	1803	745	1425	2916.4	2584.9

Source: CAPRI model

4 Sensitivity analysis

As pointed out in section 2, substitution elasticities between domestic and foreign produced goods may influence model results considerably. The following sensitivity analysis was carried out for scenario 1 and 3. The simulation was repeated 500 times each, varying all Armington elasticities given in table 4 randomly. Elasticities were drawn from a uniform distribution between +- 50% of its

standard value. Results were collected for all trade flows, production quantities and market prices. [4] Because of time constraints appearing from the size of the model, it was not possible to run the whole system for this analysis. It was therefore decided to only take the market module which according to the analysis has the main focus on. Consequently, the explicit supply response given by the CAPRI supply module is lacking and results can therefore not be compared directly to the scenario results presented in the previous section. However, the range of uncertainty expressed in this exercise should be comparable to the one in the whole system.

Scenarios 1 and 3 have been chosen for this analysis in order to compare the uncertainty when applying a relatively modest shock to the model like in Scenario 1 to that of a more serious one as in the full bilateral liberalisation between the EU25 and the Mercosur countries.

In order to get an overview of the uncertainty implied by these simulations, for each variable its mean and the coefficient of variation is computed. Those coefficients are aggregated to several layers and shown in the following table:

Table 11: Highly aggregated layers uncertainty measures. Variation measured in %

	S1		S3	
	Average Variation	Maximum Variation	Average Variation	Maximum Variation
Prices	0.03	6.23	0.33	17.92
Supply	0.02	6.23	0.26	8.17
Trade Flows	0.42	73.43	5.45	152.68
Trade Flows between EU and Mercosur	3.14	72.77	16.36	110.82

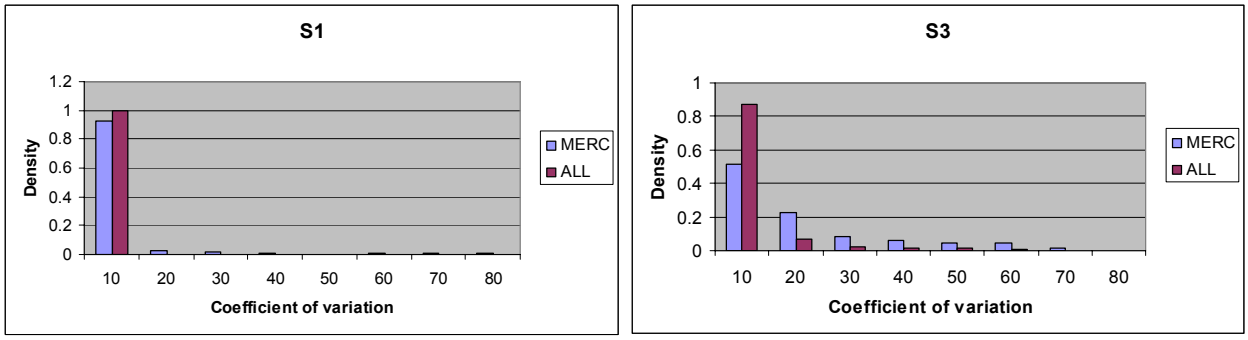
Source: Own calculations based on CAPRI results

As a first exercise, the average coefficient of variation for the three variables prices, supply and trade flows were aggregated over all observations. These are simple, not weighted averages. Additionally, for trade flows, the average was also calculated for flows between the EU25 and the Mercosur countries only. Generally, the results are in line with what was expected: Uncertainty is stronger in scenario S3. Uncertainty is not so much found in the variables prices and supply, while the strongest impact can be found for trade flows, and especially those between the EU25 and the Mercosur countries, where the liberalisation takes place. Additional information in the Table 11 is the maximum variation observed for each variable. It becomes apparent that this indicator can reach enormous ranges. The maximum variation is hence a weak indicator, since it might be an outlier. Therefore, the distribution of the variation coefficients for trade flows and for trade flows between the EU25 and the Mercosur countries is shown below.

[4] We concentrate on those three variables to reduce the amount of data to be collected which resulted already in a 50 GByte gdx file.

It becomes apparent that the variation of trade flows in Scenario 1 shows only a very small spread. Most of them are found in the range between 0 and 10%. In scenario 3, however, the spread, especially when looking only at the EU-Mercosur flows is much more severe and not negligible (Figure 1).

Figure 1 Density of coefficient of variation over trade flow observations



Source: Own calculations based on CAPRI results

To complete this picture, the variation of maize and beef imports into the EU25 from Brazil and Argentina is pictured. Those two products are chosen, since they are two of the most important ones in the bilateral trade. It further shows the difference in uncertainty, if a product is bound by a TRQ as in Scenario 1 or not, as in Scenario 3 (Table 12).

