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ASSESSING THE RESULTS OF GENERAL EQUILIBRIUM STUDIES OF MULTILATERAL TRADE NEGOTIATIONS

by

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ABSTRACT

This paper is about what we can actually say about the Uruguay Round (UR) four years after implementation began, and how this compares to the calibration-based assessments that circulated at the end of the UR. The ultimate goal is to draw lessons on how to approach the assessment of the next round so that useful insights are extracted and misperceptions avoided. The paper first offers an overview of the CGE models employed or referenced by international organizations at the close of the UR. This is followed by a summary of the results of those models and a discussion of actual experience from UR implementation. Some conclusions from this exercise, and recommendations for assessment of the next Round (or if not technically another "round" of negotiations, then for the next sets of multilateral negotiations), are then discussed.

CONTENTS

"On two occasions I have been asked … 'Pray Mr. Babbage, if you put into the machine wrong figures, will the right answers come out?' I am not able rightly to apprehend the confusion of ideas that could provoke such a question."

Charles Babbage (19th century inventor of the first "computing machine")

I. INTRODUCTION

When economists model trade policy for the policy community (as opposed to modeling for the research community), they face two critical challenges. The first involves developing a reasonable, though stylized representation of complex policy, demand, and production relationships. The trade-off here is between keeping the model workable, and keeping it realistic enough to actually be useful to the policy community. Out of necessity, this involves compromises regarding the sector and region coverage of models, the modeling of production and demand, representation of complex commercial policies, and the design of policy experiments. The second challenge involves presentation and explanation of results. With computable general equilibrium (CGE) models (the class of models covered here), there is scope to gain useful insights about policy. Recent history has demonstrated that there is also great scope for misrepresentation and misunderstanding of the meaning of model-based results. While the body of CGE-based Uruguay Round studies did provide useful insights, in critical ways the economists involved failed to effectively communicate the meaning and limitations of these results.

The policy debate surrounding ratification and implementation of the Uruguay Round (UR) results was suffused with estimates of the effects of the round on individual countries and sectors. Prominent among the estimates highlighted were early OECD estimates that the agriculture component of the UR was worth US$ 200 billion annually and early WTO estimates that the entire UR package was worth over US$ 500 billion. If one reads the studies on which the US$ 200 billion and US$ 500 billion estimates are based (Goldin, Knudsen, and van der Mensbrugghe 1993; and Francois, McDonald, and Nordström 1993), the message is more complex. However, communications of the results of these studies did not effectively highlight important caveats and limitations linked to the estimates. Critical components of the UR were missing from all studies, while the estimates themselves were generally presented in broad ranges. In addition, these were preliminary estimates, made before the UR was concluded. Subsequent estimates, based on the actual UR agreements (which involved substantially less liberalization in certain areas, like agriculture, than had been anticipated), were revised downward substantially. In the end, the US$ 200 billion and US$ 500 billion estimates remained fixed in the public mind as the relevant measure of expected gains.

For these reasons (involving a mix of poor communication by economists and the institutional spin placed on the results), the message from studies of the UR

agreements that actually reached the public was that the UR was worth a certain amount of global income. Put euphemistically, a big cheque was in the mail for each WTO Member, who had only to cash it after UR implementation. This is not the correct message to carry from these studies, but it is the one that was received. This also means that there was some confusion about the timing and size of any benefits from UR implementation.

Like the last round, quantitative modeling, and the related exercise of measuring import regimes, will be an important source of information during future WTO negotiations. With all their shortcomings, these exercises serve an important function -- social cost-benefit analysis. The techniques are crude and stylized (while mystifying and complex at the same time), yet they do provide an insight into the reasons and motivation behind multilateral liberalization. Their limitations should always be acknowledged, as economists have other tools in their tool kit that can also be used, ranging from abstract theory to empirical evidence. There are important WTO-related issues that simply cannot be handled by large computational models such as the ones discussed here. Even so, at a bare minimum such modeling exercises do provide a framework within which policy makers can better understand the implications of their decisions.

This paper is about what we can actually say about the UR, four years after implementation began, and how this compares to the assessments that circulated at the end of the UR. The ultimate goal is to draw lessons on how to approach the assessment of the next round so that useful insights are extracted and misperceptions avoided. The paper is structured as follows. The next section, Section 2, is devoted to an overview of the CGE models employed or referenced by international organizations at the close of the UR. This is followed in Section 3 by a summary of the results of those models. A discussion of actual experience from UR implementation is provided in Section 4. Some conclusions from this exercise, and recommendations for assessment of the next Round (or if not technically another "round" of negotiations, then for the next sets of multilateral negotiations), are discussed in Section 5.

II. OVERVIEW OF THE MODELS

The most often cited quantitative studies of the overall effects of the UR were based on computable general equilibrium (CGE) models. In CGE models, the "whole" economy, for the relevant aggregation of economic agents, is modeled simultaneously. This means that the entire economy is classified into production and consumption sectors. These sectors are then modeled collectively. Production sectors are explicitly linked together in value-added chains from primary goods, through higher stages of processing, to the final assembly of consumption goods for households and governments. These links span borders as well as industries. The link between sectors is both direct, such as the input of steel into the production of transport equipment, and also indirect, as with the link between chemicals and agriculture through the production of fertilizers and pesticides. Sectors are also linked through their competition for resources in capital and labour markets.[1] Regional households (the final level of demand) are typically modeled as a single or composite household.

CGE studies of the UR were produced as the round began, during the round, and after the completion of the UR. We will focus here on a set of ex-post CGE studies. The studies we will focus on, often involving updates of earlier ones, are based on the actual UR agreements, whereas the earlier literature was based on speculation about the shape of the final agreement. The studies we will discuss here are listed in Table 1. The studies in Table1 generally cover different aspects of the Uruguay Round Agreement. Most were published collectively by the World Bank in a volume edited by Martin and Winters (1996). Most of the studies involved multilateral institutions (the GATT, World Bank, and OECD), though two were produced by pure academic research teams.[2]

Among the studies listed in Table 1, different studies focused on different aspects of the UR agreements. Goldin and van der Mensbrugghe (1996), for example, focused primarily on the Agreement on Agriculture. In contrast, Nguyen, Perroni, and Wigle (1995) covered almost all components of the market access package. Brown et al. (1996) also focused on services liberalization, while Goldin and van der Mensbrugghe (1996) emphasized agricultural liberalization and industrial tariff liberalization. Sectoral focus is discussed in the next section.

A. Sectoring schemes

The sectoral and regional structures of the studies in Table 1 ranged from 9 to 29 sectors and from 8 to 24 regions. The sector and region focus was, in practice, mainly determined by the study objectives and data availability. For instance, the Rural-Urban-North-South (RUNS) model of the OECD and the World Bank was not designed specifically to study the Uruguay Round, but rather to study the implication of agricultural reforms for developing

[1] For an in-depth discussion of general equilibrium modeling, see Francois and Reinert (1997).

