A Summary of the Cost-Benefit Analyses of the Uruguay Round

General Remarks and Overview of Methodologies

The Uruguay Round on agriculture covered market access, domestic subsidies and export subsidies. In order to assess these impact policy decisions, economists and policy makers employ computable general equilibrium (CGE) models. These models are derived from input -output tables developed by Wassily Leontief and require the use of a high level of data to model the world's economy. CGE models mimic the real world based on a number of different assumptions such as full employment, various degrees of competition level within an industry, and the elasticity of demand for certain goods. In this report Brandao and Martin (1993), Francois, McDonald, and Norstrom (1994), Nguyen, Perroni, and Wigle (1991) and (1995), Brown, Deardorff, Fox, and Stern (1995), Harrison, Rutherford, and Tarr (1997), Blake, Rayner, and Reed (1999) examine reductions of export and domestic subsidies as well as tariffs. Goldin and van der Mensbrugghe (1995) assess tariffication and market access but do not domestic subsidies nor export subsidies. Greenfield, de Nigris and Konandreas (1996) examine export subsidies and tariffs but not domestic support.

The modeling of tariffication-the process of converting non-tariff barriers (NTBs) into tariff equivalents-of protectionist policies has lead to different degrees of accuracy between pre-Uruguay Round multilateral estimates and post-Uruguay FTA estimates. In the pre-Uruguay Round period, estimates of the effect of the Uruguay Round's liberalization must include each individual country's tariffication schedule as well as any subsequent reduction in tariffs, domestic subsidies and export subsidies. As many countries have transformed their NTBs to tariffs in different ways, this often leads to misleading inferences of the impact of trade negotiation depending on the way researchers model the tariffication. The Uruguay Round eliminated many non-tariff barriers and thus post-Uruguay estimates for the impact of free trade agreement do not have to consider the tariffication process and thus, are easier to model and considered more accurate in the results of their estimates. Moreover, according to Blake, Rayner and Reed (1999) differences in outcomes among estimates of the Uruguay Round reform package may arise from different aggregations of regions and commodities, imposition of different pre- and post- Uruguay round tariff level, different data sources, different modeling structure of competition, and modeling of different export subsidy constraints. These results will lead to varying degrees of estimation bias.

There are three common CGE models used to estimate the effects of free trade agreements for the Uruguay Round. First, the RUNS (Rural/Urban-North/South) model was developed by the OECD. However, this first model was supplanted with the more prevalent second model, the GTAP (Global Trade Analysis Project) model. Thirdly, there is the Michigan model which often draws its data from the GTAP database. All three of these models, RUNS, GTAP, and the Michigan model are considered global models used to analyzed multilateral agreements or the global effects of a free trade agreement. Partial equilibrium models are not suitable to analyze world or regional trade agreements because they examine only specific commodities. Among the three aforementioned models, the GTAP model continues to be the most utilized in post-Uruguay Round estimates of free trade agreements (FTAs). This is due to to the ease of using the model with its aggregated database compiled by Purdue University.

The GTAP database assumes Armington elasticities of demand. Armington elasticities assume that a country will have a different elasticity of demand for a product based on the country of its origin. In other words, this assumption assumes that consumer preferences for a particular type of good differ based on its country of origins. In nearly all the models that

analyzed the global welfare effects of the Uruguay Round (except Brown et al and Harrison et al), Armington assumptions were used in modeling demand for manufacturing goods while agricultural tradables were assumed to have homogenous demand. There are several criticisms of the GTAP model, however. Valenzuela, Hertel, Keeney and Reimer (2007) evaluate the GTAP model with regards to wheat commodities in order to determine its accuracy. They found that the model tends to overstate price volatility in major net importing markets while understanding the price volatility in major exporting regions. Moreover, government policies such as state trading corporations may limit the ability for GTAP models to effectively predict changes. Furthermore, the treatment of factor mobility tends to lead to different results for any CGE models. For instance, some modelers assume perfect labor mobility but imperfect capital mobility across all sectors, while others assume imperfect labor and capital mobility across some sectors. This will lead to estimation differences.

The GTAP model has not adequately found a way to model the service sector and the Michigan model may be better suited to do analyze this sector. This model makes several assumptions such as full employment, imperfect competition, increasing returns to scale, and product differentiation. However, it has not been used widely outside of the original authors' research and only occasionally since 2000.

There has been progress in modeling parameters since the 1990s. Since the implementation of the Uruguay Round modeling assumptions for CGE models has not significantly changed but is more dependent on authors' preferences of assumptions (Piermartini and The 2005). Authors have begun to increasingly combined various assumptions and relaxed others. The primary assumptions that impact the results of an estimate are:

- Elasticity of substitution between foreign and domestic goods;
- Monopolistic versus perfect competition;
- Constant versus increasing returns to scale;
- Mobility and substitution between factors of production between sectors;
- Static versus dynamic models;
- Aggregation;
- The author's modeling of the agreement's parameters.

While modeling, authors' may attribute particular assumptions to the economy as a whole or within specific sectors. For example, an author may assume monopolistic competition for all sectors or only within some sectors. Whether these assumptions are "strong" or "weak" in the real world, highly influences the accuracy of the estimates. Secondly, the author's ability to accurately model the negotiated and ratified trade scenarios is crucial in determining the scale of their results. Early CGE estimates conducted by Brandao and Martin (1993) and the OECD (1993) assumed much higher degrees of liberalization than the final agreement and this led to higher estimates of the Uruguay Round's potential gains. Thirdly, there has been a shift of emphasis from the assumption that production relies on Cobbs-Douglas technologies to the greater role of Leontief technologies. Cobbs-Douglas does not consider intermediary goods that need to be utilized at a fixed proportion during the production phase. Leontief technologies assume a minimum fixed proportion of substitution for inputs and more accurately reflect the real world. Depending on the technology level of an individual country, the proportion of these intermediary goods change and may lead to different precisision in estimates.

When different CGE models are utilized in later estimates, many still use the GTAP database as their data source. The primary reason is due to the work required to amalgamate the global data on trade flows is quite difficult and tedious while the GTAP data set is already compiled. Thus earlier estimates may use a wide range of data sources that in of itself may lead to differing estimates; later estimates utilize the same data source that minimize this source of estimation error.

In conclusion, its this author's opinion the accuracy and precisions of estimations depend significantly on the model used, assumptions, the data sources, and modeling parameters. Economists have made improvements in modeling the real world since the earlier pre-Uruguay Round models. However it is impossible to demonstrably attribute the macroeconomic effect of a trade agreement. CGE models are useful in estimating the impact of a trade agreement, but they are simply that: estimates. They serve as a guide for policy makers to understand the magnitude that a trade agreement could potentially have. In absence of any other way to predict the impact of a policy change, CGE models such as the GTAP model continue to be the most effective and useful tool to estimate the impact of free trade agreements.

Summaries

Brandão and Martin (1993)

Brandão and Martin (1993) assess the potential impact of the Uruguay Round on developing countries in consideration of the Dunkel Package and partial liberalization. The Dunkel package consisted of an elimination of import barriers and the reduction of tariffs 36% (from 1986-88), a reduction of 36% of government outlays on export subsidies (from 1986-89), a reduction of 24% in the volume of subsidized exports, reduction of 20% in the aggregate measure of domestic support relative to a fixed 1986-88 average external reference price.

They use the Rural/Urban-North/South (RUNS) model to estimate the price changes and welfare impact of the Uruguay Round. In this model, there is perfect substitution between domestic and foreign agricultural commodities while manufactured goods are differentiated according to region of origin (Armington substitution). The production function uses four inputs: land, labor, capital and draught cattle. Capital stock is fully mobile across all commodities. Dry land and capital are combined to make a composite factor in production. Labor migration and population growth determine the allocation to the urban-rural sectors. Demand and consumption is modeled through a Extended Linear Expenditure System. Government expenditures is assumed to grow at the same rate as GDP. Agriculture distortions for OECD countries was taken from the OECD while distortions for developing countries was taken from the USDA Economic Research Services and the World Bank data.

