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John Whalley

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An Evaluation of the Recent Tokyo Round Trade Agreement Through a General Equilibrium Model of World Trade Involving Major Trading Areas[1]

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[1]I am grateful to the US Office of the Special Trade Representative for making available their data analyses of the tariff cuts characterizing the Tokyo Round agreement. I am also indebted to Bob Hamilton and Jon Fuller for invaluable research assistance. Financial support for the development and application of this model has been provided by the Ford Foundation under their competition in International Economic Order. The subject matter of this paper overlaps considerably with that of Deardorff and Stern [1979] and substantial reliance which has been placed on much of their work in generating the results presented in this paper.

I. Introduction

This paper reports some findings from an empirically based general equilibrium model of demand, production, and trade between the US, Japan, the (9 member) EEC, and a residual rest of the world using 1973 data. This model has been used to evaluate both the recent Tokyo Round trade agreement negotiated under the GATT and the microeconomic impacts of wider aspects of trade protection practiced by major industrial world trading areas.

The model is most easily understood as an empirical counterpart of the Hecksher-Ohlin trade models which dominate pure theory of international trade. A price endogenous framework is used in which, in equilibrium, all markets clear, each country is in zero external sector balance, and full employment of factors prevails. Constant returns to scale production and demand functions which satisfy Walras' Law are used. No factor mobility between countries is considered but full mobility of goods is captured. The main departure from traditional theory is the use of the so-called "Armington" assumption which treats similar products produced in different trading areas as close but not perfect substitutes. This procedure is adopted both to yield model consistency with "cross-hauling" in the trade statistics and to allow the direct incorporation of empirically based trade elasticities. Otherwise traditional theory is preserved; the dichotomy between real and monetary phenomena in classical general equilibrium theory is present and the choice of exchange rate regime makes no difference to the characteristics of long-run equilibrium in the model. All stabilization issues are therefore excluded from the analysis as are all so-called 'dynamic' effects due to increased competitiveness and scale economies.[1]

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[1] The importance of this exclusion should nonetheless be emphasized since potentially it is of great quantitative significance. The estimates of gains to Canada from free trade between Canada and the US of around 10 1/2% of GNP produced by Wonnacott and Wonnacott [1967] which rely on a scale economy, increased specialization argument are sharply contrasted with gains from customs union estimates in the EEC under constant returns to scale produced by Johnson [1958] and Scitovsky [1958]. The latter report estimates of gains in the region of 1/10th-1/20th of one percent of GNP.

Thirty-three products (29 traded and 4 non-traded) in each trading area are identified in the model along with a number of household groups in each area. Production and demand patterns are incorporated along with trading activity between the areas. Intermediate production incorporating substitution between products by area of origin (e.g., between US and Japanese steel) is included accommodating the feature that a major portion of world trade involves intermediate products. The parameters for equations in the model are chosen so that the model reproduces 1973 benchmark equilibrium data in the presence of 1976 tariff rates as an equilibrium solution and a number of counterfactual experiments are performed yielding simulated equilibria under changed policy environments. Evaluation of policy alternatives proceeds through comparisons between the "benchmark" equilibrium and simulated equilibria.

The model attempts to incorporate the major protectionist policies of the three industrialized trading areas identified even though the data used, in several instances, is not of high quality. The rest of the world is modelled in a schematic way with no serious pretense at realism. Ad valorem tariffs are incorporated and set at rates given by 1976 data along with ad valorem equivalents of those non-tariff barriers which have been able to be quantified, albeit crudely, for inclusion in the model. Ad valorem domestic tax rates on factors, products, and incomes are also included and have a significant impact on the structure and pattern of trade. In line with traditional trade theory, terms of trade and welfare effects are captured and these are emphasized in the model findings reported later. A number of policy alternatives are considered which represent both the Tokyo Round agreement, its constituent parts, and a wider evaluation of protectionist policies by the major industrialized world trading areas.

The approach followed here is similar to that pursued by Deardorff and Stern [1979] in their recent evaluation of the Tokyo Round agreement and the similarity both in approach and findings is worth emphasizing. Several of the cases analyzed are identical in the two pieces with a broad measure of agreement in findings. Some of the cases considered here go further than Deardorff-Stern in considering more extensive trade liberalization than that contained in the Tokyo Round agreement. The Deardorff-Stern model is richer in including 18 separate OECD countries and explicitly modelling quotas as quantity restrictions rather than as ad valorem equivalents as here. The models differ in that factor markets do not clear in the Deardorff-Stern model and thus only an incomplete equilibrium is determined when policies change. A further difference is that exchange rates enter the Deardorff-Stern formulation and appear to have real effects, a feature not typical of traditional general equilibrium models. There are also similarities to the approach of Cline et. al. [1978] which incorporates substantially more commodity detail than in the present model but uses an approach closer to traditional partial equilibrium analysis.

The major conclusions from the counterfactual policy analyses conducted with the model may be summarized as follows:

(1) As with the earlier studies by Deardorff and Stern [1979] and Cline et. al. [1978] the static worldwide annual welfare gains from the tariff cuts in the Tokyo Round are estimated to be very small. The aggregate static gain is in the region of $2 billion per year using 1973 data and 1976 tariff rates from a world GNP of around $5 trillion in 1973. This indicates a welfare gain of less than 0.1% of world GNP. This can either be dismissed as negligible,

or swamped by known margins of error in national accounts and trade statistics. The suggestion from this calculation is that in terms of aggregate microeconomic impacts, current tariff reduction negotiations under the GATT are concerned with relatively minor issues and the detailed discussion of alternative tariff cutting formulae and other similar issues in such agreements may not be worthwhile. These aggregate impacts are not necessarily inconsistent with individual small groups gaining or losing significant amounts as a result of the agreement. The vocal response from small groups of losers can give an appearance of major impact, even when the economy wide aggregate impact remains small.

(2) Within the agreement, results indicate that impacts from those changes in NTB's (non-tariff barriers) which can be quantified could be larger than impacts from agreed tariff cuts. The qualification to 'could be' seems inevitable given both poor data and limited information as to the precise nature of the agreement on NTB's, but a similar finding is produced to that of Deardorff and Stern that under certain assumptions impacts from changes in government procurement practices alone are more significant in the model than impacts from all agreed tariff changes over the eight year transition period.

(3) While aggregate welfare impacts are small, terms of trade impacts are more significant and the gain or loss for individual trading areas can exceed the aggregate gain. Under certain assumptions less developed and developing countries will be the major loser from the tariff cuts under the agreement due to adverse terms of trade movements, although the rest of the world is shown in results as potentially offsetting losses from tariff cuts with gains from NTB reductions.

(4) Attempts have been made to compute equilibria capturing the retaliatory incentives for each trading area in a stylized 'tariff war' and use these equilibria as the point from which to evaluate the agreement. Under this calculation the gains acheived from negotiated reductions in levels of

protection to those currently prevailing are compared to a non-cooperative retaliatory outcome from the world trading system such as under a tariff war, rather than the pre-agreement situation which already is a partially cooperative equilibrium. These computations show much larger gains to be involved with current negotiated levels of protection if the comparision is to a retaliatory outcome in world trade rather than simply the pre-negotiation level of protection. On this basis it can be argued that the Tokyo Round agreement should be viewed not simply as a piecemeal change in levels of world protection but as part of an ongoing process of accommodation of a cooperative solution to the game theoretic structure characterizing protectionist policies between major trading blocs. As an accommodation preserving agreement the Tokyo Round appears far more significant than simply as an additional step towards complete free trade starting from current protection levels.

The plan of the paper is as follows. An overview of the Tokyo Round Agreement is first provided along with a broad evaluation of its major provisions. An outline of the general equilibrium model of world trade used is presented next. The model findings are then summarized along with an assessment of their main implications for evaluation of the Tokyo Round proposals. At the same time findings of other studies on trade liberalization are surveyed and related to results reported from the model.

II. An Outline of the Tokyo Round Trade Agreement

The Tokyo Round trade agreement initialled in April 1979 is the seventh in a sequence of rounds of trade agreements negotiated under the GATT since its formation in 1947. Many of the participants in the negotiations leading up to the agreement have portrayed it as being the most ambitious and wide ranging of the trade agreements negotiated under the GATT while a number of trade analysts not party to the agreements have suggested more modest claims may be realistic. Strong supporters of the agreement stress the continued

commitment to GATT and international cooperation which the agreement demonstrates by participating countries, the potential significance of non-tariff code changes, and the value of further tariff cuts even if existing tariffs are already low.

A reasonable overview is that the Agreement contains relatively modest cuts in already low (post-Kennedy Round) tariffs along with non-tariff code changes whose significance cannot be evaluated until several years hindsight is available. A bewildering amount of detail is contained in the Agreement[1] which to many has taken a seemingly unnecessary amount of time to acheive.[2] A lengthy period between 1973 and 1978 concentrated mainly on trying to agree on a general guiding formula for the tariff cuts. There is also an eight year transition process in the Agreement of instituting the tariff cuts which some view as unnecessarily lengthy.

The main features of the agreements are summarized in Table 1 and involve the following.

(i) Tariff Cuts: Participants have agreed to a sequence of tariff cuts to be phased in over an eight year period beginning in 1980. The tariff cuts average around 30% for the major trading areas. They are largely restricted to non-textile, non-petroleum, manufactured products although some agricultural products are included.

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[1]The Agreement contains separate bilateral agreements between participating countries with tariff cutting provisions extended through MFN status to (effectively) all participants. Tariff negotiations have involved as many as 20,000 items. While much of negotiating has been guided by general tariff cutting formulae, it is not unusual to find matters of detail which would bewilder the average analytical economist. For instance, as a result of the agreement the US will eventually have a tariff on carrots of .5¢ per lb., but 1¢ per lb. if the carrots are under four inches long; coloured special glass not over 15/32" thick and not over 2 2/3 sq. ft. is duty free, but coloured special glass not over 15/32" thick but over 7 sq. ft. has a duty of 1.5 ¢ per sq. ft. + 4%. See also the highly entertaining "Removing Tariffs on Chandalier Crystals and Canadian Race Horses" in Adams [1979]. In this paper such detail is compressed into aggregated tariff rates over aggregated commodity categories but the fact that such detail is there and the source of much of the policital negotiation should not be lost sight of.

[2]The initial GATT Ministerial Meeting in Tokyo of September 12-14 1973, issued a declaration which declared an intent to conclude negotiations in 1975 rather than April 1979 as turned out to be the case.

Table 1

Summary of Main Features of the Tokyo Round Trade Agreement*

A. Tariff Cuts

(a) Multilateral tariff cuts averaging around 25-30% on post Kennedy Round tariff rates and covering most industrial and some agricultural products.

(b) General guiding formula (so-called 'Swiss formula') for tariff cuts is of the form $t_N = \frac{k \cdot t_o}{K + t_o}$ where t_o and t_N are pre and post cut tariffs, and k is a constant in the range 0.16-0.14 depending upon the country involved.

(c) For the major trading areas of the EEC, the U.S., and Japan; precut industrial tariff rates average around 7%, post cut around 5%. Some of the smaller trading nations (such as Australia, Austria and New Zealand) with higher tariffs have approximately similar proportional cuts. Of the three major trading areas, the U.S. has the greatest dispersion in tariff rates.

(d) The timetable for the cuts is over eight years, to begin in 1980. Two-eighths of the reductions are to go into effect between January 1 and July 1, 1980 with six equal cuts to follow on January 1st of each subsequent year.

B. Non-Tariff Code Changes and Agreements

(a) Custom Valuation-agreed use of consistent market valuation with elimination of administered prices as basis for valuation. The U.S. has agreed to abandon the American selling price and American list price (administered prices for valuation)provisions but will raise tariffs on affected items to compensate for the change.