[2] The estimates produced before the conclusion of the UR were consistently higher than those produced after the results had been examined. The reasons are discussed in Section 5.

Table 1
CGE studies of the Uruguay Round

Authors	Institutional affiliation of project
Brown, Deardorff, Fox and Stern (1996) (BFS)	academic
Francois, McDonald and Nordström (1996a) (FMN)	GATT
Goldin and van der Mennsbrugghe (1996) (GM)	OECD/World Bank
Harrison, Rutherford and Tarr (1996) (HT)	World Bank
Hertel, Martin, Yanagishima and Dimaranan (1996) (HMYD)[†]	World Bank
Nguyen, Perroni and Wigle (1995) (NPW)	academic

Notes: [†] The Hertel et al paper reflected a joint research project involving the World Bank and the Global Trade Analysis Project, based at Purdue University.

countries. This is reflected in the sector aggregation, where 15 of the 20 sectors represent various agricultural products, while three other sectors (fertilizers, energy, and equipment) are important agricultural inputs. This structure proved very useful for studying the agricultural parts of the Round. However, it proved much less useful for assessing industrial sector liberalization, since most of the industrial action takes place within one sector; "other manufactures." This means, for instance, that the RUNS model was not built to assess economic effects of the phase out of MFA quotas or other industrial non-tariff barriers.

In addition, RUNS-based studies understated the effects of industrial tariff cuts due to the high level of industrial aggregation.[3]

Regional structure also matters. For example, the GM, HMYD, and HRT studies explicitly highlighted sub-Saharan Africa, and so flagged negative effects for net-food importing countries. These effects were masked by aggregations that included the region in larger composite regions, like FMN and BFS.

B. Theoretical issues

Two critical differences between the various the studies highlighted in Table 2 relate to theoretical structure. The greatest underlying differences relate to the treatment of market structure, and the treatment of savings and investment linkages. This latter issue is referred to in the literature as macroeconomic closure. Macroeconomic closure is important as it provides a link between policy and investment.

In terms of market structure, half of the studies employed versions of monopolistic competition. With monopolistic competition, products differ between firms as well as between countries. As a result, Hondas are treated as being different from

[3] In RUNS-based estimates reported at the close of the Uruguay Round, about 85 per cent of the global welfare gains were derived from agricultural reforms, while other models with emphasis on industrial sectors found that agricultural reforms contributed less than 50 per cent of the gains from the Round and sometime less than 10 per cent. See Section 3.

Table 2
Sectoring schemes and model feature

Authors	Aggregation	Dynamics	Other features
BFS	29 sectors, 8 regions	static	monopolistic competition
FMN **	19 sectors, 13 regions	savings-driven investment	monopolistic competition
GM */**	20 sectors, 22 regions	static	perfect competition
HRT **/***	22 sectors, 24 regions	savings-driven investment	monopolistic competition
HMYD **	10 sectors, 15 regions	baseline projections	perfect competition
NPW	9 sectors, 10 regions	static	perfect competition

Notes:
* The GM study employs the RUNS model, an agriculture model developed at the OECD development centre. The aggregation scheme is thus focused on agriculture and agricultural inputs.
** These studies employed the Global Trade Analysis Project (GTAP) dataset, or datasets based partially on GTAP data. The Michigan Model (BFS) now incorporates GTAP data elements as well.
*** The HRT model employs a hybrid model, with regional monopolistic competition, with trade that is Armington-based

Toyotas, even when both are produced in Japan. Both may be specified as competing directly with Chryslers and Fiats produced in other countries. This approach raises questions about the relevant market structure. If products are differentiated at the level of the firm, individual firms will have some degree of market power, allowing them to control their own prices. This implies imperfect competition, which requires estimates of parameters measuring market power and scale economies. The available estimates are crude at best, causing a great deal of uncertainty about their importance. (See Francois and Roland-Holst 1997 for a discussion of this problem).

A standard alternative to monopolistic competition is perfect competition and "Armington" preferences. Under this approach, two-way trade is explained by assuming products within the same product-category, but originating in different nations, are imperfect substitutes (the so-called Armington assumption). This is the structure of the basic GTAP (Hertel 1996) model, for example. German automobiles, hence, are treated as different from American automobiles. As a result, Germany and the United States will trade with each other for automobiles. The Armington assumption is consistent with perfect competition, making estimates of scale economies unnecessary. However, there is instead a need for econometric estimates of trade substitution elasticities as an input to the modeling process. Technically, these elasticities measure the similarity of domestic and imported goods. Like market power measures, there is a good deal of uncertainty in the economic literature about "correct" parameter values.

There are important differences between the two approaches. Models with Armington specifications usually yield smaller trade and output effects than models with either homogeneous goods (like the RUNS model) or models with firm-level product differentiation (FMN).[4] The im-

[4] In recent work within the GTAP consortium, matching this class of models to actual changes in historic trade flows suggests a higher range of trade substitution elasticities. Models (like the GTAP model) with these higher elasticities produce trade and income effects comparable to those in models with monopolistic competition.

plied adjustment costs of trade liberalization are hence much greater in both homogenous goods models and firm-level product differentiation models than in Armington models.

While models with imperfect competition make demands for additional information, in the form of market structure measures, that are available only as crude estimates, they also provide a better approximation of reality. International trade economists now stress the importance of market structure for trade and the gains from trade. These are important elements of the real world, and can imply qualitatively different results from trade liberalization than in the older models built on the perfect competition assumption. Adding this dose of realism also highlights the uncertainties and difficulties surrounding key data and parameters (an issue returned to below).

The second set of differences highlighted in Table 2 relates to long-run linkages between policy and capital stocks. Several of the models allow for linkages between trade liberalization, savings, and investment. Changes in investment, in turn, cause further changes in income. These models, therefore, tend to generate larger overall effects (both positive and negative) than the others, while their results are inherently longer-run than in models where capital stocks are held fixed. In terms of time horizons, even fixed capital stock models are medium-term models (five to seven year time horizons), as adjustments, like employment shifts, take time. The models in which capital stocks adjust in response to changes in investment inherently have longer time horizons (perhaps 15 years or longer after full implementation of a policy change) though these time horizons are not always made explicit. Because the time horizons of these studies are soft, it is difficult to flag exactly what changes should be expected in the short-run. In summary, an important difference is that in some models capital stocks are held fixed, while in others they are linked to changes in investment.[5]

[5] In one of the models covered, HMYD, trade elasticities are themselves adjusted to reflect scope for product substitution being higher in the long-run.