To analyze the Dunkel package they simulate tariffication if imports and then their reduction at an average of 36% from 1986-1988 average tariff equivalents; reduction of 36% in export subsidies and a reduction of 24% in volume of subsidized exports; a reduction of 20% of the aggregate measure of domestic support. They conduct four simulations: 1) implementation of the Dunkel package by developed countries (OECD); 2) a similar reduction in both positive and negative protectionism in both developed and developing countries (Global) ; 3) complete adoption of the Dunkel proposal; and 4) developing countries liberalize the same amount as developed countries (developing). Their results are shown to be the changes from the 2002 baseline year.

Prices

Brandão and Martin's (1993) results are reproduced below for the four liberalization scenarios. Each scenario has two columns to represent U.S. policy instruments that effect commodity prices. The U.S. may effect prices through either price support payments directly to producers which increases output or land aside requirements which reduces output levels. Land aside requirements are relaxed by 20% for wheat, coarse grains, cotton and rice in column B. In column A, they remain unchanged. Their first simulation assumes no productivity growth:

Table 1 : Price Changes without Productivity Growth						
	OECD		Global		Dunkel	Developing
	A	B	A	B	A	A
Wheat	4.35	3.87	6.29	5.77	6.32	1.03
Rice	1.99	1.79	-2.79	-3.00	4.22	-4.79
Coarse Grains	2.79	2.23	4.26	3.65	4.42	1.60
Sugar	6.41	6.25	12.37	12.29	10.18	4.81
Beef, veal and sheep	5.13	5.02	4.91	4.80	6.08	-0.78
Other meets	2.20	2.09	1.14	1.02	3.20	-1.67
Coffee	0.85	0.79	-6.78	-6.85	0.41	-7.48
Cocoa	0.60	0.57	-4.75	-4.77	0.14	-5.28
Tea	1.88	1.77	3.82	3.68	2.34	1.99
Oilseeds	2.51	2.55	3.76	3.78	4.52	1.09
Dairy	9.67	9.53	9.04	8.83	10.13	-0.25
Other food products	0.71	0.64	-1.78	-1.87	0.65	-2.31
Wool	1.65	1.41	3.24	2.82	1.96	2.41
Cotton	1.64	0.88	4.34	3.49	2.23	2.87
Other Agriculture	1.23	1.12	7.35	7.17	2.23	6.27
Source: Brandão and Martin (1993)						

Their second simulation assumes endogenous productivity growth. As one can see from the table below, prices increase slightly more with productivity growth. This is because in OECD countries there is a slowdown in the rate of productivity increase in response to lower producer prices while in non-OECD countries the rate of productivity increases in response to higher producer prices. The price change is then dependent on the share of production of the commodity between the OECD and non-OECD countries.

Table 2						
	OECD		Global		Dunkel	Developing
	A	B	A	B	A	A
Wheat	4.56	4.449	4.78	4.73	6.18	-0.15
Rice	1.95	2.01	-6.44	-6.35	4.02	-8.16
Coarse Grains	1.58	1.45	2.23	2.10	3.30	0.49
Sugar	5.87	5.91	11.62	11.67	9.92	4.55
Beef, veal and sheep	6.19	6.22	4.76	4.81	7.16	-1.54
Other meets	3.00	3.02	0.45	0.49	4.02	-2.74
Coffee	1.07	1.11	-7.68	-7.61	1.35	-8.65
Cocoa	0.93	0.99	-7.20	-7.08	0.90	-8.07
Tea	2.05	2.08	3.04	3.07	2.66	1.08
Oilseeds	1.82	1.92	2.81	2.92	3.77	0.76
Dairy	11.44	11.46	10.28	10.25	12.18	-0.71
Other food products	1.10	1.13	-1.32	-1.28	1.33	-2.33
Wool	1.41	1.32	2.92	2.62	1.96	1.95
Cotton	1.37	1.65	1.54	1.82	1.82	0.30
Other Agriculture	1.66	1.67	7.07	7.04	2.62	5.42
Source: Brandão and Martin (1993)						

Welfare Effects

Their first model simulates these scenarios under no productivity growth:

Table 3

	OECD		Global		Dunkel		Developing	
	US$ Mil	% of GDP	US$ Mil	% of GDP	US$ Mil	% of GDP	US$ Mil	% of GDP
Low-Income Asia	358	0.1	1001	0.4	585	0.2	600	0.3
China	-81	0.0	24132	2.1	893	0.1	23334	2.0
India	2020	0.3	2182	0.3	2555	0.4	225	0.0
Upper-Income Asia	-1126	-0.1	19474	2.2	9556	1.1	19968	2.3
Indonesia	45	0.0	-616	-0.2	7	0.0	-614	-0.2
Africa	-340	-0.1	-107	0.0	-217	-0.1	208	0.1
Nigeria	134	0.1	-162	-0.1	93	0.0	-227	-0.1
South Africa	-143	-0.1	194	0.2	111	0.1	264	0.3
Maghreb	-170	-0.2	-29	0.0	-123	-0.1	45	0.0
Mediterranean	-1054	-0.3	-908	-0.2	-975	-0.3	175	0.0
M. East Oil Export	-3027	-0.6	3161	0.6	207	0.0	6081	1.2
Latin America	2080	0.4	6424	1.2	3843	0.7	4045	0.8
Brazil	1595	0.2	1996	0.3	2057	0.3	412	0.1
Mexico	338	0.1	2410	0.6	1199	0.3	1948	0.5
Total Developing	629		59152		19791		56464	
Eastern Europe	36	0.0	2558	0.4	2202	0.4	-658	-0.1
CIS	5024	0.4	3926	0.3	3557	0.3	-859	-0.1
Total Non-OECD	5689		65636		25550		54947	
USA	12548	0.2	13149	0.2	11443	0.2	2587	0.0
Canada	2177	0.4	2447	0.5	2327	0.4	77	0.0
Australasia	1722	0.5	2057	0.6	2145	0.6	278	0.1
Japan	14196	0.6	16787	0.7	13197	0.6	2365	0.1
EECD	33765	0.8	30727	0.7	26382	0.6	-21028	-0.5
EFTA	8258	1.3	8258	1.3	7810	1.2	-2437	-0.4
Total OECD	72666		73425		63304		-18158	
Total World	78355		139061		88854		36789	

Source: Brandão and Martin (1993)

They also complete estimates assuming endogenous technological change induced by increased research and development activities. Modeling this allows for greater returns to trade liberalization:

Table 4								
	OECD		Global		Dunkel		Developing	
	US$ Mil	% of GDP	US$ Mil	% of GDP	US$ Mil	% of GDP	US$ Mil	% of GDP
Low-Income Asia	2361	1.0	545	0.2	2066	0.9	-1734	-0.7
China	4304	0.4	81457	7.1	7393	0.6	74900	6.5
India	6288	1.0	7983	1.2	7905	1.2	1681	0.3
Upper-Income Asia	233	0.0	21249	2.4	9811	1.1	20654	2.3
Indonesia	405	0.2	-1863	-0.7	256	0.1	-2094	-0.8
Africa	3626	1.5	341	0.1	3062	1.2	-3195	-1.3
Nigeria	973	0.4	-1397	-0.6	570	0.2	-2240	-1.0
South Africa	146	0.1	-309	-0.3	24	0.0	-433	-0.4
Maghreb	388	0.4	92	0.1	275	0.2	-357	-0.3
Mediterranean	468	0.1	132	0.0	509	0.1	-181	0.0
M. East Oil Export	-2123	-0.4	-1124	-0.2	-2395	-0.5	1518	0.3
Latin America	4348	0.8	10201	1.9	6007	1.1	5549	1.1
Brazil	6204	0.8	9311	1.2	6360	0.8	1805	0.2
Mexico	1678	0.4	4345	1.0	2421	0.6	2409	0.6
Total Developing	29299		130961		44264		98282	
Eastern Europe	1717	0.3	2878	0.5	3449	0.6	-1005	-0.2
CIS	5708	0.5	4130	0.3	3853	0.3	-873	-0.1
Total Non-OECD	36724				51566		96404	
USA	11939	0.2	10820	0.2	11381	0.2	233	0.0
Canada	1687	0.3	1792	0.3	1995	0.4	73	0.0
Australasia	2299	0.6	2046	0.6	2737	0.7	-298	-0.1
Japan	14959	0.6	17690	0.8	133447	0.6	2991	0.1
EECD	31552	0.7	23879	0.5	24128	0.5	-22739	-0.5
EFTA	8619	1.3	8745	1.3	7948	1.2	-2468	-0.4
Total OECD	71055		64972		61636		-22208	
Total World	107779		202941		113202		74196	

