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Economic Implications of Agricultural Policy Reforms in Industrial Market Economies

Vernon O. Roningen
Praveen M. Dixit

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ECONOMIC IMPLICATIONS OF AGRICULTURAL POLICY REFORMS IN INDUSTRIAL MARKET ECONOMIES. By Vernon O. Roningen and Praveen M. Dixit, Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture. Staff Report No. AGES 89-36.

Abstract

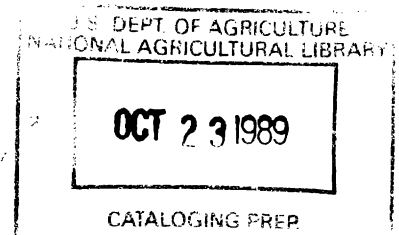
The authors used an 11-region, 22-commodity world net trade model to study the economic implications of agricultural policy reform in industrial market economies. Their analysis shows that elimination of protectionist agricultural policies would drive up world prices for most commodities and that the increases would be closely related to the levels of government assistance. The results also indicate that the United States would improve its agricultural balance of trade, while the European Community and Japan would face considerably larger trade deficits. All three economies, however, would experience income gains from multilateral liberalization, though, on a per capita basis, these gains would be small.

Keywords: multilateral trade liberalization, agricultural policy reform, producer subsidy equivalent (PSE), consumer subsidy equivalent (CSE), net trade models, SWOPSIM, economic welfare.

Acknowledgments

This study is part of a larger agricultural trade liberalization study underway at the Economic Research Service. Numerous individuals have helped us collect and input support measures into the modeling framework. We would especially like to acknowledge help from Mike Herlihy, Bob Koopman, John Sullivan, and John Wainio. Others--Brian Johnston, Steve Haley, Barry Krissoff, Steve Magiera, Jerry Sharples, Barbara Stucker, and Alan Webb--helped in various phases of model developments. We would also like to acknowledge the assistance of individuals in the agency who reviewed the study and provided suggestions/criticisms--especially, Gene Hasha, Dick Kennedy, and Bill Kost. A special word of thanks to Carol Stillwagon for her help in manuscript preparation and to Bonnie Moore for editorial assistance.

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- o Even though assistance to agriculture is high in Japan, its policies do not have much influence on international prices because it is not a major participant in world agricultural markets. The only exception to this is the rice market. Japan's policies effect world rice price more than the combined effects of all other industrial countries.

Effects on World Trade

- o Agricultural trade for most commodities would expand if industrial market economies simultaneously liberalized their trade. The largest increases would be in rice and sugar trade. World wheat trade would decline modestly because of the elimination of export subsidies.
- o The United States would improve its agricultural balance of trade by \$3 billion. Most of this improvement comes from decreases in beef import costs and increases in grain export revenues because of rising world prices.
- o The EC and Japan would face considerably larger agricultural balance-of-trade deficits, while developing countries on the aggregate would lower their import costs by nearly \$6 billion.

Effects on Domestic Production and Incomes

- o Multilateral elimination of support would reduce production of most agricultural commodities in industrial market economies. The decline in production for a liberalizing country would be more under unilateral liberalization than under multilateral liberalization.
- o Producers in the United States, EC, and Japan are likely to lose between \$15 and \$25 billion with multilateral trade liberalization unless they are compensated. Most of the losses in the United States would occur because of the elimination of government assistance to producers. Rice producers in Japan, ruminant meat producers in the EC, and grain producers in the United States account for most of the losses. World price increases would not be sufficient to offset the lost support.
- o While the losses in producer incomes may appear large, such losses would be even greater if those countries undertook the same type of policy reform unilaterally. U.S. producer losses would be cut by over two-fifths under multilateral liberalization, while losses in the EC would be a third less. This suggests that if producers are to be compensated during the transition to freer trade, the payment required would be much less under multilateral reform. Producers in Japan would lose about the same under either condition.

Effects on Economic Welfare

- o For every dollar that producers lose because of multilateral liberalization, consumers gain much more. Consumers and taxpayers in industrial market economies gain \$1.42 in transfers for every dollar lost by

producers. The transfer gains are slightly lower for the United States but greater for the EC and Japan.

- o Multilateral liberalization would generate income gains of about \$6 billion for Japan, \$9 billion for the United States, and \$14 billion for the EC. On a per capita basis, New Zealand would gain the most.
- o The welfare implications for developing countries are rather complex. While developing exporters like Argentina and Brazil would benefit from rising world prices, developing countries that are net food importers could experience welfare losses because of the rising costs of imports.

Economic Implications of Agricultural Policy Reforms in Industrial Market Economies

Vernon O. Roningen
Praveen M. Dixit

Introduction

Government intervention in the agricultural sector is pervasive in nearly every country in the world. These interventions often take the form of policy measures such as price and income supports, supply controls, and barriers to trade or export incentives, and appear to have significantly distorted the location of production and trade. While these distortionary measures were not a source of major concern in the 1970's when international agricultural trade grew rapidly, a world recession in the early 1980's changed the picture considerably. Growth in the global consumption of agricultural products slackened, while production kept expanding in response to technological advances and continued assistance to agriculture in developed countries. Many exporting countries were left holding large surpluses of commodity stocks, and escalating costs of domestic farm programs became even more worrisome. Global expenditures on domestic farm programs nearly doubled during the first 5 years of the 1980's. In 1986 alone, the United States and the European Economic Community (EC) each spent nearly \$25 billion on farm programs. Competitive efforts to dump the surplus in shrunken world markets made the situation worse, depressing international commodity prices, exacerbating the farm crisis globally, and creating trade tensions among countries.

Tensions were especially high between the United States and the EC. Each accused the other of using unfair trade practices to bolster exports, particularly grain exports. The risk of an international farm subsidy war increased even further when the enlargement of the EC to include Spain and Portugal sharply reduced future prospects for United States corn and sorghum sales. EC offers of compensation were considered inadequate, and the United States threatened retaliation against EC food and beverage sales. The EC responded with threats to counterretaliate against U.S. exports of rice and corn gluten feed (Paarlberg, 1988).¹

The United States and the EC were not the only countries embroiled in a trade dispute. Canada, upset over high deficiency payments to U.S. corn producers, imposed countervailing duties on imports of U.S. corn. The Australians, angered over U.S. and EC trading practices, coalesced 13 self-proclaimed nonsubsidizing countries into the Cairns Group of Fair Traders in Agriculture. The risk of a farm trade war was clearly increasing.

The possibility of escalating this conflict, combined with increased budgetary costs to support protectionist farm policies, brought agriculture to the top of the international economic policy agenda. At the September 1986 Minis-

1. Complete citation in References.

terial Meeting of the General Agreement on Tariffs and Trade (GATT) held in Punta del Este, Uruguay, an agreement was reached to give agriculture the highest priority in the next round of multilateral trade negotiations (MTN). The Ministerial Declaration (GATT, 1986) that launched a new round of international trade negotiations (the Uruguay Round) emphasized the "urgent need to bring more discipline and predictability to world agricultural trade by correcting and preventing restrictions and distortions ... so as to reduce the uncertainty, imbalances and instability in world agricultural markets." The declaration also drew up three broadly stated objectives: improve market access through the reduction of import barriers, increase discipline on the use of all subsidies and other measures affecting agricultural trade, and minimize the adverse effects that health and sanitary regulations can have on agricultural trade.

The United States, in July 1987, presented its proposal for the Uruguay Round calling for member countries to completely phase out over a 10-year period all policies that distort agricultural trade. The Cairns group later tabled a similar proposal. In October 1987, the EC put forth its two-stage proposal to manage exports of major internationally traded commodities in surplus and to gradually reduce support to agriculture while maintaining the broad features of the Common Agricultural Policy (CAP).²

Negotiations in agriculture are likely to be difficult and acrimonious. The process, however, could be made easier if negotiators have a good understanding of how government intervention in agriculture has affected world commodity markets. A number of studies have already been completed that attempt to document the potential economic implications of agricultural policy reform. This report adopts the methodology used by two such studies, the Organization for Economic Cooperation and Development's (OECD) Trade Mandate Study (OECD, 1987) and the World Bank's World Development Report 1986, to provide updated and more comprehensive answers to questions that may arise during the negotiations.

This report focuses on three specific issues: (1) how levels of assistance to agriculture compare across countries and commodity markets; (2) how assistance to agriculture in industrial market economies has distorted world production and trade, and which countries have contributed the most to these distortions; and (3) who would benefit from an elimination of assistance to agriculture in industrial countries.

The report begins by presenting empirical estimates of aggregate measures of support known as producer subsidy equivalents (PSE's) and consumer subsidy equivalents (CSE's). The report then provides a brief description and validation of the world agricultural net trade model used to address these issues. The distortionary effects on world agricultural markets arising from policies pursued by industrial market economies are described next. This follows with the quantification of economic costs associated with policies of individual market economies and the likely market effects of simultaneously eliminating such assistance. The report concludes with an assessment of the strengths and

2. Additional information on the various GATT proposals can be found in Rossmiller (1988).

weaknesses of the analysis and conditions under which the potential economic implications could differ.

Agricultural Support Profiles Across Industrial Market Economies

The policies and programs used to support agriculture are often complex and diverse across commodities and countries. A major practical step in understanding and quantifying these measures has been the development and acceptance of a measurement methodology in the form of producer and consumer subsidy equivalents. These measures allow the direct comparison of a broad range of policies within a simple measure (OECD, 1987).

A PSE is the level of subsidy that would be necessary to compensate producers for the removal of government programs affecting a particular commodity (Josling, 1981).³ It represents the value of government support to producers but is not a measure of distortions in domestic or world trade. The PSE for a particular commodity is positive when the net effect of all programs affecting the commodity in a country is to increase the incomes of producers over what they would be in the absence of these programs, and negative when the net effect of all programs reduces incomes.⁴ The PSE, in percentage form, allows comparison of support to producers across commodities and countries.

A CSE is the level of subsidy that would be necessary to compensate consumers for the removal of government programs. The CSE for a particular commodity is negative when the net effect of all programs affecting that commodity in a country is to increase the price consumers pay for food and positive when consumers pay less for food than they would in the absence of the program.⁵ The CSE summarizes the extent to which support to producers is paid by an implicit tax on consumers through higher food prices.

PSE's and CSE's can be expressed in at least three ways (OECD, 1987, p. 104): as the total value of assistance to the commodity produced or consumed; as the total value of assistance per unit of the commodity produced and consumed; and -----

3. The measurement methodology described by (Josling, 1981) implicitly assumes a small-country case where policies of a country cannot influence world prices.

4. The PSE's, as presently calculated, do not include forgone income resulting from policies that control supply, such as acreage reduction programs in the United States, or the effects of policies on intermediate product prices, such as the tax effect on the livestock sector caused by policies that raise feed prices. Suggestions have been made that PSE's be adjusted such that producers receive credit for supply control efforts already underway (Rausser and Wright, 1987 and McClatchy, 1988) as countries were given credit in previous GATT negotiations for unilaterally reducing tariffs.

5. The CSE estimates used in this report do not include subsidies such as U.S. food stamps or school lunch programs. Details on terminology and methodology used in estimating the PSE's and CSE's can be found in (USDA, 1987 and USDA, 1988). These same reports also provide comprehensive details on the limitations of the approach.

as the ratio of the total value of assistance to total receipts, which is value of production or consumption, including any direct net receipts. Table 1 shows the PSE and CSE levels for the base year 1986/87 by country or region for selected commodities using the ratio of assistance to total receipts. The weighted average PSE for all commodities indicates that, among the industrial market economies, Japan supports its producers the most, followed by other Western Europe (non-EC), the EC, Canada, and the United States (fig. 1). Australia and New Zealand have the lowest level of overall producer support among the industrial market economies.

Figure 2 compares the level of support for meats, dairy, and grains in the United States, EC, and Japan, the three major participants in the upcoming GATT negotiations. The illustration shows that the rates of support in all

Table 1--Producer and consumer subsidy equivalents by country or region and commodity groups, 1986/87

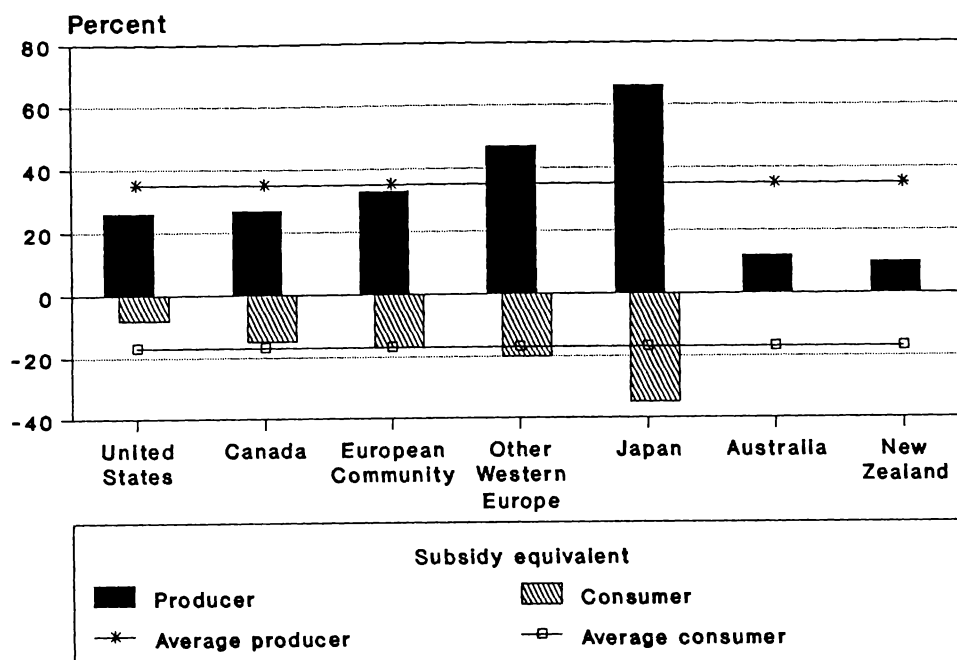
	United			Other		Aus-	New	
Commodity group 1/	States	Canada	EC-12	Western Europe	Japan	tralia	Zealand	Average
	<u>Percent</u>							
Producer subsidy equivalent:								
Ruminant meats	11	10	40	50	66	4	8	29
Nonruminant meats	11	6	22	30	32	0	0	20
Dairy products	29	42	25	53	67	29	12	32
Wheat	59	40	59	52	91	15	0	55
Coarse grains	48	40	47	49	94	2	0	47
Rice	67	0	70	0	87	13	0	85
Oilseeds and products	7	13	28	0	20	0	0	14
Sugar	79	53	47	66	74	14	0	56
Other crops	33	-21	50	0	0	1	0	35
Average	26	27	33	47	66	12	10	35
Consumer subsidy equivalent:								
Ruminant meats	-1	-1	-20	-26	-33	0	0	-14
Nonruminant meats	-2	3	-15	-23	-19	0	0	-9
Dairy products	-15	-35	-14	-14	-42	0	0	-17
Wheat	-14	-15	-41	-45	-48	0	0	-36
Coarse grains	-12	-1	-42	-45	-15	0	0	-27
Rice	-4	0	-36	0	-72	0	0	-69
Oilseeds and products	0	0	1	0	0	0	0	0
Sugar	-47	-9	-28	-37	-29	0	0	-33
Other crops	0	7	0	0	0	0	0	0
Average	-8	-15	-17	-20	-35	0	0	-17

1/ Ruminant meats (beef, mutton, and lamb); nonruminant meats (pork, poultry meat, and eggs); dairy products (milk, butter, cheese, and powder); coarse grains (corn and other coarse grains); oilseeds and products (soybeans, soymeal, soyoil, other oilseeds, other oilmeals, and other oils); other crops (cotton and tobacco). Producer and consumer subsidy equivalent averages are weighted by base production and consumption values, respectively.

Source: (31, 34).

Figure 1

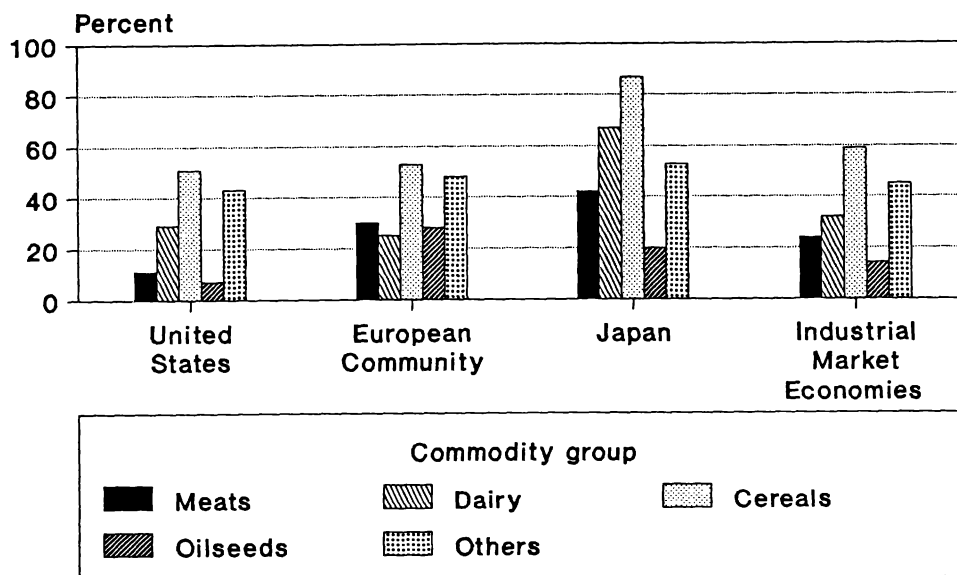
Average producer and consumer subsidy equivalents, industrial market economies, 1986/87



Source: (31, 34).

Figure 2

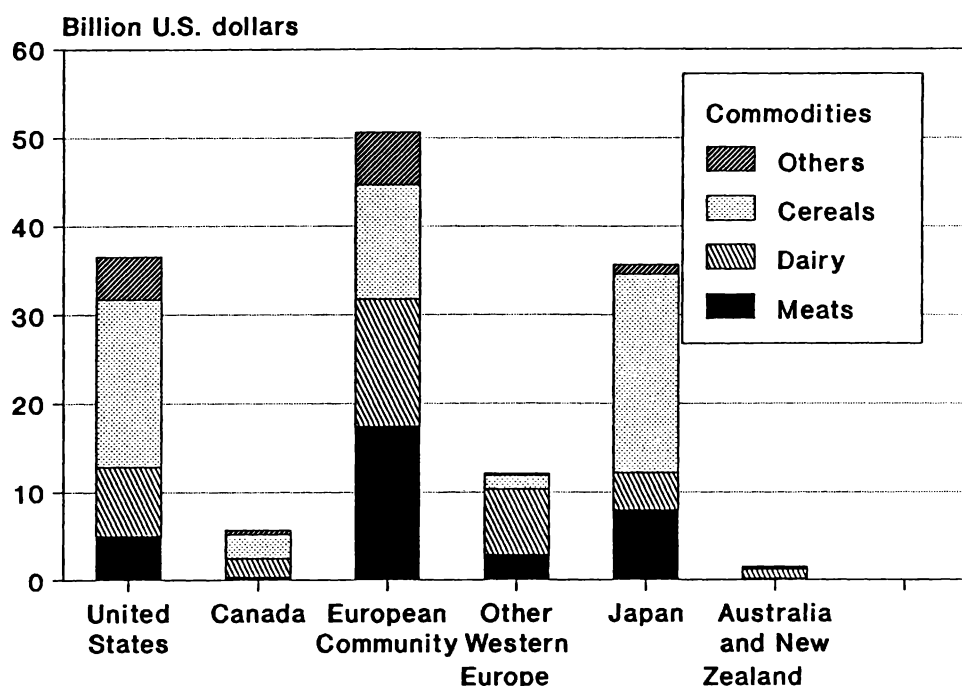
Producer subsidy equivalents by commodity groups for the United States, the European Community, and Japan, 1986/87



Source: (31, 34).

Figure 3

Value of producer support by commodity groups in industrial market economies, 1986/87



Source: (31, 34).

three regions were higher for cereal producers than those for dairy producers. Cereal support rates were similar in the United States and the EC but much higher in Japan. In addition, whereas dairy support rates were higher than those for meats in the United States and Japan, the converse was true for the EC.

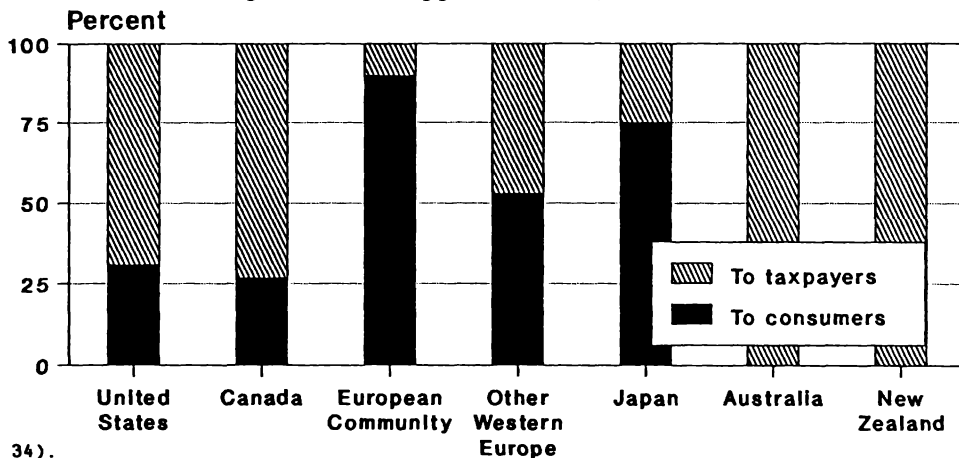
Assistance to producers can also be compared across commodities within countries. Figure 3 shows the value of producer assistance in countries by broad commodity groups of meats, cereals, dairy, and other products. The share of assistance reflects both the size of the commodity sector in total production of commodities and the level of assistance. In Canada, Australia, and New Zealand, the dairy industry receives a large part of total assistance, while in the United States, the grains industry accounts for the largest share of total government support. The share of producer assistance is distributed more evenly among the commodity groupings in the EC. Nearly two-thirds of the government assistance in Japan goes to producers of wheat, rice, and coarse grains, even though the cereals sector accounts for only 40 percent of the total value of agricultural production.

The costs of support have to be borne either directly by domestic consumers through higher food prices or by taxpayers through increased government budgets. The distribution varies considerably among countries (fig. 4). In the EC and Japan, policies that artificially raise prices (tax)⁶ to consumers

6. In the industrial market economies, the CSE's are mostly negative. For them, the CSE might almost as appropriately have been described as a

Figure 4

Distribution of cost of producer support, 1986/87



Source: (31, 34).

account for well over four-fifths of their support to agricultural commodities. Consequently, the CSE's are relatively high in those two regions. The United States, Canada, Australia, and New Zealand, however, maintain much less support through policies that transfer income from the consumer to the producer. Instead, these countries rely more on direct government budget support. The distortions in consumer prices, and, hence, the CSE's are therefore much lower.⁷

The Model: Assumptions, Features, and Data Requirements

The analysis of the effect of agricultural support is done with the Static World Policy Simulation Modeling (SWOPSIM) framework (Roningen, 1986). A SWOPSIM model is characterized by three basic features: 1) it is a nonspatial price equilibrium model, 2) it is an intermediate-run static model that represents world agricultural markets for a given year, and 3) it is a multicom-

consumer tax equivalent because policies there often have the effect of raising prices to consumers in a manner very similar to that of a sales tax. The balance of this report frequently refers to some policies as taxing consumers in this sense.

7. This difference in the source of producer support emphasizes how the structure of the support regimes in the EC and Japan differ from those of the developed country exporters. Countries that are traditional importers have an easier support option: they can tax the consumer directly by import tariffs or quotas and thereby avoid government budget exposure. Exporting countries tend to use government budget expenditures for support, since export taxes would lessen their competitiveness on world markets. Distortions in trade typically would be larger with policies that tax consumers because such policies affect both consumption and production. Depending upon how a country's policies operate, both levels of support and distribution of cost can vary with world market conditions.

modity, multiregion partial equilibrium model. To use this static, nonspatial equilibrium model to describe world agricultural trade, we make the following assumptions:

- o world agricultural markets are competitive in that countries operate as if they had no market power;
- o domestic and traded goods are perfect substitutes in consumption, and importers do not distinguish commodities by source of origin; and
- o a geographic region, though possibly containing many countries, is one marketplace.

