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ABSTRACT

The Multilateral Trade Agenda: Uruguay Round Implementation and Beyond*

In this paper we provide a quantitative examination of initiatives for post-Uruguay Round liberalization in 'traditional' GATT/WTO market access areas, as a counterpoint to the recent policy literature on newer issues such as the environment, competition policy, and labour standards. We emphasize issues such as industrial tariff liberalization, agricultural trade liberalization, recent proposals for free trade in information technologies, and an expanded Agreement on Government Procurement, along with the benefits of fully implementing the Uruguay Round Agreements. We provide a quantitative assessment of the relative magnitudes of various liberalization proposals using a computable model of the global economy.

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Keywords: World Trade Organization, Uruguay Round, trade liberalization

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NON-TECHNICAL SUMMARY

With the creation of the WTO, its Members agreed to hold bi-annual Ministerial Conferences, the first of which is scheduled for Singapore in December 1996. The Singapore Ministerial provides Members with an opportunity to assess the progress of Uruguay Round implementation and the WTO institutions, and to define the forthcoming multilateral agenda.

Ministers meeting in Singapore must both address the agenda of the Ministerial Conference itself, which is broad and far-reaching, and set the multilateral work programme for the coming years. The Conference agenda includes not only what we call 'traditional' matters, but also several new issues, which will be raised either formally or informally. These include trade and environment, trade and employment, and trade and competition. One challenge facing Members is how to strike a balance between new issues and traditional issues, such as further agricultural and services liberalization, industrial tariff reductions, and the monitoring of Uruguay Round commitments.

In this paper we provide a quantitative reminder of the important work that remains in 'traditional' GATT/WTO areas, as a counterpoint to the body of recent literature on newer issues. Hence, we emphasize issues such as further industrial tariff liberalization, related aspects of agricultural trade liberalization, recent proposals for free trade in information technologies, and an expanded Agreement on Government Procurement (AGP), along with the expected benefits of fully implementing the Uruguay Round Agreements. We assess the relative magnitudes of various liberalization proposals using a computable model of the global economy, and conclude by discussing the benefits of liberalization initiatives in these traditional market access areas. We argue that given the limited supply of trade negotiating capital, there will, by necessity, be a trade-off between those scarce negotiating resources devoted to new issues, and those devoted to further progress towards liberalization in more traditional GATT/WTO areas. While many of the new areas are important, the potential benefits of further progress in traditional market access areas are also substantial.

Our results indicate that the recent initiative to eliminate all remaining tariffs on information technology products would not only be an important gesture by Ministers at Singapore, but would in fact be a major trade liberalization act in its own right. (A gain of roughly $72 billion in annual world income, measured in 1992 dollars.) In the longer term, the further liberalization of industrial

product tariffs should not be limited to an initiative on information technology products, however. Even after the Uruguay Round, substantial tariff-induced trade distortions still cover much of the world's trade in industrial products, and our analysis indicates that further reductions in industrial product protection would result in substantial economic welfare gains. For example, a 50% reduction in remaining industrial tariffs would yield approximately $270 billion in global income (welfare) gains per year. The extent to which these gains are realized by developing countries hinges directly on whether they participate actively in such a liberalization initiative.

We also argue that a formula approach should at least be considered for future industrial tariff liberalization. In addition to easing the negotiating process, across-the-board tariff cuts, if done through some formula-based variation on a percentage cut, could also be designed to address dual developing-country concerns about tariff escalation and peak protection in OECD markets. Post-Uruguay Round protection across the OECD and developing country regions exhibits an uneven pattern – with peaks (e.g. textiles and clothing in both the United States and South Asia) often corresponding to sectors of particular export interest to the least-developed countries. Formula cuts can be used to bring peak rates closer to the average, and to reduce tariff escalation (measured as the difference between tariffs on finished products and those on primary and semi-processed products).

Lastly, we also argue that the relative merits of broad and sectoral negotiations need to be examined. Recent experience with the GATT and WTO suggests that sectoral negotiations, at least in a WTO context, progress better when packaged with other negotiations. Since several sets of market access negotiations are coming up anyway (industrial goods, services, and agriculture), a combined initiative to promote liberalization in these areas may offer a better opportunity for progress than if sectoral negotiations were all handled concurrently but separately.

