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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the authors.

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International Trade in Agriculture:
Domestic Policies, Trade Conflicts, and Negotiating Options*

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I. Introduction

In this paper we address some of the issues which will almost certainly be encountered by any serious attempt which may be made as part of a new negotiating round under the GATT to substantively address the current global situation in agricultural trade. We attempt to contribute to the re-emerging policy debate on global agricultural trade in three ways.

First, we summarize how agricultural policies work in the three major trading areas (the EEC, the U.S., and Japan), for the major product areas of grains, sugar, milk and dairy products, meat and poultry products, and fruits and vegetables, emphasizing their links to trade policies, and their deep historical and political roots. These policies are complex, and perhaps surprisingly, a comparative institutional treatment such as we lay out does not seem available elsewhere.

Second, we discuss how international trade negotiations in these key agricultural products could proceed; what the options are, and how far the domestic structure of programmes has to change to yield significant economic benefits from reform. We also emphasize how the complexity of existing programmes makes negotiations especially difficult.

Finally, we report some preliminary results from a modelling project designed to provide a quantitative evaluation of the potential gains from global trade liberalization in agriculture. These preliminary results suggest that for grains alone the potential worldwide gains from liberalizing trade (associated
with a removal of domestic price supports and other programmes) may exceed those from an elimination of remaining developed country trade barriers against manufactures. Adding in dairy, meats, and sugar will almost certainly further increase these estimates of gain, suggesting, perhaps not surprisingly, that a major focus on agricultural trade in a future GATT negotiating round would make sense from a global efficiency viewpoint.
II An Overview of Agricultural Policies and their Links to Trade

By general agreement, the current situation in agriculture is chaotic and in desperate need of reform in most if not all countries. From EEC butter mountains to wine lakes, U.S. wheat surpluses to $50 billion farm bills, Japanese beef quotas to dairy prices, wholesale intervention in domestic agricultural markets and limits on international agricultural trade abound. In developed countries, these policy outcomes are a direct implication of attempts to raise farm incomes by supporting domestic prices at levels above those prevailing on world markets through limits on imports and subsidies for exports. Of all major product categories, it is in agriculture that the ratio of international trade to global production is smallest; and despite its relatively small size in most developed countries as a fraction of GNP, it is in agriculture that perhaps the greatest potential gains from trade liberalization lie.

The trade policy situation in agriculture is little analyzed in large part because the roots of current trade conflicts so clearly lie in domestic farm income support programmes which are seen as a political rather than an economic problem. Ever since the discussions on an International Trade Organization in the late 1940's and through the subsequent period of GATT negotiations, it has been widely accepted that special arrangements should apply to agricultural trade. In part this outcome has reflected the immediate post-war concerns over food security; but
it also reflects the internal political pressures which then and subsequently determined agricultural policies in the major trading powers. Acceptance of the need for special treatment for agriculture progressed further during the 1950's with the 1955 U.S. GATT waiver for agricultural protection and the 1958 Treaty of Rome which lead to the CAP.

As the budget costs of domestic farm programmes have mounted, and the more obvious inefficiencies of stockpiling have become apparent, the situation has further escalated. Obtaining improved access to restricted domestic agricultural markets in Europe and Japan is a high profile trade policy issue for the U.S. Their current proposal is that minimum access commitments (minimum import growth targets) for agricultural imports be agreed to by all parties. The U.S. and the EEC are also in conflict over third markets. The U.S. argues that the growth in the EEC's market share, especially in developing country markets, is prima facie evidence of the use of export subsidies, and that a new set of limits on agricultural export subsidies should be negotiated under the GATT.

While farm commodity programmes in all countries are exceedingly complex, their broad objectives are relatively transparent, namely to provide price and income support to farmers, and to achieve stable prices for both consumers and producers. The instruments most commonly used in these programmes are market price supports, deficiency payments (payments to producers of the difference between target and
market prices), and supply management programmes, (frequently involving quotas on both domestic production and imports). Programmes typically operate on a commodity-by-commodity basis, and change substantially and often unpredictably from one year to the next. Even more confusing is the feature that for some commodities more than one of these policies may be used simultaneously.

In Figure 1 we illustrate the effects of agricultural price supports in the single-country case using partial equilibrium demand-supply analysis. In Panel (a) the country is assumed to be an importer on world markets, while in Panel (b) the country is treated as an exporter. In each case, the country is also assumed to be a price taker on world markets. If consumers and producers in the country both face the given world commodity price $P_W$, in the importer case domestic production is $q_1$, domestic consumption is $q_4$, and imports are given by the difference $q_4 - q_1$. If, however, the government decides to support the domestic price at a higher level, $P_C$, domestic production increases to $q_2$, domestic consumption decreases to $q_3$, and imports decrease to $q_3 - q_2$. In order to support the higher price, the importing country must use tariffs and/or quotas, giving domestic protection equal to $P_C - P_W$.

The analysis for an exporting country is shown in Panel (b). With a support price of $P_C$, producers respond by increasing their production from $q_7$ to $q_8$, while consumers decrease their consumption from $q_8$ to $q_5$. Governments have several options
Figure 1
Impacts of Agricultural Price Supports in a Small Open Economy

(a) Importing Country

(b) Exporting Country
available to deal with the resulting excess supply. One is to subsidize exports by making a payment to exporters of $P_C - P_W$ per unit (the export rebate). An alternative is for the government to buy up the surplus and store it, donate it as foreign or domestic aid, or destroy it.

The partial equilibrium welfare effects of price supports in the importing country case (supported by tariffs or quotas) can be represented using areas shown in Panel (a). These are:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of consumer loss</td>
<td>-1-2-3-4</td>
</tr>
<tr>
<td>Area of producer gain</td>
<td>+1</td>
</tr>
<tr>
<td>Tariff revenues or</td>
<td></td>
</tr>
<tr>
<td>Import premia</td>
<td>+3</td>
</tr>
<tr>
<td>National welfare loss</td>
<td>-2-4</td>
</tr>
</tbody>
</table>

The corresponding effects of price supports in the exporting country case (with export rebates) can be represented using the areas shown in Panel (b) as:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of consumer loss</td>
<td>-5-6</td>
</tr>
<tr>
<td>Areas of producer gain</td>
<td>+5+6+7</td>
</tr>
<tr>
<td>Export rebates</td>
<td>-6-7-8</td>
</tr>
<tr>
<td>National welfare loss</td>
<td>-6-8</td>
</tr>
</tbody>
</table>

The impacts of deficiency payments are shown in Figure 2 for the same small open-economy importer case. Deficiency payments are made to producers whenever the prevailing market price is below a "target" price. In the absence of deficiency payments the price both consumers and producers face is the world price, $P_W$; domestic consumption is $q_3$ and domestic production $q_1$, with the difference $q_3-q_1$ imported. If the government guarantees
producers a higher price, $P_C$, by paying them the difference between $P_C$ and $P_W$, domestic production increases from $q_1$ to $q_2$. Unlike under price supports, the government makes no attempt to support the market (consumer) price.

The difference between deficiency payment schemes and price supports is that under the former consumers pay the world price (in the small economy case), while under the latter they pay the higher support price. Deficiency payment schemes therefore tend to have only production side distorting effects, while price supports have both producer and consumer side effects.

The partial equilibrium welfare effects can also be represented using the numbered areas in Figure 2:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of producer gain</td>
<td>+1</td>
</tr>
<tr>
<td>Deficiency payments to</td>
<td>-1-2</td>
</tr>
<tr>
<td>Producers</td>
<td></td>
</tr>
<tr>
<td>National welfare loss</td>
<td>-2</td>
</tr>
</tbody>
</table>

While in practice most of the major agricultural support programmes involve one of these two mechanisms, in practice they are considerably more complicated than this. In the major producing countries, both types of programmes operate simultaneously for several products, and where price controls operate they are usually accompanied by stockpiling. Marketing quotas, set asides, and other devices are then used to counteract incentives to increase production under the higher prices.

Where large stockpiling has resulted, as in the EEC in dairy and sugar, and in the U.S. in grains, stockpile policies
Figure 2

Impact of Deficiency Payments in the Small Economy Case
themselves have become important. The use of export subsidies has become attractive when stockpiles have become large. But, because both major developed exporting and importing countries (the EEC, U.S., Japan, and others) use policies of the types mentioned above to support the incomes of domestic producers, access to export markets to dispose of accumulated stockpiles is limited, leading to (often expensive) export subsidy competition in third country markets.

Of the various methods available to control production, the most commonly used are marketing quotas, which restrict the quantity supplied both for domestic use and for export. In some cases these are administered on a producer-specific basis, with no trading in quota allowed across producers. This may add significantly to the resource misallocation costs of such programmes.

Acreage reduction programmes are also used and typically operate by requiring producers to set aside specified acreages of cropland without payment for conservation use to be eligible for market price support and deficiency payments. Paid land diver-sions may be available to producers who voluntarily divert even more acreage, with payments in the form of cash subsidies or government-held commodities. These supply control measures may partially or wholly offset the welfare consequences of agricultural price supports on the supply side in Panel (b) of Figure 1.
III. Agricultural Support Programmes in the EEC, the U.S., and Japan

While the diagrams presented above indicate the main features of agricultural programmes currently in use in major developed countries, they communicate neither the substantial complexity which has arisen within them over the years, nor the global trade conflicts which they have generated. A more detailed institutional description is needed to fully appreciate the range of problems that possible trade negotiations to deal with agriculture would encounter.

A. The EEC Common Agricultural Policy

Agricultural support programmes in the EEC reflect the objectives of the common agricultural policy (CAP) as enshrined in Article 39 of the Treaty of Rome (March 1957). These were: (i) to increase agricultural productivity by promoting technical progress and by ensuring "rational" development of agriculture; (ii) to achieve a "fair" standard of living for agricultural producers; (iii) to stabilize agricultural markets; (iv) to assure "adequate availability" of supplies; and (v) to ensure that supplies of agricultural products reach consumers at reasonable prices. Article 40 lays out the various measures through which these objectives are to be achieved. They include the creation of a common organization of community markets, a

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1 Sources for this section include: Bureau of Agricultural Economics (1981); Buckwell et al. (1982); Commission of the European Communities (1983); Fennel (1979); OECD (1974); Harris et al. (1983); and Hill (1984), Appendix 3.2.
common prices policy, and the establishment of one or more funds to finance the common organization of agricultural markets.

As CAP emerged from the formative discussions between the original six EEC member states in 1960, it enshrined three fundamental principles: market unity, Community preference, and financial solidarity. Market unity implies that intra-community trade in agricultural products should be free and unrestricted. This is to be achieved through the establishment of a common agricultural market for each commodity covered by the CAP, based on a common system of marketing and pricing. In practice, as is discussed below, this principle has been undermined by the subsequent system of "monetary compensation amounts".

Community preference on the internal market is designed to ensure that Community producers are able to compete with third country imports. Community preference is to be achieved by a system of import levies and customs duties.

Financial solidarity refers to the common financing of the CAP, which in practice takes place through the European Agricultural Guidance and Guarantee Fund (EAGGF). This receives the proceeds of import levies on agricultural products, as well as financial commitments from EEC member governments.

For each commodity covered by CAP a series of institutionally determined support prices are set:

**Target prices:** Prices that it is desired that producers receive for their products during the marketing season.
Intervention prices. Prices at which EEC member governments undertake to intervene in markets by buying products offered to them by producers. As such they are effectively minimum producer prices.

Threshold prices. Minimum entry prices for imports, typically set at a level equal to target prices. In effect, they define ceiling prices on EEC internal markets.

To enable EEC producers to compete on world markets, and to prevent imports from third countries from undercutting EEC internal market prices, a system of import levies and export refunds (so called "restitution payments") are also used at Community frontiers. Import levies cover the difference between threshold prices and "offered" prices for imports (prices at which imports are offered for sale by foreign suppliers); restitution payments (export refunds) cover the difference between EEC internal market prices and average world prices.

Understanding how CAP works is made difficult by the fact that the terminology used to describe the various EEC market support prices differs from product to product. In addition, there are other methods by which the CAP supports prices. For example, aid for private storage is available for certain producers to help them hold supplies off oversupplied internal markets. Consumer subsidies are used to encourage domestic consumption of milk and dairy products. Also, producer refunds subsidize the use of certain domestically produced agricultural inputs by manufacturers to enable producers to compete with
comparable goods supplied from outside the Community. Furthermore, for some products, such as certain fresh fruits and vegetables, the market price is supported by the withdrawal of supplies from oversupplied markets by producer groups when market prices fall to specified withdrawal prices. Imports of such products are subject to customs duties.

For other products, the EEC only supports prices through border restrictions. For these, minimum import (sluice-gate) prices are fixed quarterly, and estimates made of the cost of production in third countries. If the import supply price is below the sluice-gate price, a supplementary levy is charged. Imports are then subject to a basic levy equal to the difference between community and world prices, plus 7 percent of the previous year's sluice-gate price. The latter is rationalized as a margin of protection for processing industries within the community.

