Agricultural Policy Liberalization Using Subsidy Equivalents

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Chapter Three

Agricultural Policy Liberalization Using Subsidy Equivalents

I. Introduction

This chapter examines experiments with GAPS in which government agricultural policies are represented as production and consumption subsidy equivalents (PSEs and CSEs). This is a common and relatively simple manner in which one can incorporate policies in an applied general equilibrium model.

Section II explains the concept of subsidy equivalents, how their values are determined, and how they are used in GAPS. In Section III I discuss the setup of the counterfactual experiments which are used to simulate agricultural policy liberalization, and the anticipated effects of these experiments on prices, output, trade and welfare. The actual results of the experiments are the topic of Section IV, where they are summarized in a series of tables. In analyzing the results, I examine separately the effects of agricultural policy liberalization on (i) agricultural markets, (ii) non-agricultural markets, (iii) factor markets, and (iv) the welfare of each of the four regions in GAPS. Section V contains results from sensitivity analysis on the model. In this section, equilibria for some of the Section IV experiments are solved for using alternative values for some key elasticities of substitution.

I summarize the results of the chapter and suggest some policy implications arising from this work in Section VI.

II. The Use of Producer and Consumer Subsidy Equivalents

As measures of support to agriculture, PSEs and CSEs have recently become popular because they help to clarify the effects of complicated agricultural policy regimes. The purpose of PSEs and CSEs is to isolate the effect of government policies on a country or region's agricultural producers and consumers. Conceptually, a PSE is the level of a production subsidy which would compensate a producer for the removal of government support to a commodity, and a CSE is the level of a consumption subsidy (often negative) required to compensate a consumer for the removal of government policies.

The calculation of a PSE or CSE typically involves two components. The first component is the price wedge, the difference between the domestic and international price of a commodity, which is caused by government policy. The second component is the budgetary cost of the agricultural programs to the government expressed as a portion of the value of output, and computed at some reference price (usually an international price).

Most but not all agricultural programs are included in the computation of PSEs and CSEs. Direct income support and price support policies (including most border measures),

input subsidies and taxes, crop insurance, inspection services, research and extension, and many other programs are included. Some examples of policies which are typically excluded are rural development programs, food aid and voluntary export restraint agreements.

Values of PSEs and CSEs by commodity for 1986 are reported in USDA ( ). In developing the subsidy equivalents (SEs) for each industry in GAPS, I used an average of the SEs for each commodity included in a GAPS industry, weighing these by production (for PSEs) or by consumption and intermediate use (for CSEs). The SE values for GAPS industry 7, "Other Agriculture," are either a weighted average of SEs for other agricultural industries in the region or, when particular commodities are prominent in a region's "Other Agriculture," a weighted average of the SEs for those commodities. Similarly, values for Rest of the World (ROW) SEs are weighted averages of the other 3 regions' values for that industry unless much of the ROW production or consumption takes place in a few regions. In the latter case, the SEs for ROW are averages of the reported SEs for the major producers or consumers in ROW.

The PSEs are incorporated into GAPS as ad valorem production subsidies. A positive production subsidy raises the return to the producer above the market price. For example, if the market price of a good is $1 and there exists a production subsidy of 20%, the producer receives $1 from

the buyer and $.20 as a government subsidy for each unit sold. This production subsidy applies only to domestic production. A positive production subsidy will increase domestic production of the subsidized good; this increase in supply will force the market price down. In GAPS, since no government is modelled, the subsidy is paid by the region's single representative consumer.

The CSEs are included in GAPS as consumption and intermediate input subsidies or, since they are usually negative, taxes. Each consumption tax in a region is assessed equally on the domestic and imported versions of a good. For example, the EECs CSE for feed grains in GAPS is -16%. The EEC consumer and all EEC producers pay a 16% tax on the use of feed grains, whether they are domestically produced or imported from the US, Japan or the Rest of the World. Tax receipts (subsidy payments) are collected (paid out) by the region's consumer. The imposition of a consumption tax will reduce demand for the composite good which is taxed, reducing its market price.

The PSEs and consumption tax equivalents (negative CSEs) used in the GAPS benchmark are reported in Tables 3.1 and 3.2.

III. Policy Experiments

The policy experiments covered in this chapter involve the reduction or elimination of the subsidy equivalents for

Table 3.1

PRODUCTION SUBSIDY EQUIVALENTS IN THE BENCHMARK

GOOD:	US	EC	RW	J
1	0	0	0	0
2	0.50	0.63	0.56	1.04
3	0.64	0.58	0.56	0.94
4	0.13	0.35	0.22	0.52
5	0.59	0.66	0.58	1.05
6	0.13	0.52	0.31	0.66
7	0.35	0.49	0.42	0.79

1=Non-agriculture
2=Feed grains
3=Food grains
4=Meats
5=Dairy
6=Oilseeds
7=Other agriculture

Table 3.2

CONSUMPTION TAX EQUIVALENTS IN THE BENCHMARK

GOOD:	US	EC	RW	J
1	0.03	0.03	0.03	0.03
2	0.00	0.16	0.10	0.18
3	0.09	0.24	0.16	0.55
4	0.05	0.10	0.07	0.34
5	0.23	0.16	0.19	0.44
6	0.00	0.00	0.00	0.00
7	0.14	0.12	0.13	0.39

agricultural industries. These experiments simulate the effects of agricultural policy liberalization.

There are five liberalization scenarios; three of these involve unilateral liberalization, and two involve multilateral liberalization. For each scenario, there are two cases: (i) 100% liberalization, in which all agricultural PSEs/CSEs are removed by the liberalizing region(s), and (ii) 50% liberalization, in which the liberalizing region(s) cut(s) all PSEs and CSEs in half. The unilateral liberalization experiments are for the US, the EEC and Japan. The multilateral liberalization scenarios are (i) world agricultural policy liberalization, in which the four regions simultaneously remove or reduce all agricultural PSEs and CSEs, and (ii) US-EEC-Japan multilateral liberalization, in which only these three regions change their agricultural policies.

Because all base case PSEs in the model are positive and all base case CSEs are non-positive, agricultural market prices should tend to increase when this support is removed unilaterally. The combination of higher demand (due to the removal of the consumption taxes) and lower supply (due to the removal of the production subsidies) will push the market prices up in a liberalizing region. Because agricultural goods in other regions are close substitutes, their prices will tend to go up as well. Subsidy-inclusive (producer)

prices will, however, tend to decline.

If agricultural producer prices and nonagricultural prices all fall in a liberalizing region, factor prices should tend to fall as well. Because some land types are specific to agricultural use and because these land types are poor substitutes for non-agricultural land, the price of land will fall more than the price of other factors. Since the cost share of land in agricultural production is substantial, this will tend to offset (and could even outweigh) the partial equilibrium (upward) effects of the removal of support on market prices.

Agricultural policy liberalization will tend to decrease the price of non-agricultural goods. The reduced support to agriculture causes factors to move out of farming and into other areas of the economy, increasing the supply of non-agricultural goods. The reduction in agricultural consumption taxes, which induces consumers into demanding more agricultural goods, diminishes demand for non-ag goods. These two effects operate to force non-ag prices down. This reinforces the downward effect on factor prices which resulted from lower producer prices in agriculture.

Some general equilibrium effects may prove important in determining the direction of agricultural market price changes, however. Prices of some agricultural commodities may fall because of the factor price, intersecoral, and current account effects of liberalization.