III. OVERVIEW OF THE ESTIMATED EFFECTS

Exactly what did the studies summarized in Tables 1 and 2 say about the Uruguay Round? Some of the key results are summarized in Tables 3, 4, 5, and 6. From Table 3, it can be seen that different studies covered different aspects of the UR. Only two studies (BFS and NPW) made any attempt at all to quantify the impact of services commitments. The RUNS-based assessment really only tells us what the UR agriculture commitments may imply, while the others give some sense of the relative importance of industrial tariff liberalization.

Table 3
Scenarios modelled

Authors	Scenario
BFS	industry and services liberalization
FMN	agriculture and industrial goods liberalization
GM	agriculture liberalization
HRT	agriculture and industrial goods liberalization
HMYD	agriculture and industrial goods liberalization
NPW	goods and services liberalization

A. Income effects

Table 4 summarizes regional income effects. The list is not all-inclusive, as several studies presented alternative estimates. (See Francois, McDonald, and Nordström 1996 for a discussion). The results in the table are for the most "comprehensive" scenarios, meaning those that include the most aspects of full UR implementation. For studies that present both short- and long-run effects, the long-run effects are presented. One striking feature of the results is the wide range of regional effects. For example, estimates of gains for the United States range from 0.1 per cent of GDP to 0.9 per cent, while for China there are actual sign reversals, with effects ranging from -0.2 to +1.7 per cent of GDP. In part, the range of estimates can be explained by the underlying experiments. For example, the GM study is focused on agriculture. Hence, for agriculture, China experiences a welfare loss. This is outweighed, in more comprehensive studies, by other aspects of the Uruguay Round. Globally, estimates range from 0.4 per cent to 0.9 per cent of global GDP.

One of the most politically sensitive results is that for sub-Saharan Africa. Based primarily on expected increases in food prices, sub-Saharan Africa is projected to lose because of a deterioration in its terms of trade. This, in fact, was the motivation behind the attention paid to net food importer concerns at the Marrakech Ministerial Meeting. We will return to this issue in the next section.

Can generalizations be made? Clearly, at a regional level, the benefits of the Uruguay Round will be uneven. A

Table 4
Real income effects
(per cent of annual GDP)

Authors	Income effects
BFS	US 0.9, Canada 2.0, Europe 0.9, Japan 1.4, Mexico 2.8, Australia and New Zealand 3.6, Asian NICs 3.6, ROW 1.0
FMN	Canada 0.7, US 0.6, EFTA 0.4, EU 0.5, Japan 0.4, Australia and New Zealand 0.9, China 1.7, Latin America 1.9, East Asia 1.6, South Asia 2.0, Africa 1.1, Transition Economies 0.4 GLOBAL: 0.9
GM	Low income Asia 0.2, China -0.2, India 0.7, Upper Income Asia 1.3, Indonesia 0.1, Other Africa -0.3, Nigeria -0.1, South Africa -0.4, Maghreb -0.3, Mediterranean -0.2, Gulf Region -0.2, Other Latin America 0.0, Brazil 0.3, Mexico -0.5, US 0.1, Canada 0.0, Australia and New Zealand 0.1, Japan 0.4, EU 0.6, EFTA 1.2, FSU 0.0, Transition Economies 0.1
HRT	USA 0.4, EU 0.7, EFTA 0.7, Japan 0.7, China 0.5, Latin America 1.7, Middle East and North Africa 0.2, sub-Saharan Africa -0.4, South Asia 2.0, Transition Economies 0.1, East Asia 3.1 GLOBAL: 0.4
HMYD	North America 0.4, EU 0.7, Japan 1.0, NICs 3.8, China 1.5, Indonesia 2.9, Malaysia 21.4, Philippines 6.6, Thailand 4.5, Latin America -0.08, sub-Saharan Africa -0.5, South Asia 1.9, ROW 0.0 GLOBAL: 0.9
NPW	US 0.2, Canada 0.3, EC 0.5, Japan 1.3, Other Western Europe 0.8, Australia and New Zealand 0.3, Agricultural Exporters 0.2, Agricultural Importers 0.6, Centrally Planned 0.3, ROW 0.1 GLOBAL: 0.4

crude pattern in the estimates appears to be that the largest gains may be present in East and South Asia, while the smallest gains may be realized in the OECD countries, Africa, and Latin America. Results for sub-Saharan Africa hinge on the extent and form of agricultural trade liberalization.

Table 5 presents a breakdown of estimated effects by elements of the UR agreements. The range of issues modeled included services liberalization, the MFA phase-out, other industrial tariffs, and services. Different studies covered different elements of this set. The results in Table 5 are varied. There is a consistent message, though, which is that industrial goods trade liberalization (textiles, clothing, and other goods) was the dominant source of anticipated gains from the UR. Non-MFA liberalization alone accounts for between 30 per cent and 80 per cent of estimated gains, while broadly defined (including textiles and clothing) it accounts for roughly 40 per cent to 90 per cent of estimated gains. Agriculture, which was the dominant element in early estimates of the impact of the UR, has a smaller role in the final post-UR estimates.

B. Trade volume effects

Next, Table 6 summarizes trade volume effects. (Not all authors reported trade volume effects). The estimated trade effects range rather widely, from 3 per cent to 59 per cent increases. This is due largely to differences in trade elasticities, and also to the base year chosen. In particular, HMYD work with a projected database, in which the underlying trade flows are substantially different than trade flows in the other studies in the table, which are typically benchmarked to *circa* 1990 data.

Table 5
Breakdown of income effects
(per cent share of global total)

Authors	Agriculture/primary	Textiles/clothing	Other tariffs	Services
FMN	10	50	39	
GM	85		15	
HRT	38	12	49	
HMYD	5	14	81	
NPW	53	14	24	8

Table 6
Estimated global trade volume effects

BFS	approx 3% (Monopolistic competition)
FMN	approx 6% (Armington model)
	approx 14% (Monopolistic competition)
HMYD	approx 59% (Armington with "high" elasticities)

IV. WHAT HAS ACTUALLY HAPPENED SO FAR?

A. Tariff reductions

We now turn to an examination of what has actually happened since the end of the Uruguay Round. We start with tariff reductions. Recall from the previous section that industrial tariff reduction is an important feature of the UR highlighted in all the broad studies under discussion. (Of course, there are important elements of the UR that were completely left out of these studies). To gain some sense of what has happened to tariff rates since the UR, Tables 7 and 8 report estimates (derived from the GATT/WTO integrated database, and related World Bank tabulations) of applied rates during the UR, at the close of the UR, and as of 1998. The tables also report estimated post-UR rates (following full implementation), and the relevant level of tariff bindings.

As of 1998, most of the industrial tariff commitments appear to have been implemented. Full implementation (relative to expected outcomes) has been achieved in the case of the United States, Japan, Australia, and New Zealand. Canada and the European Union still have some tariff commitments left to implement, though the bulk of their tariff commitments appear to be in place.