SWOPSIM models are characterized by an economic structure that includes constant elasticity domestic supply and demand equations and summary policy measures (price wedges derived from PSE's and CSE's). Supply equations are functions of input or product prices, and if desired, other endogenous demand quantities (joint products). Demand equations are functions of own- and cross-product prices, and under certain circumstances, supply quantities of endogenous variables in the model. Trade is the difference between domestic supply and total demand (absorption) and, as such, does not permit separate identification of exports and imports in cases where a country is an exporter and importer of the same commodity.⁸

The policy structure is embedded in equations linking domestic and world prices. The standard policy structure is designed to allow flexibility in characterizing policies that may affect production, consumption, and trade. Policies are inserted as subsidy equivalents at the producer, consumer, export, or import level. In addition, price transmission elasticities can be used to characterize the degree of connection of domestic and world prices as world prices change. Exchange rates translate world trade prices to trade prices denominated in a country's domestic currency to link up with consumer and producer prices also denominated in the domestic currency. Details on the economic and policy structures inherent in the model can be found in (Roningen, 1986, Dixit and Roningen, 1986, and Roningen, forthcoming).

The version of SWOPSIM (ST86) that we use for this report is designed to represent the 1986/87 (base marketing year) world temperate and subtropical zone agricultural markets in intermediate-run equilibrium. In a static model like ST86, this means that all market participants (producers, consumers, traders) are assumed to have faced the prices and policies that actually existed in the base period for about 5 years and adjusted to them. The observed quantities produced, consumed, and traded in 1986/87 are, thus, assumed to be in an equilibrium that results after adjustment to 5 years of unchanged prices and policies. This assumption about the adjustment period enters the model through the selection of values for the supply, demand, and price transmission elasticities.

8. Stocks are not explicitly modeled in the SWOPSIM framework because markets are assumed to be in intermediate-run static equilibrium. Implicitly, though, stocks are presumed to be proportional to consumption flows. If shorter run adjustment problems and alternative policies for transition are important, then there would have to be an explicit treatment of stocks.

Because ST86 is a synthetic model, we do not estimate elasticity parameters. Rather, we use parameters from other empirical studies to build the model. This procedure would typically imply a breach of theoretically valid behavioral relationships. We have attempted to overcome this limitation of synthetic models by imposing symmetry and homogeneity restrictions from demand theory to ensure consistency among own- and cross-price effects and restrictions based on multi-output production theory for modeling joint products (Haley, 1988). This procedure is similar to the application of theoretical constraints in computable general equilibrium models. However, we have closed only agricultural sectors of the economy, rather than the economy as a whole.

Twenty-two agricultural commodities, representing almost 90 percent of the total value of U.S. agricultural production, are included in the model: beef, pork, mutton, poultry, dairy including manufacturing milk, butter, cheese, and other dairy products, wheat, corn, other coarse grains, rice, soybeans and soybean products, other oilseeds and oilseed products, cotton, sugar, and tobacco. The model does not include tropical products, which account for a substantial portion of agricultural trade of developing countries. The world is divided into 11 regions: 7 represent the industrial market economies, 3 characterize developing countries, and 1 describes the centrally planned economies (CP's). Region and commodity composition and the mnemonics used in presenting results are shown in table 2.

The model constructed for this exercise contains summary support measures for all regions except the centrally planned economies. Commodity-specific price transmission elasticities which limit the passage of world price signals to their region, however, constrain the interactions of the CP's domestic sector with the world market. The CP's are assumed to have a price transmission of 0.2, indicating that only a fifth of the changes in world prices are transmitted to the domestic economy. A price transmission elasticity of 0.5 is used for all developing countries when the industrial market economies liberalize their policies.⁹ For all industrial countries, a price transmission of 1 is used. This implies that any multilateral removal of support would also remove any insulation of domestic markets from world price movements.

Six types of data were required for each commodity in each country to construct ST86: supply, demand, and trade data for 1986/87; own- and cross-price elasticities of demand and supply; price transmission elasticities; technical coefficients such as feed conversion ratios; PSE and CSE data; and macro-economic data such as exchange rates.

Supply, demand, and trade data were obtained from the U.S. Department of Agriculture's Foreign Agricultural Service, while exchange rate information was acquired from the International Monetary Fund's International Financial Statistics. The own- and cross-price elasticity estimates for demand and supply were based on a number of empirical studies. Details on it and the technical coefficients used in the model are presented in (Gardiner, Liu, and -----

9. Very little information exists in the literature concerning price transmission elasticities for centrally planned economies and developing countries. The estimates we use are our best judgments based on studies presented in (Carter and Gardiner, 1988).

Table 2--Commodity and country coverage in ST86

Product aggregates	ST86 detailed product coverage and mnemonic 2-letter codes
Ruminant meats	Beef and veal (BF), mutton and lamb (ML)
Nonruminant meats	Pork (PK), poultry meat (PM), eggs (PE)
Dairy	Milk (DM), butter (DB), cheese (DC), milk powder (DP)
Dairy products	Butter (DB), cheese (DC), milk powder (DP)
Wheat	Wheat (WH)
Coarse grains	Corn (CN), other coarse grains (CG)
Rice	Rice (RI)
Oilseeds and products	Soybeans (SB), soymeal (SM), soyoil (SO), other oilseeds (OS), other meals (OM), other oils (OO)
Sugar	Sugar (SU)
Other crops	Cotton (CT), tobacco (TB)
Farm products	Beef (BF), pork (PK), mutton and lamb (ML), poultry meat (PM), eggs (PE), milk (DM), wheat (WH), corn (CN), other coarse grains (CG), soybeans (SB), other oilseeds (OS), cotton (CT), sugar (SU), tobacco (TB)
ST86 country or region	Database country coverage and TLIB mnemonic 2-letter codes <u>1/</u>
United States	United States (US)
Canada	Canada (CN)
European Community (12)	European Community-10 (EC), Spain (SP), Portugal (PT)
Other Western Europe	Other Western Europe (WE)
Japan	Japan (JP)
Australia	Australia (AU)
New Zealand	New Zealand (NZ)
Developing exporters	Brazil (BZ), Argentina (AR), Indonesia (DO), Thailand (TH), Malaysia (ML), Philippines (PH)
New industrialized Asia	South Korea (SK), Taiwan (TW), other East Asia (EA)
Centrally planned economies	Eastern Europe (EE), Soviet Union (SV), China (CH)
Developing importers	South Africa (SF), Mexico (MX), Central America and Caribbean (CA), Venezuela (VE), other Latin America (LA), Nigeria (NG), other Subsaharan Africa (AF), Egypt (EG), Middle East and North Africa, oil producers (MP) Middle East and North Africa, non-oil producers (MO) India (ND), other South Asia (OS), other Southeast Asia (SA), other Asia (OA), rest-of-world balancing world trade (RW)

1/ TLIB is a 22-commodity 36-country or region database for 1984 and 1986, containing production, consumption, trade, price, and support data. Data from the TLIB database were aggregated according to the above regional groupings to form the ST86 model used for this report. Although the full TLIB database has been used as a large model, turn around time for model runs is much less if the model is aggregated to a regional level adequate to explore the research problem at hand.

Sources: Details on the TLIB database can be found in (Sullivan, Wainio, and Roningen, 1989). Information on aggregation and other model procedures and updates can be found in (Roningen, a forthcoming staff report further documenting the SWOPSIM model).

Roningén, 1989) while a discussion on the appropriateness of the selection of elasticities is treated in more detail later in this report. Information on price transmission can be found in (Sullivan and Liu, forthcoming), while data on PSE's and CSE's are given in (USDA, 1988).

Since PSE's reported in (USDA, 1988) do not incorporate costs of required supply control associated with farm programs, they, in effect, exclude some of the production-offsetting elements of policies. Such policies, therefore, are incorporated directly as volume shifters when modeling the sector. Additional information on supply management programs and their treatment in the modeling framework can be found in Appendix D and (Herlihy, Johnston, and Haley, forthcoming).

This report presents the results of experiments using the ST86 model in which new equilibrium solutions are obtained by removing PSE's and CSE's. The new solutions represent an approximation of the resulting adjustments in production, consumption, trade, and prices of agricultural commodities to be expected after 5 years, with the important proviso that all other conditions remain the same as in the base year, 1986/87. This permits the analysis to isolate and identify the differences between the new solution and the initial or reference solution that are attributable to the removal of distortionary policies.

The Model: Validation and Properties

The reference solution in ST86 replicates the actual prices and quantities produced, consumed, and traded in the base year. This replication is not, however, evidence of a valid model. Rather, it only describes our system of initializing the model. A practical check of validity is to examine whether certain model properties appear reasonable.¹⁰

One such property that is of considerable interest is a measure of producer and consumer response to price changes. Table 3 presents aggregate supply and demand elasticities that reflect the variation of own- and cross-price elasticities for all regions in the model. In general, the parameters suggest that agricultural output in most industrial market economies do not respond greatly to changes in the level of agricultural prices over the medium term. The aggregate supply elasticities range between 0.35 and 0.5 for industrial countries and reflect the possibility of resources shifting slightly among several alternative outputs. This is consistent with constraints on inputs, like land, which would limit the aggregate response of farm sectors to price changes expected from trade reform. Among developing countries, the aggregate supply elasticities vary little, ranging from a low of 0.27 for the rest of the world importers to 0.33 for the newly industrialized economies of Asia that practice intensive agriculture. Aggregate demand elasticities are inelastic for both industrial and developing countries. Several other models, including those of the (OECD, 1987) and (Parikh, Fischer, Frohberg, and Gulbrandsen, 1988), obtain similar aggregate elasticities.

10. No acceptable validation procedure exists for synthetic models. Validation, in our context, refers more to the reasonableness of certain parameters implied by the model.

Table 3--Aggregate supply and demand elasticities in ST86

Country or region	Supply	Demand
United States	0.37	-0.37
Canada	.35	-.39
European Community (12)	.37	-.30
Other Western Europe	.40	-.29
Japan	.50	-.37
Australia	.42	-.35
New Zealand	.40	-.13
Developing exporters	.30	-.36
Centrally planned economies	.22	-.20
New industrialized Asia	.33	-.37
Developing importers	.27	-.36

Source: Calculated by the authors by weighting product supply and demand elasticities by production and consumption.

Partial net trade elasticities also provide some indication of the validity of the model. Table 4 gives the own-price partial net trade elasticities faced by the United States over the medium term. These partial elasticities were derived by exogenously increasing the world price for the particular commodity in the reference solution by 10 percent while holding all other prices fixed. We focused on the United States largely because of the availability of such information for comparative purposes.

The net trade elasticities for U.S. grain exports are -1.9 for corn, -4.2 for wheat, and -19 for rice. The wheat and corn estimates fall within the longrun bounds provided by (Gardiner and Dixit, 1987). The large estimates for rice reflects the small share of U.S. exports in world rice trade.¹¹

The medium-term elasticity of export demand for U.S. soybeans is -1.0. This compares favorably to the Gardiner and Dixit longrun mean of -1.3. The elasticity estimates for most animal products are large, especially for non-ruminant meats. Here again, these estimates reflect the small share of world animal products trade accounted for by the United States.

While comparing U.S. net trade elasticities may provide some indications of the validity of the model, it certainly is not foolproof. For one thing, we were unable to find empirical estimates of net trade elasticities for a number of commodities, including animal products, sugar, and tobacco. Moreover, even for those commodities for which estimates were available, there was little

11. The estimates in table 4 are based on a price transmission elasticity of 1 for industrial market economies but 0.5 and 0.2 for developing countries and centrally planned economies, respectively. This suggests that the elasticity estimates are probably larger than those that exist with current policies in place but much smaller than those that would exist under a free trade environment.

Table 4--Own-price net trade partial elasticities for U.S.
agricultural products implied by ST86

Commodity group	Own price change	All price changes
Ruminant meats <u>1/</u>	16.3	12.6
Nonruminant meats	44.6	29.6
Dairy products	-52.0	-37.3
Wheat	-4.2	-2.0
Coarse grains	-1.9	-.4
Rice	-19.1	-16.4
Oilseeds and products	-1.0	-.3
Sugar	10.3	8.7
Other crops	-2.2	-1.8

1/ Elasticities reported are those for the most important commodity within the commodity group: Ruminant meat (beef), nonruminant meat (pork), dairy products (butter), coarse grains (corn), and other products (cotton).

Source: Calculated by the authors as described in the text of the report.

consensus in the literature on the size of the parameters. Lastly, even though the U.S. estimates may appear reasonable, that does not necessarily ensure that we modeled the responses of other countries adequately, especially for those markets in which the United States does not play a major international role.

Market Effects of Removing Assistance to Agriculture in Industrial Countries

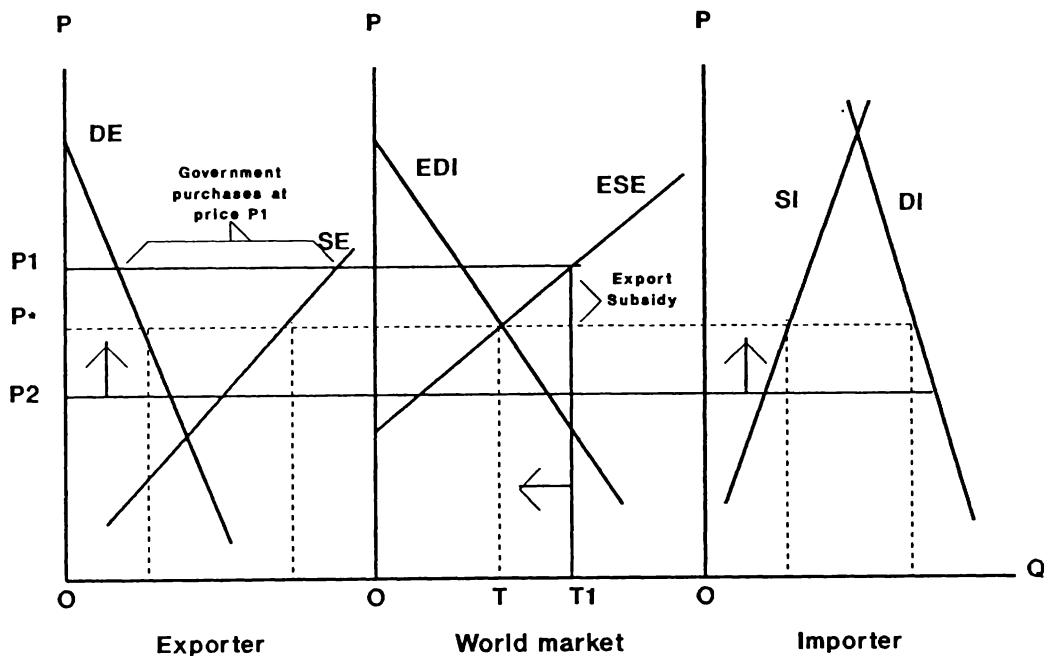
To understand the theoretical market effects of eliminating assistance to agriculture in developed countries, consider figure 5 which assumes a one-exporter one-importer, and one-commodity partial equilibrium world market. If there were no interventions in the markets, the equilibrium world price would be P^* . At price P^* , the excess supply in the exporting country would just equal excess demand in the importing country, and quantity OT would be traded.

Consider the case where the exporting country intervenes in its domestic markets and raises the domestic price to P_1 . At P_1 , the exporting country would be producing more but consuming less, increasing its excess supply. If the exporting country stockpiled this surplus, as the United States has done over the years, the world price could be maintained at P_1 . But over any length of time, the surpluses cannot be stored except at prohibitive costs. Under such circumstances, the exporting country may pursue a policy to dump the surpluses in the world market through the use of export subsidies, as is done by the EC. World prices would then fall to P_2 , and the level of assistance to producers in developed countries, as measured by PSE's, would be the difference between domestic and world price ($P_1 - P_2$). World trade would expand to OT1 because of the use of export subsidies.

In the current market environment, exporting countries are intervening with a high domestic price, lowering the world price to P_2 . If they eliminated their

Figure 5

Market effects of liberalizing trade in exporting countries



support to agriculture, the removal of assistance (PSE's) would lower internal prices, curtailing domestic production and increasing consumption.

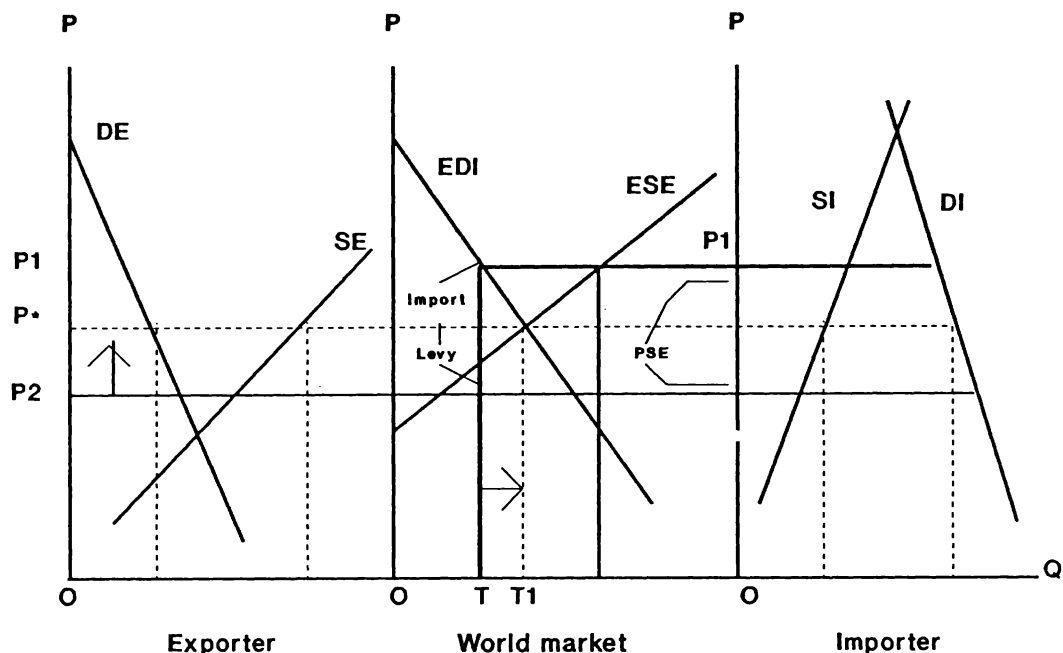
Aggregate demand would exceed aggregate supply in the world market, and the world price would rise to achieve equilibrium. World trade would fall to OT, and world price would increase to P^* . The magnitude of the increase in world price ($P^* - P_2$) would be closely related to the level of support ($P_1 - P_2$). The higher the level of support, the greater would be the increase in world price.

We just illustrated that in a one-commodity case with a subsidizing exporter, trade liberalization by the exporting country would increase world prices and contract world trade. This, however, need not be the case. If importing countries distort world trade through the use of trade barriers, as has been the case with Japanese beef imports, removal of protection could expand world trade and increase prices (fig. 6). The initial market environment is one where the importing country imposes import restrictions and limits world trade to OT at a world market price of P_2 . If the importing country was subsequently to remove its import levy, imports would increase and world trade would expand to OT1. World price, as before, would increase to P^* .

Exporting and importing countries use a variety of measures that distort trade, with some expanding trade and others limiting trade. A priori, therefore, it is difficult to hypothesize the domestic and international effects of trade liberalization. Our study is designed to identify the market implications of agricultural policies pursued by a number of industrialized market

Figure 6

Market effects of liberalizing trade in importing countries



economies. We focus on two issues: the global market effects of multilateral trade liberalization by industrial market economies, and the contribution of each country's policies to current market conditions.

Two points need to be kept in mind in interpreting model results. First, our findings are based on a static model that assumes the new solution represents an equilibrium after about 5 years of adjustment, with all other conditions remaining the same. This means that our static results do not account for changes that may occur in a dynamic world economy even without the removal of government assistance. Hence, the results can only approximate the magnitude of changes that might be expected if only the factors varied in the model were operative. In reality, however, additional factors not covered in the model would also be varying over time and have additional important influence on the outcome. Increases or decreases implied by the model could, when translated into a real world environment, represent only expanded or reduced growth and not increases or decreases in absolute magnitudes. For instance, a production decline obtained from the model could be interpreted as a decline in the rate of increase in production that might occur because of secular growth trends.

Second, to identify a country's contribution to world market changes, we eliminate agricultural assistance in each country unilaterally, keeping the price transmission elasticity for all other industrial market economies at 1. This may not represent a realistic unilateral liberalization because a price transmission elasticity of 1 implies that other industrial countries do not insulate their domestic sectors from changes in the world market price but maintain their specific (\$/metric ton) protection rates. However, to the extent that increases in world prices are considered desirable by governments in most industrial market economies, it seems reasonable to assume that they

would allow the world price effects to be translated to their domestic economies.

Effects on World Prices

The estimated world price effects of liberalizing agricultural policies in some or all industrial economies are given in table 5. Our results suggest that world agricultural prices would, on average, increase by 22 percent if industrial market economies simultaneously eliminated all assistance to agriculture. The rise in world prices would be greatest for dairy products (65 percent), followed by sugar (53 percent). These large price increases occur because levels of assistance to dairy products and sugar in industrial countries are relatively high and industrial country trade is a major part of world trade. World prices for wheat (37 percent), rice (26 percent), coarse grains (26 percent), and ruminant meats (21 percent) would also increase noticeably for the same reasons. By contrast, world prices for oilseeds and products (6 percent) would increase only slightly, indicating that agricultural policies pursued by industrial countries have only had modest price-depressing effects on those commodities.

How meaningful is the roughly 20-percent increase in world prices that follows multilateral liberalization in terms of price behavior on world agricultural markets? The price change is equal to the average deviation in world prices in any particular year as a percentage of average prices over the past 20 years (fig. 7). It is much less than the average extreme deviation in world

Table 5-- World price effects of liberalization, 1986/87

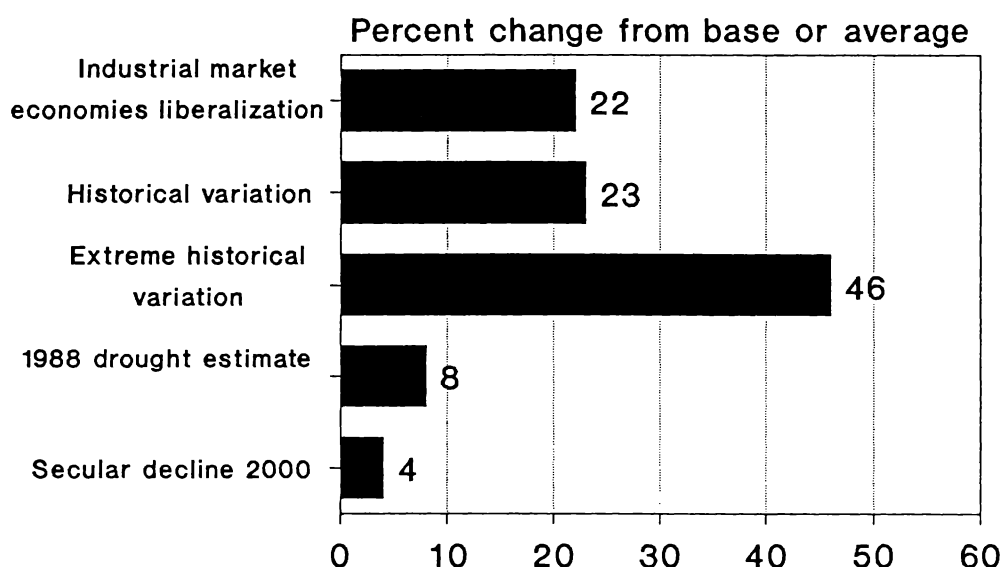
Commodity group	Unilateral liberalization ^{1/}							Multi-lateral by industrial market economies
	United States	Canada	European Community (12)	Other Western Europe	Japan	Australia	New Zealand	
	<u>Percent</u>							
Ruminant meats	3.8	0.4	13.5	1.5	1.8	0.2	0.2	21.0
Nonruminant meats	3.0	.5	5.8	1.0	2.3	.1	0	12.4
Dairy products	23.5	4.1	31.6	6.2	4.5	.7	.5	65.3
Wheat	10.6	4.1	19.1	1.6	2.5	1.6	0	36.7
Coarse grains	11.6	2.2	11.5	1.5	.6	.2	0	26.3
Rice	2.9	.4	3.2	.2	19.6	.2	0	26.2
Oilseeds and products	-2.6	.5	7.9	.2	.4	0	0	6.4
Sugar	22.8	.4	18.6	3.3	6.4	1.1	0	52.7
Other crops	4.0	0	3.3	.1	.7	-.1	0	7.7
Aggregate	5.9	1.2	10.6	1.4	3.6	.3	.1	22.0

^{1/} Unilateral liberalization means that each country removed its support while others maintained theirs. Multilateral means all industrial market economies simultaneously remove their agricultural support.