As mentioned above, we should expect to see lower agricultural supply (at least of most ag goods) and greater non-agricultural output in a liberalizing region. In a non-liberalizing region, supply and demand for domestic goods will respond to the prices of the competing imports. As the price of ag imports rises, consumers shift to domestic ag goods, raising their price and the quantity supplied. Similarly, as the price of non-ag imports falls, consumers in non-liberalizing regions shift away from the domestic version, causing its price to fall and the quantity supplied to decline.

In a liberalizing region, with agricultural production tending to fall and agricultural consumption tending to rise, agricultural imports will tend to increase. The value of imports will also tend to increase, since the price of agricultural imports tends to rise as well. Ag exports will tend to fall, since the prices of its ag goods rise. Because each region's current account balance is fixed, this increase in net ag imports must be offset by an increase in net exports of non-agricultural goods. This is another way in which agricultural policy liberalization could have important intersectoral effects. We might expect typically to find substantial gains to the liberalization of such distortionary policies as we currently see in agriculture. However, the deterioration in the terms of trade (the price of a country's exports relative to the price of its imports) necessary to

bring the current account back to the required level may outweigh the efficiency gains within the liberalizing region. This is more likely in the case of a large ag importer, and the case of a large non-ag exporter, than in other situations.

Under multilateral liberalization the analysis becomes more complex and less transparent. Within a region, agricultural prices will still tend to rise and non-ag prices will fall. However, the magnitude of ag price changes vis a vis other varieties of each good (i.e. the good's close substitutes) is unclear. A region may be able to increase ag exports despite an increase in the prices of its agricultural goods. This will be especially advantageous to a large ag exporter such as the U.S.

On the other hand, a large agricultural importer (Japan) can get hurt quite badly from multilateral liberalization because in this case all agricultural imports become more expensive, not just those from a single region. In fact, multilateral liberalization will tend to increase the price of each region's agricultural goods by more than unilateral liberalization, so we should anticipate a large increase in import prices for a large agricultural importer under multilateral liberalization.

IV. Results.

The results are presented in Tables 3.3A through 3.4H. The Table 3.3 Series (A-H) contains results for the 100%

liberalization scenarios. Results from the 50% liberalization simulations are in the Table 3.4 Series. Each series includes five experiments; the column titles assigned to these experiments are as follows:

100% Liberalization

UTLIB: Total agricultural policy liberalization by the US (the US sets all production and consumption subsidies on agricultural goods to zero).
ETLIB: Total agricultural policy liberalization by the EEC.
JTLIB: Total agricultural policy liberalization by Japan.
WTLIB: Total agricultural policy liberalization by all regions of the world simultaneously.
UEJTLIB: Total agricultural policy liberalization by the US, the EEC and Japan simultaneously.

50% Liberalization

U50LIB: 50% reduction of all agricultural PSEs and CSEs in the US.
E50LIB: 50% reduction of all agricultural PSEs and CSEs in the EC.
J50LIB: 50% reduction of all agricultural PSEs and CSEs by Japan.
W50LIB: 50% reduction of all agricultural PSEs and CSEs in all regions simultaneously.
UEJ50LIB: 50% reduction of all agricultural PSEs and CSEs in the US, EC and Japan simultaneously.

Within a series, the tables contain the following information:

TABLE A presents the welfare effects of each liberalization scenario on each region. This welfare effect is measured as the percent change in gross national product (GNP) using an equivalent variation. Read under a column heading to find the welfare effect of that scenario on each of the four regions.

TABLE B contains the market prices of each of the model's 28 goods which result from the various experiments. In the benchmark all prices are equal to one, so a number less than one indicates a fall in price (relative to the price of the numeraire good, J1). The left most column identifies each good based on a region identifier (U=US, E=EEC, R-Rest of the World, and J=Japan) and an industry identifier (numbers 1-7, defined at the bottom of each table). For example, R2 is defined as feed grains produced in the Rest of the World. Read under a column heading to find the effect of that scenario on the market price of each good.

TABLE C gives the output level of each good relative to its output level in the benchmark. A number greater than one indicates an expansion in the output of that good, and a number less than one indicates a contraction. Read under a column heading to find the effect of that scenario on the output of each good.

TABLE D indicates the level of imports, relative to the benchmark, in each region by sector. For example, in the left most column EM_2 represents EEC imports of feed grains. A number greater than one means that import volume increases. Read under a column heading to find the effect of that scenario on each region's imports in each of the seven sectors.

TABLE E presents the prices of each of the composite import goods. For example, the line which begins with "UM1"

contains the price levels of US non-agricultural imports under each scenario. Read under a column heading to find the effect of that scenario on the price of each region's imports, by sector.

TABLE F contains the consumer price index for each region and each scenario. Read under a column heading to find the effect of that scenario on consumer prices in each region.

TABLE G presents each of the four (regional) agricultural land quantity indexes. This indicates the amount of land, relative to the benchmark, used in agriculture in each region and for each scenario. A number greater than one implies that land from non-agricultural uses is brought into agricultural use. A number less than one indicates movement in the opposite direction. Because of the nature of the land transformation function in GAPS (see Chapter 2), these numbers should be interpreted as "efficiency units" of agricultural land rather than simply as acreage. Read under a column heading to find the effect of that scenario on the amount of agricultural land in each region.

TABLE H gives the factor price effects of each scenario. In the left-most column, each factor is identified by region and factor type. As always, U, E, R, and J identify the regions. The letters K. L. and T refer to capital, labor and land, respectively. The land varieties are identified as

T1 non-agricultural land
TA (aggregated) agricultural land
T2 land used in feed grains, food grains and oilseeds

T3 land used in meats and milk
T4 land used in other agriculture

Read below a column heading to find the effect of each scenario on the price of each factor.

From Table 3.3B we can see that in the three unilateral 100% liberalization scenarios, the prices of agricultural goods in the liberalizing region increase in 17 of 18 cases. The exception is US oilseeds (U6) under UTLIB; this is because

Table 3.3A

WELFARE RESULTS OF THE 100% LIBERALIZATION SCENARIOS
(Percent Change in GNP using Equivalent Variations)

	Liberalization Scenario				
Region:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
US	+0.20	+0.06	+0.20	+0.35	+0.50
EC	-0.06	-0.32	+0.04	+0.38	-0.31
RW	0.00	+0.06	+0.11	+0.34	+0.17
JP	-0.31	-0.14	-1.31	-1.27	-1.73

Figures are in terms of percent change in national income using equivalent variation

UTLIB=100% agricultural liberalization by the US
ETLIB=100% agricultural liberalization by the EC
JTLIB=100% agricultural liberalization by the Japan
WTLIB=100% agricultural liberalization by all four regions simultaneously
UEJTLIB=100% agricultural liberalization by the US, EC and Japan simultaneously

existing support for U6 is quite low and the removal of support to other ag goods generates a large decrease in the price of land used in the production of U6. Of the 17 cases in which the price increases, it does so by less than the amount of the production subsidy in 16 cases. Here the exception is US dairy (U5). The explanation for this exception is that the price of an important intermediate input of U5, US feed grains (U2) increases by 38%, and that a large consumption tax on U5 of 23% is removed along with the production subsidy. The former of these two effects underlines the importance of modeling intermediate inputs (a feature omitted from some applied general equilibrium models).

Another observation from Table 3.3B is that the price of the non-agricultural good in a region which liberalizes unilaterally declines in all 3 cases. This intersectoral effect of agricultural liberalization is most pronounced in the case of Japan; under JTLIB the price of Japanese non-agriculture (J1) falls by nearly 12%. This price effect spreads to other regions' non-agricultural goods as well, which works to pull down factor prices in those regions, and pulls down agricultural prices in the non-liberalizing region. In some instances, this effect dominates the tendency of an increase in the price of one variety to pull up the price of other varieties (for example, under UTLIB the price of J3 falls by 1.5% even though the price of U3 increases by 51%).