(b) Government procurement-agreement to open international bidding for government contract work in all trading areas. The U.S. feels that relative to other countries their current government procurement practices are substantially more liberal and so the U.S. should gain from the change.

(c) Import Licensing procedures-agreement to simplify administration and operate procedures in "neutral and fair" manner. The impact of this is unclear.

(d) Subsidies and Countervailing Duties-countries pledge that domestic subsidies will not be administered so as to harm trading interests of other countries, nor countervailing measures against subsidies in other countries be used so as to "unjustifiably impede" international trade. The impact of this is also unclear.

(e) Standards: Agreement to follow international standards as far as possible for health, safety, consumer, and environmental protection. The impact of this is also unclear.

(f) Civil Aircraft Agreement-This is the sole separate sector agreement resulting from the sector by sector approach common in earlier GATT agreements. Tariffs on most civil aircraft and parts are abolished and some non-tariff barriers modified on civil aircraft and parts by the U.S., EEC, Japan, Sweden, and Canada.

C. Discussions on a "New Framework" for International Trade

(a) Possibility discussed of revising MFN status definition to allow for a more flexible system of trade preferences towards LDC's by industrialized countries than under the generalized system of preferences (GSP).

(b) Discussion of extension of guidelines on use of trade restricting policies to restore balance of payments equilibrium.

(c) Possibility raised of forming international agricultural consultative council to oversee price stabilization and stockpiling programs for selected agricultural commodities; but no concrete proposals made.

(d) Possible revisions discussed to Anti Dumping Code but not proposed.

*The agreement concluded April 12, 1979 covers 41 countries including 19 developing countries although 99 countries have been involved in the discussion on the trade agreements at various stages. The major participants are the industrialized OECD countries with the U.S., the EEC and Japan forming the dominant trading blocs.

A substantial amount of time was spent during the negotiations on the choice of a general formula to guide the multilateral cuts with the final choice resting on the compromise Swiss formula listed in Table 1. The Europeans argued strongly for a "harmonization" formula which would cut large tariffs more than proportionately than low tariffs. This seems to have been motivated partly by the European desire to harmonize, and also by the more pronounced dispersion in the American tariff. In the Kennedy round the Europeans had taken a similar position arguing the case that tariff "disparities" constitute a major issue. The U.S. favoured a linear cut in tariffs; the Swiss formula is an accommodation between the two. Interesting, Deardorff and Stern show that a mechanical application of the Swiss Formula to 1976 tariff rates produces tariff cuts quite different in some cases than those appearing in the data produced by the Special Trade Representatives Office in the U.S. (STR) as characterizing the tariff cuts in the agreement. The reasons for this would seem to be either that the actual cuts are some distance from the general guiding formula or that averaging the tariff rates across the detailed categories involved produces this result.

Arguments made over these proposed cuts follow a number of different lines including the following

(a) Given that post Kennedy round tariffs are already low for the U.S., the EEC, and Japan, not too much can be expected from any further sequence of tariff reductions. This view argues that major reductions in tariffs have already occurred under the Kennedy round and in preceding GATT rounds and not too much remains to be cut that can have a major impact on world trade. Under this view of things, concerns over the length or structure of the phasing in arrangements, the form of the general formula, etc., are misplaced in the sense that impacts will be very small whatever the structure of the tariff cuts.

(b) The tariff cuts do not result in significant liberalization of trade in agricultural goods and textiles, and prevent developing and less developed countries from achieving major gains. While they share in the tariff cuts on manufactured products these are not items heavily exported by these countries. Indeed, the expansion in world trade in manufactured products can be expected to move the terms of trade against third world countries possibly more than offsetting any modest gains they receive from reductions in tariffs on their manufactured exports.

(c) Even if the tariff cuts are small, the maintenance of a momentum in the direction of free trade could be stressed rather than the size of the change. This view stresses the role of the agreement in preserving a cooperative accommodation to the pressures leading to a retaliatory protectionist war between major world trading blocs. In addition, small welfare gains from further cuts in low tariffs, while not of dramatic quantitative significance, should clearly not be foregone by not entering into the agreed cuts.

In Table 2 the data used to represent the tariff cuts in the model used later are presented. The data presented draw on a compilation produced by the U.S. Special Trade Representative's Office (STR). Pre-agreement tariff rates are 1976 tariff rates calculated on a duties paid basis with no allowance for either administered prices or differences in valuation procedures in calculating the tariff base. Post-agreement rates are as projected by STR for the end of the transitional period specified in the agreement. The average 30% tariff cut is revealed as is the dispersion by product for the major trading areas considered. The later data analyses use the applied Japanese rates rather than the GATT (primarily upperbound) rates.

Table 2

Pre and Post Tokyo Round Ad Valorem Tariff Rates, by product and by trade area, as used in the model[1]

Industrial and Product Category Used In the Model Discussed Later	EEC		U.S.		Japan			
					GATT Rates[3]		Applied Rates[3]	
	Pre (1976)	Post[2]	Pre (1976)	Post[2]	Pre (1976)	Post[2]	Pre (1976)	Post[2]
Agriculture								
(1) Meats and Dairy Products	1.0	0.8	6.0	4.1	10.4	9.9	7.9	7.2
(2) Cereals	5.0	3.3	3.1	2.8	11.3	10.9	0.4	0.9
(3) Other Agricultural Products Fruits, Vegetables, Oil Seeds, Nuts, Animal Feed, Crude Animal and Vegetable Materials. Silk Wool, Cotton, Jute and Vegetable Fibres.	4.9	3.4	1.8	1.7	15.8	14.7	14.9	14.5
(4) Forestry and Fisheries	1.9	1.2	0.5	0.4	6.4	5.7	6.3	5.7
Mining								
(5) Coal	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.0
(6) Oil, Natural Gas	0.0	0.0	4.0	4.0	11.0	11.0	0.0	0.0
(7) Metallic, Non-Metallic and Other	0.3	0.2	0.3	0.1	0.3	0.1	0.9	0.7
Manufacturing								
Non-Durable Goods								
(8) Tea, Sugar, Coffee, Spices, Cocoa	2.0	1.8	5.5	5.3	34.8[2]	34.7	34.1[2]	34.1
(9) Alcoholic Drinks	11.0	9.0	8.2	5.2	53.1[2]	34.3	39.6[2]	32.7
(10) Other Foods Animal and Vegetable Oils and Fats, Misc. foods Prep. fruits and veg., Prep. cereals, Beverages, Prep. meat and fish.	6.3	4.5	3.9	2.7	10.3	8.6	9.5	8.4
(11) Tobacco	0.0	0.0	13.5	13.0	54.3[2]	54.3	54.3[2]	54.3
(12) Apparel and Textile Products	12.2	9.0	19.6	15.9	10.0	8.2	8.4	8.0
(13) Paper, Printing, Publishing	5.7	4.0	0.7	0.3	5.6	2.7	2.2	1.4
(14) Pharmaceuticals and Toiletries	11.2	6.8	8.0	4.5	9.9	5.3	7.0	5.3
(15) Other Chemical and Allied Products	8.8	6.3	6.0	3.9	8.4	5.0	6.0	4.8
(16) Petroleum and Coal Products	9.5	6.3	0.0	0.0	8.9	2.7	1.5	1.4
(17) Rubber and Plastics	11.3	7.5	5.6	4.3	11.6	6.6	8.8	6.6
Durable Goods								
(18) Lumber, Wood and Furniture	3.5	2.5	4.5	2.2	0.8	0.5	0.6	0.5
(19) Primary and Fabricated Metals, Stone Glass	6.9	4.7	4.7	3.2	5.1	2.3	3.1	2.2
(20) Machinery Except Electrical	7.2	5.0	4.6	2.9	11.3	4.6	8.5	4.6
(21) Electrical Machinery	9.8	7.9	6.4	4.2	10.3	4.4	7.2	4.4
(22) Transport Vehicles	8.2	6.2	3.5	2.5	14.9	2.1	6.9	2.1
(23) Scientific and Precision Instruments	9.7	6.1	10.1	5.5	14.5	5.3	9.5	5.3
(24) Miscellaneous Manufacturing	8.5	6.1	6.7	4.7	6.4	5.5	11.1	6.4
Construction								
(25) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Services								
(26) Water Transportation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(27) Other Transportation and Communications	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(28) Housing Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(29) Electricity, Gas and Water Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(30) Wholesale and Retail Trade	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(31) Finance, Insurance and Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(32) Other Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(33) Government Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRADE WEIGHTED TARIFF AVERAGES A. All	5.16	3.67	4.41	3.25	7.01	5.13	6.79	5.43
B. All (excluding items 8, 9, 11 for Japan)	5.16	3.67	4.41	3.25	6.30	4.42	4.13	3.53
C. Manufactures (8-24)	7.65	5.47	6.01	4.35	8.96	5.58	5.03	3.61
D. Manufactures (excluding items 8, 9, 11 for Japan)	7.65	5.47	6.01	4.35	7.22	3.74	3.40	2.80

[1]Source: 1976 Tariff Data on SITC classification provided by the Special Trade Representative's Office, U.S. Government.

[2]These high tariffs partially reflect the use of tariffs rather than excise taxes in Japan for so-called "merit want" items. These items are heavily taxed in the EEC and the U.S. and should not simply be interpreted as part of a harsher protective posture by Japan relative to the U.S. and the EEC.

[3]The difference here is between the GATT bound rates (primarily upperbounds) and the rates applied and expected to be applied after the agreement. The difference in these two rate schedules is pronounced and in the data analysis which follow most stress is place on the applied rates.

(ii) Codes Covering Non-Tariff Barriers

The changes in non-tariff barriers in the Tokyo Round agreement cover a variety of issues. A consensus at the present time seems to be that it is very difficult if not impossible to evaluate their importance until they have been in place for some time since their impact in practice depends largely on their interpretation and administration.

The principal items covered are as follows

(a) Customs Valuation: Here the agreement is to use consistent valuation practices for trade between all signatories using a so-called 'transactions' price. Currently the U.S. (and Canada) value imports on an f.o.b. basis for customs purposes while the EEC, Japan and most other GATT countries use c.i.f. valuations. The agreement will remove these different bases and also move the U.S. away from use of administered prices. The U.S. use administered prices (American selling price and American list price) particularly for footwear and pharmaceutical products along with the so-called 'wine gallon' assessment for some spirits. Upward revision in tariff rates will be used in some cases to offset the changes in valuation method.

(b) Government procurement: Currently all countries given preferences of various forms to domestic contractors when bidding occurs for government contract work. In the U.S. this is explicitly recognized in a 12% cost differential allowed to domestic firms in bidding for federal government contracts; in the EEC and Japan there is no formula cost advantage but the impression is widespread that foreign contractors are largely excluded from all government contract activity except where goods and services are completely unavailable from domestic sources. The agreement seeks to open up all government procurement practices to competitive bidding by both domestic and foreign firms.

(c) Import licensing procedures: Contracting parties undertake to simplify the administration of import licensing schemes and administer them in a "neutral and fair" way. The quantitative importance of this is difficult to realistically evaluate although complaints by exporters of administrative delay and complexity are common in many countries.

(d) Subsidies and countervailing duties: Here the agreement aims to bind countries to general principles that the use of subsidies by them will not harm the trading interests of other countries nor that countervailing measures against subsidies to exports by other countries should 'unjustifiably impede' international trade. Exactly what this will mean in practice remains to be determined but a significant change is a U.S. agreement to apply a test of material injury before imposing countervailing duties.

(e) Standards: A code has been agreed under which countries will, by and large, follow international standards for health, safety, consumer and environmental protection, and the like, and will not use standards to create impediments to trade.

