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Deepening Integration of MERCOSUR: Dealing with Disparities

MERCOSUR: asymmetries and strengthening of the Customs Union
Options for the Common External Tariff

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MERCOSUR: ASYMMETRIES AND STRENGTHENING OF THE CUSTOMS UNION

OPTIONS FOR THE COMMON EXTERNAL TARIFF

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I. INTRODUCTION

The enforcement of the MERCOSUR as an imperfect customs union is determined by the existence of a Common External Tariff (CET) which has not been fully applied up to this moment. The definition of this CET has been a conflictive issue, as long as there are strong asymmetries among the member countries, not only in relation to their economic size but also regarding their specialization in production and trade. The smallest countries in the MERCOSUR are more open, more specialized and a larger share of their total trade is intra-bloc. Their integration to the MERCOSUR deeply affected their external relations and their output composition. On the contrary, for the largest countries, especially Brazil, their integration to the MERCOSUR has had much less impact on production and trade.

Several studies show that the CET approved in Ouro Preto was more consistent with the Brazilian interests than with those of the other members. Olarreaga and Soloaga (1998) show that national lobbies' activity, weighted by country size, has been the strongest determinant of the structure of the CET approved by the MERCOSUR in 1994. Therefore, the Brazilian interest prevailed over those of the small countries. The authors conclude that there is a high probability of maintaining the structure of the CET in the future because it is representative of the main interest groups of the MERCOSUR.

The small countries tried to protect their interests through exceptions that delayed the full enforcement of the CET, maintaining the effective protection to local industries. As a result, the CET was accompanied by several lists of exceptions which have not been completely overruled.

As of now, it is not clear whether the MERCOSUR will make progress towards a customs union or will go back to a free trade area, given the controversy among its partners concerning the structure and level of the CET. Even though most exceptions have been eliminated and some bilateral agreements have been renegotiated, the most critical discrepancies and many perforations remain.

Previous studies found that even though the MERCOSUR is a relatively small bloc in relation to the world economy, it has had a significant impact on terms of trade. Chang and Winters (2002) conclude that the price effects of the creation of Mercosur have been significant for non member exporters to Brazil. Olarreaga, Soloaga and Winter (1999) also found that the MERCOSUR has had a significant impact on terms of trade. This could be an argument in favor of a CET not too low. However, the interests of each partner may differ on this issue as the composition of trade in each of them is not the same.

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The objective of this paper is to assess the effects on each of the MERCOSUR countries of different options for the CET. More precisely, the welfare effects and the impact on economic activities of several options are assessed for each of the MERCOSUR countries, using a computable general equilibrium (CGE) model.

The paper is organized as follows. In section 2 we present a brief summary of the main characteristics of the CET and how it has been applied, emphasizing the main issues under discussion on this matter. Sections 3 to 5 describe the model we used, its calibration and the simulations design. In section 6 we present and discuss the results obtained and finally, in section 7, the main conclusions are drawn.

II. THE COMMON EXTERNAL TARIFF OF THE MERCOSUR AND ITS PERFORATIONS

In 1994 the MERCOSUR countries agreed on the creation of a Customs Union (CU) starting on January 1st, 1995. The center piece of this agreement was the approval of a common external tariff (CET) for the MERCOSUR, as the cornerstone of the common trade policy of the bloc. Originally, the CET varied between 0% and 20%, with an average of 11%. Tariffs increase as goods get closer to final demand: for intermediate goods they vary from 0% to 12%, for capital goods from 12% to 16% and for final goods from 18% to 20% (Kume and Piani, 2001). However, many *exceptions* were admitted as no agreement was reached for a number of items.

Most exceptions have been overruled, but those related to capital goods and to computing and telecommunication goods still remain. This is the most conflictive issue because the smaller countries want to maintain their tariffs for these types of goods as low as possible in order to preserve their competitiveness, while Brazil wants to raise tariffs as high as possible in order to protect local production of those goods.

The tariffs applied at present by the MERCOSUR members are different from the agreed CET in several ways. In addition to the exceptions agreed in Ouro Preto and still in force, imports through several special regimes remain excepted from the CET enforcement, thus generating numerous perforations to the same. Most exceptions of this kind are due to the existence of bilateral agreements that the MERCOSUR countries had previously signed with other members of the Latin American Integration Association (LAIA). The renegotiation of these agreements has been more complicated than expected, because they contemplated asymmetries by accepting differences in the preferential treatment granted to each country. Moreover, some specific duties and the use of commercial defense instruments have also given rise to discrepancies between the CET and the applied tariffs.

Table 1 shows the weighted average of total tariff and extra-zone tariff applied in 2000 in each country. The smallest countries show a lower level of protection because they apply lower tariffs on capital goods and computer and telecommunication goods and also because the share of intra-zone imports in their total imports is significantly higher than in Argentina or Brazil. As a result, their average tariff is one half of the Brazilian one. The average tariff applied in Brazil is the highest of those applied by the four countries.

Table 1
Applied tariff by country in 2000
Weighted average (%)

	Extrazone	Total
Argentina	12.9	9.4
Brazil	14.2	12.2
Paraguay	11.4	5.9
Uruguay	10.2	6.1

Table 2 shows the CET and the applied tariffs in each country, by sector of origin, respectively. The CET of MERCOSUR is higher for final consumption goods than for intermediate and capital goods, but the highest tariffs are found in the case of vehicles. The average tariff actually applied on the automotive sector is higher in Argentina and Brazil than in the other countries. For capital goods Brazil has the highest average applied tariffs.

The sectors that show the highest tariffs in all the countries (greater than 14%, which is the average CET) are dairy products, beverages and tobacco, textiles and leather and footwear and sugar (table 2). The automobile sector is heavily taxed in Brazil. The sectors with the lowest tariffs (lower than 7%) are corns and other grains, soybeans, oilseeds and mining.

The differences between the CET and the applied tariffs are larger in the case of Paraguay and Uruguay than in the case of Argentina or Brazil. Also, differences are larger in the case of capital goods, intermediate goods and vehicles than in other sectors. Argentina and Brazil apply high tariffs on vehicles while the smallest partners of the MERCOSUR apply the lowest tariffs on capital goods and telecommunication goods.

Table 2
CET and applied tariff by sector and country in 2000
Weighted average (percentages)

Source: Based on IDB database	CET	AR	BR	PR	UR
Rice and Wheat	8.1	10.5	10.5	10.5	10.5
Corn and Other Grains	4.9	6.6	6.6	6.6	6.6
Vegetables and Fruits	8.5	11.1	11.1	11.1	11.1
Soybeans	4.0	5.5	5.5	5.5	5.5
Oil Seeds	4.4	6.0	6.0	6.0	6.0
Sugar	15.0	19.0	17.2	22.1	17.7
Coffee and Other Crops	7.4	9.7	9.7	9.5	9.6
Livestock and Animal Products	7.3	9.8	9.3	9.3	9.3
Mining	3.1	5.8	6.0	5.8	5.8
Bovine Meat	10.4	13.4	13.4	13.4	13.4
Poultry Meat	10.0	13.0	13.0	13.0	13.0
Dairy Products	15.3	20.3	20.3	17.9	18.3
Beverages and Tobaccos	18.1	21.1	21.2	19.7	21.2
Vegetable Oils and Other Food	11.5	14.7	14.7	14.4	14.7
Textiles and Leather and footwear	17.2	20.3	20.0	19.7	20.0
Light Manufactures	12.6	15.4	15.4	14.3	15.4
Petroleum and Chemicals	7.5	10.6	10.6	9.8	10.1
Metals	11.1	15.1	15.0	13.6	14.6
Automobiles	14.5	16.0	19.8	10.0	11.9
Machinery and Equipment	12.4	13.3	16.5	9.2	9.8

III. THE MODEL

The analysis is based on a computable general equilibrium (CGE) model, a methodology that has been widely used for discussing trade policy issues. It has been inspired by the work carried out by Mercenier (1997), but our model is much simpler than Mercenier's which deal with imperfect competition and dynamic behavior.

The model used here takes full account of the variety and the disparities within MERCOSUR as it considers each of the four members of the bloc separately. The disaggregation of the four countries allows the analysis of trade policy in each case, identifying the disparities between the large and the small countries.

CGE models take into account structural features that are absent in macro models, but they remain a stylized representation of the real world. Many aspects of the economic behavior of different agents are ignored or simplified, focusing on the features that are most relevant for the issues under study. Therefore, simulation results cannot be interpreted as predictions of what will eventually happen, but rather, as indicators of the direction and relative size of the possible effects of a given policy, as long as the exogenous or excluded variables remain unchanged.

We used a trade model that only takes care of real flows, ignoring the existence of money and financial flows. As it is well-known, financial flows are very important in the Mercosur economies, as the most recent crisis shows. Neither does it consider some significant features of modern economies, like imperfect competition, economies of scale, segmented labor markets or other market failures. If some of these factors were considered, probably the impact of the simulated policy changes would be larger than under perfect competition. In addition, being a static model it can only show the impact of trade policy on the reallocation of resources and the redistribution of income. Despite these limitations, CGE models are useful to evaluate the impact of trade policy on trade flows, resource allocation and specialization.

The model is presented in detail in the Appendix. It is a multicountry, multisector model that includes twelve countries or regions and twenty-two sectors. Perfect competition and constant returns to scale are assumed for all sectors. However, goods are not homogenous as they are differentiated by geographic origin, using Armington functions (Armington, 1969).

In every country, output for each sector is obtained by combining intermediate inputs from different origins with primary factors (land, capital and labor). The supply for each factor is fixed in each country and there is no international factor mobility.

In each country there is only one representative consumer. Government is not explicitly modeled, so tariff and tax revenues are directly allocated to the only representative consumer in each country. Total income in each country is obtained by adding all factor payments received by the representative consumer plus production taxes and tariffs.

The representative consumer allocates his income to different goods so as to maximize his utility, subject to his budget constraint. He also chooses how much of each good to buy from domestic production and from imports coming from different countries. Total demand by sector in each country is composed by intermediate and final demand in the domestic market and exports to each trading partner. Total supply by sector includes domestic production and imports from all trading partners.

When the model is solved, simultaneous equilibrium in all goods and factor markets is found. Equilibrium is obtained in factor markets when the sum of demands from the different sectors is equal to factor supply, which is fixed in each country. External equilibrium is reached when foreign debt in every country is equal to the difference between domestic income and consumption. The assumption made for the model closure is that foreign debt is fixed.