Table 3.3B

PRICES IN THE 100%
LIBERALIZATION SCENARIOS

GOOD:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
U1	0.9692	0.9928	0.9850	0.9947	0.9465
E1	0.9965	0.9428	0.9899	0.9903	0.9269
R1	1.0	1.0	1.0	1.0	1.0
J1	0.9785	0.9853	0.8836	0.9280	0.8544
U2	1.3846	0.9970	0.9902	1.4533	1.3569
E2	1.0134	1.2616	0.9952	1.4251	1.2605
R2	1.0071	1.0062	1.0019	1.4676	1.0156
J2	0.9921	0.9872	1.6615	1.8077	1.6378
U3	1.5096	0.9971	0.9903	1.5865	1.4802
E3	1.0110	1.2605	0.9945	1.4091	1.2566
R3	1.0075	1.0065	1.0022	1.4456	1.0165
J3	0.9849	0.9865	1.5771	1.6956	1.5425
U4	1.0917	0.9988	0.9937	1.1564	1.0784
E4	1.0023	1.1841	0.9946	1.2847	1.1723
R4	1.0045	1.0074	1.0040	1.2164	1.0158
J4	1.0124	0.9902	1.3512	1.5220	1.3626
U5	1.6964	0.9957	0.9884	1.7710	1.6634
E5	1.0006	1.5574	0.9924	1.6819	1.5394
R5	1.0058	1.0058	1.0012	1.6851	1.0132
J5	1.0028	0.9892	1.8112	2.0064	1.8070
U6	0.9433	1.0013	0.9958	1.0156	0.9287
E6	1.0123	1.1778	0.9955	1.3290	1.1748
R6	1.0084	1.0081	1.0028	1.1836	1.0195
J6	0.9842	0.9873	1.3470	1.4489	1.3166
U7	1.2102	1.0054	0.9952	1.3269	1.2034
E7	1.0067	1.2593	0.9942	1.3912	1.2535
R7	1.0028	1.0031	1.0030	1.3617	1.0090
J7	0.9858	0.9893	1.4223	1.5583	1.3897

TLIB = 100% Agricultural liberalization

U=United States
E=EEC
R=Rest of the World
J=Japan

1=Non-agriculture
2=Feed grains
3=Food grains
4=Meats

5=Dairy
6=Oilseeds
7=Other agriculture

Table 3.3C

OUTPUT LEVELS IN THE 100% LIBERALIZATION SCENARIOS

INDUSTRY:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
U_1	1.0050	0.9996	0.9996	1.0030	1.0046
E_1	0.9988	1.0135	0.9996	1.0099	1.0126
R_1	0.9995	0.9995	0.9997	1.0076	0.9987
J_1	0.9996	0.9997	1.0075	1.0055	1.0069
U_2	0.5604	1.0229	0.9885	0.6354	0.5782
E_2	1.0596	0.5320	1.0096	0.6934	0.5768
R_2	1.0725	1.0590	0.9927	0.6861	1.1255
J_2	1.5140	1.0562	0.1331	0.3000	0.2217
U_3	0.3618	1.0655	1.1930	0.6116	0.4293
E_3	1.0479	0.6187	1.0107	0.8336	0.6633
R_3	1.0185	1.0112	1.0091	0.8072	1.0410
J_3	1.0122	0.9999	0.7579	0.8236	0.7954
U_4	0.9032	1.0093	1.0212	0.9544	0.9325
E_4	0.9991	0.8370	1.0088	0.8478	0.8451
R_4	1.0031	1.0089	1.0106	0.9014	1.0217
J_4	0.9704	1.0158	0.6586	0.6685	0.6595
U_5	0.6100	1.0161	0.9996	0.6870	0.6441
E_5	1.0482	0.5800	1.0112	0.6960	0.5919
R_5	1.0519	1.1440	1.0148	0.7160	1.2129
J_5	0.9748	1.0080	0.5360	0.6343	0.5504
U_6	1.0773	0.9730	0.9795	1.0754	1.0450
E_6	0.9220	0.4768	1.0092	0.4285	0.4380
R_6	0.9663	0.9915	0.9903	0.7503	0.9424
J_6	0.9833	1.0498	0.2509	0.2731	0.2530
U_7	0.6277	1.0593	1.0499	0.9070	0.7056
E_7	1.0274	0.6430	1.0113	0.7782	0.6757
R_7	1.0069	1.0072	1.0090	0.8325	1.0231
J_7	1.0271	1.0161	0.5695	0.7085	0.6010

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Under world total liberalization (WTLIB), prices increase for each of the 24 agricultural goods. Furthermore, each agricultural price increases by more under WTLIB than under any unilateral liberalization. The price of each non-agricultural good falls (relative to the price of the numeraire, R1). When the US, EEC and Japan liberalize but the Rest of the World maintains its policies (UEJTLIB), all agricultural prices except that of U6 rise. For only one good (Japanese meats, J4), however, does the price rise by more than under the home region's unilateral liberalization. Part of the difference between the effects of WTLIB and UEJTLIB on agricultural prices may be due to the effects of these experiments on the price of the numeraire good. If under WTLIB there is downward pressure on the price of R1, this will be reflected in higher prices of all other goods, since they are measured relative to the price of R1.

Unilateral liberalization typically leads to a decrease in the output of each agricultural good in the liberalizing region and an increase in the output of competing agricultural goods (Table 3.3C). Despite the removal of a consumption tax simultaneous with the removal of the production subsidy, output in the liberalizing region falls in 23 of 24 cases (recall, however, that the consumption tax applied to imports as well as the domestic version of each good). The exception, again, is US oilseeds (U6), for which the initial production

subsidy is only 13%.

Output of the non-agricultural good in the liberalizing region increases, and output of competing non-ag goods falls, in each unilateral liberalization scenario. While the intersectoral effect in the other regions is very small, that on the liberalizing region can be substantial (as high as 1.35% for E1 under ETLIB). When the liberalization is global (WTLIB), the output of each of the four non-ag goods rises. Under WTLIB, output of all agricultural goods falls, except US oilseeds (U6).

As can be seen from Table 3.3D, import levels in a country which liberalizes unilaterally tend to rise, usually substantially. Imports in the non-liberalizing regions tend to fall in response to higher import prices (see Table 3.3E). Under world liberalization, import volumes of agricultural goods fall for most regions and most goods (An exception is Japan, which increases imports in 4 of the 6 agricultural sectors). However, import values rise in nearly all regions and sectors under WTLIB.