The net effect of these non-tariff agreements is exceedingly difficult to evaluate. The extent to which trade is already interfered with by non-tariff barriers is not known with any accuracy and the estimation of the effects of changes in these barriers is doubly difficult if the initial levels are the subject of little more than guesswork. One can argue, on the one hand, that these are vague agreements on non-tariff changes with no clear enforcement procedure and thus cannot have a major impact on world trade. On the other hand, one can argue that for the first time a round of GATT negotiations have substantively moved beyond the field of tariff cuts into consolidation of non-tariff barriers and a framework for mutual understanding has been established which will lead eventually to significant reductions in current levels of protection.

While it may seem a little disturbing that there does not appear to be a reasonable procedure available to differentiate between these two divergent views, any complete evaluation of these changes must, in the author's opinion, remain largely hypothetical. The procedure adopted here is to use whatever information is available for those code changes which can be quantified in the spirit of a best guess procedure; while there may be few alternatives, there are clear limitations of such a procedure and a skeptical caution of such quantification is healthy even if one proceeds with it.

(iii) A New Framework for International Trade

In addition to the tariff cuts and the changes in non-tariff codes, the Agreement also contains sections which both point forward to directions for future agreements, and suggest modifications and extensions of the existing framework for world trade.

The Agreement suggests

(a) Possible redefinition of most favoured nation provisions in the GATT to allow for more flexible trade preferences towards less developed and developing countries than exist under the system of generalized preferences (GSP).

(b) An extension of the guidelines for use of trade restricting policies to restore balance of payments equilibrium to make it easier for developing countries to use trade restricting measures for balance of payments and development objectives.

In addition, a possible international agricultural consultative council to oversee price stabilization and stockpiling of agricultural commodities and possible revisions to the Anti-Dumping Code were discussed while the Agreement was being framed. No provisions along these lines are included in the final documents and they have been left as issues for future negotiations, whenever these might occur.

In broad terms, then, the Agreement contains reasonably clear tariff cuts to come into operation over an eight year period, a number of proposed modifications to non-tariff barriers whose structure and impact remain highly uncertain, and some suggestions for modifications of GATT rules as they apply to developing countries.

The aggregate effects of the tariff cuts in quantitative terms are likely to be small because they are modest cuts in already low tariffs. It remains an issue of substantial political importance as to who gains and who loses and a further question remains as to how small the effects have to be before they can be dismissed as insignificant. Even if the effects in aggregate are small it does not follow automatically that the effects for any given trading area are also small since some areas may gain and others may lose.

The predominant exclusion of agricultural products, natural resource items, and textiles from the Agreement suggests that developing and less developed countries may not gain from the agreement and can conceivably lose. This would follow from the terms of trade effect against these countries from tariff cuts on items produced almost exclusively by developed countries.

The assessment of the effects of changes in non-tariff barriers is inevitably little more than educated guesswork given the almost total absence of reliable data, but in spite of this it seems worthwhile to attempt to evaluate whether the effects of NTB changes may (given current best guesses) dominate the effects of tariff cuts or are of a comparable order of magnitude.

Even if the impacts of changes in protection under the Tokyo Round are small, an argument in favour of the whole process which remains is that the Agreement is part of an ongoing accommodation of existing cooperative arrangements under the GATT to the trade policy retaliatory incentives which dominated protective policies in the 1930s when many tariffs reached 50% and higher. To

the extent that this is true it becomes important to evaluate the agreement not in terms of its departure from the last agreement but relative to a retaliatory trade war outcome (a Nash equilibrium). Such an evaluation is inevitably quantitatively imprecise, to say the least, but it does place the current agreement in a different perspective compared to a simple evaluation of the immediate effects of the changes in protection ignoring any retaliatory issues.

This overview of issues provides the perspectives from which the Agreement is evaluated in the analysis which follows.

III. An Overview of Trade Protection in Major Trading Areas

A multi-purpose general equilibrium model capable of analyzing the price distorting effects of a number of policy interventions in world trade is used to evaluate the Tokyo Round Agreement, and a number of different components of commercial policy are considered in the model. Tariffs, selected non-tariff barriers, and domestic tax policies for the EEC, the U.S. and Japan are all incorporated in ad valorem form and these change the pattern and structure of world trade between the trading blocs from a no-policy regime. This approach of treating protectionist policies as a commercial policy package is followed even though there are obvious difficulties in quantifying the non-tariff barriers.

To place the Tokyo Round Agreement in the fuller quantitative perspective of existing protectionist policies, it is useful to expand on these components of commercial policy and their model representation and in Table 3 the protective effects of these three components of commercial policy, as modelled, are outlined. The broad pattern of tariff rates along with non-tariff barriers in ad valorem equilibrium form as used in the model is given with rates for the product categories considered in the model reported by trading bloc. Tax induced deviations in domestic prices from world producer prices are also reported and discussed later.

Table 3

Protection by trading area as represented in the model (All figures are percentages)

Product Category	U.S. 1976 Tariffs	U.S. NTB ad valorem equivalents[2] used in the model	U.S. Partial Equilibrium Estimate of Tax induced Deviation from World Prices[3]	EEC 1976 Tariffs	EEC NTB ad valorem equivalents[2] used in the model	EEC Partial Equilibrium Estimate of Tax induced Deviation from World Prices[3]	Japan 1976 (Applied Rate) Tariffs	Japan NTB ad valorem equivalents[2] used in the model	Japan Partial Equilibrium Estimate of Tax induced Deviation from World Prices[3]
Agriculture									
(1) Meats and Dairy Products	6.0	36.0	-4.1	1.0	54.0	-1.8	7.9	126.0	-3.0
(2) Cereals	3.1	0.0	-5.4	5.0	51.0	-1.2	0.4	6.0	-4.8
(3) Other Agricultural Products Fruits, Vegetables, Oil Seeds, Nuts, Animal Feed, Crude Animal and Vegetable Materials. Silk Wool, Cotton, Jute and Vegetable Fibres.	1.8	88.0	-8.0	4.9	37.0	+1.2	14.9	132.0	-4.5
(4) Forestry and Fisheries	0.5	66.0	-9.5	1.9	24.0	-5.4	6.3	54.0	-1.9
Mining									
(5) Coal	0.0	0.0	-5.9	0.9	97.0	0.0	0.0	92.0[4]	-2.0
(6) Oil, Natural Gas	4.0	0.0	+0.7	0.0	97.0[4]	+5.8	0.0	92.0[4]	+9.2
(7) Metallic, Non-Metallic and Other	0.3	0.0	+1.7	0.3	0.0	+0.3	0.9	0.0	-2.6
Manufacturing									
Non-Durable Goods									
(8) Tea, Sugar, Coffee, Spices, Cocoa	5.5	19.0	+3.7	2.0	42.0	-3.7	34.1	75.0	-1.5
(9) Alcoholic Drinks	8.2	[0.0][1]	+3.8	11.0	[0.0][1]	+0.4	39.6	[0.0][1]	+0.8
(10) Other Foods Animal and Vegetable Oils and Fats, Misc. foods Prep. fruits and veg., Prep. cereals, Beverages, Prep. meat and fish.	3.9	6.0	+3.2	6.3	37.0	-1.9	9.5	55.0	-2.0
(11) Tobacco	13.5	[0.0][1]	+3.5	0.0	[0.0][1]	-1.2	54.3	[0.0][1]	-0.6
(12) Apparel and Textile Products	19.6	41.0	+1.9	12.2	31.0	+5.0	8.4	5.0	+1.7
(13) Paper, Printing, Publishing	0.7	28.0	+1.2	5.7	57.0	+0.2	2.2	15.0	+1.7
(14) Pharmaceuticals and Toiletries	8.0	26.0	+1.7	11.2	31.0	-5.2	7.0	86.0	+5.8
(15) Other Chemical and Allied Products	6.0	[0.0][1]	+2.6	8.8	[0.0][1]	-1.0	6.0	[0.0][1]	+3.3
(16) Petroleum and Coal Products	0.0	0.0	0.0	9.5	0.0	-13.1	1.5	0.0	-3.6
(17) Rubber and Plastics	5.6	0.0	+4.0	11.3	0.0	+3.0	8.8	0.0	+2.9
Durable Goods									
(18) Lumber, Wood and Furniture	4.5	0.0	+4.7	3.5	0.0	-0.8	0.6	0.0	-0.7
(19) Primary and Fabricated Metals, Stone Glass	4.7	0.0	+0.5	6.9	0.0	+2.2	3.1	0.0	-0.3
(20) Machinery Except Electrical	4.6	0.0	+1.0	7.2	0.0	+1.9	8.5	0.0	+0.1
(21) Electrical Machinery	6.4	0.0	+0.7	9.8	0.0	+6.3	7.2	0.0	+2.2
(22) Transport Vehicles	3.5	0.0	+1.6	8.2	0.0	+6.0	6.9	0.0	+3.6
(23) Scientific and Precision Instruments	10.1	0.0	+3.0	9.7	15.0	+7.3	9.5	14.0	+2.2
(24) Miscellaneous Manufacturing	6.7	0.0	+0.4	8.5	[0.0]	+2.7	11.1	[0.0]	+0.9
Construction									
(25) Construction	0.0	0.0	-1.1	0.0	0.0	+0.8	0.0	0.0	-0.7
Services									
(26) Water Transportation	0.0	0.0	-0.7	0.0	0.0	+1.5	0.0	0.0	-3.6
(27) Other Transportation and Communications	0.0	0.0	+1.1	0.0	0.0	-2.3	0.0	0.0	+4.0
(28) Housing Services	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
(29) Electricity, Gas and Water Services	0.0	0.0	-3.5	0.0	0.0	+1.3	0.0	0.0	+7.5
(30) Wholesale and Retail Trade	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
(31) Finance, Insurance and Real Estate	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--
(32) Other Services	0.0	0.0	-5.0	0.0	0.0	-1.3	0.0	0.0	-1.1
(33) Government Services	0.0	0.0	--	0.0	0.0	--	0.0	0.0	--

[1] No ad valorem equivalents seem to exist for commodity categories where parentheses with zeros are entered. In these cases the absence of estimates, coupled with a belief that no major trade discriminatory NTB's operate has lead to a procedure of assuming zero values in the model to be discussed later. In some of these cases there are suggestions in the literature that some NTB's are applied (e.g., standards on machinery items in Japan) and the use of zero entries in these cases is in all probability a cause of downward bias in protection towards manufactures in the model.

[2] References to data sources appear in the text. The impacts of government procurement policies are excluded from this column but are separately incorporated in the model. A description appears later in the text.

[3] The calculations involved in these cases are discussed more fully in the text. No numbers are reported for non-traded goods and columns are not exactly zero because of the presence of non-traded goods in the model.

[4] These are estimates using 1973 data for coal and energy products which have been used for both coal, and oil, natural gas. For later years these estimates are in all probability too high but since no tariff for policy changes on oil are considered these earlier year estimates have been used.

The average tariff rates in Table 3 across all manufactured products do not differ sharply between the U.S., the EEC, and Japan with lower rates prevailing in Japan reflecting unilateral cuts in Japanese tariffs beyond those cuts agreed in the Kennedy Round made in the period preceding the conclusion of the Tokyo Round. These data are tariffs for 1976 which make no allowance for differences in valuation procedures and are used in the main analyses reported later in unadjusted form, although some correction for this is attempted in secondary runs. This dispersion in tariff rates within non-durable and durable manufacturing is more pronounced in the U.S. case. The 'post' tariff rates, corresponding to the end of the phase in period under the trade agreement, have already been commented upon.

Non-tariff barriers include an assortment of policies which either deliberately or coincidentally affect trading patterns in addition to those effects induced through tariff policies. In recent years they have attracted increasing attention due to the view of many people that they serve in practice as a more severe impediment to trade than conventional tariff policies. A number of studies (Baldwin [1970], Walter [1972], UNCTAD [1969, 1970]) have attempted to classify and describe these barriers, although numerical estimates as to their importance are somewhat sparse. A study by Roningen and Yeats [1976] drawing on UNCTAD documentation provides estimates for France, Japan, Sweden, and the U.S., and a related study by Yeats [1976] contains estimates of the role of non-tariff barriers on agricultural products in the EEC. These two studies have been drawn upon heavily in the quantification used here.
A descriptive list of non-tariff barriers would include government purchasing policies, quotas, seasonal restrictions, specific licensing regulations, valuation procedures for tariff purposes, voluntary export restraints, special import charges (including such items as variable levies in the European

Community Agricultural Policy), and health and sanitary regulations. Clearly, some of these are more important than others and some can be quantified more satisfactorily than others.