IV. CALIBRATION OF THE MODEL

The model parameters were calibrated from a database obtained from IDB. The data used in this study have been provided by the Integration and Regional Programs Department of the Inter-American Development Bank (IDB-INT). The SAMs benchmarked at year 2000 are based on the GTAP v.5 (1997) dataset and updated using the GDP and CPI deflators when possible or estimated by IDB-INT. The main data sources are as follows : trade data have been extracted form DATAINTAL, FTAA and UN COMTRADE databases ; protection data have been extracted from the FTAA database, and supplemented by SICE and the official website of Mercosur. Ad valorem equivalents of specific and mixed tariffs and of tariff-rate-quotas (TRQs) have been estimated by the IDB, using tariff information at the HS8 digit level and information provided by USITC and Jank (2004); supplemental data sources include Government Finance Statistics and International Financial Statistics Yearbooks from IMF; additional data have been provided by the Central Banks of Paraguay and Uruguay. The twelve countries or groups of countries considered are presented in Table 3, while aggregation by sectors is shown in Table 4.

Table 3
Countries or regions considered in the model

Code	Country or region	Code	Country or region
ARG	Argentina	CAC	Central America and Caribbean
BR	Brazil	MEX	Mexico
PRY	Paraguay	CAN	Canada
URY	Uruguay	USA	United States
CHL	Chile	E_U	European Union
A_C	Andean Community	ROW	Rest of the world

Table 4
Sectors considered in the model

Code	Sector	Code	Sector
WHEAT	Rice and Wheat	DAIRY	Dairy Products
CORNS	Corn and Other Grains	BVTBC	Beverages and Tobaccos
VEGET	Vegetables and Fruits	OTHFD	Vegetable Oils and Other Food Products
SYBNS	Soybeans	TXTIL	Textiles and Leather and footwear
OSEED	Oil Seeds	OTLMF	Light Manufactures
SUGAR	Sugar	PETRO	Petroleum and Chemicals
COFFE	Coffee and Other Crops	METAL	Metals
LVSTK	Livestock and Animal Products	VEHCL	Automobiles
MNING	Mining	MCHNY	Machinery and Equipment
BVNMT	Bovine Meat	UTLTY	Utilities and Construction
OMEAT	Poultry Meat	SERVC	Trade and Services

The database contains information for the year 2000 and it disaggregates data for the four MERCOSUR countries. The tariff data include applied tariffs, taking into account some of the agreements in the framework of LAIA (MERCOSUR, Chile- MERCOSUR, Andean Community, Andean Community-MERCOSUR). However, it does not consider the agreements between Mexico and the MERCOSUR countries. This is an important advantage of this database because a previous work by Laens and Terra (2005) showed the incidence of preferences on the results from different simulations related to the FTAA, especially for countries like Uruguay and Chile. Therefore, in order to analyze the asymmetries in the MERCOSUR it seemed relevant to take into account all these preferences.

For each sector and country the tariffs applied are simple averages of those applied to all goods belonging to that specific sector. This solution has some underpinnings, since it represents neither the average tariff for goods that are actually traded, nor the average tariff for goods that are actually produced in each country. In general, trade is biased towards goods with low tariffs while domestic output is biased towards goods with high tariffs. Simple averages clearly are not realistic but at least they are free from those biases.

V. SIMULATIONS

The simulations carried out were intended to illustrate the effects of several options that are commonly discussed in relation to the CET of the MERCOSUR. Debate frequently focus

on the desirable tariff level, on the convenience or inconvenience of having a flat tariff, on the adequacy of the approved CET to the interests of every country and on the need to establish high or low tariffs for some particular sectors. Many experts argue that the CET approved in Ouro Preto is too high and it has an excessive number of levels. Therefore, the simulations were designed to provide some insights that may contribute to clarify what is at stake in this debate.

The first option was to change the internal structure of the presently applied external tariff by simulating a flat rate (FLAT). A second option was to simulate the full enforcement of the approved CET. Then, two different options for the CET were considered, taking into account the controversy between the large country interests (namely, Brazil) and the small countries interests (basically, Paraguay and Uruguay). In order to simulate these diverging standpoints, in our third simulation we assumed that all the four countries apply the external tariff presently applied by Uruguay (CETUR). In this case, the CET exceptions are taxed with much lower tariffs than in the previous simulation. On the contrary, in the fourth simulation we assumed that all the four countries apply the external tariff presently applied by Brazil (CETBR). This means that the CET exceptions (mainly, capital goods) are taxed as they are now in Brazil.In the CET, CETUR and CETBR simulations the 3% rise accepted in 1997 was completely eliminated. Tariffs applied to intrazone trade remained unchanged in every scenario.

In addition, the effects of a mere change in the tariff level was considered by simulating different levels for the four tariff structures described in the previous paragraph. For the flat tariff, the simulated tariff levels were 0%, 6%, 10%, 15% and 20%. For the CET, CETUR and CETBR options we simulated a 50% and a 100% cut and a 50% and 100% increase. Also , the same experiments were performed assuming a unilateral tariff change in Uruguay and Paraguay.

The simulations were carried out with different values for the elasticity of substitution between domestic and imported goods. Firstly, we used the set of elasticities commonly used in the GTAP model (elasticity S1). Our second set of elasticities (S2) was the GTAP vector multiplied by 2 for developing countries (all Latin America and Caribbean), leaving the US, the EU, Canada and the rest of the world unchanged. Finally, our third set of elasticities (S3) is equal to the GTAP vector multiplied by 4 in the case of those countries.

Several papers have used elasticity values much higher than ours (Harrison et al, 2002; Sánchez, 2001; ALADI, 2004; CEI, 2001; Harrison et al 2004). The rationale for these high elasticity values stems from empirical studies that have found very high values for demand elasticity in developing countries (Reidel, 1988). Even though Reidel has been seriously criticized by several authors, among CGE experts there is a widespread feeling that the Armington elasticities estimated by econometric methods are too low and generate too large effects on the terms of trade. A recent paper by Panagariya (1996) finds very high elastiticities for the demand of textile exports from Bangladesh. The literature is not conclusive on this issue but shows that these models are very sensitive to the Armington elasticity.

In all cases, we base our comments on the results obtained when the S2 set of elasticities was used. In the first set of experiments described above, the tariffs of the four partners are

changing simultaneously, so we are considering both the direct effects of the changes in the tariff of a given country and the indirect effects of the tariff changes in the other partners of the MERCOSUR. In the second set of experiments, we isolated the direct effects of the changes in the own tariff for the smallest Mercosur partners.

The model and the simulations were run using GAMS. The GAMS code used was adapted from Mercenier's code for a multicountry, dynamic model.

VI. RESULTS OF THE SIMULATIONS

The global results

Tables 5 to 8 show the global results for the simulations in which we focused our analysis: FLAT (6% flat tariff), CET (full enforcement of the CET), CETUR (tariff structure applied in Uruguay in 2000) and CETBR (tariff structure applied in Brazil in 2000).

For the MERCOSUR as a whole, the four simulations cause a reduction of the external tariff, which was 13,9% in the benchmark (see Table 5). When a 6% flat tariff is simulated (FLAT), the average tariff is cut by more than half. The reduction is also significant in the simulation based on the Uruguayan external tariff (CETUR). At the other end, when the Brazilian tariff is applied as common external tariff (CETBR), the average only falls by 2 percentage points. The full enforcement of the CET also brings about a small reduction of the average external tariff.

Table 5
Average tariff for the MERCOSUR and each member country
In percentages

	Baseline	6% flat tariff	CET enforcement	Uruguay's External Tariff	Brazil's External Tariff
Simulation code	BASE	FLAT	CET	CETUR	CETBR
Average tariff					
MERCOSUR		5,2	8,9	6,5	9,6
Argentina	9,4	4,9	8,2	6,4	8,7
Brazil	12,2	5,4	9,4	6,7	10,3
Paraguay	5,9	3,5	5,9	4,3	6,1
Uruguay	6,1	4,0	5,5	4,7	5,7
Average external tariff					
MERCOSUR	13,9	6,0	10,7	7,6	11,7
Argentina	12,9	6,0	11,0	8,1	11,9
Brazil	14,2	6,0	10,6	7,4	11,7
Paraguay	11,4	6,0	12,2	7,7	13,0
Uruguay	10,2	6,0	9,4	7,7	10,0

Table 6
Global results for the MERCOSUR and each member country
In percentages

Simulation code	6% flat tariff FLAT	CET enforcement CET	Uruguay's External Tariff CETUR	Brazil's External Tariff CETBR
MERCOSUR				
Equiv. Variations (EV)	-0,09	-0,02	-0,08	-0,02
Terms of Trade Effect (TOTX)	-0,21	-0,08	-0,16	-0,05
GDP Effect (GDPX)	0,12	0,06	0,07	0,03
Real exports	9,34	3,23	6,87	2,07
Real imports	6,07	2,13	4,51	1,40
ARGENTINA				
Equiv. Variations (EV)	-0,12	-0,06	-0,11	-0,06
Terms of Trade Effect (TOTX)	-0,20	-0,08	-0,15	-0,05
GDP Effect (GDPX)	0,08	0,01	0,04	-0,01
Real exports	5,07	0,53	2,67	0,05
Real imports	2,59	-0,17	1,04	-0,32
BRAZIL				
Equiv. Variations (EV)	-0,07	0,01	-0,07	0,01
Terms of Trade Effect (TOTX)	-0,22	-0,08	-0,16	-0,05
GDP Effect (GDPX)	0,14	0,09	0,10	0,06
Real exports	11,93	4,74	9,29	3,17
Real imports	8,00	3,29	6,33	2,26
PARAGUAY				
Equiv. Variations (EV)	0,13	-0,05	0,03	-0,13
Terms of Trade Effect (TOTX)	-0,05	0,02	0,00	0,00
GDP Effect (GDPX)	0,18	-0,07	0,02	-0,13
Real exports	2,67	-0,28	1,85	-0,48
Real imports	1,26	-0,11	1,04	-0,31
URUGUAY				
Equiv. Variations (EV)	-0,17	-0,10	-0,17	-0,11
Terms of Trade Effect (TOTX)	-0,22	-0,06	-0,14	-0,04
GDP Effect (GDPX)	0,05	-0,04	-0,03	-0,07
Real exports	0,75	-0,29	-0,31	-0,32
Real imports	0,13	-0,33	-0,46	-0,34

The results obtained in the case of Argentina and Brazil are similar to those of the bloc as a whole, but the reduction in external tariff is higher for Brazil. In contrast, in the case of Paraguay and Uruguay, both the full enforcement of the CET and the application of the Brazilian tariff would lead to a very slight reduction (or even an increase) of the average external tariff. This is explained by the fact that both countries have much lower tariffs on capital goods and vehicles than the CET agreed in Ouro Preto or than the tariff applied by Brazil to that kind of goods.

The flat tariff and the application of the Uruguayan tariff in all countries would bring the total average tariff to very low levels in Paraguay and Uruguay. This total average was around 6% in the benchmark but it falls to around 4% in both countries. These average tariffs are much lower than those prevailing in Argentina and Brazil, due to the much higher ratio of intra-zone trade in the smallest countries.

The global indicators presented in Table 6 show slight variations in welfare, terms of trade and GDP in all simulations. As it was said before, the static CGE models can only show the reallocation and terms of trade effects and therefore, the welfare changes are usually very small. This is particularly true when perfect competition is assumed.