The same statement can also be said about many of the developing countries in the tables. For example, India, the Philippines, Sri Lanka, Turkey, Tunisia, and Venezuela now have applied tariffs rates at or below the average rates that were projected after full UR implementation. In the case of India, recent reforms mean a dramatic fall in protection vis-à-vis what was expected. These further reforms are not reflected in the UR studies discussed above.

At the same time, some countries (Argentina, Peru, Zimbabwe) now have applied rates above those in place at the end of the Uruguay Round. In Zimbabwe's case, they are well above projected rates. This reflects the fact that, for most of the developing countries in the tables, tariff bindings are well above applied rates. In such cases, it proved very difficult to try and project what applied tariff rates will be after the UR, as there is such great scope for significant increases in tariff rates. This situation is different from that in the OECD countries, where tariffs are generally at the bound rate (an exception being Australia). Overall, modeled tariff reductions for OECD countries have been implemented. Because LDC tariffs are effectively unbound, the pattern of LDC liberalizations that was modeled has not matched experience. India has launched reforms not reflected in the estimates, while other countries have raised tariff rates. We return to the issue of developing country bindings in Section 5.

Table 7
MFN tariffs on all merchandise
Uruguay Round base, current, and post-Uruguay Round rates

	Basis for end of UR applied rate	Weight average applied rate at end of UR	Weight average applied rate in 1998	Estimated end of UR applied rate	End of UR bound rate	Extent of implementation (out of 100)
Argentina	1993	11.3	12.9	10.3	31.0	77.0
Australia	1993	7.7	3.7	8.9	11.1	100.0
Brazil	1992	23.1	16.6	11.7	29.0	78.8
Canada	1993	6.8	3.8	2.4	4.2	79.4
Chile	1992	10.9	10.9	11.0	25.0	100.0
Colombia	1994	12.0	10.6	10.9	39.7	100.0
El Salvador	1995	8.5	4.3	10.7	34.2	100.0
European Union	1994	6.6	3.5	2.8	3.2	89.4
Hungary	1991	12.3	10.2	6.8	6.6	72.4
India	1990	83.0	27.7	30.9	52.2	100.0
Indonesia	1993	21.7	13.8	10.7	38.4	85.7
Japan	1988	3.7	2.0	2.8	3.7	100.0
Korea, Republic of	1992	10.7	9.5	7.7	16.4	83.2
Malaysia	1993	11.1	9.4	6.8	9.3	76.6
Mexico	1991	13.1	12.5	10.4	34.1	84.0
New Zealand	1993	7.7	3.5	6.8	10.8	100.0
Norway	1988	5.0	2.2	1.0	4.2	76.0
Peru	1993	17.1	12.6	14.6	33.7	100.0
Philippines	1993	20.2	9.3	19.0	21.9	100.0
Poland	1991	10.4	14.9	6.9	12.3	23.1
Sri Lanka	1993	23.0	20.7	28.6	38.9	100.0
Sweden	1988	3.8	3.5	2.8	3.2	81.6
Tunisia	1992	26.2	23.4	24.8	48.7	100.0
Turkey	(IDB)	32.8	7.4	26.3	33.3	100.0
United States	1989	4.4	2.8	2.8	3.3	100.0
Uruguay	1992	5.5	10.0	14.6	29.4	100.0
Venezuela	1992	16.1	10.9	12.4	31.6	100.0
Zimbabwe	(IDB)	10.3	20.0	4.5	35.3	-50.5

Source: Finger, Ingco and Reincke; and World Bank *World Development Indicators*.

Table 8
MFN tariffs on manufactured goods
Uruguay Round base, current, and post-Uruguay Round rates

	Basis for end of UR applied rate	Weight average applied rate at end of UR	Weight average applied rate in 1998	Estimated end of UR applied rate	End of UR bound rate	Extent of implementation (out of 100)
Argentina	1993	13.7	14.1	10.6	30.9	74.5
Australia	1993	9.7	4.4	9.7	12.1	100.0
Brazil	1992	27.4	18.3	11.8	27.7	76.3
Canada	1993	8.0	3.2	2.6	4.3	92.5
Chile	1992	10.8	10.9	11.0	25.0	100.0
Colombia	1994	12.4	10.5	10.4	35.2	99.2
El Salvador	1995	8.4	3.8	10.9	31.7	100.0
European Union	1994	7.0	3.5	2.9	3.2	91.4
Hungary	1991	13.0	9.4	6.7	6.1	79.2
India	1990	93.6	29.5	29.0	34.2	99.5
Indonesia	1993	24.5	14.9	11.5	36.9	86.1
Japan	1988	3.3	1.5	1.4	1.5	97.0
Korea, Republic of	1992	10.8	7.8	7.6	6.9	98.1
Malaysia	1993	12.6	9.4	6.4	8.9	76.2
Mexico	1991	13.8	12.0	11.4	33.3	95.7
New Zealand	1993	9.4	4.0	7.7	11.9	100.0
Norway	1988	6.4	2.4	0.8	2.6	75.0
Peru	1993	17.3	12.5	14.6	29.4	100.0
Philippines	1993	21.0	9.1	20.4	21.3	100.0
Poland	1991	11.4	14.2	6.9	8.5	36.0
Sri Lanka	1993	22.3	19.8	27.2	17.9	100.0
Sweden	1988	4.8	3.5	2.9	3.2	87.5
Tunisia	1992	27.9	23.5	26.4	38.4	100.0
Turkey	(IDB)	30.5	5.7	24.2	16.3	100.0
United States	1989	4.8	2.7	3.1	3.5	100.0
Uruguay	1992	5.9	10.7	9.1	27.9	72.9
Venezuela	1992	16.9	10.9	12.0	31.3	100.0
Zimbabwe	(IDB)	10.5	20.5	4.5	23.6	-52.4

Source: Finger, Ingco, and Reincke; and World Bank *World Development Indicators.*

To summarize, based on recent tariff data, WTO Members are well on their way to full implementation of tariff commitments. This means that the required conditions for benefits to be realized are now in place. However, to the extent that developing countries have been increasing tariffs, or alternatively launching significant reforms since the end of the UR, the post-UR scenario modeled does not fully reflect actual events.

A logical question, at this stage, is to ask whether we can measure the gains actually realized because of these tariff reductions? There is both a practical and a conceptual problem with this question. On a practical level, the reality is that just a few years into the process it is too early to identify results. On a conceptual level, the income gains reported in CGE studies are actually measures of social well-being (community welfare), and so can not be observed directly. The income values are notional or dollar metrics. In other words they are not actual increases in income, but increases in social welfare, realized ultimately through improved consumption possibilities. (See Martin 1997 on this point). We can, however, look at other quantitative measures, such as trade flows and production shifts, to gauge how well the models perform.