For some other (relatively minor) products deficiency payments are instead used to offset the difference between target and world market prices. Flat rate production subsidies are also used, fixed on a per hectare sown and harvested basis.²

²Although these also affect only a small fraction of total Community agricultural production.
EEC Agricultural Policies by Commodity

When first introduced in 1962, the commodities covered by CAP were cereals, meat, poultry, eggs, fruit and vegetables, and wine. The coverage of CAP has since widened, and currently applies to nearly all EEC agricultural production.

(1) Cereals - Common and Durum Wheat, Barley, Rye, Maize

Support policies for cereals largely follow the description given above. Each year the Community sets target and intervention prices for common wheat, durum wheat, barley, rye and maize. Target prices are meant to reflect prices in Duisburg (West Germany), where grain was thought in 1962 to be in shortest supply within the Community. Intervention prices reflect the Ormes market (Paris Basin) where grain was thought to be in greatest surplus. The difference between target and intervention prices largely reflects transport costs between Ormes and Duisburg, although an additional element represents the difference between the market price and intervention price at Ormes. Intervention agencies in the various countries are obliged to buy all commodities offered to them at these prices.

A common intervention price applies for common wheat, barley, rye and maize, but a different intervention price for durum wheat and a special reference price applicable only to wheat of breadmaking quality. This latter is set above the common intervention price to compensate farmers for the below average yields of breadmaking quality varieties. Further measures are used to support the reference price when internal
markets are deemed to be oversupplied. These take the form of storage payments for producers who keep their grain off the market.

Other supports also operate. Production refunds are paid to users of products affected by domestic price supports, such as maize and common wheat used to manufacture starch, and maize used for brewing and manufacturing glucose. These are paid directly to the manufacturers to allow them to compete with comparable goods supplied from outside the Community. Flat rate subsidies are given for durum wheat producers in certain regions of the Community which have below average yields.

Border regulations also operate to protect internal market prices. Threshold prices are set such that target prices are not undercut by imports. Differences between import supply prices and threshold prices are covered by import levies. Exports receive restitution payments. The Community also uses food aid to developing countries (mainly in the form of wheat deliveries) as a way of disposing of surpluses.

(ii) Rice

Policies towards rice are similar to those for the cereals mentioned above. Target prices are set in Duisburg, expressed in terms of husked rice, and intervention prices are set in Vercelli, expressed in terms of paddy rice (i.e., unprocessed rice). The difference between the target and intervention prices reflects price conditions in Vercelli and the cost of transportation between Vercelli and Duisburg plus costs involved in
de-husking. Separate threshold prices apply for husked rice, milled round grain rice, and milled long grain rice. Intervention takes the form either of support buying or aid for private storage. Production refunds are available for purchasers of broken rice used in the manufacture of starch and for brewing beer. Border regulations take the form of import levies and export refunds, with some rice exported for food aid.

(iii) **Sugar**

Sugar prices are also supported through target, intervention and threshold prices, but support buying applies to sugar products (i.e., raw and white sugar), rather than the farm product itself.\(^3\)

The intervention price for white sugar is set such that after allowing for freight and processing costs, farmers receive a guaranteed minimum price for their beet. Intervention buying is not often resorted to since the Community mainly uses export refunds to dispose of surplus sugar. An intervention price for raw sugar could be similarly set, but few beet factories in the EEC produce raw sugar.

The target price for white sugar is set 5 percent above the intervention price. The threshold price (the minimum import price for imports) is set equal to the target price plus a storage levy. The latter finances the storage cost subsidies available to holders of inventory of white and raw sugar. The

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\(^3\) Only beet sugar is produced in the EEC.
levy applies to all sales by sugar manufacturers (apart from that sold into intervention). The minimum market price for sugar products is thus effectively the white sugar intervention price plus the storage cost levy. If the internal market price is below this, it will pay manufacturers to sell into intervention.

Unlike the case of wheat, output of sugar is also subject to quotas and levies to limit excess production. A basic quota (termed the 'A' quota) approximately equals domestic consumption. A 'B' quota covers production in excess. Together, the A and B quotas constitute what is termed the maximum quota.

An annual levy on producers based on 2 percent of their maximum quota production is used to cover the cost of export refunds, and an additional levy of 30 percent is charged on 'B' quota production. If these revenues do not cover export refunds, a supplementary levy of 7.5 percent may be charged on the following year's 'B' quota. Production of sugar outside the maximum quota is referred to as 'C' sugar. This sugar is ineligible for price support and must be exported without export subsidies.

Other support measures include production refunds for sugar used in the chemical industry, and import levies, export refunds, and food aid as in the case of wheat and rice.

(iv) Milk and Dairy Products

Support policies for milk and dairy products are similar to those for sugar in that supports apply to dairy products rather than directly to fluid milk. Intervention prices for butter,
skim milk powder, and some grades of cheese are set to ensure that milk producers achieve a target price for their fluid milk. Intervention takes the form either of support buying of dairy products or aid for private storage. Subsidies are given to users of skimmed milk and skimmed milk powder in production of animal feed, so that they can compete with other feed-stuffs.

In administering these policies, the EEC combines dairy products into 12 groups, each with a 'pilot product' (representing the type of product). Threshold prices are fixed for pilot products, and import levies calculated such that third country imports cannot undercut the implied target price for fluid milk. The import levy for "assimilated products" in the same group is calculated using the pilot product threshold price. Export refunds are paid on all dairy products. Exports of butter oil and skimmed milk powder also occur under food aid programmes.

Over the years, stockpiles of dairy products have been one of the more visible signs of the problems created by CAP. The EEC has used a variety of measures to curb overproduction and reduce surpluses. Measures to stimulate demand have taken a number of forms, mostly aiming to reduce the price of dairy products entering final consumption. Prior to 1982 a system of non-delivery and conversion premiums operated on the production side which compensated dairy farmers for part of their income loss from the non-marketing of milk and dairy products, conversion from dairy to beef or sheep production, or from leaving
dairy production altogether. In their intent, these were not
dissimilar to the set aside programmes for wheat which are used
in the U.S. (see discussion below). Also, a co-responsibility
levy system has been in operation since 1977, under which
producers are obliged to share in the costs of disposing of
surplus production. In 1984, a new system of production quotas
for milk was introduced with sharp tax penalties on overpro-
duction.

(v) Pork

Pork price supports under CAP differ from the other
commodities described above. The desired producer price is
termed the 'basic price', and is supported by intervention
whenever the average market price is between 78 and 92 percent of
the basic price. Intervention takes the form either of govern-
ment purchases or aid for private storage, with the latter more
frequently used.

A system of sluice-gate prices and import levies apply at
the border. The sluice-gate price is set to roughly equal the
cost of producing pork in third countries. If the import supply
price is below the sluice gate price it is raised to this level
by a supplementary levy. In addition, a basic levy is charged
equal to the difference between EEC and world market prices, plus
7 percent of the average sluice-gate price in the previous year.
Export refunds are also available.
(vi) Poultry and Eggs

Prices of poultry and eggs are supported under CAP solely through import restrictions; there are no formal internal price supports. A sluice-gate price is set which reflects production costs in third countries. A supplementary levy and a basic levy are charged on imports and are calculated as for pork. Export refunds are again also available.

(vii) Beef and Veal

Support prices for beef and veal are based on a guide price set for adult cattle and calves, with intervention measures taken whenever internal market prices fall to 90 percent of the guide price. Intervention takes the form either of support buying or aid for private storage.

However, producers are not paid an intervention price but instead receive a different "buying-in" price, determined by applying various coefficients and conversion factors applied to the market intervention price. These are intended to reflect both differing market conditions between Community states and a "killing-out" percentage based on the yield of carcass meat from animals.

Import levies cover the difference between the guide price and the duty paid import price, although the proportion of the levy actually applied is determined by the relationship between the internal market price and the guide price. When the internal market price is between 98 and 100 percent of the guide price the whole of the levy is applied. When the internal market price is
below (above) the guide price, the import levy is increased (reduced). The purpose is both to provide protection to producers within the community, and to comply with GATT obligations to increase imports of beef and veal. Export refunds are again available.

Other internal measures used to support prices include subsidies on consumption and premium payments on production based on the difference between the internal market price and a target price which may not exceed 85 percent of the guide price.

(viii) **Fruit and Vegetables**

CAP supports for producers of fruit and vegetables differ from those for other agricultural commodities, in part due to the difficulties of stockpiling. The mechanism used is to fix basic prices for the main fruit and vegetables using average prices over the preceding three years for the "most representative" markets within the Community. Buying-in prices are set at between 40 and 70 percent of the basic prices, depending on the product.

If internal prices fall below these buying-in prices, intervention buying can take place, but in practice this is rarely used. Instead, producer organizations establish withdrawal prices, equal to the buying-in price plus 10 percent of the basic price, and operate their own voluntary withdrawal schemes. In return, they receive compensation from Community funds calculated using the withdrawal price. Other internal measures include Community support to improve the production and
marketing of certain varieties of citrus fruits produced within
the Community.

The border treatment of imports includes customs duties and
countervailing charges based on reference prices. Reference
prices represent minimum c.i.f. prices at which products from
third countries may be imported. If the price of imports is
below the reference price it is raised to this level by a
countervailing charge. Customs duties cover the difference
between reference prices and minimum import prices. Export
refunds are once again available.

Administration of CAP

CAP is financed by the European Agricultural Guidance and
Guarantee Fund (EAGGF). The Guidance section finances structural
improvements such as farm modernization, vocational guidance and
training, and aids to various producer groups. The more impor-
tant Guarantee section finances intervention payments, export
refunds (including food aid), and Monetary Compensation Amounts
(discussed below). The Community receives revenues from import
levies, production levies on sugar and milk, customs duties, and
contributions from value added tax revenues collected in the
Member States. These enter the Community budget, from which CAP
is financed through the EAGGF.

A central principle of CAP is that uniform agricultural
prices should prevail throughout the whole of the Community, with
prices calculated in common European units of account which are
then translated into different national currencies using national
exchange rates. This common unit, the European Currency Unit (ECU), was substituted for the Agricultural Unit of Account (AUA) after the introduction of the European Monetary System in 1979.

This idea of calculating common prices based on the ECU has generated a further level of complexity within CAP which will be important in any trade negotiations. In 1969, the French Franc was devalued, followed by a revaluation of the German Mark. The volatility in exchange rates that followed created difficulties in many Member States because the exchange rates used to calculate agricultural support prices were similarly adjusted, generating instability in both producers' incomes and food prices. An agreement was reached to use fixed representative (green) exchange rates in calculating support prices, realigning them only gradually to new market determined rates.

This meant, however, that producers in countries with a depreciating currency selling in other member states would have been able to make a foreign exchange gain by converting the foreign currency they received at market rates. Conversely, producers in countries whose currency was appreciating would have made an exchange loss selling abroad.

To limit these inter-country effects a system of monetary compensation amounts (MCAs) was introduced to operate alongside CAP. These amounts equal the difference between the central bank rate of exchange and the green rate of exchange multiplied by the intervention price. Producers in a country with a depreciating
currency pay an MCA tax on their exports and importers receive an MCA subsidy. In a country with an appreciating currency the effects are reversed. Through this use of fixed exchange rates for domestic currency price calculations, CAP has spawned a further system of compensating taxes and subsidies which come into operation as market determined exchange rates change.

B. Agricultural Support Policies in the U.S.\textsuperscript{4}

Although the major focus of trade discussions on agriculture is usually the CAP, it is crucial to remember that U.S. farm commodity programmes are also exceedingly complex. Their current structure reflects a long history of price support and supply management programmes that began in the early 1930s and has evolved, changed, and grown since that time. The political roots of today’s farm supports are perhaps deeper and even more entrenched than in the EEC, and as various farm bills have passed through Congress over the years, embellishments on the basic programmes have added layers of increasing complexity to the underlying supports. Because this historical process is so important to an understanding of the complexities of any future international agricultural trade negotiation, we have summarized this history in tabular form in Appendix A.

U.S. Policies by Commodity

U.S. agricultural programmes aim to stabilize and support farm incomes and prices; manage supplies; and aid in the distribution of agricultural commodities. Their principle features include commodity loans and purchases, direct income payments to farmers, production limits, grain reserves, import duties and quotas, and various export measures.

(1) Wheat, Feed Grains, and Rice

Price supports for producers of wheat, feed grains (corn, grain sorghum, oats, barley, and rye), and rice are provided through the Commodity Loan Programme. Under this Programme, the Commodity Credit Corporation (CCC)\(^5\) makes non-recourse commodity loans to farmers using commodities committed by the farmer as security which are stored either on the farm or in commercial warehouses. These loans mature on demand, but on or before the loan's maturity date, producers have the option of regaining possession of their crop by paying the loan plus any interest accrued, or forfeiting the farm or warehouse-stored commodities to the CCC as full payment of the loan. In effect price supports operate through the setting of the loan rate.

However, further price supports are also available to farmers under a further Target Price Programme, which applies to wheat, feed grains (excluding rye), and rice, and which is used

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\(^5\)This is a government-owned and operated corporation established in 1933 to stabilize and support farm incomes and prices.
in conjunction with the Loan Programme. Target prices define deficiency payments. If the national average market price falls below the target price, deficiency payments equal the difference between the target price and the higher of the national average market price and the loan rate. No payments are made if the national average market price either equals or is above the target price. However, farmers who want to receive deficiency payments on their harvested acreage are required to reduce their planted acreage by a percentage specified by the Secretary of Agriculture. Deficiency payments under the wheat, feed grain, rice, and cotton programmes combined are capped at $50,000 per farmer.