The more major non-tariff barriers by trading bloc and by product are outlined in Table 4 which also reports ad valorem equivalents for these barriers for the aggregated commodity classification used by Brown and Whalley [1980]. Table 3 reports the ad valorem equivalents of non-tariff barriers (excluding government procurement policy effects) used in the model described later. The latter are separately incorporated as an equivalent 50% tariff on imports by government in the EEC and Japan following an approximate calculation reported in a working paper produced by the U.S. Department of Labor.[1] The relative size of these non-tariff barriers compared to the tariffs, while apparent from Tables 3 and 4, should be emphasized nonetheless. In addition, this portion of the overall data set inevitably involves crude approximation and for some commodity categories the absence of any information has resulted in an assumed zero value for the NTB equivalent even though some restrictions on trade through standards and other measures may occur.[2]

[1] This figure is contained in Attachment 2 "Government Procurement Code: Impact on U.S. Trade and Employment" to U.S. Department of Labour, Trade and Employment Effects of Tariff Reductions Agreed to in the MTN, June 15, 1979. This attachment projects an increase in U.S. exports using 1977 data at $1.3-$2.3 bill with a modest increase in U.S. imports of $.3 bill from the changes in government procurement practices. This attachment indicates a larger impact on the U.S. trade balance (at fixed prices) from procurement changes than from all the tariff cuts in the Agreement.

[2] It is important to note, in addition, that quotas and other non-tariff barriers are represented in the model in ad valorem equivalent form rather than as direct restrictions on quantities imported. A distinguishing characteristic of quotas and other non-tariff barriers is that, in practice, they generate no tax revenue for the government. This is accommodated in the model by returning receipts from these charges in lump sum form to consumer groups; the lump sum payments being determined by ratios of consumer incomes in basic data. The effects of quotas are more realistically captured in a general equilibrium model not as equivalent ad valorem charges but directly as quantity restrictions. For a computational point of view it is straightforward to incorporate the quantity restrictions implied by quotas by considering an additional fictitious commodity which must be purchased when a good involved is imported. The endowment of this commodity can be made equal to the value

Table 4

Summary[1] of Major Non-Tariff Barriers by Broad Category and by Trading Bloc U.S. reported in Brown and Whalley [1980]

Category	Non-tariff Barriers on US Imports: Description	Ad Valorem Equivalent Used for Category	Non-tariff Barriers on Japanese Imports: Description	Ad Valorem Equivalent Used for Category	Non-tariff Barriers on EEC Imports: Description	Ad Valorem Equivalent Used for Category
Agricultural and Food Products	Quotas on Meat and Dairy Products International Agreements on Coffee, Sugar, Cocoa	31.9	Health and Sanitary Restrictions Subsidies (primarily to rice producers) International Agreements on Coffee, Sugar, Cocoa State trading in Alcohol and Tobacco	97.0	Common Agricultural Policy (Meat, Dairy, and Grains) International Agreements on Coffee, Sugar, Cocoa	45.4
Raw Materials	Licence fee system on Petroleum Imports Quotas (Petroleum, and Metallic and non-metallic ores) Depletion Allowances	Effects Small: Value of 0 Used	Subsidies to Coal Quotas on Petroleum, Natural Gas	65.6	Subsidies to Coal, Quotas on Coal State Trading in Coal, Petroleum, Natural Gas	88.6
Non-Durable Manufactures	Quotas on Petroleum and Oil Products, Textile Quotas	28.0	Quotas on Chemical and Petroleum Products	17.9	Quotas on Chemical Products, Petroleum and Coal Products Rubber, Textiles	22.9
Durable Manufactures	Subsidies via Government Research Expenditures . Steel Restrictions	Effects Small in 1973: Value of 0 Used	Quotas (Computers, transistors, communications equipment) subsidies (ship-building)	9.0	Quotas (Steel, electrical machinery, transport equipment) Subsidies Restrictive Standards	16.8
Service Items and Other	Merchant Marine Flag Discrimination	No Estimates Available - Assumed Small: Value of 0 Used		No Estimates Available - Assumed Small: Value of 0 Used		No Estimates Available - Assumed Small: Value of 0 Used
General Non-tariff Barriers	Government Procurement Policies		'Buy National' and Government Procurement Policies Voluntary Export Restraints		'Buy National' and Government Procurement Policies	

[1] Summary and rates apply as far as possible to the period immediately prior to 1973 and take no account of subsequent changes in policies, especially to raw materials since the events of late 1973.

[2] Sources: for description; various GATT and UNCTAD documents, U.S. Tariff Commission Reports [1974]; for estimates of rates, Yeats and Roningen [1976], Baldwin [1970] and authors' own calculations.

Domestic taxation and subsidy policies also affect trade patterns and to the extent that they change a country's terms of trade they can have impacts on a country's trade and welfare comparable to that of a tariff. Domestic taxes and subsidies are thus included in the present model as part of the combined policy set characterized as 'commercial policy'. The model used incorporates the domestic taxation and subsidy systems of each of the trading blocs by treating corporate and property taxes as taxes on profit type returns by industry, social security contributions as taxes on labour use by industry, value-added and sales taxes as production taxes, specific excises as consumption taxes, and income taxes as charges on income receipts by consumer groups.

In Table 3 an approximate calculation has been made as to the effects of domestic taxes and subsidies on the terms of trade for the three major trading areas considered. Assuming factor prices to be unity all domestic taxes and subsidies are abolished, cost covering product prices calculated for all domestic products calculated and the resulting prices rescaled so that they sum to the same value as before the tax abolition. Where prices rise one can argue that in relative terms the tax system depresses that product price relative to world prices. The calculations in Table 3 suggest that tax systems in the EEC, the U.S., and Japan operate partially as an export tax on manufactured products. A prominent tax feature accounting for this is the capital tax structure in the factor tax system in these areas, a suggestion which is explored more fully in Whalley [1980].

Viewed in the context of the estimates of protection presented in Table 3 the relative insignificance of the tariff cuts becomes a stronger null hypothesis. In ad valorem terms the indications are that non-tariff barriers are quantitatively of considerably greater significance than tariffs.

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of the quota involved and owned by the recipient of the rents which quotas create. If a quota is not binding in equilibrium, the corresponding artificial commodity will have a zero price. While this approach can be implemented in small dimensions, the extra dimensions created by simultaneously considering several quotas raise computational difficulties which are avoided with the present model by considering quotas in equivalent ad valorem form.

In addition the partial equilibrium tax estimates reported suggest that the terms of trade for each trading bloc may be more sharply altered by domestic taxes and subsidies than would seem likely through modifications to the low tariff rates reported.

IV. A General Equilibrium Model of World Trade[1]

The general equilibrium model used to evaluate the Tokyo Round Trade Agreement incorporates four trading blocs reflecting major participants in world trade; the (nine-member) EEC, the U.S., Japan, and a residual 'rest of the world'. The sizes of these blocs in the model reflect relative GNP for these areas for 1973.[2] The EEC, the U.S. and Japan between them account for some 60% of world production and a substantial fraction of world trade.[3] In setting their tariff policies each of these areas can therefore be expected to have some impact on the terms of trade which they face since none is treated as a small open price taking economy.

The model considers a number of products with each traded good treated as being produced in all of the trading blocs with an assumed heterogeneity by trading area prevailing across production sources. Products are differentiated on the basis of geographical point of production as well as their physical characteristics with 'similar' products being close substitutes in demand; thus Japanese cars are treated as qualitatively different products from U.S. or EEC cars. As already noted, this 'Armington type' Heckscher-Ohlin model is used to accommodate the statistical phenomenon of 'cross-hauling' in international trade and to exclude complete specialization in production. This structure

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[1] A more detailed description of an earlier version of the model is given in Whalley [1978]. The differences in structure between the version used here and the earlier version are that the earlier version uses a fixed coefficient technology to describe intermediate production while the version used here embodies substitutability between intermediate products.

[2] GNP for the rest of the world is obtained from the World Bank Atlas [1975].

[3] For each of the trading blocs there is a trading area considered in the model as part of the rest of the world which is important for that bloc while relatively unimportant for the others. For the U.S., Canada fills this role; for the EEC, it is EFTA; for Japan, Taiwan, Hong Kong and South Korea. Tariff policies towards each of these areas is important for the major blocs concerned while relatively unimportant for the others. These additional areas are not separately identified in the model.

also enables empirically based import demand elasticities to be incorporated into the model specification.

The model used is related to that described in Whalley [1978] but incorporates the richer specification of behavioural functions described in Brown and Whalley [1980] and Whalley [1980]. Some advances in the computational speed of equilibrium solution compared to methods used in the two later pieces enable a more detailed product classification to be used. The products considered are listed in Table 5 along with the household classification used for the demand side in each trading area. Even the 33 product classification considers broad groups of commodities which are much coarser than the finely-divided categories which are the subject of detailed tariff negotiations. As has already been mentioned, tariff negotiations under the Tokyo Round involved negotiations on a tariff-line basis which included as many as twenty thousand commodity items in certain cases, and it is clearly not possible to use a tariff-line basis in the model as this produces a general equilibrium structure which is neither able to be formulated nor solved. The model, therefore, gives indications of general equilibrium impacts in terms of broad product categories which summarize the tariff cuts. The detail by household gives a capability of exploring income distribution and other household effects of trade policy changes; since the effects of the changes in the Agreement are relatively small this feature is not exploited to any significant extent in the results presented later with most attention placed on aggregate impacts.

An outline of the model is given in Table 6. Production and demand patterns in each of the trading blocs revolve around the domestic and world price system. Producers maximize profits and competitive forces operate such that in equilibrium all supernormal profits are competed away. Explicit demand functions are used which are derived from utility maximization.

Table 5

Product and Industrial Classification Used in the General Equilibrium Trade Model

Agriculture

(1) Meats and Dairy Products
(2) Cereals
(3) Other Agricultural Products
(4) Forestry and Fisheries

Mining

(5) Coal
(6) Oil, Natural Gas
(7) Metallic, Non-Metallic and Other

Manufacturing

Non-Durable Goods

Prepared Food and Kindred Products

(8) Tea, Sugar, Coffee, Spices, Cocoa
(9) Alcoholic Drinks
(10) Other Foods
(11) Tobacco
(12) Apparel and Textile Products
(13) Paper, Printing, Publishing
(14) Pharmaceuticals and Toiletries
(15) Other Chemical and Allied Products
(16) Petroleum and Coal Products
(17) Rubber and Plastics

Durable Goods

(18) Lumber, Wood and Furniture
(19) Primary and Fabricated Metals, Stone, Glass
(20) Machinery Except Electrical
(21) Electrical Machinery
(22) Transport Vehicles
(23) Scientific and Precision Instruments
(24) Miscellaneous Manufacturing

Services

(25) Construction[1]
(26) Water Transportation
(27) Other Transportation and Communications
(28) Housing Services[1]
(29) Electricity and Sanitary Services
(30) Wholesale and Retail Trade[1]
(31) Finance, Insurance and Real Estate
(32) Other Services
(33) Government[1]

Classification of Households in Each Trading Area On the Demand Side of the Model

U.S.