B. Agriculture

An important outcome of the URAA has been tariff-rate quotas (TRQs). To ensure that the "liberal" manner in which tariff equivalents were calculated did not lead to less trade instead of more, the URAA embedded the tariff components of market access commitments into a parallel set of commitments on current access and minimum access. Current access commitments, made in quantity terms, were portrayed to those outside agriculture negotiating circles (i.e. the public) as ensuring that there would not be an erosion in effective market access as a result of the URAA. At the same time, some liberalization was to be guaranteed through minimum access commitments, set at 5 per cent of 1986-1988 consumption levels. The combination of the two leads directly to quantitative commitments (and quantitative restrictions) on market access.

In theory, while current access commitments could be allocated on a bilateral basis, minimum access commitments should have been allocated on an MFN (i.e. non-discriminatory of most-favored nation) basis. In practice, there is typically no distinction between the two regimes in national tariff schedules. Up to the total access (current and minimum) quota levels, we tend to find a within-quota tariff in national tariff schedules, with imports above this access level, or outside the quota, typically assessed at a higher tariff. In cases where the out-of-quota rate is prohibitive but the quota is largely filled, we in effect have a strict quota system for food imports. The sharing of the relevant quota rents is determined by how the quotas are allocated, and by the in-quota tariff rates. Where the out-of-quota rates are not prohibitive, the two-tiered tariff structure still creates quota rents and all of the political economy considerations associated with rent seeking (and well known from our experience with the Multi-Fibre Arrangement). In yet other cases, the in-quota tariff rate is so high that exports are below the quota levels (i.e. market access has eroded since the end of the UR), and the in-quota tariff rate is the binding constraint. In contrast to the regime for textiles and clothing, wherein trade restrictions were largely a North-South issue, in agriculture TRQs have been employed by developed and developing countries. Hence, the implied quota rent transfers are potentially a drain on incomes of both developed and developing food importers.

One of the reasons quotas are unfilled is the way quotas are allocated. While access commitments were supposed to be MFN based, silent deals were sometimes struck wherein quota allocations were awarded to key suppliers during bilateral negotiations. (Tangermann 1998). As a result, in practice these quotas often are

purely bilateral. In addition, the bilateral nature of these quotas has been reinforced by liberal interpretation of the rules. For example, in the case of the EU, there has been an explicit assertion that expanded access for Central and East Europeans under the Associate Agreements will be counted against overall access commitments. The net result is that we now have a system where protection of politically sensitive agricultural products is often bilateral, and involves quota rents.

C. Actual changes in trade volumes

One of the projected impacts of the UR was an increase in trade volumes. In fact, all of the other estimated effects of the UR hinge on changes in trade volumes and trade prices, due to the changes in border protection like that shown in Tables 7 and 8. It is important to remember that income effects are not the same as trade effects. This should be apparent from Tables 4 and 6. A US$ 1 increase in exports is not equivalent to a US$ 1 increase in income. To produce additional exports, resources must be used which could otherwise have been used to produce goods and services for domestic residents. It is the net gain that is relevant. For example, if the resources that produced US$ 1 of exports would have produced US$ 0.9 in domestic goods and services, the true net income gain is the US$ .10 difference. Unfortunately, discussions of the effects of trade liberalization do not always distinguish sharply between these effects

Table 9 reports actual changes in trade volumes over the period 1990-1998. In the period immediately before and after completion of the UR (1990-1995), trade volumes grew at 6 per cent per annum. Trade growth fell below the trend line in 1996. From the tariff data used to produce Tables 7 and 8, we know that this was followed by implementation of UR tariff cuts. Coincident with these tariff reductions, trade volumes did grow by 10.5 per cent in 1997, well above the average for the prior period and almost twice the 1996 rate. (The WTO characterized 1997 as a year of "unusually strong trade growth." WTO 1999.) However, this was then followed by the East Asian financial crisis, which depressed trade volumes and commodity prices. Hence, while 1997 saw a surge in exports (particularly from Asia and Latin America), the subsequent economic crisis dampened export growth in 1998.

The apparent impact of the Asian crisis on trade volumes illustrates the problem with isolating the impact of multilateral tariff reductions from other economic events. Clearly, there is a certain lack of precision in the data. While one might argue that export growth in 1997 was due to tariff cuts in Tables 7 and 8, and while the slowdown does coincide with the East Asian crisis, there are of course other factors that need to be considered. The UR itself does appear to be moving forward in terms of market access changes and export growth. However, more time is needed (particularly given the adjustment times discussed above) before these results can be compared with confidence to those projected in the CGE modeling exercises.

Table 9
Growth in export volumes 1990-1998

	1990-1995	1996	1997	1998
World	6.0	5.5	10.5	3.5
North America	7.0	6.0	11.0	3.0
Latin America	8.0	11.0	11.0	6.5
Western Europe	5.5	5.5	9.5	4.5
European Union	5.5	5.5	9.5	5.0
Transition economies	5.0	6.5	12.5	10.0
Asia	7.5	5.0	13.0	1.0
Japan	1.5	1.0	12.0	-1.5
East Asia	11.5	7.5	11.5	2.0

Source: World Trade Organization

Another important issue, and an important source of estimated gains, is the phase-out of the MFA through the Agreement on Textiles and Clothing (ATC). As noted from Tables 2 and 3, OECD commitments for tariff reductions have largely been implemented. However, the ATC was structured at the outset to deliberately backload quota liberalization. Therefore, while the tariff-related effects in Tables 4 and 5 should be realized in the next few years, a substantial share of the ATC-related effects will remain on hold until full implementation of commitments on textile and clothing quotas.

D. Commodity prices

Critical in the link between relative export volumes and estimated welfare/income effects is the change in relative prices of exports and imports (the terms of trade). For countries that earn a high share of export revenue through raw materials and agricultural products, this translates into changes in commodity prices. Studies that flagged adverse effects for net-food importing countries in sub-Saharan Africa (GM, HRT, HMYD) emphasized a possible rise in the price of foodstuffs relative to (primarily commodity) export prices for those same countries.

Tables 10 and 11 present actual changes in commodity prices for the period 1995-1999. The 1999 commodity price indexes are based on prices for January-July 1999. Table 10 presents indexes of commodity prices in United States dollar terms, while Table 11 presents indexes of prices relative to the basket of goods imported from the industrial countries by developing countries. The price of this basket of imports is represented by the price index MUV-G5.