Table 12: Uncertainty for beef and Maize trade

		S1		S3	
		MEAN(1000t)	Variation %	MEAN(1000t)	Variation %
ARG	MAIZ	1806	0.04	4775	14.814
	BEEF	41	0.09	796	25.520
BRA	MAIZ	1142	0.01	865	25.212
	BEEF	160	0.05	1255	13.967

Source: Own calculations based on CAPRI results

In scenario 1, there is almost no variation with respect to the Armington elasticities. The resulting trade flows are defined by the TRQs applied in the scenario. The variation in scenario 2 is at the same time very strong, so that results have to be regarded highly uncertain.

This sensitivity analysis shows that Armington elasticities impact strongly on resulting trade flows. The degree of uncertainty is correlated with the degree of liberalisation that takes place for a certain flow. If TRQs are in place, varying the Armington elasticities has no strong impact, as long as this TRQ is binding. Furthermore, the impact on prices and production quantities are relatively small compared to those of trade flows. The need of statistically robust estimates of Armington elasticities could be indicated by this analysis.

5 Conclusion

The CAPRI model has been adopted in several ways to fit the new requirements. As a first, newly estimated supply and demand elasticities have been included. The fit of the new elasticities with the calibrated ones was pictured. The result is that the supply elasticities can be fitted mostly wherefore the calibrated demand elasticities only fit the newly estimated elasticities for a few own price elasticities, since restrictions in the original estimation do not match those of the calibration.. The second adoption is the implementation of two different baselines in the model. The baselines are defined through different production projections reflecting the dynamic in the production development.

In a last step the scenarios where defined according to the above mentioned. When regarding the impact of a possible degree of trade liberalisation between the EU25 and the Mercosur countries the results give a clear picture. The impact on the EU25 is marginally low. In contrast to this stand single Mercosur countries where the impact is simulated has being high. Therefore, the changes of the EU25 have not been included in the analysis. The difference between the two baselines appears according to the projections of the production.

The results appearing between the three different scenarios are quite reasonable. The main results in scenario 1 where additional quotas are given to the different Mercosur countries are that those will be mostly filled through production increment. The second scenario combines the bilateral trade liberalisation with the G20 proposal. This leads to a phenomena called preferential erosion. The increase of the import flows of the Mercosur countries into the EU25 is less than in Scenario 1 as other importers into the EU25 receive trade liberalisation as well. Therefore the advancement in competitiveness of the Mercosur countries is reduced. In scenario 3 huge changes to the imports from the Mercosur countries into the EU take place. With the examples of beef and maize from Argentina and Brazil it is shown that those changes might be overestimated. Here again increasing exports mainly stem from the redirection of Mercosur export flows from other countries to the EU25.

The sensitivity analysis on Armington elasticities is provided and shows that the choice of those elasticities is very crucial with respect to model results. Uncertainty is here highly correlated with the degree of liberalisation applied in a scenario and affects mainly trade flows. The need of robust elasticities could be underlined.

Summarising, changes for the EU25 over all scenarios for the two baselines are marginally low. In contrast it can be seen that changes in the Mercosur countries appear according to the definition of the scenarios. Still these changes tend to be lower than those appearing through the changes in the baseline projection. The production and export potential of the Mercosur countries seems to be limited more through the projected production than through trade restrictions.