In periods when price supports (and loan rates) have increased rapidly, such as in the late 1970's, the outcome has been a sharp growth in stockpiles, especially of wheat and feed grains. As a result, a significant further portion of grains policies are oriented to stockpile management.

The most commonly used approach has been acreage reduction programmes. These require participating producers to limit their acreage of a programme crop (wheat, barley, oats, corn, grain sorghum, and rice). These programmes operate when the Secretary of Agriculture determines that the supplies of particular crops are likely to be excessive relative to projected domestic and net export demand, plus any desired changes in end of year reserve stocks. In order to be eligible for loans, purchases, and payments, if an acreage reduction or set-aside is in effect,
producers must reduce their plantings, without payment, by a specified percentage of the normal crop acreage (NCA) base for the commodity. This acreage must then be devoted to approved conservation uses. Producers may also be required to comply with acreage reductions on other programme crops. In addition, they have the option of diverting additional croplands out of production to receive land diversion payments. Crop specific acreage reduction programmes may be substituted for a more general set-aside programme for wheat and feed grains (excluding rye) that calls for reduced plantings, but does not specify which crops have to be cut back.

A further effort to reduce surplus stocks of wheat, corn, grain sorghum, and rice was reflected in the Payment-In-Kind (PIK) programme introduced in 1983. Under this programme, farmers who agreed to reduce their acreage by between 10 and 30 percent more than the amount required to be eligible for loans, purchases, and payments were compensated by the government in-kind out of its own commodity reserves. Participating farmers were required to liquidate as much of their loan reserves as necessary to meet their eligibility for PIK, and only where farmers did not have enough loans were liabilities met from CCC stocks. The response rate to PIK in 1983 was large, and CCC stocks were insufficient to meet federal government liabilities. As a result, the PIK programme has been scaled back. Currently, the programme applies only for wheat, and the payment limit of $50,000 in federal subsidies per farmer includes PIK payments.
Farmers receive further support through disaster payments, which apply for wheat, feed grains (excluding rye), and rice. A producer qualifies for payment under these programmes if he is prevented from planting any amount of these crops because of conditions beyond his control, or if his total yield is less than 60 percent of his farm's estimated potential yield. To be eligible for disaster payments, producers must again comply with any acreage reduction or set-aside programmes in effect, and payment per farmer per year cannot exceed $100,000.

In 1980, a comprehensive Federal Crop Insurance programme replaced most previously applicable disaster payments, with the costs of the programme shared between the government and the farmers. The earlier Disaster Payment Programme was continued only for producers ineligible to receive Federal Crop Insurance payments.

Further farm supports operate under a farmer-owned grain reserve programme for wheat and feed grains (excluding rye). This programme is designed to insulate both the domestic and the world market, in effect preventing both domestic and world market prices from dropping sharply due to the disposal of U.S. surpluses. The programme includes all producers with CCC commodity loans. As their loans approach maturity, producers have the option of redeeming the loan or extending it for three years by placing the grains in a farmer-held grain reserve. The grain can be stored on a farm or in commercial warehouses, and producers receive annual payments from the CCC in advance to help
pay the costs of the reserve storage. Grain is released from the reserve when national average market prices rise to specified levels.

Imports of wheat, feed grains, and rice are all subject to customs duties, which protect domestic market prices. Export credit guarantees, targeted export assistance, and export PIK's\(^6\) all apply on the export side. In addition, food aid is used as a way of disposing of CCC stocks.

(ii) Sugar

Before the last Sugar Act expired in 1974,\(^7\) domestic sugar was produced and marketed—and foreign sugar imported—under a quota system. Between 1975 and 1976 a free market in sugar prevailed, but since 1977, sugar price support programmes have again been included in farm legislation enacted by Congress every four years. Under the current programme, price supports to producers of sugarcane and sugarbeets operate through standing offers by the CCC to buy raw cane sugar and refined beet sugar under the Commodity Loan Programme. Imports of cane and beet sugar are subject to quotas\(^8\) and import tariffs and fees.

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\(^6\) Under the export PIK plan, the Secretary is authorized to provide CCC-owned commodities free or at reduced prices to foreign purchasers.

\(^7\) See Appendix A.

\(^8\) Import quotas were established in May 1982 and allocated to sugar exporting countries on the basis of their 1976-81 exports to the United States.
(iii) Milk and Dairy Products

Income support for dairy producers operates through price supports for processed products, since these are easier to store than unprocessed milk. The CCC has standing offers to purchase manufactured dairy products (butter, cheese, and milk powders) at prices which are based on a desired level of prices for raw milk for manufacturing use. These offer prices include an allowance for processor's margins to cover processing costs. Imports of dairy products are subject to customs duties and restrictive bilateral and global quotas.

Fluid milk prices are also supported by federal marketing orders that establish minimum prices that milk processors are required to pay dairy farmers producing in specified marketing areas, according to the milk's use as fluid milk (Class I) or manufacturing milk (Class II and Class III). Minimum prices for Class I milk are calculated on the basis of specified differentials across various marketing areas relative to the price of milk entering processing in Minnesota and Wisconsin.

9 Class I includes whole milk, low fat milk, and skim milk. Class II milk includes cream, yogurt, cottage cheese, and ice cream, while Class III includes butter, cheese, and dried milk.

10 These differentials reflect costs of transporting fluid milk; the added costs of producing and marketing milk for fluid use; and supply and demand conditions for milk including the cost of alternative supplies. These differentials are designed to allow farmers in each marketing order area to meet area demand and to discourage them from shipping milk between marketing areas.
(the major surplus production area)—the M-W price. This is done so that milk prices in all regions will automatically reflect changes in the national supply-demand situation and in price support levels under the dairy price support programme. Milk which is surplus to fluid demand is manufactured into dairy products. Reserve milk prices which are based on the M-W price,¹¹ but are lower than Class I prices in order to encourage handlers in fluid milk markets to meet fluid milk demands first before engaging in manufacturing. Producers of fluid milk receive a "blended" price based on the proportions of milk used for fluid consumption and for manufacture of dairy products.

Some of the surplus of hard manufactured products which these price supports generate are used in domestic and foreign feeding programmes, but much of it stays in storage. Current estimates are that around 25 percent of the butter produced in the U.S. is given away in domestic programmes. In part to reduce the budgetary costs of these donations, the 1982 Omnibus Budget Reconciliation Act required dairy farmers to share in the costs of support purchases.

(iv) Beef and Veal

While there are no price supports for producers of beef and veal, import controls are mandated under the Meat Import Act of 1979. These apply if import volumes equal or exceed a "trigger

¹¹ The Class III price is the same as the M-W price, while the Class II price is the M-W price plus a variable Class II differential.
level", which is 110 percent of an adjusted base quantity determined at the beginning of each year. The value of this base quantity was estimated to be $1.11 billion of imports in 1984. If the President decides to restrict imports, his discretion is limited to restricting them to the adjusted base quantity (but not less than 1.25 million pounds). While beef and veal imports can be restricted in this way by formal import quotas, in recent years, the government has instead negotiated voluntary restraint agreements and exchanged letters of understanding with supplying countries.12

C. Japanese Agricultural Supports13

Japan is a significant net food importer, but has set itself the goal of moving closer to food self sufficiency. This objective underlies the widespread and restrictive agricultural protection in Japan. The protective policies used are numerous, complicated, and as in the EEC and the U.S., differ among various agricultural commodities. They include cost-of-production pricing; direct subsidies (deficiency payments) to producers; incentive payments to rice growers; import quotas; and import

12In 1982, and again in 1983, a voluntary restraint agreement programme was negotiated with Australia and New Zealand and a letter of understanding was signed with Canada for the fourth quarter. The import restrictions limited the total volume of imports in each year to above the trigger level.

13The material presented in this section draws on Bureau of Agricultural Economics (1981); Sanderson (1978); and Saxon et al. (1980).
duties and levies. These policies are used singly or in combination.

(1) **Rice**

The most important agricultural policies in Japan are those for rice. These aim to provide high support prices for rice producers through purchase operations by the Japanese Food Agency which sells the rice to consumers at prices substantially below the purchase prices to growers.

Rice consumption has been falling in Japan almost continuously since the early 1960s, and improved yields and the increased profitability of growing rice (in part due to the price supports) have both led to growth of surpluses. The government has tried to curb the growth of surpluses by various measures, including encouraging farmers to divert land from rice to alternative crops (discussed below), encouraging the use of surplus rice as stock feed, and encouraging rice consumption through consumer pricing policies, school lunch programmes, and indirectly through advertising.

The current rice land diversion scheme is a 10-Year Paddy Field Utilization and Reorganization Programme which started in 1978. Under this programme aggregate targets for diversion for areas are chosen, and these are divided between individual farms. Incentive payments are offered to farmers to divert land from rice to specified crops in which there is deemed to be a low level of self-sufficiency.
The financing costs of the Food Agency's intervention programme for rice are the largest item in the country's agricultural budget, although efforts are now being made to reduce this by gradually increasing consumer prices. Because of these domestic policies, imports of rice are strictly controlled through quotas, with c.i.f. import prices stabilized at around the target selling prices.

(ii) **Other Grains**

Despite the fact that Japan imports the majority of its wheat and barley consumption, a further thrust of Japanese grain policy has been to try to increase production of these two crops. The aim is again a higher degree of self-sufficiency, which in turn is justified as providing a more secure food supply. However, grains used for feed and industrial purposes (maize and sorghum) which have accounted for Japan's main growth in grain consumption in recent years, are both imported free of duty and quotas.

Wheat and barley production have increased both because of the rice land diversion payments mentioned above, and production incentives. Producer prices for wheat and barley are determined on the basis of a 1950-51 "parity" price index, and are supported through purchase and sale operations by the Food Agency. The difference between the purchase price paid to growers and the selling price to consumers is financed by the National Treasury. Imports of wheat and barley are controlled through import quotas,
which are set such that the average purchase price for imports is stabilized at around the selling price to consumers.

(iii) **Sugar**

Although Japan also imports the majority of its sugar, there is still domestic production of both sugar beet and sugar cane. Japanese cane production is limited in Japan by climate, while rotational requirements and the lack of infrastructure constrain the production of sugar beet. But motivated again by the objective of self-sufficiency, the Japanese nonetheless pursue policies to stimulate both cane and beet production which, in turn, have impacts on Japanese trade.

The main policies used are incentive payments above basic producer prices (which are determined each year using a 1950-51 parity price index). Their effect on increasing production has been limited, but the accompanying policies have significantly restricted trade.

A Sugar Stabilization Agency both stabilizes prices and co-ordinates the market for domestic and imported sugar. The agency purchases all domestically produced cane sugar from cane millers at a standard manufacturing price which incorporates the basic producer price, mentioned above, and the costs of milling. It then sells the raw sugar back to the millers at the raw sugar equivalent of the wholesale market price for refined sugar. This is substantially below the purchase price to millers but is set at a level that is competitive with imported sugar. The millers are required to sell the raw cane sugar to refiners
at the agency selling-back price. The price for white beet sugar is similarly subsidized.

Under these arrangements imports of sugar are subject to a complex system of levies, surcharges, and rebates, determined by the interaction of maximum and minimum stabilization prices, target prices, and average import prices. Maximum and minimum stabilization prices, respectively, are set at one standard deviation above and below a "centre" price for imported sugar, based on London market prices over a specified period of time. Target prices reflect the cost of producing domestic beet and cane sugar, although target prices are set substantially below the agency's buying price for domestic sugar, and typically lie in the range between the maximum and minimum stabilization prices.

Imports of sugar are purchased by trading houses and sold to refiners. The average import price is based on a calculated index of imported sugar prices, and imports of sugar are subject to import duties as well as the various charges and rebates mentioned above. The refiners then sell the imported sugar to the Sugar Agency which, in turn, sells it back to refiners at a price net of levies, surcharges, and rebates, as in the case of domestically producer sugar.

Import levies, surcharges, and rebates for sugar are determined using an extremely complex scheme. If the average import price is below the minimum stabilization price, a levy equal to the difference is charged. In addition, a surcharge is
applied; equal to the difference between the minimum price and the target price multiplied by the estimated fraction of domestic production of sugar and glucose in total production of these sweeteners. This fraction is referred to as the 'factor'. If the average import price is between the minimum stabilization price and the target price, a surcharge equal to the difference multiplied by the factor is applied. If the average import price is between the target price and the maximum stabilization price, no levy or surcharge is applied. If the average import price is above the maximum stabilization price, a refund equal to the difference is paid. Import levies go into a stabilization fund used to finance import refunds to refiners. Import surcharges go into a fund used to subsidize domestic producer prices.

(iv) Milk and Dairy Products

There are two major milk markets in Japan, drinking milk and manufacturing milk, and price supports reflect this structure. The price paid to producers of drinking milk is negotiated annually between producers, dairy co-operatives, and milk companies in each prefecture in Japan. These prices are typically set at levels above the price for manufacturing milk, which is based on a target rate of return for producers of manufacturing milk. This rate of return is set each year and based on a cost of production formula for milk.