Source: Brandão and Martin (1993)

Organisation of Economic Co-operation and Development (1993)

The OECD estimate the global welfare effects using a static computable general equilibrium model. This model may underestimate the costs of the trade agreement due to adjustment costs and the assumption that there is a high mobility and substitutability between factors of production. At the same time, their model may underestimate the benefits due to not modeling the impact of the Uruguay Round to service industries, market access, or investment liberalization. The also assume constant returns to scale which may underestimate the results and Armington elasticities. They highly aggregate their commodities to only four different groups: manufacturing, agriculture, other import, non-traded. They obtain their data sources from the OECD, USDA and the World Bank while trade flows are from UN COMTRADE.

They estimate the results of a 36% reduction of *all* tariffs and tariffs equivalents of import barriers. This is markably different than the final act where negotiators agreed to an *average* 36% reduction of all tariffs. They estimate a 2002 baseline year with no Uruguay Round reforms and then they model the change under two scenarios: 1) this 36% reduction in OECD countries only; 2) this same reduction globally. Table 5 reports their results.

Table 5				
Country/Region	**(1) OECD in $US millions**	**(1) OECD in percentage**	**(2) World in $US millions**	**(2) World in percentage**
Australia & NZ	1,587	0.5	1,896	0.6
Canada	5,916	1.1	6,649	1.2
EEC	78,317	1.9	71,271	1.7
EFTA	34,238	5.4	38,384	6.0
Japan	35,490	1.5	41,968	1.8
USA	26,298	0.4	27,558	0.4
Total OECD	181,846	-	187,726	-
Rest of World	29,942	-	86,362	-
Total World	211,788	-	274,088	-
Source: OECD (1993)				

Francois, McDonald, and Norstrom (1994)

Francois et al (1994) base their study on the actual text of the Uruguay Round to assess the impact of the tariff reductions using a 15 sector, 9 region CGE model. They account for imperfect competition, scale economies, specialization, medium-run investment effects, and the combination of intermediate product specialization. Manufactured products gained the most, followed by agricultural (depending on the model). Their data is from the OECD and USDA estimates on agricultural support. They assume Armington elasticity between goods. They combine the GTAP (based on 1990) with a social accounting matrix that provides a relationship between different sectors in different regions. The following results (in 1990 billion US dollars) estimate the benefits from the Uruguay Round by 2005:

Table 6								
	CRTS, PC, Dynamic				**IRTS, MC, Dynamic**			
	Ind. Tariffs	**Ind. NTBs**	**Agricul ture**	**Total**	**Ind. tariffs**	**Ind. NTBs**	**Agricul ture**	**Total**
Canada	-0.5	2.7	1.6	3.8	0.7	10.2	1.5	12.4
United States	7.0	38.4	3.8	49.2	13.7	102.3	6.3	122.4
EFTA	5.5	4.2	7.7	17.5	89.8	17.7	6.0	33.5
European Union	16.8	42.9	18.7	78.5	33.8	115.1	14.6	163.5
Australia and New Zealand	0.4	0.3	1.7	2.4	3.1	0.6	2.1	5.8
Japan	10.1	-0.4	11.5	21.2	18.1	2.1	6.5	26.7
China	9.5	-3.5	0.8	6.9	11.6	5.4	1.7	18.7
Taiwan	5.9	-1.3	0.5	5.1	7.7	2.1	0.4	10.2
Developing and Transition	0.3	-12.2	11.2	-0.7	33.4	68.4	14.3	116.1
Total	55	71	58	184	132	324	53	510

Hathaway and Ingco (1995)

Hathaway and Ingco use 1986-88 as the baseline year international prices of agricultural goods because it was the lowest in decade. This resulted in there being a high gap between internal prices and international market prices. Thus, when they estimated the value of tariffs based on the baseline year, they were able to determine whether the tariffication process under the Uruguay round was excessively protectionist or within reason. In the case of the EU, they determined that their tariffication was higher than the baseline, and thus

overly protectionist. On the other hand, Japan's tariffication rates for agricultural products was less than their estimates. Their view is that the Uruguay round was a sweeping level of reform eliminating non-tariff barriers and the binding of all tariffs on agricultural products. However, export subsidies still remained with a defined upper limit by country and commodity. Developed countries have 10 years to implement reductions of export subsidies to 14% of volume and 24% of spending. However, the exact specification for a commodity was up to a country to decide and thus, allowed many countries to change their aggregation. They conclude that the Uruguay round's liberalization for developing countries is relatively minor. In addition, they argue that it will not force developing countries to open up its markets to international competition, increase agricultural commodity prices, nor reduce the quantity of food aid available.

Prices

To analyze price changes they use a simple equation such that the average price reduction is estimated to be (F-B)/(1+0.5(F+B)) where F=final tariff and B=baseline tariff. They then report the percentage changes from this average using data from two different time periods for tariffs to provide different baselines for possible price changes:

Table 7: Change in Prices using a Long Run Average Tariff Rate

Country	Wheat	Rice	Coarse Grains	Sugar	Meat	Other Meat	Coffee	Cocoa
EU	0	0	0	0	-9	0	-0.6	-4
US	9	0	0	0	0	0	0	0
Japan	47	na	-55	-35	6	0	-4	-2
Australia	-1	-9	0	0	0	-8	-1	0
Canada	0	0	0	0	0	0	0	0
EFTA	0	-8	0	-11	0	0	-2	0
Upper Income Asia	-109	0	-78	-7	-33	-20	0	0
Indonesia	0	0	0	0	0	0	0	0
India	0	0	0	0	0	0	0	0
Low-income Asia	0	0	0	0	0	0	0	0
Brazil	-7	0	0	0	0	0	0	0
Mexico	0	0	0	0	0	0	0	0
Other Latin America	0	0	0	0	0	0	0	0
Nigeria	-15	0	-75	0	0	0	0	0
Mediterranean	0	0	0	0	0	0	0	0
Other Africa	0	0	0	0	0	0	0	0
South Africa	0	0	0	0	0	0	0	0
Maghreb	0	0	0	0	0	0	0	0

Country	Tea	Oilseeds	Dairy	Fruits Veg	Wool	Cotton	Other Non-Food	

Table 7: Change in Prices using a Long Run Average Tariff Rate								
EU	-2	0	0	-4	0	-1	-13	
US	-1	0	-8	-4	-4	-9		
Japan	-3	0	0	-3	0	0	0	
Australia	0	-1	-16	0	-1	-1	-4	
Canada	-5	0	0	0	0	0	-1	
EFTA	-1	0	0	0	0	-1	-3	
Upper Income Asia	0	-3	0	0	-2	-2	-20	
Indonesia	0	-33	0	0	0	0	0	
India	0	-18	0	0	0	0	0	
Low-income Asia	0	0	0	0	0	0	0	
Brazil	0	0	0	0	0	0	0	
Mexico	0	0	0	0	0	0	0	
Other Latin-America	0	0	0	0	0	0	0	
Nigeria	0	0	0	0	0	0	0	
Mediterranean	0	0	0	0	0	0	0	
Other Africa	0	0	0	0	0	0	0	
South Africa	0	0	0	0	-26	0	0	
Maghreb	0	0	0	0	0	50	0	
Source: Hathaway and Ingco (1996). Long-run Average, 1982-93								