Table 10
Commodity prices
(1994=100, measured in United States Dollars)

	1994	1995	1996	1997	1998	1999
MUV-G5	100.0	108.2	103.6	98.2	94.5	97.4
Agriculture	100.0	98.2	98.2	106.3	92.9	81.5
agriculture, beverages	100.0	94.8	82.8	117.9	100.7	79.5
cocoa	100.0	94.9	100.8	118.1	127.2	94.4
coffee	100.0	93.1	78.7	128.3	95.5	74.6
tea	100.0	92.2	107.6	140.6	145.3	134.7
agriculture, food	100.0	101.0	111.3	110.3	104.1	89.6
maize	100.0	106.1	149.1	110.9	100.5	91.8
rice	100.0	110.9	122.4	115.5	120.5	103.4
wheat	100.0	109.3	134.0	108.5	89.3	84.1
sugar	100.0	101.7	95.5	95.9	78.1	54.4
grain sorghum	100.0	105.9	139.6	107.4	100.0	89.3
soybeans	100.0	95.1	117.0	119.5	101.0	83.9
coconut oil	100.0	102.0	101.5	110.1	114.7	133.7
palm oil	100.0	109.9	97.1	105.2	134.6	97.0
agriculture, raw materials	100.0	99.1	98.2	92.1	73.7	74.0
cotton	100.0	111.6	97.3	100.9	86.8	75.5
logs	100.0	95.0	83.2	87.8	91.9	85.1
Metals	100.0	110.4	101.3	107.8	94.8	88.0
Petroleum	100.0	100.0	123.8	122.2	87.3	98.0

Source: Pink Sheet -- Commodity Price Data World Bank, and *World Development Indicators.*

While some patterns may be evident, the data is not always clear (i.e. commodity prices have been quite volatile), so that isolating general changes due to the UR at this stage is probably premature. In addition, the East Asian crisis has hit commodity prices just as it hit trade volumes, causing a depression in raw materials prices. Changes have not been uniform across commodity groups. Tea exporter prices have risen in relative terms (Table 11), as have rice and coconut oil prices. Other commodities, like sugar and log prices, have fallen considerably in relative terms.

Figures 1 and 2 try to summarize the data in the tables. Figure 1 presents prices for broad commodity groups, relative to the price of imports from the industrial countries. Beverage and raw materials prices show the greatest level of price suppression.

What has been the recent experience of net-food importers? Figure 2 charts the trend in commodity prices relative to the price of basic foodstuffs. This is the metric that gets closest to the net-food importer concerns raised at the end of the UR. The figure shows that raw materials food exporters, for a range of reasons (including a mix of rising relative agriculture prices and a fall in demand due to recession in East Asian economies) have experienced a rather dramatic fall in prices of exports vis-à-vis food prices.

Table 11
Commodity prices
(1994=100, measured relative to the price of imports from industrial countries)

	1994	1995	1996	1997	1998	1999
MUV-G5	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	100.0	90.8	94.8	108.2	98.2	83.7
agriculture, beverages	100.0	87.6	79.9	120.1	106.6	81.7
cocoa	100.0	87.7	97.3	120.3	134.6	96.9
coffee	100.0	86.1	76.0	130.7	101.0	76.6
tea	100.0	85.3	103.8	143.2	153.7	138.3
agriculture, food	100.0	93.4	107.4	112.4	110.1	92.1
maize	100.0	98.1	143.8	112.9	106.3	94.3
rice	100.0	102.5	118.2	117.7	127.4	106.2
wheat	100.0	101.0	129.3	110.5	94.4	86.3
sugar	100.0	94.0	92.1	97.6	82.6	55.9
grain sorghum	100.0	97.9	134.7	109.4	105.8	91.7
soybeans	100.0	87.9	112.9	121.7	106.8	86.1
coconut oil	100.0	94.2	97.9	112.2	121.4	137.3
palm oil	100.0	101.6	93.7	107.2	142.3	99.7
agriculture, raw materials	100.0	91.6	94.8	93.8	77.9	76.0
cotton	100.0	103.1	93.8	102.8	91.8	77.5
logs	100.0	87.8	80.3	89.4	97.2	87.4
Metals	100.0	102.0	97.7	109.8	100.3	90.4
Petroleum	100.0	92.4	119.5	124.5	92.3	100.6

Source: Pink Sheet -- Commodity Price Data World Bank, and *World Development Indicators.*

Figure 1

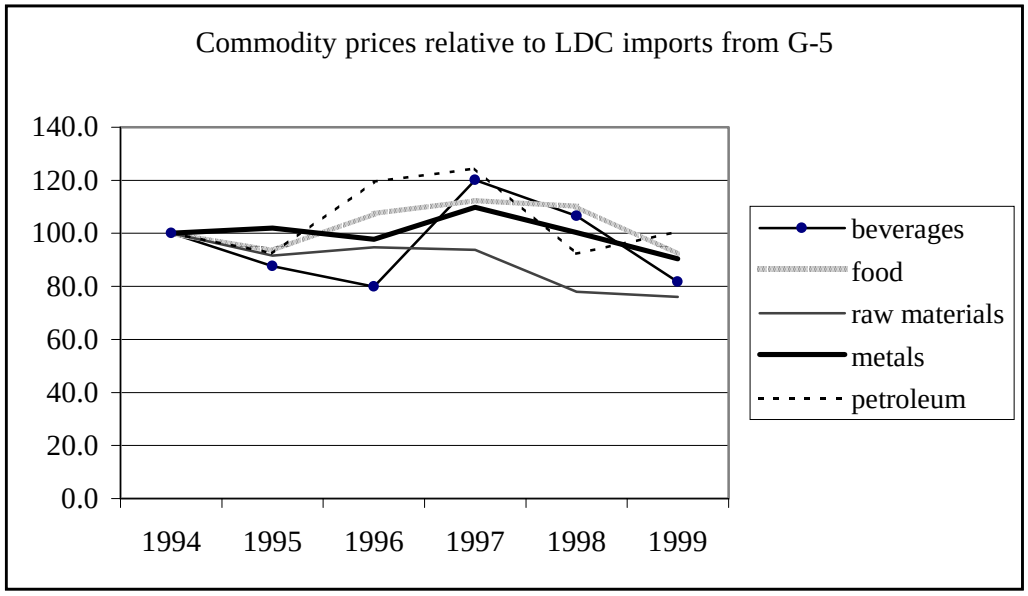
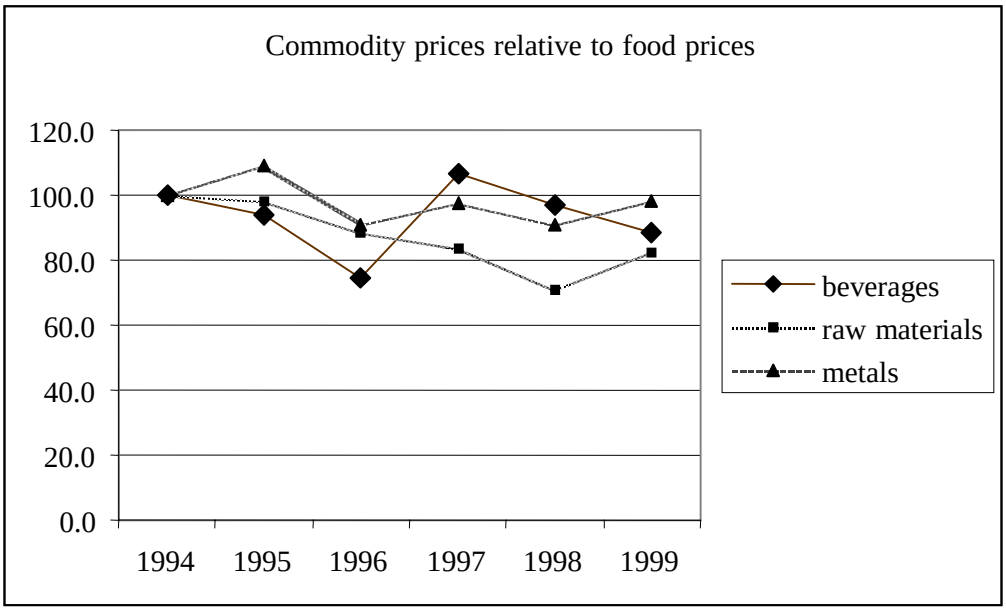