Source: Results from SWOPSIM ST86 simulation by authors for this report.

Figure 7

World price effects of industrial market economies liberalization in perspective



Source: Calculated by the authors from SWOPSIM ST86 simulations, (27), and ERS and World Bank price data.

prices that occurred in the mid-1970's, but more than double the price effects of the 1988 drought. Furthermore, it overwhelms a secular decline in real prices that could occur up to the year 2000 if historical long-term trends continue.¹²

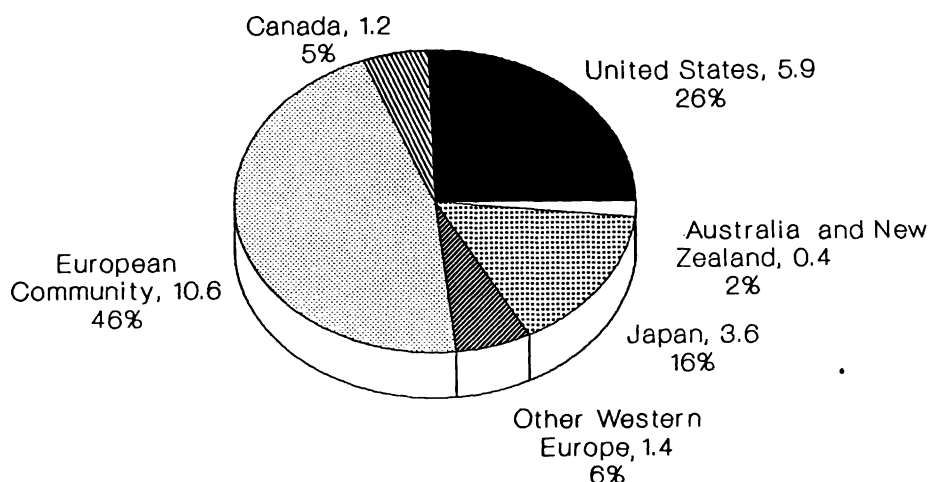
Thus, in historical terms the magnitudes are significant but not overwhelming. This means that historical experience with price changes is relevant both to the analysis of trade liberalization and to real world adjustment problems that might arise from that liberalization.

Our results also show that the EC and the United States are by far the most important contributors to the world price effects. Unilateral liberalization of agricultural policies by the EC would raise world agricultural prices an average of 11 percent (fig. 8). This is nearly half of the increase that would result if all industrial market economies simultaneously eliminated their support to agriculture. The price effects of EC policies are most

12. Variation in world prices is measured as a weighted average of coefficients of variation of ST86 reference prices from 1960/61 to 1984/85. The average extreme deviation is the weighted average of half the difference between minimum and maximum prices adjusted to the means of the respective commodity prices for the entire period. The 1988 drought estimates are ST86 price effects implied by U.S. and Canadian crop shortfalls (Washington Post, Aug. 12, 1988). The 4-percent secular decline is the result of an ST86 projection to the year 2000 and represents an ST86 interpretation of downward long-term real price trends (Roningen, Dixit, and Seeley, 1988).

Figure 8

Contribution to world price changes, 1986/87



Source: Results from SWOPSIM ST86 simulation by authors for this report.

visible in the dairy products, sugar, ruminant meats, and wheat markets. Our results indicate that if the EC were to unilaterally remove all assistance to agriculture, world prices for dairy products and wheat would rise by 32 and 19 percent, respectively. EC policies also appear to influence world coarse grain prices. Elimination of assistance to agriculture, mainly export refunds to barley and variable levies on corn imports, would raise world coarse grain prices by 12 percent.

Unilateral elimination of agricultural support policies by the United States would raise world sugar and coarse grain prices by 23 and 12 percent, respectively, equivalent to nearly half the increases in world prices from multilateral liberalization. These increases in world prices are consistent with our earlier observation that the sugar and grains sectors were the two most heavily supported sectors in the United States during 1986/87. Our results also indicate that U.S. policies are partly responsible for depressed world prices for wheat. U.S. liberalization alone would account for nearly a third of the increase in world prices for wheat that would accompany multilateral liberalization. By contrast, even though support to rice producers is highest among the grains, unilateral liberalization by the United States would have very little effect on the world rice price (3 percent) because U.S. shares of the world rice production and consumption are very small (1 percent).

An interesting inference from our results is that, despite similar rates of producer support, U.S. policies have had far less price-depressing effects in world grain markets than have EC policies. One reason for this is that U.S. consumer prices are not very distorted. Consequently, removal of support does not lead to increased quantity demanded. Another is that the distortionary implications of U.S. grain policies are moderated somewhat by set-aside programs, which have restricted acreage expansion that would have otherwise occurred with high domestic producer prices.

The success of these supply management programs, however, depends to a large extent on the effects on production from land set aside. The agricultural economics literature (Tweeten, 1979) seems to suggest that U.S. acreage set-aside programs have only been partially successful in controlling supply because of production slippage (Appendix E). Production slippage occurs if government supply management programs were to either draw more land into production than would otherwise be cultivated or if farmers were to increase their yield on cropped land in response to supply management programs. For this study, we assumed--based on empirical econometric estimates--that because of set-aside requirements, average yields on cropped lands were 2-10 percent higher and that 3 of 4 acres set aside come back into production. In a separate experiment, however, we assumed that U.S. set-aside policies were completely effective and no slippage occurred. Under those circumstances, we found that U.S. unilateral liberalization would increase world prices of wheat, coarse grains, and rice by 4, 4, and 1 percent, respectively, compared with the 11, 12, and 3 percent with slippage. U.S. set-aside programs would be almost trade neutral if production slippage did not occur.

Even though assistance to agriculture is high in Japan and non-EC Western European countries, policies in these countries do not have very much influence on international prices because these countries are not major participants in the world agricultural market. The only exception to this would be Japan in the rice market. Japan's policies affect world rice prices more than the combined effects of all other developed countries' policies. Policies of Canada, Australia, and New Zealand do not affect international prices very much because of their small size in world markets.

Effects on World Trade

One would expect that liberalization would increase specialization by countries because of their comparative advantage and lead to larger trade. Indeed, model results indicate that world agricultural trade volumes (table 6) for most commodities would expand when all industrial market economies liberalize simultaneously. The expansion is substantial for rice and sugar trade. Much of the expansion in sugar and rice trade results from liberalization by the United States and Japan, respectively. The elimination of production incentives leads to lower production and expanded imports for each commodity. Quantity traded of other agricultural commodities would also expand. World trade in oilseeds and oilseed products would increase by 14 percent and that for ruminant meats by 10 percent. Even though the proportionate increases in nonruminant meats and dairy trade are large, in absolute volume terms, these changes are rather small.

World wheat trade volumes would contract (20 percent) with multilateral liberalization. The increase in world price is not enough to compensate producers in industrial countries for the loss in government assistance, thereby leading to lower production and reduced exportable surpluses. This occurs despite the impetus for increases in U.S. wheat production, resulting from the release of land set aside under government programs. Trade in coarse grains would also decline, but by much less (5 percent).

Traditional food exporters like Australia and New Zealand would not only expand their exports of grains but would also increase exports of high-valued products like meats and dairy products. The United States, in contrast, would

Table 6--Trade balance changes from multilateral industrial market economies liberalization, 1986/87

	United States	Canada	EC-12	Other Western Europe	Japan	Aus- tralia	New Zealand	Devel- oping export- ers	Cent- rally planned econ- omies	New indus- trial Asia	Devel- oping import- ers
<u>Million metric tons</u>											
Trade volumes:											
Ruminant meats	1.1	0.1	-1.9	-0.2	-0.4	0.2	0.1	0.4	0.1	0	0.5
Nonruminant meats	.4	.1	-.9	-.3	-.5	.1	0	.2	.5	.1	.3
Dairy products	-.4	-.1	-.3	-.2	-.2	.1	.2	.1	.3	0	.4
Wheat	-3.0	-.8	-12.9	-.7	-.8	1.6	.1	1.1	4.6	.2	10.6
Coarse grains	-8.3	-3.2	-5.0	-1.0	3.9	.4	.1	3.0	1.9	.2	8.1
Rice	-.4	0	-.6	0	-8.9	0	.1	2.0	1.0	.1	6.8
Oilseeds and products	1.7	.1	-1.7	.3	.5	0	0	-.6	-.1	-.1	-.1
Sugar	-3.4	0	-1.5	-.4	-.8	.5	0	1.8	-.1	.1	3.1
Other crops	-.2	0	0	0	0	0	0	0	0	0	.1
<u>Billion dollars</u>											
Trade values: <u>1/</u>											
Ruminant meats	2.5	.2	-4.8	-.5	-1.1	1.1	.8	1.0	.3	0	.6
Nonruminant meats	1.0	.1	-1.1	-.6	-1.9	.2	0	.4	1.5	.1	.4
Dairy products	-1.2	-.3	.1	-.3	-.8	.6	1.6	.1	1.0	0	-.9
Wheat	.7	.7	-1.4	-.1	-.4	.9	0	.1	-.4	-.2	0
Coarse grains	.3	-.2	-.6	-.1	-.1	.1	0	.5	0	-.2	.3
Rice	0	0	-.2	0	-2.4	0	0	.8	.3	0	1.4
Oilseeds and products	.4	.2	-.7	.1	0	0	0	.3	.1	0	-.2
Sugar	-.9	0	-.3	-.1	-.2	.2	0	.7	-.2	0	1.0
Other crops	-.1	0	-.3	0	-.1	0	0	0	.1	-.1	.4
Total	2.8	.7	-9.1	-1.8	-7.0	3.2	2.4	3.9	2.5	-.5	2.8
<u>Percentage point change</u>											
Export shares:											
Wheat	1.0	2.4	-10.8	-.3	N/A	4.6	N/A	1.3	.9	N/A	.9
Coarse grains	-7.2	-3.8	5.4	-.4	N/A	.6	.1	3.3	.8	N/A	1.3
Rice	-7.6	N/A	-2.5	N/A	N/A	-.6	N/A	3.9	1.7	-.2	5.2

+ and - = Increases and decreases in net trade (exports minus imports).

N/A = Not applicable.

1/ The signs for trade value changes may differ from signs of trade volume changes because price changes may more than compensate for quantity trade balance changes.

Source: Results from a SWOPSIM ST86 multilateral trade liberalization scenario run by the authors for this report.

reduce its exports of grains but increase its exports of meats. The EC would switch from an exporter of ruminant meats to one of the largest importers, and the same would be true in Japan for rice. In the sugar market, the United States would more than double its imports of sugar from developing markets, while the EC would curtail their sugar exports and be barely self-sufficient in sugar.

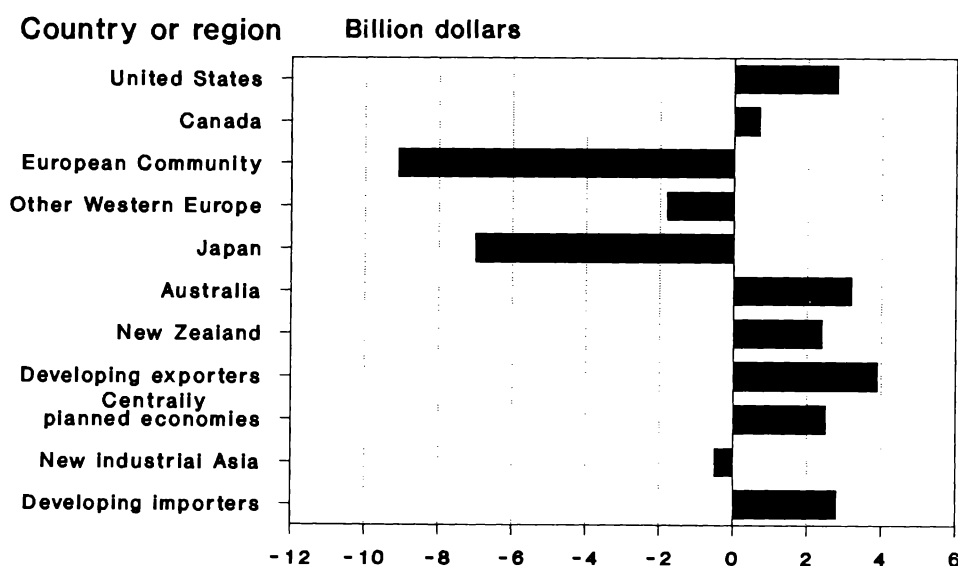
The value of net trade also changes substantially with liberalization (fig. 9 and table 6). The United States would improve its agricultural balance of trade by \$3 billion, or nearly 25 percent. Most of this improvement would result from decreases in beef import costs and increases in grains export revenues because of rising world prices.

Australia and New Zealand would each improve their agricultural balance of trade by nearly \$3 billion, or over two-thirds of their 1986/87 agricultural trade earnings, while the EC and Japanese balance of trade would worsen by \$9 billion and \$7 billion, respectively. Industrial market economies' net export earnings would decline by \$9 billion, while developing countries on the aggregate would reduce their net import costs by \$6 billion. The value of global trade would increase by \$18 billion with multilateral liberalization.

Much of the source of trade conflict among developed countries in the last few years has been the issue of export market shares. The EC proposal for the Uruguay Round of the GATT, for instance, advocates managing exports of commodities in surplus. This is tantamount to fixing grain market shares. Table 6 shows the changes in export market shares for wheat, rice, and coarse

Figure 9

Change in agricultural trade balance with industrial market economies liberalization, 1986/87



Source: Calculated from SWOPSIM ST86 simulation by the authors for this report.

grains, following liberalization. Our results indicate that EC export shares in wheat trade would fall greatly with multilateral liberalization. U.S. export shares in the coarse grain and rice market would fall moderately, while rising moderately in the wheat market. The major gainers would be Australia and some of the developing exporters.

Our results on world price and trade changes point to three basic implications. First, if industrial market economies were to liberalize their policies simultaneously, world prices and trade for most commodities would increase. Second, the price increases would be greater than those that would result if individual countries liberalized unilaterally. The total effect on world prices from a multilateral removal of support is roughly the sum of all unilateral effects. Finally, there would be some changes in market shares among most major grain exporters.

Effects on Domestic Prices and Production

The multilateral elimination of support to agriculture in industrial market economies would lower overall producer prices for most commodities in many industrial countries (table 7).¹³ Japanese producer prices would decline the most (49 percent), followed by producer prices in the EC (20 percent). As indicated earlier, both Japan and the EC have high levels of protection for domestic producers. The overall decline in U.S. producer prices (13 percent) would be much more moderate, because of increased prices for livestock producers. Producers in Australia and New Zealand would actually experience higher prices (14 and 16 percent, respectively) because increases in world prices would more than compensate for declines in government assistance.

In the case of the United States, however, prices received by producers at the farmgate level (excluding direct payments), would rise by 13 percent because of increases in world trade prices. Consequently, despite the loss of government assistance, cash receipts of U.S. producers from the market would increase by \$2.6 billion following multilateral liberalization. By contrast, both farmgate prices and cash receipts from marketing would decline for EC and Japanese producers.

Production of most agricultural commodities in industrial market economies would fall with multilateral liberalization because of declines in domestic producer prices. Total U.S. farm output would fall by 1 percent, while in the EC and Japan it would decline by 7 and 32 percent, respectively. Farm output in Australia and New Zealand, not surprisingly, would increase in response to higher producer prices, as would output in all developing countries.

For industrial market economies as a whole, the largest output declines under multilateral liberalization would be for rice, sugar, and wheat. While Japan would account for nearly the entire fall in rice production, the United States would account for much of the output decreases in sugar. Over two-thirds of the decline in wheat production would occur in the EC. Global supply would

13. Producer prices in the context of our model refer to the incentive price received by producers. Incentive prices include the full value of the producer subsidy equivalent. Farmgate prices exclude direct payments to producers (See Appendix D for additional information).

Table 7--Producer price and output changes from multilateral industrial market economies liberalization

Commodity group	United States		Canada	Other Western EC-12	Europe	Japan	Australia	New Zealand	Developing exporters	Centrally planned economies	New industrial Asia	Developing importers
<u>Percent</u>												
Producer price: <u>1/</u>												
Ruminant meats	7	8	-27	-41	-59	18	16	11	2	5	11	
Nonruminant meats	2	5	-13	-22	-24	13	15	6	2	6	5	
Dairy products	-15	-27	-2	-51	-56	51	71	22	8	0	6	
Wheat	-44	-18	-44	-35	-87	17	37	11	8	8	21	
Coarse grains	-33	-26	-34	-37	-92	19	24	10	4	3	10	
Rice	-59	26	-62	26	-83	9	0	10	5	3	13	
Oilseeds and products	-7	-4	-24	7	-19	8	5	2	1	0	5	
Sugar	-69	-29	-20	-48	-60	31	53	17	5	11	19	
Other crops	-27	26	-42	5	4	9	4	3	1	2	4	
Farm products	-13	-6	-20	-24	-49	14	16	8	3	4	9	
Production quantity: <u>2/</u>												
Ruminant meats	4	3	-15	-24	-13	8	11	5	0	1	4	
Nonruminant meats	0	-2	0	-9	-15	7	8	3	0	2	2	
Dairy products	-5	-4	0	-17	-18	8	15	6	2	0	4	
Wheat	-6	-3	-16	-13	-61	10	23	2	1	2	6	
Coarse grains	-4	-15	-4	-10	-71	5	11	4	0	0	3	
Rice	-11	2	-32	5	-48	3	-1	3	0	0	4	
Oilseeds and products	2	1	-16	-1	-16	0	9	0	0	0	-1	
Sugar	-42	-10	-3	0	-34	14	0	8	0	2	5	
Other crops	-7	5	-11	-26	0	-1	7	0	0	0	0	
Farm output	-1	-2	-7	-13	-32	7	10	2	0	1	2	
Agricultural gross domestic product <u>3/</u>												
	16	18	16	5	-6	35	47	21	20	17	25	

1/ Producer incentive prices, including direct support payments (see Appendix D for model details).

2/ Value weighted quantity index.

3/ Value of farm production excluding support.

Source: Results from a SWOPSIM ST86 multilateral liberalization scenario produced by the authors for this report.

remain largely the same for all commodities despite multilateral liberalization. Increases in world prices would modestly stimulate production in developing countries and compensate for output changes in industrial market economies.

Despite the decline in production in most industrial countries, the net value added by agriculture would increase in those economies because of rising world

prices. The increases in nominal agricultural gross domestic product would be between 15 and 20 percent for the United States, Canada, and the EC, but much larger for Australia and New Zealand. Japanese agricultural gross domestic product would actually fall by 6 percent because of large declines in production. We might also add that agricultural gross domestic product would decline in all industrial countries if they unilaterally liberalized their policies.

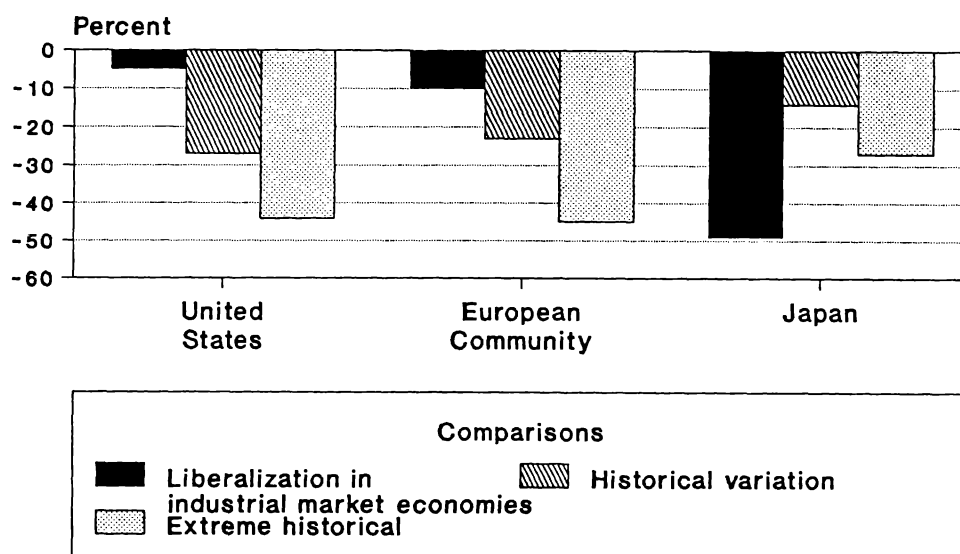
Finally, how do the magnitudes of estimated production changes compare with historical experience? As was the case with world price movements, we compared the estimated change in cereals production for the United States, the EC, and Japan with other indicators of change (fig. 10). The country comparisons provide very different perspectives. While the production decreases in the United States are much lower than the expected average annual deviation, exactly the opposite is true for Japan. In the EC, in contrast, the declines in production following multilateral liberalization are about the same as the annual average expected deviation. Farmers in the United States and the EC would be better suited to cope with production changes following liberalization than would farmers in Japan.

Effects on Economic Welfare

Agricultural support policies in industrial countries have reduced national income by encouraging inefficient use of resources. They have also transferred incomes from the nonfarm to the farm sector and from consumers and taxpayers to agricultural producers. To better understand the economic welfare

Figure 10

Decline in cereal production versus historical experience



Source: Calculated by the authors from a SWOPSIM ST86 multilateral liberalization scenario and from USDA historical production data.

implications of agricultural trade liberalization, we pose two questions: What are the distortionary costs associated with the agricultural policies of each industrial market economy? What are the potential gains that can be generated if all industrial market economies liberalized their agricultural policies simultaneously?

Table 8 summarizes our estimates of the annual costs to consumers and taxpayers, the benefits to producers, and the efficiency losses (welfare costs) from distortionary policies pursued in 1986/87. Our results indicate that the costs to consumers and taxpayers of distortionary policies in individual industrial market economies are considerably more than the benefits to producers. For every dollar that producers in industrial market economies gain because of protectionist policies, consumers and taxpayers lose \$1.42. Consumers and taxpayers in the United States forfeit \$1.38 in transfers for every dollar gained by producers. The transfer costs are higher for the EC (\$1.45) and Japan (\$1.49).

Indeed, our study shows that only about 70 percent of the costs to consumers and taxpayers in industrial countries are transferred to producers. The rest represents income losses to society arising out of misallocated resources. The income losses are greatest for the EC (\$15 billion), followed by the United States and Japan (\$9 billion each). Because Japan has a much smaller population than either the United States or the EC, the annual per capita costs to Japan (\$71) are much bigger than those for the United States (\$38) or the EC (\$46).

Table 8--The annual benefits of agricultural support to producers and costs to consumers and taxpayers in industrial market economies, 1986/87 ^{1/}

Country or region	Producer benefits	Consumer costs	Tax- payers costs	<u>Net economic costs</u>		<u>Transfer benefits</u>			
				Total <u>2/</u>	Per capita	Per	Per	Producer share of transfers	Ratio of transfers to income loss
						nonfarm household	dollar lost by producers		
<hr/>									
	-----	<u>Billion dollars</u>	-----		-----	<u>Dollars</u>	-----	<u>Percent</u>	
United States	26.3	6.0	30.3	9.2	38	459	1.38	72	3.95
Canada	3.7	2.3	3.8	2.4	92	736	1.65	61	2.57
EC	33.3	32.6	15.6	14.9	46	485	1.45	69	3.23
Other W. Europe	8.8	4.3	6.3	1.9	58	1,073	1.21	82	5.71
Japan	22.6	27.7	5.7	8.6	71	902	1.48	68	3.90
Australia	.6	-.5	1.1	.1	6	130	1.16	86	7.22
New Zealand	.2	-.2	.5	0	3	223	1.05	96	23.00
<hr/>									
Industrial market economies	95.4	72.4	63.1	36.9	49	564	1.42	71	3.65

^{1/} Estimates based on unilateral liberalization by the countries or regions.

^{2/} Total cost is the sum of producer benefits (+), consumer costs (-), and taxpayers costs (-), and includes transfers to other groups, for example, quota holders.