This target return is supported through national offer-to-purchase prices (or so-called 'stabilization indicative prices') for designated dairy products (butter and most major condensed or
powdered dairy products). The market prices for these designated products are maintained within a stabilization price band by the Livestock Industry Promotion Corporation (LIPC), which also controls imports. The floor price is set at 90 percent of the stabilization price, and the ceiling price at 104 percent. Milk producers achieve their target return, both by selling processed dairy products at supported prices and receiving deficiency payments.

Revenues of farmers selling in the drinking milk market and the manufacturing milk market are pooled within the co-operative milk distribution organization in each prefecture, and an average price for milk determined. Revenues are then distributed between all farmers in the prefecture by quantity sold at the average price.

There are no imports of drinking milk due to Japan's health regulations that prohibit the transport of fresh milk long distances. There are, however, imports of dairy products, but to protect the manufacturing milk industry these are subject to import quotas.

As in the EEC and the U.S., the last decade has witnessed the growth of stockpiles of both butter and skim milk powder in Japan, reflecting low growth in consumption and continual production increases. The rate of growth of wholesale prices has been modest, but producer prices have increased with rises in costs of production, and deficiency payments have increased. For obvious budgetary reasons, in recent years the government has
tried to limit the volume of manufacturing milk eligible for
deficiency payments. Measures include widespread promotion
campaigns to encourage the drinking of milk, and government
support for diverting milk from butter and skim milk production
to cheese, which Japan imports.

Other measures include a school lunch programme to increase
consumption of milk and dairy products; a stock-feed price
stabilization scheme to protect dairy producers from short-term
price fluctuations; and direct assistance to develop pasture
lands. Health regulations, milk distribution zoning arrange-
ments, and dairy co-operative agreements further restrict the
movement of drinking milk between prefectures, between which
prices typically vary.

(v) Beef

Japanese beef policies also aim to achieve higher levels of
self-sufficiency. Domestic wholesale prices are maintained well
above their equivalent import levels, and are supported by
stabilization schemes administered by the LIPC, which controls
imports and/or regulates market supplies to maintain the whole-
sale price within a cost-related stabilization band.

A voluntary feeder-calf price stabilization scheme supple-
ments beef price stabilization arrangements. Under this scheme,
when market prices for feeder calves fall below a predetermined
standard price, producers receive a deficiency payment equal to
80 percent of the difference. The scheme is financed by a
stabilization fund supported by participating producers, the prefectural governments, and the national government.

A range of direct subsidies for beef production operate. These include funds to promote large-scale breeding in designated areas; funds to cover improvements in the marketing system for beef; a school lunch programme to expand consumption of beef; a stock-feed price stabilization scheme to protect producers from sharp changes in the price of feed; and direct assistance measures to develop pasture lands.

Imports of beef are controlled by import quotas consisting of a general quota, of which approximately 90 percent is allocated to the LIPC, and the rest to private users, with special quotas for school lunch programmes and other specified purposes.

Imports of LIPC quota beef are subject to LIPC minimum prices and enter under three different forms of import arrangement. Under one scheme, the LIPC buys frozen beef from licensed importers at prices determined by monthly tenders, and sells the beef to specified domestic users at approximately the same price as prevails for domestic beef. The difference between the import and market prices becomes the trading profit of the LIPC.

A second scheme covers "one-touch chilled" beef. Under this scheme, licensed importers sell LIPC quota beef directly to designated stores. The LIPC imposes import levies to raise the price of the imported beef to around the price for domestic beef. In the past, the LIPC has allowed some quota beef to be
sold under reduced duty rates to lower retail prices to consumers. Finally, there is a modified tender system which involves a set price. Under this scheme, importers and non-designated users of imported beef submit joint tenders to purchase. Successful tenders are determined on the basis of the difference between the total importers' and users' tenders.

The LIPC levies and the profits earned on imports are used to finance many of the direct support arrangements for beef producers mentioned above, including the feeder-calf stabilization scheme. An important implication for trade negotiation is that because of the budget cost of supports to agriculture from general revenues, the government sees its interest as both protecting beef producers, and in maintaining a flow of beef imports sufficient to fund beef support programmes directly through import levies.

(vi) Fruit

Fruit prices in Japan are less heavily supported by direct government payments and market coordination programmes than those of other agricultural commodities. Protection for Japanese fresh fruit operates directly through formal import restrictions. Imports of fresh fruit, other than bananas, are restricted by quarantine regulations, and imports of fresh oranges and tangerines are subject to import quotas. Significant duties also apply to imports of most fresh fruit.

The main fruits produced in Japan are mandarin oranges and apples. Mandarin oranges have been and still are in surplus
supply, and government assistance policies aim to encourage growers to convert land to other crops. Apples have been in short supply since the 1970s, and the government encourages new plantings through assistance in financing farm machinery, sorting and packing equipment, and through subsidies to encourage planting of dwarf trees.
IV. International Trade Agreements and Agriculture

From the description of EEC, U.S., and Japanese agricultural support programmes in the previous section, it is clear not only that these programmes are extraordinarily complex and that global agricultural trade is much affected by them, but that multilaterally negotiating limits on them would be a prospect to daunt the most determined negotiators. Similar forms of intervention are common in most other developed countries. In developing countries wholesale intervention in agriculture also occurs; the main difference being that lowered producer prices are commonly used as a redistributive mechanism aimed at a small wealthy landowning class.

The net result of these policies has been small volumes of global agricultural trade, the entrenchment of powerful agricultural interests in both exporting and importing countries, and the capitalization of price supports in land prices. The ever growing complexity of these programmes makes them difficult to understand, and as a result equally difficult to change or negotiate internationally. This situation is not new. Nor are attempts to improve the situation. During the 1930s there were efforts to negotiate international agreements to manage agricultural trade and related domestic policies, and these have continued in the post-war years under the GATT and in other fora.

Broadly speaking, however, both previous and current international agricultural agreements do little to fundamentally
liberalize agricultural trade. In the main, they either attempt to deal with troublesome side effects of domestic programmes, such as export subsidy competition between stockpiling countries; or try to manage trade through producer cartels, export quotas, or commodity agreements which set price bands for international trade. As such, present international arrangements, weak as they are, are best seen as imposing a further layer of intervention on top of domestic agricultural programmes, rather than providing agreements which significantly restrict domestic policies and liberalize trade (as is true of trade agreements covering manufactures).

There are two quite different types of international agricultural agreements: broad framework arrangements under the GATT (largely exceptions from GATT rules for agriculture) and commodity-specific international agreements.

The GATT and Agriculture$^{14}$

It is widely agreed that trade liberalization under the GATT since 1947 has concentrated mainly on trade in manufactures. Agricultural trade has not been included in any serious way in any of the seven GATT negotiating rounds that have occurred.

It was always accepted from the start that for domestic political reasons GATT rules would have to be different and ultimately more lenient for agricultural than for other product categories. Because of the structure of their farm programmes,

$^{14}$Also see the discussion in Stone (1984); Dann (1970); Jackson (1969); and Hufbauer and Erb (1984).
the U.S. insisted on exceptions to GATT rules for trade in agriculture as a condition for its initial participation. These exceptions applied to the use of quantitative restrictions on agricultural imports (Article XI), and subsidies on agricultural exports (Section B of Article XVI).

Article XI allows the use of quantitative restrictions on agricultural imports where these are "deemed necessary" to support domestic programmes restricting quantities of products marketed or produced, or attempting to remove temporary surpluses of domestic products. These restrictions are not supposed to be used to reduce imports relative to domestic production, but in practice this interpretation of Article XI has never been put to the test.

Article XVI permits export subsidies for agricultural products provided that they do not result in a country gaining more than an "equitable" share of world exports of the product. No definition of subsidy appears in Article XVI, nor is the concept of equitable share defined.

Exceptions for agriculture under the GATT were further widened in 1955, when, in response to pressure from domestic agricultural interests, the U.S. requested and was granted a broad, open-ended waiver allowing them to use import restrictions on a wide range of agricultural products. The U.S. waiver was strongly opposed at the time by major exporters of agricultural products, and has been a major source of contention ever since. But the U.S. has consistently refused to give up its waiver,
which, in turn, has made it difficult for them to challenge the use of trade restrictions on agricultural products in other countries.

The formation of the EEC in 1958 also had a major impact on agricultural trade arrangements. Article XXIV of the General Agreement allows for an exemption from the most-favoured-nation (MFN) rules of GATT for customs unions and free-trade areas under certain conditions. The European arrangement was scrutinized by other GATT members at the time, and was found to be inconsistent with Article XXIV, and damaging to the trade interests of others. The most serious concerns arose with CAP, and especially its impact on GATT member countries with significant exports of agricultural products. Non-EEC countries have therefore always treated both CAP and the EEC with caution, and this has further held back substantive GATT negotiations on issues concerning agricultural trade.

In the two most recent GATT rounds (the Kennedy and Tokyo Rounds) token efforts have been made to strengthen GATT discipline over agricultural trade. Little, if any, progress has been achieved. The U.S. has refused to abandon its broad, open-ended waiver; the EEC is unwilling to negotiate any changes in CAP; and most other countries refuse to discuss the impacts of their own national agricultural policies on world trade.

Although no firm start date has yet been set, there now appears to be a general consensus that a further round of GATT
negotiations both should and will take place.\textsuperscript{15} How to include agriculture in a future round is a central issue. The U.S. is a strong proponent of the inclusion of agriculture, seeing both its market share eroded in key agricultural export markets by the EEC and the reduction in import volumes in Europe. They are arguing for both new restrictions on the use of agricultural export subsidies, and minimum access commitments under which participating countries would agree to minimum growth rates for agricultural imports as a way of partially liberalizing the restrictive effects of domestic programmes. Among the Europeans, the French and the Italians have resisted including agriculture, fearful that major changes in the structure of CAP might result. By contrast, the Japanese, driven by a concern to improve the security of their market access for manufactures through a new negotiating round seem agreeable, though somewhat reluctant, to including agriculture.

\textsuperscript{15}It currently seems likely that these negotiations will be launched in the fall of 1986.
International Commodity Agreements

World trade in some key agricultural products has also been the subject of other international agreements which aim to control production, trade, and world prices, with a view to dampening price fluctuations.

International agreements of this form date back to the pre-war years. The International Wheat Agreement, concluded in 1933, was the first such agreement involving both producer and consumer countries. The International Sugar Agreement followed in 1937.

The perceived special difficulties affecting international trade in primary products have affected the evolution of these agreements. They were a major topic of discussion during a series of international conferences which took place during 1946-48 within the United Nations (UN). These led, in early 1948, to the Havana Charter for the International Trade Organization (ITO). This Charter contained a section (Chapter VI) that sets out in some detail the concepts and objectives of commodity agreements, along with their principles and rules for negotiation and operation.

In 1950, when the U.S. failed to ratify the Havana Charter, the GATT became the main instrument through which international trade was to be regulated. The GATT's purpose in 1947 was only to record the results of a tariff-reducing conference held under

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16 Also see Stone (1984); Dam (1970); Jackson (1969); Behrman (1977); Hamilton and Whalley (1986); GATT (1984), (1985); and Food and Agriculture Organization of the United Nations (1981a).
the auspices of the ITO, and was considered to be an interim arrangement, pending the ratification of the Havana Charter. The General Agreement did not contain any of the provisions of the Havana Charter on international commodity agreements, but did establish a general exception to GATT obligations for measures taken under intergovernmental commodity agreements conforming to UN principles. The UN later adopted guidelines for negotiating and operating international commodity agreements using the principles set out in Chapter VI of the Havana Charter, and established an Interim Coordinating Committee for International Commodity Agreements (ICCICA) as a framework for negotiating commodity agreements.

However, because of price declines for primary products during the 1950's, it was developing rather than developed countries who sought international commodity agreements, not just to stabilize prices but to stop further deterioration in their terms of trade. Their interest in commodity agreements was one of the factors leading to the creation of the United Nations Conference on Trade and Development (UNCTAD) in 1964. And within UNCTAD, the UN position on commodity agreements has subsequently broadened from the principles embodied in the Havana Charter to more widespread use of commodity agreements within a special Integrated Programme for Commodities (IPC).

While the IPC itself is generally regarded as ineffective, there have nonetheless been six international commodity price-stabilization agreements negotiated between producer and consumer
countries since 1947 covering wheat, sugar, coffee, cocoa, tin, and natural rubber. All have been temporary, involving periodic renegotiations for renewal or extension. Not all of these have operated continuously, and some have since been abolished. These agreements differ and include: multilateral supply and purchase commitments within negotiated price ranges; supply management measures, including export quotas and production policies; and buffer-stock arrangements with price bands.

**Wheat**

The first International Wheat Agreement under ICCICA auspices was concluded in 1949. This and successive agreements have aimed to stabilize prices within negotiated price ranges, which could then be periodically reviewed and, if appropriate, revised. The approach has been to simultaneously negotiate contractual obligations by exporting countries to sell specified quantities of wheat, called "guaranteed sales", if world prices reach agreed maximum prices, and reciprocal obligations by importing countries to purchase specified quantities of wheat, called "guaranteed purchases", if world prices fall to agreed minimum prices.