1. Introduction

The Bretton Woods institutions were established -- near the end of a turbulent half century marked by international conflict and global economic collapse -- with an explicit mandate to promote a stable multilateral system for international commerce. This mandate called for a system that would reduce macroeconomic uncertainty and "facilitate the expansion and balanced growth of international trade." The financial leg of this institutional setup, the International Monetary Fund, was, among other things, intended to "assist in the establishment of a multilateral system of payments in respect of current transactions between members and in the elimination of foreign exchange restrictions which hamper the growth of world trade." The commercial leg of the system, the stillborn International Trade Organization (ITO), was meant to promote the stability and liberalization of the commercial policy environment. While the GATT Secretariat administered the commercial end of the system for the first 45 years of the Post-War period, it was not until 1995, with the conclusion of the Uruguay Round of multilateral trade negotiations, that the World Trade Organization (WTO) was established to take the place originally envisaged for the ITO.

With the creation of the WTO, its Members agreed to hold Ministerial Conferences, composed of representatives of all Members, at least once every two years. The first such Ministerial, scheduled for Singapore in December 1996, will include plenary meetings and various multilateral, plurilateral and bilateral sessions. It provides Members the opportunity to assess the progress of Uruguay Round implementation and the WTO institutions, and to define the coming multilateral agenda.

Our objective in this paper is to provide a quantitative reminder of the important work that remains in "traditional" GATT/WTO areas, as a counterpoint to the recent policy literature on newer issues such as the environment, competition policy, and labour standards. (i.e. Wood 1996 and Hoekman 1996a). Hence, we emphasise issues like further industrial tariff liberalization, related aspects of agricultural trade liberalization,

recent proposals for free trade in information technologies, and an expanded Agreement on Government Procurement (AGP), along with the expected benefits of fully implementing the Uruguay Round Agreements. We assess the relative magnitudes of various liberalization proposals using a computable model of the global economy, and conclude by discussing the benefits of liberalization initiatives in these traditional market access areas. We argue that given the limited supply of trade negotiating capital, there will be by necessity a tradeoff between those scarce negotiating resources devoted to new issues, and those devoted to further progress toward liberalization in more traditional GATT/WTO areas. While the new areas are important, the potential benefits of further progress in traditional market access areas are also substantial.

2. Trade liberalization -- old and new issues

In this section we discuss several proposed and scheduled trade liberalization initiatives. Ministers meeting in Singapore will have to both address the agenda of the Ministerial Conference itself, which is broad and far-reaching, and set the multilateral work programme for the coming years. The Conference agenda includes not only tariffs, nontariff measures and other traditional matters, but also several new issues, which will be raised either formally or informally. These include trade and the environment, trade and employment, and trade and competition. Because negotiating capital (and the resources of the WTO Secretariat) are limited, one challenge facing Members is the need to strike a balance between new issues and the pursuit of more traditional issues, like scheduled agricultural negotiations, proposed industrial tariff reductions, and the monitoring of Uruguay Round commitments.

2.1 Pre-set negotiations

One of the results of the Uruguay Round was a commitment to continued negotiations after the Round, with pre-programmed negotiations upcoming in agriculture and services.

In addition, Australia has called for further negotiations on tariff reductions (see WTO 1996a), arguing that the Uruguay Round Agreements failed to call for further industrial tariff negotiations in conjunction with services and agricultural negotiations through an oversight. Australia has proposed that, in Singapore, the Members call for preparatory work on tariff negotiations to begin in 1997. This would put industrial tariffs on the same negotiating track as services and agriculture.

While not involving formal negotiations, constructive dialogue will also be important if the MFA phaseout is to proceed smoothly. WTO Members (including the ASEAN countries, Hong Kong, India, and Singapore) have voiced concerns regarding the MFA phaseout. They have argued that the first stage of the phaseout has not generally covered goods actually restricted by the MFA, that safeguards are being employed to dampen actual liberalization, and that rules of origin changes have effectively slowed progress toward liberalization. The United States and European Union have also voiced concerns, particularly that exporting countries had not complied with provisions in the Agreement on Clothing and Textiles (ATC) to achieve improved market access in the sector, and that there are problems with transshipment. Because a significant share of estimated gains from the Uruguay Round Agreements followed from the MFA phaseout, significant economic gains hang on the successful pursuit of constructive discussion in this area.

2.2 Information technology

One proposed post-Round initiative involves an Information Technologies Agreement (ITA), which would involve free trade in information technology equipment (like data processing and telecommunications equipment), and possibly software sales and licensing as well.

The potential scope for such an agreement is illustrated in Tables 1 and 2. Information processing and telecommunications equipment (proxied in the tables by office

machines and telecommunications equipment) accounted for 15.4 percent of manufactured goods trade in 1994 (WTO 1995). They account for roughly 15 percent or more of merchandise exports in North America, developing Asia, and OECD Asia (Table 2), and more than 12 percent of West European and Latin American imports.