Source: Results from SWOPSIM ST86 simulations done by the authors for this report.

The net economic costs in table 8 do not provide an accurate indication of the total domestic costs associated with distortionary agricultural policies because they do not fully reflect the transfers from consumers and taxpayers to producers. For industrial market economies as a whole, distortionary policies cost consumers and taxpayers over \$135 billion, whereas the welfare losses would be about \$37 billion. The cost to consumers and taxpayers is nearly four times the welfare costs.

Most countries pursue protectionist policies to support farm incomes. Since farm population, however, accounts for only a small proportion of total population in most industrial countries, the nonfarm sector provides a large share of the assistance that goes to the agricultural sector. Our study indicates that it costs each nonfarm household in industrial market economies over \$500 annually to maintain agricultural support. This burden of agricultural support programs on the nonagricultural sector is considerably more in Japan than in the United States and the EC. Because Australia and New Zealand have low levels of support, the cost to nonfarm households there is considerably lower than in other countries.

The domestic costs of distortionary agricultural policies represent a part of the welfare costs of such policies. Individual country policies not only affect producers, consumers, and taxpayers within the country but also those in other countries (table 9). While U.S. policies raise producer incomes by \$26 billion, they cost producers in other countries nearly \$17 billion because of their price-depressing effects. Most of the costs of U.S. policies are borne by dairy producers in the EC, and grain and sugar producers in developing countries. Producers in the other remaining countries are not greatly influenced by U.S. agricultural policies.

Table 9--Costs and benefits of agricultural support to producers, 1986/87 ^{1/}

From policies of country or region	United States	Canada	EC-12	Other Western Europe	Japan	Aus- tralia	New Zea- land	Devel- oping ex- porters	Cent- rally planned econ- omies	New indus- trial Asia	Devel- oping im- porters	Total costs
<u>Billion dollars</u>												
United States	26.3	-0.7	-7.2	-0.8	-0.5	-0.6	-0.5	-1.1	-2.7	-0.1	-3.2	-17.4
Canada	-.7	3.7	-1.2	-.2	-.1	-.1	-.1	-.2	-.6	0	-.6	-3.8
European Community	-8.1	-1.6	33.3	-1.2	-.8	-1.2	-1.1	-2.4	-4.9	-.2	-5.2	-26.7
Other Western Europe	-1.1	-.2	-1.7	8.8	-.1	-.1	-.1	-.3	-.7	0	-.6	-4.8
Japan	-1.2	-.1	-2.0	-.2	22.6	-.2	-.1	-1.3	-1.9	-.2	-2.9	-10.3
Australia	-.2	-.1	-.3	0	0	.6	0	-.1	-.1	0	-.2	-.9
New Zealand	-.1	0	-.1	0	0	0	.2	0	0	0	0	-.1
Total costs of others' policies	-11.3	-2.7	-12.5	-2.5	-1.5	-2.3	-2.0	-5.3	-10.9	-.5	-12.6	-64.0

^{1/} Benefits (+) of support defined as lost producer surplus from unilateral liberalization scenarios of countries or regions on left.

Source: Results from SWOPSIM ST86 simulations done by the authors for this report.

By contrast, EC support policies substantially affect producers in almost every region. The gains to EC producers from their policies (\$33 billion) are not much greater than losses incurred by producers in other industrial countries (\$27 billion). The losses are largest for U.S. producers (\$8 billion), followed by producers in developing importers (\$5 billion), and \$1 to \$2 billion each for producers in the other regions. Most of the losses occur as a result of the EC's distortionary grain and beef policies.

Japanese agricultural policies also cost producers in other countries substantially (\$10 billion). Over a third of these costs are borne by rice producers in developing countries. Most of the remaining costs are incurred by beef, pork, and dairy producers in the United States and the EC.

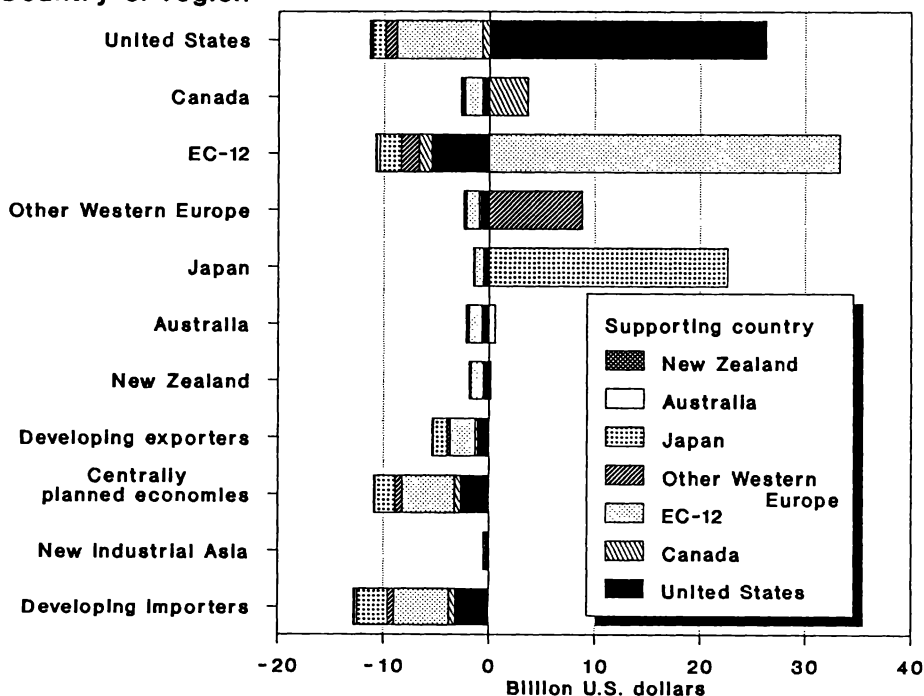
Policies of Australia, New Zealand, Canada, and other Western Europe benefit their own producers significantly but have little effect on producers of other countries. This suggests that these three regions either have relatively low levels of protection or account for a small share of world agricultural trade.

One justification for the perpetuation of high levels of farm support is the need to offset losses to domestic producers from protectionist policies of other countries. Our results suggest that such an argument has merit. In the United States, for instance, over 40 percent of the support to farmers merely offsets the losses created by policies of other industrial market economies (fig. 11). The compensation required to offset losses to producers in Japan and the EC would be much less.

Figure 11

Producer perspective: Costs of other countries's support (-), and benefits (+)

Country or region



Source: Results from SWOPSIM ST86 simulations done by the authors for this report.

Because protectionist agricultural policies of industrial countries have encouraged the inefficient use of resources, those economies in the aggregate would gain over \$35 billion annually, about 10 percent of their combined agricultural gross domestic product (GDP) but less than one-half of 1 percent of their total GDP, from multilateral liberalization (table 10). Global real income gains would be slightly less (\$30 billion). The EC would be the largest gainer (about \$14 billion), followed by the United States (\$9 billion) and Japan (\$6 billion). These three gains would account for over 80 percent of the gains to industrial market economies from multilateral trade liberalization. Most of the gains to the United States would come from government budget savings, while those in the EC and Japan would come from consumer savings. These gains to industrial market economies depend to a large extent on our assumption of the price transmission elasticities for the centrally planned economies and developing countries. If we had assumed smaller price transmission elasticities for those regions, then the increases in world prices following multilateral liberalization would be more, and the gains to the industrial market economies would be expected to be higher. Conversely, if these economies were to take advantage of the increases in world prices and allow all of it to be transmitted to their domestic economies, then the income gains to the industrial countries would most likely be less.

Table 10--Welfare implications of multilateral trade liberalization by industrial market economies, 1986/87 ^{1/}

	Producer	Consumer	Treasury	Net benefits 2/	
Country or region	welfare	welfare	savings	Total	Per capita
	----- <u>Billion dollars</u> -----			<u>Dollars</u>	
United States	-16.2	-4.6	30.3	8.6	36
Canada	-1.3	.2	3.8	2.6	101
European Community	-22.7	21.2	15.6	14.0	43
Other Western Europe	-6.8	1.8	6.3	1.3	41
Japan	-21.8	24.7	5.7	6.3	52
Australia	1.6	-1.5	1.1	1.1	71
New Zealand	1.7	-.8	.5	1.3	396
Developing exporters	5.1	-4.8	-.3	.7	2
Centrally planned economies	9.8	-10.3	.1	-.8	-1
New industrial Asia	.5	-.9	.1	-.9	-13
Developing importers	11.8	-14.5	-.1	-4.4	-2
Industrial market economies	-65.6	40.9	63.1	35.3	51
Developing countries	17.4	-20.2	-.3	-4.5	-2
Centrally planned economies	9.8	-10.3	.1	-.8	-1
Global	-38.4	10.4	62.8	29.9	7

^{1/} Estimated change in producer surplus, consumer surplus, net government expenditures, and the sum of all three.

^{2/} Net benefits include losses by other groups, for example, quota holders.

Source: Multilateral liberalization scenario with the SWOPSIM ST86 world agricultural trade model.

On a per capita basis, the country that would benefit the most from multilateral liberalization would be New Zealand (\$396). Much of the gains in New Zealand would accrue to producers who obtain higher international prices for their exports. The net per capita benefits to the United States (\$36), the EC (\$43), and Japan (\$52) would be relatively low, less than 1 percent of per capita gross national product. The U.S., EC, and Japanese gains are low because agriculture's contribution to gross domestic product is very small (about 2 percent) in all three regions unlike that for New Zealand (9 percent).

These modest per capita gains, however, should not be used to decry the importance of policy reform. For one thing, the net benefit to a country is small when compared with the transfer of incomes within the country. The income gains to consumers and taxpayers in the United States and the EC are nearly three times the increase in national incomes. In Japan, the ratio is four to one. Another reason for the small gains is the relatively low agricultural net supply elasticities assumed, which imply that resources cannot easily shift away from the sector. If larger elasticities were assumed, then resource movements among sectors would be easier and the gains from liberalization would be larger. This has been well illustrated by (Bale and Lutz, 1981) in their work on an international comparison of agricultural price distortions.

Whether producers gain or lose from multilateral liberalization and require compensation, could be of considerable concern in the new round of international trade negotiations.¹⁴ Our results indicate that producers in the EC, Japan, and the United States could lose between \$15 and \$25 billion with multilateral trade liberalization. Most of these losses result from the elimination of government assistance. Rice producers in Japan, beef producers in the EC, and grain producers in the United States account for most of the losses.

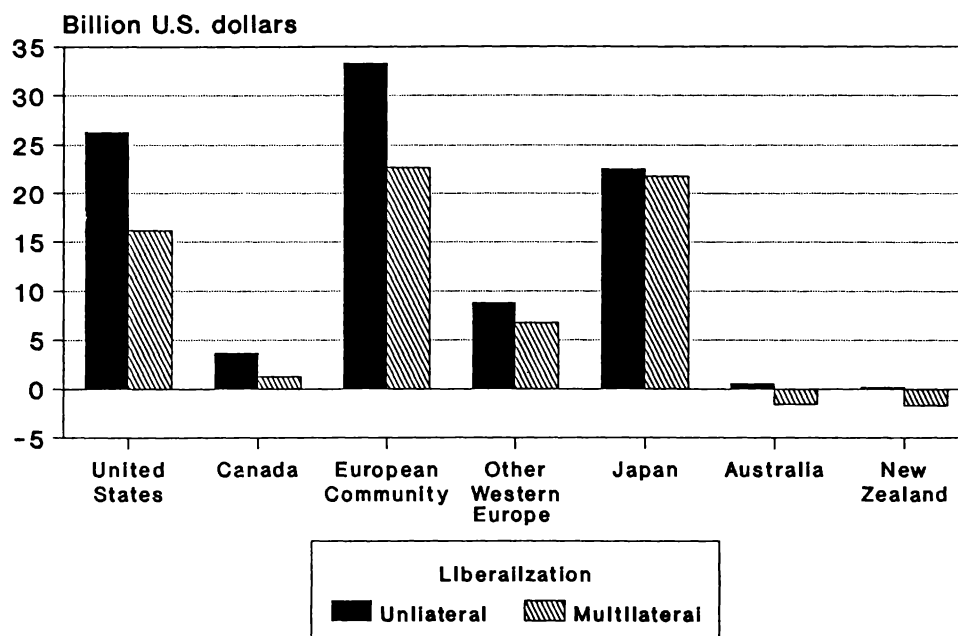
While the losses in producer incomes may appear large, such losses would be even greater if industrial market economies were to attempt unilateral policy reform to redress their budgetary problems. An important feature of our results is that producers would lose much less (or require much less compensation) in a multilateral reduction of support as opposed to unilateral elimination of agricultural assistance because increases in international prices would be much higher when all countries eliminate support (fig. 12). U.S. producer losses would be cut by nearly two-fifths under multilateral liberalization, while those for the EC would be a third lower. Producers in Japan, in contrast, would lose about the same under either scenario because Japanese agricultural support levels (PSE's) are high relative to those of other countries.

The United States and the EC clearly have greater incentives to enter into a multilateral agricultural policy reform agreement than Japan. Much less compensation would be required to maintain income levels if all countries removed

14. Presumably losses by producers could be compensated for by decoupled payments as stated in the U.S. proposal (Rossmiller, 1988), especially if losses to producers are less than the government expenditures on farm programs. In the case of the United States, even if all losses in producer incomes are compensated for, the savings to the Treasury would still be \$14 billion.

Figure 12

Compensation requirements for multilateral and unilateral liberalization



Source: Results from SWOPSIM ST86 liberalization scenarios.

agricultural support simultaneously.¹⁵

Producers, consumers, and taxpayers in developing countries would also be affected by agricultural trade liberalization by industrial market economies (table 10). The effect is through changes in world market prices. It is easy to understand why food-importing developing countries like India, Nigeria, or even Taiwan and South Korea would lose with higher world prices. The increases in costs of food and fiber to consumers would be more than the income gains to farmers. Developing countries who are agricultural exporters, like Argentina and Brazil, in contrast, would gain from multilateral industrial country liberalization because increases in incomes from agricultural exports would more than offset the higher food costs to consumers. Since developing countries as a whole are net importers of agricultural products included in our model, they would lose nearly \$5 billion from multilateral trade liberalization by industrial market economies.

Limitations of the Analysis

Since the forces influencing trade are constantly changing, the economic implications of trade liberalization are likely to differ depending upon the period under analysis. In comparing the results of this study with an earlier

15. The actual compensation required may less than the producer income losses shown by our results because, in reality, part of the transfer goes to upstream and downstream activities.

study (Roningen and Dixit, 1987) that used the 1984/85 marketing year as the base, we found that liberalization of policies by industrial market economies would have led to much larger increases in world agricultural prices under 1986/87 market conditions than under 1984 conditions (fig. 13). The price increases would be especially large for wheat, coarse grains, and rice because levels of protection on grains rose rapidly during the two periods relative to those for other products. Similarly, the real income gains from liberalization would be larger under 1986/87 conditions than under 1984/85 conditions simply because agricultural protectionism, measured as the weighted average of PSE's across commodities and countries, rose between the two periods. Changes in the market structure would affect the outcome of trade liberalization considerably.

Furthermore, our model deals with only a subset of agricultural products. Most notable among the omissions are tropical products which account for nearly half the value of global agricultural trade. Producers of these commodities tend to be taxed in developing countries but protected in industrial market economies. Their inclusion in our model would increase the benefits of agricultural trade liberalization to developing countries. Our conclusions on the implications of industrial market economy trade liberalization to developing countries are more applicable to developing exporters like Argentina because a large portion of their agricultural trade is accounted for by commodities included in the model.

Our model provides a very naive interpretation of the world agricultural market. It does not recognize the substantial product differentiation among the broad commodity aggregates we use. Hard high-protein wheat exported by the United States, for example, is very different from soft low-protein wheat exported by the EC. The model also does not take into account institutional rigidities and politics. The failure to recognize some of these real world complexities could have different implications than suggested by our model.

The model results are based upon the assumption that the centrally planned economies do not change their policies as a result of higher world prices. If policies change, the results could change. This is especially true in the grain sector, where centrally planned economies account for a substantial portion of world trade.

The true benefits to society from multilateral liberalization are likely to be underestimated in a model like ours. Our costs do not include the expenses incurred by farm group lobbying to support farmers or other groups seeking to reduce food costs. In addition, the costs associated with the greater instability of international prices generated by distortionary policies are not taken into account. These costs, however, are likely to be very small.

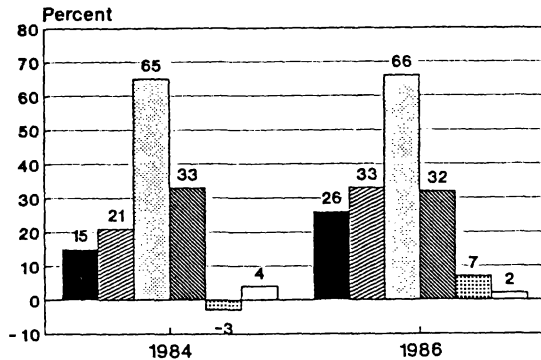
Our results are generated from a partial equilibrium intermediate-run model which assumes that factor prices are fixed. This assumption implies that the agricultural sector faces an infinitely elastic supply of factors. While this assumption may hold for capital, it is much less likely to be true for labor, especially in the short run, and land.¹⁶ A general equilibrium model could

16. Land prices are certainly not fixed with respect to agricultural policy, but this assumption may not create much of a problem if agricultural land has no alternative use and its return is pure rent.

Figure 13

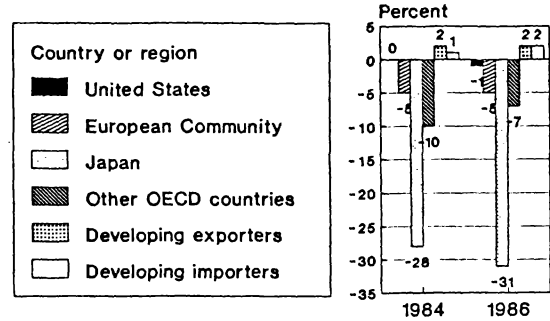
Comparison of 1984 and 1986 industrial market economies liberalization scenarios

Average support levels (PSE's)



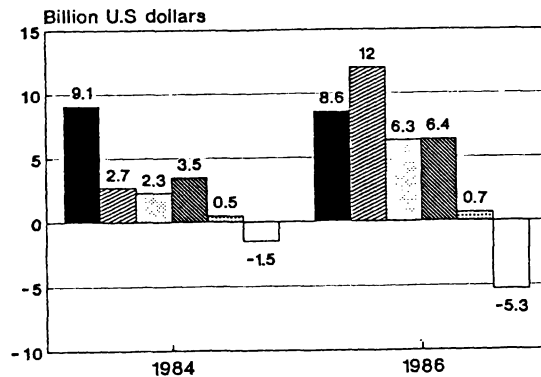
Index weighted by base production value

Change in production levels

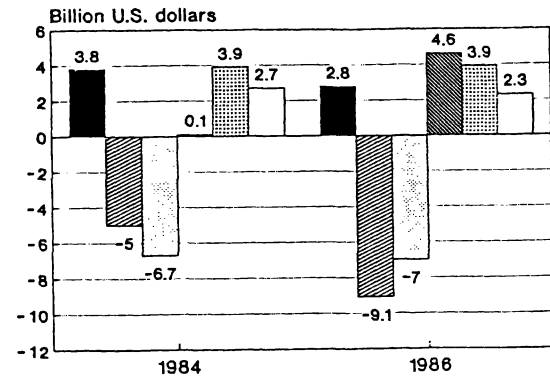


Index weighted by base production value.
Other OECD countries = Canada, other Western Europe, Australia, New Zealand.

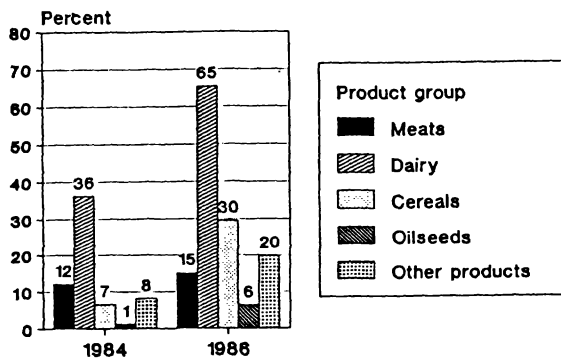
Change in welfare



Change in trade balance

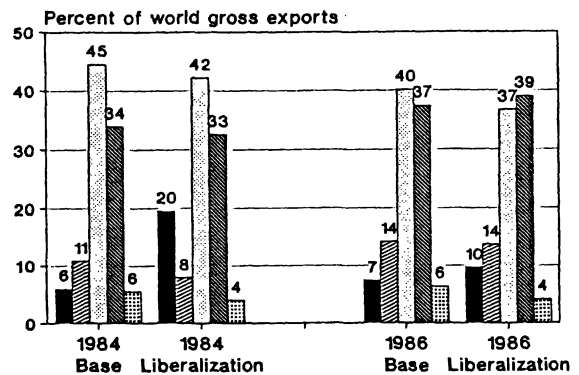


Increase in world prices



Index weighted by base world production

U.S. export shares



Source: Results of SWOPSIM ST84 and ST86 multilateral liberalization scenarios.

examine resource shifts between agriculture and the rest of the economy and provide greater insights about the effects of agricultural liberalization on other sectors, factor markets, and balance of payments. These effects, as pointed out in a number of recent studies, could be substantial.

(Stoeckel and Breckling, 1988) show that agricultural protection in the EC has contributed to deindustrialization in Europe, lowering manufacturing output by 1.2 percent and directly costing the EC between 2 and 4 million jobs.

(Hertel, Thompson, and Tsigas, 1988) similarly illustrate the substantial non-farm costs to support U.S. agriculture. To keep one farm job in agriculture, they say, the nonfarm economy gives up \$107,000 in nonfood output. To the extent that the effects on the nonagricultural sector are not taken into account in our modeling effort, our study possibly understates the true benefits to society from agricultural liberalization.

How would factor markets be influenced by agricultural liberalization?

Economic theory suggests that price supports cannot influence wages and returns to capital in agriculture alone because, in the long run, capital and labor are mobile between sectors. A rise in agricultural prices encourages agricultural production and increases demand for all factors of production in that sector. Because agriculture is small relative to the rest of the economy, labor and capital can be attracted without changes in factor prices. This, however, would not be the case with land. Agricultural land is basically fixed in supply and so its price is bid up with increases in output prices. Thus, in the long run, the benefits of farm support accrue not to labor and capital but to landowners at the time the farm policies were introduced. Some farmers own land and benefit accordingly but many do not and end up paying higher rents from price supports (Winters, 1987).

(Robinson, Adelman, and Kilkenny, 1988) report that unilateral liberalization of U.S. agricultural policies could lower use value of land by as much as 34 percent. (Hertel, Thompson, and Tsigas, 1988) point out that U.S. farm policies may have created capitalized value of landowner gains of as much as \$114 billion, more than four times greater than our estimate that the income loss to U.S. producers of eliminating farm programs would be about \$25 billion. If one believes that many of the benefits of government support programs arise from an appreciation in land values, then the adjustment costs to landowners of eliminating such programs could be greater than those reported in this study.

What about the effects of liberalization on family farms and the structure of farming? The largest 30 percent of U.S. farms receive nearly 90 percent of direct government payments to agriculture, while 25 percent of farmers in the EC receive 75 percent of the assistance offered by the CAP. Moreover, evidence in both region indicates that even with government programs, the number of farms has been rapidly declining, while the size of holdings has been increasing. It could be argued that government programs may have arrested the decline in family farms by enabling high-cost producers to remain in agriculture.¹⁷ Indeed, if this were true, any elimination of government programs could force the marginal producer to exit farming, leading to larger and more efficient farms. Yet, despite this possibility, it appears highly

17. Others argue that government programs have raised the cost of production and accelerated the exodus of small farmers from agriculture.

unlikely that elimination of government subsidies would substantially affect the financial survival of most farms currently in the sector given that adjustments are already occurring in agriculture, especially U.S. agriculture, in response to declining profitability. The structure of agriculture may change, but this would more likely be a continuation of trends in the 1980's rather than the direct result of agricultural liberalization. The changes that do occur directly from liberalization would be confined more to factor use and the nature of farming, intensive versus extensive farming, rather than to solvency and farm structure.¹⁸

Our model also does not fully capture the long-term effect of liberalization on economic efficiency. The gains we reported are primarily medium-term gains. In the longer run, investment and research efforts can be redirected and technology changed. The rate and extent to which factors of production can move between alternative economic activities would be critical in determining the longrun dynamic efficiency gains from liberalization.

