Macroeconomic Impacts on the U.S. Agricultural Sector: A Quantitative Analysis for 1980–84

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Introduction

Agricultural trade problems have been receiving increased attention in the United States for the last few years. The reason is obvious. After a decade during which the value of agricultural exports grew from $8 billion annually to a peak of nearly $44 billion in 1981, both quantities and values of exports have fallen substantially. Recent USDA estimates project $32 billion in farm exports in 1985. In the long history of U.S. agriculture, exports have often been a major force in agricultural prosperity and distress. It is a natural tendency, therefore, to look at export growth as a solution to the dismal state of the farm economy. Unfortunately, poor export performance is only one of a complex array of factors that have contributed to the current distress in agriculture and many of these factors are jointly related to macroeconomic policies and conditions as discussed by McCalla (1982); Freebairn, Rauser, and deGorter (1982); and Schuh (1984).

Empirical studies have verified the linkage between macroeconomic policies and conditions and U.S. agriculture. Chambers and Just (1982) estimated the impact of money supply changes on commodity markets. A recent study by Devadoss, Meyers, and Starleaf (1985) found that the contractionary monetary policy pursued by the U.S. government in the early 1980s put upward pressure on exchange rates and interest rates and had a substantial adverse effect on the farm economy. In a related study, Starleaf, Meyers, and Womack (1985) presented evidence that the real income of U.S. farmers has generally increased during periods of economic expansion and declined during periods of economic contraction. A recent study by Meyers, Thamodaran, and Helmar (1985) found that the stagnant income growth in foreign countries and the appreciation of the U.S. dollar had important adverse effects on U.S. agricultural exports.

The major elements of change in the macroeconomic environment from the 1970s to the 1980s are noted in Table 1. The economic policies that successfully wrung inflation out of the U.S. economy also slowed economic growth here and in many foreign countries. U.S. inflation rates fell more rapidly than interest rates, causing real rates of interest to rise. The 1981 tax cut reduced government revenues without an associated cutback in government expenditures, causing the federal budget deficit to increase rapidly and putting further upward pressure on real rates of interest. As foreign investors bought dollars to invest in the United States and earn these high returns, the dollar appreciated and made U.S. exports more costly abroad. The resulting decline in exports relative to imports created a substantial increase in the current account deficit. The world economic slowdown in the early 1980s, combined with high real interest rates and an appreciating dollar, contributed to debt crisis in many Third World economies. Public and private debt disbursements to developing countries declined and debt repayments increased until the net debt transfers became negative.

Table 1. 1980s Economic Environment Compared to 1970s

	1970s	1980-1984
Argentina Real GDP Annual Growth Rate (%)	2.70	-1.32
Brazil Real Income Annual Growth Rate (%)	5.72	1.44
Canada Real GDP Annual Growth Rate (%)	4.50	1.52
Eastern Europe Real GDP Annual Growth Rate (%)	4.10	2.48
EC Real GDP Annual Growth Rate (%)	3.10	0.94
Japan Real GDP Annual Growth Rate (%)	4.90	4.36
USSR Real Income Annual Growth Rate (%)	3.00	0.02
Spain Real GDP Annual Growth Rate (%)	3.98	1.16
Thailand Real GDP Annual Growth Rate (%)	7.06	2.04
U.S. Real GNP Annual Growth Rate (%)	2.90	1.80
U.S. Inflation Rate (%)	5 to 10	3 to 5
U.S. Real Interest Rate (%)	-1 to 3	5 to 9
U.S. Budget Deficit Range (1980$ Billion)	15 to 115	66 to 158
U.S. Current Account Range (1980$ Billion)	-20 to 8	2 to -81
U.S. Exchange Rate Change (%)	(1969-1980) -29	(1980-1984) +58
Net Debt Transfers to Developing Countries ($ Billion)	(1978-1981) 30/yr.	(1982-1983) -2/yr.
U.S. Ag Export Changes ($ Billion)	(1971-1981) 35.8	(1981-1985) -14.8
U.S. Ag Program Costs (1983$ Billion)	(1971-1981) 5/yr.	(1982-1985) 14/yr.