Table 8: Change in Prices using a recent period average tariff rate								
Country	**Wheat**	**Rice**	**Coarse Grains**	**Sugar**	**Meat**	**Other Meat**	**Coffee**	**Cocoa**
EU	0	0	0	0	-12	0	-6	-4
US	-15	0	0	0	0	0	0	0
Japan	-81	na	-91	-47	-1	-9	0	0
Australia	00	-4	0	0	0	-5	-1	0
Canada	0	0	0	0	0	0	0	0
EFTA	0	0	-1	-14	0	0	-2	0
Upper Income Asia	0	0	0	0	0	0	0	0
Indonesia	0	0	0	0	0	0	0	0
India	0	0	0	0	0	0	0	0
Low-income Asia	0	0	0	0	0	0	0	0
Brazil	-31	0	0	0	0	0	0	0
Mexico	0	0	0	0	0	0	0	0
Other Latin-America	0	0	0	0	0	0	0	0
Nigeria	-12	0	-16	0	0	0	0	0
Mediterranean	0	0	0	0	0	0	0	0
Other Africa	0	0	0	0	0	0	0	0
South Africa	0	0	0	0	0	0	0	0
Maghreb	0	0	0	0	0	0	0	0
Country	**Tea**	**Oilseeds**	**Dairy**	**Fruits Veg**	**Wool**	**Cotton**	**Other Non-Food**	

Table 8: Change in Prices using a recent period average tariff rate								
EU	2	0	0	-4	0	1	-13	
US	-1	0	-8	-4	0	0	n/a	
Japan	0	0	-14	0	0	0	0	
Australia	0	-1	-19	0	-1	-1	-4	
Canada	-5	0	0	0	0	0	-1	
EFTA	0	-18	0	0	0	0	-3	
Upper Income Asia	0	-33	0	0	0	0	0	
Indonesia	0	0	0	0	0	0	0	
India	0	0	0	0	0	0	0	
Low-income Asia	0	0	0	0	0	0	0	
Brazil	0	0	0	0	0	0	0	
Mexico	0	-1	0	0	0	0	0	
Other Latin-America	0	0	0	0	0	0	0	
Nigeria	0	0	0	0	0	0	0	
Mediterranean	0	0	0	0	0	0	0	
Other Africa	0	0	0	0	0	0	0	
South Africa	0	0	0	0	-26	0	0	
Maghreb	0	0	0	0	0	-51	0	
Source: Hathaway and Ingco (1996). Recent Period Average, 1989-93								

Nguyen, Perroni, and Wigle (1991) and (1995)

Nguyen, Perroni, and Wigle (1991) use a CGE model assuming Armington elasticities, perfect competition, and constant returns to scale. They include producer subsidy equivalents and border restrictions as agriculture policy variables. Each region is represented by a single consumer endowed with labor, capital and agricultural sector-specific primary factors. The commodity aggregates of domestic and imported goods are is a CES composite. Production is modeled with two primary inputs- capital and labor- and the nine region-specific commodity type aggregates. Commodity and country aggregation as well as primary factor elasticities may be found in Appendix I.

They to estimate the two scenarios. In the first scenario, they model is a 70% reduction in agriculture support for OECD countries, agriculture exporters, and agriculture importers. Moreover, they assume 50% cut in barriers and a "dramatic" relaxation of quotas on textiles and clothing in all regions except the Centrally Planned Economies. They also assume a 50% reduction in tariffs on merchandise goods for OECD countries with a 20% cut to the remaining poor countries. In their second scenario they parameterize a 30% reduction in agricultural support for OECD countries, agriculture exporters, and agricultural importers. They assume a 50% increase in MFA quotas, They assume that there is a 50% reduction in the tariff formula and a 20% reduction in countries aggregated to Middle Income Agricultural Exporters, Middle Income Agricultural Importers and the rest of the world. They assume a lack of progress in service liberalization and poor countries would not support the agreement due to a lack of progress in agriculture. In both scenarios they assume Centrally Planned Economies would not participate in the liberalization.

Nguyen et al (1995) reevaluate their 1991 analysis on the adoption of the Uruguay round agreement. In their 1991 study they anticipated substantially higher levels of liberalization. In their new study, they revise their original estimates but are somewhat "optimistic" on the level of service liberalization. They model the following changes for

agriculture protectionism: a 15% reduction in producer subsidy equivalents in Japan, 10% in all other regions except former centrally planned economies, and the rest of the world experience no changes; all border reductions are reduced by 20% in high-income regions and 10% in low income regions; centrally planned economies make no changes to border measures. Table 9 reports a comparison of their estimates' results in Nguyen et al (1991) and Nguyen et al (1995).

Table 9: Welfare Impacts of Uruguay Round (in 1984 US dollars)

Region	Nguyen, Perroni, and Wigle (1995)		Nguyen, Perroni, and Wigle (1991) Scenario 1		Nguyen, Perroni, and Wigle (1991) Scenario 2	
	$US Billion	Percent of GDP	$US Billion	Percent of GDP	$US Billion	Percent of GDP
Agricultural Exporters	2.8	0.2	12.1	2.3	2.5	0.5
Agricultural Importers	2.3	0.6	7.6	2.9	4.2	1.6
Centrally Planned	10.9	0.3	23.6	0.6	6.6	0.2
Other Western Europe	3	0.8	9.3	1.6	4.0	0.7
US	9.6	0.2	73.5	1.7	35.3	0.8
Canada	1.2	0.3	9.3	2.5	4.4	1.2
EC	19	0.5	60.4	1.7	27.5	0.8
Japan	17.8	1.3	50.1	2.5	27.6	1.4
Australia and New Zealand	0.6	0.3	3.2	1.6	0.9	0.4
Rest of the World	2.7	0.1	13.3	0.7	5.6	0.3
World	69.9	0.4	262.5	1.5	118.7	0.7

Source: Nguyen, Perroni, and Wigle (1991) and Nguyen, Perroni, and Wigle (1995)

Goldin and van der Mensbrugghe (1995)

Goldin and van der Mensbrugghe (1995) quantify the impact of the tariffication of the Uruguay Round; however, they do not try to assess the impact of reforms of NTB. Their model's data is based on GDP and population trends, the FAO agricultural statistics and the OECD, World Bank, and GATT level of protectionism. They compare their results to a previous study they conducted before the Uruguay Round was completed and examine possible short-run and long-run gains. They found that lower income Asia countries tend to protect cereal crops like rice and tax their export crops. On the other hand, they found that their previous estimates of upper income Asia to misestimate the distribution of protectionism but not the level. For OECD countries they find that their initial estimates to be generally correct with high levels of protection for the European Free Trade Area albeit still lower than Japan's.

From this initial starting point, they undertake five simulations to quantify the impact of the the Uruguay Round. The first assumes that the 1994-2002 level of protection would be 1982-1993 average level of protection and input subsidies would remain unchanged. The second is similar to the first but use more recent years (1989-1993) as a base for the level of protectionism. Simulation 3 is like 2, but assumes a reduction of input subsidies. They assume that OECD countries reduce their subsidies by 36% while non-OECD countries reduce it by 24%. Their fourth simulation examines what would have been expected had the Uruguay Round ended with the acceptance of the Draft Final Act rather than what was

eventually accepted under the agreement. Simulation 5 is similar to simulation 3 but with the assumption of full employment lifted.

Their model, the Rural/Urban-North/South Model (RUNS) examines three dimensions: regions, commodities, and price. Their model has 22 regions based on geographical area, with a commodity space of 20 items (15 of which are agriculture), over the years 1985-2002. The model then simulates the world economy using fixed resources, land, capital and labor for each year which then define the trade relations among countries. They allow for factor accumulation and growth in capital and labor, but not of productivity. This model uses a multi-input/output production function to model agriculture (rural) production. Urban production is consistent with standard CGE models using Leontief-fixed coefficients. Households are divided into rural and urban with different consumption functions based on the Extended Linear Expenditure System. Agricultural trade is the difference between agricultural production and agricultural demand. They also assume homogenous agricultural commodities globally while others goods are assumed to have Armington elasticities.