On a regional level, the largest software import market (Table 1) is Western Europe. Software exports are particularly important for the United States. According to the U.S. Department of Commerce, the United States supplied 60 percent of the software markets in Western Europe and Japan, and 73 percent of the remaining global market in 1992. In computer-aided design and computer-aided manufacturing (CAD/CAM) markets, the United States supplied two-thirds of the global total, with Asian firms supplying an additional 20 percent and European producers another 10 percent.

On net, an ITA leading to free trade in these products would imply an agreement directly affecting at least 15 percent of world merchandise trade, and a potentially large share of related trade. A successful initiative in this area could also bring substantial global welfare gains. ITA-related liberalization may also serve to reinforce ongoing procompetitive gains flowing from deregulation in national telecommunications markets.

2.3 Post-Uruguay Round tariff cuts

Beyond the pre-set negotiations, there remain substantial potential benefits from further tariff cuts, a point that should be remembered amid discussion over new systemic issues. Quite apart from new issues, there is still considerable benefit to be derived, especially across the developing world, from liberalization under traditional m.f.n. tariff reduction mechanisms. The scope for further tariff reductions is illustrated in Table 3, which presents aggregate data on the results of tariff commitments under the Uruguay Round. These data include crude estimates of the agricultural commitments made under the Agreement on Agriculture.

The Uruguay Round led to deeper participation (and greater tariff binding commitments) by developing countries as a group than in previous Rounds. As illustrated in Table 4, we have gone from having roughly 13 percent of developing country imports being covered by bound tariffs following the Tokyo Round, to roughly 61 percent of developing country imports now covered by bound tariffs following the Uruguay Round. However, many developing countries retain tariff bindings well above the global average (See Table 3). In fact, most developing country bindings are ceiling bindings, placed well above current applied rates. Given the high rates of m.f.n. protection, we should expect significant benefits from further tariff liberalization initiatives that target remaining developing country protection.

In what form should industrial tariff cuts be attempted? A formula-based variation on a percentage cut (versions of which were followed in both the Kennedy and Tokyo Rounds) offers two important advantages over other methods -- simplicity and transparency. The departure from the formula cuts approach in the Uruguay Round led to sometimes tortuous, detailed tariff line negotiations. It also made it harder for smaller and less developed countries to push for real progress against peak protection and tariff escalation. (See Croome 1995, Chapter III). By the same token, it made it easier for larger industrial countries to preserve peak protection on sensitive sectors. These shortcomings could be greatly eased if tariff reductions were attempted according to a relatively rigid formula approach. Such an approach would simplify the negotiating process itself, and in the context of ongoing regional trade initiatives, like APEC's initiative for free trade in 2010 (2020 for developing countries), would also provide an incentive for these to be mfn based by offering a mechanism for Members to earn WTO negotiating credit through m.f.n. bindings placed on some share of what would otherwise be unbound liberalization moves.

Formula-based tariff cuts can also be designed to address developing country's dual concerns about tariff escalation (measured as the difference between tariffs on

finished products and those on primary and semi-processed products) and peak protection in OECD markets. (See Laird and Yeats 1988). As illustrated in Table 3, post-Uruguay Round protection across the OECD and developing country regions still exhibits a pattern of highly uneven protection. Remaining peaks (like textiles and clothing in both the United States and South Asia) often correspond to sectors of particular export interest to the least developed countries. (See Blackhurst et al 1995).

2.4 Government procurement

Another liberalization initiative on the table involves the Agreement on Government Procurement (AGP), which currently is a plurilateral agreement, limited in terms of members and sectoral coverage. The current membership of nine (EU as one) consists of Israel and most of the OECD countries. The share of procurement in those countries currently covered by the agreement is relatively limited. (For example, Francois, Nelson, and Palmeter 1996 estimate that it involves 10 percent of U.S. procurement and a smaller share of EU procurement). At least one WTO Member with very liberal procurement practices, New Zealand, expresses no interest in joining the AGP, believing that the trade liberalizing effects of the Agreement are limited by its accommodation of bilateral reciprocity and sectoral exemptions (WTO, 1996b).

In conjunction with deregulation and privatization initiatives, WTO Members could expect significant benefits from expanded AGP coverage. However, the privatization and deregulation of telecommunications and utilities by OECD and middle-income countries makes the potential gains from expanded AGP coverage in these markets much smaller than would have been the case even 10 years ago, when the reach of public procurement rules extended much further into infrastructure services. (Though substantial benefits may be realized by developing countries. See Hoekman 1996b). In addition, while estimates found in the literature of effective government preference margins are often large (30% or more), the impact of these margins is greatly limited in

many markets, in market access terms, by the low share of government in total demand. (Francois, Nelson, and Palmeter 1996). It is in the exceptional cases, like military equipment and infrastructure construction, that procurement preferences are likely to be important. Given the likelihood of continued exemptions for defense, the most important areas for a GPA will therefore not be in merchandise, but rather in services like construction. Hence, progress in procurement liberalization will be closely linked to progress in services liberalization. In the General Agreement on Trade In Services (GATS), Article XIII calls for multilateral negotiations on government procurement in services. This will be important to real progress in multilateral services liberalization.