The results indicate that changes in welfare (measured by equivalent variations) are negligible for all the simulations and all the countries. The same thing happens with the terms of trade and production effects. There is a welfare loss for MERCOSUR, Argentina and Uruguay in every scenario. However, Brazil improves its welfare when the external tariff has only a small decline (CET and CETBR scenarios) and Paraguay has a welfare gain when the tariff falls down (FLAT and CETUR scenarios).

The negative sign in EV can be mainly explained by the deterioration of the terms of trade observed in every simulation, except in Paraguay. The effect on GDP is positive for all countries (and for the Mercosur) in the simulation FLAT, when the average tariff decreases the most. In fact, Brazil shows an efficiency gain in every simulation, because its protection level goes down in all of them. In the other countries the sign of the effect varies: Argentina increases its GDP in the CET and CETUR simulations, while Paraguay only in the latter, as the average tariff is lower. In the case of Uruguay, GDP declines in the three scenarios.

The effects on trade are much larger than those observed on GDP. Trade increases whenever the average tariff is reduced and, therefore, Brazil is the country that benefits the most because it shows the largest tariff cuts. In the smallest countries trade growth is relatively modest (or even negative in the case of Uruguay except in FLAT). This is not surprising as the small countries have a higher share of trade within the bloc, so the portion of trade affected by the tariff change is less important. In the small countries the percentage of exports and imports to and from the rest of the world reaches its maximum level with the flat tariff. Trade decreases in Uruguay, even when tariffs are cut, because the deterioration of the terms of trade offsets the increase in relative prices of exportable goods that the tariff cut brings about. Therefore, resources are reallocated to import substitution sectors and the economy becomes less open.

Trade openness does not show a significant change because when trade increases, GDP also rises (see Table 7). The largest change in trade openness is found in Brazil when the 6% flat tariff is simulated. In this simulation Brazil reaches the largest tariff reduction in absolute size (8 percentage points). In addition, Brazil has the highest share of extra-zone trade in total trade. Both factors amplify the effects of the tariff change as compared with those obtained for the other countries.

Table 7
External trade results for the MERCOSUR member countries
In percentages

	Baseline data	6% flat tariff	CET enforcement	Uruguay's External Tariff	Brazil's External Tariff
Simulation code	BASE	FLAT	CET	CETUR	CETBR
ARGENTINA					
Trade openness	21,39	22,17	21,43	21,77	21,37
Share of extra - zone exports in total exports	71,96	78,64	75,43	77,74	74,22
Share of extra - zone imports in total imports	79,28	85,83	80,49	83,10	79,19
BRAZIL					
Trade openness	25,40	27,84	26,38	27,32	26,07
Share of extra - zone exports in total exports	88,74	92,58	89,56	91,14	88,77
Share of extra - zone imports in total imports	89,78	92,68	91,49	92,44	90,98
PARAGUAY					
Trade openness	52,87	53,68	52,82	53,56	52,75
Share of extra - zone exports in total exports	67,74	71,63	69,25	69,81	69,09
Share of extra - zone imports in total imports	61,50	66,57	58,86	63,85	57,80
URUGUAY					
Trade openness	41,40	41,60	41,30	41,29	41,30
Share of extra - zone exports in total exports	71,53	79,44	74,21	77,33	73,27
Share of extra - zone imports in total imports	67,86	72,43	66,89	68,32	66,12

Table 8
Terms of Trade Effect Decomposition
In percentages

	6% flat tariff	CET enforcement	Uruguay's External Tariff	Brazil's External Tariff
Simulation code	FLAT	CET	CETUR	CETBR
MERCOSUR				
Terms of Trade Effect (TOTX)	-0,21	-0,08	-0,16	-0,05
Exports price variation	-0,27	-0,10	-0,20	-0,06
Imports price variation	-0,06	-0,02	-0,04	-0,01
ARGENTINA				
Terms of Trade Effect (TOTX)	-0,20	-0,08	-0,15	-0,05
Exports price variation	-0,27	-0,10	-0,20	-0,06
Imports price variation	-0,07	-0,02	-0,05	-0,01
BRAZIL				
Terms of Trade Effect (TOTX)	-0,22	-0,08	-0,16	-0,05
Exports price variation	-0,26	-0,10	-0,19	-0,06
Imports price variation	-0,05	-0,02	-0,03	-0,01
PARAGUAY				
Terms of Trade Effect (TOTX)	-0,05	0,02	0,00	0,00
Exports price variation	-0,35	-0,09	-0,21	-0,06
Imports price variation	-0,30	-0,11	-0,22	-0,07
URUGUAY				
Terms of Trade Effect (TOTX)	-0,22	-0,06	-0,14	-0,04
Exports price variation	-0,42	-0,13	-0,28	-0,08
Imports price variation	-0,20	-0,07	-0,14	-0,04

These results are very much influenced by the Armington assumption adopted in the model, which implicitly considers every country as a price-maker. Although some authors consider that the elasticities assumed for the Armington function might be overstating the terms of trade effect, to some extent, these results seem to be consistent with Chang and Winters (2005) results. If the creation of the MERCOSUR generated an improvement in its terms of trade, a reduction in the external tariff would lead to their deterioration. However, table 8 shows some aspects that were not considered by these authors, as the main factor explaining the terms of trade deterioration is the fall in export prices and not, as they argue, the rise of import prices.

When tariffs go down, Brazil's trade increases, export supply and import demand go up. Tables 5 and 6 show that trade growth is larger when the tariff reduction is larger (FLAT and CETUR scenarios). Table 8 shows that both export and import prices go down, but the terms of trade effect is mainly explained by the fall in export prices. Even though the theoretical or empirical literature on customs unions focus their arguments on the behavior of import prices, the effect on export prices seems to be quite reasonable in the case of MERCOSUR.

Table 9 shows the share of MERCOSUR in world exports and imports for the total and for selected goods. The global share of MERCOSUR in world trade is small, but in the case of some goods where it has clear comparative advantages, its share is far from negligible. Therefore, when tariffs fall and resources are reallocated from the import substitution sectors to the export sectors, the world supply of those goods increases, lowering their export prices. Given its trade composition, MERCOSUR has a greater capacity of influencing its export prices than its import prices.

Table 9
Share of MERCOSUR in world trade

		Share in world export (%)					Share in world import (%)				
Sector		ARG	BR	PRY	URY	MERC	ARG	BR	PRY	URY	MERC
Rice and Wheat	WHEAT	13,4	0,1	0,1	1,8	15,4	0,0	11,6	0,1	0,0	11,8
Corn and Other Grains	CORNS	10,8	0,5	0,3	0,0	11,6	0,2	2,9	0,1	0,4	3,6
Vegetables and Fruits	VEGET	2,9	2,0	0,0	0,2	5,0	0,6	1,2	0,1	0,1	2,0
Soybeans	SYBNS	9,4	23,6	3,3	0,0	36,3	0,4	1,5	0,0	0,0	2,0
Oil Seeds	OSEED	8,2	0,1	0,1	0,0	8,4	0,4	0,4	0,1	0,1	0,9
Sugar	SUGAR	1,4	19,5	0,3	0,1	21,2	0,0	0,0	0,0	0,4	0,5
Coffee and Other Crops	COFFE	1,0	8,3	0,3	0,2	9,8	0,4	1,4	0,1	0,2	2,2
Livestock and Animal Products	LVSTK	2,7	4,3	0,1	1,0	8,1	0,6	0,8	0,0	0,1	1,5
Bovine Meat	BVNMT	6,4	6,0	1,0	4,4	17,8	0,2	1,2	0,0	0,0	1,4
Poultry Meat	OMEAT	0,2	9,7	0,0	0,0	9,9	1,1	0,0	0,0	0,1	1,2
Dairy Products	DAIRY	3,7	0,1	0,0	1,5	5,4	0,4	4,5	0,1	0,0	5,1
Beverages and Tobaccos	BVTBC	1,2	0,5	0,0	0,4	2,1	0,3	1,2	0,7	0,1	2,3
Vegetable Oils and Other Food Products	OTHFD	6,1	6,2	0,1	0,3	12,7	0,7	1,3	0,1	0,2	2,4
Mining	MNING	1,3	1,7	0,0	0,0	3,0	0,2	1,6	0,0	0,1	1,9
Textiles and Leather and footwear	TXTIL	0,5	1,5	0,0	0,2	2,3	0,5	0,7	0,0	0,1	1,3
Light Manufactures	OTLMF	0,3	2,0	0,0	0,0	2,4	0,6	0,7	0,1	0,1	1,5
Petroleum and Chemicals	PETRO	0,6	1,1	0,0	0,1	1,8	1,2	3,2	0,1	0,2	4,7
Metals	METAL	0,6	3,1	0,0	0,0	3,7	0,6	1,2	0,0	0,1	1,9
Automobiles	VEHCL	0,4	1,6	0,0	0,0	2,0	0,7	1,4	0,0	0,1	2,1
Machinery and Equipment	MCHNY	0,1	0,5	0,0	0,0	0,6	0,7	1,6	0,0	0,1	2,3
Trade and Services	SERVC	0,4	0,9	0,1	0,1	1,5	0,7	2,1	0,1	0,1	2,9
	Total	0,6	1,4	0,0	0,1	2,2	0,7	1,7	0,1	0,1	2,5

The results obtained for Brazil are basically due to the changes in its own tariff, but those of the other partners cannot be analyzed without considering the indirect effect of the variation in the tariffs of the rest of the bloc, especially those of Brazil.

In the case of Argentina, the results are similar to those of Brazil. In fact, table 6 shows that the terms of trade effect is very similar for Argentina, Brazil and Uruguay. The main reason for the decrease in the Argentine and the Brazilian terms of trade is the decrease in production and export prices as a result of trade openness, while the variation of import prices from the rest of the world is small.

To understand the results obtained for the small Mercosur partners, some additional simulations were carried out, with the purpose of separating the impact of the change in their own tariffs from the effect of the change in their partners'. Table 10 shows how equivalent variations, terms of trade and GDP change in Uruguay and Paraguay when their tariffs change without a simultaneous variation in their partners'. In all the experiments where tariffs are reduced, welfare and GDP rise, both in Uruguay and Paraguay. In every scenario the same change in extra-zone tariffs brings about a welfare and efficiency gain if the change is carried out by these countries alone without a simultaneous variation in the tariffs of the other partners. This shows the importance of the effect of their preferential access to the other partners´markets. The positive effect of their own opening is partially offset by the loss of their preferential access to the markets of the large MERCOSUR countries when the latter also lower their tariffs simultaneously.