Prices

Table 10: Change in Global Agriculture Prices
(Percent deviation from 2002 benchmark levels)

Commodity	I	II	III	IV	V
Wheat	1.2	3.8	6.3	10.3	6.6
Rice	-1.5	-0.9	0.8	3.6	1.3
Coarse Grains	0.1	2.3	3.2	5.4	3.3
Sugar	-1.0	1.8	2.5	11.4	3.0
Beef, Veal, and Sheep	0.2	0.6	1.4	6.0	2.3
Other Meats	-0.9	-0.6	-0.1	2.3	0.6
Coffee	-1.7	-1.5	-1.4	-0.7	-0.7
Cocoa	-1.3	-0.7	-0.6	0.3	-0.1
Tea	-1.6	-1.4	-1.2	0.9	-0.7
Oils	-0.6	-0.3	3.9	5.4	4.6
Dairy	-1.3	1.2	2.3	12.1	2.5
Other Food Products	-1.3	-1.4	-1.5	-0.7	-1.1
Wool	-1.1	-0.9	0.5	1.2	0.2
Cotton	-1.3	-1.2	-0.3	1.1	0.2
Other Agriculture	-0.5	0.8	0.9	2.9	1.4

Source: Goldin and van der Mensbrugghe (1995)

Welfare

Table 11: Estimates on the Impact of the Uruguay Round to Global Welfare					
Countries	I	II	III	IV	V
Low Income Asia	0.2	0.1	0	0.4	0
China	-0.1	-0.1	-0.2	-0.2	-0.2
India	0.4	0.5	0.7	0.8	0
Upper Income Asia	0.8	1.3	1.3	2	4.9
Indonesia	0.1	0.1	0.1	0.3	0.5
Other Africa	-0.2	-0.2	-0.3	-0.5	-0.4
Nigeria	-0.1	-0.1	-0.1	0.1	-0.1
South Africa	-0.2	-0.4	-0.4	-0.4	-0.9
Maghreb	0	-0.1	-0.3	-0.9	-0.4
Mediterranean	-0.1	-0.1	-0.2	-0.3	0.3
Gulf Region	0.2	0	-0.2	0.3	0.1
Other Latin America	-0.3	-0.3	0	0.4	0.2
Brazil	0.3	0.4	0.3	0.4	-0.1
Mexico	-0.1	-0.4	-0.5	-0.6	-0.5
United States	0	0	0.1	0.2	0.1
Canada	-0.2	-0.2	0	0.4	0.2
Australia, New Zealand	-0.1	0	0.1	0.6	0.4
Japan	0.2	0.4	0.4	0.9	1.6
European Economic Community	0.1	0.3	0.6	0.9	1.6
European Free Trade Area	0.3	1	1.2	1.6	2.8
European Economies in Transition	0.3	0.3	0	-0.2	0.1
Former Soviet Union	0	0.1	0.1	0.7	0.4
(in billions of 1992 US dollars)					
Africa	-1.3	-1.8	-2.5	-3.1	-3.3
Low Income	2	1.3	0.9	3.4	-2.4
Latin America	0.6	0.3	0.6	3.1	-1.7
Other Developing	9.7	14.9	13.2	24.2	59.8
OECD	14.2	32.4	54.7	103.6	178.6
Other	0.1	0.8	1.5	5.5	4.1
Total	25.4	48	68.4	136.6	235.1
Source: Goldin and van der Mensbrugghe (1995)					

Brown, Deardorff, Fox, and Stern (1995)

Brown et al (1995) estimate the impact of the Uruguay round using the Brown-Deardorff-Stern CGE model of World Production and Trade. They aggregate countries into groups of the following: United States, Canada, Mexico, Europe, Japan, Asian Newly Industrializing Countries, Australia/New Zealand, and a group of Other Major Trading Nations. They examine 29 sectors of 23 tradable product categories of agriculture and manufacturing and 6 categories covering services and government. Agriculture is assumed to be perfectly competitive with differentiation by country of production. They assume full employment at a constant level, unchanged trade balance, revenue from tariffs are assumed to be redistributed to consumers in the tariff levying country, fixed relative wages, and fixed labor supply. Their model is static and do not account for foreign direct investment and cross-border movement of workers however they allow for labor and capital to be intersectorally mobile.

They compare the Uruguay Round's final reform package to the Uruguay Round base rate. Their data source is the GATT Integrated Data Base which contains information for the pre- and post- Uruguay Round tariffs using the Harmonized System tariff classification. They

note that agricultural tariffs were not processed in the same way that industrial tariffs were. They use a data from provided by Ingco (1995) that contained the country schedule for agricultural and related goods. Agricultural liberalization was measured to be the difference between the Base Rate before the Uruguay Round versus the Final Offer rate.

They test the following scenarios: A) a reduction in Uruguay Round tariffs in industrial products only and NTB trade cover ratios set to zero; B) 25% reduction in post-Uruguay Round service sector ad valorem tariff equivalents, with NTB coverage ratios in agricultural and manufacturing sectors equal to zero; C) reduction in Uruguay Round tariff rates on Industrial products combined with an assumed 25% reduction in post-Uruguay Round service sector ad-valorem tariff equivalent, with NTB trade coverage ratios set to zero (p.15-16).

In scenario A, their results predict that the largest welfare gains occur in Europe with $20.7 billion, Japan with $16.6 billion, the United States $14.5 billion, and the Asian NICs $12.2 billion. In scenario B, their results estimate Europe's welfare increases by $39.3, the United States' by $36.1 billion and Japan's by $23.7 billion. In scenario C (which combines 1 and 2), they estimate that Europe gains $60.1 billion, the US gains $50.6 billion, Japan gains $40.4 billion, Canada gains $11.5 billion, and a 3.6% increase in GDP for Asian NICs.

Appendix II reports their results at the sectoral level for scenarios A and B.

Table 12 : Summary results of Uruguay Round (Percentage change)

Country	Terms of Trade	Equivalent Variation	Real Wage Rate	Real Return to Capital
A. Industrial Product Trade Liberalization				
United States	-0.1	0.3	0.1	0.3
Canada	-0.2	0.4	0.2	0.3
Mexico	0.1	0.1	0.0	0.2
Europe	-0.1	0.3	0.1	0.3
Japan	0.1	0.6	0.3	-0.1
Asia	0.9	2.4	1.3	-0.9
Australia-NZ	-1.0	1.2	0.3	1.0
Other Trading Nations	-1.6	0.0	0.2	1.7
B. Services Trade Liberalization				
United States	.2	0.7	0.2	-0.1
Canada	-.01	1.6	0.5	0.1
Mexico	-.2	2.7	0.4	0.3
Europe	0.1	0.6	0.1	0.0
Japan	-0.5	0.8	0.2	0.4
Asia	0.1	1.1	0.7	0.3
Australia-NZ	-0.4	2.8	0.3	0.5
Other Trading Nations	-0.3	1.0	0.3	0.4
A. Industrial Product and Service Liberalization				
United States	0.2	0.9	0.3	0.2
Canada	-0.3	2.0	0.7	0.4
Mexico	-0.1	2.	0.4	0.5
Europe	0.0	0.9	0.3	0.3
Japan	-0.4	1.4	0.5	0.3
Asia	1.0	3.6	2.1	-0.6
Australia-NZ	-1.4	3.9	0.6	1.6
Other Trading Nations	-1.9	1.0	0.5	2.1
Source: Brown et al (1995)				

Greenfield, de Nigris and Konandreas (1996)

Greenfield et al (1996) utilized the FAO's World Food Model to analyze the effects of the Uruguay Round by the year 2000 using 1987-89 base year data. This model disaggregates all commodities to 147 countries or country groups. Modeling for provisions if done at the primary commodity level where tariff changes for derived products are based on their average primary-equivalent tariff. This model incorporates reductions in export subsidies, but not deal with the agreement's required domestic support programs. They assume that the reductions in the bound tariffs from 1995 to 2000 represent what would have been the country's tariff reduction schedule in the absence of the Uruguay Round.