3. What's further multilateral liberalization worth?

To provide some quantitative assessment of the issues raised above, we define two scenarios for formal analysis. These scenarios are then examined with an applied general equilibrium model of the world economy, similar to the one employed by the GATT Secretariat to assess the Uruguay Round. (Technical aspects of this model are discussed in the appendix.) The results of this analysis are not forecasts, as much is likely to happen in the world economy before the Uruguay Round Agreements are fully implemented. Even so, they do offer a broad perspective on the importance of various post-Uruguay Round liberalization proposals.

Our first scenario relates to Uruguay Round implementation, while the other involves a stylized representation of various post-Round liberalization initiatives. Our Uruguay Round implementation scenario involves the following:

- industrial NTB elimination modelled through export taxes (including the MFA and EU restrictions on Japanese automobile exports);
- industrial tariff reductions as scheduled (See Table 3);
- liberalization of agricultural trade, involving both scheduled reductions in export subsidies, and also including some reductions in import restrictions (see Table 3);
- new government procurement provisions.

Similarly, we focus on a subset of proposed market access initiatives for post-Uruguay Round liberalization.

- Free trade in information technologies (modelled as telecommunications and office equipment -- See Table 5);
- A hypothetical further 50 percent reduction in agricultural border interventions from Uruguay Round levels. As defined by the Agriculture Agreement, we model this as involving both primary agriculture and processed food;
- A hypothetical further 50 percent reduction in the level of all industrial tariffs;
- An expansion of the AGP to all WTO Members, involving a 50 percent reduction in estimated preference margins (typically now in the range of 30 per cent) for core government demand. This involves, primarily, government merchandise demand.[1]

We present income effects (i.e. changes in national welfare) from this exercise in Tables 6 and 7, where they are reported in terms of billions of 1992 U.S. dollars and in terms of the equivalent percentage of 1992 national income.[2] Our Uruguay Round implementation scenario covers industrial nontariff barriers, reductions in industrial tariffs, the liberalization resulting from the Agreement on Agriculture, and reforms of the plurilateral Agreement on Government Procurement. We have modelled six post-Uruguay Round liberalization scenarios: free trade in information technologies involving the tariffs shown in Table 5 (Column 1 of Table 7) , a 50 per cent reduction in agricultural tariffs and export subsidies (Column 2 of Table 7), a 50 per cent reduction in all industrial tariffs (Column 3 of Table 7), and expansion of the Agreement on Government Procurement (column 4 of Table 7). Finally, we offer an estimated of the total impact of implementing all of these simultaneously (basically a Singapore Round

[1] Estimated preference margins are based on a comparison of government and private expenditure patterns, as described in Francois, Nelson, and Palmeter (1996). Technically, these margins cover goods and services. However, the coverage of our services trade data, which are based on the underlying GTAP data, are limited at best, so that most of the liberalization modelled involves demand for goods rather than services. We also expect important margins in particular service sectors to be obscured by the sectoral aggregation of the model. As such, a more detailed treatment of service sector trade would be likely to identify greater gains from liberalization.

[2] These reflect the incremental on benchmark GDP, which is for 1992.

scenario) in column 5 of Table 7. The last column of Table 7 offers a similar set of estimates, but for a scenario under which mfn liberalization is only undertaken by the OECD countries.

Results for the Uruguay Round implementation scenario suggest that the largest source of global welfare gains is the reduction of industrial nontariff barriers (including the elimination of nontariff measures on textiles and clothing under the Multi-Fibre Arrangement) and tariff reductions for industrial products. These two sources account for some 90 per cent of the total result for the four sources modelled, and together result in an estimated annual global welfare gain of nearly $300 billion.[3] Welfare results from the Agreement on Agriculture for the time being appear relatively small. This is because the greatest achievement of the Agreement was not liberalization per se, but rather the conversion of nontariff measures into tariffs, which has set the stage for the more substantive liberalization of agricultural trade in the future. The impact of the AGP, which we model as involving partial liberalization primarily in the U.S. and EU markets, has limited global impact. Given the limited coverage of the agreement, this is not surprising.

Turning to the post-Uruguay Round liberalization scenarios, we model an ITA as involving global free trade in the affected sectors. Our results indicate that an agreement to eliminate tariffs on trade in information technology equipment would result in substantial economic welfare gains, possibly in the range of $70 billion annually. If agreed at the Singapore Ministerial Conference, this would be an important contribution to global trade liberalization with real, positive implications.