Under the Kennedy Round (1967), the Wheat Agreement was broadened into an International Grains Agreement, which covered other grains as well as wheat. This consisted of two parts; the Wheat Trade Convention, whose objectives were similar to those of the previous wheat agreements; and the Food Aid Convention with specified minimum food aid contributions for contracting parties.
to the Convention. The International Grains Agreement reverted
to cover wheat alone in 1971, and the new agreement incorporated
the Wheat Trade Convention and the Food Aid Convention.

The International Wheat Agreement has been extended several
times since 1971, but due to a lack of agreement between
producing and consuming countries, its price stabilization
features have become inoperative. The Agreement now largely
continues to function only as a basis for exchanges of production
and marketing information between countries.

Sugar

The first sugar agreement under the ICCICA was concluded in
1954, and since that time successive agreements have aimed to
stabilize world prices for sugar within target price ranges,
subject to periodic review and revision. These target price
ranges have been achieved by using negotiated quotas on exports
which are reduced or increased by producer countries when world
prices fall or rise to specified levels. Under the agreement,
consuming countries also agree to limit their trade with non-
member countries.

Like the Wheat Agreements, the Sugar Agreements have largely
been inoperative in recent years as far as price stabilization
features are concerned. The Sugar Agreement was suspended
altogether from 1962 to 1967 and its price-stabilization features
abandoned between 1973 and 1977. A new Sugar Agreement was
negotiated in 1977 under which both nationally financed buffer
stocks and export quotas by producer countries were to be used
to control world prices. National bodies were to buy and sell from the stockpile when world prices fell or rose to agreed levels, but because the EEC was not included, the Agreement was weakened, especially as the global market share of the EEC increased in the late 1970s. In 1983 and 1984, there were negotiations on an extension of the Agreement, but these broke down due to the lack of agreement among producers on export quotas, and further disagreements among existing producer country signatories on how to treat the EEC under the agreement.

Other Agricultural Commodity Agreements

Two other agricultural commodity agreements, concluded directly under the GATT rather than under the ICCICA or UNCTAD, are indicative of the limited current impact of these international agreements on global agricultural trade.

The International Dairy Arrangement (in force since January 1980) aims to promote the expansion of world trade in dairy products, and to liberalize dairy trade in the interests of both producing and consuming countries. The arrangement provides for information exchange and co-operation between dairy producing countries, and is accompanied by provisions which establish minimum export prices for milk powders, milk fat (including butter), and certain cheeses. An International Dairy Products Council has also been established within GATT to assess the functioning of the Arrangement, and to evaluate the international market for dairy products.
The other agreement covers bovine meat (also in force since January 1980). The objective is to promote the expansion of international trade in bovine meat and live animals. However, the agreement only provides for information exchange and cooperation, with an International Meat Council established within GATT to implement the provisions of the Arrangement and to monitor market developments.
V. Evaluating The Gains from Liberalized Global Agricultural Trade

That global agricultural trade is severely affected by domestic agricultural programmes is hardly in doubt. What is more uncertain is how significant the foregone gains from trade are, especially compared to the international gains from trade that could be achieved through further liberalization involving a systematic lowering of trade barriers affecting manufactures. As a fraction of production in developed market economies, agriculture is small (perhaps 4-5 percent, or even lower). As a fraction of current trade, agriculture is even smaller. But it is precisely the fact that trade is so small that suggests that restrictions on agricultural trade are so important, and that liberalization in this area should be actively pursued.

What the Literature Suggests

Existing literature contains a small number of studies which provide some indication of the impacts of global impacts of agricultural protection; and hence the gains that might be involved with liberalization of agricultural trade.

One of the best known is by Bale and Lutz (1981), which provides partial equilibrium estimates of the effects of agricultural price distortions on output, consumption, trade, and efficiency cost calculations for each of nine countries: Japan, West Germany, France, Great Britain, Thailand, Egypt, Argentina, Pakistan, and Yugoslavia. Their study covers nine commodities: wheat, maize, barley, sugar, beef, rice, cotton, and rubber;
using a base year of 1976, although not all the commodities are analyzed for each country. They use estimates of the differences between domestic prices and international prices, and own price elasticities of supply and demand from Rojko et al. (1978), with sensitivity analysis on their elasticity estimates.

Bale and Lutz's data clearly indicate that agricultural policies in developed countries provide significant protection, while in developing countries agricultural policies effectively tax domestic production. Their results also confirm that in developed countries price distortions have the effect of increasing production, decreasing consumption, and stimulating exports. In France, for example, using their high elasticity estimates, the level of wheat production is 26 percent higher due to price supports, whereas the level of wheat consumption is 6 percent smaller. In developing countries the situation is reversed. Their welfare analyses indicate that both the developed and developing countries incur significant welfare losses from restrictive agricultural policies. These range from $26 million per year for the United Kingdom (based on low elasticity estimates) to $4 billion per year for Japan (based on high elasticity estimates).

A related study is that by Chisholm and Tyers (1985) who analyze the effects of agricultural protection and market insulation policies in a multi-commodity stochastic simulation global model. They analyze five commodities—rice, wheat; coarse grains, ruminant meats, and non-ruminant meats, for the period
1980 to 1990, and for 24 countries. Eighteen of these are aggregated into three major country groupings—the OECD, Asia-Pacific newly industrialized countries (NIC's), and the developing countries (LDC's). The model incorporates cross-price effects between the five food commodities on both the supply and demand side, as well as stockpiling equations for each of the grain commodities. Domestic and international commodity markets are linked through price transmission equations.

The model is used to simulate various multilateral trade liberalization scenarios, including complete liberalization of agricultural trade in the OECD-NIC bloc, in the LDC's, and in all 18 countries identified in the model. As net food importers, developing countries suffer welfare losses from agricultural trade liberalization in the OECD-NIC bloc, arising from unfavourable terms of trade effects. These are estimated to be about U.S. $6 billion per year (based on 1980 data). On the other hand, countries in the combined OECD-NIC bloc obtain substantial welfare gains from trade liberalization, estimated to be about $70 billion per year. Trade liberalization in all 18 countries has about the same impact on the total welfare of all countries as does trade liberalization in the OEC-NIC bloc. The stability of world commodity prices is greatly improved when trade is liberalized in each of the countries examined. However, the important role that stockpiling plays in stabilizing world commodity prices when trade insulating policies are present is
reflected in a six-fold increase in world price volatility when
stockpiling is eliminated from the model.

A further study relevant to the issues discussed in this
paper is by Valdes and Zietz (1980) who use a multi-commodity
partial equilibrium model to investigate the effects of a 50
percent reduction in trade barriers for 99 agricultural commodi-
ties in 17 OECD countries. The base period for their analysis is

A reduction of this size in agricultural trade restrictions
by OECD countries results in an increase in world exports of
about $8.5 billion per year. Approximately 36 percent of this
increase accrues to the LDC's, 20 percent to OECD exporters, and
44 percent to exporters from the rest of the world (ROW). Among
OECD countries, the major increases in agricultural imports take
place in Japan ($1.6 billion), Germany ($1.5 billion), the United
Kingdom ($1.5 billion), and Italy ($1.4 billion). The major
increases in exports come from the United States ($2.1 billion),
Canada ($0.5 billion), and Australia ($0.5 billion). France and
Italy suffer significant reductions in exports ($1.3 billion and
$1.4 billion, respectively).

A final study is that by Cline et al. (1978), who as part of
a broader evaluation of trade liberalization under the Tokyo
Round evaluate the trade and welfare impacts of a 60 percent cut
in tariff-equivalents of agricultural non-tariff barriers in
Europe, Japan, and the United States using a partial equilibrium
approach. Their estimates are based on 1974 data and cover four
of the major participants in the Tokyo Round: the U.S., Canada, Japan, and the EEC.

In contrast to the other studies mentioned above, their results suggest that trade liberalization covering manufactures has a larger impact on trade than liberalization of agricultural non-tariff barriers. In the U.S., relative to general multilateral tariff liberalization, exports increase by only 13 percent more if liberalization of agricultural non-tariff barriers is also included in the policy change. For Canada, agricultural liberalization provides a more important source of increased exports (approximately 37 percent). For Japan, including agriculture in trade liberalization would provide modest increases in Japanese imports. Liberalization of agricultural barriers in the EEC would increase imports by around 30 percent.

Cline et al. also calculate the additional welfare gains from liberalization of agricultural non-tariff barriers over tariff liberalization alone. For the U.S., static welfare gains from removing agricultural non-tariff barriers yield only one-twelfth\(^{17}\) the corresponding welfare gains from tariff liberalization alone; for Japan, the corresponding figure is two-thirds. In contrast, the EEC generates welfare gains from

\(^{17}\)In the Cline et al. study, however, only distortions on the import side are considered. Welfare costs from distortions associated with support programmes where the U.S. is a net exporter (such as grains) are not included.
agricultural liberalization approximately four times those of tariff liberalization.

Estimates from a General Equilibrium Model of Global Trade and Production in Grains

Most of the existing literature estimates of the effects of liberalizing agricultural trade are based on partial equilibrium calculations, and to further investigate the potential global benefits from liberalizing agricultural trade we have made some general equilibrium calculations\(^{18}\) of the effects which would follow from the removal of price support policies for grains\(^ {19}\) in major world trading blocs.

Our central case estimate from these calculations is that the global gains from eliminating price distortions in grain markets due to domestic agricultural programmes are around $20 billion (1980 $U.S.), approximately 6 percent of 1980 global grain production. These gains are substantially larger in proportional terms than estimates of gains which would follow from a removal of all remaining barriers to global trade in manufactures obtained from existing global models (see Whalley (1985) and Deardorff and Stern (1986)). Since the estimates reported here refer only to grains, adding in the effects of

\(^{18}\)See also Burnieaux (1985) who uses a general equilibrium approach to analyze the effects of CAP on agricultural trade of developing countries.

\(^{19}\)Grains refer here to wheat, rice, corn, oats, and other cereal crops.
price support programmes for dairy, sugar, and other items would significantly increase these estimates.

The general equilibrium model we use for these calculations is presented in more detail in Appendix B. There are nine regions (country groups), each of which is assumed to have a constant-elasticity-of-substitution (CES) production possibility frontier (PPF) defined over grain (G) and all other commodities (X). The supply elasticity of grain is determined by the elasticity along the transformation frontier, which we refer to as $\sigma_T$. If $\sigma_T$ is 1, a 10 percent increase in the producer's price of grain leads to a 10 percent increase in the ratio of grain (G) to non-grain (X) production.

Producers in each region maximize profits by equating the marginal rate of transformation (MRT) to the ratio of producer prices. Intermediate production is not explicitly considered in the model. Producer prices in each region reflect the total impact of deficiency payments, price supports, taxes and/or import restrictions, and thus differ from world prices.²⁰

In each region, a single consumer maximizes a CES utility function defined over grains and other commodities, and faces consumer prices which reflect the effects of the market interventions mentioned above. Each region satisfies external sector balance, which in this simple model implies that the value of

imports equals the value of exports at world prices. Unlike other global modelling efforts,\textsuperscript{21} products are treated in this model as homogeneous across regions; the assumption of product heterogeneity by region (the Armington assumption) is not made.

The model is calibrated to a 1980 global benchmark data set involving production, consumption, and trade in each of the two products for the nine regions. In the 1980 data used to parameterize the model, the necessary equalities between producer, consumer and world prices are not satisfied because of domestic agricultural policies. As we show in Figure 4, a country adopting a "high price" policy will experience inefficiency (through overproduction of grain) and consumer welfare losses due to foregone consumption.

In this figure domestic grain prices for both producers and consumers are supported above world prices through export subsidies. Producer and consumer prices may differ if more than one agricultural programme simultaneously operates; such as both a price support and a deficiency payment programme. The outputs of grain and other goods are respectively $G_A$ and $X_A$; consumption of grain is $G_B$, with $G_A-G_B$ exported. Improvements in welfare occur if agricultural price supports are eliminated, or if either consumers face world prices or producers receive world prices. A no-intervention equilibrium will be a global Pareto-optimum since

\textsuperscript{21}Such as Deardorff and Stern (1986) and Whalley (1985).
domestic producers receive the same prices as the consumers pay, and both are equal to world prices.

This model of global production of grains and the effects of domestic policies dramatically simplifies the complexities of actual agricultural support schemes. For instance, the model ignores losses from stockpiling, set aside programmes, and inefficient domestic production resulting from producer quota systems with no trading of quotas.

Data and Elasticities Used in the Model

A number of data sources are used to construct the global microconsistent data set for 1980 to which the model is calibrated (see Mansur and Whalley (1984)). This data set includes production, consumption, and trade in both grains and all other commodities for all regions, along with information on the price supports.

Data for 1980 on production of wheat, rice, and other grains are from the Food and Agriculture Organization of the United Nations (1981b), which we aggregate to reflect production of a composite "grain" product in each of the nine regions in the model. Consumer and producer price indexes for grains by region reflect price data for rice from Sarris and Freebairn (1984) and for wheat from Lattimore (1982, Ch. 3). These indices define the ratio of domestic to world prices for grain in each region for both consumers and producers, with a choice of units such that
world grain prices equal $1.00.\textsuperscript{22} The data on production and net trade in grains by region and prices are listed in Table 1.