Lucas argued that models estimated using data under past policy regimes may not be relevant to current or future market conditions (Lucas, 1976). This issue is of special concern when large shocks like trade liberalization occur. Should policy regimes change drastically, as would be the case with trade liberalization, a model based on historical parameters may not quite give us the correct story.

Other studies, however, generally confirm the type of results we get for trade liberalization even though different models are used. (Magiera and Herlihy, 1988) show that most prominent studies get similar patterns of world price changes with liberalization and that a SWOPSIM model can obtain similar world price changes if it uses support levels from those studies (fig. 14).

Furthermore, (Magiera and Herlihy, 1988) show that the support levels themselves are the most important elements in determining the degree of world price change with liberalization. Studies using higher levels of support tend to get larger world price changes and associated effects (fig. 15). Moreover, as shown by (Kilkenny and Robinson, 1988), our results, derived from a partial equilibrium model, are also broadly consistent with results that were obtained from a Computable General Equilibrium model that takes a longer term outlook.

Lessons to be Learned

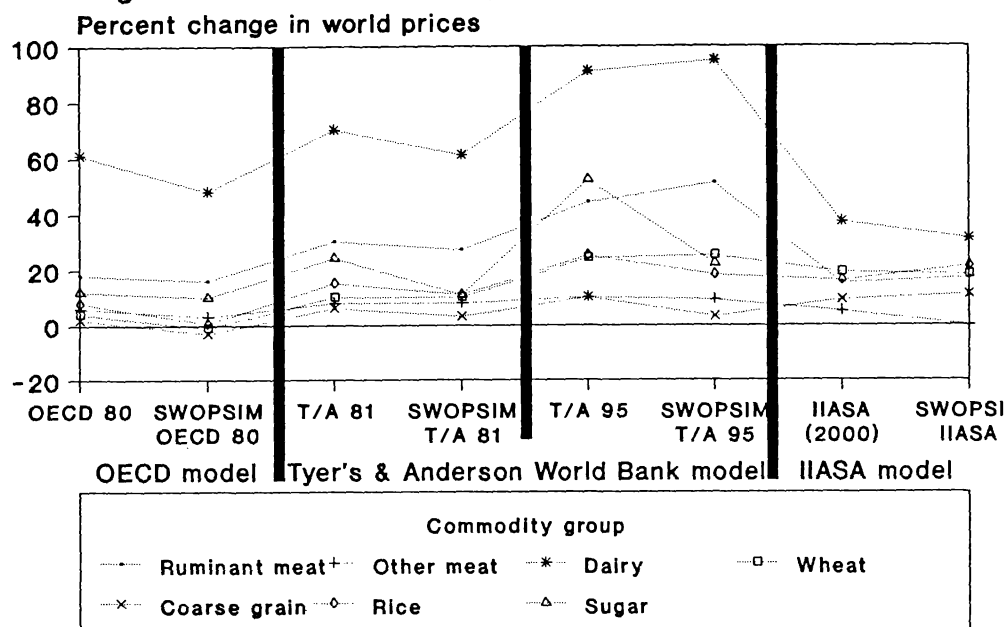
Recently, there has been growing concern about the costs of protectionist agricultural policies and the potential benefits that would accrue if countries were to multilaterally eliminate assistance to agriculture. Our results suggest that such concerns are justified because current policies have introduced substantial distortions into the domestic and international marketplace.

Consumers and taxpayers have had to bear the burden of support to agricultural producers. Where the support has been financed through budgetary measures,

18. Because the price of land would be lower relative to labor and capital, one would expect that with trade liberalization, there would be a tendency for extensive farming.

Figure 14

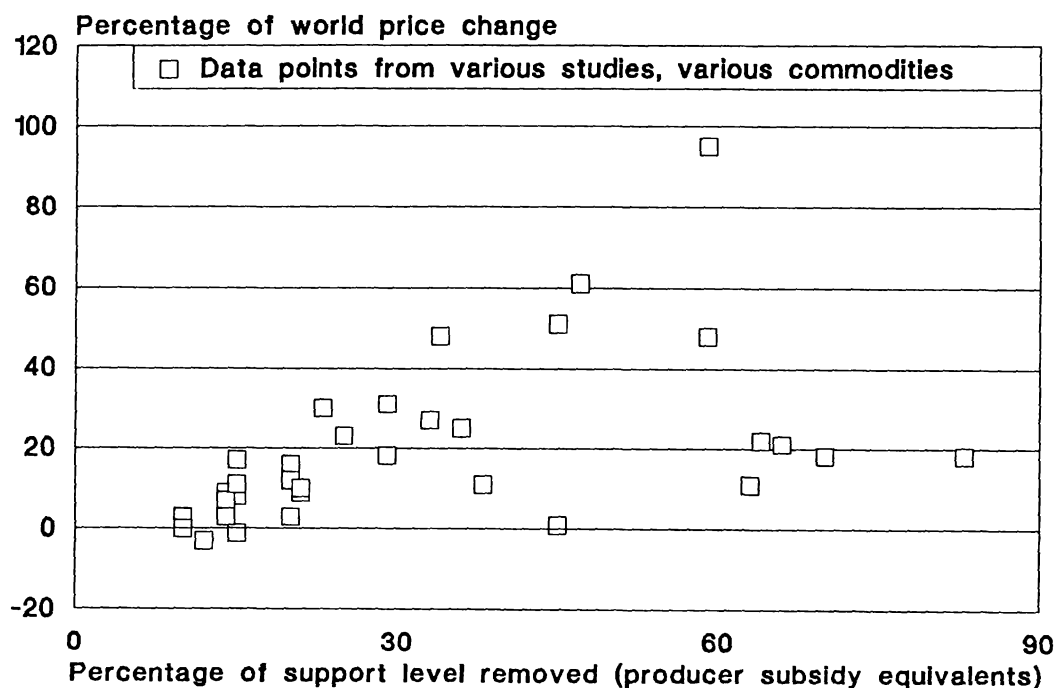
World price changes from liberalization, results from selected studies



Source: (17) Effects across studies are shown by the commodity line. Effects of the same support level in the original model and the SWOPSIM version are shown BETWEEN the bars.

Figure 15

Scatter diagram of world price changes versus support levels



Source: (17).

the costs have been apparent. In other instances, where support has originated through production controls or other similar price-enhancing measures, the costs are more hidden. Nevertheless, the costs to consumers and taxpayers in most countries outweigh the benefits to producers, generating real income losses domestically and globally. Indeed, our results suggest that policies used by industrial market economies to transfer resources between the farm and the nonfarm sectors are inefficient, and that less distortionary and wasteful alternatives could be devised to achieve the same farm income objectives.

The incentives for liberalization vary widely across countries. On a per capita basis, Australia and New Zealand have a lot to gain from any liberalization effort. It is, therefore, not surprising that these two countries have been in the forefront of the international effort to reverse the proliferation of agricultural protectionism. The incentives for the United States and the EC originate not necessarily from the potential real income gains from multilateral liberalization, but rather from the need to curtail escalating costs of farm programs. Elimination of agricultural assistance could go a long way in reducing government deficits and lowering trade tensions among political allies. For Japan, the incentive for liberalization rests on consumer well-being. Whether this is a realistic motivation, however, remains to be seen. History suggests that Japanese consumers are willing to sacrifice for the well-being of agricultural producers and that there might not be sufficient significant domestic political pressures for substantial policy reform.

The story for developing countries is complex because of the diversity in their economies as well as their policy regimes. Developing exporters like Argentina and Brazil would benefit immensely from any increases in world prices. Yet, since most developing countries are net importers of food products, liberalization that lead to higher prices could hurt them. This suggests that industrial market economy liberalization might be more acceptable to them if accompanied by increased development assistance or trade concessions in other areas.

Any policy reform will inevitably generate both winners and losers. Our objective in this report was to provide a quantitative assessment of the potential gains and losses from multilateral trade liberalization. We infer from our analysis that multilateral liberalization would primarily benefit consumers and taxpayers at the expense of producers and that adjustment costs to the farm sector could be minimized if countries liberalized their agricultural policies simultaneously rather than unilaterally.

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Appendix A--Master Model File For ST86

SWOPSIM models require a master model file that defines the commodities and countries or regions covered in a particular model. This appendix shows the master model file for the model used for this study, ST86.

ST86 has 22 commodities or commodity groups. The mnemonics for these are presented and defined in the master file. Most SWOPSIM programs use the information in this master file to determine country and commodity coverage. The first part of the file gives a matrix of country or commodity coverage where letters or a 1 indicates that there are supply, demand, and trade equations for a particular country or region and commodity. The matrix also gives information on commodities such as beef, pork, mutton, poultry meat, eggs, and milk that are using feeds such as wheat, corn, other coarse grains, soymeal, other meals and which commodity is nontraded, such as fluid milk in ST86. Information is also given on intermediate demand input sectors (milk, soybeans, and other oilseeds) and intermediate demand output sectors (butter, cheese, milk powder, soymeal, soyoil, other meals, and other oils).

The base data source for quantity data is the Foreign Agricultural Service's (FAS) world supply and utilization database, while the source of agricultural support data is the Economic Research Service's agricultural world support (PSE's and CSE's) database.

SWOPSIM aggregation programs were used to aggregate country or region base data, elasticities, and support data into broader aggregate regions for ST86. Spain and Portugal were added to the EC-10. Brazil, Argentina, Indonesia, Thailand, Malaysia, and the Philippines were aggregated as developing country exporters. Eastern Europe, the Soviet Union, and China became the centrally planned economies region. The developing country importers region is an aggregation of South Africa, Mexico, Central America and the Caribbean region, Venezuela, the other Latin America region, Nigeria, the other Sub-Saharan Africa region, Egypt, the Middle East and North Africa regions (oil producers and nonoil producers), India, the other South Asia region, the other Asia region, and the rest-of-the-world region (which contains data to balance world exports and imports).

The aggregate commodity groups are: other coarse grains (barley, rye, oats, millet, sorghum, and mixed grains), other oilseeds (peanuts, copra, palm kernels, flaxseed, cottonseed, sunflower seed, rapeseed, sesame seed, and safflower seed), other meals (peanut meal, copra meal, palm kernel meal, linseed meal, cottonseed meal, sunflower meal, rapeseed meal, sesame meal, safflower meal, and fishmeal), and other oils (peanut oil, copra oil, palm kernel oil, cottonseed oil, sunflower oil, rapeseed oil, palm oil, sesame seed oil, and safflower oil). Since aggregation routines were used on the FAS database for these categories, the operational definition of the commodity aggregates may differ for each region, according to that region's mix of commodities. The aggregation assumption, however, is that these aggregate groups are effectively one market.

IME----- DC CP DC---

[illegible]

SECTOR CODES

- | | |
|----|----------------------------|
| IU | Input Using sector |
| I | Input (e.g. feed) |
| IN | intermediate demand Input |
| OU | intermediate demand Output |
| NT | Non-Traded product |
- Industrial Market Economies
Developing Countries
Centrally Planned countries

Appendix table A1: Master model file for ST86--Continued

Commodity Group Definitions for ST86

CODE	PRODUCT GROUP-----	CODE	PRODUCT GROUP-----	TLIB data set source:
BF	Beef and veal	CG	other Coarse Grains	FAS Commodity Supply and Utilization data
PK	Pork	RI	Rice	ERS Commodity Support data
ML	Mutton and Lamb	SB	SoyBeans	
PM	Poultry - Meat	SM	SoyMeal	
PE	Poultry - Eggs	SO	SoyOil	
DM	Dairy - fresh Milk	OS	Other oilSeeds	Note that capitalization patterns in the commodity
DB	Dairy - Butter	OM	Other Meals	and country\region names in this master file suggest
DC	Dairy - Cheese	OO	Other Oils	the mnemonic used. This worksheet is a direct copy
DP	Dairy - milk Powder	CT	CoTton	of the ST86 master computer file.
WH	WHeat	SU	SUGar	
CN	CorN	TB	ToBacco	

World Reference Prices and Sources for ST86

1986 World price	----Published price----			Product used	Unit	Factor used for	
WDPRICE	.00	.00	1.00	for world	Unit	conversion to	
	1984	1985	1986	price		U.S.\$/MT	Source-----+-----
BF 2091	103.11	97.67	94.88	Beef	US cents/lb.	22.0462	IFS - 76kb - All Origins (US Ports)
PK 2341	2122.18	2031.91	2341.79	Pork	US\$/MT	1	FATUS - United States (Import Unit Value)
ML 2030	87.70	83.56	92.11	Lamb	US cents/lb.	22.0462	IFS - 76pf - New Zealand (London)
PM 1083	1225.91	1074.47	1083.77	Poult y Meat	US\$/MT	1	FATUS - United States (Export Unit Value)
PE 2145	2067.27	1766.76	2145.74	Poultry Eggs	US\$/MT	1	FATUS - United States (Export Unit Value)
DM 275	278.00	270.00	275.00	Milk - whole	US\$/MT	1	ERS - New Zealand (CONSTRUCTED product prices)
DB 2048	93.93	91.23	92.92	Butter	US cents/lb.	22.0462	IFS - 76fl - New Zealand (Lond.-1984, CONST. 85,86)
DC 2744	2774.74	2694.89	2744.80	Cheese	US\$/MT	1	FATUS - U.S. (Import Unit Value-1986, CONST. 85,86)
DP 1984	.91	.88	.90	Milk Powder	US\$/lb.	2204.62	United States (Average Price-1984, CONST. 85,86)
WH 115	4.15	3.70	3.13	Wheat	US\$/bu.	36.7437	IFS - 76d - United States (US Gulf Ports)
CN 87	3.45	2.85	2.23	Maize	US\$/bu	39.368	IFS - 76j - United States (US Gulf Ports)
CG 82	118.19	102.97	82.41	Sorghum	US\$/MT	1	IFS - 76tr - United States (US Gulf Ports)
RI 210	252.25	217.42	210.19	Rice	US\$/MT	1	IFS - 76h - Thailand (Bangkok)
SB 208	282.08	224.42	208.42	Soybeans	US\$/MT	1	IFS - 76jf - United States (Rotterdam)
SM 184	197.17	157.17	184.75	Soybean Meal	US\$/MT	1	IFS - 76jj - United States (Rotterdam)
SO 342	725.17	576.00	342.41	Soybean Oil	US\$/MT	1	IFS - 76ji - All Origins (Dutch Ports)
OS 324	349.76	349.85	324.76	Groundnuts	US\$/MT	1	IFS - 76bh - Nigeria (London)
OM 166	187.50	146.25	166.00	Groundnut Cake	US\$/MT	1	IFS - 76bj - All Origins (Europe)
OO 569	1016.70	905.30	569.40	Groundnut Oil	US\$/MT	1	IFS - 76bj - West Africa (Europe)
CT 1056	80.94	59.92	47.94	Cotton	US cents/lb.	22.0462	IFS - 76f - Liverpool Index
SU 133	5.20	4.05	6.05	Sugar	US cents/lb.	22.0462	IFS - 76ia - Caribbean (New York)
TB 3606	185.60	184.33	163.60	Tobacco	US cents/lb.	22.0462	IFS - 76m - United States (All Markets)

Appendix table A1: Master model file for ST86--Concluded

Country/Region Definitions in ST86

			(Sources of World Reference Price Data)	
TLIB CODE	COUNTRY/REGION IN TLIB DATABASE -----	CODE IN ST86 MODEL	IFS - International Financial Statistics from the International Monetary Fund - Washington, D.C.	
--DC---	Developed Countries-----		FAO - United Nations Food and Agriculture Organization - Rome	
US	United States	US		
CN	CaNada	CN		
EC	European Community	EC	ERS - Economic Research Service - U.S. Department of Agriculture - Washington, D.C.	
SP	SPain	EC		
PT	PorTugal	EC		
WE	other Western Europe	WE	FAS - Foreign Agricultural Service - U.S. Department of Agriculture - Washington, D.C.	
JP	JaPan	JP		
AU	AUstralia	AU		
NZ	New Zealand	NZ		
SF	South Africa	RW		
--CP---	Centrally Planned countries-----		--ME---	Subsaharan Africa & Middle East----- ST86 CODE
EE	Eastern Europe	CP	NG	NiGeria RW
SV	SoViet Union	CP	AF	Other subsaharan Africa RW
CH	CHina (Peoples' Republic)	CP	EG	EGypt RW
			MP	Middle East & N. Africa - oil Producers RW
			MO	Middle East & N. Africa - O. countries RW
--LA---	Latin America-----		--AS---	ASia-----
MX	MeXico	RW	ND	INDia RW
CA	Central America & Caribbean	RW	OS	Other South Asia RW
BZ	BraZil	DE	DO	InDOnesia DE
AR	ARgentina	DE	TH	THailand DE
VE	VEnezuela	RW	ML	MaLaysia DE
LA	other Latin America	RW	PH	PHilippines DE
			SA	other Southeast Asia RW
			SK	South Korea DA
			TW	TaiWan DA
			EA	other East Asia DA
--RW---	Rest of world-----	RW	OA	Other Asia RW

Note: Base data, elasticities, and support data for ST86 are aggregated from a larger (TLIB) 22 commodity, 36 region data base by SWOPSIM aggregation routines.

Appendix B--Supply and Demand Elasticity Matrices

This appendix lists the supply and demand elasticity matrices for each country/region in the ST86 model. Additional details on all 36 countries/regions can be found in (Sullivan, Wainio, and Roningen, 1989).

The commodity codes bordering the matrices are defined as: BF - beef and veal, PK - pork, ML - mutton and lamb, PM - poultry meat, PE - poultry eggs, DM - dairy milk, DB - dairy butter, DC - dairy cheese, DP - dairy milk powder, WH - wheat, CN - corn, CG - other coarse grains, RI - rice, SB - soybeans, SM - soymeal, SO - soyoil, OS - other oilseeds, OM - other meals, OO - other oils, CT - cotton, SU - sugar, and TB - tobacco. The sum column at the end of the rows is the sum of the own- and cross-price elasticities in that row. A blank space in the matrix indicates that an elasticity is not generally allowed in the model for that cell. A zero means that an elasticity value of zero is assumed.

For details about the sources of elasticities, see (Gardiner, Liu, and Roningen, 1989). For details about the application of duality theory to feed demand elasticities in meat supply equations and to elasticities for the dairy and oilseed sectors, see (Haley, 1988). Given the elasticities in the matrices, SWOPSIM programs create constant elasticity supply and demand equations with intercepts initializing the equations for base period data. Milk demand is specified as demand for fluid and manufacturing milk (used to make butter, cheese, and powder), and oilseed demand is interpreted as a crushing demand for domestic or imported oilseeds. Elasticities for aggregate regions are weighted for aggregation purposes by supply quantity on the supply side and by consumption quantity on the demand side.

The last table in this appendix gives the assumed feed demand shares for each feed for each country or region as well as the share of fluid (drinking) milk assumed in milk production. These shares were aggregated across database for countries or regions to ST86 aggregates using consumption quantity weights.

The column sums serve as overall checks on the elasticity matrices. Own- or cross-price elasticities were adjusted if the row sums were negative on the supply side or positive on the demand side. In addition, the row sums were compared across similar commodity groups and across countries. Extreme variances not explainable usually led to adjustments in elasticities.

The elasticities are considered mid-term to long term and represent an adjustment that could occur with shocks to supply or demand over a 5-year or longer period. The reasonableness of quantity changes in the ST86 world model resulting from shocks served as the ultimate test of the believability of the elasticities.

Appendix table B1: United States--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	.65	-.01	--	--	--	.02				--	-.07	-.02			-.01			--					.56
PK	-.02	1.00	--	-.01	--	--				-.01	-.27	-.07			-.13			-.01					.47
ML	--	--	.80	--	--	--				--	-.18	-.04			--			--					.58
PM	--	-.01	--	.65	-.02	--				-.02	-.08	-.02			-.11			--					.39
PE	--	--	--	-.04	.55	--				-.02	-.10	-.03			-.06			--					.30
DM	.02	--	--	--	--	.50				--	-.04	-.01			-.01			--					.45
DB						-.18	.50	-.77	.50														.05
DC						-.25	-.19	.68	-.19														.05
DP						-.28	.72	-1.11	.72														.05
WH	+KEY+										.60	-.25	-.06	--	.05		-.03			--	-.01	--	.31
CN	+-----+-----+										-.09	.48	--	--	-.07		--			--	--	--	.29
CG	BF	BeeF, veal				CG	other Coarse Grains			-.10	-.03	.60		-.09			-.05						.32
RI	PK	Pork				RI	Rice			--	--	--	.40	--			--						.40
SB	ML	Mutton, Lamb				SB	SoyBeans			.03	-.15	-.04		.60			--			-.11	--	-.01	.34
SM	PM	Poultry Meat				SM	SoyMeal							-.38	.30	.13							.05
SO	PE	Poultry Eggs				SO	SoyOil							-.38	.30	.13							.05
OS	DM	Dairy - Milk				OS	Other oilSeeds			-.09	--	-.11	--	--			.55			-.08	--	--	.21
OM	DB	Dairy - Butter				OM	Other Meals										-.69	.30	.44				.05
OO	DC	Dairy - Cheese				OO	Other Oils										-.69	.30	.44				.05
CT	DP	Dairy - Powder				CT	CoTton			--	--	--	--	-.25			-.04			.74	--	--	.45
SU	WH	WHeat				SU	SUGar			-.09	--	--	--	--			--			--	.50	--	.45
TB	CN	CoRN				TB	ToBacco			--	--	--	--	-.05			--			--	--	.25	.20
+-----+-----+																							
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	-.70	.05	--	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.62
PK	.10	-.86	--	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.72
ML	--	.16	-.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.54
PM	.08	.04	--	-.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.44
PE	--	--	--	--	-.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.35
DM	--	--	--	--	--	-.11	--	.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.06
DB	--	--	--	--	--	--	-.63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.63
DC	--	--	--	--	--	--	--	-.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.60
DP	--	--	--	--	--	--	--	--	-.65	--	--	--	--	--	--	--	--	--	--	--	--	--	-.65
WH	--	--	--	--	--	--	--	--	--	-.35	.15	.10	--	--	--	--	--	--	--	--	--	--	-.10
CN	--	--	--	--	--	--	--	--	--	.05	-.21	.05	--	--	.02	--	--	--	--	--	.01	--	-.08
CG	--	--	--	--	--	--	--	--	--	.13	.20	-.47	--	--	--	--	--	--	--	--	--	--	-.14
RI	--	--	--	--	--	--	--	--	--	--	--	--	-.25	--	--	--	--	--	--	--	--	--	-.25
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.48	.30	.13	--	--	--	--	--	--	-.05
SM	--	--	--	--	--	--	--	--	--	--	.05	--	--	--	-.31	--	--	.05	--	--	--	--	-.21
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.37	--	--	.15	--	--	--	-.22
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.37	.12	.17	--	--	--	-.09
OM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.62	--	--	-.90	--	--	--	--	-.28
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.33	--	--	-.69	--	--	--	-.36
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20	--	--	-.20
SU	--	--	--	--	--	--	--	--	--	--	.02	--	--	--	--	--	--	--	--	--	-.24	--	-.22
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20	-.20