All of these factors contributed to a substantial decline in U.S. agricultural exports from the peak in 1981. In addition to the weak foreign and domestic demand, the bumper crops in the United States in 1981 and 1982 set the stage for a substantial decline in farm prices, incomes, and land values. Commodity programs designed to provide a measure of protection to farm prices and income absorbed substantial amounts of the growing surplus by building stocks and reducing acreage planted. Program costs rose to nearly three times the rate of expenditures incurred during the 1970s.

The reversal of conditions that existed before the turn of the decade could hardly have been more complete. Exchange rate changes and export declines can be viewed as casualties rather than causes of this turnaround. It is clear that macroeconomic policies and conditions have been a major element in this reversal. The large negative impacts of the changed macroeconomic conditions on agriculture are now widely acknowledged. The purpose of this analysis is to provide a quantitative evaluation of the impact of the changing macroeconomic environment on agricultural markets and trade.

Analytical Method

Since the adverse macroeconomic environment in the 1980s is hypothesized to have a substantial impact on commodity markets, the approach of this study is to ask what might have occurred had the 1970s macroeconomic conditions continued into the 1980-84 period. In general, this entails a hypothetical 1980-84 scenario in which economic growth rates in the United States and abroad are higher and the U.S. dollar remains at the very favorable exchange levels of 1979. This alternative scenario is compared to a baseline scenario which represents actual conditions existing during the period.

The analysis is illustrated in Figure 1. The actual price and quantity levels for the period are represented by P_0 (price), D_0 (domestic demand), S_0(domestic supply), and X_0 (exports). Higher income growth rates would shift domestic and export demands to the right as indicated by (1) and (2). Preserving the favorable 1979 exchange rates would make it possible for importers to buy more with one unit of their own currency, which would move export demand further to the right as in (3). All of these changes would generate a new price and quantity solution at P_1, D_1, S_1, and X_1. The foreign price PF may also rise but not as much as the U.S. price. Exports and domestic consumption may go up or down depending on the size of the demand shifts relative to the price change. The value of exports in U.S. dollars would increase from P_0X_0 to P_1X_1 and value of production would increase from P_oS_o to P_1S_1. The higher prices would very likely reduce substantially the costs of farm programs, which are designed to reduce price and income risk for producers.

The U.S. livestock sector analysis is illustrated in Figure 2. Actual price and quantity levels for the period are represented by PL_0 (price) and QL_0 (quantity supplied and consumed). Assumed higher U.S. income group for the macroeconomic alternative increases demand for livestock products (1). As result of the crop sector changes, feed prices increase and shift livestock supply to the left

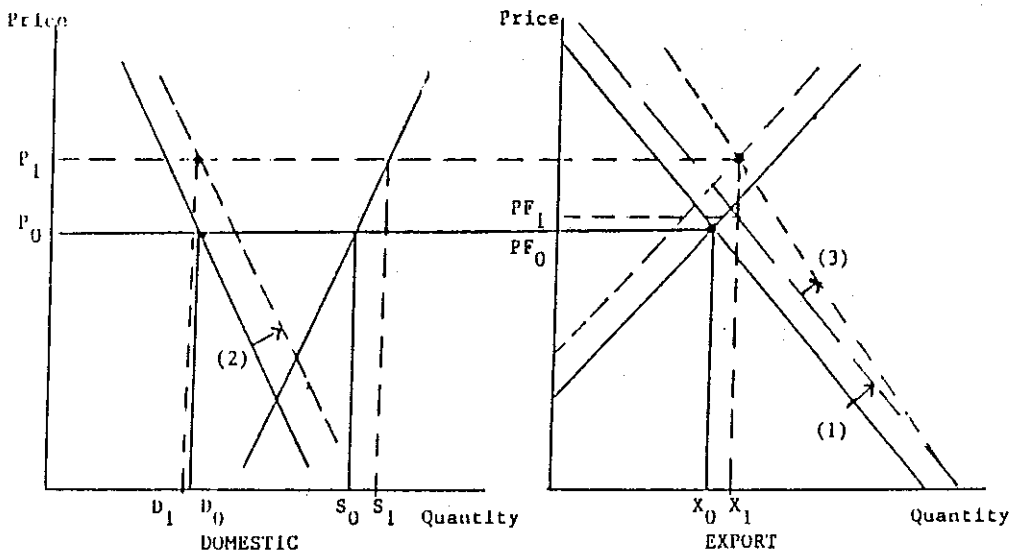

Figure 1. Impacts of Increasing Income Growth Rates and a Depreciation of the U.S. Dollar