Figure 2


Commodity prices relative to food prices
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1994
1995
1996
1997
1998
1999
beverages
raw materials
metals

V. WHAT LESSONS CAN WE DRAW FOR THE NEXT ROUND?

A number of lessons were drawn from the experience with CGE studies of the UR. On the positive side, these studies did flag four important areas related to market access commitments. These are agriculture, industrial tariffs, the Agreement on Textiles and Clothing (ATC), and the services agreement. While only two studies examined services explicitly, the basic thrust of the BFD work is that services liberalization is likely to yield significant benefits. (Not so much with the UR, but with post-UR liberalization). Similarly, the dramatic drop in estimated gains from the UR agreement on agriculture, as we moved from expected to actual agreement, suggests that there are significant benefits to be had in this area in future negotiations.

In terms of industrial tariffs, three points should be noted from the literature and recent experience. First, the WTO has been successful, in the sense that there has been a rapid implementation of tariff commitments. (See Tables 7 and 8). Second, there remains significant room for future negotiations on industrial tariffs. While industrial tariff reductions stood out as important in all of the CGE studies, most of the action in this area involved reducing the tariffs of industrial countries. These tariffs averaged 4.1 per cent before the UR, and will soon average roughly 2.5 per cent as a result of UR commitments. The average tariff applied by the industrial countries against imports from developing countries will be higher, averaging roughly 4 per cent. This implies room for reducing, in the next round, the bias of industrial country tariff structures against developing country exports, even after UR commitments are implemented. Even more striking is the level of developing country tariff protection against imports from other developing countries. While developing countries face a tariff wall of 4 per cent in the industrial countries, the corresponding tariff wall protecting developing country markets is over 10 per cent. The HYMD study indicated that, over the next decade, developing countries will become increasingly important to each other as export markets. Hence, regardless of the position of industrial countries vis-à-vis developing countries, the position of developing countries vis-à-vis each other should be an important element of negotiation (and also modeling of commitments) in the next round.

However, notwithstanding the importance of developing country markets vis-à-vis each other, a third point to note from the UR experience is that substantial developing country tariff cuts are unlikely in the next round. Table 12 presents summary data on industrial bindings and applied rates for 29 countries. These data reflect the tendency of developing country tariffs to be unbound, or to be bound well above applied rates. Where developing economies had bound all or a significant portion of tariffs prior to the end of the Uruguay Round (Chile, Costa Rica, El Salvador, Mexico and Venezuela), the Uruguay Round tariff commitments often reflected a decline in ceiling rates (rather than applied rates). For these reasons, implementation of Uruguay Round tariff commitments by developing countries has involved virtually no declines in current applied tariffs.

What is important for the next Round is the current level of ceiling bindings vis-à-vis applied rates and the limited scope of bindings coverage. Taken together, these

mean that developing countries will, collectively, be able to reduce ceiling bindings (or introduce them for the first time) while having to make only modest (and in many cases no) changes to applied rates. This is also illustrated in the table. For most developing countries in the table, a 25 per cent reduction in average bound rates would imply a zero reduction in average applied rates.

Hence, for industrial tariffs, the relevant scenarios for the next round are likely to involve little or no reduction in many developing country applied tariffs. This will be true whether or not developing countries take an active part in industrial tariff negotiations. There are important exceptions in developing Asia (Malaysia, India, and Indonesia). These are however exceptions rather than the rule. In the case of India, there is also the complication of quantitative restrictions. Therefore, as in previous rounds, there is a good chance that industrial tariff reduction will primarily involve OECD countries.

With respect to the ATC, instead of relying on the computational studies as a guide to expected effects, one can also view them as providing signals of potential political problems with implementation related to adjustment costs. Some of the most dramatic adjustments (and hence adjustment costs) identified in the modeling literature are ATC related. For example, a close reading of the literature identifies a basic pressure for (potentially substantial) resources to shift into textiles and clothing in the developing countries (particularly Asia). Among the developing countries, there is likely to be a shift in textile and clothing production toward China and South Asia. The mirror image will be strong pressure for a contraction of textile and apparel production in the OECD, and in the older quota-protected supply countries. In a sense, this confirms the obvious. (Some members of the modeling community made this point at the end of the round.)

This highlights a negative aspect of the way economists presented the results of UR studies. One ostensible value of these exercises, for the policy community, is that they serve as social cost-benefit assessments of economy-wide (i.e. far reaching) policy changes. Yet, in practice, the economists involved placed emphasis on the net benefits, without due attention to the underlying sources of gross benefits and costs. The literature does examine the UR, in terms of components of the final UR market access package. However, not enough attention was devoted to adjustment costs within countries. Estimates of sectoral adjustment and resource shifts were (sometimes) reported but were not emphasized. Neither did the economists involved highlight the budget implications of tariff commitments. (It helps to recall that, in many developing countries, tariffs are a significant source of government revenue.) For the next round, closer attention to estimated adjustment pressures would lend more credibility to quantitative exercises, and also more useful guidance regarding public reaction to the down-side of trade liberalization (displaced labour, budget problems, etc.).