Prices

Table 13 reports reduction the percentage change in real world food prices by the year 2000 according to their model. As one can see, the baseline scenario is what would have been the change in prices had the Uruguay Round not been in effect. It appears that the Uruguay Round increased the prices of agricultural commodities. However, it should also be noted that the base years of the analysis, 1987-89, were years with below average agricultural commodity prices.

Table 13

	Baseline	Uruguay Round effect	Total
Wheat	-3	+7	+4
Rice	+7	+7	+15
Maize	+3	+4	+7
Millet/sorghum	+6	+4	+10
Other grains	-3	+7	+5
Fats and oils	-4	+4	0
Oilmeal Proteins	+3	0	+3
Bovine meat	+6	+8	+14
Sheep meat	+3	+10	+13
Pig meat	+13	+10	+24
Poultry	+5	+8	+14
Milk	+32	+7	+41

Source: Greenfield et al (1996)
Note: Total does not necessarily equal the sum of the two columns

Production

Table 14 reports changes in production as a result of the Uruguay round. The Uruguay Round produces somewhat modest results in terms of net changes in production, production has shifted from one region/country to another.

Table 14: Impact of Uruguay Round on Production (Thousands of tons)					
Commodities	**Global Production**	**Developing Countries Production**	**Developing Countries Consumption**	**Developed Countries Production**	**Developed Countries Consumption**
Wheat	-1583	5143	-1578	-6727	-203
Rice	683	1657	662	-974	-49
Coarse grains	3423	804	-230	2618	2158
Fats and oils	1067	1010	574	57	464
Oilmeals	516	565	471	-50	29
Bovine meat	164	-249	-195	413	362
Pig meat	-1567	-739	-590	-828	-894
Bovine meat*	-36	-25	-46	-11	10
Poultry meat	-36	-8	104	-28	-141
Milk	371	439	-951	-67	1364
Butter	-73	-103	28	30	-17
Coffee, cocoa, tea	155	155	80	0	106
Sugar	1081	629	739	452	319
Bananas	-1092	-1034	-145	-58	-458

Source: Greenfield et al (1996)
* repeated bovine meat category was not defined

Harrison, Rutherford, and Tarr (1997)

Harrison et al (1997) use a 24 region, 22 commodity general equilibrium model based on GTAP v. 2 to 1) assess the importance of the round and a 2) expand the understanding of the results. They estimate that the round will favor developed countries more so than developing countries in the short-run while all countries gain in the long-run. Their explanation for the short-run loss in developing countries is that the reduction of agriculture subsidies in the US, EU and EFTA resulted in terms-of-trade loss in some net food importing countries and Multi-Fibre Arrangement (MFA) protection and agricultural distortions being eliminated. They estimated the US, EU and Japan would gain $13 billion, $39 billion, and $17 billion annually, respectively, from the reduction of trade barriers in their static model. In particular, Japan gained primarily from agriculture welfare increases of nearly $15.2 billion from the reduction of import protection. However, Japan still loss $500 million from the MFA reductions. For their increasing returns to scale model, they predict the US and Japan to gain $26.7 billion and $22.7 billion, respectively. Japan's agricultural welfare gain is nearly $16.8 billion. Their model uses intermediate inputs and primary factors of labor, capital and land. The primary factors are mobile across sectors within a region, but are internationally immobile. They use a constant elasticity of substitution Cobbs-Douglas production function with Leontief production functions for technology and intermediate inputs. A listing of their commodity aggregation may be found in Appendix III.

Josling (1997)

Josling overviews the developments in government outlays since the implementation of the Uruguay round. He assesses the Uruguay Round in three dimensions-market access, export competition, and domestic support-and discusses issues that will remain in subsequent negotiations.

For market access Josling reports that the level of tariffs agreed upon were higher than the true tariff equivalent of the NTB they replaced. Secondly, many developing countries bound "ceiling" tariffs without actually going through the calculation of the tariff equivalent.

Thirdly, many bound tariff rates were higher than what they were applying at the commercial level. For export competition, Josling writes that the Uruguay Round made progress in removing export subsidies and market distortions. In particular, he commends the round for banning new export subsidies and for defining what constitutes an export subsidy more clearly.

To assess domestic support, Josling examines the OECD's producer subsidy equivalent which measures the payment that would have been given to to offset the income effects had the policies not been in place. This measure shows that PSE had increased since the early part of the 1990s; however, the percentage of output it represents had decreased. The PSE relative to the value of output has declined from 45% in 1986-88, to 40% in 1995, to 36% in 1996. Josling notes that the decrease in the relative PSE to output is due to high producer prices, and thus, improvements in this ratio may actually vanish if prices collapsed. Josling contends that the advantage of the of the OECD's measurement of PSE is that it allows a way to compare different countries in how they each support farm policies over time.

Government Outlays

Table 15: Government Outlays					
	1986-88	**1993-95**	**1994**	**1995**	**1996**
Total Transfers by country					US$ billions
EU	114.1	132.5	128.5	138.6	120.3
US	68.2	74.1	76.4	62.4	68.7
Japan	62.5	89.9	87.2	100.5	77.4
Canada	7.3	6.1	5.8	5.7	4.8
OECD	278.9	332.1	328.2	332.9	297.1
Transfers per farmer (Full Time Farmer Equivalent)					US$
EU	12,785	18,657	18,336	19,478	17,474
US	27,892	29,384	30,285	24,742	27,240
Japan	17,280	31,647	29,402	38,440	30,091
Canada	15,742	14,085	13,750	13,318	11,225
OECD	11,100	15,651	15,440	15,955	14,493
Transfers per hectare					US$
EU	851	953	944	951	825
US	159	174	179	146	161
Japan	11,705	17,553	17,013	19,618	15,107
Canada	99	84	80	78	66
OECD	236	284	280	284	254
PSE (US$ Billion)	159	na	na	180	166
PSE (percent)	45	na	na	50	36
NAC (producer prices)	1.8	na	na	1.6	1.5
NAC (consumer prices)	1.6	na	na	1.4	1.3
Source: Josling (1997)					

Blake, Rayner, and Reed (1999)

Blake et al (1999) use a modified GTAP model to analyze the effects of the Uruguay Round. In addition to normal assumptions (single household, Armington assumption, immobile factors of production internationally, and so forth) of GTAP, they assume that

cereal (wheat and other grains) is to be specific to the commodity (sub-sector) so that set-aside may be modeled by a reduction in this base area and that resources employed in agriculture are immobile between sectors. They have a non-standard aggregation of 17 sectors with 5 sectors are agriculture, 1 sector is all primary activity, 4 sectors are food processing. 2 sectors are textiles and clothing, 3 sectors are manufacturing, and 1 sector is service. There are thirteen regions based upon per capita income, net balance of their agricultural goods, and structure of domestic agriculture production. See Appendix IV for more details.

They analyze the Uruguay Round package under three reforms: conversion of all-non tariff barriers to tariffs, a 36% (24% in low-income countries) reduction in average tariffs and converted non-tariff barriers for all goods, a 36% (24% in low-income countries) reduction in agricultural export subsidy rates, a 20% (13.33% in low-income countries) reduction in agricultural output subsidy rates, an elimination of voluntary export restraints (VERs) on textiles and clothing. They assume that the proportion of factors of production in agricultural to be sector specific.

Prices

Blake et al (1999) estimate the change in prices for the EU.