Table 10
Unilateral tariff variation results (in percentages)
Uruguay and Paraguay

Simulation code	6% flat tariff FLAT	CET enforcement CET	Uruguay's External Tariff CETUR	Brazil's External Tariff CETBR
PARAGUAY				
Equiv. Variations (EV)	0,21	-0,01	0,05	-0,09
Terms of Trade Effect (TOTX)	-0,11	0,00	-0,07	0,01
GDP Effect (GDPX)	0,32	-0,01	0,12	-0,09
Real exports	4,42	0,05	2,27	-0,12
Real imports	2,29	0,04	1,15	-0,05
URUGUAY				
Equiv. Variations (EV)	0,14	0,01	0,06	-0,04
Terms of Trade Effect (TOTX)	-0,08	-0,01	-0,04	0,00
GDP Effect (GDPX)	0,22	0,02	0,09	-0,03
Real exports	3,80	0,41	1,56	0,03
Real imports	3,00	0,31	1,23	0,01

In the small countries, both import and export prices decline because they have a large share of intra-zone exports and therefore, when tariffs are cut in the whole bloc, their partners' prices go down (see table 7). Nevertheless, the terms of trade deterioration in Uruguay is explained by the fall in export prices, while in Paraguay import prices decline even more than export prices, so there is an improvement in the terms of trade. The decline in export prices of the small partners takes place even when the average external tariff increases, because they receive a strong impact from the decrease in Brazilian and Argentine prices.

Paraguay and Uruguay show a positive effect on GDP when trade increases (the FLAT or the CETUR in the case of Paraguay), but the result is negative otherwise. For Paraguay, this is due to the fact than in the other two simulations the average tariff increases, so the efficiency gains of trade are lost. In the case of Uruguay, even when tariff protection goes down, trade decrease in all scenarios, except in the flat 6% tariff. This happens because the terms of trade deterioration leads to a reallocation of resources from export oriented sectors to import substitution sectors, thus compensating the positive impact of tariff reduction.

The results by sector

Table 11 presents output variations by sector in the four countries for each of the simulations. Only the sectors with variations larger than 1% in any of the simulations are reported. Tables 1 through 8 of the Appendix show the percentage variations of exports and imports by sector and scenario for each country.

Table 11
MERCOSUR, Output by sector

		Share in total output in baseline	Variation by Scenario			
			6% flat tariff	CET enforcement	Uruguay external tariff	Brazil external tariff
			FLAT	CET	CETUR	CETBR
ARGENTINA						
Rice and Wheat	WHEAT	0,9	1,8	0,8	0,6	0,4
Corn and Other Grains	CORNS	0,6	3,3	1,4	2,4	0,7
Soybeans	SYBNS	1,2	2,0	0,9	1,8	0,5
Oil Seeds	OSEED	0,3	2,3	1,0	1,8	0,5
Livestock and Animal Products	LVSTK	0,7	1,7	0,7	1,4	0,4
Vegetable Oils and Other Food Products	OTHFD	6,4	1,4	0,6	1,3	0,3
Mining	MNING	1,9	6,0	-0,2	2,3	-0,7
Textiles and Leather and footwear	TXTIL	7,5	-0,6	0,1	0,5	0,0
Automobiles	VEHCL	5,6	-7,2	-2,7	-6,0	-0,7
Machinery and Equipment	MCHNY	4,2	-2,8	-0,3	-2,7	0,4
		29,4				
BRASIL						
Soybeans	SYBNS	0,8	1,8	0,7	1,4	0,4
Coffee and Other Crops	COFFE	1,1	2,0	0,8	1,6	0,3
Beverages and Tobaccos	BVTBC	0,7	-1,1	-0,1	-1,0	-0,1
Mining	MNING	1,4	4,6	0,7	2,7	0,1
Metals	METAL	5,6	1,30	0,61	1,17	0,54
Automobiles	VEHCL	3,6	0,8	0,9	0,1	1,7
Machinery and Equipment	MCHNY	4,8	-1,7	-0,2	-2,0	0,2
		18,0				
PARAGUAY						
Rice and Wheat	WHEAT	1,0	-0,5	-0,35	-1,02	-0,23
Soybeans	SYBNS	5,2	1,3	0,36	0,82	0,42
Coffee and Other Crops	COFFE	6,6	-0,6	-0,86	-0,94	-1,15
Beverages and Tobaccos	BVTBC	1,5	-5,9	-0,5	-8,5	-0,2
Mining	MNING	0,5	-0,1	-1,2	-0,4	-1,1
Textiles and Leather and footwear	TXTIL	3,1	-7,6	-1,7	-0,4	-1,7
Light Manufactures	OTLMF	3,7	-2,3	-0,9	0,1	-1,0
Petroleum and Chemicals	PETRO	1,6	0,4	-1,1	0,1	-1,2
Metals	METAL	0,7	-4,9	-2,9	-2,3	-2,2
Automobiles	VEHCL	0,1	-6,0	9,5	0,3	14,9
Machinery and Equipment	MCHNY	0,2	-0,6	2,9	-0,8	3,8
Services	SERVC	44,8	1,1	0,3	0,6	0,2
		68,9				
URUGUAY						
Livestock and Animal Products	LVSTK	2,3	2,3	0,4	1,3	-0,1
Bovine Meat	BVNMT	2,4	3,6	1,1	2,2	0,3
Dairy Products	DAIRY	2,7	-0,9	-0,4	-4,1	-0,2
Beverages and Tobaccos	BVTBC	3,1	-5,6	-0,8	-5,9	-0,7
Mining	MNING	0,2	3,0	-3,0	-1,4	-2,8
Textiles and Leather and footwear	TXTIL	3,9	-0,1	0,5	3,4	-0,4
Light Manufactures	OTLMF	2,9	-4,2	-1,2	-0,7	-1,3
Petroleum and Chemicals	PETRO	4,9	-1,4	-1,4	-0,6	-1,2
Metals	METAL	2,0	-2,8	-0,8	-1,5	-0,1
Automobiles	VEHCL	1,8	-21,6	-5,4	-16,8	1,5
Machinery and Equipment	MCHNY	1,4	-2,2	2,0	-2,4	3,3
		27,5				

The adoption of a low tariff, (like in the simulation of a flat 6% tariff), would reinforce the specialization pattern based on agricultural production to the detriment of manufacturing production in all MERCOSUR partners. This is particularly worrisome for countries like Argentina and Uruguay, whose comparative advantages are found in agricultural goods which are heavily protected in developed economies and where they have greater capacity to affect the terms of trade. In the smallest countries, this would provoke an output decline in agroindustrial activities exporting within the bloc, like the dairy industry or other light manufactures which have a relatively high share in total output (food, textile and leather industries, among others).

The adoption in all countries of an external tariff like the one applied in Uruguay (CETUR) would not have a negative effect on light manufacturing in Argentina or Brazil, but it could have a strong negative effect on heavy industries with high technological contents. This effect would be more important in Argentina and Brazil, because vehicles and capital goods have a greater weight in their output composition. In the small countries, these industries do not have a significant share in total output.

On the other hand, the adoption of the Brazilian tariff (CETBR) would not lead to great changes in the productive structure of the largest MERCOSUR partners, but it would have a negative impact on GDP in Paraguay and Uruguay. In these countries, the tariff increase would only affect positively some sectors with a small share in total output, like automobiles and machinery and equipment. Therefore, the output effect of an increase in protection would be negligible, even if the percentage variation vis-à-vis the baseline is high.

The full enforcement of the CET does not bring about significant changes in resource allocation in Argentina. The most significant change is a 2.7% fall in vehicle production and 1.4% increase in the production of corns and other grains. Exports rise in almost every sector because protection to the domestic market falls down. The exception is the automobile sector whose exports decline. Imports of manufactured goods and of some agricultural goods increase significantly. On the other hand, imports of machinery and equipment and of soybeans and oil seeds would fall due to the tariff increase in those particular sectors.

Like in Argentina, in the case of Brazil the CET enforcement would not have important effects on output composition, but it would lead to an increase in exports from all sectors, especially metals, vehicles and machinery and equipment.

In Paraguay, the full enforcement of the CET would lead to a change in the tariff structure and an increase in protection. The result is an export fall in almost every sector, especially in the case of agricultural goods and metals. In addition, imports would rise in almost every sector, except for machinery and equipment, vehicles and services. The former would be the sectors with the highest tariff increase. The result would be an increase in vehicle and machinery and equipment production and a fall in others like beverages and tobacco, mining, textiles, light manufactures, petroleum and chemicals and metals. It should be noticed that in the baseline, the automobile and machinery industries are almost inexistent in Paraguay (they add to only 0,2% of total output), so an increase of 10% is meaningless. The most affected sectors (positively or negatively) represent 69% of initial output.

In the case of Uruguay, the most affected sectors by the full enforcement of the CET would be mining, light manufacturing, petroleum and chemicals, while production of machinery and equipment would increase. Total exports would remain almost unchanged but several agricultural sectors would increase their exports, while manufacturing exports would fall. Imports would rise in almost every sector, but they would fall in the case of machinery and equipment and vehicles, because tariffs rise in these sectors.

Both in the case of Paraguay and Uruguay, output variations are much higher than in the case of Argentina and Brazil, so the adjustment costs stemming from the change in the allocation of resources could be higher than in the larger countries.

Level and structure of the CET

The four simulations that are discussed imply different levels and structure of the CET. The results show that in the four countries the adoption of a 6% flat tariff (FLAT) is the best option in terms of its effects on productive efficiency (measured by GDP growth). The application of the Uruguayan tariff to the whole bloc (CETUR), the full enforcement of the CET and the application of the Brazilian tariff (CETBR), are ranked in that order in terms of their efficiency effects. The latter is the worst option for the four members and for the MERCOSUR as a whole.

However, when the effects of the change in the tariff level and in the tariff structure are analyzed separately, we found that such a ranking depends, basically, on the differences in the tariff level of each option. In fact, the lower the tariff, the larger the trade increase and the efficiency in resource allocation except for very low tariff levels. This does not mean that a tariff structure with low protection levels on capital goods (like the CETUR option) would be superior to one with a high level of protection on that sector (like the CETBR option), if they had similar average levels of protection.

Graphs 1 to 5 show the real GDP variation by average tariff level in the four options for the MERCOSUR and for each partner. The flat tariff (FLAT) appears as a clearly superior option in every case, followed by the CET option, the Brazilian tariff option (CETBR) and finally, the Uruguayan option (CETUR). Nevertheless, as the average tariff goes down, the tariff structures become more uniform and the differences among them are smaller.

The adoption of the CET approved in 1994, despite the exceptions, was a great change in the structure and level of protection for the smallest MERCOSUR countries, that reduced their tariffs for the most sensitive goods, even though they maintained the exceptions for goods with lower tariffs than the CET (like capital goods). For these countries, the opening to the MERCOSUR provoked a very significant fall in average protection, because a large share of their total trade is intra-zone trade. As a result, both the tariff level and the tariff dispersion in these countries are lower than in the large countries and they have paid the costs of adjusting their economies to that increased opening.