10 Households classified by annual gross incomes in 1973 expenditure survey data

$0-1000/1000-1999/2000-2999/3000-3999/4000-4999/5000-5999/6000-7499/7500-9999/10000-14999/15000+

Japan

16 Households classified by annual gross incomes in 1973 expenditure survey data

mill Yen 0-4/4-6/6-8/8-10/10-12/12-14/14-16/16-18/18-20/20-25/25-30/30-35/35-40/40-45/45-50/50+

EEC

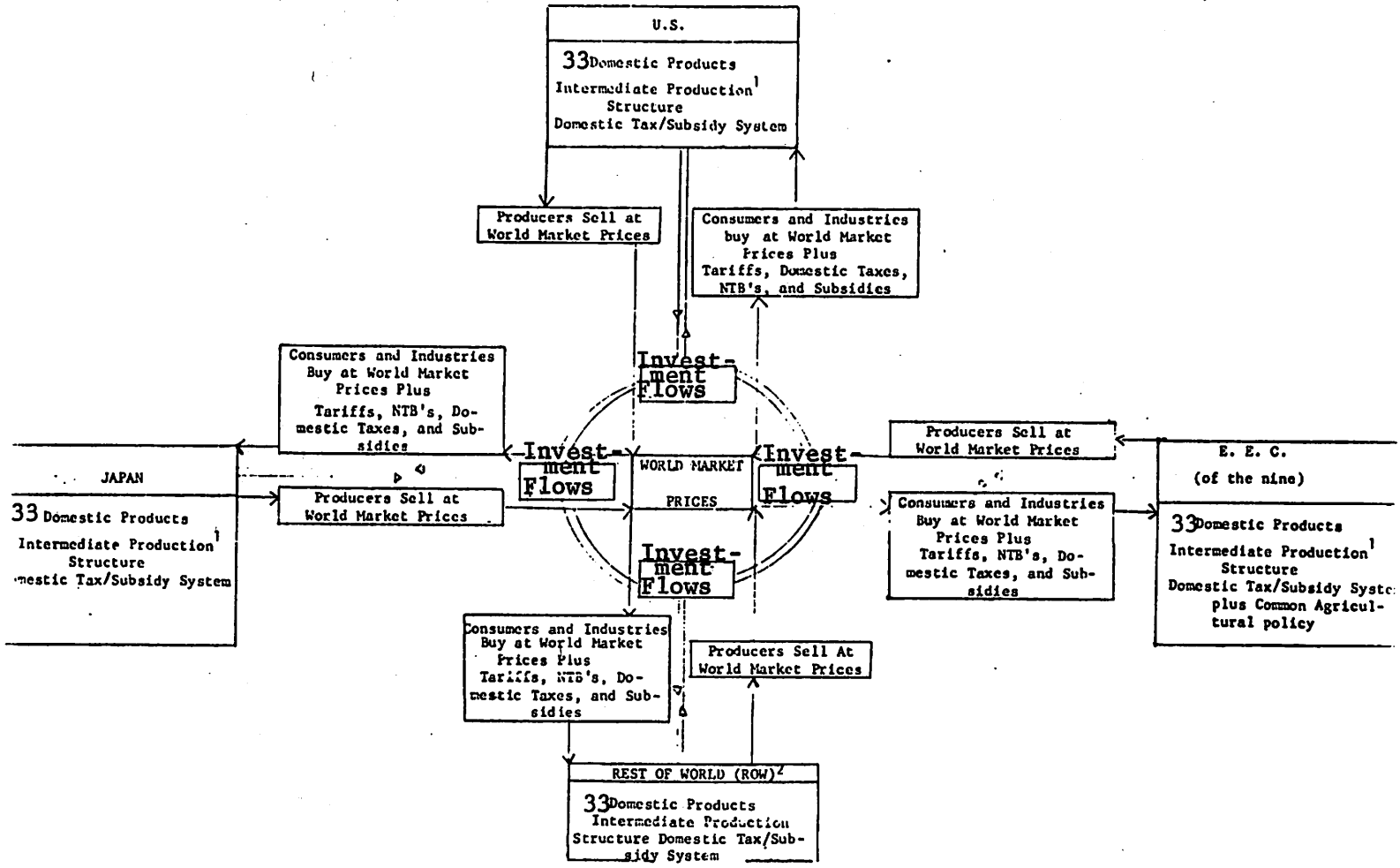
6 major nationally groups[2]
W. Germany/France/Italy/Netherlands/Belgium/U.K.

[1]Denotes a non-traded good.

[2]Ireland, Denmark and Luxembourg are not separately identified on the demand side of the model but the production side of the activity in these economies is incorporated in the single EEC economy. Incomes of these economies (a population of approximately 5 mill from a community total of 250 mill) are to be thought of as distributed uniformly across the groups included.

Table 6

THE GENERAL EQUILIBRIUM MODEL OF US-EEC-JAPANESE TRADE - A STRUCTURAL OUTLINE



World General Equilibrium

A set of world market prices such that

(1) Demand equals supply for all goods and factors.

(2) No industry make positive profits, with those in operation breaking even.

(3) Each trading bloc is in zero trade balance (including capital movements).

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[1] This incorporates intermediate substitution between similar inputs differentiated by country or origin, e.g. a fixed steel requirement per car produced in the U.S. might be specified but this can be met by a substitutable mix of domestically produced steel and steel imported from the various trading blocs.

[2] The rest of the world is specified 'schematically' and no strong claims to realism are made. An arithmetic average of comparable parameters in the three major trading areas is used. This also applies to policy parameters in the rest of the world. The factor endowments in the rest of the world are, however, selected to reflect the relative capital abundance of the three major trading areas. The capital to labour ratio in the rest of the world is considered to be in aggregate 1/5 of that in the combination of the three major trading areas with a ratio of 1/10 for manufacturing.

For each product the market price is the price at point of production. Sellers receive these prices, purchasers (of both intermediate and final products) pay these prices gross of tariffs and domestic taxes; no transportation costs are considered. Financial investment flows enter the world market system and are treated as components of foreign trade. These are treated as purchases of capital goods by agents located in the country of source of the capital funds. The difference between investment flows and merchandise trade is that the capital goods acquired are not repatriated to the country of location of the purchaser, but remain in the source country to generate income in future time periods.

An equilibrium in the model is a situation where demands equal supplies for all products and in each industry a zero-profit condition is satisfied representing the absence of supernormal profits. A zero foreign trade balance condition (including investment flows, dividends, interest and transfers) applies for each country. The effect of a tariff change in any country is to alter the relative prices of imported and domestically-produced goods and affect the volume of imports. This, in turn, changes the pattern of domestic demands and, indirectly, prices of products. Alterations in trade policies affect the equilibrium achieved, resulting in new equilibrium prices and quantities. Measures of worldwide gains or losses and the distribution by trading bloc from trade policy variations are obtained through a comparison of equilibria using Hicksian compensating and equivalent variations.

Production Side of the Model

On the production side of the model, each industry in each trading bloc has available a number of possible methods of production. Each production process uses two different sets of inputs. The first are substitutable capital and labour inputs located in that country, the second intermediate products produced by other industries.

Each industry has a value-added production function of CES form which specifies the substitution possibilities between the primary factor inputs, capital services and labour services. No technical change is incorporated and it is thus assumed that no changes in technology will result from adoption of alternative tariff policies. This specification also excludes the possibility of relocation by industries in response to tariff changes.

In addition to the CES value-added functions, each industry uses the outputs of other industries (both domestic and imported) as inputs into its own production process. In the earlier version of this model described in Whalley [1978] it is assumed that input-output coefficients are fixed and are unable to change. This is somewhat unrealistic in that it specifies, for example, fixed amounts of both Japanese and U.S. steel as required to produce a car in the U.S. These intermediate requirements operate independently of the relative prices of Japanese and U.S. steel. In the version of the model used here, substitution between intermediate products is considered and fixed coefficients in terms of composite goods only are assumed. Thus, the fixed amount of steel required to make a car can be met by a substitutable mix of Japanese and U.S. steel. Each fixed coefficient in terms of composite goods is a CES function with elements of the composite (products identified by geographical point of production) entering as arguments.

Demand Side

On the demand side of the model a number of household consumer groups are considered in each of the trading blocs. Ten household groups are considered in the U.S. stratified by income range, 16 groups also stratified by income range are considered in Japan, and 6 separate nationality groupings in the EEC. Each of these groups has demand functions defined over the various products available. Government and business (investment) are separately treated with each having price endogenous demand patterns.

These demand functions for each agent are obtained by maximizing a nested CES utility function. Within this functional form a fixed elasticity of substitution is assumed between products imported from the various trading areas and domestic products of a similar type, along with a different elasticity of substitution between the composite products. This approach enables empirical estimates of price elasticities in world trade to be incorporated into the model and these values are used to guide parameter choice for inter-nest elasticity values in the CES functions (i.e., between 'similar' products subscripted by location and production).

Since each group generates demands from utility maximization the market demand functions satisfy Walras' Law, the condition that at any set of prices the total value of demands equals the total value of incomes. The incomes of consumer groups are derived from the ownership of primary factors located in each trading bloc (which can be sold at the set of factor prices which each consumer faces) plus transfers received from the government. The government in each trading bloc collects taxes from households and also disperses transfer incomes. Government expenditures enter as a separate demand category and are financed by tax collections. A separate demand category is incorporated for investment expenditures.

Estimation and Equilibrium Solution of the Model

The model as specified contains a large number of parameter values which must be estimated prior to the model being used to evaluate the effects of alternative trade policies. A model on such a scale cannot be easily estimated in its entirety using conventional econometric methods and resort is therefore made to a sequence of procedures which have been developed in recent years for parametric specification of large-scale general equilibrium

models (Whalley [1973], Fullerton, Shoven, and Whalley [1978]). The procedure is to assemble a set of data for a given period of time in a form which is consistent with the equilibrium conditions of the model; a so-called 'benchmark' equilibrium data set. Once assembled, parameter values for equations can be directly estimated from the equilibrium conditions. This benchmark equilibrium data set has the properties of a worldwide competitive equilibrium in that demands and supplies for products will balance, no profits will be made in any of the domestic industries, and each country will be in zero balance in its trading relations with all other countries.

The adoption of this overall approach implies the need to construct an equilibrium data set involving both the domestic and trading activity of each of the trading blocs and many divergent source materials need to be assembled and corrected for inconsistent classifications and definitions. Even when this is complete, further adjustments are necessary to mutually adjust the data so that the equilibrium conditions of the model are satisfied. A complete description of sources used in the assembly of this data set for the year 1973 appears in Appendix B of Whalley [1978]. 1973 was chosen as a recent year for which much of the data was available at the time of assembly of the data set (1977-78).[1] A further argument for the choice of year was that the disruptions stemming from the Middle East war towards the end of 1973 are largely absent and substantial macroeconomic disturbances occur in subsequent years. Even so, there are substantial problems of inconsistent classifications and definitions, gaps in data availability, and differences

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[1]The data used for the U.S. draw heavily on the data set constructed by Fullerton, Shoven, and Whalley [1978] for 1973; certain of the data used for Japan and the EEC had 1973 as the latest year of availability at the time of construction.

in dates of basic sources and the data set produced must therefore be considered only as a first approximation to an ideal set for the model.

The estimation procedure uses the model equilibrium conditions as a set of identifying restrictions. A non-stochastic estimation procedure is used of determining parameter values which are consistent with both benchmark data and the model equilibrium conditions. On the demand side, demand functions are solved for parameters consistent with both equilibrium prices and quantities. On the supply side, cost functions derived from the production structures assumed are used to solve for parameter values consistent with equilibrium prices and input use by industry.

Depending upon the complexity of functional forms this procedure may require additional identifying restrictions beyond those represented by the benchmark equilibrium data set, and these identifying restrictions, where needed,[1] take the form of the specification of unit-free parameters represented by the elasticities of substitution in the functional forms. On the production side the elasticities of substitution are obtained from a literature search.[2] On the demand side no empirical evidence is directly available and a procedure is used of relating the substitution elasticities in preference functions to estimates of price elasticities in world trade.