Ministers at Singapore will also have the opportunity to begin to set the work programme for further agricultural trade liberalization. Our results point to the importance of building on the Uruguay Round accomplishment of tariffying agricultural

[3] These welfare effects are broadly consistent with other ex-post CGE studies. See Martin and Winters (1995). These represent gains for the 1992 global economy. By 2005, we can expect these gains to be magnified by underlying growth of the world economy.

trade barriers by moving forward with substantial reductions of agricultural tariffs. The halving of these tariffs could result in global welfare gains five times larger than those stemming from Uruguay Round implementation of the Agriculture Agreement and amounting to some $100 billion annually. At Marrakesh, Ministers agreed (Agreement on Agriculture, Article 20) that negotiations to continue the process of "substantial progressive reductions in support and protection" would begin by the end of 1999. Given the large potential economic welfare gains associated with agricultural tariff reductions, our results suggest significant benefits if the Singapore Ministerial lays the groundwork necessary to ensure the success of these negotiations.

While substantial tariff liberalization of industrial products was undertaken in the Uruguay Round, further reductions would have large economic welfare benefits. Such tariff cuts have been proposed by Australia. Our scenario of the halving of industrial product tariffs results in an estimated global annual welfare gain of some $270 billion, the largest of our four post-Uruguay Round liberalization scenarios. Steps taken in this direction at the Singapore Ministerial would indeed be important.

Finally, the importance of developing country participation is made evident by comparison of the last two columns of Table 7. In the first, we have modelled a liberalization round that involves full participation by developing country Members, while in the last we have modelled a liberalization round that excludes liberalization by developing countries. The contrast is striking. For example, in Africa, failure to participate actively through own-liberalization translates significant gains into losses. This is because, under the OECD-only scenario, agricultural liberalization, combined with preference erosion, leads to deteriorating terms-of-trade for Africa. This is especially true of net food importers in the region. For the region as a whole, this can be more than compensated for, however, through significant own-liberalization. For South and East Asia, active participation increases the combined gains for the regions by $100 billion, which amounts to 25 percent of total estimated global gains. Overall, for

developing regions, it is not OECD liberalization but own-liberalization that translates into the greatest economic gains.

4. Concluding comments

We have focused in this paper on Uruguay Round implementation and the place of traditional GATT/WTO issues on the future negotiating agenda. Our basic objective has been to examine the scope for further liberalization in traditional market access areas, as a counterpoint to recent literature on newer issues such as the environment, competition policy, and labour standards.

Our emphasis of trade liberalization is not meant to imply that we view these as the only areas worth pursuing within the WTO. For example, among other elements of the "built-in" agenda, services negotiations are not only required by the GATS but have the potential to generate large welfare gains by eliminating substantial trade distortions. (See Brown et al, 1995). A multilateral agreement on investment under the WTO has been argued for as well (WTO 1996c) and, given the close relationship between trade and investment, could complement other WTO agreements. We also view the spread of contingent protection regimes, particularly anti-dumping regimes, as endangering the effective implementation of the Uruguay Round results and future liberalization initiatives. (See Francois, McDonald, and Nordström 1996 for discussion). The best time to strengthen the disciplines in these areas is now, before more such regimes are established under the current rules.

A number of new issues will be raised in Singapore. Several of these have the potential to consume a great deal of limited negotiating energy and capital. To the extent that their examination goes beyond the WTO's basic mandate to promote open markets, the Members will be exploring relatively uncharted territory, possibly without the promise of immediate returns. At the same time, in our view, several more traditional areas also deserve immediate attention. These areas do promise relatively immediate returns, and

fall directly within the existing mandate of the WTO. They include aggressive implementation of the Uruguay Round agreements, further integration of developing countries in the system, monitoring of member country trade policy regimes through the Trade Policy Review Mechanism, upcoming agriculture negotiations, sectoral liberalization within the GATS, and proposed industrial tariff reductions.

Finally, the relative merits of broad and sectoral negotiations need to be examined. Recent experience with the GATT and WTO suggests that sectoral negotiations, at least in a WTO context, may progress better when packaged with other negotiations. Since several sets of market access negotiations are coming up anyway (industrial goods, services, and agriculture), a combined initiative to promote liberalization in these areas may offer a better opportunity for progress than if sectoral negotiations were all handled concurrently but separately.

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Appendix -- the CGE model

To assess the scenarios described in this paper, we work with a global computable general equilibrium (CGE) model. Interested technical readers are referred to the text and technical appendix of Francois et al (1995) for details. In that paper, we provide sensitivity analysis and discussion of the merits and drawbacks of different model features. The algebraic aspects of major features of the model (like capital accumulation and imperfect competition) are also discussed in that paper. This appendix is limited to a relatively terse, qualitative discussion of basic model features.