Figure 1: ARGENTINA
Real GDP Variation by Scenario

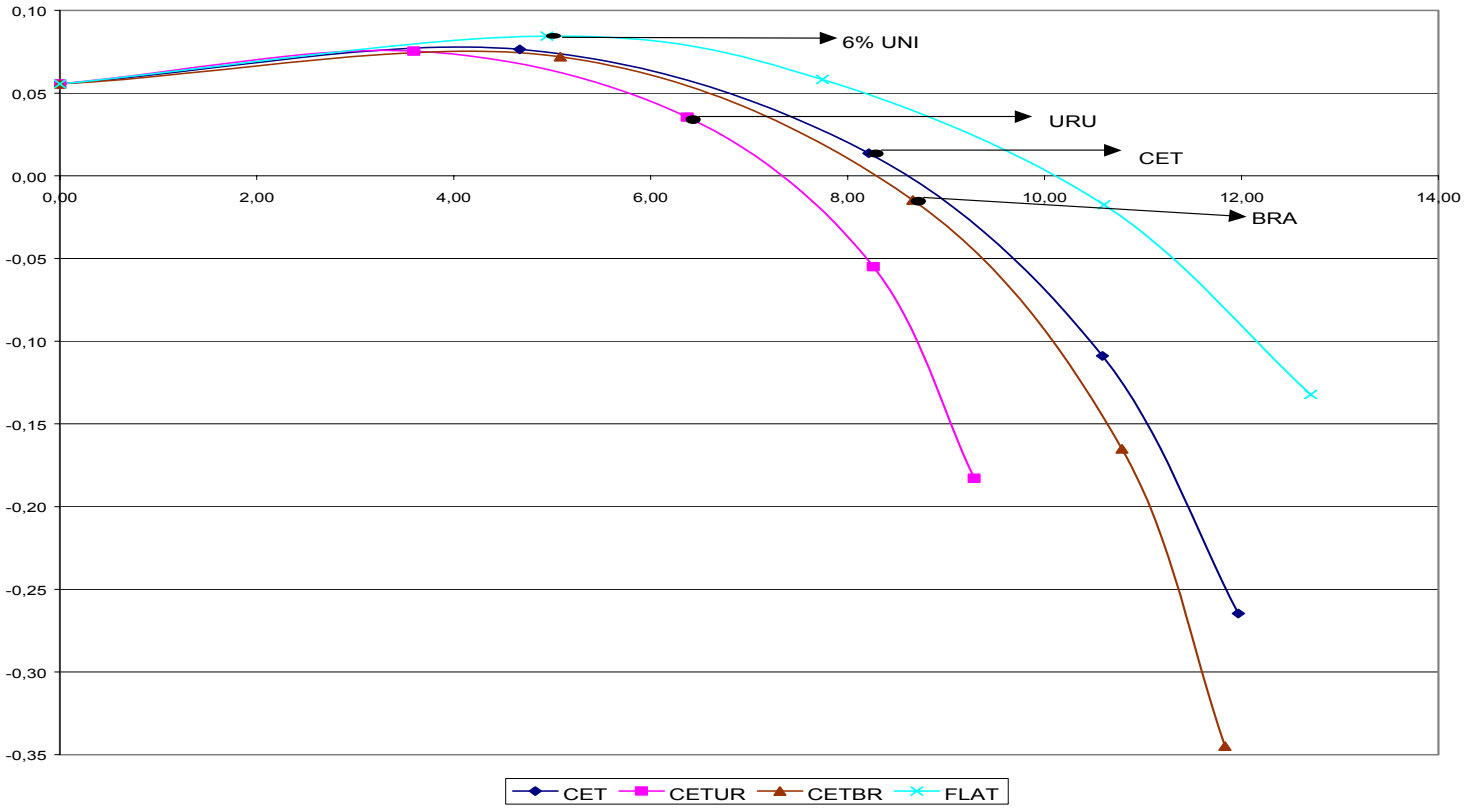


Figure 2: BRASIL
Real GDP Variation by Scenario

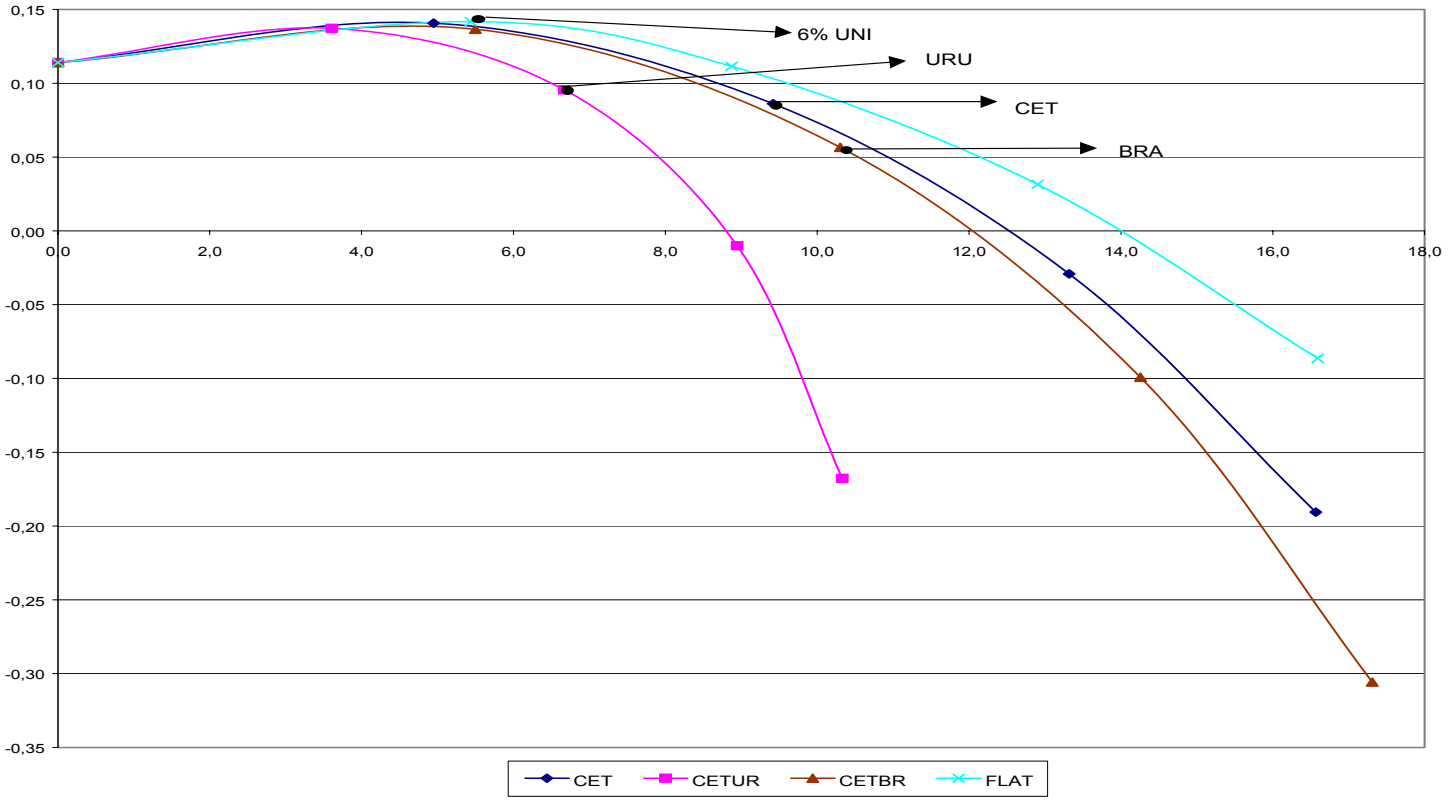


Figure 3: PARAGUAY
Real GDP Variation by Scenario

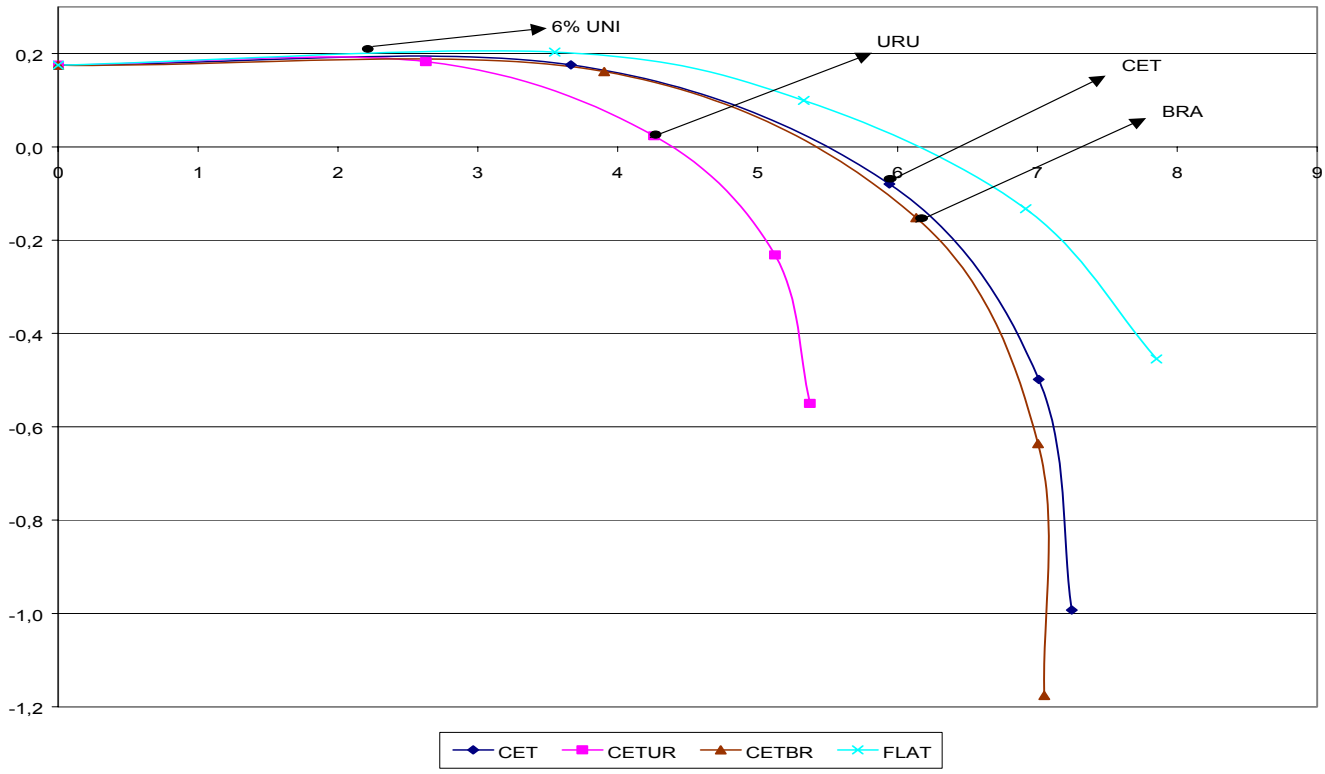


Figure 4: URUGUAY
Real GDP Variation by scenario

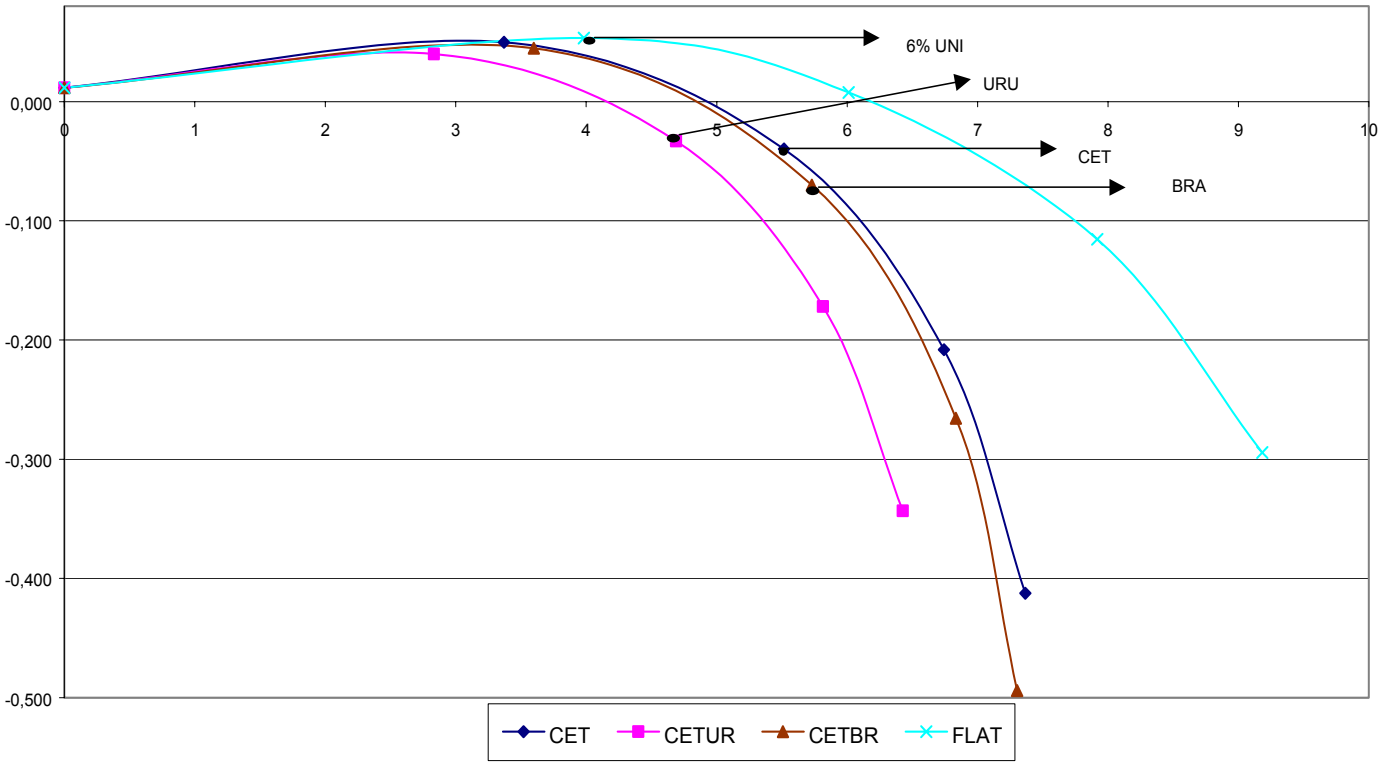
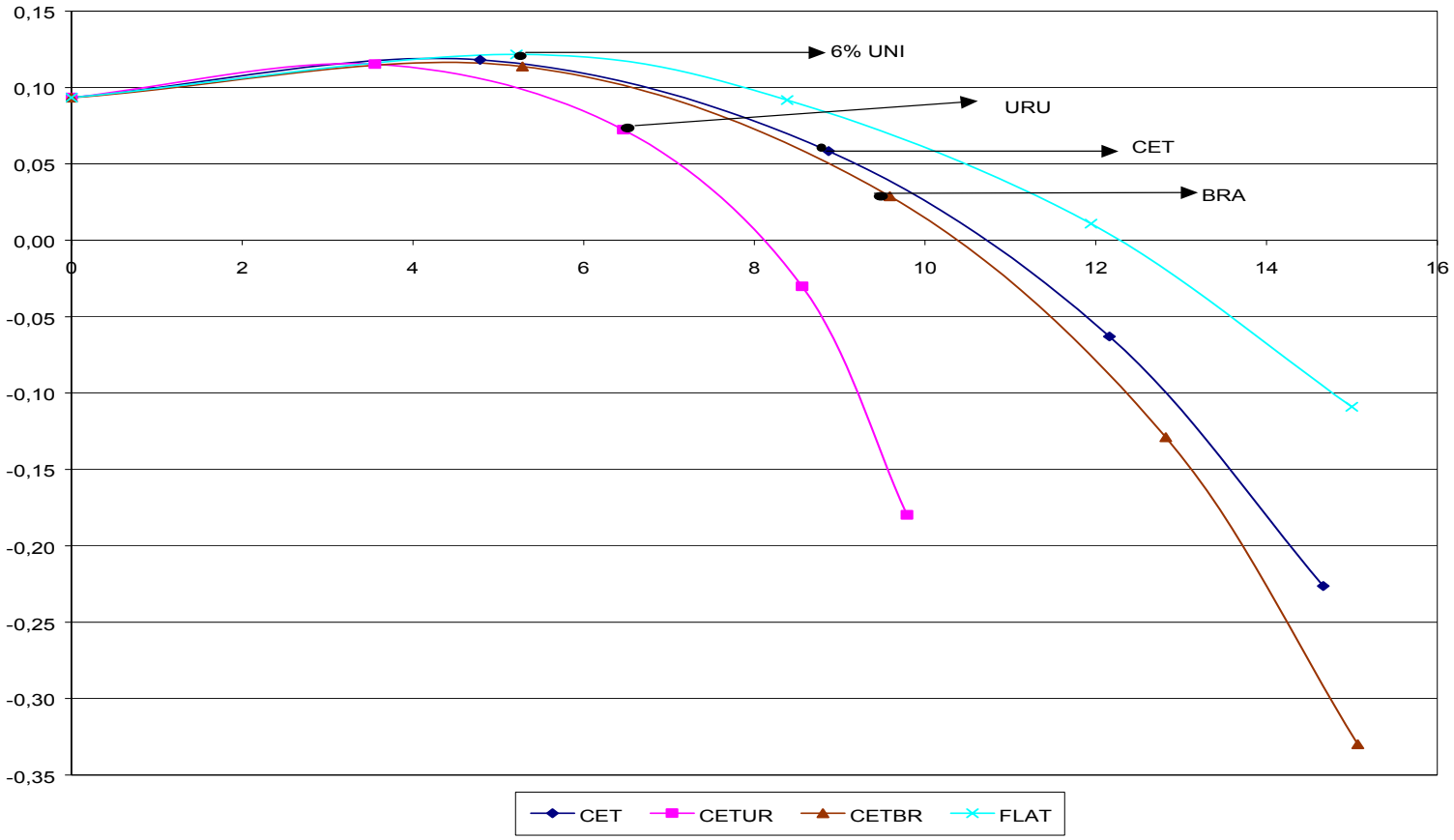


Figure 5: MERCOSUR
Real GDP Variation by scenario



The simulation results also show that, even though the changes in total trade would be lower in the small countries, the effects on output would be larger than in Argentina or Brazil. Therefore, any tariff change that alters the average level should be studied carefully, as the adjustment costs in the smallest economies can be very significant.

Nevertheless, a change in the tariff structure leading to a more uniform tariff could have no negative consequences, as long as it does not raise the level of protection. Moreover, a more uniform tariff structure could contribute to increase efficiency in all partners. This does not necessarily mean that there will be a welfare gain, because the terms of trade effect is higher when the specialization in agricultural goods is more important. In addition, production of manufactured goods could have other externalities which could increase welfare. All these arguments should be taken into account, but they are out of the scope of this paper.

In terms of efficiency and allocation of resources, the CET agreed in Ouro Preto is superior to a tariff structure with very low tariffs on capital goods (as the small countries want). However, the graphs show that the full enforcement of the CET would lead to a GDP growth in Argentina and Brazil and a decline in Paraguay and Uruguay. They also show

that an option that cuts the average tariff about 2 percentage points, as compared to the CET, could be beneficial for the four MERCOSUR members.

VII. CONCLUSIONS

It could be argued that there are no theoretical arguments that support a high tariff level for capital goods and for computer and telecommunication goods (Kume and Piani, 2001). The only exception is the infant industry argument, which always has to be taken cautiously. Even if we accept the existence of a learning process or other type of externalities associated to the production of these goods, more empirical elements would be needed to support a tariff increase.