Appendix table B2: Canada--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	.50	-.03	--	--	--	.05	--	--	--	--	-.02	-.04	--	--	--	--	--	--	--	--	--	--	.45
PK	-.05	1.50	--	-.05	--	--	--	--	--	-.24	-.15	-.23	--	-.19	--	--	--	-.06	--	--	--	--	.53
ML	--	--	.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.50
PM	--	-.09	--	.70	--	--	--	--	--	-.27	-.04	-.05	--	--	--	--	--	--	--	--	--	--	.25
PE	--	--	--	--	.50	--	--	--	--	-.19	-.02	-.03	--	--	-.02	--	--	--	--	--	--	--	.24
DM	.04	--	--	--	--	.45	--	--	--	--	--	-.01	--	--	-.01	--	--	--	--	--	--	--	.45
DB	--	--	--	--	--	-.17	.34	-.46	.34	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
DC	--	--	--	--	--	-.21	-.30	.85	-.30	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
DP	--	--	--	--	--	-.30	.54	-.73	.54	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
WH	KEY+	--	--	--	--	--	--	--	--	.50	--	-.15	--	--	--	--	-.15	--	--	--	--	--	.20
CN	+	--	--	--	--	--	--	--	--	--	.23	--	--	-.03	--	--	--	--	--	--	--	--	.20
CG	BF	BeeF, veal	--	--	--	CG	other Coarse Grains	--	--	-.33	--	.75	--	--	--	--	-.11	--	--	--	--	--	.22
RI	PK	Pork	--	--	--	RI	Rice	--	--	--	--	--	.10	--	--	--	--	--	--	--	--	--	.10
SB	ML	Mutton, Lamb	--	--	--	SB	SoyBeans	--	--	-.09	--	--	--	.35	--	--	--	--	--	--	--	--	.17
SM	PM	Poultry Meat	--	--	--	SM	SoyMeal	--	--	--	--	--	--	-.37	.30	.12	--	--	--	--	--	--	.05
SO	PE	Poultry Eggs	--	--	--	SO	SoyOil	--	--	--	--	--	--	-.37	.30	.12	--	--	--	--	--	--	.05
OS	DM	Dairy - Milk	--	--	--	OS	Other oilSeeds	--	--	-.34	--	-.05	--	--	--	--	.85	--	--	--	--	--	.61
OM	DB	Dairy - Butter	--	--	--	OM	Other Meals	--	--	--	--	--	--	--	--	--	-.97	.30	.72	--	--	--	.05
OO	DC	Dairy - Cheese	--	--	--	OO	Other Oils	--	--	--	--	--	--	--	--	--	-.97	.30	.72	--	--	--	.05
CT	DP	Dairy - Powder	--	--	--	CT	CoTton	--	--	--	--	--	--	--	--	--	--	--	--	.10	--	--	.10
SU	WH	WHeat	--	--	--	SU	SUGar	--	--	--	--	--	--	--	--	--	--	--	--	--	.30	--	.30
TB	CN	CoRN	--	--	--	TB	ToBacco	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.20	.20
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	-.80	.06	--	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.71
PK	.13	-.86	--	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.70
ML	--	.11	-1.00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.89
PM	.09	.04	--	-.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.54
PE	--	--	--	--	-.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.30
DM	--	--	--	--	--	-.11	.01	.03	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	-.05
DB	--	--	--	--	--	--	-.70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.70
DC	--	--	--	--	--	--	--	-.72	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.72
DP	--	--	--	--	--	--	--	--	-.50	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50
WH	--	--	--	--	--	--	--	--	--	-.20	.02	.06	--	--	--	--	--	--	--	--	--	--	-.13
CN	--	--	--	--	--	--	--	--	--	.07	-.21	.09	--	--	--	--	--	--	--	--	--	--	-.05
CG	--	--	--	--	--	--	--	--	--	.13	.06	-.22	--	--	--	--	--	--	--	--	--	--	-.02
RI	--	--	--	--	--	--	--	--	--	--	--	--	-.25	--	--	--	--	--	--	--	--	--	-.25
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.47	.30	.12	--	--	--	--	--	--	-.05
SM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40	--	--	.30	--	--	--	--	-.10
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40	--	--	.20	--	--	--	-.20
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.37	.09	.23	--	--	--	-.05
OM	--	--	--	--	--	--	--	--	--	--	--	.04	--	--	.88	--	--	-1.00	--	--	--	--	-.08
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.05	--	--	-.60	--	--	--	-.55
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.25	--	--	-.25
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.24	--	-.24
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20	-.20

Appendix table B3: European Community (12)--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	.56	-.07	--	--	--	.15				-.01	--	-.02			--			--					.58	
PK	-.10	.89	--	-.01	--	--				-.11	-.07	-.12			-.07			-.03					.38	
ML	--	--	.69	--	--	-.07				-.02	-.02	-.04			-.01			--					.53	
PM	--	-.03	--	.78	-.04	--				-.05	-.06	-.09			-.08			-.03					.41	
PE	--	--	--	-.03	.74	--				-.05	-.04	-.08			-.05			-.03					.46	
DM	.12	--	--	--	--	.65				-.02	-.02	-.03			-.02			-.01					.64	
DB						-.11	.23	-.31	.23														.05	
DC						-.18	-.15	.53	-.15														.05	
DP						-.21	.38	-.50	.38														.05	
WH	+KEY+										.52	-.05	-.17	--	--			-.05			--	--	--	.24
CN	+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+										-.21	.61	-.17	--	--			--	--	--	--	--	.30	
CG	BF	Beef, veal				CG	other Coarse Grains				-.31	-.09	.57	--	--			-.03			--	--	--	.20
RI	PK	PorK				RI	Rice				--	--	--	.40	--			--			--	--	--	.40
SB	ML	Mutton, Lamb				SB	SoyBeans				--	--	--	--	.40			--			--	--	--	.30
SM	PM	Poultry Meat				SM	SoyMeal								-.37	.30	.12							.05
SO	PE	Poultry Eggs				SO	SoyOil								-.37	.30	.12							.05
OS	DM	Dairy - Milk				OS	Other oilSeeds				-.19	--	-.07	--	-.01			.71			--	--	--	.45
OM	DB	Dairy - Butter				OM	Other Meals											-.27	.07	.25				.05
OO	DC	Dairy - Cheese				OO	Other Oils											-.27	.07	.25				.05
CT	DP	Dairy - Powder				CT	CoTton				--	--	--	--	--			--			.24	--	--	.24
SU	WH	WHeat				SU	SUGar				-.02	--	-.01	--	--			--			--	.17	--	.14
TB	CN	CoRN				TB	ToBacco				--	--	--	--	--			--			--	--	.20	.20
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+																								
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	-.70	.21	--	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.46
PK	.24	-.77	.02	.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.48
ML	.03	.07	-.87	.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.67
PM	.08	.10	.07	-.88	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.63
PE	--	--	--	--	-.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20
DM	--	--	--	--	--	-.10	.01	.05	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.03
DB	--	--	--	--	--	--	-.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.42
DC	--	--	--	--	--	--	--	-.40	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.38
DP	--	--	--	--	--	--	.02	.08	-.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.29
WH	--	--	--	--	--	--	--	--	--	-.28	.06	.08	.01	--	--	--	--	--	--	--	--	--	--	-.13
CN	--	--	--	--	--	--	--	--	--	.17	-.44	.14	--	--	.02	--	--	--	--	--	--	--	--	-.09
CG	--	--	--	--	--	--	--	--	--	.13	.08	-.35	--	--	.02	--	--	--	--	--	--	--	--	-.11
RI	--	--	--	--	--	--	--	--	--	.17	--	--	-.47	--	--	--	--	--	--	--	--	--	--	-.30
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.39	.24	.10	--	--	--	--	--	--	--	-.05
SM	--	--	--	--	--	--	--	--	--	--	.02	.03	--	--	-.37	--	--	.17	--	--	--	--	--	-.14
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.57	--	--	.38	--	--	--	--	-.19
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.63	.13	.45	--	--	--	--	-.05
OM	--	--	--	--	--	--	--	--	--	--	.03	.04	--	--	.39	--	--	-.68	--	--	--	--	--	-.23
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.06	--	--	-.57	--	--	--	--	-.51
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.51	--	--	--	-.51
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.48	--	--	-.48
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.46	--	-.46

Appendix table B4: Other Western Europe--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	.57	-.07	--	--	--	.19				--	-.01	-.04			--			--					.62
PK	-.05	.80	--	--	--	--				-.03	-.03	-.11			-.01			--					.55
ML	--	--	.80	-.04	--	--				--	-.08	-.31			-.04			-.02					.31
PM	--	-.01	--	.75	-.02	--				-.11	-.02	-.06			-.04			-.02					.47
PE	--	--	--	-.01	.75	--				-.05	-.05	-.16			-.02			--					.45
DM	.08	--	--	--	--	.60				--	-.01	-.04			--			--					.62
DB						-.13	.24	-.30	.24														.05
DC						-.20	-.13	.52	-.13														.05
DP						-.25	.40	-.50	.40														.05
WH	+KEY+										.80	-.05	-.40	--	--		--			--	--	--	.35
CN	+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+										-.15	.60	-.20	--	--		--			--	--	--	.27
CG	BF	Beef, veal				CG	other Coarse Grains				-.23	-.05	.50				--			--	--	--	.19
RI	PK	Pork				RI	Rice				--	--	--	.20	--		--			--	--	--	.20
SB	ML	Mutton, Lamb				SB	SoyBeans				--	--	--	--	.45		--			--	--	--	.45
SM	PM	Poultry Meat				SM	SoyMeal							-.37	.30	.12							.05
SO	PE	Poultry Eggs				SO	SoyOil							-.37	.30	.12							.05
OS	DM	Dairy - Milk				OS	Other oilSeeds				--	--	--	--	--		.30			--	--	--	.30
OM	DB	Dairy - Butter				OM	Other Meals										-.63	.20	.48				.05
OO	DC	Dairy - Cheese				OO	Other Oils										-.63	.20	.48				.05
CT	DP	Dairy - Powder				CT	CoTton				--	--	--	--	--		--			.20	--	--	.20
SU	WH	WHeat				SU	SUGar				--	--	--	--	--		--			--	.45	--	.45
TB	CN	CoRN				TB	ToBacco				--	--	--	--	--		--			--	--	.20	.20
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+																							
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	-.70	.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.52
PK	.08	-.60	--	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50
ML	--	--	-.47	.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.46
PM	--	.22	--	-.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.43
PE	--	--	--	--	-.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.35
DM	--	--	--	--	--	-.16	.02	.08	.03	--	--	--	--	--	--	--	--	--	--	--	--	--	-.02
DB	--	--	--	--	--	--	-.45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.45
DC	--	--	--	--	--	--	--	-.48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.48
DP	--	--	--	--	--	--	--	--	-.40	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40
WH	--	--	--	--	--	--	--	--	--	-.35	.02	.15	.01	--	--	--	--	--	--	--	--	--	-.17
CN	--	--	--	--	--	--	--	--	--	.05	-.75	.40	--	--	.04	--	--	.01	--	--	--	--	-.25
CG	--	--	--	--	--	--	--	--	--	.10	.11	-.45	--	--	.01	--	--	--	--	--	--	--	-.23
RI	--	--	--	--	--	--	--	--	--	.11	--	--	-.44	--	--	--	--	--	--	--	--	--	-.33
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40	.25	.10	--	--	--	--	--	--	-.05
SM	--	--	--	--	--	--	--	--	--	--	.09	.08	--	--	-.55	--	--	.01	--	--	--	--	-.37
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.45	--	--	.20	--	--	--	-.25
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.53	.14	.34	--	--	--	-.05
OM	--	--	--	--	--	--	--	--	--	--	.05	.09	--	--	.02	--	--	-.55	--	--	--	--	-.40
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.05	--	--	-.50	--	--	--	-.45
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20	--	--	-.20
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.29	--	-.29
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50	-.50

Appendix table B5: Japan--Supply and demand elasticity matrices

Appendix table B6: Australia--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	.70	-.03	-.10	-.01	--	-.05				--	--	-.01			--			--					.50	
PK	-.09	.80		--	--	--				--	--	-.07			-.01			-.03					.58	
ML	-.30	--	.70	--	--	-.05				--	--	-.02			--			--					.32	
PM	-.05	--	--	.80	-.02	--				-.01	--	-.04			--			--					.68	
PE	--	--	--	-.02	.60	--				--	--	-.06			--			-.02					.49	
DM	-.06	--	-.02	--	--	.50				--	--	--			--			--					.41	
DB						-.30	.65	-.95	.65														.05	
DC						-.28	-.47	1.26	-.47														.05	
DP						-.28	.61	-.88	.61														.05	
WH	+KEY+	-.10								.90	--	-.20	--	--			-.05			-.04	--	--	.60	
CN	+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+										-.04	.80	-.32	--	--			--		--	--	--	.45	
CG	BF	Beef, veal				CG	other Coarse Grains				-.71	-.02	.83	--	--			--		--	--	--	.21	
RI	PK	Pork				RI	Rice				-.11	--	--	.60	--			--		--	--	--	.46	
SB	ML	Mutton, Lamb				SB	SoyBeans				--	--	--	--	.50			-.30		--	--	--	.20	
SM	PM	Poultry Meat				SM	SoyMeal							-.38	.30	.13							.05	
SO	PE	Poultry Eggs				SO	SoyOil							-.38	.30	.13							.05	
OS	DM	Dairy - Milk				OS	Other oilSeeds				-.44	--	--	--	-.04			.60		--	--	--	.24	
OM	DB	Dairy - Butter				OM	Other Meals											-.70	.25	.50			.05	
OO	DC	Dairy - Cheese				OO	Other Oils											-.70	.25	.50			.05	
CT	DP	Dairy - Powder				CT	CoTton				-.34	--	--	--	--			--		.50	--	--	.02	
SU	WH	WHeat				SU	SUGar				--	--	--	--	--			--		--	.50	--	.50	
TB	CN	CoRN				TB	ToBacco				--	--	--	--	--			--		--	--	.50	.50	
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+																								
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	-.78	.10	.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.53
PK	.11	1.02	.18	.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.58
ML	.29	.31	1.20	.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.44
PM	--	.26	.17	-.80		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.36
PE	--	--	--	--	-.25		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.25
DM	--	--	--	--	--	-.18	.05	.08	.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DB	--	--	--	--	--	--	-.45			--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.45
DC	--	--	--	--	--	--	--	-.40		--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40
DP	--	--	--	--	--	--	--	--	-.45		--	--	--	--	--	--	--	--	--	--	--	--	--	-.45
WH	--	--	--	--	--	--	--	--	--	-.24	--	.04	--	--	--	--	--	--	--	--	--	--	--	-.20
CN	--	--	--	--	--	--	--	--	--	--	-.35	.15	--	--	--	--	--	--	--	--	--	--	--	-.20
CG	--	--	--	--	--	--	--	--	--	.01	.01	-.36	--	--	--	--	--	--	--	--	--	--	--	-.34
RI	--	--	--	--	--	--	--	--	--	--	--	--	-.45	--	--	--	--	--	--	--	--	--	--	-.45
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.40	.25	.11	--	--	--	--	--	--	--	-.05
SM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.60	--	--	.35	--	--	--	--	--	-.25
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.93	--	--	.70	--	--	--	--	-.23
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.48	.14	.28	--	--	--	--	-.06
OM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.17	--	--	-.44	--	--	--	--	--	-.27
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.07	--	--	-.65	--	--	--	--	-.58
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20	--	--	--	-.20
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.25	--	--	-.25
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50	--	-.50

Appendix table B7: New Zealand--Supply and demand elasticity matrices

[illegible]

Appendix table B9: Centrally Planned Countries--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	.26	-.04	--	-.01	--	.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.26
PK	-.02	.47	--	--	--	--	--	--	--	-.02	-.03	-.01	--	--	--	--	--	--	--	--	--	--	.37
ML	--	--	.29	--	--	--	--	--	--	-.01	-.02	-.02	--	--	--	--	--	--	--	--	--	--	.22
PM	-.07	-.02	--	.56	--	--	--	--	--	-.03	-.07	-.06	--	--	-.03	--	--	-.02	--	--	--	--	.26
PE	--	--	--	--	.28	--	--	--	--	-.02	-.01	-.02	--	--	--	--	--	--	--	--	--	--	.21
DM	.08	--	--	--	--	.23	--	--	--	-.01	--	--	--	--	--	--	--	--	--	--	--	--	.27
DB	--	--	--	--	--	-.10	.11	-.07	.11	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
DC	--	--	--	--	--	-.17	-.17	.55	-.17	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
DP	--	--	--	--	--	-.33	.28	-.18	.28	--	--	--	--	--	--	--	--	--	--	--	--	--	.05
WH	+KEY+										.20	-.02	-.03	-.01	--	--	--	--	--	--	--	--	.14
CN	+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+										-.04	.22	-.03	-.01	--	--	--	--	--	--	--	--	.14
CG	BF	BeeF, veal	--	--	--	CG	other Coarse Grains	--	--	-.04	-.02	.25	--	--	--	--	--	--	--	--	--	--	.18
RI	PK	Pork	--	--	--	RI	Rice	--	--	--	--	--	.15	--	--	--	--	--	--	--	--	--	.14
SB	ML	Mutton, Lamb	--	--	--	SB	SoyBeans	--	--	--	-.01	--	--	.12	--	--	-.01	--	--	--	--	--	.10
SM	PM	Poultry Meat	--	--	--	SM	SoyMeal	--	--	--	--	--	--	-.35	.30	.10	--	--	--	--	--	--	.05
SO	PE	Poultry Eggs	--	--	--	SO	SoyOil	--	--	--	--	--	--	-.35	.30	.10	--	--	--	--	--	--	.05
OS	DM	Dairy - Milk	--	--	--	OS	Other oilSeeds	--	--	-.01	--	--	--	--	--	--	.14	--	--	--	--	--	.12
OM	DB	Dairy - Butter	--	--	--	OM	Other Meals	--	--	--	--	--	--	--	--	--	-.61	.22	.44	--	--	--	.05
OO	DC	Dairy - Cheese	--	--	--	OO	Other Oils	--	--	--	--	--	--	--	--	--	-.61	.22	.44	--	--	--	.05
CT	DP	Dairy - Powder	--	--	--	CT	CoTton	--	--	--	--	--	--	--	--	--	--	--	--	.12	--	--	.12
SU	WH	WHeat	--	--	--	SU	SUGar	--	--	--	--	--	--	--	--	--	--	--	--	--	.17	--	.17
TB	CN	CoRN	--	--	--	TB	ToBacco	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.16	.16
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+																							
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	-.22	.05	--	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.16
PK	.01	-.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.36
ML	--	--	-.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.22
PM	.06	.08	--	-.34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.20
PE	--	--	--	--	-.13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.13
DM	--	--	--	--	--	-.09	.02	.01	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	-.04
DB	--	--	--	--	--	--	-.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.15
DC	--	--	--	--	--	--	--	-.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.15
DP	--	--	--	--	--	--	--	--	-.36	--	--	--	--	--	--	--	--	--	--	--	--	--	-.36
WH	--	--	--	--	--	--	--	--	--	-.20	.02	.02	--	--	--	--	--	--	--	--	--	--	-.14
CN	--	--	--	--	--	--	--	--	--	.06	-.22	.04	--	--	--	--	--	--	--	--	--	--	-.12
CG	--	--	--	--	--	--	--	--	--	.06	.04	-.26	--	--	--	--	--	--	--	--	--	--	-.15
RI	--	--	--	--	--	--	--	--	--	--	--	--	-.12	--	--	--	--	--	--	--	--	--	-.12
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.23	.09	.03	--	--	--	--	--	--	-.11
SM	--	--	--	--	--	--	--	--	--	--	.02	.03	--	--	-.36	--	--	.06	--	--	--	--	-.26
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.17	--	--	.01	--	--	--	-.15
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.38	.11	.21	--	--	--	-.06
OM	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.05	--	--	-.29	--	--	--	--	-.24
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.31	--	--	--	-.31
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.13	--	--	-.13
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.26	--	-.26
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.13	-.13

Appendix table B10: Developing Asian Country Importers--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE					WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	.50	-.10	--	--	--	--				--	-.01	--			--			--					.37
PK	-.03	.64	--	--	--	--				-.03	-.07	-.04			-.05			--					.41
ML	--	--	.40	--	--	--				--	-.02	--			--			--					.38
PM	--	--	--	.55	--	--				-.03	-.08	-.04			-.06			--					.34
PE	--	--	--	--	.61	--				-.03	-.09	-.04			-.06			--					.39
WH	+KEY+									.43	--	-.13	-.12	--			--			--	-.01	--	.17
CN	+-----+-----+										.47	-.09	-.17	--			--			--	-.07	--	.14
CG	BF	BeeF, veal				CG	other Coarse Grains				-.03	.42	-.12	-.08			--			--	--	--	.19
RI	PK	PorK				RI	Rice				--	--	.31	--			--			--	--	--	.30
SB	ML	Mutton, Lamb				SB	SoyBeans				--	-.09	--	.30			-.02			--	--	--	.19
SM	PM	Poultry Meat				SM	SoyMeal							-.37	.30	.12							.05
SO	PE	Poultry Eggs				SO	SoyOil							-.37	.30	.12							.05
OS	DM	Dairy - Milk				OS	Other oilSeeds				--	-.02	--	-.08			.35			--	--	--	.25
OM	DB	Dairy - Butter				OM	Other Meals										-.59	.15	.49				.05
OO	DC	Dairy - Cheese				OO	Other Oils										-.59	.15	.49				.05
CT	DP	Dairy - Powder				CT	CoTton				--	--	--	--						.22	--	--	.22
SU	WH	WHeat				SU	SUGar				-.03	--	--	--						--	.20	--	.16
TB	CN	CorN				TB	ToBacco				--	--	-.05	--						--	--	.36	.32
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum
BF	-.72	.20	--	.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50
PK	.07	-.62	--	.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.50
ML	--	--	-.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.41
PM	.03	.18	--	-.66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.45
PE	--	--	--	--	-.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.32
WH	--	--	--	--	--	--	--	--	--	-.49	.03	.04	.22	--	.02	--	--	--	--	--	--	--	-.18
CN	--	--	--	--	--	--	--	--	--	.04	-.48	.08	--	--	.10	--	--	--	--	--	--	--	-.26
CG	--	--	--	--	--	--	--	--	--	.08	.16	-.84	.07	--	.06	--	--	--	--	--	--	--	-.46
RI	--	--	--	--	--	--	--	--	--	.02	--	--	-.21	--	--	--	--	--	--	--	--	--	-.19
SB	--	--	--	--	--	--	--	--	--	--	--	--	--	-.17	.08	.03	--	--	--	--	--	--	-.06
SM	--	--	--	--	--	--	--	--	--	.04	.14	.05	--	--	-.76	--	--	--	--	--	--	--	-.52
SO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.86	--	--	--	--	--	--	-.70
OS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.29	.05	.15	--	--	--	-.10
OM	--	--	--	--	--	--	--	--	--	.02	.02	.02	--	--	.08	--	--	-1.01	--	--	--	--	-.88
OO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.09	--	--	-.87	--	--	--	-.77
CT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.43	--	--	-.43
SU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.72	--	-.72
TB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.45	-.45

Appendix table B11: Other Developing Country Importers (Rest of World)--Supply and demand elasticity matrices

Supply	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	.38	-.02				.03																	.36	
PK	-.05	.55		-.02								-.02			-.03			-.01					.40	
ML			.44								-.02	-.04						-.01					.35	
PM		-.02		.61						-.04	-.06	-.09			-.07			-.03					.30	
PE					.51						-.02	-.03			-.03			-.03					.39	
DM	.02					.33												-.01					.32	
DB						-.03	.08	-.08	.08														.05	
DC						-.10	-.07	.30	-.07														.05	
DP						-.22	.27	-.27	.27														.05	
WH	+KEY+										.40	-.01	-.03	-.03				-.03			-.02	-.01	--	.27
CN	-----+-----										-.02	.44	-.04	-.03				-.03			--	--	--	.31
CG	BF	Beef, veal				CG	other Coarse Grains				-.04	-.05	.46	-.02				-.06			-.01	--	--	.27
RI	PK	Pork				RI	Rice				-.01			.36				-.02			-.01	--	--	.29
SB	ML	Mutton, Lamb				SB	SoyBeans				.04	-.02	-.07	-.01	.41			-.09			--	--	--	.26
SM	PM	Poultry Meat				SM	SoyMeal								-.37	.30	.12							.05
SO	PE	Poultry Eggs				SO	SoyOil								-.37	.30	.12							.05
OS	DM	Dairy - Milk				OS	Other oilSeeds				-.05	-.02	-.04	-.04				.30			-.02	--	--	.14
OM	DB	Dairy - Butter				OM	Other Meals											-.41	.11	.35				.05
OO	DC	Dairy - Cheese				OO	Other Oils				-.04							-.41	.11	.35				.05
CT	DP	Dairy - Powder				CT	CoTton				-.02		-.01	-.06				-.04			.49	--	--	.34
SU	WH	WHeat				SU	Sugar							-.02							--	.32	--	.26
TB	CN	CoRN				TB	ToBacco							-.03							--	--	.22	.19
	-----+-----																							
Demand	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	TB	Sum	
BF	-.69	.12		.05		.02				-.02			-.02										-.53	
PK	.35	-.94		.08																			-.51	
ML	.02		-.50	.08		.11	.03			-.03	-.01	-.03	-.11										-.45	
PM	.13	.07	.07	-.65																			-.40	
PE					-.52	.10	.03			-.03	-.03	-.01	-.03										-.47	
DM	.01		.02		.04	-.11				-.07			-.07										-.15	
DB	.03		.05		.09		-.60			-.05	-.04	-.06	-.06			.02			.12				-.47	
DC	.04							-.38															-.34	
DP	.02				.02				-.33														-.32	
WH	-.02		-.01		-.02	-.10				-.25	.03	.02	.08										-.29	
CN	-.02		-.01		-.05		-.02			.09	-.34	.02	.04		.01								-.30	
CG	-.02		-.03		-.02		-.03			.06	.02	-.37	.06										-.32	
RI			-.01			-.04				.03			-.42										-.45	
SB														-.37	.23	.09							-.06	
SM											.05	.04			-.56			.13					-.34	
SO							.04			-.01			-.04			-.59			.22				-.40	
OS																	-.34	.07	.22				-.06	
OM											.03	.02			.10			-.34					-.19	
OO							.03									.03			-.41				-.36	
CT																				-.48			-.49	
SU																					-.36		-.36	
TB																						-.47	-.47	