CGE models are characterized by an input-output structure that explicitly links industries in a value added chain from primary goods, over continuously higher stages of intermediate processing, to the final assembling of goods and services for consumption. Inter-sectoral linkages are direct, like the input of steel in the production of transport equipment, and indirect, via intermediate use in other sectors. CGE models capture these linkages by modelling firms' use of factors and intermediate inputs.

The most important aspects of the model used here are the following: (i) it covers all world trade and production; (ii) it allows for scale economies and imperfect competition; (iii) and it allows for trade to affect capital stocks through investment effects. The multi-region model used here divides the world into ten regions, each with ten sectors (Table A-1). Consumer demand is generated from a representative regional household with Cobb-Douglas preferences over sectoral composites. Each sector consists of differentiated products, and consumer and firm demand for these are generated by CES preferences. Government services are produced through a Cobb-Douglas technology, which means that government expenditure shares over product categories are fixed. The total level of government service provided in each region is assumed to remain unchanged under all alternative scenarios.

Scale economies and monopolistic competition are allowed for in manufacturing sectors. Scale economies incorporated in the model depend on a firm's own production level and are thus *internal to* the firm. In particular, based on evidence of scale economies (Pratten 1988; Cecchini 1988), we model sectors as being characterized by Chamberlinian large-group monopolistic competition for traded intermediate and final goods (Ethier 1982; Krugman 1980). Operational features of this type of model are examined by Brown (1994). Other sectors are characterized by constant returns and perfect competition, but output is differentiated by regions (Armington assumption). Formally, factors are combined according to a CES function, while intermediates are used in fixed proportions. Both approaches (Armington and monopolistic competition) have two significant ramifications: (i) intermediate input prices enters firms' cost functions, so price-raising trade barriers directly affect firms' costs, and (ii) firms' demands for each variety of intermediates, whether differentiated by region (Armington assumption) or firm (monopolistic competition) follows standard CES derived demand functions. With product differentiation in all sectors, the model supports two-way trade in all traded sectors.

The cost of trade is modelled explicitly as consisting of a combination of trade and transport services. Revenue from non-frictional trade barriers are returned to the

representative consumer in each region. This includes quota rents, which are generally modelled as accruing to exporters. Regional labour supplies are assumed to be fixed, but regional capital stocks are endogenous. Capital is produced according to a fixed-coefficient production function from various intermediate inputs, such as transport equipment and other machinery. A region's steady-state capital stock is the level that balances its savings (a fixed proportion of income) with capital depreciation (equal to what a fixed share of the underlying capital stock). Regional capital stocks are then determined by a simplified capital market. That is, the regional stocks move to maintain equilibrium between supply (savers) and demand (firms) in the capital market.

With the exception of substitution and scale elasticities, which are drawn from the literature, model parameters are calibrated to social accounting data from the August 1996 revision of the Global Trade Analysis Project (GTAP) version 3 data base (Hertel et al 1996). The GTAP dataset includes information on national and regional input-output structure, bilateral trade flows, final demand patterns, and government intervention, and is benchmarked to 1992. Bilateral tariff data are based on World Bank and WTO data on pre- and post-Uruguay Round protection, and reflect differential bilateral weighting of detailed trade data within model sectors. Our NTB data are described in Francois et al (1995). In this paper we start with the pre-Uruguay Round protection data. We represent Lomé preferences by assuming that the Middle East & Africa region in the model receives duty free treatment from Western Europe for primary goods (excluding agriculture) and manufactured goods. Estimates therefore reflect some degree of preference erosion, and the negative impact of preference erosion, given this specification, is most certainly overstated.

Table 1
Trade in information technology
1992 imports, billion dollars

	office machines and telecomm equipment	software
North America	83.2	5.5
Western Europe	132.3	23.4
Japan, Korea	22.8	0.6
Australia, New Zealand	5.5	1.6
Middle East & Africa	4.2	0.8
South Asia	0.6	0.1
East Asia	32.8	0.9
China, Hong Kong	14.0	0.2
Latin America	13.4	0.4
Rest of world	33.1	0.5

hardware data are from WTO 1995.
software data are for 1993, and are from US&FCS, Dept of Commerce, 1994.

Table 2
Office machines and telecomms as a share of merchandise trade

	export share	import share
North America	17.5	19.5
Western Europe	8.5	12.5
OECD Asia	24.5	16.5
developing Asia	28.0	22.0
Middle East & Africa	2.0	7.0
Latin America	11.5	12.5
Central & Eastern Europe and the FSU	2.0	9.0
Middle East	7.5	7.0

data are from WTO 1995.