Another problem is the obvious discrepancies across studies. As is clear from Tables 4, 5, and 6, there were substantial differences in the results of various studies. This holds as we look across countries, and also as we look across various aspects of the UR package. (For more on this, see Francois, McDonald and Nordström 1996b and Perroni 1998). This is even the case for studies that

Table 12
Industrial tariff rates and bindings

	Percent of GATT imports		Unbound or bound above applied rates	Mean industrial tariffs		Percent applied rate cut implied from an average reduction in bound rates of 25 per cent *
	Bound	Bound above applied rates		Current Applied rates	Bound rates	
Argentina	100.0	99.9	99.9	14.1	33.5	0.0
Australia	96.9	31.7	34.8	4.4	12.1	0.0
Brazil	100.0	91.0	91.0	18.3	27.7	0.0
Canada	99.8	45.7	45.9	3.2	4.3	0.0
Chile	100.0	99.7	99.7	10.9	24.9	0.0
Colombia	100.0	97.7	97.7	10.5	35.2	0.0
El Salvador	97.1	96.0	98.9	3.8	31.7	0.0
European Union	100.0	17.7	17.7	3.5	3.2	25.0
Hungary	93.6	3.3	9.7	9.8	6.1	25.0
India	69.3	14.8	45.5	29.5	34.2	13.1
Indonesia	92.3	86.6	94.3	14.9	36.9	0.0
Japan	95.9	0.1	4.2	1.5	1.5	25.0
Korea, Republic of	89.8	3.4	13.6	7.8	6.9	25.0
Malaysia	79.3	31.0	51.7	9.4	8.9	25.0
Mexico	100.0	98.4	98.4	12.0	33.3	0.0
New Zealand	100.0	46.5	46.5	4.0	11.9	0.0
Norway	100.0	36.5	36.5	2.4	2.6	18.8
Peru	100.0	98.5	98.5	12.5	29.4	0.0
Philippines	67.4	15.5	48.1	9.1	21.3	0.0
Poland	92.8	44.6	51.8	14.2	8.5	25.0
Singapore	36.5	11.7	75.2	2.7	6.9	0.0
Sri Lanka	9.2	1.4	92.2	19.8	17.9	0.0
Thailand	67.4	8.9	41.5	43.7	27.3	25.0
Tunisia	67.9	41.5	73.6	23.5	38.4	0.0
Turkey	49.3	0.0	50.7	5.7	16.3	0.0
United States	100.0	14.0	14.0	2.7	3.5	25.0
Uruguay	100.0	96.3	96.3	10.7	27.9	0.0
Venezuela	100.0	90.3	90.3	10.9	31.3	0.0
Zimbabwe	13.6	3.9	90.3	20.5	23.6	0.0

Notes: * If more than seventy five per cent of trade is unbound or bound above applied rates, the cut is assumed to be zero. This affects Sri Lank and Zimbabwe. All other values are based on comparison of adjusted bound rate to applied rate. In the case of the United States, the gap between bound and applied rates is 0.8 per cent. Given the different data source, changes in weighting, and the Information, Technology Agreement (not in the bound rate estimates), a new 25 per cent cut in bindings is assumed to yield a 25 per cent reduction in applied rates.
Source: Finger, Ingco, and Reincke; and World Bank *World Development Indicators.*

employed the "same" dataset. This is discussed below.

Notwithstanding the problems, the CGE studies were a useful too1 during the UR, and should be a useful one during the next round as well. While there are many areas where they will not be useful or relevant, there are others where they are ideally suited to the task of social cost-benefit accounting. Several steps would help to ensure their usefulness in this respect.

1. *The limitations of these studies need to be highlighted by the economists involved when results are reported, and kept in mind by the policy community.* They are not forecast models (consider the East Asian financial crisis), and they cannot include all aspects of a negotiating round. Furthermore, there is a great deal of uncertainty about specific numbers. Hence modeling results need to be used with care. More emphasis needs to be placed, by the modeling community, but also by international institutions, policy makers, and the press, on qualitative aspects of results rather than on specific numbers. Uncertainties also need to be highlighted.

2. *Better advantage should be taken of the relative strengths of these analytical tools.* CGE models provide a wealth of information, apart from income effects. This includes highlighting potential shifts in resources within countries, and flagging problem areas related to implementation (again following from adjustment pressures).

3. *Better developing country access needs to be provided to these tools.* Ultimately, this requires the support of governments and development organizations. During the UR, computational modeling was done, for the most part, by international organizations and by the industrial countries. The industrial countries were able to use these models, when appropriate, to flag their own interests. Access by developing countries was more limited. While progress has been made (in particular through the GTAP consortium), the greatest stumbling block involves integrating accurate developing country data for individual countries into the standard datasets (like GTAP) used for these exercises.

4. *Data quality needs to be improved.* The economists involved (and the institutions supporting them) need to devote more resources to data quality issues. In the studies covered here, most but not all were able to take advantage of a common dataset. Further movement in this direction will help. This includes accurate national income data for developing countries, but also better protection data and a better representation of market structure issues. (For example, market structure should be central to assessment of service sector liberalization, as many of these sectors are former monopolies.)

5. *Transparency of market access offers is important.* It is critical that timely information on tariffs (bound and applied) and tariff offers be made available in a meaningful form for use in assessments not only by WTO Members but also by the general research community. Such assessments may be quantitative, qualitative, or may involve a mix of methods. Whatever the approach, better access to tariff data will prevent the problem of over-optimistic assessments (like the US$ 500 billion estimate), as happened last time. It should be possible, by releasing data at a slightly aggregated level,

to maintain the confidentiality of detailed tariff offers. If economists (and the public) lack access to accurate information on applied rates and offers, then this will only heighten uncertainty about estimated effects. Related to this, quantitative details on the general scope of agriculture and services commitments need to be made available at least to the delegations, UNCTAD, and the World Bank) in quantitative form. In some areas (like agriculture) there was significant obfuscation by the negotiating parties during and even after the Uruguay Round regarding offers. (Tariff schedules were sometimes submitted in paper rather than electronic form. Specific tariffs also complicate the problem of assessment.) The implications of the UR agriculture agreement and its implementation to assess what market access commitments were actually made (see Ingco 1996, for example), still needs further study. This accounts for some of the qualitative discrepancy between early and more recent computational assessments of the agriculture component of the UR. Large problems also confronted the trade policy community regarding the assessment of UR service commitments (see Hoekman 1995). Of course, transparency should not only be for the sake of modelers. Since tariff negotiations are largely about tax rates, one might naively expect that, at least in the case of representative governments, transparency should be the operating norm for the sake of the public at large.

6. *Modelers need to be transparent about methods and results.* The “black box” syndrome needs to be avoided. This could be avoided if modelers followed a rule of posting full model documentation on the internet, including datasets, the programmes needed to replicate published results, and clear instructions on how to modify these experiments.

7. *Empirical "validation" is needed.* For the long-run, the academic community needs to devote attention to model validation exercises and measures of "goodness of fit" for relevant macroeconomic indicators. While many of the differences across UR studies can be explained by experiment design, differences in aggregation, dataset modifications, and differences in model structure, there is still a great deal of house-cleaning to do. These differences need to be better resolved by the academic community, in terms of reasons for and significance of the variation in model performance. More empirical work also needs to be done to guide appropriate theoretical choices, as theoretical structure can make a large difference to results. Basically, the long-run viability of these tools requires extensive academic work on model validation, including matching performance to expectation and validating theoretical structure through traditional econometric and statistical exercises.

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