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[1] If Cobb-Douglas functional forms are used for demand functions, the exponents in the Cobb-Douglas functions are given directly by the expenditure shares in basic data. With CES functions more information is needed and extraneous values of substitution elasticities are needed prior to the use of this procedure.

[2] The survey by Caddy [1976] provides the main source for these estimates. An average over the estimates reported by Caddy is used for each industry in the model with some use of 'best guesses' where industry estimates do not occur in Caddy. The values adopted are the same for each trading area, and are, on average, below unity reflecting the preponderance of time series estimates (as opposed to cross section) in Caddy. The problems of reconciliation between time series and cross section estimates is discussed in Berndt [1976].

These values chosen for these elasticities, as well as the numbers appearing in the benchmark data set, will clearly have a substantial impact on the results produced by the model and, ideally, considerable space should be devoted to a discussion of the values used. Because of the focus of the present paper on model results, and the lengthier discussion of elasticities in Whalley [1978] and Whalley [1979], these values are neither fully reported nor adequately discussed here. A critical set of parameters is the implicit trade elasticities and because of their special importance a separate short section has been devoted to a discussion of the values used.

Once fully specified, the model is solved for a general equilibrium by using a Newton method involving an estimate of the Jacobian matrix of excess factor demands and government budget imbalances. This method works considerably more quickly than Scarf's algorithm[1] or the restart methods of Merrill and others for the type of general equilibrium problems solved with this model. The Newton method works swiftly and, although there is no ex ante argument of convergence which is built into the procedures, they have been successful in implementation. Because of the complexity of the model no guarantee of uniqueness of equilibrium is available although with numerical solution of similar models some experimentation has been done in displacing equilibria once found and then checking that these are returned to and also approaching equilibria from different points and at different speeds. None of these tests has yet to reveal a situation of non-uniqueness of equilibria in these complex environments, although non-uniqueness is certainly not excluded.[2]

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[1] See Scarf [1973] and the extension to international trade models with tariffs by Shoven and Whalley [1974].

[2] Kehoe [1980] has shown that for general equilibrium models with production an index can be associated with any equilibrium which is either +1 or -1 with the property that the sum of the indices will be +1. There is a suggestion that -1 equilibria are unstable. In a simple numerical example involving four commodities and four households with Cobb-Douglas demands and activities, Kehoe has also shown a case of non-uniqueness which does not seem to be in any way an extreme or implausible specification. In this example, the equilibrium prices are widely separated between the equilibria suggesting that non-uniqueness may not be as a likely an occurrence as the numerical ad hoc tests seem to indicate.

V. The Specification of Trade Elasticities in the Model

A subset of the substitution elasticities in preferences and production is derived from import price elasticities and are critical parameters for the model as their values substantially affect trade responses to policy variations. Heavy reliance in this area of parametric specification has been placed on the recent compendium of elasticity values produced by Stern, Francis, and Schumacher (SFS) [1976]. These authors suggest that the empirical evidence on price elasticities in world trade is not conclusive and argue that limited reliability can be placed in elasticity values available for detailed product classifications. They produce 'best guess' estimates for price elasticities for total imports by country and conclude the majority of these are approximately in the range of -1.0. This is somewhat larger (in absolute value) than the region suggested by Houthakker and Magee [1971] in their earlier survey although some authors, such as Balassa and Kreinen [1967], have argued for and used higher values on the grounds of a downward bias associated with time series estimation procedures.

Two specifications of the substitution elasticities derived from the SFS import demand function estimates are used. One has the substitution elasticities between 'similar' products differentiated by trading area of origin in demand functions to be the same value for all product categories in the trading area. The value used can be thought of as related to a compensated price elasticity estimate in an aggregate import function. This specification gives implicit import price elasticities with limited variation across product types. In the second specification, different elasticity values by product type are used to calibrate approximately to the best guess SFS estimates by broad product group.

The relevant SFS elasticities are reported in Table 7. For comparability elasticity values used in other international trade studies

have also been listed in Table 7. The values used here can be seen to approximate the weighted average values for import demand elasticities reported in the Brookings Study referred to earlier. Balassa and Kreinen use the higher values listed. Because of the importance of these elasticity values to our results, sensitivity analysis has been performed around the central specification substitution elasticity values.

The model also incorporates substitution between domestic and imported products in intermediate use and the same elasticity value as reported the aggregate import demand functions is used for this elasticity in each trading area. Sensitivity analysis around these values is also performed.

Table 7

Summary of Import Price Elasticities by Trading Area and by Broad SITC Categories as reported by Stern, Francis and Schumacher (SFS) [1976]

A. SFS Values	SITC Categories	"Best Guess" Values U.S.	EEC*	Japan
0 + 1	Food, Beverages, and Tobacco	- .8	- .8	- .66
2 + 4	Crude materials; Oils and Fats	- .47	- .45	- .91
3	Mineral Fuels	- .96	-1.22	- .57
5 - 9	Manufactured goods	-1.84	-1.78	-1.42
0 - 9	Total Imports	-1.66	- .91	- .78
	Export Price Elasticities	-1.41	- .96	-1.25
B.	Weighted Average Import price elasticities reported by Cline et al [Brookings Study] [1978]	-1.85	- .92	-1.39
C.	Import price elasticities for finished manufactures used by Balassa/Kreinen [1976]	-4.12	-3.09	-3.09

*This involves a simple arithmetic average over the values for the U.K., W. Germany, France and Italy for the SFS values.

VI. Results from an evaluation of the Tokyo Round Agreement

The model described in earlier sections has been used to evaluate the Tokyo Round Agreement by computing a sequence of counterfactual equilibria each determined under an assumed policy change. Each of these equilibria are then in turn compared to the benchmark equilibrium characterized by the 1973 data. Once each new equilibrium has been determined several alternative comparisons can be made; changes in relative prices of particular products, changes in employment and output levels in specified industries, and any other comparison possible between the equilibria through the construction of index numbers.

Major emphasis is placed in the present set of results on welfare comparisons between equilibria. For each consuming agent in each equilibria the Hicksian compensating and equivalent variations are computed. The compensating variation is the sum of money needed to compensate a consumer for the price and income changes occurring so as to leave him as well off as originally; the equivalent variation is the monetary transfer which would be equivalent in welfare terms to the changes which have occurred. Strictly speaking these two measures are opposite in sign, but a convention is followed consistently of reporting a welfare improving change by a positive magnitude.

In Table 8 the static welfare impacts of alternative analyses of the trade agreement are reported. In Section A of the table a case is considered where the tariff cuts reported in Table 2 are analyzed. These are termed 'data cuts' since the tariff changes are exactly as they appear in the data on the trade agreement obtained from STR, the term 'data cut' constrasts with 'formula cut', since some cases are reported later where the Swiss tariff cutting formula is mechanically applied to the 1976 tariff rates appearing in the STR data.

Table 8

Static Welfare Impacts of Components of the MTN in Total and by Trading area

1973 $ bill.--figures in parentheses are % of 1973 GNP for the area involved

	(1) EEC	(2) U.S.	(3) Japan	(4) Rest of the World	(1)+(2)+(3)+(4) World
A. Tariff Cut for EEC, U.S., Japan as in data (Table 2); Row cuts tariffs by 1/3					
(1) sum of equivalent variations (Σ EV)	2450.0 (0.2)	430.8 (0.0)	959.5 (0.2)	-1956.8 (-0.2)	1883.5 (0.0)
(2) sum of compensating variations (Σ CV)	2471.9 (0.2)	431.4 (0.0)	967.7 (0.2)	-1930.6 (-0.2)	1940.4 (0.0)
(3) terms of trade movement (+ indicates gain, - indicates loss)	0.9	-0.3	0.8	-1.4	
(4) fraction of households who gain	1.0	0.79	0.98	(0.0)	
B. Data Tariff Cuts for EEC, U.S., Japan (Table 2); Alternative Cuts for Rest of World (ROW)					
(1) ROW cut by 40% (Σ CV)	3039.7 (0.3)	482.8 (0.0)	1125.8 (0.3)	-2368.4 (-0.2)	2279.9 (0.1)
(2) ROW cut by 33% (Σ CV)	2450.0 (0.2)	430.8 (0.0)	959.5 (0.2)	-1956.8 (-0.2)	1883.5 (0.0)
(3) ROW cut by 25% (Σ CV)	1700.3 (0.1)	-35.4 (-0.0)	712.6 (0.2)	-882.5 (-0.1)	1495.0 (0.0)
C. Quantifiable NTB changes					
(1) (Σ CV)for government procurement changes	-4180.3 (-0.4)	1453.4 (0.1)	506.7 (0.1)	3108.9 (0.3)	888.6 (0.0)
(2) (Σ CV)for possible valuation basis changes	-198.8 (-0.0)	22.6 (0.0)	-56.8 (-0.0)	296.5 (0.0)	63.5 (0.0)
(3) (Σ CV) for agricultural NTB changes	5.6 (0.0)	44.4 (0.0)	-144.6 (-0.0)	597.1 (0.1)	502.4 (0.0)
(4) (Σ CV) for (1), (2), (3) considered simultaneously	-4036.5 (-0.4)	1475.9 (0.1)	376.9 (0.1)	3640.2 (0.3)	1456.5 (0.0)
D. Tariff Cuts as in A plus NTB changes in B considered simultaneously					
(1) (Σ CV)	-2261.7 (-0.2)	2260.4 (0.2)	969.9 (0.2)	2257.2 (0.2)	3225.8 (0.1)
(2) (Σ EV)	-2273.1 (-0.2)	2217.1 (0.2)	954.0 (0.2)	2227.1 (0.2)	3125.0 (0.1)

The main conclusion from the numbers reported in Section A are that the static welfare impacts of the tariff cuts in the trade agreement are small. This confirms findings of other studies of the welfare impacts of tariff cuts but the effect for the world (as reported in Table 8) is that the overall worldwide welfare gain from the tariff cuts will be no more than 0.1 percent of worldwide GNP, which is extremely small.

The effects by trading area are not quite so small and a more striking implication of Table 8 is that the rest of the world comes out as a loser as a result of the tariff cuts. The reason for this is that the tariff cuts are concentrated heavily on manufactured products with existing tariffs on agricultural and raw material items already low so that the tariff cuts on manufactured items result in a terms of trade move against third world and developing countries who appear as part of the rest of the world trading bloc in the model. Of the major developed trading areas the EEC is a more substantial gainer in absolute terms than either the U.S. or Japan. In terms of proportions of GNP gains by Japan and the EEC are comparable and significantly exceed those by the U.S. This is reflected in the terms of trade movements which represent an improvement for both the EEC and Japan by nearly 1 percent. Terms of trade effects move sharply against the rest of the world.

The relatively poor performance in terms of tariff cuts by the U.S. is accounted for by a combination of factors. The U.S. exports more agricultural products than either the EEC or Japan and there is an adverse terms of trade move against these items. The volume of manufactured product exports by the U.S. is significantly smaller than by the EEC, and lastly the cuts in tariffs by Japan before the Tokyo Round mean that in absolute terms their cuts are smaller than those made by the U.S. The sharp move in terms of trade against

the rest of the world is noticeable and derives from the increase in manufactures trade resulting from a tariff cut concentrated on manufactures. This result, of course, runs counter to the suggestion that third world countries gain from GATT tariff cuts due to increased access for their limited manufactured exports, since this effect is more than offset by the terms of trade movement against them.

Section B reports results in which tariff cuts of alternative depths are made by the rest of the world and the results are seen to be sensitive to the assumed cut. This sensitivity indicates that because of the structure of world trade by commodity and by area, the more significant impacts from GATT tariff cuts may well be in the terms of trade movements for each of the major industrialized trading blocs with trading areas outside 'the bloc of three' (the U.S., the EEC and Japan). It is also interesting that if the ROW is small enough the U.S. loses due to the adverse move in its terms of trade with both the EEC and Japan.