Table 3
Applied merchandise tariffs of WTO Members, pre and post Uruguay Round, mfn-based

	North America		Western Europe		Japan and Korea	
	pre-UR	post-UR	pre-UR	post-UR	pre-UR	post-UR
primary agriculture*	0.335	0.334	0.455	0.449	1.164	0.671
mining, forestry, fisheries	0.005	0.005	0.007	0.006	0.029	0.026
processed food	0.103	0.081	0.229	0.192	1.131	0.735
textiles and clothing	0.176	0.151	0.124	0.102	0.121	0.092
chemicals	0.060	0.035	0.068	0.043	0.080	0.036
transport equipment	0.044	0.039	0.056	0.048	0.032	0.028
other machinery and equipment	0.039	0.019	0.061	0.032	0.082	0.050
other manufactures	0.059	0.042	0.042	0.026	0.066	0.045

	Australasia		Middle East & Africa		South Asia	
	pre-UR	post-UR	pre-UR	post-UR	pre-UR	post-UR
primary agriculture*	0.030	0.029	0.209	0.200	0.085	0.084
mining, forestry, fisheries	0.003	0.002	0.170	0.170	0.161	0.136
processed food	0.058	0.041	0.224	0.215	0.286	0.286
textiles and clothing	0.360	0.221	0.329	0.328	0.574	0.540
chemicals	0.089	0.057	0.163	0.163	0.448	0.292
transport equipment	0.189	0.162	0.202	0.202	0.245	0.184
other machinery and equipment	0.112	0.072	0.195	0.195	0.359	0.264
other manufactures	0.132	0.090	0.222	0.221	0.463	0.341

	East Asia		Latin America		ROW	
	pre-UR	post-UR	pre-UR	post-UR	pre-UR	post-UR
primary agriculture*	0.909	0.630	0.044	0.029	0.067	0.051
mining, forestry, fisheries	0.077	0.065	0.083	0.082	0.108	0.106
processed food	0.370	0.262	0.162	0.155	0.354	0.302
textiles and clothing	0.197	0.135	0.283	0.264	0.334	0.279
chemicals	0.105	0.094	0.156	0.131	0.159	0.128
transport equipment	0.219	0.191	0.246	0.234	0.182	0.161
other machinery and equipment	0.102	0.082	0.214	0.178	0.122	0.106
other manufactures	0.097	0.086	0.194	0.178	0.201	0.185

source: GTAP, based on World Bank and World Trade Organization tariff data (See Finger et al 1996).
note: tariffs reflect Uruguay Round commitments on bound mfn tariffs.
Hence, further unilateral post-Uruguay liberalizations, which are unbound,
are not reflected in estimates of applied mfn rates.

* Agriculture protection reflects estimates, based on comparison of pre-Round imports and protection and post-Roun bindings. See Finger et al (1996).

Table 4
Tariff bindings on industrial products

		by major country group			
		Total	Developed economies	Developing economies	Transition economies
Tariff lines	Pre-	43	78	21	73
	Post-	83	99	73	98
Imports	Pre-	68	94	13	74
	Post-	87	99	61	96

		by region					
		North America	Latin America	Western Europe	Central Europe	Africa	Asia
Tariff lines	Pre-	99	38	79	63	13	16
	Post-	100	100	82	98	69	68
Imports	Pre-	99	57	98	68	26	16
	Post-	100	100	98	97	90	68

source: GATT/WTO tariff schedules and integrated database. See Blackhurst et al (1996).

Table 5
Applied mfn rates for office and telecommunications equipment, post-Uruguay Round

	pre-Round	post-Round
OECD North America	0.038	0.012
OECD Europe	0.058	0.030
OECD Pacific	0.069	0.047
OECD Asia	0.063	0.035
Middle East & Africa	0.167	0.167
South Asia	0.612	0.578
East Asia	0.097	0.055
Latin America	0.275	0.188
Rest of World	0.092	0.074

source: authors' calculations from WTO integrated database tariff data for pre- and post-Uruguay Round applied mfn rates, based on a comparison of applied rates and mfn bindings.