From Table 3.3G we can see the effects of each liberalization scenario on land use in the economy. Under each unilateral liberalization scenario, land is moved out of agriculture and into other uses in the liberalizing region. In the non-liberalizing regions, land is moved into agriculture. This is in response to generally lower producer prices for ag goods in the liberalizing region, and higher

Table 3.3D

IMPORT LEVELS IN
THE 100% LIBERALIZATION SCENARIOS

COMPOSITE GOOD:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
UM_1	0.9626	1.0132	1.0277	1.0273	1.0006
EM_1	1.0035	0.9531	1.0064	1.0096	0.9599
RM_1	1.0148	1.0360	1.0400	1.0337	1.0947
JM_1	0.9920	1.0013	0.9099	0.9444	0.9071
UM_2	1.8429	0.8366	0.9665	0.6389	1.4846
EM_2	0.8769	1.2453	0.9947	0.6119	1.0495
RM_2	0.6727	0.7855	1.0341	0.7322	0.4683
JM_2	0.8171	0.9991	0.7781	0.6261	0.6649
UM_3	2.1129	0.7825	1.0129	0.8752	1.5777
EM_3	0.8358	1.5849	0.9868	0.6805	1.2665
RM_3	0.5620	0.7774	1.0338	0.7091	0.3667
JM_3	0.5748	0.9472	3.7825	1.2432	2.1527
UM_4	1.2782	0.8942	0.9603	0.7310	1.0855
EM_4	0.9574	1.6390	0.9640	1.0835	1.4829
RM_4	0.9068	0.6889	1.0354	0.8394	0.6320
JM_4	0.9348	0.8837	2.1951	1.6740	1.8791
UM_5	5.0681	0.5978	0.9636	0.8439	2.9655
EM_5	0.9766	3.7368	0.9639	0.6837	3.4673
RM_5	0.9301	0.2679	1.0337	0.7051	0.1989
JM_5	0.9680	0.7279	5.8044	1.2820	4.3296
UM_6	0.8191	0.9172	0.9767	0.5919	0.7181
EM_6	1.0911	0.8286	0.9992	0.9210	0.8878
RM_6	1.2258	1.0264	1.0243	1.2855	1.3391
JM_6	1.0624	0.9933	0.6950	0.7961	0.7577
UM_7	1.2492	0.9370	0.9777	0.8065	1.1448
EM_7	0.9110	1.3723	0.9743	0.8440	1.2183
RM_7	0.7698	0.7426	1.0167	0.8291	0.5548
JM_7	0.9262	0.9614	1.6250	1.0699	1.4775

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Table 3.3E

COMPOSITE IMPORT PRICES IN
THE 100% LIBERALIZATION SCENARIOS

COMPOSITE GOOD:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
UM1	0.9942	0.9850	0.9689	0.9806	0.9486
EM1	0.9926	0.9972	0.9835	0.9906	0.9735
RM1	0.9853	0.9652	0.9616	0.9758	0.9134
JM1	0.9868	0.9826	0.9915	0.9955	0.9601
UM2	1.0087	1.0515	1.0002	1.4564	1.0598
EM2	1.0614	1.0039	0.9990	1.4642	1.0669
RM2	1.1443	1.0983	0.9927	1.4389	1.3054
JM2	1.1874	1.0033	0.9943	1.4577	1.1887
UM3	1.0089	1.0855	0.9990	1.4301	1.0926
EM3	1.0697	1.0042	0.9994	1.4742	1.0767
RM3	1.1937	1.0840	0.9921	1.4981	1.3638
JM3	1.1577	1.0019	0.9963	1.5075	1.1607
UM4	1.0042	1.0276	1.0025	1.2260	1.0343
EM4	1.0121	1.0065	1.0029	1.2096	1.0215
RM4	1.0286	1.1052	0.9943	1.2346	1.1368
JM4	1.0219	1.0253	1.0000	1.2100	1.0488
UM5	1.0035	1.1350	0.9973	1.6837	1.1401
EM5	1.0058	1.0058	1.0012	1.6851	1.0132
RM5	1.0247	1.4265	0.9920	1.6895	1.5495
JM5	1.0044	1.0731	0.9989	1.6843	1.0795
UM6	1.0090	1.0302	1.0015	1.2039	1.0402
EM6	0.9665	1.0039	0.9985	1.0691	0.9600
RM6	0.9433	1.0013	0.9958	1.0156	0.9287
JM6	0.9627	1.0035	0.9980	1.0601	0.9548
UM7	1.0034	1.0358	1.0037	1.3680	1.0430
EM7	1.0434	1.0035	1.0037	1.3546	1.0506
RM7	1.0948	1.1084	0.9968	1.3588	1.2284
JM7	1.0194	1.0064	1.0021	1.3585	1.0279

U=United States
E=EEC
R=Rest of the World
J=Japan

1=Non-agriculture
2=Feed grains
3=Food grains
4=Meats

5=Dairy
6=Oilseeds
7=Other agriculture

prices in other regions. Under global liberalization, agricultural land is moved into non-agriculture in all regions.

Reasons for the changes in the pattern of land use can be seen more clearly with the help of Table 3.3H. Agricultural land prices fall by 42% to 56% in a country which liberalizes unilaterally (*TA is the agricultural land price index for region *). The price of non-agricultural land also tends to fall, but the changes here are not as extreme. Even under world liberalization agricultural land prices fall substantially. These changes range from 24.6% in the US to 42.3% in Japan. Capital and labor prices also decline, but their changes are not as large.

The welfare results of the complete liberalization scenarios are, in several instances, quite surprising.[1] Table 3.3A lists these effects as the percent change in national income using equivalent variations.

Of the US, EEC and Japan, only the US gains from its unilateral liberalization. Although its welfare increase of 0.2% seems so small, this figure represents about 8% of agricultural GNP in the US. This welfare improvement is due to efficiency gains resulting from the removal of distortions.

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[1]Some of these "surprising" results are very sensitive to changes in the elasticity values, as we will see in Section V.

Both Japan and the EC are rewarded with efficiency gains when they liberalize unilaterally as well; however, in these

Table 3.3F

CONSUMER PRICE INDEXES IN THE 100% LIBERALIZATION SCENARIOS

CPI:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
US	.9733	.9926	.9842	.9981	.9496
EEC	.9967	.9537	.9896	1.0008	.9379
ROW	1.0001	.9997	.9994	1.0084	.9992
JAPAN	.9796	.9855	.8875	.9348	.8595

Table 3.3G

AGRICULTURAL LAND QUANTITY INDEXES IN THE 100% LIBERALIZATION SCENARIOS

LAND INDEX:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
U_TA	0.9119	1.0067	1.0077	0.9527	0.9232
E_TA	1.0060	0.8998	1.0029	0.9335	0.9081
R_TA	1.0026	1.0028	1.0021	0.9505	1.0074
J_TA	1.0071	1.0029	0.8768	0.9161	0.8908

Table 3.3H
FACTOR PRICES IN THE 100% LIBERALIZATION SCENARIOS

FACTOR:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
UK	0.9653	0.9933	0.9859	0.9927	0.9437
EK	0.9967	0.9370	0.9903	0.9879	0.9216
RK	1.0004	1.0007	1.0008	0.9935	1.0019
JK	0.9782	0.9852	0.8828	0.9268	0.8533
UL	0.9703	0.9928	0.9854	0.9958	0.9481
EL	0.9965	0.9390	0.9903	0.9892	0.9234
RL	1.0000	1.0003	1.0005	0.9995	1.0008
JL	0.9782	0.9853	0.8817	0.9258	0.8522
UT	0.9147	0.9987	0.9922	0.9609	0.8989
ET	1.0076	0.8231	0.9956	0.8975	0.8158
RT	1.0060	1.0068	1.0055	0.9068	1.0186
JT	0.9825	0.9868	0.8410	0.8935	0.8161
UT1	0.9623	0.9937	0.9864	0.9907	0.9410
ET1	0.9976	0.9271	0.9909	0.9795	0.9123
RT1	1.0008	1.0011	1.0012	0.9862	1.0031
JT1	0.9788	0.9853	0.8807	0.9251	0.8514
UTA	0.5767	1.0326	1.0310	0.7540	0.6028
ETA	1.0380	0.4855	1.0100	0.6361	0.5039
RTA	1.0190	1.0207	1.0162	0.7036	1.0567
JTA	1.0177	1.0010	0.4357	0.5766	0.4577
UT2	0.5214	1.0225	1.0232	0.6596	0.5287
ET2	1.0617	0.3593	1.0106	0.5560	0.3869
RT2	1.0333	1.0295	1.0104	0.6412	1.0754
JT2	1.0156	0.9926	0.4960	0.6155	0.5208
UT3	0.7205	1.0176	1.0238	0.8545	0.7481
ET3	1.0185	0.5806	1.0087	0.6820	0.5882
RT3	1.0152	1.0308	1.0200	0.7762	1.0661
JT3	0.9655	1.0041	0.4262	0.5238	0.4299
UT4	0.4764	1.0792	1.0606	0.8193	0.5462
ET4	1.0461	0.4425	1.0113	0.6306	0.4701
RT4	1.0153	1.0165	1.0173	0.7103	1.0496
JT4	1.0225	1.0094	0.3715	0.5387	0.3912