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7 Appendix

Appendix I: Results Baseline 1

		Welfare Mn €			Market balance 1000 t														Import flows into EU25 1000 t						
					Net production							Demand													
		Total welfare	Money metric	Agri. income	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled
EU25	S1	9094250	9005619	189009	128605	51721	7876	21704	11786	614	2696	111910	53663	8385	20929	11481	24485	3222							
		-364	534	-531	41	-150	-31	-3	-17	2	0	-76	27	-18	0	7		2							
	S2	9096373	9025579	176922	128908	50615	7764	21707	11801	627	2698	111813	54254	8325	20922	11443	24390	3217							
		1759	20494	-12617	344	-1256	-143	0	-2	16	3	-173	618	-78	-8	-30		-3							
	S3	9090313	9015180	180875	128997	50247	7312	21668	11521	643	2696	110407	53262	8472	20892	11686	23958	3293							
		-4301	10095	-8665	434	-1624	-595	-39	-282	32	1	-1579	-375	69	-37	212		73							
Venezuela	S1	95617	93355	2310	99	1930	469	120	1177	13	816								0.0	2.9	0.0	0.0	0.0	0.0	0.0
		0	0	0	0	1	0	0	0	0	0								0.0	0.0	0.0	0.0	0.0	0.0	0.0
	S2	95619	93328	2336	99	1935	469	120	1178	13	816								0.0	7.1	0.0	0.0	0.0	0.0	0.0
		1	-27	25	0	5	0	0	0	0	0								0.0	4.2	0.0	0.0	0.0	0.0	0.0
	S3	95608	93331	2318	99	1933	469	120	1177	13	818								0.0	2.9	0.0	0.0	0.0	0.0	0.0
		-9	-24	7	0	3	0	0	0	0	2								0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brazil	S1	554786488	554733860	85171	6440	53637	9143	3308	8262	58551	13824								0.1	1153.7	161.0	13.6	392.0	12323.9	0.0
		143	-131	342	3	29	19	2	26	-140	-3								0.1	26.0	26.3	5.8	44.0	-60.6	0.0
	S2	554786862	554733497	86207	6444	53899	9171	3301	8487	58284	13837								0.1	1190.8	180.9	14.6	569.8	12216.7	0.0
		518	-493	1378	7	291	47	-5	251	-407	10								0.1	63.0	46.1	6.8	221.8	-167.9	0.0
	S3	554789959	554731256	92447	6455	54166	9804	3292	8693	54817	13743								0.1	854.6	1115.5	36.1	1113.5	10781.6	0.0
		3615	-2735	7618	18	558	680	-14	457	-3874	-84								0.0	-273.1	980.8	28.3	765.5	-1603.0	0.0
Paraguay	S1	9381368	9381724	988	461	1280	231	153	98	3866	135								0.0	61.1	6.2	0.0	0.0	88.3	0.0
		0	-4	6	-2	6	1	0	0	-4	0								0.0	11.2	2.9	0.0	0.0	-0.6	0.0
	S2	9381371	9381712	1008	436	1360	231	152	98	3845	134								0.0	67.7	6.2	0.0	0.0	86.3	0.0
		2	-16	25	-28	86	1	0	0	-25	-1								0.0	17.8	3.0	0.0	0.0	-2.6	0.0
	S3	9381372	9381672	1062	445	1339	240	152	98	3888	137								0.0	109.5	21.0	0.0	0.0	86.1	0.0
		4	-56	80	-18	65	10	-1	0	18	3								0.0	59.6	17.7	0.0	0.0	-2.8	0.0
Argentina	S1	235182064	235170142	14436	15206	21115	4734	183	1241	47213	592								94.0	1882.0	43.1	0.0	5.5	902.6	3.0
		10	-34	70	-17	62	4	0	0	-61	0								65.1	312.2	9.3	0.0	0.7	-4.8	2.9
	S2	235182001	235170060	14576	15132	21268	4766	183	1246	47080	597								88.6	2239.3	80.5	0.0	5.5	893.4	1.8
		-53	-116	209	-91	214	36	0	6	-195	4								59.6	669.5	46.6	0.0	0.7	-13.9	1.7
	S3	235182090	235169433	15592	14395	21836	5228	182	1238	46548	600								1588.0	5057.7	926.4	0.0	7.8	873.9	2.0
		35	-744	1225	-829	782	498	-2	-2	-727	7								1559.0	3487.9	892.6	0.0	3.1	-33.4	1.9
Uruguay	S1	14856710	14855572	1320	587	199	709	19	63	813	1487								0.3	1.8	43.3	0.0	0.0	8.5	33.1
		3	-6	10	1	0	6	0	0	-1	-1								0.3	-0.2	10.7	0.0	0.0	0.0	11.5
	S2	14856717	14855562	1340	596	200	712	19	63	804	1499								0.3	0.7	43.9	0.0	0.0	8.4	44.5
		10	-17	29	10	1	9	0	0	-10	11								0.3	-1.3	11.2	0.0	0.0	-0.1	22.9
	S3	14856766	14855502	1450	682	199	734	19	63	715	1610								0.7	0.3	93.4	0.0	0.0	7.7	467.9
		59	-76	139	96	0	31	0	0	-99	122								0.6	-1.7	60.7	0.0	0.0	-0.7	446.4