Table 16: Percent Price Changes in EU Sectors under Full Uruguay Reform

	Prices and Costs				Real Quantities				Export Subsidies		Import Subsidies	
	A	B	C	D	E	F	G	H	I	J	K	L
Rice	-6.57	-1.02	-5.55	-7.5	-6.07	-26.91	15.7	-0.26	-36.00	-7.18	-24.02	-14.25
Wheat	-2.13	-0.28	-1.85	-1.28	-4.01	-26.09	-4.32	-0.63	-36.00	-12.27	-18.76	-14.25
Other grains	-2.29	-0.43	-1.86	-2.27	-4.03	-28.3	18.76	-34	-36.00	-8.97	-19.31	-14.25
Non grain crops	-7.2	-0.49	-6.71	-4.2	-7.11	-21	15.58	0.14	-60.21	-48.94	-21.44	-14.25
Livestock	-1.59	-0.29	-1.3	-0.62	-0.9	21.96	19.26	-0.49	-100	-100	-15.36	-14.25
Other primary industries	0.24	0.07	0.17	0.21	0.26	4.35	0.52	0.19				
Processed rice	-1.02	-1.2	0.18	-3.24	-2.81	6.87	46.89	1.7				
Meat products	-0.48	-0.6	0.12	-0.87	-0.8	-21.19	27.63	1.07	-36.00	-18.43	-15.32	-14.25
Milk and milk products	-0.56	-0.77	0.21	-0.99	-1.8	-21	55.02	1.01	-38.51	-21.72		
Other agricultural products	-0.36	-0.56	0.2	-0.44	0.99	16.71	3.78	0.28				
Textiles	-2.19	-2.37	0.18	-3.25	-1.9	11.31	24.68	-0.81				
Wearing Apparel	-2.15	-2.33	0.18	-12.82	-28.4	15.65	94.28	5.75				
Energy	0.38	0.09	0.29	0.34	-0.13	1.02	4.55	-0.5				
Chemicals, rubbers and plastic	-0.7	-0.24	0.17	-0.71	-0.41	6.78	8.73	-0.34				
Machinery and equipment	0.00	-0.22	0.22	-1.26	-0.63	6.41	10.19	0.45				
Other manufacturing	0.15	-0.06	0.21	-0.03	0.9	9.79	5.19	0.45				
Services	0.35	0.01	0.34	0.35	0.34	1.09	0.16	0.15				

Table 16: Percent Price Changes in EU Sectors under Full Uruguay Reform												
	Prices and Costs				Real Quantities				Export Subsidies		Import Subsidies	
	A	B	C	D	E	F	G	H	I	J	K	L

Source: Blake et al (1999)

A)Producer Price
B)Intermediate Cost
C)Value Added Cost
D)Consumer Price
E)Output
F)Exports
G)Imports
H)Demand
I)Expenditure
J)Ad Valorem Rate
K)Expenditure
L)Ad Valorem Rate

Welfare Effects

Table 17 reports the welfare gains from the Uruguay Round reform package and three components- agriculture, textiles and clothing, and industrial market access.

Table 17 : Regional Equivalent Value Welfare Gains								
	Full Uruguay Round Reforms		Agricultural Components		Textiles and Clothing Liberalization		Industrial Market Access	
	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%
Australia and NZ	1.04	0.36	0.96	0.33	0.20	0.07	-0.14	-0.05
Canada	1.57	0.30	1.03	0.20	1.55	0.30	-1.06	-0.20
United States	21.46	0.41	2.65	0.05	15.99	0.30	2.55	-0.05
Japan	26.65	0.84	5.16	0.16	-1.02	-0.03	22.91	0.72
European Union	24.86	0.42	11.37	0.19	11.62	0.20	1.63	0.03
Taiwan and South Korea	2.50	0.52	3.93	0.82	-1.60	-0.33	0.35	0.07
Hong Kong and Singapore	-3.21	-7.11	0.01	0.02	-3.59	-7.95	0.36	0.79
Economies in Transition	-1.68	-0.23	-0.29	-0.04	-1.13	-0.15	-0.19	-0.03
Brazil	1.57	0.47	0.70	0.21	0.04	0.01	1.04	0.31
Other middle income	-8.43	-0.34	0.18	0.00	-5.13	-0.21	-2.98	-0.12
Sub-Saharan Africa	-0.49	-0.33	0.00	0.00	-0.15	-0.10	-0.32	-0.22
China	6.13	1.37	0.11	0.02	5.46	1.22	0.60	0.13
Other Low Income	6.22	1.49	0.15	0.04	6.12	1.46	0.08	0.02
World	78.20	0.39	25.94	0.13	28.25	0.14	24.83	0.12

Source: Blake et al (1999)

Table 18 reports the decomposition of the impact of different elements of the of the agricultural portion of the Uruguay Round reform package. Countries such as Japan and South Korea experience significant loses from subsidy reform because the price they pay for agricultural imports increases when subsidies are reduced (p. 409).

Table 18 : Decomposition of the Agricultural Reforms								
	Import Tariff Reform		Export Subsidy Reforms		Output Subsidy Reforms		Set-Aside Reforms	
	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%
Australia and NZ	0.42	0.15	0.30	0.10	0.15	0.05	0.00	0.00
Canada	0.33	0.07	0.39	0.07	0.23	0.04	0.00	0.00
United States	0.81	0.02	0.86	0.02	0.95	0.02	0.00	0.00
Japan	6.65	0.21	-1.06	-0.03	-0.06	0.00	-0.06	0.00
European Union	3.56	0.06	4.52	0.08	2.80	0.05	-0.18	0.00
Taiwan and South Korea	4.37	0.91	-0.27	-0.06	-0.13	-0.03	0.00	0.00
Hong Kong and Singapore	0.22	0.48	-0.09	-0.21	-0.10	-0.22	0.00	0.00
Economies in Transition	0.04	0.00	-0.41	-0.06	0.15	0.02	-0.01	0.00
Brazil	0.68	0.20	0.06	0.02	0.15	0.04	0.09	0.03
Other middle income	1.50	0.06	-1.16	-0.05	0.17	0.00	0.00	0.00
Sub-Saharan Africa	0.17	0.12	-0.19	-0.13	0.05	0.04	0.00	0.00
China	0.15	0.03	-0.13	-0.03	0.09	0.02	0.00	0.00
Other Low Income	0.22	0.05	-0.13	-0.03	0.07	0.02	0.00	0.00
World	19.15	0.09	2.67	0.01	4.52	0.02	-0.17	0.00

Source: Blake et al (1999)
Note: sum across columns does not equal the sum of agricultural components in Table 17 due to interaction between components.

Different assumptions

Blake et al (1999) also estimate the impact of the Uruguay Round in absence of their assumptions modified. Table 19 reports that using the standard GTAP assumptions, they tend to overestimate the effects of the reform package.

Table 19: Decomposition of Regional Welfare Effects of Differing Assumptions								
	Standard GTAP Assumptions		Main model with no endogenous subsidy rates		Main model with no fixed factors		Main Model	
	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%
Australia and NZ	1.12	0.38	1.08	0.37	1.06	0.36	1.04	0.36
Canada	1.35	0.26	1.42	0.27	1.56	0.30	1.57	0.30
United States	20.96	0.40	20.76	0.39	21.66	0.41	21.46	0.41
Japan	30.51	0.96	27.17	0.86	29.65	0.94	26.65	0.84
European Union	36.55	0.62	29.06	0.50	30.10	0.51	24.86	0.42
Taiwan and South Korea	3.29	0.68	2.66	0.55	3.09	0.64	2.50	0.52
Hong Kong and Singapore	-3.22	-7.12	-3.21	-7.11	-3.21	-7.11	-3.21	-7.11
Economies in Transition	-1.78	-0.24	-1.92	-0.26	-1.42	-0.19	-1.68	-0.23
Brazil	1.68	1.57	1.57	0.47	1.67	0.50	1.57	0.47
Other middle income	-8.02	-8.47	-8.47	-0.34	-7.89	-0.32	-8.43	-0.34
Sub-Saharan Africa	-0.77	-0.56	-0.56	-0.38	-0.64	-0.43	-0.49	-0.33
China	6.38	6.18	6.18	1.38	6.28	1.40	6.13	1.37
Other Low Income	6.44	6.27	6.27	1.50	6.37	1.52	6.22	1.49
World	94.48	0.47	82.01	0.41	88.30	0.44	78.20	0.39

Source: Blake et al (1999)

Table 20 reports their results when they have different Armington elasticities of demand. In these cases, the higher the elasticity of demand, the greater the gains from the reform package are.