K=Capital
L=Labor
T=Land
TA=Agricultural land
T1=Non-agricultural land

T2, T3, T4 =Types of agricultural land

regions the gains are outweighed by terms of trade losses. Japan's terms of trade, for example, fall by 11%, causing a welfare loss of $24.3 billion[2] to Japan. The overall welfare loss for Japan of 1.31% is equal to about $23 billion.

This terms of trade loss comes from the 11.6% decline in the price of J1 (Japanese non-agriculture), a good which accounts for 99.8% of Japanese exports (see Table 3.5 for the production, import and export shares of each good in each region). The price of J1 falls for three reasons: (i) the home demand for J1 falls when consumption taxes are taken off agriculture, (ii) productive resources move out of agriculture when production subsidies are removed, and (iii) After net agricultural imports increase as a result of liberalization, Japanese export prices must fall in order to bring the current account back to its exogenously specified balance. Other regions suffer the same effects when they liberalize, but such effects are especially strong for Japan because of its pattern of trade. Exporting very little agriculture, it gets virtually no effect on its terms of trade from the increase in its agricultural prices. Because non-agricultural prices fall and Japan has a high export share and low import share in non-ag, while agricultural prices rise and Japan is a large importer and tiny exporter of agriculture, the terms of trade

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[2]Determined as the percent change in the price of exports times the base value of exports, minus the percent change in the price of imports times the base value of imports.

effects on Japan are more acute than are those on other regions which liberalize unilaterally.

The consideration of an optimal tariff argument offers another perspective on the welfare losses from unilateral liberalization which occur for the EEC and Japan. Because each good in the model is differentiated by region of origin, each region has an amount of monopoly power. This power is greater the lower is the substitutability (to foreigners) between its goods and those of other regions. To the extent that a consumption tax affects the terms of trade as a tariff does, a reduction in the tax could move the region away from its optimum policy point and reduce its welfare. If Japan's agricultural consumption taxes behave more like tariffs than do the taxes of other regions (because a higher portion of agricultural consumption in Japan is imported), then Japan will tend to lose more, or gain less, from the removal of these taxes than other regions would from the removal of theirs. This is another explanation why Japan's terms of trade effects under unilateral liberalization are stronger than other regions'.

The EEC is also a net importer of agriculture (as it is defined in this model). When the EEC liberalizes unilaterally, it suffers welfare losses for the same reasons that Japan does. These losses are, however, considerably smaller than Japan's; furthermore, even the direction of this

change is sensitive to elasticity values specified from outside the model. This will be discussed in Section V.

Some of the cross-welfare effects in Table 3.3A deserve mention. The US gains from the unilateral liberalization of both the EEC and Japan since demand for US agricultural exports increases. It has a higher share of its total exports in agriculture, and a higher share of its total imports in non-agriculture, than any other region (see Table 3.5). Japan, at the other extreme of the four regions in these trade shares, loses when either the US or EC liberalizes unilaterally because of the effect on the price of its imports.

Each of the other regions enjoy improved welfare when Japan liberalizes unilaterally. They take advantage of the lower price of Japanese non-agriculture and the increased demand for their agricultural exports; these effects seem to outweigh the cost of increased distortions which results from the expansion of their (still distorted) agricultural industries.

Under global liberalization (WTLIB in Table 3.3A) all regions gain except Japan. For the US, EEC and ROW, the welfare effects are about 0.35% of national income, or about 10% to 15% of agricultural GNP in these regions. Japan's losses under WTLIB are large, as they are under its unilateral liberalization; here they are equal to 1.27% of national

income, or about 50% of agricultural GNP. The magnitude of this loss is especially sensitive to some model parameters.

International trade statistics under WTLIB are presented in Table 3.7B, and can be compared to the benchmark trade statistics in Table 3.7A. Table 3.7B confirms that Japan increases its net agricultural imports substantially, from $20 billion to $28.7 billion. The US increases its net ag exprts by about $2.7 billion, and the ROW's increases is approximately $6 billion. The EEC's agricultural trade balance is virtually unchanged.

When all regions except the ROW liberalize (UEJTLIB), the welfare effects on each region are similar to those obtained by simply summing the effects on that region of each unilateral liberalization. For example, the US gains 0.2% under UTLIB, 0.06% under ETLIB and 0.2% under JTLIB. The total of 0.46% is very close to the US welfare gain under simultaneous liberalization by the US, EEC and Japan, which equals 0.5%.

Results of the 50% liberalization scenarios are presented in Tables 3.4A-3.4H. These experiments have effects which are qualitatively similar to the 100% liberalization effects, but smaller by about 50%, as we might have anticipated. Roughly speaking, however, it does seem that more of the "action" in the model comes in cutting support from 50% of previous levels to zero than in cutting agricultural support from its previous

levels to 50% of those levels. If this contention is correct, the distortionary impact of agricultural policies increases with the size of the policies, but it increases at a decreasing rate.

Table 3.4A

WELFARE RESULTS OF THE 50% LIBERALIZATION SCENARIOS

	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
US	0.15	0.03	0.08	0.18	0.27
EC	-0.03	-0.01	0.01	0.23	-0.01
RW	0.00	0.02	0.05	0.19	0.07
JP	-0.14	-0.06	-0.40	-0.45	-0.60

Figures are in terms of percent change in national income using equivalent variation