In Section C, some results are reported reflecting attempts to quantify the effects of changes in NTB codes. These results are dependent upon some crude approximations and assumptions which may bias these results in undetermined ways. In the case of changes in government procurement the procedure has been to follow the suggestion of a study by the U.S. Labor Department that government procurement practices outside of the U.S. can be approximated by, on average, a 50 percent tariff applied on imports purchased by government. The procedure used is to consider this as an additional tariff which exists in the benchmark data set and then to remove this tariff. Because Japanese government purchases of imports are already very small, the effect of the removal of the 50 percent tariff is that they do not expand very substantially, whereas in the EEC the removal of the 50 percent tariff has a much more dramatic effect. For the EEC there is a welfare loss which is twice the size and opposite in sign from the welfare gain from the tariff cuts. In

addition the gain to the U.S. is more substantial than the gain from the tariff cuts. The rest of the world comes out as a gainer simply because in this set of simulations it is assumed that government procurement practices are only changed in the EEC and Japan and therefore greater access is obtained by exporters in the rest of the world to Japanese and the EEC markets. Even though these calculations remain highly speculative they indicate the striking possibility that changes in government procurement practices alone could be of more importance in the agreement than all of the tariff cuts. A similar conclusion can be drawn from one of the sets of calculations of impacts of changes in government procurement procedures in Deardorff and Stern.

In addition to government procurement changes, an attempt has also been made to simulate the effect of possible changes in valuation bases for tariffs which may well, in fact, go beyond those likely from the Tokyo Round agreement. In this case a calculation has been made of the implications for the EEC and Japan of switching from a c.i.f. basis to an f.o.b. basis for valuation purposes in the application of tariffs, assuming that tariff rates remain unchanged. In these cases the EEC and Japan come out as losers and the U.S., somewhat predictably, comes out as a winner although the quantitative effects are quite small. In Case 3 in Section B of Table 9 the effects of agricultural NTB changes in the Agreement are simulated and their quantitative impacts reported. This quantification takes the same trade volume change projections used by Deardorff and Stern for this part of the Agreement, and reproduces these approximate quantity effects through a partial relaxation to agricultural NTB ad valorem equivalents. These appear to be small relative to changes in government procurement codes, but are significant compared to the effects of tariff cuts. In Case 4 the composite of these three cases is considered, and as can be seen, there is a dominance by the government procurement changes.

In Section D all of the quantifiable NTB changes and the tariff cut changes are considered simultaneously and the aggregate effects reported. The EEC loses whereas the rest of the world gains; the opposite of the result for the tariff cuts taken alone. The overall quantitative effect of those portions of the Agreement which are quantified remains small, a conclusion returned to later on in discussion.

In Table 9 further welfare analyses of the tariff cuts in the Agreement are presented. In the cases reported, alternative formulae for tariff cuts and different forms of tariff reduction are investigated. Case 1 repeats the central case results for the tariff cut analysis in Table 8. In Case 2 the application of the Swiss formula as a general tariff cutting formula (with a coefficient of 0.14) to 1976 tariffs is analyzed in constrast to the data cut reported in data from STR assumed in Section A of Table 8. The welfare results are not too dissimilar even though the tariff cuts projected in the two sets of data are of some variance. The major difference is that the overall world gain is larger by approximately one billion dollars from a complete Swiss formula cut, a 40 percent increase on the total gain for the comparable case in Section A of Table 8. The EEC is a more substantial gainer as are the Japanese.

In Cases 3, 4, and 5 of Table 9 the tariff cuts in the trade agreement are implemented by each of the major participants in turn on a unilateral basis. Each trading area loses by cutting their own tariffs because of a terms of trade movement against the area involved; these cases illustrate the incentives for multilateral cooperation through tariff cutting agreements. This same point is reinforced by Cases 6 and 7 where bilateral tariff cuts firstly between the U.S. and the EEC and secondly between the U.S. and Japan are considered, with the tariff cuts by these trading areas extended to all other countries in the model through the operation of most favored nation status clauses under the GATT. In these cases the countries involved in the bilateral tariff cuts are losers except

Table 9

Further Welfare Analysis of the MTN Agreement - Static Welfare Gains from Alternative Tariff Policy Changes

($ 1973 bill. % of 1973 GNP in parentheses.)

	EEC		U.S.		Japan		Rest of the World		Total	
	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV
1. Data Tariff Cut for EEC, U.S., Japan 1/3 for ROW (Table 9, Case A)	2471.9 (0.2)	2450.0 (0.2)	431.4 (0.0)	430.8 (0.0)	967.7 (0.2)	959.5 (0.2)	-1930.6 (-0.2)	-1956.8 (-0.2)	1940.4 (0.0)	1883.5 (0.0)
2. Swiss Formula Tariff Cut for EEC, U.S., Japan, ROW; coefficient 16 assumed.	2786.2 (0.2)	2758.4 (0.2)	956.1 (0.1)	953.7 (0.1)	1020.7 (0.2)	-1012.3 (0.2)	-1912.2 (-0.2)	-1944.6 (-0.2)	2850.9 (0.1)	2779.7 (0.1)
3. U.S. unilateral tariff cut as in data for agreement.	348.6 (0.0)	347.4 (0.0)	-866.0 (-0.1)	-872.7 (-0.1)	214.7 (0.0)	213.8 (0.0)	429.8 (0.0)	428.5 (0.0)	127.1 (0.0)	116.9 (0.0)
4. EEC unilateral tariff cut as in data for agreement.	-833.4 (-0.1)	-838.3 (-0.1)	135.7 (0.0)	135.4 (0.0)	-1.3 (-0.0)	-1.3 (-0.0)	805.5 (0.1)	802.3 (0.1)	106.5 (0.0)	98.1 (0.0)
5. Japanese unilateral tariff cut as in data for agreement.	48.3 (0.0)	48.3 (0.0)	51.9 (0.0)	51.9 (0.0)	-146.6 (-0.0)	-147.2 (-0.0)	84.6 (0.0)	84.5 (0.0)	38.2 (0.0)	37.5 (0.0)
6. U.S.-EEC bilateral tariff cut(extended by MFN) as in data for agreement.	-520.1 (0.0)	-521.3 (0.0)	-911.1 (-0.1)	-917.5 (-0.1)	185.9 (0.0)	184.6 (0.0)	1471.4 (0.0)	1459.3 (0.0)	226.2 (0.0)	205.1 (0.0)
7. Japan-U.S. bilateral tariff cut (extended by MFN) as in data for agreement.	398.5 (0.0)	397.0 (0.0)	-815.0 (-0.1)	-821.1 (-0.1)	67.3 (0.0)	67.0 (0.0)	512.8 (0.0)	511.1 (0.0)	163.5 (0.0)	154.0 (0.0)
8. U.S.-EEC-Japan customs union.	850.9 (0.1)	847.5 (0.1)	-540.0 (-0.0)	-545.9 (-0.0)	1212.0 (0.3)	1193.7 (0.3)	-836.9 (-0.1)	-838.7 (-0.1)	685.9 (0.0)	656.6 (0.0)
9. All countries abolish all tariffs.	7365.1 (0.6)	7162.3 (0.6)	1355.5 (0.1)	1343.4 (0.1)	2978.0 (0.7)	2897.8 (0.6)	-5429.8 (-0.5)	-5647.9 (-0.5)	6268.1 (0.2)	5755.7 (0.1)

in the Japanese case in the U.S.-Japan cut. The main effect of the tariff cut in these cases is a redistribution between countries rather than an expansion of worldwide welfare. In the case of the EEC-U.S. bilateral tariff cut, each country's change in welfare is in absolute terms larger than the total change for the whole world.

In Case 8 the U.S., EEC and Japan form a customs union and do not extend their tariff preferences to third world countries. In this case there are gains to these three countries and losses to the rest of the world; an example of an empirical investigation of customs union issue. In Case 9 all countries abolish all tariffs and the overall gain for the world is in the region of six billion dollars with most of those gains accruing to the EEC and Japan. The third world countries are significant losers by approximately five billion dollars because of the adverse terms of trade movement against them which the expansion of trade in manufactures produces. This result suggests that potentially significant further gains have been foregone in the Tokyo Round agreement by limiting the tariff cuts to the sizes agreed rather than having total abolition of all tariffs.

In Table 10 some sensitivity analyses are reported around the welfare impacts estimated in Table 8 for a data tariff cut. In all of these cases the elasticities in trade and in intermediate production are varied in a number of different ways; in Cases 2, 3, 4 and 5 the elasticities of substitution are moved between .5 and 5. As to be expected, the estimates of overall welfare effects are sensitive to these parametric variations but not dramatically so, save in the case where trade elasticities become very small (.5). In all cases the major impact of the tariff cuts is on the rest of the world. In Case 6 the trade elasticities by product as specified in Stern, Francis and Schumacher are incorporated and reasonably similar results to those in Table 8 are produced. This provides further indication of the robustness of the findings in Table 8 to parametric variation.

Table 10

Sensitivity Analysis of Estimated Static Welfare Impacts from Tariff Cuts in the MTN

$1973 bill

(% of 1973 GNP in parentheses)

	EEC		US		Japan		Row		Total	
	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV	ΣCV	ΣEV
1. Data Tariff Cut for EEC, US, Japan, 1/3 for ROW (Table 8, Case A)	2471.9 (0.2)	2450.0 (0.2)	431.4 (0.0)	430.8 (0.0)	967.7 (0.2)	959.5 (0.2)	-1930.6 (-0.2)	-1956.8 (-0.2)	1940.4 (0.0)	1883.5 (0.0)
2. As 1, But Trade Related Elasticities of Substitution set at 0.5 in all trade areas	4644.8 (0.4)	4618.6 (0.4)	3353.2 (0.3)	3315.1 (0.3)	2690.7 (0.6)	2644.0 (0.6)	-7974.3 (-0.7)	-8333.0 (-0.7)	2714.5 (0.0)	2244.7 (0.0)
3. As 1, but trade related elasticities of substitution set at 1.25 in all trade areas	2096.9 (0.2)	2083.0 (0.2)	901.2 (0.1)	897.9 (0.1)	765.9 (0.2)	761.8 (0.2)	-1762.3 (-0.2)	-1786.3 (-0.2)	2001.7 (0.0)	1956.4 (0.0)
4. As 1, but trade related elasticities of substitution set at 3.0 in all trade areas	2076.8 (0.2)	2065.4 (0.2)	956.3 (0.1)	954.1 (0.1)	790.1 (0.2)	786.2 (0.2)	-529.6 (-0.1)	-537.6 (-0.1)	3293.6 (0.1)	3268.1 (0.1)
5. As 1, but trade related elasticities of substitution set at 5.0 in all trade areas	2348.1 (0.2)	2336.3 (0.2)	1215.0 (0.1)	1219.9 (0.1)	898.9 (0.2)	894.7 (0.2)	516.5 (0.1)	518.5 (0.1)	4978.5 (0.1)	4962.4 (0.1)
6. As 1, but final demand trade elasticities set at SFS best guess values by broad product category in all trade areas	2188.4 (0.2)	2171.2 (0.2)	470.5 (0.0)	469.6 (0.0)	893.8 (0.2)	886.7 (0.2)	-1663.6 (-0.2)	-1685.0 (-0.2)	1889.1 (0.0)	1842.5 (0.0)
7. As 1, but trade elasticities in intermediate substitution all set at 3.0	2178.2 (0.2)	2164.4 (0.2)	661.3 (0.0)	660.2 (0.0)	854.1 (0.2)	848.5 (0.2)	-989.8 (-0.1)	-1002.5 (-0.1)	2703.7 (0.0)	2670.6 (0.0)
8. As 1, but trade elasticities in final demand all set at 3.0	1969.2 (0.2)	1956.5 (0.2)	886.1 (0.1)	883.7 (0.1)	714.3 (0.2)	710.9 (0.2)	-1124.7 (-0.1)	-1144.8 (-0.1)	2439.9 (0.0)	2406.3 (0.0)