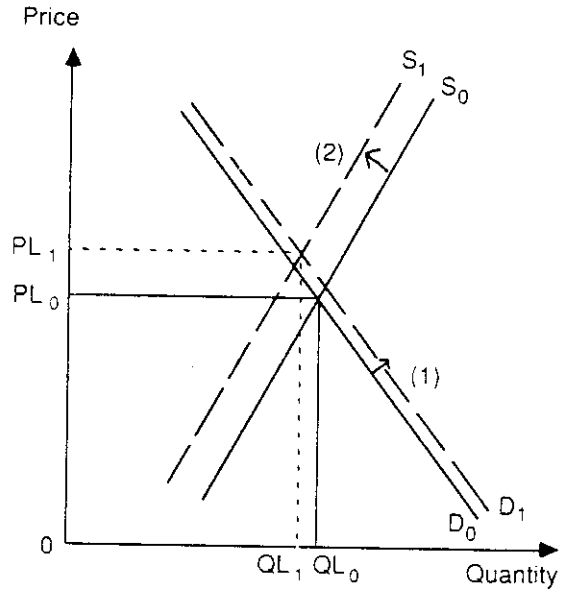

Figure 2. U.S. Livestock Sector under Alternative Economic Conditions

(2). An unambiguous effect of these changes is a livestock price increase from PL_0 to PL_1. Whether the quantity supplied increases or decreases depends on the relative magnitudes of the demand and supply shifts. Our analysis later indicates that livestock supply declines as shown here.

Empirical Models

The analysis is primarily conducted with an econometric regional trade model developed and maintained by the Food and Agricultural Policy Research Institute (FAPRI) at Iowa State University. The U.S. livestock sector impacts and linkages with crops were evaluated using the econometric livestock model maintained by FAPRI at the University of Missouri-Columbia. The trade model includes wheat, coarse grains, soybeans, and soymeal and explicitly incorporates exchange rates and price transmission relationships between countries and regions. A dynamic nonspatial equilibrium approach is used in this model. The basic elements of a nonspatial equilibrium supply and demand model are illustrated in Figure 3 and the corresponding mathematical model is given in Appendix A. Net imports and exports are determined in the model but not trade flows between specific regions. The net demands of importers (EDT) less the net supplies of other exporters (ESO) is the net excess demand facing the U.S. market (EDN).

The major importers and exporters for each commodity are endogenized; these differ somewhat from commodity to commodity. Those countries for which parameters have not been directly estimated with econometric techniques have been assigned price and income response elasticities based on the best judgement of the USDA project task force. These elasticities are converted to net import elasticities and reported in Table A.8 in the Appendix. The regional coverage and the endogenous components of internal markets are evident in the Appendix summary tables of structural elasticities. A descriptive econometric approach is employed in the structural specification, so there are few constraints imposed in the estimation of the structural parameters. The functional form is generally linear.

Assumptions for the Alternative Macroeconomic Scenario

The baseline scenario for this analysis is simulated through the 1984/85 crop year using actual levels of all exogenous variables. Predetermined variables in the model are dynamically determined in the model simulation. The objective in developing the alternative scenario is to continue the macroeconomic conditions that prevailed in the 1970s. The variables in the model which are directly affected by macroeconomic conditions are income levels, inflation rates, and exchange rates. Other macroeconomic variables which play a minor role in the model are the U.S. interest rate, the Argentine budget deficit, and the international reserves of developing countries. Since the foreign livestock sectors are exogenous to this model, the livestock variables in other countries are linked to income levels in order to capture the effect of income growth changes on livestock product demand.