On the other hand, there are theoretical arguments in favor of adopting a low tariff for capital goods and for computer and telecommunication goods. The main argument has to do with the incentives to investment. Bradford De Long and Summers (1991) and Jones (1994) show that the growth rates in different countries are associated with the relative price of capital goods more than with the savings rate. The model we have used is not appropriate for this discussion as a dynamic model would be needed to capture these effects.

In addition, Hsieh (2000) finds a negative correlation between the relative price of capital goods and the share of imports in total supply of that type of goods. The adoption of high tariffs in capital goods would hinder the introduction of technical change embodied in those goods and would delay technical progress. Developed countries, with an abundant supply of skilled labor, have comparative advantages in R&D-intensive goods. Therefore, the incorporation of technical progress in the MERCOSUR would be associated to the capacity of importing machinery and equipment. Several studies consider this issue, specifying trade models with technological externalities associated to machinery and equipment imports (Monteagudo y Watanuki, 2003; ALADI, 2004).

Another issue to consider is that the MERCOSUR has the power of changing the terms of trade for agricultural goods, even though it may be considered as a small bloc in the world economy. This effect on prices of agricultural goods would be added to the price distortion generated by the agricultural protection policies implemented by developed countries. Instead, in the case of trade with developing countries, the MERCOSUR partners have shown comparative advantages in manufactured goods, in which the MERCOSUR has less capacity for changing its terms of trade. Therefore, a specialization based on agricultural goods would have greater terms of trade effects than a specialization with more emphasis in manufactured goods. In any case, a dynamic model could explore some of these effects in a more appropriate way.

The global effects on GDP, welfare and consumption are scarce in every simulation for all the MERCOSUR members. However, the effects on global trade are not negligible, especially for the largest MERCOSUR partners that receive the greatest impact from trade liberalization. This is because their share of extra-zone trade is much higher than for the smallest partners.