UTLIB=100% agricultural liberalization by the US

ETLIB=100% agricultural liberalization by the EC

JTLIB=100% agricultural liberalization by the Japan

WTLIB=100% agricultural liberalization by all four regions simultaneously

UEJTLIB=100% agricultural liberalization by the US, EC and Japan simultaneously

Table 3.4B
PRICES IN THE 50% LIBERALIZATION SCENARIOS

GOOD:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
R1	1.0000	1.0000	1.0000	1.0000	1.0000
U1	0.9857	0.9968	0.9939	0.9981	0.9762
E1	0.9981	0.9735	0.9958	0.9963	0.9670
J1	0.9902	0.9934	0.9516	0.9710	0.9365
U2	1.1510	0.9986	0.9957	1.1808	1.1426
E2	1.0057	1.0971	0.9979	1.1652	1.0991
R2	1.0035	1.0028	1.0006	1.1841	1.0069
J2	0.9970	0.9943	1.2351	1.2789	1.2257
U3	1.1898	0.9986	0.9957	1.2210	1.1814
E3	1.0046	1.0998	0.9976	1.1618	1.1005
R3	1.0036	1.0029	1.0007	1.1761	1.0073
J3	0.9935	0.9940	1.2141	1.2505	1.2003
U4	1.0412	0.9995	0.9973	1.0704	1.0367
E4	1.0006	1.0790	0.9977	1.1220	1.0756
R4	1.0020	1.0033	1.0015	1.0953	1.0069
J4	1.0065	0.9956	1.1493	1.2087	1.1530
U5	1.2603	0.9980	0.9951	1.2871	1.2507
E5	0.9999	1.2095	0.9968	1.2538	1.2045
R5	1.0029	1.0027	1.0004	1.2578	1.0061
J5	1.0019	0.9952	1.2777	1.3339	1.2754
U6	0.9689	1.0005	0.9976	1.0081	0.9646
E6	1.0051	1.0684	0.9980	1.1345	1.0696
R6	1.0040	1.0036	1.0008	1.0824	1.0085
J6	0.9931	0.9943	1.1475	1.1824	1.1341
U7	1.0895	1.0024	0.9982	1.1392	1.0887
E7	1.0030	1.1051	0.9977	1.1599	1.1046
R7	1.0013	1.0014	1.0013	1.1506	1.0041
J7	0.9937	0.9952	1.1651	1.2132	1.1526
UU	0.9876	0.9967	0.9936	0.9996	0.9777
EU	0.9982	0.9784	0.9958	1.0008	0.9719
RU	1.0000	0.9999	0.9998	1.0036	0.9997
JU	0.9908	0.9935	0.9531	0.9737	0.9387

50LIB=Fifty percent agricultural liberalization

U=US
E=EEC
RW=Rest of the World
J=Japan

1=Non-agric
2=Feed grains
3=Food grains
4=Meats

5=Dairy
6=Oilseeds
7=Other agriculture

Table 3.4C

OUTPUT IN THE 50% LIBERALIZATION SCENARIOS

INDUSTRY:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
U_1	1.0026	0.9998	0.9999	1.0015	1.0023
E_1	0.9995	1.0067	0.9998	1.0047	1.0062
R_1	0.9998	0.9998	0.9999	1.0036	0.9994
J_1	0.9998	0.9999	1.0034	1.0024	1.0030
U_2	0.7795	1.0107	0.9973	0.8181	0.7885
E_2	1.0263	0.7785	1.0035	0.8631	0.8039
R_2	1.0319	1.0262	0.9972	0.8502	1.0560
J_2	1.2239	1.0259	0.4464	0.6353	0.5660
U_3	0.6331	1.0285	1.0589	0.8134	0.6833
E_3	1.0237	0.8207	1.0041	0.9313	0.8456
R_3	1.0103	1.0052	1.0025	0.9154	1.0184
J_3	1.0073	0.9999	0.9138	0.9346	0.9262
U_4	0.9565	1.0043	1.0086	0.9777	0.9692
E_4	1.0000	0.9273	1.0036	0.9305	0.9308
R_4	1.0014	1.0038	1.0044	0.9538	1.0094
J_4	0.9855	1.0081	0.8500	0.8531	0.8473
U_5	0.8254	1.0090	1.0000	0.8533	0.8376
E_5	1.0141	0.7926	1.0033	0.8617	0.8013
R_5	1.0152	1.0650	1.0029	0.8684	1.0841
J_5	0.9878	1.0054	0.8222	0.8468	0.8220
U_6	1.0464	0.9871	0.9934	1.0394	1.0295
E_6	0.9583	0.7337	1.0029	0.6974	0.7031
R_6	0.9814	0.9956	0.9960	0.8759	0.9719
J_6	0.9865	1.0228	0.5512	0.5778	0.5541
U_7	0.8139	1.0264	1.0210	0.9548	0.8548
E_7	1.0133	0.8304	1.0048	0.8995	0.8474
R_7	1.0033	1.0033	1.0039	0.9234	1.0105
J_7	1.0127	1.0072	0.8038	0.8773	0.8216

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Table 3.4D

IMPORT LEVELS IN THE 50% LIBERALIZATION SCENARIOS

COMPOSITE GOOD:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
UM_1	0.9829	1.0060	1.0107	1.0112	0.9990
EM_1	1.0014	0.9790	1.0025	1.0047	0.9822
RM_1	1.0069	1.0162	1.0158	1.0137	1.0397
JM_1	0.9965	1.0007	0.9635	0.9780	0.9615
UM_2	1.3055	0.9213	0.9861	0.8260	1.1846
EM_2	0.9264	1.0920	0.9974	0.8066	1.0026
RM_2	0.8202	0.8980	1.0133	0.8771	0.7269
JM_2	0.9087	1.0006	0.9302	0.8324	0.8549
UM_3	1.3451	0.8918	1.0012	0.9395	1.1870
EM_3	0.9025	1.2163	0.9946	0.8501	1.0853
RM_3	0.7495	0.8892	1.0139	0.8675	0.6514
JM_3	0.7559	0.9762	1.8131	1.0889	1.3484
UM_4	1.1233	0.9467	0.9835	0.8678	1.0435
EM_4	0.9777	1.2568	0.9851	1.0370	1.2058
RM_4	0.9547	0.8357	1.0146	0.9218	0.8056
JM_4	0.9701	0.9423	1.4835	1.2755	1.3658
UM_5	2.0933	0.7522	0.9849	0.9426	1.5527
EM_5	0.9868	1.7913	0.9851	0.8466	1.7360
RM_5	0.9531	0.5472	1.0137	0.8697	0.5046
JM_5	0.9866	0.8381	2.1985	1.0762	1.8338
UM_6	0.9069	0.9619	0.9900	0.7871	0.8598
EM_6	1.0428	0.9165	1.0000	0.9655	0.9525
RM_6	1.1144	1.0121	1.0112	1.1236	1.1496
JM_6	1.0337	0.9982	0.8837	0.9252	0.9178
UM_7	1.1142	0.9693	0.9905	0.9129	1.0698
EM_7	0.9554	1.1586	0.9887	0.9270	1.0945
RM_7	0.8839	0.8712	1.0060	0.9211	0.7677
JM_7	0.9649	0.9823	1.2683	1.0319	1.2073

50LIB=Fifty percent agricultural liberalization

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4=Meats

5=Dairy
6=Oilseeds
7=Other agriculture

Table 3.4E

COMPOSITE IMPORT PRICES IN
THE 50% LIBERALIZATION SCENARIOS

COMPOSITE GOOD:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
UM1	0.9973	0.9932	0.9875	0.9924	0.9781
EM1	0.9966	0.9987	0.9934	0.9963	0.9887
RM1	0.9931	0.9840	0.9844	0.9905	0.9618
JM1	0.9939	0.9920	0.9966	0.9983	0.9823
UM2	1.0040	1.0235	0.9999	1.1792	1.0272
EM2	1.0317	1.0018	0.9994	1.1833	1.0333
RM2	1.0690	1.0430	0.9967	1.1729	1.1201
JM2	1.0872	1.0015	0.9974	1.1816	1.0865
UM3	1.0040	1.0387	0.9994	1.1701	1.0419
EM3	1.0371	1.0019	0.9995	1.1860	1.0391
RM3	1.0929	1.0383	0.9965	1.1936	1.1430
JM3	1.0784	1.0008	0.9982	1.1971	1.0781
UM4	1.0018	1.0135	1.0009	1.0993	1.0163
EM4	1.0058	1.0029	1.0011	1.0927	1.0098
RM4	1.0134	1.0492	0.9975	1.1035	1.0619
JM4	1.0104	1.0126	0.9999	1.0931	1.0233
UM5	1.0016	1.0733	0.9988	1.2560	1.0745
EM5	1.0029	1.0027	1.0004	1.2578	1.0061
RM5	1.0155	1.1797	0.9966	1.2568	1.2085
JM5	1.0021	1.0416	0.9995	1.2567	1.0439
UM6	1.0042	1.0135	1.0003	1.0905	1.0179
EM6	0.9819	1.0017	0.9988	1.0344	0.9807
RM6	0.9689	1.0005	0.9976	1.0081	0.9646
JM6	0.9799	1.0015	0.9986	1.0301	0.9781
UM7	1.0016	1.0170	1.0018	1.1527	1.0204
EM7	1.0208	1.0016	1.0019	1.1484	1.0243
RM7	1.0437	1.0489	0.9990	1.1498	1.0969
JM7	1.0095	1.0030	1.0009	1.1496	1.0134