The general approach to generating assumptions for the alternative scenario is given next to each one of the variables

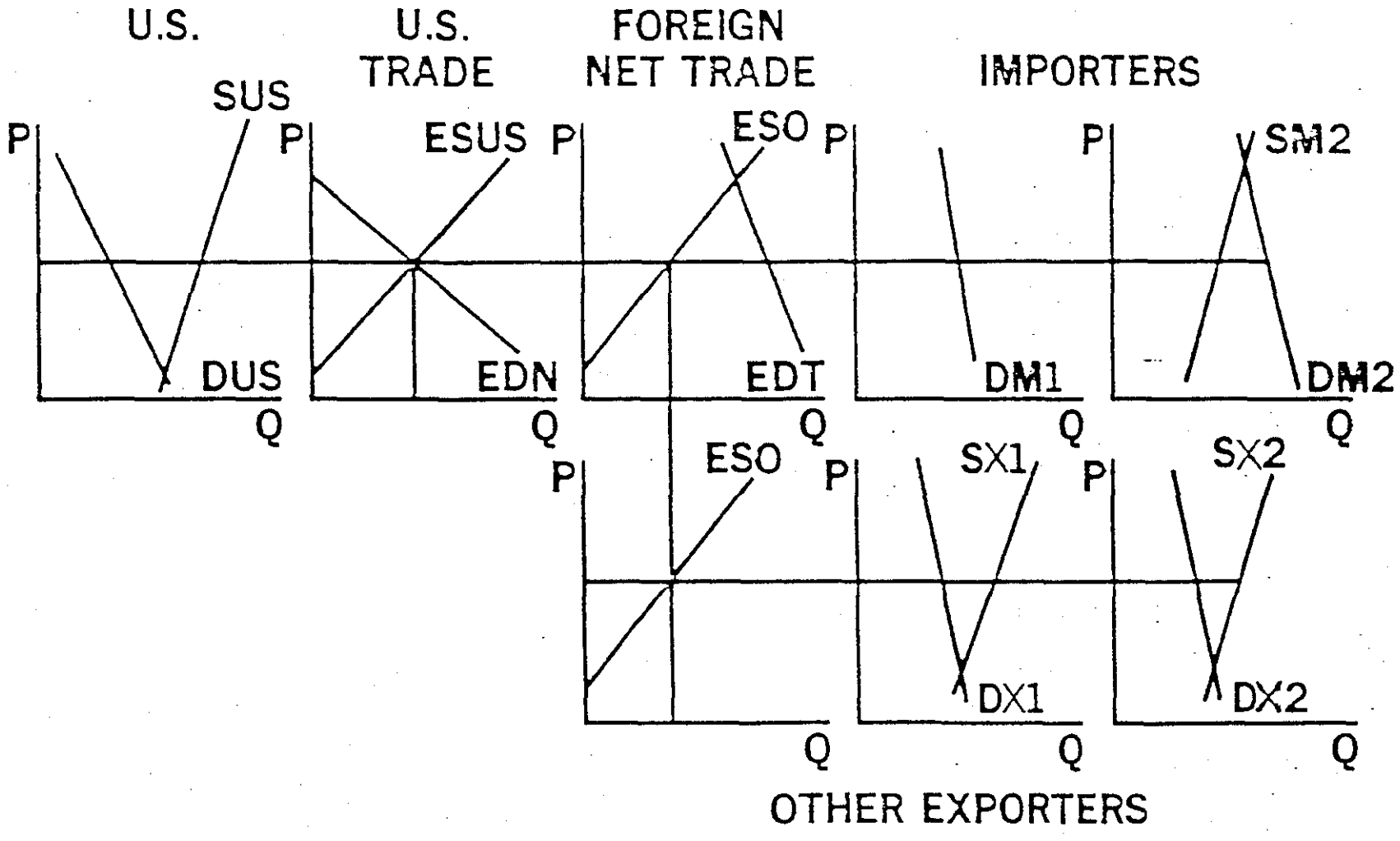

Figure 3. Illustration of the Nonspatial Equilibrium Supply and Demand Model

listed below:

1. Income growth--1970s trend
2. Inflation rates--1970s trend
3. Exchange rate--constant real exchange rate

plots of the actual data are compared to values under the alternative scenario in the Appendix Figures A.1 to A.4.

Economic growth rates in the 1980s were considerably lower in the United States and in many foreign countries compared to those in the 1970s (see Table 1). This slower growth is attributed primarily to the macroeconomic policies pursued by various countries in the 1980s, especially the United States, and to a lesser degree to the oil price shock of the late 1970s. Considering this slower economic growth in the 1980s, the alternative macroeconomic assumption is to continue the income growth of the 1970s into the 1980s. Since most of the countries' income growth exhibited a trend growth in the 1970s, the income growth rates for the 1980-84 alternative scenario were assumed to follow the 1970s trend.