Table 20: Decomposition of Regional Welfare Effects of Differing Armington Elasticities						
	Half Standard Values		Standard Values		Double Standard Values	
	$US Billion 1992	%	$US Billion 1992	%	$US Billion 1992	%
Australia and NZ	0.71	0.24	1.04	0.36	1.81	0.62
Canada	0.69	0.13	1.57	0.30	3.90	0.72
United States	12.00	0.23	21.46	0.41	42.79	0.81
Japan	22.04	0.70	26.65	0.84	34.21	1.08
European Union	19.88	0.34	24.86	0.42	41.33	0.70
Taiwan and South Korea	0.58	0.12	2.50	0.52	6.56	1.36
Hong Kong and Singapore	-3.46	-7.67	-3.21	-7.11	-2.65	-5.86
Economies in Transition	-2.00	-0.27	-1.68	-0.23	-1.09	-0.15
Brazil	0.78	0.23	1.57	0.47	3.57	1.07
Other middle income	-11.61	-0.47	-8.43	-0.34	-3.65	-0.15
Sub-Saharan Africa	-0.67	-0.45	-0.49	-0.33	-0.33	-0.22
China	2.37	0.53	6.13	1.37	10.02	2.24
Other Low Income	1.97	0.47	6.22	1.49	11.00	2.63
World	43.26	0.21	78.20	0.39	147.48	0.73
Source: Blake et al (1999)						

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Sharma, Konandreas and Greenfield (1996) surveyed several previous studies. They noted that several of these studies modeled different aspects of uruguay round commitments and thus may have led to different results.

	Model Structure		Uruguay Round Commitment Modeled			
Model	**Sector/ commodity coverage**	**Country/region covered**	**Tariff reduction**	**Minimum access**	**Export subsidy**	**Domestic support**
ATPSM (UNCATD, 1995)	Partial equilibrium/12 group of food commodities	Separately for 145 countries	Yes, as per the Uruguay Schedules (1986-88 base)	Yes	Yes	Yes
WFM (FAO, 1995)	Partial equilibrium/12 group of food commodities	Separately for over 130 countries and 10 country aggregates	Yes, as per the Uruguay Round Schedule (1986-1988 base)	Yes	Yes	No, assumed to be non-binding
RUNS (Goldin and Mensbrugghe, 1995)	General equilibrium/15 agriculture, 5 non-agricultural commodities	22 regions (10 selected countries and 12 country aggregates)	Yes, but reductions from 1991-93 and 1982-92 bases	Ignored	Yes	Yes, input subsidies based on PSEs
FMN (Francois et al, 1995)	General equilibrium/19 sectors with 4 agricultural commodities (cereals, non-grain crops, livestock and processed food)	13 regions (4 selected countries and 9 country aggregates)	No, assumed prohibitive	Yes	Yes	No, assumed to be non-binding
MRT (Harrison et al., 1995)	General equilibrium/22 sectors with 8 agricultural commodities (4 cereals, non-cereal crops, beverages, dairy and meat)	24 regions (17 selected countries and 7 country aggregate)	Yes, reduced from recent base, as RUNS above	No information given	Yes, only value limits	Yes
Source: Sharma, Konandreas and Greenfield (1996); Table 1						

Summary Table

Study	Model	Estimate
Brandão and Martin (1993)	RUNS Model	Static Model - From $37 billion to $139 billion Productivity Improvements - $74 billion to $202 billion
OECD (1993)	Computable General Equilibrium Model	Static Model - $274 billion
Francois et al (1994)	GTAP v.2 SAMS	Constant Returns to Scale - $184 billion Increasing Returns to Scale - $510 billion
Hathaway and Ingco (1995)	Simple tariff change	Not applicable
Nguyen Perroni and Wigle (1995)	Not available	$69.9 billion
Brown Deardorf, Fox, and Stern (1995)	Michigan Model	Japanese gains of $16.6 billion to $40.4 billion
Goldin and van der Mensbrugghe (1995)	RUNS Model	Total - $25.4 billion to $235.1 billion (1992 dollars)

Study	Model	Estimate
Greenfield, De Nigris and Konandreas (1996)	FAO's World Food Model	Not applicable
Harrison, Rutherford and Tarr (1997)	Commodity General Equilibrium Model (GTAP v. 2)	Static Model - $96 billion, annually Increasing Returns to Scale - $171 billion, annually.
Josling (1997)	OECD PSE	Not applicable
Blake, Rayner, and Reed (1997)	GTAP	Static Model - $78 billion

References

- Blake, A. T., A. J. Rayner, and G. V. Reed. "A Computable General Equilibrium Analysis of Agricultural Liberalisation: The Uruguay Round and Common Agricultural Policy Reform." Journal of Agricultural Economics 50, no. 3 (1999): 400-24.
- Brandão, Antonio Salazar P., and Will J. Martin. "Implications of Agricultural Trade Liberalization for the Developing Countries." Agricultural Economics 8 (1993): 313-33.
- Brown, Drusilla, Alan Deardorff, Alan Fox, and Robert Stern. "Computational Analysis of Goods and Services Liberalization in the Uruguay Round." In The Uruguay Round and the Developing Countries. Washington, D.C., 1995.
- Francois, Joseph, Brad McDonald, and Håkan Nordström. "The Uruguay Round: A Global General Equilibrium Assessment." In Discussion Paper: Centre for Policy Research, 1994.
- Goldin, Ian, and Dominique van der Mensbrugghe. "The Uruguay Round: An Assessment of Economywide and Agricultural Reforms." In The Uruguay Round and the Developing Economies, edited by Will Martin and L. Alan Winters, 25-52: World Bank Group, 1995.
- Greenfield, Jim, Maurizio de Nigris, and Panos Konandreas. "The Uruguay Round Agreement on Agriculture: Food Security Implications for Developing Countries." Food Policy 21, no. 4-5 (1996): 365-75.
- Harrison, Glenn W., Thomas F. Rutherford, and David G. Tarr. "Quantifying the Uruguay Round." The Economic Journal Vol. 107, no. 444 (1997): 1405-30.
- Hathaway, Dale, and Merlinda Ingco. "Agricultural Liberalization and the Uruguay Round." In The Uruguay Round and Developing Economies, edited by Will Martin and L. Alan Winters: The World Bank, 1995.
- Ingco, Merlinda. "Agricultural Trade Liberalization in the Uruguay Round: One Step Forward, One Step Back?", 1995.
- Josling, Tim. "The Uruguay Round Agreement on Agriculture: A Forward-Looking Assessment." Stanford University, 1998.
- Nguyen, Trien, Carlo Perroni, and Randall Wigle. "A Uruguay Round Success?" World Economy 18, no. 1 (1995): 25-30.
- Nguyen, Trien T., Carlo Perroni, and Randall M. Wigle. "The Value of a Uruguay Round Success." World Economy 14, no. 4 (1991): 359-74.
- Nguyen, Trien T., Carlo Perroni, and Randall M. Wigle. "A Uruguay Round Success?" World Economy 18, no. 1 (1995): 25-30.
- OECD. "Assessing the Effects of the Uruguay Round." In Trade Policy Issues 2. Paris: Organisation for Economic Co-Operation and Development, 1993.
- OECD. "The Uruguay Round: A Preliminary Evaluation of the Impacts of the Agreement on Agriculture in the Oecd Countries." edited by OECD. Paris: Organisation for Economic Co-operation and Development, 1995.
- Piermartini, Roberta, and Robert Teh. "Demystifying Modelling Methods for Trade Policy." In WTO Discussion Paper. Geneva: World Trade Organization, 2005.
- Sharma, Ramesh, Panos Konandreas, and Jim Greenfield. "An Overview of Assessments of the Impact of the Uruguay Round on Agricultural Prices and Incomes." Food Policy 21, no. 415 (1996): 351-63.
- Valenzuela, Ernesto, Thomas W. Hertel, Roman Keeney, and Jeffrey J. Reimer. "Assessing Global Computable General Equilibrium Model Validity Using Agricultural Price Volatility." American Journal of Agricultural Economics 87, no. 2 (2007): 383-97.

- World Trade Organization. "The Uruguay Round." The World Trade Organization, http://www.wto.org/trade_resources/history/wto/urug_round.htm.