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7=Other agriculture

Table 3.4F

CONSUMER PRICE INDEXES IN
THE 50% LIBERALIZATION SCENARIOS

CPI for:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
US	0.9876	0.9967	0.9936	0.9996	0.9777
EEC	0.9982	0.9784	0.9958	1.0008	0.9719
ROW	1.0000	0.9999	0.9998	1.0036	0.9997
JP	0.9908	0.9935	0.9531	0.9737	0.9387

Table 3.4G
AGRICULTURAL LAND QUANTITY
INDEXES IN THE 50% LIBERALIZATION SCENARIOS

Land Index:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
U_TA	0.9119	1.0067	1.0077	0.9527	0.9232
E_TA	1.0060	0.8998	1.0029	0.9335	0.9086
R_TA	1.0026	1.0028	1.0021	0.9505	1.0074
J_TA	1.0071	1.0029	0.8768	0.9161	0.8908

The agricultural land quantity index indicates the amount of land in agriculture relative to the benchmark.

Table 3.4H

FACTOR PRICES IN THE 50% LIBERALIZATION SCENARIOS

FACTOR:	U50LIB	E50LIB	J50LIB	W50LIB	UEJ50LIB
UK	0.9837	0.9970	0.9943	0.9971	0.9747
EK	0.9982	0.9708	0.9960	0.9952	0.9645
RK	1.0002	1.0003	1.0003	0.9971	1.0008
JK	0.9901	0.9934	0.9513	0.9706	0.9361
UL	0.9864	0.9968	0.9941	0.9986	0.9771
EL	0.9981	0.9719	0.9960	0.9959	0.9655
RL	1.0000	1.0001	1.0002	0.9999	1.0003
JL	0.9901	0.9934	0.9508	0.9701	0.9356
UT1	0.9818	0.9971	0.9944	0.9959	0.9730
ET1	0.9986	0.9649	0.9962	0.9909	0.9591
RT1	1.0004	1.0005	1.0005	0.9934	1.0014
JT1	0.9904	0.9934	0.9498	0.9696	0.9349
UT2	0.7336	1.0097	1.0070	0.8248	0.7416
ET2	1.0270	0.6447	1.0037	0.7764	0.6652
RT2	1.0160	1.0131	1.0032	0.8233	1.0328
JT2	1.0092	0.9968	0.7673	0.8297	0.7765
UT3	0.8600	1.0081	1.0093	0.9276	0.8743
ET3	1.0071	0.7837	1.0032	0.8453	0.7897
RT3	1.0063	1.0136	1.0079	0.8910	1.0279
JT3	0.9838	1.0034	0.7303	0.7803	0.7259
UT4	0.7139	1.0349	1.0252	0.9095	0.7577
ET4	1.0216	0.6999	1.0048	0.8194	0.7190
RT4	1.0072	1.0075	1.0074	0.8595	1.0221
JT4	1.0111	1.0043	0.6766	0.7876	0.6896
UTA	0.7693	1.0144	1.0114	0.8740	0.7865
ETA	1.0167	0.7238	1.0039	0.8207	0.7374
RTA	1.0089	1.0093	1.0066	0.8555	1.0249
JTA	1.0095	1.0006	0.7230	0.8082	0.7337
UT	0.9550	0.9993	0.9966	0.9804	0.9494
ET	1.0031	0.9067	0.9981	0.9495	0.9055
RT	1.0028	1.0030	1.0022	0.9541	1.0082
JT	0.9922	0.9941	0.9289	0.9546	0.9163

K=Capital
L=Labor
T=Land
TA=Agricultural land
T1=Non-agricultural land

T2, T3, T4 =Types of agricultural

V. Sensitivity Analysis.

The elasticities of substitution between the varieties of non-agricultural goods are very important in the determination of model results. Qualitative as well as quantitative changes occur in the results when these elasticities are varied by large amounts.

In order to analyze the importance of these parameters, two related tests were performed. In the first, the elasticities of substitution in each region between domestic non-agriculture and imported non-agriculture, and between the three (regional) varieties of imported non-agriculture, are increased by fifty percent. In the second test these elasticities are doubled. The welfare results of the 100% liberalization scenarios under these alternative non-agricultural trade elasticities are given in Tables 3.6A and 3.6B. Table 3.3A is reproduced here for ease of reference.

Japanese welfare under its own unilateral liberalization, and under the two multilateral scenarios, is especially sensitive to the elasticity changes. While it decreases by 1.27% under world liberalization (WTLIB) with the base elasticities, it falls by only 0.80% and 0.64% in Tables 3.6A and B. It can be seen from Table 3.6C that the price of Japanese non-agriculture follows a pattern similar to that of Japanese welfare under the various scenarios and elasticity specifications; indeed, since J1 accounts for 99.8% of

Japanese exports, changes in its price may be a primary cause of Japanese welfare changes.

Recall that one reason non-agricultural prices fall in the unilateral liberalizations in that net imports of agriculture into the liberalizing region increase, requiring that net non-ag exports also increase, and forcing the price down. When the different (regional) versions of non-ag goods are more nearly homogeneous, the price decrease needed to bring the current account back to its exogenously-specified balance is reduced. This explanation seems to fit the results we see for Japan.

A similar story applies to the EEC under its unilateral liberalization. With base case elasticities, its welfare falls by 0.32%; however, if non-ag goods are more substitutible its welfare actually increases under the same experiment (by 0.12% in Table 3.6A and by 0.31% in Table 3.6B). With base case elasticities, the price of EEC non-agriculture falls by 5.7%. When the previously named elasticities are increased by 50% this price falls by only 3.5%, and when they are doubled it falls by only 2.4%.

Japan still loses welfare under each of the scenarios, but the amount of each loss declines when the elasticities are increased by 50%, and falls farther when they are doubled. The US, which gains welfare under each scenario when the base elasticities are used, gains less as the elasticities are

increased (except under UTLIB where its gains increase); in fact, the US loses slightly in Table 3.6B under EEC liberalization (ETLIB). The ROW, which gains under each scenario in Table 3.3A (less than 0.005% under UTLIB), loses in 3 of 5 scenarios in Table 3.6B. It seems that net agricultural exporters (US, ROW) in the model fare better under liberalization when non-agricultural goods are highly differentiated, while net agricultural importers are better off when these goods are more homogeneous.

The results in this section suggest that the model is sensitive to the degree of differentiation between non-agricultural goods. Although the doubling of the elasticities of substitution between non-ag goods probably provides an extreme test, even the results in Table 3.6A show considerable sensitivity of the model to these elasticities and suggest that more work needs to be done in this area.

VI. Summary

This chapter examined the results of unilateral and multilateral agricultural policy liberalization simulations. For all the experiments in this chapter, agricultural policies were represented as producer and consumer subsidy equivalents (PSEs and CSEs).