For most of the countries inflation rates in the first year or two of the 1980s were higher than the inflation rates in the 1970s because of the oil price shock in the later 1970s. The inflation rates declined subsequently in response to contractionary macroeconomic policies pursued by various countries. In the case of Argentina, inflation skyrocketed in 1983 and 1984 because of that country's expansionary monetary policy and huge budget deficit. The approach used to generate the inflation rates for the 1980-84 alternative scenario is that these continue at their 1970s trend.

For the exchange rate in the alternative scenario, it was assumed that the real exchange rate that existed in 1979 would continue. This means that the exchange rate of the United States relative to each of the foreign currencies included would change only by the amount necessary to offset differing rates of inflation. This is equivalent to maintaining purchasing power parity at the 1979 level.

Considering the significant rise in real interest rates in the 1980s, the alternative assumption for the U.S. real interest rate was to maintain it at a long run rate equal to 3 percent. Argentina's budget deficit has increased rapidly in the 1980s. In the alternative scenario, the budget deficit is maintained at its 1980 level. International reserves of developing countries in the 1980s were assumed to follow the trend which prevailed in the 1970s.

This study does not investigate whether this hypothetical macroeconomic environment could have been achieved during the 1980s or how it could have been achieved. Rather it assumes that the 1970s macroeconomic conditions continued into the 1980s. Given this assumption, the effects of these favorable macroeconomic conditions on the U.S. agricultural market are evaluated and compared to what occurred under actual macroeconomic conditions. This comparison

provides insight into the importance to agriculture of the change in macroeconomic conditions that was experienced in the 1980s.

Analytical Procedure and U.S. Policy Adjustments

The impacts of alternative macroeconomic policies were generated by first running a baseline and then running the alternative macroeconomic scenario for 1980-84. The difference between the two scenarios is a measure of the dynamic impacts of the changed macroeconomic environment over the five-year period. Several steps were involved in this process:

1. The alternative macroeconomic assumptions were imposed on the individual commodity trade models and the U.S. livestock model. New equilibrium supply, demand, price, and trade results were estimated with the models.

2. To incorporate the cross-commodity interaction among these commodities, the new price estimates were passed between the crop models until a new cross-commodity equilibrium was obtained.

3. To incorporate the cross-commodity interaction between feed and livestock in the United States, the new crop and livestock prices and livestock animal unit indices were passed between the crop and livestock models until a new cross-commodity equilibrium was obtained.

4. Adjustments in commodity program provisions were made according to the new price level estimates. Where prices were above the release level for wheat and corn, the grain was removed from the farmer-owned grain reserve (FOR) either until the price was lowered to the release price or until the reserves were exhausted, whichever came first. If the reserves were exhausted and the price was still above the government-owned stock release level, then government-owned stocks were released until the price was lowered to the government release price level. Stock accumulations in the FOR were also adjusted for changing price levels. Then, if the price in a year prior to an actual paid diversion or PIK program was $.10/bushel below the target price or higher, the paid diversion or PIK program was eliminated.

5. This process was continued until all the models were in equilibrium and the policy conditions were satisfied. In the end the PIK program and all paid diversions were removed for wheat and corn and substantial quantities of FOR and government stocks were released to the market.

Evaluation Results

The results of the macroeconomic impact analysis are discussed first in terms of the estimated effects on major traded crops--wheat, corn, and soybeans. These results include effects on major importing and exporting countries and regions. Next, several measures of the aggregate industry impacts across commodities will be presented including acreage planted, value of crop production, value of agricultural exports, cash receipts from crops and livestock, and net farm income. Finally, some measures of the impacts on government programs are presented including the level of government stocks and the cost of commodity programs. All the measures are summarized by taking the average of the last four years of the period, crop years 1981/82 to 1984/85, and comparing the difference between the alternative macro scenario and the baseline. The year-by-year data are presented in the tables and figures which accompany the discussion.