These data only partially reflect how government policies actually operate in these regions. According to the data, high consumer and producer prices apply both in the EEC and Japan, but not in developing countries. In these latter countries, however, aggregation across countries tends to mask country specific interventions. High price food policies in Chile, for example, are offset by cheap food policies in Brazil. Contrasting policies in India (cheap food) and Pakistan (where there are food taxes) lead to the appearance of relatively small deviations from world prices in the "Near East" region. What is unambiguously true, however, is that the EEC and Japan maintain domestic producer (and consumer) prices substantially above those of the major grain exporting regions (North America and Oceania).

The model also requires elasticity values for transformation surfaces and preferences in each region for calibration, in addition to base year microconsistent data. Our central case model analyses are based on elasticities of grain supply and demand of .8 and -2.3, respectively, in all regions. These are the mid-points of the ranges of elasticities used by Bale and Lutz (1981), and are similar to values used in other studies of agricultural trade, which use supply elasticities for grain

\textsuperscript{22}Further details on the data used are provided in Appendix B.
significantly higher (in absolute value) than demand elasticities. But because of the uncertainties surrounding these values, sensitivity analysis is also used.

**Results**

The general equilibrium model described above has been used to analyze the effects of eliminating domestic price support programmes for grains in all regions. This is done by allowing consumer and producer prices in all regions to equal world prices, and using the model to endogenously determine market clearing world prices for grain and non-grain commodities. This equilibrium solution also determines production, consumption, and trade by region. A comparison between the 1980 microconsistent data and the new simulated equilibrium solution allows welfare and other measures of the impact of this change to be calculated.

Our results are summarized in Table 2. While several regions experience gains as a result of a move to free trade in grains, no regions experience significant welfare losses. Most notable in the former category are the EEC and Japan, who have welfare gains respectively of around $5 billion and $11 billion. In the EEC, approximately 30 percent of the welfare gain is attributable to consumer-side gains, with the remaining 70 percent occurring from diversion of resources on the production side. In Japan, 35 percent of the gains are from consumer gains, with the remaining 65 percent due to production side effects.

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23This is also true of the elasticity values used in Lattimore (1982), and Gerrard and Posehn (1985).
These large gains in these two regions are clearly due to the removal of the sizable distortions induced by domestic support programmes for agriculture.

The remaining regions experience either small gains or losses, due to terms of trade changes. These correspond to their positions as either net exporters or net importers. Gains from the elimination of domestic distortions are less important outside the EEC and Japan; although, as emphasized above, aggregation across countries undoubtedly underestimates the effects of policy intervention in Latin America, the Near East, and the Far East.

These results also indicate that the price at which grain trades in the world market increases by over 11 percent if all price support policies are removed. In the 1980 microconsistent data, consumer and producer prices in exporting countries are close to the world price. Producer and consumer prices in the major importing regions (Japan and the EEC) are significantly above world prices. These high prices in importing regions represent the major price distortions present in the data. When Japanese and EEC consumers face lower (world) prices, they increase demand for grains, and as Japanese and EEC producers face lowered prices, the supply of grain is reduced. Both of these factors lead to upward pressures on world grain prices, as reflected in the results.

Perhaps the most important result, however, is that global gains from liberalizing grain trade are in the region of $20
billion; approximately 6 percent of the value of 1980 global production of grain. This is towards the top end of the range of estimates of potential welfare gains from the removal of remaining barriers to global trade in manufactures in developed countries (see Whalley (1985)). Since welfare impacts from support programmes in dairy, sugar, and meats are excluded from this calculation, as emphasized earlier the implication is that liberalizing agriculture trade through an initiative under GATT may be more important than further negotiations on trade in manufactures.

Results using alternative estimates of supply and demand elasticities have been used to investigate the sensitivity of these results, and these results are reported in Table 3. The choice of elasticity values in the sensitivity analyses reflect extreme values for supply and demand elasticities for grains reported in Bale and Lutz (1981). While the qualitative behaviour of the model is largely unaffected by these alternative elasticity values, the quantitative orders of magnitude clearly change, especially in the case of welfare estimates for Japan. But the sign of all welfare effects is unchanged in all regions, and in no case is the direction of change of grain production affected.

While suggestive, however, our central case estimates should be treated with caution for other reasons besides the sensitivity to elasticity values. The model does not incorporate losses attributable to set-aside programmes, and other inefficiencies
attributable to intervention from producer-specific quotas or input subsidies. Losses from stockpiling are not included, and the price data probably underestimates the degree of subsidy implied by individual support programmes within regions.
VI. **Negotiating Options for Liberalizing Global Agricultural Trade**

While the main purpose of our paper is to argue that barriers to agricultural trade are of major significance to the global trading system, developing concrete negotiating options for their reduction and eventual removal is quite a different matter; and one which has largely eluded the GATT process as it has evolved in previous negotiating rounds. In part, this is because of the special GATT provisions for agriculture under Articles XI and XVI, the 1955 U.S. waiver, and the subsequent creation of the EEC, with CAP. But the quite extraordinary complexity of these programmes as they have evolved in the post-war years has itself become a major factor. Balancing concessions either across agricultural products, or between agriculture and manufactures (or services) in a trade negotiation requires a degree of transparency and comprehension of what these domestic programmes actually do, which is simply not present. This complexity itself is now a major barrier to negotiated liberalization.

We would argue that the attempts made in the Kennedy and Tokyo Rounds to liberalize agricultural trade were unsuccessful in large part because the fundamental features of domestic agricultural support programmes and their links to trade were not dealt with. In the initial communiques preceding these

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24 For further discussion see Hathaway (1983).
two rounds, the importance of achieving liberalization in agricultural trade was stressed, but the negotiations themselves yielded little of significance because the effects of domestic price support programmes became the main focus, rather than the programmes themselves. The issue therefore is how to achieve substantive liberalization either within the GATT, or under some other institutional framework and to do so in a way which is more than symbolic.

Containing the Trade Effects of Domestic Agricultural Supports

At the present time, the preferred GATT approach to achieving liberalized agricultural trade still seems to be to focus on the trade effects of domestic agricultural programmes and either minimize or alleviate them. This approach leaves individual contracting parties to the GATT largely free to pursue whatever form of domestic agricultural supports they wish, and both reflects and accepts the idea of separate treatment for agriculture inherent in the exceptions to the GATT which already exist.

In current pre-Round negotiations, two major options are being discussed. One concerns export subsidies and the current GATT code which defines agricultural export subsidies largely in terms of their effects, (i.e., an increased country share of world export trade in agricultural commodities above "fair" levels). The current American complaint against the EEC is that they must be subsidizing agricultural exports because they
have managed to increase their share of world markets. In simple terms, the American proposal is to ban export subsidies while the European response is more cautious, indicating a willingness to discuss a new code restricting their use. Competition between the EEC and the U.S. for third country markets is the major driving force behind this component of current attempts to initiate an agricultural negotiation.

The main difficulty here is that there is no clearly agreed upon definition of what an agricultural export subsidy is, since subsidies are defined by their effects not by their characteristics. Indeed, because of the similarities in the broad structure of agricultural support programmes in these major trading areas, under any coherent definition of export subsidy, one would have to say that either both of these trading areas or neither of them uses subsidies. If there is a single international price, there is no export subsidy in the sense of products being sold at below world market prices. On the other hand, world markets are so distorted that for many transactions there is no relevant world market price, and intervention agencies are heavily involved in many international sales. Trying to both define and limit export subsidies without discussing the structure of domestic support programmes and their direct and indirect links to international transactions seems to us to be a difficult undertaking, to put it mildly.

\[25\text{But clearly not in either their commodity by commodity or institutional detail.}\]
The other proposal under active discussion at the present time is to try to increase agricultural trade through so-called "minimum access commitments". These would be negotiated import undertakings, under which the major trading areas would establish either minimum annual growth rates for agricultural imports into each region, or alternatively set targets for minimum import volumes.

The difficulty here is that no restraints are being placed on domestic policies through such an agreement, only on their effects. If these minimum import undertakings make no mention of the prices at which trade takes place, they may do little to generate increased welfare gains from liberalized agricultural trade. What could happen, for instance, would be that, in effect, an exchange of stockpiles between the major trading areas could be used to meet these import targets, with little impact on domestic production, prices, or consumption.

Negotiations which seek to limit or offset the trade effects of domestic policies would thus seem to only be an indirect and relatively inefficient way to proceed. Major definitional issues arise in trying to define the trade effects of policies. Without an approach towards negotiations which aims to restrain the domestic policies themselves rather than negotiate their trade effects, substantive progress towards a more liberal trading order in agricultural products seems unlikely to occur. Indeed, attempts to contain the trade effects of domestic programmes through a further overlay of restrictions
superimposed upon existing domestic policies could make the situation even worse.

**Bindings of Domestic Programmes**

While domestic agricultural price supports are inherently trade-distorting, the negotiating framework under the GATT has not yet been fully developed to deal with their trade effects. Nonetheless, the process which the GATT has evolved to achieve a more liberal trade order in manufactures should, in principle, be equally applicable to agricultural trade. While many portray the GATT as only having achieved substantive trade liberalization in manufactures through the Dillon, Kennedy, and Tokyo Rounds when tariffs were significantly reduced, the fact remains that the binding of tariff rates which occurred in the early GATT rounds were equally important as a precondition to the negotiated reductions achieved in later rounds.

There is therefore some logic to the suggestion that a first step in the process of liberalizing agricultural trade should be to enter into a similar process, with bindings of support levels (or standstills) as a step towards subsequent negotiations designed to reduce them. In the current policy setting, a binding of agricultural price supports by major trading areas would do much to restrain the growth of agricultural supports. This would especially be the case if these bindings fixed agricultural supports in nominal terms, so that their significance in real terms would slowly erode. Bindings of domestic agricultural price supports would also have the virtue of
allowing for slow adjustment under any subsequent liberalization and the gradual unwinding of the major capitalization effects associated with domestic agricultural programmes.

The difficulties of using this approach are two fold. First, major change as regards the special treatment of agriculture under the GATT would have to be made. It would undoubtedly require the U.S. to surrender their GATT waiver, something they have consistently refused to do; and the EEC would have to accept limits on CAP which they would see as in conflict with the Treaty of Rome. The size and scope of the change involved may for now prove too much for the major trading powers to accept.

Second, there are enormous difficulties in both defining and implementing bindings (or a stand still). The programmes at issue are so institutionally diverse that how this would work by commodity and by region would need to be carefully negotiated. It would make a great difference to individual countries whether bindings initially applied to, say, grains or dairy; or whether a comprehensive across the board approach were used. And the kinds of modifications to individual programmes that would be allowed under the bindings would all have to be spelled out in detail, suggesting a complex and lengthy negotiation. Modifications to loan arrangements involving the CCC in the U.S. are difficult to compare to changes in the myriad of intervention price and compensation payment schemes in Europe. Also, agreement to bindings would be viewed as a concession by many countries for
which they would seek reciprocal concessions on manufactures or services as part of a trade negotiation.

Realistically, the major reason for thinking of moving in this direction may be that governments in many countries are under pressure from farm lobbies to raise or maintain current support levels, especially in light of the debt situation in the farm sector. While a broad framework statement may be difficult to implement, such a statement can provide political support for governments who, for budgetary reasons, want to restrain their farm programmes. Through such a multilateral declaration and subsequent restraint, the groundwork for a more concrete multilateral negotiating process can be laid.

While clearly more ambitious than a new export subsidies code for agriculture, or agreement on minimum access commitments, trying to move agriculture along the same path that trade liberalization in manufactures has followed does seem to offer some long term prospect of eventually using multilateral negotiations to realize more of the benefits from freer trade in agriculture.

**Sectoral Negotiations**

If indeed the present situation in agriculture can be viewed as akin to the situation in the late 1940's in manufactures prior to the initiation of the GATT process, another possibility for agricultural trade discussions is sectoral negotiations, much as happened in early GATT rounds.
The problems with sectoral negotiations under the GATT are also well known. On the one hand, they would have the advantage of allowing for special features of agricultural policies, covering narrowly defined commodities to be taken into account in negotiations. On the other hand, it is difficult to make balancing concessions either across commodities, or more broadly between particular agricultural commodities and other products. Perhaps the most one can say at the present time is that sectoral negotiations might usefully take place at the same time as broader negotiations seeking to achieve an eventual binding of price supports. These could focus on the harmonization of domestic policies in particular agricultural sectors, and provide an information and data base from which more substantive negotiations on eventual reductions in levels of support could subsequently take place.

**Negotiating Reductions in Supports**

If domestic agricultural price support programmes ever do become bound, the aim in successive rounds of negotiations would be to move forward to negotiate mutual reductions in levels of support. As with GATT trade negotiations covering manufactures, these could proceed initially on a sector-by-sector basis, but could widen to a broad framework approach with a general reduction formula, much as happened in the Tokyo and the Kennedy Rounds. While these reductions might be localized to agriculture, in a widening set of trade negotiations reductions in price
supports for agriculture could be traded against partner concessions made on other products.

As in all trade negotiations, the balancing of concessions between different product areas is what is ultimately of crucial importance. For instance, since the Japanese are a major net importer of agricultural products, concessions by them on agriculture will presumably need to be balanced by improvements in market access for their exports of manufactures. Achieving an even broader commodity basis for trade negotiations than we currently have under the GATT could prove to be one of the major and most enduring benefits of initiating a process aiming at a more liberal global trade regime in agriculture.