We found that liberalization increased the market price of agricultural goods relative to non-agricultural goods, and

that this tends to help agricultural exporters and harm agricultural importers. We also found that agriculture tended to contract in liberalizing regions and that this contraction forced farm land prices down considerably.

The intersectoral effects of agricultural liberalization were quite strong. This seemed to be due to (i) productive factors moving out of agriculture as production subsidies were removed, (ii) consumers substituting ag goods for non-ag goods as the consumption taxes on ag goods were removed, and (iii) the specification of a fixed current account balance, which required that when net ag imports rose, net non-agricultural exports rose as well. The intersectoral effects were so strong in some instances that they seemed to drive the welfare results. This appeared to be the case for Japan under several scenarios.

The welfare results were very sensitive to the numerical specification of the elasticities of substitution between varieties of the non-agricultural goods. The key role of these parameters seemed to be in determining the magnitude of the change in the price of a non-ag good necessary to bring the current account back to its specified balance.

Though Japan loses from world agricultural liberalization, all other regions gain; these gains are between 0.25% and 0.38% of national income, or about 10% to 15% of agricultural GNP. Because the gains from agricultural

liberalization are unevenly distributed, the gainers may need to make concessions to Japan in order to reach a liberalization agreement in any negotiations.

Based on the welfare figures, the US should consider pushing only for liberalization by the EEC, Japan and itself; under each of the three sets of elasticities, the US fares better under the UEJTLIB scenario than it does under WTLIB.

Within each region redistribution from agricultural land owners to other factor owners takes place. Because agricultural land prices fall by as much as 60%, we might expect considerable internal opposition to any agreement which does not compensate agricultural land owners for their losses.

Table 3.5

PRODUCTION,[a] EXPORT AND IMPORT SHARES IN THE BENCHMARK

Good		US	EC	RW	JP
1	Prodn	.982	.970	.962	.991
	Export	.881	.944	.898	.998
	Import	.942	.932	.939	.791
2	Prodn	.004	.002	.001	.0001
	Export	.015	.004	.004	
	Import	.001	.001	.005	.024
3	Prodn	.001	.002	.004	.003
	Export	.018	.008	.002	
	Import	.0003	.002	.013	.008
4	Prodn	.005	.010	.004	.002
	Export	.006	.006	.012	
	Import	.007	.007	.003	.024
5	Prodn	.002	.005	.001	.0005
	Export	.001	.008	.002	
	Import	.001	.002	.006	.001
6	Prodn	.002	.001	.001	.0001
	Export	.024	.0003	.005	
	Import	.002	.012	.004	.013
7	Prodn	.004	.010	.027	.004
	Export	.053	.030	.076	.002
	Import	.046	.041	.029	.138

[a]Share of production at world prices.

1=Non-agric
2=Feed grains
3=Food grains
4=Meats
5=Dairy
6=Oilseeds
7=Other agriculture

Table 3.3A
WELFARE RESULTS OF THE 100% LIBERALIZATION SCENARIOS WITH BASE CASE ELASTICITIES

Liberalization Scenario

Region:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
US	+0.20	+0.06	+0.20	+0.35	+0.50
EC	-0.06	-0.32	+0.04	+0.38	-0.31
RW	0.00	+0.06	+0.11	+0.34	+0.17
JP	-0.31	-0.14	-1.31	-1.27	-1.73

Table 3.6A
WELFARE RESULTS WITH ALL NON-AG TRADE ELASTICITIES INCREASED BY FIFTY PERCENT

Liberalization Scenario

Region:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
US	+0.24	+0.01	+0.08	+0.27	+0.38
EC	-0.08	+0.12	0.00	+0.38	+0.09
RW	-0.03	0.00	+0.04	+0.30	+0.02
JP	-0.19	-0.07	-0.48	-0.80	-0.73

Table 3.6B
WELFARE RESULTS WITH ALL NON-AG TRADE ELASTICITIES DOUBLED

Liberalization Scenario

Region:	UTLIB	ETLIB	JTLIB	WTLIB	UEJTLIB
US	+0.26	-0.01	+0.04	+0.25	+0.34
EC	-0.09	+0.31	-0.02	+0.38	+0.27
RW	-0.04	-0.02	+0.01	+0.29	-0.04
JP	-0.15	-0.06	-0.20	-0.64	-0.40

Figures are in terms of percent change in GNP using equivalent variation
UTLIB=100% agricultural liberalization by the US
ETLIB=100% agricultural liberalization by the EC
JTLIB=100% agricultural liberalization by Japan
WTLIB-100% agricultural liberalizaiton by all four regions simultaneously
UEJTLIB=100% agricultural liberalization by the US, EC and Japan simultaneously

Liberalization consists of removing the production subsidies and consumption taxes in place on the agricultural goods.

Table 3.7A

BENCHMARK EQUILIBRIUM TRADE STATISTICS

	US			EC			JP		
	Imp		Exp	Imp		Exp	Imp		Exp
1)	67.90	E	42.58						
	81.26	J	32.30	31.02	J	20.29			
	196.87	R	107.83	197.09	R	221.33	29.08	R	105.46
2)	0.09	E	0.25						
	--	J	1.64	--	J	0.05			
	0.27	R	1.47	0.81	R	1.46	0.90	R	
3)	0.04	E	0.17						
	--	J	0.35	--	J	--			
	0.06	R	3.41	0.55	R	2.68	0.37	R	
4)	.36	E	0.20						
	--	J	0.49	--	J	0.32			
	1.96	R	0.61	1.71	R	1.21	1.27	R	
5)	0.21	E							
	--	J	--	--	J	0.03			
	0.26	R	0.26	0.48	R	2.52	.09	R	
6)	0.10	E	2.17						
	--	J	0.90	---	J	--			
	0.48	R	2.13	1.37	R	--	0.44	R	--
7)	2.85	E	2.92						
	.14	J	1.39	0.12	J	0.23			
	13.69	R	6.92	8.89	R	6.74	11.91	R	0.11
Agric Trade Totals	20.51		25.28	19.64		18.89	20.38		.37
Non-ag trade surplus	-163.32			38.83			136.07		
Ag trade surplus	4.77			-0.75			-20.01		

Table 3.7B

TRADE STATISTICS UNDER GLOBAL LIBERALIZATION

	US			EC			JP		
	Imp		Exp	Imp		Exp	Imp		Exp
1)	68.12	E	42.56						
	83.73	J	30.37	31.31	J	19.10			
	196.72	R	108.35	196.85	R	222.60	27.31	R	107.45
2)	0.09	E	0.23						
	--	J	1.53	--	J	0.05			
	0.24	R	1.51	0.72	R	1.58	0.81	R	
3)	0.05	E	0.13						
	--	J	0.57	--	J	--			
	0.07	R	3.03	0.58	R	3.38	0.79	R	
4)	0.27	E	0.30						
	--	J	1.17	--	J	0.53			
	1.81	R	0.79	2.20	R	1.09	2.52	R	
5)	0.29	E							
	--	J		--	J	0.07			
	0.37	R	0.27	0.55	R	3.05	0.19	R	
6)	0.05	E	2.49						
	--	J	0.86	--	J				
	0.36	R	2.78	0.99	R		0.26	R	
	3.04	E	3.47						
	0.12	J	2.12	0.11	J	0.31			
	15.26	R	8.18	10.03	R	7.24	17.22	R	0.09
Ag trade totals	22.02		29.43	21.8		21.09	29.00		0.32
Non-Ag Trade Surplus	-167.29			+39.1			+145.71		
Ag Trade Surplus	7.41			-0.71			-28.68		