Appendix table B12: Estimated feed shares for animal product production in ST86

United States							Australia							Other Developing Country Importers						
Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM
WH	.05	.03		.07	.04	.03	WH	.01	.08	.01	.09	.08	.03	WH	.00	.00	.00	.01	.00	.00
CN	.21	.25	.01	.10	.08	.15	CN	.10	.21	.07	.07	.14	.06	CN	.04	.00	.02	.06	.05	.06
CG	.24	.27	.01	.11	.08	.16	CG	.12	.24	.08	.08	.16	.07	CG	.03	.02	.03	.08	.07	.05
SM	.11	.31		.36	.12	.10	SM	.08	.45	.05	.03	.21	.18	SM	.07	.11	.02	.32	.29	.11
OM	.11	.31		.36	.12	.10	OM	.08	.45	.05	.03	.21	.18	OM	.03	.04	.04	.09	.22	.24
Canada							New Zealand							+KEY+						
Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM	+-----+						
WH		.13		.18	.18		WH	.01	.04	.02	.03		.08	Feed						
CN	.24	.30		.09	.06	.14	CN	.12	.11	.32	.04		.25	WH Wheat						
CG	.25	.31		.09	.06	.15	CG	.08	.08	.21	.03		.17	CN Corn						
SM	.10	.53			.12	.25	SM	.06	.17	.16	.09		.51	CG other Coarse Grains						
OM	.10	.53			.12	.25	OM	.06	.17	.16	.09		.51	SM SoyMeal						
European Community (12)							Developing Country Exporters							Animal Product						
Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM	BF Beef, veal						
WH	.04	.16	.00	.03	.06	.08	WH	.00						PK Pork						
CN	.08	.26	.02	.10	.12	.16	CN	.16	.08	.00	.14	.07	.16	ML Mutton, Lamb						
CG	.09	.26	.03	.10	.13	.18	CG	.19	.08	.02	.11	.10	.25	PM Poultry Meat						
SM	.06	.31	.02	.17	.19	.25	SM	.10	.17	.00	.37	.12	.10	PE Poultry Eggs						
OM	.06	.31	.01	.14	.20	.27	OM	.09	.15	.00	.31	.10	.08	DM Dairy - Milk						
Other Western Europe							Centrally Planned Countries							+-----+						
Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM	Estimated Share of Milk Going to Use						
WH	.03	.13		.05	.03	.04	WH	.03	.08	.00	.01	.04	.06	Other Than the Manufacture of Butter,						
CN	.14	.39	.01	.02	.08	.29	CN	.07	.42	.02	.08	.06	.08	Cheese, and Milk Powder						
CG	.13	.36	.01	.02	.07	.27	CG	.11	.19	.02	.08	.09	.11	Country/Region in ST86						
SM	.15	.38	.01	.09	.06	.31	SM	.07	.13	.01	.16	.17	.45	Share						
OM	.15	.38	.01	.09	.06	.31	OM	.05	.44	.01	.13	.09	.26	United States						
Japan							Developing Asian Country Importers							Canada						
Feed	BF	PK	ML	PM	PE	DM	Feed	BF	PK	ML	PM	PE	DM	European Community						
WH		.01					WH	.02	.17		.07	.07		Other Western Europe						
CN	.10	.22		.14	.26	.05	CN	.03	.38	.00	.18	.25		Japan						
CG	.12	.27		.18	.32	.06	CG	.01	.40		.18	.20		Australia						
SM	.06	.31		.17	.31	.11	SM	.01	.42		.20	.25		New Zealand						
OM	.06	.31		.17	.31	.14	OM	.02	.38		.15	.34		Developing Country Exporters						
														Centrally Planned Countries						
														Developing Asian Importers						
														Other Developing Importers						
														+-----+						

Appendix C--ST86 Base Quantity, Price, and Support Data

The SWOPSIM framework allows for the use of spreadsheets (worksheets) containing support information about producer and consumer subsidy equivalents. The worksheets include base quantity and price data which are used, along with the support information, to calculate price wedges used in SWOPSIM models to move along supply and demand schedules in response to policy changes. This appendix presents, in summary tables for each ST86 country or region, information available in the full support worksheets for ST86. Additional details on all 36 countries/regions can be found in (Sullivan, Wainio, and Roningen, 1989).

The top half of the summary table gives the base data used in ST86. The left half shows the quantities of supply, demand, exports, imports, and net trade (equal to exports minus imports as well supply minus demand). The right half gives the base price data which includes the world (trade reference) price, the market price seen by the producer (includes market support but not direct payments to producers), the producer and consumer incentive prices (includes direct payments and/or taxes or fees collected), and the derived trade price at the producer level (the market price minus market support). The final top column gives the base value of production valued at producer market prices. This variable is an example of an indicator of sector size that is frequently used in the ST86 model and database. The prices are derived from some initial observed price, using support data and relationships explained in Appendix D.

The bottom half of the table summarizes the agricultural support information used in ST86. This includes the producer subsidy equivalent (PSE) and the consumer subsidy equivalent (CSE) as a percentage of the producer and consumer incentive prices. (Recall that in SWOPSIM notation, subsidies are positive numbers while taxes are negative). These support measures are most comparable to ones appearing in other studies. Next the producer, consumer, and market support rates are given on a per unit basis. In addition, price wedges broken down as they appear in the model are given: the distortive producer subsidy wedge (DPSW), consumer subsidy wedge (CSW), export subsidy wedge (ESW), and import subsidy wedge (MSW). These measures will appear both in the support worksheet and in the model and solution data set. The commodity code definition and mnemonic scheme appear in the final column in the bottom half of the summary table.

The full support worksheets (summarized in these tables) contain budget and consumer-producer transfer information in local currency, which form the basis for PSE, CSE, and price wedge calculations. The worksheets also contain several indicators derived from the support and base data that provide additional information on support patterns and serve as a check on the support data. The worksheet calculates the government budget exposure from the basic support data. SWOPSIM computer programs move the relevant price wedge, budget, and price data from the support worksheet to model worksheets. Each full country or region support worksheet is about 9-11 pages long and allows for documentation of the source of support information.

Appendix table C1: United States--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V. (Mil. \$)
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	
BF	11292	12031	239	978	-739	2091	1878	2049	3414	1833	21202
PK	6379	6849	39	509	-470	2341	1494	1612	2988	1494	9532
ML	153	171	1	19	-18	2030	2902	3336	5804	2889	444
PM	8263	7987	276		276	1083	1049	1131	1907	952	8667
PE	4058	3994	74	10	64	2145	1092	1160	1668	1073	4431
DM	65354	65354				275	278	287	555	222	18147
DB	545	522	25	2	23	2048	2549	2549	3187	1024	1389
DC	2363	2470	27	134	-107	2744	2358	2358	3188	1372	5573
DP	582	282	409	109	300	1984	1659	1659	2014	992	965
WH	56925	30173	27324	572	26752	115	86	168	122	68	4872
CN	209632	170547	39136	51	39085	87	59	101	66	53	12388
CG	43316	35860	8110	654	7456	82	71	102	78	53	3058
RI	4280	1644	2719	83	2636	210	122	348	244	113	522
SB	52801	32117	20684		20684	208	171	189	180	171	9015
SM	25163	18541	6622		6622	184	184	184	230	184	4630
SO	5803	5304	499		499	342	342	342	684	342	1985
OS	6634	6023	677	66	611	324	240	298	266	240	1589
OM	1611	1653	120	162	-42	166	166	166	208	166	267
OO	697	1456	277	1036	-759	569	569	569	1138	569	397
CT	2119	664	1456	1	1455	1056	1152	2040	2304	1150	2441
SU	5461	7158	460	2157	-1697	133	418	324	885	67	2284
TB	475	465	217	207	10	3606	3606	3946	7212	3606	1713

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----					+-----+-----+			
	Percent		----Summary Support Rates----			-----Model Price Wedges-----			Product Definition and Code Mnemonics		
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import		
BF	10	-1	215	-44	44	171			-44	BF	Beef, veal
PK	7		117			117				PK	PorK
ML	13		447	-12	12	435			-12	ML	Mutton, Lamb
PM	16	-5	17	-97	97	82		97		PM	Poultry Meat
PE	8	-1	87	-19	19	68		19		PE	Poultry Eggs
DM	23	-10	65	-55	55	65	-55			DM	Dairy - Milk
DB	60	-48	1525	-1525	1525			1525		DB	Dairy - Butter
DC	42	-30	986	-966	986	986	-966			DC	Dairy - Cheese
DP	40	-33	667	-667	667			667		DP	Dairy - Powder
WH	59	-14	100	-17	17	82		17		WH	WHeat
CN	47	-9	48	-6	6	42		6		CN	CorN
CG	48	-22	49	-17	17	32		17		CG	o. Coarse Gr.
RI	67	-4	234	-9	9	226		9		RI	Rice
SB	10		18			18				SB	SoyBeans
SM										SM	SoyMeal
SO										SO	SoyOil
OS	20		58			58				OS	Other oilSeeds
OM										OM	Other Meals
OO										OO	Other Oils
CT	44		890	-2	2	889		2		CT	CoTton
SU	79	-47	257	-415	352	257	-415			SU	SUGar
TB	9		340			340				TB	ToBacco

Appendix table C2: Canada--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	1040	1047	105	112	-7	2091	2015	2205	3664	1983	2096
PK	908	707	215	14	201	2341	1290	1440	2579	1290	1171
ML	8	21			-13	2030	2030	2236	4060	2030	16
PM	628	663	3	38	-35	1083	1085	1190	1972	1149	681
PE	349	356	11	18	-7	2145	2004	2199	3341	2145	700
DM	7925	7925				275	356	383	904	250	2820
DB	109	109				2048	5369	5369	7104	1867	585
DC	226	235	12	21	-9	2744	4011	4011	5782	2027	906
DP	109	43	66		66	1984	3405	3405	4256	1609	371
WH	31377	10567	20810		20810	115	90	149	150	90	2811
CN	5912	6402	150	640	-490	87	63	77	70	60	370
CG	19760	12817	6943		6943	82	46	84	51	46	902
RI	1	121		120	-120	210	210	210	420	210	
SB	958	980	178	200	-22	208	163	214	172	163	157
SM	731	1344	7	620	-613	184	184	184	230	184	135
SO	160	165	5	10	-5	342	342	342	684	342	55
OS	4870	2193	2814	137	2677	324	648	757	722	648	3156
OM	926	505	442	21	421	166	166	166	208	166	154
OO	648	425	290	67	223	569	569	569	1138	569	369
CT	1	53		52	-52	1056	1056	1056	2112	1056	1
SU	60	1138	67	1145	-1078	133	122	213	244	100	7
TB	63	36	29	2	27	3606	2973	2973	5945	3606	187

Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----							+-----+-----+	
Percent		----Summary Support Rates----			-----Model Price Wedges-----				Product Definition	
Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics	
BF	10	222	-32	32	190			-32	BF	BeeF, veal
PK	10	151			151				PK	PorK
ML	9	206			206				ML	Mutton, Lamb
PM	3	3	40	65	-65	105		65	PM	Poultry Meat
PE	2	4	54	141	-141	195		141	PE	Poultry Eggs
DM	35	-33	133	-299	106	133	-299		DM	Dairy - Milk
DB	65	-55	3502	-3895	3502	3502	-3895		DB	Dairy - Butter
DC	49	-35	1984	-2036	1984	1984	-2036		DC	Dairy - Cheese
DP	53	-42	1796	-1796	1796			1796	DP	Dairy - Powder
WH	40	-15	59	-22		59	-22		WH	WHeat
CN	22	-3	17	-2	2	14		-2	CN	CorN
CG	45		38			38			CG	o. Coarse Gr.
RI									RI	Rice
SB	24		51			51			SB	SoyBeans
SM									SM	SoyMeal
SO									SO	SoyOil
OS	14		109			109			OS	Other oilSeeds
OM									OM	Other Meals
OO									OO	Other Oils
CT									CT	CoTton
SU	53	-9	113	-22	22	91		-22	SU	SUGar
TB	-21	11	-633	633	-633			-633	TB	ToBacco

Appendix table C3: European Community (12)--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	7445	6691	1177	423	754	2091	3024	3081	5499	1955	22515
PK	10158	9909	351	102	249	2341	1561	1564	3013	1171	15855
ML	717	910	3	196	-193	2030	4106	5001	8212	2042	2944
PM	4492	4164	410	82	328	1083	1430	1435	2600	954	6425
PE	4117	4031	128	42	86	2145	2341	2341	3902	2145	9638
DM	112047	112047	26	26		275	263	261	524	225	29420
DB	2142	1941	270	69	201	2048	3469	3469	4210	1333	7431
DC	3905	3658	330	83	247	2744	3829	3829	5470	2925	14951
DP	2262	1956	326	20	306	1984	1994	1994	2436	992	4511
WH	66933	51236	18561	2864	15697	115	182	184	259	76	12149
CN	21002	21756	1365	2119	-754	87	183	183	204	70	3852
CG	47888	40999	7119	230	6889	82	161	160	178	98	7688
RI	831	1028	507	704	-197	210	350	351	685	105	291
SB	899	10760	8	9869	-9861	208	208	424	219	208	187
SM	7983	15615	1096	8728	-7632	184	184	184	230	184	1469
SO	1754	1190	565	1	564	342	342	342	684	342	600
OS	6365	7791	49	1475	-1426	324	162	473	179	162	1031
OM	4025	8808	113	4896	-4783	166	166	166	208	166	668
OO	3163	4467	617	1921	-1304	569	569	653	1090	569	1800
CT	207	1044	17	854	-837	1056	1056	3585	2112	1056	219
SU	13423	10438	4449	1464	2985	133	442	364	884	191	5931
TB	308	555	118	365	-247	3606	3606	5950	7212	3606	1111

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----						+-----+	
	Percent		-----Summary Support Rates---			-----Model Price Wedges-----			Product Definition	
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics
BF	37	-19	1126	-1069	1069	57		1069		BF BeeF, veal
PK	25	-13	394	-390	390	3		390		PK PorK
ML	59	-25	2959	-2064	2064	895			-2064	ML Mutton, Lamb
PM	33	-18	481	-476	476	4		476		PM Poultry Meat
PE	8	-5	196	-196	196			196		PE Poultry Eggs
DM	14	-7	35	-36	37	35	-36			DM Dairy - Milk
DB	62	-48	2136	-2010	2136		126	2136		DB Dairy - Butter
DC	24	-17	904	-904	904			904		DC Dairy - Cheese
DP	50	-41	1002	-1002	1002			1002		DP Dairy - Powder
WH	59	-41	109	-106	106	3		106		WH WHeat
CN	62	-56	114	-114	114				-114	CN CorN
CG	39	-35	62	-63	63			63		CG o. Coarse Gr.
RI	70	-36	246	-245	245				-245	RI Rice
SB	51		216			216				SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS	66		311			311				OS Other oilSeeds
OM										OM Other Meals
OO	13	4	84	48		84	48			OO Other Oils
CT	71		2529			2529				CT CoTton
SU	47	-28	173	-250	250	-78		250		SU SUgar
TB	39		2344			2344				TB ToBacco

Appendix table C4: Other Western Europe--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V. (Mil. \$)
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	
BF	673	581	112	20	92	2091	2091	4224	5169	2091	1407
FK	1157	1105	64	12	52	2341	2341	3468	6039	2341	2709
ML	11	11				2030	2030	3728	5228	2030	22
FM	168	218		50	-50	1083	1083	2192	2834	1083	182
FE	237	269	25	57	-32	2145	2145	2145	3575	2145	508
DM	16196	16196	30	33		275	275	435	591	275	4454
DB	244	218	34	8	26	2048	2048	7351	4572	2048	500
DC	464	358	157	51	106	2744	2744	8651	5294	2744	1273
DP	164	122	43	1	42	1984	1984	6624	3841	1984	325
WH	4333	3507	1441	615	826	115	115	242	299	115	498
CN	1913	1998	154	239	-85	87	87	205	210	87	166
CG	10350	9985	1119	754	365	82	82	154	159	82	849
RI	1	233		232	-232	210	210	210	420	210	
SB	1	508		507	-507	208	208	208	219	208	
SM	397	847	150	600	-450	184	184	184	230	184	73
SO	88	164	15	91	-76	342	342	342	684	342	30
OS	601	582	160	141	19	324	324	324	360	324	195
OM	283	441	1	159	-158	166	166	166	208	166	47
OO	197	367	73	243	-170	569	569	569	1138	569	112
CT	1	106	2	107	-105	1056	1056	1056	2112	1056	1
SU	1039	1424	92	477	-385	133	133	392	423	133	138
TB	2	49	6	53	-47	3606	3606	3606	7212	3606	7

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----							+-----+	
	Percent		----Summary Support Rates----			-----Model Price Wedges-----				Product Definition	
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics	
BF	50	-26	2133	-1367		2133	-1367			BF	BeeF, veal
FK	32	-22	1127	-1357		1127	-1357			FK	PorK
ML	46	-22	1698	-1168		1698	-1168			ML	Mutton, Lamb
FM	51	-31	1109	-865		1109	-865			FM	Poultry Meat
FE										FE	Poultry Eggs
DM	37	-7	160	-41		160	-41			DM	Dairy - Milk
DB	72	-44	5303	-2012		5303	-2012			DB	Dairy - Butter
DC	68	-26	5907	-1374		5907	-1374			DC	Dairy - Cheese
DP	70	-35	4640	-1361		4640	-1361			DP	Dairy - Powder
WH	52	-45	127	-135		127	-135			WH	WHeat
CN	58	-54	118	-113		118	-113			CN	CorN
CG	47	-43	72	-68		72	-68			CG	o. Coarse Gr.
RI										RI	Rice
SB										SB	SoyBeans
SM										SM	SoyMeal
SO										SO	SoyOil
OS										OS	Other oilSeeds
OM										OM	Other Meals
OO										OO	Other Oils
CT										CT	CoTton
SU	66	-37	259	-157		259	-157			SU	SUGar
TB										TB	ToBacco

Appendix table C5: Japan--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	559	815		256	-256	2091	9237	10140	16703	3460	5164
PK	1552	1849		297	-297	2341	3020	3365	6041	1764	4688
ML	1	160		159	-159	2030	3287	3287	6573	2030	3
PM	1421	1601		180	-180	1083	1472	1601	2676	1245	2091
PE	2194	2372	1	179	-178	2145	2510	2723	4183	2145	5506
DM	7457	7457				275	529	629	1247	226	3943
DB	88	90		2	-2	2048	7542	7542	9428	1418	664
DC	24	105		81	-81	2744	3175	3175	4535	2744	76
DP	184	275		91	-91	1984	3383	4254	4210	992	623
WH	876	6266	391	5781	-5390	115	137	1443	376	137	120
CN	2	15502		15500	-15500	87	118	118	131	111	
CG	351	6261		5910	-5910	82	131	1260	145	78	46
RI	10599	10619		20	-20	210	305	2274	2189	305	3234
SB	245	5165		4920	-4920	208	416	1966	475	416	102
SM	2990	3170		180	-180	184	184	184	230	184	550
SO	693	691	2		2	342	342	342	684	342	237
OS	49	2151		2102	-2102	324	324	324	360	324	16
QM	1047	1277		230	-230	166	166	166	208	166	174
OO	733	1033		300	-300	569	569	569	1138	569	417
CT	1	804		803	-803	1056	1056	1056	2112	1056	1
SU	943	2796	4	1857	-1853	133	921	1026	2633	266	868
TB	106	160	12	66	-54	3606	3606	3606	7212	3606	382

Subsidy Equivalent			-----1986 Support Rates (U.S. \$/Metric Ton)-----						+-----+	
Percent			----Summary Support Rates----			-----Model Price Wedges-----			Product Definition	
Producer	Consumer		Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics
BF	66	-34	6680	-5685	5778	6033	-5038		-647	BF BeeF, veal
PK	48	-21	1601	-1257	1257	345			-1257	PK PorK
ML	38	-19	1257	-1257	1257				-1257	ML Mutton, Lamb
PM	22	-8	355	-226	226	129			-226	PM Poultry Meat
PE	21	-9	578	-365	365	213			-365	PE Poultry Eggs
DM	64	-39	403	-492	303	403	-492			DM Dairy - Milk
DB	81	-65	6124	-6124	6124	6124	-6124			DB Dairy - Butter
DC	14	-9	431	-431	431				-431	DC Dairy - Cheese
DP	77	-57	3262	-2391	2391	3262	-2391			DP Dairy - Powder
WH	91	-48	1307	-181		1307	-181			WH WHeat
CN	6	-5	7	-7	7				-7	CN CorN
CG	94	-36	1182	-53	53	1130			-53	CG o. Coarse Gr.
RI	87	-72	1969	-1579		1969	-1579			RI RIce
SB	79		1550			1550				SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS										OS Other oilSeeds
QM										QM Other Meals
OO										OO Other Oils
CT										CT CoTton
SU	74	-29	760	-756	655	501	-498		-258	SU SUGar
TB										TB ToBacco

Appendix table C6: Australia--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	1478	669	809		809	2091	1167	1226	2123	1167	1725
PK	270	267	3		3	2341	2341	2341	4682	2341	632
ML	584	363	221		221	2030	1015	1041	2030	1015	593
PM	367	365	2		2	1083	1083	1083	1969	1083	397
PE	190	185	5		5	2145	2145	2145	3575	2145	408
DM	6205	6205				275	138	241	269	138	853
DB	105	56	49		49	2048	2048	2400	2560	2048	215
DC	170	124	66	20	46	2744	2744	3014	3920	2744	466
DP	131	43	88		88	1984	1984	2066	2480	1984	260
WH	16190	690	15500		15500	115	70	82	100	70	1128
CN	250	175	80	5	75	87	87	87	97	87	22
CG	6400	3185	3215		3215	82	67	69	75	67	429
RI	392	27	375	10	365	210	105	121	168	105	41
SB	135	135				208	208	208	219	208	28
SM	104	114		10	-10	184	184	184	230	184	19
SO	24	44		20	-20	342	342	342	684	342	8
OS	647	600	52	5	47	324	324	324	360	324	210
OM	264	259	5		5	166	166	166	208	166	44
OO	154	281		127	-127	569	569	569	1138	569	88
CT	205	22	261	78	183	1056	528	537	843	528	108
SU	3404	546	2858		2858	133	107	125	214	107	364
TB	11	22	1	12	-11	3606	3606	3606	7212	3606	40

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----						+-----+	
	Percent		-----Summary Support Rates-----			-----Model Price Wedges-----			Product Definition	
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics
BF	5		59			59				BF BeeF, veal
PK										PK PorK
ML	2		26			26				ML Mutton, Lamb
PM										PM Poultry Meat
PE										PE Poultry Eggs
DM	43		103			103				DM Dairy - Milk
DB	15		352			352				DB Dairy - Butter
DC	9		270			270				DC Dairy - Cheese
DP	4		82			82				DP Dairy - Powder
WH	15		12			12				WH WHeat
CN										CN CorN
CG	3		2			2				CG o. Coarse Gr.
RI	13		16			16				RI RIce
SB										SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS										OS Other oilSeeds
OM										OM Other Meals
OO										OO Other Oils
CT	2		9			9				CT CoTton
SU	14		18			18				SU SUGar
TB										TB ToBacco