Table 11

Crude Calculations of 'First Step Optimal' Tariffs in the general equilibrium model of EEC-U.S.-Japanese trade

(All results refer to Compensating and Equivalent Variations as a % of GNP by area.[1])

		EEC		US		Japan		Rest of World		Total	
		CV as % of GNP	EV as % of GNP	CV as % of GNP	EV as % of GNP	CV as % of GNP	EV as % of GNP	CV as % of GNP	EV as % of GNP	CV as % of GNP	EV as % of GNP
A. EEC replacement of existing tariffs by uniform tariff at	125%	2.0	1.6	-0.3	-0.3	0.2	0.3	-2.5	-3.0	-0.1	-0.4
	150%	2.1	1.6	-0.3	-0.4	0.3	0.3	-2.8	-3.4	-0.2	-0.5
	175%	2.1	1.5	-0.3	-0.4	0.3	0.3	-3.0	-3.7	-0.3	-0.6
	200%	2.1	1.4	-0.4	-0.4	0.3	0.4	-3.1	-4.0	-0.3	-0.8
B. US replacement of existing tariffs by uniform tariff at	125%	-0.8	-0.9	2.2	1.6	-1.2	-1.4	-1.6	-1.8	-0.2	-0.5
	145%	-0.8	-0.9	2.2	1.6	-1.3	-1.5	-1.7	-2.0	-0.2	-0.6
	160%	-0.8	-1.0	2.3	1.6	-1.3	-1.6	-1.7	-2.1	-0.2	-0.6
	180%	-0.9	-1.0	2.2	1.5	-1.4	-1.7	-1.8	-2.2	-0.3	-0.7
C. Japanese replacement of existing tariffs by uniform tariffs at	150%	-0.1	-0.1	-0.3	-0.4	2.3	1.3	-0.8	-0.9	-0.1	-0.2
	175%	-0.1	-0.1	-0.4	-0.4	2.4	1.2	-0.9	-0.9	-0.1	-0.3
	200%	-0.1	-0.1	-0.4	-0.4	2.4	1.1	-0.9	-1.0	-0.1	-0.3
	225%	-0.1	-0.1	-0.4	-0.5	2.4	0.9	-1.0	-1.0	-0.2	-0.4
D. Simultaneous adoption of uniform tariffs at rates of	175% in EEC 160% in US 200% in Japan 178% in Rest of the World	-5.0	-6.8	-2.2	-2.3	-5.1	-6.7	-1.4	-1.6	-3.2	-4.0
E. Simultaneous adoption of uniform 60% tariffs in all trading areas		-2.1	-2.3	-0.3	-0.4	-2.1	-2.3	-0.1	-0.0	-1.0	-1.1

[1] +ve indicates a gain and -ve indicates a loss.

In Table 11 a number of cases are considered which go substantially beyond the policy changes in the trade agreement and in the opposite direction. The purpose of these cases is to explore the incentives for retaliatory protective policies in each of the trading areas. Because terms of trade effects operate in the model there are incentives for each country to attempt to move towards an optimal tariff and Table 11 tries to explore how large these optimal tariffs are and what the potential gains are for each individual country through such a process. Cases are reported where tariffs are set in each trading area alternatively at high levels on all products and in all cases countries individually gain from such a tariff. The cases also reported where tariffs are set in all trading areas at 60 percent in which case the worldwide welfare loss is in the region of 1 percent of GNP from such a calculation. If the retaliatory process is pushed even further it appears that the individual countries have incentives for tariffs which are even larger than 60 percent. The compensating and equivalent variations from cases where tariffs are set at even higher ranges are calculated and the maximum welfare gain for the U.S. is from a tariff in the region of 150 percent whereas for the EEC the maximum tariff is somewhat lower. While these values may appear to be unrealistically high they are a direct implication of the underlying SFS import price elasticity values used in the model; a further paper by Hamilton and Whalley [1980] analyzes these optimal tariff calculations in more detail tracing their relation to elasticity values. While the numerical values of these optimal tariffs may appear implausible, the results in this table do suggest that strong national incentives for protection exist in the world economy for those trading areas which are large enough to be able to influence their terms of trade. This, in turn, suggests that the view of the Tokyo Round as an accommodation preserving

agreement may be an important difference in view from examining it simply as a smaller scale follow on from the earlier Kennedy Round.

In Tables 12 and 13 the welfare effects of tariff cuts and other forms of trade liberalization produced by other studies have been listed in order to obtain some degree of comparison between these and the results presented in this paper. All of these studies produce estimates for different years and these have been corrected through a price index adjustment so that all estimates appear in 1973 billions of dollars.

The first study listed is by Balassa and Kreinen of the Kennedy-Round where an approximate 50 percent cut on significantly tariffs than in the Tokyo Round was involved. An important characteristic of the Balassa-Kreinen study was the use of substantially higher trade elasticities than used in the present study and the welfare gains from the Kennedy-Round tariff cuts they produce are extremely small. In 1973 dollars, the industrialized countries of the U.S., Europe and Japan total only .5 billion dollars in welfare gains. This is in the region of 30 percent of the welfare gain produced by the calculations reported in Table 8 for the Tokyo Round cuts which are a smaller cut on substantially lower tariffs.

In Part B the estimates from the Cline et al (Brookings) are reported in 1973 billion dollars where a 60 percent linear cut on 1973 industrial tariffs including and excluding textiles are considered. Even in the case where the tariff cut includes textiles, total gains are reported which are smaller than those which are reported here for the 30% Tokyo Round agreement cuts which largely exclude textiles, again a smaller cut on smaller 1976 tariffs. Interestingly, the Cline study suggests that the U.S. is a major gainer; a finding which present results and Deardorff and Stern do not confirm. A further difference between this study and the Cline study is the projection in the Cline study from the static annual welfare gains which are small to an

estimate of total welfare gains which is much larger. This projection involves a factor of 5 to represent the ratio between static and dynamic gains and a discounting into present value terms of the stream of annual gains. This procedure produces a number in the region of 170 billion 1973 dollars as the total gain form the Tokyo Round. Given the initial starting point of the smaller static welfare gains, a similar procedure if applied to the present results would produce an even larger number. In this author's opinion, there are interpretive problems involved both with the dynamic gain calculation and the calculation in discounted present value terms. The discounted present value of the welfare gain should be compared to the discounted present value of the total income stream from the world economy over time and the fractional gain thus still appears to be small.

In Deardorff and Stern (Section C) an approach is taken similar to the present paper and numbers are not too dissimilar to those produced here for the welfare effects of the Tokyo Round agreement. They find that the EEC is a more substantial gainer than the U.S. from the tariff cuts, a conclusion substantiated by the results obtained here, although they show Japan a less significant gainer relative to the U.S. than in the present calculations.

In Section D some earlier results from a simplified version of the present model are reported where Brown and Whalley investigate the effects of tariff cutting proposals in the Tokyo Round using 1973 tariff rates. The welfare gains turn out to be somewhat comparable to the numbers which are reported in the present paper with the major change being in the relative size of gains for the U.S. and Japan. This reflects the present use of 1976 tariff rate data as against the earlier use of 1973 rate data.

Table 13 reports some estimates of welfare impacts from unilateral reductions in protection by the U.S. The Magee study suggests that the effects of removal of U.S. tariff barriers are very small with a gain to the U.S. of

Table 12

Welfare Effects of Multilateral Tariff Cuts Obtained by Other Studies

A. Balassa/Kreinen [1967]. Kennedy Round (Approx. 50%) cut on 1960 industrial tariffs -variant assuming fixed export prices-

Country	Welfare Gain in 1973 $ bill.
U.S.	.230
Canada	.066
EEC (of the 6)	.048
U.K.	.086
Continental EFTA	.040
Japan	.032
Industrial Countries (Sum of Above)	.502

B. Cline et al. [1978]. 60% linear cut on 1973 industrial tariffs including and excluding textiles.

Country	Welfare gain in 1973 $ bill. (including textiles)	Welfare gain in 1973 $ bill. (excluding textiles)
U.S.	.904	.447
Canada	.224	.162
Japan	.277	.264
EEC (9)	.489	.412

C. Deardorff/Stern [1979]. Tokyo Round Agreement (Aprox. 30%) cut on 1976 industrial tariffs.

Country	Tariff Cut Welfare Gain in 1973 $ bill.	Tariff Cut Welfare Gain + Gains From Changes in NTB's (Variant 1)
U.S.	.561	.792
Canada	.232	.226
EEC (9)	1.077	1.304
Japan	.374	.124
18 Major OECD countries	2.050	2.629

D. Brown/Whalley [1980]. Swiss Proposal Formula Tariff Cut for Tokyo Round (excluding textiles).

Country	Welfare Gain in 1973 $ bill.
EEC	1.45
U.S.	0.81
Japan	0.45
Rest of the World	-1.72

E. 1973 GNP by trading area in $ bill. as appearing in the model

Country	1973 $ bill.
EEC	1,275.1
U.S.	1,201.8
Japan	458.5
Rest of the World	1,114.1

Table 13

Welfare Effects of Unilateral Reductions in US Protection Obtained by Other Studies

A. Magee [1972]

	US Static Welfare Gain in 1973 $bill from
(a) removal of tariffs	.110
(b) removal of quotas	2.975

B. Baldwin/Multi/Richardson [1978]

	US Static Welfare Gain in 1973 $bill from
50% unilateral cut in tariffs	.110

C. 1973 US GNP in $bill as appearing in the model (1973 $bill)

1201.8

.1 billion dollars while the gains from removal of quotas are of far larger order of magnitude. A notable feature is that the Magee study suggests that removing tariffs in the U.S. will improve welfare in the U.S. The conclusions in this paper are that removing tariffs would worsen the position for the U.S. because of an adverse movement in the terms of trade. Baldwin, Multi, and Richardson produce an estimated gain in welfare to the U.S. from a 50 percent unilateral cut in tariffs approximately equal to the Magee estimate of the total removal of tariffs of .1 billion dollars. The conclusion from both Baldwin, Multi, Richardson, and Magee is that these welfare gains are small. While not providing any precise confirmation for findings presented here, the broad agreement between all these studies and the present paper on the small size of the welfare effects from trade liberalization is a striking similarity.

The overall conclusion therefore, both from these studies and the present paper is that the static welfare effects of changes in tariff policies as outlined in the Tokyo Round agreement are likely to be small. A prominent feature of the present results not highlighted in previous literature is the suggestion that there will be losses for third world countries from MTN tariff cuts because of an adverse move in the terms of trade. There are also reasons to suggest that under some assumptions the changes in the NTB codes in the agreement may be more significant than the tariff cuts. The appraisal of the Agreement as a cooperative accommodation to retaliatory trade war pressures in the world economy suggests this may be a significant if not the most significant aspect of the whole agreement.

VII. Conclusion

This paper reports some results from a general equilibrium model which has been used to evaluate the effects of the trade agreements which have been recently initialled as part of the Tokyo Round trade negotiations. The three parts of the trade liberalization package are emphasized including tariff cuts, changes in non-tariff barrier codes and the possible extensions of international agreements in other areas. It is suggested that only the tariff cuts are readily quantifiable although some attempts are made to quantify some of the NTB code changes. The implications of the calculations are that the overall welfare effects are small, that third world countries, if anything, will lose from the tariff cuts. The EEC and Japan are larger gainers than the U.S. from tariff cuts but this could be more than offset by the NTB code changes and in particular changes in government procurement practices. The Agreement is also evaluated as a cooperative arrangement designed to offset pressures towards a retaliatory trade war outcome (Nash equilibrium) in world trade, and it is suggested that this is a highly significant aspect of the agreement.

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