Those familiar with the history of both previous negotiations on trade in manufacture under the GATT and the series of somewhat half-hearted attempts over the years to include agriculture in this process will no doubt react to any new proposals for negotiations as both utopian and naive. This may in fact prove to be the case, but the fact remains that agriculture is perhaps now the most heavily distorted area of trade among the major developed countries, and the domestic ramifications of the support programmes are becoming increasingly apparent. Liberating both themselves and their trading partners from the effects of these policies and achieving mutual gains from trade is the challenge for countries participating in these negotiations.
VII. Concluding Remarks

In this paper we discuss the current trade situation in agriculture, focusing on domestic agricultural support policies in the EEC, the U.S., and Japan. They produce major distortions of global trade, and have been little affected by the negotiating process which has taken place thus far under the GATT since 1947, and are extraordinarily complex. The reasons for this are in part political, reflecting the strengths of domestic farm lobbies, but also reflect the actions of the major trading partners themselves. First they have allowed special exceptions for agriculture under the GATT, compounding the situation through waivers and the formation of regional trade arrangements with special preferences towards agriculture. Secondly, they have allowed an unending complexity of detail to overtake their programmes, to such a degree that makes any international negotiation extremely difficult.

Since the days when decisions on the broad treatment of agriculture under GATT were made, the situation in agriculture has worsened and is now widely agreed to be in major need of reform. The literature suggests that significant global benefits would follow from a more liberal trading order in agriculture. We have performed a series of calculations using a small general equilibrium model of global trade in grains, which suggests that the potential for gains from liberalizing global trade in grains is large, perhaps larger than the gains from further liberalization among developed countries in all manufactures.
Adding in the effects of domestic programmes covering dairy, sugar, meats, and other commodities would undoubtedly increase these estimates. This all lends weight to the argument that major benefits would accrue from active pursuit of negotiating options for agricultural trade under GATT.

Feasible negotiating options have proved somewhat elusive in the past. The present approach within the GATT seems to be one of containing the trade effects of domestic agricultural policies. We argue, however, that this may be less fruitful than trying to restrict the policies themselves. We suggest that because of the process that has been followed within the GATT, agriculture should be viewed at being at a stage comparable to that of manufactures in 1947. The approach which seems most natural is to improve the transparency of domestic agricultural supports, and eventually bind them.

Given the unending complexity of these programmes in most or all countries, a symbolic multilateral statement of intent to this effect may be a useful way to proceed. It would provide support for governments seeking to restrain domestic programmes for budgetary and other reasons. If further restraint occurred, the political support for a more concrete negotiated set of bindings might be reinforced. In this event, it might prove possible to move forward to negotiate multilateral reductions in supports; in effect, converting current agricultural policies into negotiable trade instruments. In this process, the linkages between manufacturing trade and agriculture could be further
developed to allow for a mutual exchange of concessions between agricultural exporters and net importers. A major benefit from this process would be that the commodity coverage of GATT negotiations would be widened.

In the past, many commentators have noted the chaos and apparent intractability of agriculture from a trade policy perspective. It may well be somewhat naive to suggest negotiations based on improved transparency and eventual bindings at this time, but the domestic implications of these programmes are now much more widely appreciated than in the past and the trade problems perceived to be more acute. Negotiators thus have an opportunity to shape the direction of negotiations both in and beyond the next round through the broad negotiating postures which they are willing to consider.
APPENDIX A

THE HISTORY OF U.S. AGRICULTURAL PRICE-SUPPORT AND ADJUSTMENT PROGRAMS

1924 McNary-Haugen Plan introduced into Congress containing a two-price scheme in which products for domestic consumption are to be sold at a "fair exchange value," and surplus products are to be sold abroad at world prices. Provisions are to apply to: wheat, corn, cattle, and rice. Subsequently, five versions of the bill evolved, the last of which was before Congress in 1928, when it was vetoed for the second time by President Coolidge.

1929 Agricultural Marketing Act establishes a Federal Farm Board to both encourage the formation of farm co-operative marketing associations through low interest loans, and to control surpluses through purchase operations and production controls.

1933 In May, the Federal Farm Board was abolished because its efforts to stabilize farm incomes and prices had proved unsuccessful.

1933 Agricultural Adjustment Act, approved on May 12, sets "price parity" as the goal for farm prices to be achieved through a number of measures: (1) voluntary acreage reductions for basic commodities, with direct payments to farmers for participation in the programme; (2) regulated marketing through voluntary agreements

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26 For the major product areas of grains, sugar, milk and dairy products, and beef and veal.

27 Defined as the ratio between farm prices received by farmers and the general price index which prevailed in the 1905-14 period. The 1905-14 period was chosen as the base because it was seen as representing a "normal relationship" between farm and non-farm incomes.

28 Defined as the ratio between farm prices received by farmers and the index of prices paid by farmers which prevailed in the 1909-14 period.

29 Including wheat, field corn, rice, and milk and its products. This list was later expanded to include rye, barley, grain sorghum, cattle, sugar cane, and sugar beets.
with processors and producer organizations; and (3) taxes on processors, with the proceeds to be used to cover the costs of adjustment payments, market expansion programmes, and removing agricultural surpluses. In addition, non-recourse loans were introduced by the Commodity Credit Corporation (CCC) to provide price support protection to farmers. Special surplus disposal programmes were initiated as a supplement to the acreage reduction programmes.

1934 Jones-Costigan Act of May 9 establishes a quota system for domestic and foreign sugar producers and imposes a processing tax on raw sugar, to support a programme of benefit payments to domestic cane and beet sugar producers.

1935 Agricultural Adjustment Act Amendments give the President authority to impose import quotas on farm commodities when imports interfere with agricultural price support programmes.

1936 On January 6, the Hoosac-Mills Supreme Court decision invalidates the acreage control and processing tax provisions of the 1933 Act.

1936 Soil Conservation and Domestic Allotment Act of February 29, aims at: (1) encouraging soil conservation and the efficient use of agricultural resources by paying farmers for voluntarily shifting acreage from soil-depleting surplus corps to soil-conserving crops such as legumes and grasses; (2) achieving "income parity" for farmers; and (3) "protecting" consumers by maintaining an "adequate" supply of food products.

1937 Sugar Act of 1937 largely reenacts the quota system of 1934. An excise tax is substituted for the processing tax which was invalidated by the Supreme Court decision in 1936.

1937 Agricultural Marketing Agreement Act reaffirms the marketing agreements and orders of the 1933 Act. Marketing agreements and orders for milk were different from those for other commodities. Milk marketing orders involved establishing minimum prices that fluid milk handlers must pay to dairy farmers in specified marketing areas, according to the milk's use as fluid

30 Defined as the ratio between purchasing power of farm and non-farm net per capita incomes which prevailed in the 1909-14 period.
or manufacturing milk. Other commodities could be controlled indirectly through production, quality, and marketing restrictions.

Agricultural Adjustment Act provides for: (1) mandatory non-recourse loans at support rates for producers of corn and wheat, if marketing quotas were approved by referendum, and discretionary bans for other commodities; (2) marketing quotas for corn, rice, and wheat when agricultural surpluses reached certain levels; (3) parity payments to producers of corn, rice, and wheat in amounts that would restore farm income and prices to parity; and (4) special payments to farmers to encourage them to use land previously unsuitable for cultivation of production. The Act also introduces a nation-wide school lunch programme, a low-cost milk programme, and a food stamp programme. In addition, provisions are made for acreage allotments for corn, rice, and wheat.

Loan rates for corn, wheat, and rice are raised to 85 percent of parity, and prices for non-basic commodities are raised to not less than 85 percent of parity by the Steagall Amendment.

Stabilization Act raises loan rates on corn, rice, and wheat, and on Steagall non-basic commodities to not less than 90 percent of parity, and provides for continued high price supports for basic commodities for two years after the war.

Because of the war, penalties for exceeding acreage allotments are relaxed, and marketing quotas for many of the basic commodities are discontinued.

Stabilization Extension Act, approved in June, raises the loan rate for corn, rice, and wheat to 90 percent of parity.

Agricultural Act continues the wartime system of high, fixed price supports for basic and non-basic commodities through December 31, 1949, after which there would be a return to the pre-war system of flexible price supports. The legislation also contains provisions for updating the parity formula to account for changes in productivity and other factors since the base period, which is now defined as the period from

31 Including manufacturing milk, butterfat, chickens, eggs, and turkeys.
1910 to 1914, and a sliding scale of price supports for all basic commodities beginning in 1950.

1948
Sugar Act of 1948 continues the system of sugar quotas established under the 1937 Act, but with one modification. Quotas for the various producing areas are to be specified as fixed tonnage instead of percentages of the general quota.

1949
Agricultural Act supersedes the 1948 Act and continues the wartime system of high price supports for basic commodities at the rate of 90 percent of parity in 1950, and between 80 and 90 percent in 1951. For 1952 and subsequent years, price supports for basic commodities are to be set at levels ranging from 75 to 90 percent of parity. The price of milk to producers is to be supported at a level between 75 and 90 percent of parity, and prices of other non-basic commodities are to be supported at levels up to 90 percent of parity.

1950
National security provisions of the 1949 Act are used to keep support prices for all basic commodities at 90 percent parity through 1952. To secure increased production for war needs, production and marketing restrictions are removed for the 1951 and 1952 basic crops of wheat, rice, and corn.

1952
Legislation approved in June provides price supports for basic commodities at a rate of 90 percent of parity through 1953.

1952
Legislation in July extends the period for mandatory price supports for basic commodities through 1954.

1953
In reaction to mounting surplus stocks of farm products following the end of the Korean War, marketing quotas are introduced for the 1954 wheat crop and acreage allotments are reinstated for the 1954 corn crop.

1954
Agricultural Trade Development and Assistance Act, (Public Law 480), approved in July, becomes the basic act for authorizing the disposal of surplus commodities by export, donation, emergency relief, and other channels.

1954
Agricultural Act, approved in August, establishes flexible price supports for all basic commodities at a level between 82.5 and 90 percent of parity in 1955, and between 75 and 90 percent for succeeding crop years. Most other commodities can be supported at up to 90 percent of parity. Dairy prices are to be
supported at a level between 75 and 90 percent of parity.

1956

Agricultural Act establishes a Soil Bank to deal with agricultural surplus problem. The programme involves both long- and short-term land conserving practices by farmers in which they are paid for setting aside a portion of their land from producing certain major crops and putting it into conservation use. The legislation also contains a two-price scheme for rice, a mechanism reminiscent of the McNary-Haugen Plan.

1958

Under the Agricultural Act, approved in August, feed grain farmers are given two options and they choose to discontinue acreage allotments for 1959 and subsequent crops and receive price supports at 90 percent of the average farm price for the preceding three years. The two-tiered price support programme for rice is continued under the new legislation but price supports are lower.

1961

On March 22, in response to historically high levels of surplus stocks of agricultural commodities and low levels of farm income and prices, the government introduces a payment-in-kind (PIK) programme for corn and grain sorghum. Under the programme, producers are eligible for price supports at 74 percent of parity if they agree to cut land planted to corn and grain sorghum by 20 percent. Producers are paid for 50 percent of their normal yield in the form of certificates which are redeemed in grain with assistance to farmers in marketing the grain. Farmers are also given the option of being paid for an additional 20 percent reduction in production at a 60 percent rate.

1961

Agricultural Act, approved in August, continues the corn and grain sorghum PIK programme and expands it to include barley. The Act also extends the 1954 Agricultural Trade Development and Assistance Act through 1964. In addition, a new wheat programme is announced under which farmers who agree to cut back acreage by 10 percent are eligible for price supports at 75 percent of parity, with the option of additional payments for further reductions.

1962

Food and Agriculture Act continues the feed grains PIK programme with only limited changes. In order to increase exports and at the same time protect farmers, price supports for 1963 corn are to be lowered and supplemented by an additional price support payment to be made in kind. Other feed grains are to receive similar treatment. Optional reduction payments are
reduced from 60 percent to 50 percent of normal yield, and supports for 1963 wheat are increased to 83 percent of parity for complying farmers.

1963 Legislation approved in May continues the PIK programme for feed grains through 1964 and 1965 with few modifications.

1963 Agricultural Act begins a voluntary wheat-marketing certificate programme for the 1964 and 1965 crop years under which farmers receive land diversion payments and price supports through loans and marketing certificates if they comply with existing wheat acreage allotments and participate in land diversion programmes. Price supports for wheat destined for domestic consumption are set at 79 percent of parity; for foreign consumption at 61 percent of parity; and for the remaining wheat at 52 percent of parity.

1964 Meat Import Act gives the President authority to impose import controls on certain fresh, chilled, and frozen beef, veal, mutton, and goat meat products when imports of these products are expected to equal or exceed 110 percent of the adjusted base quantity determined at the beginning of each year.

1965 Food and Agriculture Act, approved in November, extends the wheat, feed grain, and rice programmes for another four years. The Act also sets up a cropland adjustment programme involving five- to ten-year contracts with farmers who agree to retire cropland into conservation uses. Under the programme complying farmers receive payments on not more than 40 percent of the value of their normal crop produced on the land.