Appendix table C7: New Zealand--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V. (Mil. \$)
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	
BF	466	126	340		340	2091	1046	1150	1744	1046	487
PK	48	48	1	1		2341	2341	2341	4682	2341	112
ML	611	89	522		522	2030	1015	1091	1537	1015	620
PM	46	46				1083	1083	1083	1969	1083	50
PE											
DM	8226	8226				275	138	172	257	138	1131
DB	299	75	224		224	2048	2048	2160	2560	2048	612
DC	127	36	91		91	2744	2744	2813	3920	2744	348
DP	290	38	252		252	1984	1984	2070	2480	1984	575
WH	400	380	100	80	20	115	115	115	164	115	46
CN	254	198	56		56	87	87	87	97	87	22
CG	662	432	230		230	82	82	82	91	82	54
RI											
SB	1	1				208	208	208	219	208	
SM	1	4		3	-3	184	184	184	230	184	
SO	1	11		10	-10	342	342	342	684	342	
OS	1	11		10	-10	324	324	324	360	324	
OM	1	1				166	166	166	208	166	
OO	1	14		13	-13	569	569	569	1138	569	1
CT											
SU	1	167		166	-166	133	133	133	256	133	
TB	2	6	1	5	-4	3606	3606	3606	7212	3606	7

Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----							+-----+	
Percent		----Summary Support Rates----			-----Model Price Wedges-----				Product Definition	
Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics	
BF	9	104			104					BF BeeF, veal
PK										PK PorK
ML	7	76			76					ML Mutton, Lamb
PM										PM Poultry Meat
PE										PE Poultry Eggs
DM	20	34			34					DM Dairy - Milk
DB	5	112			112					DB Dairy - Butter
DC	2	69			69					DC Dairy - Cheese
DP	4	86			86					DP Dairy - Powder
WH										WH WHeat
CN										CN CorN
CG										CG o. Coarse Gr.
RI										RI RIce
SB										SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS										OS Other oilSeeds
OM										OM Other Meals
OO										OO Other Oils
CT										CT CoTton
SU										SU SUgar
TB										TB ToBacco

Appendix table C8: Developing Country Exporters--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	4945	4778	601	434	167	2091	1986	1897	3611	2091	9822
PK	1498	1563	5	70	-65	2341	2430	2430	4860	2341	3640
ML	88	78	10		10	2030	2030	2030	4060	2030	179
PM	2701	2422	302	23	279	1083	1088	1087	1977	1083	2938
PE	828	829		1	-1	2145	2145	2145	3575	2145	1776
DM	16096	16096				275	275	275	550	275	4426
DB	97	114		17	-17	2048	2269	2269	2836	2048	220
DC	441	465	8	32	-24	2744	2744	2744	3920	2744	1210
DP	42	197	1	156	-155	1984	1984	1984	2480	1984	83
WH	14604	16377	4467	6240	-1773	115	111	167	158	115	1620
CN	49536	43191	7804	1459	6345	87	88	126	97	87	4346
CG	4728	3797	1236	305	931	82	79	79	87	82	372
RI	52397	48419	4381	403	3978	210	212	252	463	210	11115
SB	25947	22020	4852	925	3927	208	194	238	205	208	5045
SM	15306	4396	11850	940	10910	184	184	184	230	184	2816
SO	3546	1838	1813	105	1708	342	342	342	684	342	1213
OS	9418	9068	480	130	350	324	330	330	367	324	3112
OM	4230	1101	3287	158	3129	166	166	166	207	166	702
OO	10031	3294	6922	185	6737	569	546	546	1093	569	5480
CT	789	1307	86	604	-518	1056	1056	1056	2112	1056	833
SU	15520	10876	5307	663	4644	133	163	164	327	133	2536
TB	640	408	271	39	232	3606	3606	3606	7212	3606	2308

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----							+-----+
	Percent		----Summary Support Rates----			-----Model Price Wedges-----				Product Definition
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics
BF	-10	3	-194	105	-105	-89		-105		BF BeeF, veal
PK	4	-2	89	-89	89	89	-89			PK PorK
ML										ML Mutton, Lamb
PM			4	-5	5			5		PM Poultry Meat
PE										PE Poultry Eggs
DM										DM Dairy - Milk
DB	10	-8	221	-221	221				-221	DB Dairy - Butter
DC										DC Dairy - Cheese
DP										DP Dairy - Powder
WH	31	3	52	4	-4	56			4	WH WHeat
CN	31		39			39				CN CorN
CG	-4	4	-3	3	-3			-3		CG o. Coarse Gr.
RI	17	-9	42	-40	2	39	-38	2		RI RiCe
SB	13	7	30	14	-14	44		-14		SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS	2	-2	6	-6	6			6		OS Other oilSeeds
OM										OM Other Meals
OO	-4	2	-23	23	-23			-23		OO Other Oils
CT										CT CoTton
SU	19	-9	31	-30	30	1		30		SU SUgar
TB										TB ToBacco

Appendix table C9: Centrally Planned Countries--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V.
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	(Mil. \$)
BF	10797	10858	319	380	-61	2091	2091	3791	3305	2091	22577
PK	30661	30110	856	305	551	2341	2341	2259	4376	2341	71777
ML	1803	1751	92	40	52	2030	2030	2468	3408	2030	3660
PM	6566	6405	348	187	161	1083	1083	1164	1891	1083	7111
PE	7085	7024	91	30	61	2145	2145	2263	3575	2145	15197
DM	149249	149249	27	29		275	275	221	423	275	41043
DB	2454	2598	92	236	-144	2048	2048	4530	1499	2048	5026
DC	1549	1504	86	41	45	2744	2744	3022	3186	2744	4250
DP	2217	2095	133	11	122	1984	1984	1984	2480	1984	4399
WH	221925	248175	2450	28700	-26250	115	115	99	127	115	25521
CN	120300	125800	6350	11850	-5500	87	87	87	97	87	10466
CG	145840	151735	745	6640	-5895	82	82	93	74	82	11959
RI	121714	121499	1100	805	215	210	210	210	415	210	25560
SB	13163	13599	1615	2051	-436	208	208	210	207	208	2738
SM	3919	9149	1160	6390	-5230	184	184	184	230	184	721
SO	697	1658	2	963	-961	342	342	342	684	342	238
OS	34847	34228	1075	456	619	324	324	338	360	324	11290
OM	13114	12491	1164	541	623	166	166	166	207	166	2177
OO	7597	7885	733	1021	-288	569	569	569	1138	569	4323
CT	6193	5759	1382	948	434	1056	1056	1065	1640	1056	6540
SU	19677	25650	1205	7178	-5973	133	133	228	291	133	2617
TB	2247	2350	111	214	-103	3606	3606	3606	7212	3606	8103

Subsidy Equivalent			-----1986 Support Rates (U.S. \$/Metric Ton)-----							+-----+	
Percent			----Summary Support Rates----			-----Model Price Wedges-----				Product Definition	
Producer	Consumer		Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code	Mnemonics
BF	45	15	1700	497		1700	497			BF	BeeF, veal
PK	-4	7	-82	306		-82	306			PK	PorK
ML	18	19	438	652		438	652			ML	Mutton, Lamb
PM	7	4	81	78		81	78			PM	Poultry Meat
PE	5		118			118				PE	Poultry Eggs
DM	-25	30	-54	127		-54	127			DM	Dairy - Milk
DB	55	71	2482	1061		2482	1061			DB	Dairy - Butter
DC	9	23	278	734		278	734			DC	Dairy - Cheese
DP										DP	Dairy - Powder
WH	-16	29	-16	37		-16	37			WH	WHeat
CN										CN	CorN
CG	12	23	11	17		11	17			CG	o. Coarse Gr.
RI		1		5			5			RI	Rice
SB	1	6	2	12		2	12			SB	SoyBeans
SM										SM	SoyMeal
SO										SO	SoyOil
OS	4		14			14				OS	Other oilSeeds
OM										OM	Other Meals
OO										OO	Other Oils
CT		29	9	472		9	472			CT	CoTton
SU	42	-9	95	-25		95	-25			SU	SUGar
TB										TB	ToBacco

Appendix table C10: Developing Asian Importers--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V. (Mil. \$)
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	
BF	213	344	2	133	-131	2091	2091	4270	7348	2091	445
PK	1291	1401	128	238	-110	2341	2341	2148	4774	2341	3022
ML	5	11	14	20	-6	2030	2030	2030	4060	2030	10
PM	625	771	18	164	-146	1083	1083	1600	2505	1083	677
PE	612	709	5	102	-97	2145	2145	2170	3693	2145	1313
DM											
DB											
DC											
DP											
WH	8	5184	50	5226	-5176	115	116	247	169	115	1
CN	424	8024		7600	-7600	87	87	149	97	87	37
CG	576	1706		1130	-1130	82	82	386	229	82	47
RI	7424	7807	197	580	-383	210	210	811	986	210	1559
SB	217	3052	35	2870	-2835	208	208	871	533	208	45
SM	1917	2266	36	385	-349	184	184	184	230	184	353
SO	413	455	95	137	-42	342	342	342	684	342	141
OS	120	252	125	257	-132	324	324	324	360	324	39
OM	42	234	12	204	-192	166	166	166	207	166	7
OO	40	483	596	1039	-443	569	569	569	1138	569	23
CT	3	1197	59	1253	-1194	1056	1056	1056	2112	1056	3
SU	606	1806	177	1377	-1200	133	133	283	527	133	81
TB	79	83	30	34	-4	3606	3606	3981	7212	3606	285

	Subsidy Equivalent		-----1986 Support Rates (U.S. \$/Metric Ton)-----					-----Model Price Wedges-----		Product Definition and Code Mnemonics
	Producer	Consumer	Producer	Consumer	Market	Producer	Consumer	Export	Import	
BF	51	-48	2179	-3546		2179	-3546			BF Beef, veal
PK	-9	-2	-193	-92		-193	-92			PK PorK
ML										ML Mutton, Lamb
PM	32	-21	517	-536		517	-536			PM Poultry Meat
PE	1	-3	25	-118		25	-118			PE Poultry Eggs
DM										DM Dairy - Milk
DB										DB Dairy - Butter
DC										DC Dairy - Cheese
DP										DP Dairy - Powder
WH	53	-2	132	-4		131	-3			WH WHeat
CN	42		62			62				CN CorN
CG	79	-60	304	-138		304	-138			CG o. Coarse Gr.
RI	74	-57	601	-566		601	-566			RI Rice
SB	76	-59	663	-314		663	-314			SB SoyBeans
SM										SM SoyMeal
SO										SO SoyOil
OS										OS Other oilSeeds
OM										OM Other Meals
OO										OO Other Oils
CT										CT CoTton
SU	53	-50	150	-261		150	-261			SU Sugar
TB	9		375			375				TB ToBacco

Appendix table C11: Other Developing Country Importers--ST86 base quantity, price, and support data

	-----1986 Quantity Data (1000 Metric Tons)-----					-----1986 Price Data (U.S. \$/Metric Ton)-----					Prod. V. (Mil. \$)
	Supply	Demand	Exports	Imports	Net Trade	World	Market	Producer	Consumer	Trade	
BF	4732	5661	324	1253	-929	2091	1960	2102	3693	2091	9273
PK	1465	1504		39	-39	2341	2341	2341	4682	2341	3430
ML	1442	1856	63	490	-414	2030	2030	1912	3959	2030	2927
PM	3717	4322	39	644	-605	1083	1083	1135	2015	1083	4026
PE	3801	3704	153	56	97	2145	2145	2145	3575	2145	8153
DM	65398	65398	218	40		275	268	229	497	275	17494
DB	938	1293		355	-355	2048	2368	2368	2960	2048	2221
DC	878	1161	8	291	-283	2744	2747	2747	3925	2744	2412
DP	325	1204	103	982	-879	1984	2023	2023	2528	1984	657
WH	110543	150029	1808	41294	-39486	115	115	92	142	115	12710
CN	61939	76198	2640	16899	-14259	87	91	110	90	87	5645
CG	71828	84055	1343	13570	-12227	82	82	85	89	82	5913
RI	117613	123877	2795	9059	-6264	210	210	201	439	210	24728
SB	3925	6605	908	3588	-2680	208	217	230	200	208	850
SM	4373	6518	1372	3517	-2145	184	184	184	230	184	805
SO	899	3006	91	2198	-2107	342	358	358	716	342	322
OS	29154	29563	500	909	-409	324	328	330	364	324	9563
OM	11175	9896	1498	219	1279	166	159	159	199	166	1781
OO	8971	12728	1243	5000	-3757	569	635	635	1270	569	5697
CT	5768	4078	2266	576	1690	1056	1030	1038	1995	1056	5942
SU	37676	35517	12350	10191	2159	133	133	171	314	133	5017
TB	1375	1108	425	158	267	3606	3606	3606	7212	3606	4958

Subsidy Equivalent			-----1986 Support Rates (U.S. \$/Metric Ton)-----					+-----+		
Percent			-----Summary Support Rates-----			-----Model Price Wedges-----			Product Definition	
Producer	Consumer		Producer	Consumer	Market	Producer	Consumer	Export	Import	and Code Mnemonics
BF			11	1	-131	142	-130		131	BF BeeF, veal
PK										PK PorK
ML	-6	3	-118	101		-118	101			ML Mutton, Lamb
PM	5	-2	52	-46		52	-46			PM Poultry Meat
PE										PE Poultry Eggs
DM	-20	9	-46	46	-7	-46	46			DM Dairy - Milk
DB	14	-11	320	-320	320	320	-320			DB Dairy - Butter
DC			3	-3	3	3	-3			DC Dairy - Cheese
DP	2	-2	39	-39	39	39	-39			DP Dairy - Powder
WH	-25	15	-23	22		-23	22			WH WHeat
CN	21	8	23	7	4	22	8			CN CorN
CG	4	2	3	2		3	2			CG o. Coarse Gr.
RI	-4	-4	-9	-19		-9	-19			RI Rice
SB	10	10	22	20	9	18	24		-4	SB SoyBeans
SM										SM SoyMeal
SO	4	-2	16	-16	16				-16	SO SoyOil
OS	2	-1	6	-4	4	10	-8		4	OS Other oilSeeds
OM	-4	3	-7	7	-7			-7		OM Other Meals
OO	10	-5	66	-66	66	14	-14		-52	OO Other Oils
CT	-2	5	-18	92	-26	-12	85	-6		CT CoTton
SU	22	-15	38	-48		38	-47			SU SUGar
TB										TB ToBacco

Appendix D--Initialization in ST86

Initialization is a modeling procedure that determines the shape and location of the supply and demand curves, and in the process, replicates the prices and quantities produced, consumed, and traded in the base year. It indicates the existence of a reference solution and requires three types of basic data: initial quantities produced, consumed, and traded; initial prices to which consumers, producers, and traders respond, and price elasticities of supply and demand.

Data on quantities are generally robust and are normally not a source of concern during initialization. The most notable point about the ST86 quantity data is that demand includes stock changes. This is necessary because ST86 does not model stocks and requires that net trade equals supply minus demand. Thus, the model implicitly assumes that normal stock to consumption ratios will prevail.

Far less certainty, however, exists regarding the choice of appropriate elasticities and prices, and a lot more attention is usually devoted to these data during initialization. Because issues concerning elasticities have been addressed elsewhere (Gardiner, Liu, and Roningen, 1989), the discussion in this appendix will focus on price initialization only.

The price at which the supply quantity is initialized in ST86 is called the producer incentive price. The producer incentive price is defined as the border (trade) price adjusted for the full per unit value of the producer subsidy equivalent (PSE) and all known marketing margins between the producer and the farm gate. Because our source of policy data (USDA, 1988), however, does not always explicitly report border prices, we generally derive the border prices at the producer level by adjusting USDA's market price at the producer level by the market price support component of their PSE (Appendix C). The producer incentive price in this case is the sum of the derived trade price and the per unit PSE. Margins are not explicitly added under this approach because the market price at the producer level is assumed to incorporate the spread between the border and producer prices. Where data on border prices and market prices are not available, the producer incentive price is derived using the world reference price.

Deriving consumer incentive prices is even more complicated. Because consumer prices reported in (USDA, 1988) are at different levels of the marketing chain, the prices are not strictly comparable either across commodities or countries. From a modeling perspective, this means that the consumer prices reported in (USDA, 1988) may not necessarily be compatible either with the definition of PSE's and CSE's or the quantity data which is often cited at the producer level. To maintain an element of consistency among the price, quantity, elasticity, and policy data set, we constructed consumer incentive prices based on the derived trade price at the producer level, the consumer subsidy equivalent (CSE), and the marketing margin between the producer level market price and the retail prices. The producer to retail margin, a fixed ratio, for each commodity is assumed to be identical across countries and is derived from historical U.S. spreads (table D1).

In practice, it is usually not possible to find a series of prices across the production-consumption-trade chain for many commodities and countries. There-

Table D1--Assumed market price share of consumption price

Commodity	Price
Beef & veal, and poultry meat	0.55
Pork, mutton & lamb, dairy - milk, rice, soyoil, other oils, cotton, sugar, and tobacco	.50
Poultry eggs	.60
Dairy - butter, dairy - powder, soymeal, and other meals	.80
Dairy - cheese and wheat	.70
Corn, other coarse grains, and other oilseeds	.90
Soybeans	.95

fore, we selected a hierarchy of prices for initialization via formal relationships. We selected an observed market price first. If that was unavailable, we used an observed consumer price. If that was unavailable, another price was chosen, and so on. All other prices required in the ST86 model were derived from the selected observed price, support information, the assumed producer-consumer marketing spread, and the formal relationships. The order of hierarchy of selection for the observed price was: the market price, the consumer price, the trade price, and finally the world reference price.

Formally, the producer and consumer incentive prices are related as follows:

PSE = producer subsidy equivalent,
 CSE = consumer subsidy equivalent,
 MPS = market price support component of both PSE and CSE (tariffs, quotas)
 PIP = producer incentive price,
 CIP = consumer incentive price,
 MKP = market price at producer level,
 TPP = trade price at producer level,
 WRP = world reference price,

s = ratio of market price at producer level to consumer price (table D1)
 (= MKP/CIP), and

MA = fixed margin between MKP and CIP; $MA = (1-s)*CIP$.

Given the PSE, CSE, MPS, MKP, the producer and consumer incentive prices and the derived trade prices are

$TPP = MKP - MPS$,
 $PIP = TPP + PSE$, and
 $CIP = TPP - CSE + MA$.

Appendix E--Supply Controls in ST86

Countries like the United States and Japan have programs that require that farmers idle a portion of their land to qualify for price and income supports. Because the producer subsidy equivalents, as presently calculated, do not include forgone income due to policies that control supply, they, in effect, exclude some of the production-offsetting element of policies. Therefore, liberalizing agricultural policies requires not only reducing PSE's, but also relaxing supply controls at the same time.

Figure E1 illustrates the case of supply controls. With no income and price support, the producer faces price PF and produces QF. With price and income supports (per unit PSE = $PS - PF$), he produces QS because the support inclusive price is PS. If a supply control scheme is imposed requiring a cutback in production to QA from QS, then he produces QA with incentive price PS. Our model is initialized at the observed quantity of QA with an incentive price of PS.

The key analytical issue when eliminating all support to agriculture is to locate the supply curve that would be expected in the absence of supply controls, that is, to determine the magnitude of the shift (LM) in the observed supply curve S1 in figure E1. The shift represents the cutback in production induced by supply control requirements. The cutback in production depends on three parameters: the amount of land that was required to be taken out of production, the average yield on cropped land, and the "slippage" coefficient. Slippage describes the situation where the effectiveness of acreage reduction programs on production is less than the number of idle acres would suggest. Slippage occurs either because average yields on cropped land would be lower without government programs (yield slippage) or because government programs tend to draw more land into production than would otherwise be cultivated (acreage slippage). Details on the concepts can be found in (Ericksen and Collins, 1985).

Figure E1

Set-asides in ST86

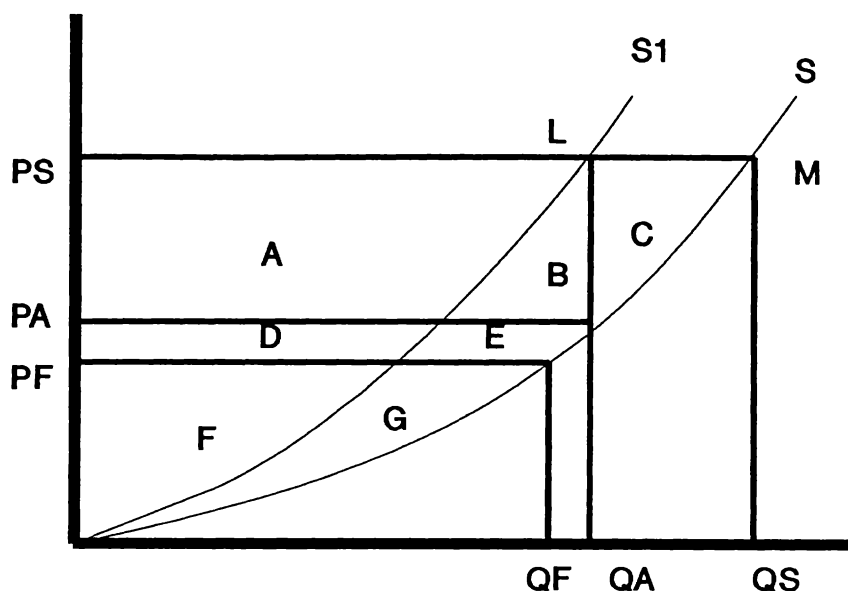


Table E1--Acreage, yield, and production slippages in ST86

Commodity	Yield	Acreage	Production
Wheat	0.06	0.25	0.44
Corn	.03	.39	.56
Sorghum	.03	.42	.59
Rice	.09	.24	.43
Cotton	.02	.37	.42

Source: (11)

While information on the amount of land taken out of production and average yields are readily available, much less is known about the slippage coefficients. At one extreme, we could assume a situation of no slippage. In this case, the amount of shift (LM) would be the production forgone on idled land taking into account only the proportion of idled acres that would be harvested and average yields.

The agricultural economics literature (Tweeten, 1979), however, seems to suggest that slippage does occur when government programs are in existence. A review of the literature indicates that average yields on cropped land would be lower without government programs because: productivity on diverted land is lower than productivity on land actually cropped (Weisgerber, 1969), and there is a substitution of other inputs for land because government programs lower price risks faced by producers. Table E1 presents the yield slippage coefficients used in our modeling exercise for the United States. The estimates range from 0.02 for cotton to 0.09 for rice. In other words, if set-aside requirements did not exist, average yields on cropped land would be 9 percent lower for rice and 2 percent lower for cotton.

The literature also suggests that not all diverted acres would return to crop production. The estimates we use in our model imply that less than two-thirds of the acres diverted under the corn and cotton programs would return to production. The acreage slippage coefficients are smaller for wheat (0.25) and rice (0.24), nearly 3 of 4 acres set aside would come back into production.

Production slippage, the ratio of expected reduction in production to actual reduction in production, is derived from yield and acreage slippage coefficients. The coefficients in table E1 suggest that cutbacks in production induced by supply controls would be 40-60 percent less than what would be expected if no slippages were assumed. This means that the shift in the supply curve in figure E1 (LM) would be different depending on our assumptions on slippage. The two situations, no slippage vis-a-vis slippage based on empirical econometric estimates, could be interpreted to define the extremes on the location of the conjectural supply curve if production controls are relaxed.

The gains and losses to producers from supply controls can also be seen in figure E1. If price and income support are accompanied by supply controls, then the initial producer welfare could be represented either by area A+D,

assuming that land of average quality is withdrawn from production, or area A+B+D+F+G+E assuming that producers withdraw the most unproductive land from production ((Haley, 1989) and (Haley and Dixit, 1988)). If, in contrast, supply controls were not necessary to qualify for support, then the initial producer welfare would be represented by area A+D+F+B+C+E+G. This means that supply control requirements impose a cost of either area B+C+E+G or area C on producers. In our modeling exercise, the additional cost of supply control is represented by area C, implying that we assume that producers idle their most unproductive land to fulfill government set-aside requirements.

A final note on PSE's, supply controls, and our modeling exercise. Since PSE's reported in (USDA, 1988) do not incorporate costs of required supply control associated with farm programs, such as acreage reduction programs in the United States and the paddy-field reorientation program in Japan, such policies are incorporated directly into the model as volume shifters. An alternative means of handling such policies would be to adjust the PSE's by an implied tax on producers and initialize the model at the observed quantity of QA (fig. E1) with an incentive price of PA. The adjusted PSE's, under those circumstances, would be more representative of the trade-distorting effects of support. Details on alternative methods of modeling production control are provided in (Haley, 1989).