In the simulations that imply tariff reductions, an increase in trade flows is observed, together with a more efficient allocation of resources and a GDP increase; when tariffs rise, the opposite effect is found. This happens in all the simulations except in some simulations for Uruguay. In this country, trade declines even when the tariffs go down because the negative terms of trade effects compensate the positive impact from tariff reduction on domestic prices.

The welfare effects are less clear. In general, a tariff reduction generates a deterioration of the terms of trade, which compensates for the positive effect of the efficiency gain. This effect is lower when substitution elasticity between domestic and imported goods is higher. The revised literature is not conclusive on this subject. In any case, the sensitivity analyses show that models are sensitive only for very large variations of the elasticity values.

For the elasticity values used, the price effects on the rest of the world of a tariff change in the MERCOSUR are not negligible. This is a crucial issue for policy decision-making. Even though the share of MERCOSUR in world imports is very small, several econometric studies show that the effect of its creation on import prices was not negligible. There are no empirical studies analyzing the effects of the MERCOSUR creation on export prices, but in this paper we found that a tariff cut in the MERCOSUR would have a negative impact on the terms of trade due to a significant decline in its export prices. This result is consistent with the importance of MERCOSUR in world markets for its main export goods.

For the small MERCOSUR countries, if the strengthening of the customs union is not followed by a significant improvement of the free circulation of goods within the bloc that compensates for the erosion of preferential access, Uruguay would be better off by avoiding the convergence to a CET. Unless the convergence to a CET brings about other benefits not considered in this paper, Uruguay and Paraguay would rather prefer a situation where its own tariffs are low while its partners' are relatively high. However, this result should be taken cautiously because the free circulation of goods may significantly reduce the costs of access to the partners and avoid the use of rules of origin.

The arguments for maintaining positive tariff levels follow different lines: political economy reasons that point to the capacity for improving market access through negotiation, effects on production specialization and other dynamic effects or effects stemming from the existence of economies of scale. None of this have been explored in this paper, so the results obtained with our model should be taken cautiously and complemented with other type of studies.

In sum, the effects of different options for the MERCOSUR external tariff are not the same for the largest and for the smallest countries. The latter might have a greater impact on their real output, so any change in policy should be studied carefully to avoid (or compensate) high adjustment costs.

APPENDIX

THE MODEL

The model used in this paper is a static, multisector, multicountry CGE model with perfect competition, constant returns to scale and differentiated goods by geographic origin. There is no modeling of the government sector, so that tariff and tax revenue is assigned directly to the only representative consumer in each country. Transport costs are iceberg type, so that they are lost in transit between the exporter and the importer country.

Production *Z* is obtained by combining intermediate inputs and primary factors (land, labor and capital) following a Cobb-Douglas production function. Variable unit cost *V,* obtained through optimization, is as follows:

$$\log V_{j,sd} = \sum_{s} (\alpha_{j,s,sd} . \log PI_{j,s,sd}) + \alpha^{W}_{j,sd} . \log W_{j} + \alpha^{R}_{j,sd} \log R_{j} + \alpha^{T}_{j,sd} . \log RT_{j} + tax_{j,sd} \log V_{j,sd}$$

where *i* and *j* indicate countries, *s* and *d* indicate sectors, *PCI* is the average price of intermediate inputs, *W* is the wage, *R* is the return to capital and *RT* is the rent on land. The *alphas* are parameters that represent the shares of factors and inputs on total production and *tax* is the tax (or subsidy) rate on production.

The producer price *P* is equal to the variable unit cost *V* divided by *G* being $G_{i,j,s} = \frac{1}{1 + g_{i,j,s}}$ and *g* the transport cost obtained as the difference between trade flows valued at CIF and FOB prices.

$$P_{ijs} = V_{is} \Big/ G_{ijs}$$

The average price of intermediate inputs is obtained by the optimization of an nested Armington function that combines domestic and imported goods and goods coming from different geographic origin, being *eta* the distribution parameter of the Armington function, *sigma* the substitution elasticity between goods from different origin and *TAR* the tariff applied by country *j* to imported goods coming from country *i*:

$$PI^{1-\sigma a_{j,s}}_{j,s,sd} = \gamma_{j,s,sd} PD^{1-\sigma a_{j,s}}_{j,s} + (1 - \gamma_{j,s,sd}) PCI^{1-\sigma a_{j,s}}_{i,s,sd} \ ,$$

$$PCI^{1-\sigma_{j,s}}_{j,s,sd} = \sum_{i} \eta^{\text{int}}_{i,j,s,sd} . \left[P_{i,s} . \left(1 + TAR_{i,j,s}\right) \right]^{1-\sigma_{j,s}} \text{ and}$$

$$PD_{j,s} = V_{j,s}$$

The quantities of intermediate inputs used by each sector *sd* are determined through the expression:

$$\log EI_{i,j,,sd} = \log \eta^{INT}_{i,j,s,sd} + \sigma_{j,s} \left(\log PCI_{j,s,sd} - \log P_{i,j,s} - \log\left(1 + TAR_{I,J,S}\right) \right) + \log CIM_{i,s,sd}$$

$$\log CID_{j,s,sd} = lo\gamma_{i,s,sd} + \sigma a_{,s}\left(\log PI_{j,s,sd} - \log PD_i\right) + \log \alpha_{j,s,sd} + \log V_{j,sd} + \log Z_{j,sd} - \log PI_{J,S,SD}$$

$$\log CIM_{j,s,sd} = \log(1-\gamma_{i,s,sd}) + \sigma a_{,s}\left(\log PI_{j,s,sd} - \log PCI_{i,S,SD}\right) + \log \alpha_{j,s,sd} + \log V_{j,sd} + \log Z_{j,sd} - \log PI_{J,S,SD}$$

where *Z* is the output of sector *sd* in country *j*.

The representative consumer in country *j* maximizes a Cobb-Douglas utility function which combines goods from different sectors. In turn, in each sector, he chooses a nestedArmington combination of domestic and imported goods and goods coming from country *i*, being its average price *PCFC* equal to:

$$PCFC_{J,S}^{1-\sigma_{J,S}} = \sum_I \eta_{i,j,s}^{FC}.\left[P_{i,s}.\left(1+TAR_{i,j,s}\right)\right]^{1-\sigma_{j,s}}$$

and the quantities of final goods consumed *EC* is obtained as follows:

$$\log EC_{i,j,s} = \log \eta_{i,j,s}^{FC} + \sigma_{j,s}\left(\log PCFC_{j,s} - \log P_{i,s} - \log\left(1+TAR_{i,j,s}\right)\right) + \log \rho_{j,s} + \log CON_j + \log PCON_j - \log PCFC_{j,s}$$

where CON_j is total consumption in country *j* in volume and *PCON* is the price of aggregate consumption in that country, *etaFC* is the distribution parameter of the Armington function and *rho* is the share parameter of each sector *s* in consumption in country *j*.

$$\log PCON_i = \sum_s \rho_{i,s}.\log PCFC_{i,s}$$

Total imports (exports) of country *j (i)* are equal to the sum of intermediate and final imports (exports):

$$E_{i,j,s} = \sum_{sd} EI_{i,j,s.sd} + EC_{i,j,s}$$

Total income *REV* in country *i* is obtained by adding factor payments, production taxes and tariffs:

$$REV_i = \sum_s \left[\left(\alpha_{i,s}^W + \alpha_{i,s}^R + \alpha_{i,s}^{RT}\right).V_{i,s}.Z_{i,s}\right] + \sum_s tax_{i,s}.V_{i,s}.Z_{i,s} + \sum_{s,j}\left[E_{j,i,s}.TAR_{j,i,s}.P_{j,s}\right]$$

Equilibrium in goods market is obtained when output *Z* is equal to total demand (domestic market and exports):

$$Z_{i,s} = \sum_j E_{i,j,s} / G_{i,j,s}$$

In the factors markets equilibrium is obtained when the sum of demands from the different sectors is equal to each factor supply, which is fixed (*LSUP, KSUP* and *TSUP,* respectively for labor, capital and land):

$$LSUP_i = \sum_s \frac{\alpha_{i,s}^W . V_{i,s} . Z_{i,s}}{W_i}$$

$$KSUP_i = \frac{\alpha_{i,s}^R . V_{i,s} . Z_{i,s}}{R_i}$$

$$TSUP_i = \frac{\alpha_{i,s}^T . V_{i,s} . Z_{i,s}}{RT_i}$$

Finally, external equilibrium is reached when the external balance *DET* is equal to the difference between income and consumption in each country:

$$0 = DET_i + REV_i - CON_i . PCON_i$$

The model closure assumes a constant debt.

ANNEX TABLES

Annex Table 1

Argentina: Export variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	3.960	1.686	0.825	0.523
Corn and Other Grains	CORNS	8.364	3.343	1.741	6.012
Vegetables and Fruits	VEGET	8.594	2.992	0.878	5.634
Soybeans	SYBNS	8.671	3.581	2.194	6.855
Oil Seeds	OSEED	10.386	4.065	2.408	7.678
Sugar	SUGAR	11.483	4.368	2.718	8.660
Coffee and Other Crops	COFFE	10.579	3.732	1.426	7.742
Livestock and Animal Products	LVSTK	13.295	5.133	2.849	10.088
Bovine Meat	BVNMT	8.526	3.468	2.128	6.620
Poultry Meat	OMEAT	11.265	4.354	2.653	8.546
Dairy Products	DAIRY	-9.213	-1.847	-0.429	-25.255
Beverages and Tobaccos	BVTBC	-7.958	2.206	0.294	-11.079
Vegetable Oils and Other Food Products	OTHFD	9.571	3.652	1.930	7.957
Mining	MNING	15.073	0.019	-1.295	5.773
Textiles and Leather and footwear	TXTIL	4.412	4.283	1.193	12.347
Light Manufactures	OTLMF	3.945	2.474	-0.109	9.298
Petroleum and Chemicals	PETRO	4.990	-0.925	-1.895	4.559
Metals	METAL	13.862	4.458	2.242	11.447
Automobiles	VEHCL	-42.910	-23.856	-10.869	-40.912
Machinery and Equipment	MCHNY	-6.218	-2.434	-0.778	-9.100
Utilities and Construction	UTLTY				
Trade and Services	SERVC	12.181	4.303	2.403	8.720