1970 Agricultural Act replaces the earlier acreage diversion programme with a general set aside programme that provides a more flexible approach to supply control since it does not specify which croplands have to be taken out of production. A compliance provision in the programme requires farmers to set aside a specified portion of their crop allotments for conservation use as a condition for eligibility for payments, loans, and purchases of wheat and feed grains. In addition, there is a $55,000 payment limit for deficiency and diversion payments which an individual farmer can receive under the wheat and feed grain programmes and cotton programmes (not discussed in this appendix) combined. The price of milk is to continue to be supported at a level ranging from 75 to 90 percent of parity.
1973 Agriculture and Consumer Protection Act replaces price support payments with a new target price programme which is to operate simultaneously with the commodity loan programme. Under the target price programme a deficiency payment is made if market prices fall below established target prices. The payment rate is equal to the difference between the target price and the higher of the market price or the loan price. The 1974 and 1975 target prices are set at $2.05 per bushel for wheat and $1.35 per bushel for corn. The 1976 and 1977 target prices will be the target prices for 1975 adjusted for production cost increases and improved productivity. The Act also reduces the payment limit for deficiency and diversion payments to $20,000. In addition to the target price programme, the Act establishes a disaster payment programme under which eligible producers are qualified to receive payments if they are prevented from planting any portion of their allotment crops or if their yields have fallen below two-thirds of their established farm yields.


1975 Rice Production Act makes provisions for acreage set asides and diversion payments; maximum payment limits per producer of $55,000; a dual target price and commodity loan programme; and disaster payments to eligible producers.

1977 In response to both farm income and price instability, the Food and Agriculture Act sets loan rates and target prices above those of the 1973 Act. Associated with the target price programme is a voluntary acreage reduction provision which stipulates that producers must reduce their acreage planted for harvest by a recommended percentage to be eligible for deficiency payments on the full amount of their production. A farmer-owned reserve programme for wheat is established in the Act through an extended price support loan programme of 3 to 5 years. Farmers are paid for storing their reserve grain, with interest charges on the CCC commodity loans waived or adjusted. Also established is a commodity loan programme for 1977 and 1978 crops of sugar cane and sugar beets, with price support levels not less than 13.5 cents per pound. The Act extends the disaster payment programme through 1979, and the 1975 Rice Production Act through 1981. The Act also raises the payment limit for wheat, feed grains and cotton to $40,000 in 1978 and $45,000 in 1979. The payment limit for rice is lowered to $52,250 in 1978 and $50,000 in 1979. For the 1980 and 1981
crop years, the payment limit is to be $50,000 for wheat, feed grains, rice, and cotton combined.

1978

As a response to weak prices and depressed incomes, congress passes the Emergency Assistance Act which gives the Secretary of Agriculture the authority to increase the target prices for wheat and feed grains for the 1978-81 crops.

1979

On December 31, a new Meat Import Act is signed which is in many respects similar to the 1964 Act. In addition to fresh, chilled, and frozen cattle, mutton, and goat meat products, certain other prepared and preserved beef and veal products are also covered in the law.

1980

Federal Crop Insurance Act, approved in September, establishes a more comprehensive federal crop insurance programme with subsidized payments.

1980

In December, a two-tiered loan programme is introduced that provides for producer loans at higher levels for grains in the farmer-owned grain reserve with interest charges on these loans being waived.

1981

Agriculture and Food Act aims at reducing government expenditures on agriculture and developing and expanding markets. The Act continues the system of target prices and loans for grains and rice, but tries to contain their escalation. The Act also continues acreage reductions and the farmer-owned grain reserve, but rice allotments and marketing quotas are eliminated. Dairy supports are reduced in the Act, and a revolving export credit fund is established to promote exports. Also established is a purchase programme for sugar processed between December 22, 1981 and March 31, 1982, and a sugar price support loan programme for the 1982 through 1985 crop years. A $50,000 payment limit continues to apply for deficiency and diversion payments, and a $100,000 limit is established for disaster payments.

1982

In line with the objectives of the 1981 Act, acreage reduction programmes are announced on January 29 for the 1982 crops of wheat, feed grains, and rice. Feed grain farmers who want to benefit from price supports are required to cut 10 percent of their acreage without payment, while wheat and rice farmers are required to cut 15 percent.
1982 In response to growing surpluses due to large yields, the government introduces the Omnibus Budget Reconciliation Act on September 8 which makes wheat and rice subject to an acreage reduction of 20 percent, and corn subject to a 15 percent reduction. The Omnibus Act also freezes dairy price supports for 1983 and 1984 at their 1982 level, and at an equivalent parity level for 1985. In addition, the Act requires dairymen to pay part of the costs of support purchases by a 50 cent deduction from price support payments.

1983 As a more drastic approach to reducing surpluses and curbing over-production the government announces a new payment-in-kind (PIK) programme on January 11 for corn, wheat, grain sorghum, and rice. Farmers have to participate in the acreage reduction programme to be eligible to participate in PIK. Under PIK, farmers who agree to idle an additional 10 to 30 percent of their base acreage receive in-kind payments equal to 80 percent of normal yield for all commodities except wheat, where the rate is 95 percent.

1983 Dairy and Tobacco Adjustment Act, approved on November 29, launches a comparable voluntary dairy diversion programme under which farmers have to divert between 5 and 30 percent of their land for payments of $10 per hundredweight. In addition, the Act authorizes the Secretary of Agriculture to make a 50 cent deduction from price support payments if government purchases of dairy products exceed established levels.

1984 Agricultural Programmes Adjustment Act freezes wheat, feed grain, and rice target price increases scheduled in the 1981 Act. The Act also establishes acreage reduction and paid diversion programmes for all these commodities. For wheat, a 20 percent acreage reduction programme plus a 10 percent paid diversion is required for 1984 and 1985 crops. For feed grains, a 5 to 20 percent reduction is required if estimated carryovers on September 30, 1985 exceed 1.1 billion bushels, of which at least 5 percent must be a paid diversion. A similar programme applies to rice if estimated stocks exceed 25 million cwt. In addition to the acreage reduction and paid diversion programmes, the Act continues the programme for wheat, and limits 1984 payments (including PIK) to $50,000.

1985 Food Security Act aims at ensuring an efficient farm sector and expanding agricultural exports. The Act continues the wheat, feed grain, and rice programmes, but with generally lower minimum supports. In addition, the Act allows up to 5 percent of total
deficiency payments to be made in-kind, and establishes a market enhancement programme which allows producers to repay loans at their original loan rate or the market price, whichever is lower. The payment limits for price supports and disaster payments are the same as those set in the 1981 legislation. However, any increase in deficiency payments because loans are cut in 1986, or by more than 5 percent a year in 1987-90, and any gains from repaying loans at less than the loan rate are exempt from the payment limits. Acreage reduction is continued but with some modifications from 1985. Minimum and maximum limits on acreage reduction are established for wheat and feed grains, and at least 2.5 percent of the reduction must be in the form of an in-kind payment. The Secretary of Agriculture may offer a voluntary paid diversion beyond the maximum acreage cut. For rice, the Act requires an acreage reduction programme plus a voluntary paid diversion. Dairy support levels are reduced in the Act, and an 18-month Dairy Termination Programme is introduced to reduce the quantity of milk marketed for commercial use. Under the programme, participating producers agree to terminate milk production for five years and offer to sell their dairy cattle for slaughter or export. Price supports for sugar are extended through 1990 as is the farmer owned grain reserve. The Act establishes a conservation acreage reserve which operates similar to the 1965 cropland adjustment programme, except that contracts are for 10 to 15 years. The Act also focuses on expanding exports through export credit guarantees, food aid donations, targeted export assistance, and export PIK's at reduced prices. In addition, the revolving export credit fund is extended through 1990.

Appendix B

Structure of the Global General Equilibrium Grain Model

This appendix presents the functional forms used in the global model of trade and production in grains. We also outline the method used to solve for counterfactual equilibria using the model.

1. Production

Each of the nine regions is assumed to have a constant elasticity of transformation (CET) production possibility frontier, defined over the quantities of grain $G_i^s$ and other goods $Q_i^s$ produced in each region $i$. The elasticity of transformation ($\sigma_T$) is calibrated to the literature estimates of the elasticity of supply of grains. For simplicity, we use a common value for all regions. The CET functional form is:

$$\bar{Y}_i = \left[ b \cdot G_i^s + (1-b) \cdot Q_i^s \right]^{1/r}$$

where $b$ is a share or distribution parameter, and $\sigma_T$ is equal to $\frac{1}{r-1}$.

Producers are assumed to be price takers, and profit maximization implies that the marginal rate of product transformation between $G_i^s$ and $Q_i^s$ equals the ratio of producers' prices. This condition is used to yield the profit maximizing outputs of grain and other goods, $\hat{G}_i^s$ and $\hat{Q}_i^s$.

$$\hat{G}_i^s = \frac{\bar{Y}_i}{\left[ b \cdot D_i^r + (1-b) \right]^{1/r}}$$

$$\hat{Q}_i^s = \left[ \frac{\bar{Y}_i^r - (1-b) \cdot \hat{G}_i^s}{b} \right]^{1/r}$$
where:

\[ D_i = \left[ \frac{(1-b) \ P_i^P}{b} \right]^{\frac{1}{r-1}} \quad i=1\ldots9 \]  

and \( P_i^P \) refers to the relative producer price of grain in region \( i \) in terms of manufactured goods. In the commonly used two commodity diagram, this corresponds to a tangency between the producer's prices and the PPF. For convenience, manufactured goods are chosen as the numeraire in all our calculations.

2. Demand

Each of the regions identified in the model is modelled on the demand side as a single consumer, or equivalently as multiple consumers with identical homothetic preferences. These preferences are assumed to be CES, i.e.,

\[ U_i = \left[ a \ G_i^D + (1-a) \ Q_i^D \right]^{1/k} \quad i=1\ldots9 \]  

where \( G_i^D \) and \( Q_i^D \) are quantities consumed of grain and other goods, respectively. The elasticity of substitution \( \sigma_C \) is equal to \( \frac{1}{k-1} \), and \( a \) is again a distribution parameter. As on the supply side a common value of \( \sigma_C \) is used for all regions, based on literature estimates of the elasticity of demand for grains. Demands reflect utility maximizing behaviour given regional incomes and relative consumer prices (\( P_i^C \)) in the region. We write the regional budget constraint as:

\[ P_i^C \ G_i^D + Q_i^D = I_i \quad i=1\ldots9 \]  

where \( I_i \) represents income in the region.
As in general equilibrium tax models, \( I_i \) is not determined by producer prices alone since income must also include net transfers from redistributed tax revenues or lump sum taxes raised to finance subsidies. Total income remains unknown until we also know total purchases of all goods (and thus total tariff and tax revenues), but income depends on these revenues which, in turn, depend on demands. This problem is overcome in the tax models by introducing an additional dimension into the equilibrium problem which represents transfers from the government to households. In equilibrium, the revenue assumed to be transferred will equal the revenue actually raised.

In this model, no such additional term is necessary. Since consumers equate their marginal rate of substitution to the consumer price ratio, and all trade takes place at world prices, it will always be true that:

\[
P^W G_i + Q_i^S = P^W G_i^D + Q_i^D \quad i = 1 \ldots 9
\]

(A7)

where \( P^W \) corresponds to the world price of grains. Equation (7) thus implies that the value of production evaluated at world prices equals the value of consumption evaluated at world prices. This condition and the consumer tangency condition are enough to calculate demands from utility maximizing behaviour as:

\[
G_i^D = \frac{1}{z_i} \left[ 1 + P^W \left( \frac{(1-a) P^C_i}{a} \right)^{1/k-1} \right]
\]

(A8)

and

\[ Q^D_i = (Z - G^D_i) / p^W_i \] (A9)

where

\[ z_i = p^W_i G^D_i + Q^D_i. \]

3. Counterfactual Equilibrium Solution of the Model

Since grain is assumed to be a homogeneous product across the regions in the model (i.e., grain from the U.S. is a perfect substitute for Latin American grain or grain produced in any other region) only the world relative price of grain in terms of other goods needs to be determined to solve the model for a counterfactual equilibrium (such as under the elimination of support prices for grain producers).

The procedure used in solving the model (once calibrated) is outlined in Figure B.1 below. For an initial guess on \( p^W \), given the price controls applying in each region demands and production are evaluated. Excess demands by region are then calculated and the market excess demands for grains and other goods obtained by summing across regions. A Newton method is used to find a zero of the market excess demand functions. Given the small dimensionality involved, counterfactual equilibria are typically found rapidly, dispensing with the need for a sophisticated fixed point algorithm to determine an equilibrium.
Counterfactual Equilibrium Solution of Global Grain Model

1. Policy Change Specified
2. Initial Guess of $P^W$ Chosen
3. $P^C$, $P^P$ Determined in each region
4. Production Quantities Determined
5. Income Evaluated in each Region
6. Consumer Demands Evaluated in each Region
7. Excess Demands Evaluated in each Region and Summed to Yield Market Excess Demand Function
8. Approximate Equilibrium? NO → New Value of $P^W$ Calculated
9. Solution
10. Stop
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