Appendix II: Results Baseline 2

		Welfare Mn €			Market balance 1000 t														Import flows into EU25 1000 t						
					Net production							Demand													
		Total welfare	Money metric	Agri. income	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled	Wheat	Grain maize	Beef	Pork meat	Poultry meat	Soy beans	Rice milled
EU25	S1	9093185	9005445	188715	128565	51835	7890	21703	11788	613	2696	116784	54192	8392	20930	11486	24496	3221							
		-402	358	-352	5	-37	-17	-4	-15	1	0	-59	-38	-11	0	12	-14	1							
	S2	9095246	9027041	175186	128362	51058	7567	21608	11571	636	2680	116747	53512	8353	20933	11738	24499	3291							
		1659	21953	-13882	-199	-814	-341	-99	-232	25	-15	-97	-718	-50	4	264	-11	71							
	S3	9088893	9018372	177089	129217	49939	7058	21661	11478	644	2696	114544	52985	9041	20877	11828	24194	3319							
		-4694	13284	-11979	656	-1933	-849	-46	-325	32	1	-2300	-1245	638	-53	354	-316	98							
Venezuela	S1	95598	93355	2278	99	1930	469	120	1177	13	816								0.00	2.89	0.00	0.00	0.00	0.00	0.00
		-1	0	-1	0	1	0	0	0	0	0								0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S2	95620	93330	2304	99	1938	469	120	1178	13	815								0.00	13.11	0.00	0.00	0.00	0.00	0.00
		22	-25	25	0	8	0	0	0	0	-1								0.00	10.22	0.00	0.00	0.00	0.00	0.00
	S3	95586	93329	2282	99	1936	469	120	1177	13	817								0.00	2.86	0.00	0.00	0.00	0.00	0.00
		-12	-26	4	0	7	0	0	0	0	1								0.00	-0.03	0.00	0.00	0.00	0.00	0.00
Brazil	S1	554796328	554733879	96812	7567	112157	9143	3309	8264	83163	19097								0.12	1510.23	161.88	13.67	392.78	14632.63	0.00
		100	-112	266	8	-27	19	3	27	-84	-18								0.09	-45.67	26.38	5.80	43.37	-32.83	0.00
	S2	554796555	554733571	97637	7615	112055	9201	3303	8532	82936	18974								0.10	1220.52	194.03	14.67	651.47	14528.99	0.00
		327	-420	1092	56	-129	77	-2	295	-312	-141								0.06	-335.38	58.54	6.80	302.05	-136.46	0.00
	S3	554798839	554732037	102147	7761	111934	9576	3301	8819	81067	18788								0.08	1969.72	677.59	39.25	1336.25	13890.30	0.00
		2611	-1954	5602	202	-249	452	-4	582	-2181	-327								0.05	413.81	542.09	31.38	986.84	-775.16	0.00
Paraguay	S1	9381505	9381725	1127	461	2655	231	153	98	5507	69								0.00	69.59	6.21	0.00	0.00	113.69	0.00
		0	-3	4	0	0	1	0	0	-2	0								0.00	-2.08	2.92	0.00	0.00	-0.35	0.00
	S2	9381510	9381719	1143	449	2696	232	152	98	5488	68								0.00	72.88	6.27	0.00	0.00	112.43	0.00
		5	-9	20	-11	41	2	0	0	-21	-2								0.00	1.20	2.97	0.00	0.00	-1.60	0.00
	S3	9381513	9381684	1193	463	2673	245	152	98	5472	70								0.00	181.25	25.52	0.00	0.00	108.22	0.00
		8	-44	70	2	18	15	0	0	-37	1								0.00	109.57	22.23	0.00	0.00	-5.81	0.00
Argentina	S1	235183623	235170147	16048	17787	25731	6181	183	1241	53706	404								94.27	1884.81	44.57	0.00	5.50	987.61	3.07
		10	-30	56	0	9	-2	0	0	-30	0								65.02	101.02	-1.29	0.00	0.74	-2.09	2.95
	S2	235183507	235170002	16246	17566	25920	6299	183	1247	53538	406								78.63	2304.24	235.37	0.00	5.50	974.97	1.86
		-105	-174	253	-221	198	116	0	6	-198	2								49.38	520.45	189.50	0.00	0.74	-14.74	1.74
	S3	235183328	235168772	17795	15328	26467	7608	181	1243	52975	392								533.75	4700.18	2630.74	0.00	8.20	942.63	2.34
		-285	-1404	1803	-2460	745	1425	-2	2	-761	-13								504.50	2916.38	2584.87	0.00	3.44	-47.08	2.22
Uruguay	S1	14856745	14855577	1352	657	199	1200	19	63	999	1601								0.35	2.03	45.07	0.00	0.00	10.09	33.18
		1	-1	2	1	0	0	0	0	-1	1								0.33	-0.02	-0.56	0.00	0.00	0.01	4.67
	S2	14856777	14855548	1416	654	198	1226	19	63	1004	1586								0.34	0.82	123.76	0.00	0.00	10.15	45.61
		33	-30	65	-2	-1	26	0	0	4	-14								0.33	-1.24	78.13	0.00	0.00	0.07	17.10
	S3	14856875	14855470	1594	717	194	1274	19	63	942	1652								0.66	0.29	234.37	0.00	0.00	9.63	603.13
		131	-108	244	61	-4	74	0	0	-58	52								0.64	-1.77	188.74	0.00	0.00	-0.45	574.62