Annex Table 2

Brazil: Export variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	2.628	1.004	0.560	2.137
Corn and Other Grains	CORNS	7.147	2.465	0.798	4.548
Vegetables and Fruits	VEGET	7.413	2.407	0.902	5.157
Soybeans	SYBNS	6.020	2.197	1.264	4.485
Oil Seeds	OSEED	7.560	2.620	1.468	5.618
Sugar	SUGAR	7.568	2.773	1.623	5.633
Coffee and Other Crops	COFFE	8.628	3.123	1.666	6.341
Livestock and Animal Products	LVSTK	9.964	3.418	1.703	7.154
Bovine Meat	BVNMT	5.600	2.036	1.204	4.233
Poultry Meat	OMEAT	7.573	2.623	0.520	5.011
Dairy Products	DAIRY	-16.029	-5.370	-1.690	-31.191
Beverages and Tobaccos	BVTBC	-1.450	2.556	1.048	-4.449
Vegetable Oils and Other Food Products	OTHFD	7.477	2.608	1.343	5.963
Mining	MNING	11.802	3.842	2.166	8.536
Textiles and Leather and footwear	TXTIL	9.127	4.018	1.611	10.172
Light Manufactures	OTLMF	8.834	3.407	1.524	8.421
Petroleum and Chemicals	PETRO	5.094	1.143	0.230	4.715
Metals	METAL	12.144	4.206	2.327	9.977
Automobiles	VEHCL	31.210	12.815	10.381	22.824
Machinery and Equipment	MCHNY	11.572	7.228	6.686	8.183
Utilities and Construction	UTLTY				
Trade and Services	SERVC	8.796	2.947	1.573	6.416

Annex Table 3

Paraguay: Export variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	-3.196	-3.070	-1.712	-7.770
Corn and Other Grains	CORNS	-2.060	-2.696	-1.629	-5.885
Vegetables and Fruits	VEGET				
Soybeans	SYBNS	2.378	0.535	0.661	1.417
Oil Seeds	OSEED	7.355	0.047	-0.528	-2.488
Sugar	SUGAR	7.604	2.048	1.600	4.924
Coffee and Other Crops	COFFE	-2.646	-5.793	-7.737	-5.736
Livestock and Animal Products	LVSTK	0.039	-3.100	-4.240	-4.076
Bovine Meat	BVNMT	-1.061	-1.458	0.052	-1.774
Poultry Meat	OMEAT				
Dairy Products	DAIRY				
Beverages and Tobaccos	BVTBC				
Vegetable Oils and Other Food Products	OTHFD	0.866	-1.595	-1.187	2.118
Mining	MNING	11.533	-10.100	-9.435	-3.752
Textiles and Leather and footwear	TXTIL	-10.963	-3.327	-3.116	0.119
Light Manufactures	OTLMF	-2.630	-2.244	-2.459	1.092
Petroleum and Chemicals	PETRO	2.626	-3.381	-3.619	0.915
Metals	METAL	-21.280	-13.356	-10.031	-10.285
Automobiles	VEHCL				
Machinery and Equipment	MCHNY				
Utilities and Construction	UTLTY				
Trade and Services	SERVC	7.565	1.782	1.210	4.695

Annex Table 4

Uruguay: Export variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	3.066	0.455	0.467	0.040
Corn and Other Grains	CORNS	-0.021	-1.297	-1.075	-3.534
Vegetables and Fruits	VEGET	8.898	2.954	1.821	6.267
Soybeans	SYBNS	8.479	2.789	1.837	5.609
Oil Seeds	OSEED	35.949	0.406	-19.866	-19.914
Sugar	SUGAR	9.427	2.868	1.702	6.516
Coffee and Other Crops	COFFE	8.217	2.167	0.895	5.715
Livestock and Animal Products	LVSTK	7.277	1.067	-0.572	4.109
Bovine Meat	BVNMT	7.593	2.220	0.714	4.559
Poultry Meat	OMEAT				
Dairy Products	DAIRY	-6.825	-2.882	-0.961	-21.806
Beverages and Tobaccos	BVTBC	-40.524	-5.987	-5.105	-46.755
Vegetable Oils and Other Food Products	OTHFD	5.358	1.022	0.208	4.975
Mining	MNING	11.964	-1.636	-2.216	3.442
Textiles and Leather and footwear	TXTIL	5.293	1.826	0.111	7.653
Light Manufactures	OTLMF	-14.800	-4.703	-5.494	-0.053
Petroleum and Chemicals	PETRO	-3.865	-5.805	-5.227	-1.767
Metals	METAL	1.813	-2.137	-2.541	3.099
Automobiles	VEHCL	-58.246	-20.913	-3.247	-48.954
Machinery and Equipment	MCHNY	-10.947	-3.570	-0.052	-14.259
Utilities and Construction	UTLTY				
Trade and Services	SERVC	9.181	2.683	1.585	6.084

Annex Table 5

Argentina: Import variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	-0.121	-0.138	-0.076	-0.223
Corn and Other Grains	CORNS	-3.361	1.425	10.608	8.223
Vegetables and Fruits	VEGET	-1.421	1.001	3.226	1.380
Soybeans	SYBNS	-0.356	-0.443	-0.089	-0.462
Oil Seeds	OSEED	-9.173	-0.477	7.331	7.598
Sugar	SUGAR				
Coffee and Other Crops	COFFE	-1.173	0.677	2.578	1.267
Livestock and Animal Products	LVSTK	0.155	1.425	3.185	1.819
Bovine Meat	BVNMT	0.235	-0.568	5.982	4.533
Poultry Meat	OMEAT	-1.903	-0.647	2.340	0.242
Dairy Products	DAIRY	7.213	1.557	0.482	23.146
Beverages and Tobaccos	BVTBC	23.862	1.817	4.417	26.408
Vegetable Oils and Other Food Products	OTHFD	4.177	1.331	1.841	0.288
Mining	MNING	-5.294	2.430	2.463	0.524
Textiles and Leather and footwear	TXTIL	16.264	1.343	1.908	0.687
Light Manufactures	OTLMF	6.858	1.314	2.041	-0.587
Petroleum and Chemicals	PETRO	0.940	2.027	2.025	0.385
Metals	METAL	4.635	2.186	2.250	-0.456
Automobiles	VEHCL	14.192	-0.576	-3.042	8.402
Machinery and Equipment	MCHNY	4.844	-0.766	-1.827	4.460
Utilities and Construction	UTLTY				
Trade and Services	SERVC	-5.422	-2.006	-1.142	-3.976

Annex Table 6

Brazil: Import variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	0.908	0.557	0.415	1.749
Corn and Other Grains	CORNS	0.805	0.613	0.556	1.541
Vegetables and Fruits	VEGET	0.800	1.136	2.125	2.908
Soybeans	SYBNS	0.228	-0.107	0.153	-0.020
Oil Seeds	OSEED	-2.062	1.166	1.867	5.430
Sugar	SUGAR				
Coffee and Other Crops	COFFE	1.607	1.895	3.073	2.426
Livestock and Animal Products	LVSTK	1.854	1.705	2.722	3.220
Bovine Meat	BVNMT	0.001	-0.029	0.113	0.121
Poultry Meat	OMEAT				
Dairy Products	DAIRY	5.333	1.321	0.678	15.356
Beverages and Tobaccos	BVTBC	24.531	2.807	2.723	27.662
Vegetable Oils and Other Food Products	OTHFD	7.145	2.422	2.320	2.212
Mining	MNING	-3.086	3.278	3.300	2.213
Textiles and Leather and footwear	TXTIL	24.527	3.257	3.357	2.489
Light Manufactures	OTLMF	13.920	3.500	3.924	1.903
Petroleum and Chemicals	PETRO	3.247	3.197	2.836	1.786
Metals	METAL	13.102	5.807	4.753	5.733
Automobiles	VEHCL	39.257	12.249	5.282	31.681
Machinery and Equipment	MCHNY	15.251	5.777	3.593	13.891
Utilities and Construction	UTLTY				
Trade and Services	SERVC	-4.085	-1.424	-0.774	-3.048

Annex Table 7

Paraguay: Import variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	0.693	0.770	0.320	0.869
Corn and Other Grains	CORNS	0.192	0.441	0.066	0.400
Vegetables and Fruits	VEGET	-0.217	0.421	0.602	0.484
Soybeans	SYBNS	0.015	0.346	0.011	0.316
Oil Seeds	OSEED	1.188	0.929	0.402	1.328
Sugar	SUGAR	1.833	1.210	0.533	1.583
Coffee and Other Crops	COFFE	0.743	0.797	0.565	0.985
Livestock and Animal Products	LVSTK	0.319	0.653	0.161	0.617
Bovine Meat	BVNMT				
Poultry Meat	OMEAT				
Dairy Products	DAIRY	0.825	1.034	0.658	1.153
Beverages and Tobaccos	BVTBC	6.229	0.839	0.576	12.769
Vegetable Oils and Other Food Products	OTHFD	1.275	0.855	1.067	1.093
Mining	MNING	-0.093	1.028	0.359	0.846
Textiles and Leather and footwear	TXTIL	13.618	1.488	1.665	1.432
Light Manufactures	OTLMF	4.766	0.963	0.772	0.655
Petroleum and Chemicals	PETRO	0.484	0.711	0.448	0.722
Metals	METAL	0.641	0.391	0.171	0.470
Automobiles	VEHCL	1.868	-0.728	-0.979	0.473
Machinery and Equipment	MCHNY	0.992	-1.471	-2.164	0.723
Utilities and Construction	UTLTY				
Trade and Services	SERVC	-3.172	-0.747	-0.539	-2.044

Annex Table 8

Uruguay: Import variation, by scenario

		6% flat tariff	CET enforcement	Brazil external tariff	Uruguay external tariff
		FLAT	CET	CETUR	CETBR
Rice and Wheat	WHEAT	0.669	0.595	0.210	0.384
Corn and Other Grains	CORNS	0.122	0.522	1.909	0.188
Vegetables and Fruits	VEGET	0.382	1.350	1.843	0.441
Soybeans	SYBNS				
Oil Seeds	OSEED	-0.075	0.514	0.242	0.153
Sugar	SUGAR	-0.781	0.077	-0.056	-0.718
Coffee and Other Crops	COFFE	-0.054	0.678	0.911	0.190
Livestock and Animal Products	LVSTK	0.304	1.870	1.723	1.797
Bovine Meat	BVNMT				
Poultry Meat	OMEAT	-1.014	0.311	4.883	0.286
Dairy Products	DAIRY	0.722	0.605	0.282	0.012
Beverages and Tobaccos	BVTBC	13.850	1.899	1.272	0.979
Vegetable Oils and Other Food Products	OTHFD	1.852	0.942	1.041	0.513
Mining	MNING	-3.717	1.761	1.662	0.605
Textiles and Leather and footwear	TXTIL	13.064	1.724	1.549	1.449
Light Manufactures	OTLMF	2.787	0.820	1.062	0.124
Petroleum and Chemicals	PETRO	0.959	1.291	1.072	0.615
Metals	METAL	1.731	2.132	2.600	-0.991
Automobiles	VEHCL	1.703	-2.550	-2.895	-0.730
Machinery and Equipment	MCHNY	0.713	-3.030	-3.851	0.598
Utilities and Construction	UTLTY				
Trade and Services	SERVC	-4.538	-1.360	-0.804	-3.030

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