Table 6

The Uruguay Round implementation

real income effects, billions of 1992 dollars

(PERCENT OF REAL GDP IN PARENTHESES)

	industrial NTBs	industrial tariffs	agreement on agriculture	AGP	TOTAL
North America	20.4	16.7	2.2	0.6	**35.8**
	(0.3)	(0.3)	(0.0)	(0.0)	**(0.6)**
Western Europe	29.1	17.5	17	0.5	**63.7**
	(0.4)	(0.3)	(0.2)	(0.0)	**(1.0)**
Japan & Korea	10.4	37.5	8.5	0.3	**58.4**
	(0.3)	(1.1)	(0.2)	(0.0)	**(1.7)**
Australia & New Zealand	2.3	3.3	0.4	0	**6.2**
	(0.8)	(1.1)	0.1	(0.0)	**(2.1)**
Middle East & Africa	0.5	3.2	-2.5	0	**1.4**
	(0.1)	(0.4)	-(0.3)	(0.0)	**(0.2)**
South Asia	5.5	6.1	0	0	**10.1**
	(1.8)	(1.9)	(0.0)	(0.0)	**(3.4**
East Asia	76	33.8	2.6	-0.9	**125.5**
	(13.6)	(4.8)	(0.3)	-(0.1)	**(22.4)**
China and Hong Kong	-1.4	6.5	-1.9	0	**2.2**
	-(0.4)	(1.6)	-(0.4)	(0.0)	**(0.5)**
Latin America	2.4	5.3	-0.5	0	**7.4**
	(0.3)	(0.7)	-(0.1)	(0.0)	**(0.9)**
Rest of World	1.2	5.7	-1.9	0	**4.9**
	(0.1)	(0.6)	-(0.2)	(0.0)	**(0.6)**
World Total	149.2	135.5	23.4	0.7	**315.6**

source: authors estimates based on welfare changes (equivalent variation):
note: total involves implementation of all proposals. Due to policy interactions, reported parts do not sum to the total shown.

Table 7

Post-Uruguay Round liberalization scenarios
real income effects, billions of 1992 dollars
(PERCENT OF REAL GDP IN PARENTHESES)

	free trade for information technologies	50 % reduction in agriculture protection*	50 % reduction in industrial tariffs	AGP expansion	**TOTAL** reductions by all WTO Members	**TOTAL** reductions by OECD only
North America	14.0	8.3	23.1	1.9	**41.2**	**20.9**
	(0.2)	(0.1)	(0.4)	(0.0)	**(0.7)**	**(0.3)**
Western Europe	21.8	32.2	53.3	3.9	**110.4**	**47.1**
	(0.3)	(0.5)	(0.8)	(0.1)	**(1.6)**	**(0.7)**
Japan & Korea	23.4	46.3	33.1	2.1	**108.9**	**92.2**
	(0.7)	(1.3)	(0.9)	(0.1)	**(3.1)**	**(2.6)**
Australia & New Zealand	0.4	7.7	4.7	-0.2	**13.5**	**9.5**
	(0.1)	(2.6)	(1.6)	-(0.1)	**(4.5)**	**(3.2)**
Middle East & Africa	1.1	-2.1	8.1	0.0	**9.5**	**-0.1**
	(0.1)	-(0.3)	(1.1)	(0.0)	**(1.2)**	**-(0.0)**
South Asia	0.2	3.4	75.0	0.2	**63.6**	**5.2**
	(0.1)	(1.0)	(22.6)	(0.1)	**(19.2)**	**(1.6)**
East Asia	6.9	2.0	39.1	0.8	**65.9**	**13.6**
	(0.9	(0.3)	(5.2)	(0.1)	**(8.7)**	**(1.8)**
China and Hong Kong	0.5	1.6	10.8	0.0	**8.2**	**8.6**
	(0.1)	(0.4)	(2.6)	(0.0)	**(1.9)**	**(2.0)**
Latin America	4.4	0.8	12.8	-0.2	**15.9**	**4.7**
	(0.5)	(0.1)	(1.6)	-(0.0)	**(2.0)**	**(0.6)**
Rest of World	-0.9	4.2	8.1	0.0	**8.9**	**4.4**
	(-0.1)	(0.5)	(0.9)	(-0.0)	**(1.0)**	**(0.5)**
World Total	71.9	104.4	268.1	8.7	**446.1**	**206.1**

source: authors estimates based on welfare changes (equivalent variation).
note: total involves implementation of all proposals. Due to policy interactions, reported parts do not sum to the total shown.

* Agriculture scenario involves tariff and export subsidy reductions from applied levels (which are generally below bound levels).

Appendix Table A-1
Model Sectors and Regions

sectors	regions
primary agriculture	North America
mining, forestry, fisheries	Western Europe
processed food	Japan & Korea
textiles and clothing	Australia & New Zealand
chemicals	Middle East and Africa
transport equipment	South Asia
other machinery and equipment	East Asia
other manufactures	China and Hong Kong
trade, transport, communications	Latin America
other services	Rest of World

note: Sectors and regions are based on the sectoring scheme for the 1996 version 3 editi of the Global Trade Analysis Project dataset.