Wheat

The more favorable macroeconomic assumptions increase wheat exports over the last four years of the period by nearly 18 percent (Table 2). There is also an increase in wheat feed demand in some years because of its more favorable price relative to coarse grains, but the net effect is a slight decline in wheat feeding over the four year period. The stronger export demand reduces carryover stocks, increases prices by nearly 20 percent, and increases annual wheat supply an average of nearly five percent. Wheat supply actually declines in the first two years because the decline in beginning stocks is greater than the increase in production. In the last two years there are large increases in planted acres as a result of the removal of PIK and paid diversion acreage reduction programs.

Total net exports of the major exporting countries increase an average of only 2.5 percent, but the United States gains market share at the expense of the EC and Argentina (Table 3). The higher income growth rates in the EC and Argentina lead to larger domestic consumption and less wheat available for export. The U.S. market share, instead of falling by 12 percentage points in the 1982/84 period, maintains a level equal to or greater than the share in 1979/80.

In the import markets the higher income growth assumed under the macro alternative scenario is in some cases being offset by the higher prices of wheat (Table 4). China's imports decline the most because trend income growth in the alternative scenario is lower than what actually occurred. In the USSR, East Europe, Africa and the Middle East, and other West Europe income effects dominate price effects, but in other regions there is either a decline or only a slight increase in net imports.

TABLE 2. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. WHEAT DOMESTIC SUPPLY AND USE

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
SUPPLY	83.23	89.35	102.71	106.79	107.09	108.70	106.32
DOMESTIC USE	21.31	21.31	23.05	24.71	30.24	31.38	27.35
EXPORTS	37.42	41.20	48.20	41.07	38.89	38.75	41.73
END STOCKS	24.50	26.84	31.46	41.01	37.96	38.57	37.25
PRICE ($/MT)	138.89	143.67	134.11	130.44	129.71	124.19	129.61
MACRO ALTERNATIVE							
SUPPLY	83.23	89.35	99.05	105.65	116.10	125.13	111.48
DOMESTIC USE	21.31	21.39	21.24	24.99	30.64	31.48	27.09
EXPORTS	37.42	44.10	50.40	47.92	45.46	51.79	48.89
END STOCKS	24.50	23.86	27.41	32.74	40.00	41.86	35.50
PRICE ($/MT)	138.89	139.63	157.80	154.59	163.75	144.08	155.06
PERCENT CHANGE	(PERCENT)						
SUPPLY	0.00	0.00	-3.56	-1.07	8.41	15.11	4.72
DOMESTIC USE	0.00	0.38	-7.85	1.13	1.32	0.32	-1.27
EXPORTS	0.00	7.04	4.56	16.68	16.89	33.65	17.95
END STOCKS	0.00	-11.10	-12.87	-20.17	5.37	8.53	-4.78
PRICE ($/MT)	0.00	-2.81	17.66	18.51	26.24	16.02	19.61

TABLE 3. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON WHEAT NET EXPORTS BY EXPORTER

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
CANADA	15.00	17.00	17.60	21.40	21.80	19.40	20.05
AUSTRALIA	15.00	10.60	11.00	8.10	10.60	15.30	11.25
EC	5.10	10.20	10.80	11.70	11.80	15.30	12.40
ARGENTINA	4.80	3.90	4.30	7.50	9.70	8.00	7.38
TOTAL NON-U.S.	39.90	41.70	43.70	48.70	53.90	58.00	51.08
UNITED STATES	37.42	41.20	48.20	41.07	38.89	38.75	41.73
EXPORT SHARE (%)	48.40	49.70	52.45	45.75	41.91	40.05	45.04
WORLD TOTAL	77.32	82.90	91.90	89.77	92.79	96.75	92.80
MACRO ALTERNATIVE							
CANADA	15.00	17.00	18.17	22.59	23.42	20.39	21.14
AUSTRALIA	15.00	10.56	11.23	7.98	10.63	14.83	11.17
EC	5.10	10.02	9.49	7.41	7.00	11.11	8.75
ARGENTINA	4.80	3.80	3.14	4.68	7.53	5.60	5.24
TOTAL NON-U.S.	39.90	41.38	42.03	42.66	48.58	51.93	46.30
UNITED STATES	37.42	44.10	50.40	47.92	45.46	51.79	48.89
EXPORT SHARE (%)	48.40	51.59	54.53	52.90	48.34	49.93	51.43
WORLD TOTAL	77.32	85.48	92.43	90.58	94.04	103.72	95.19
PERCENT CHANGE	(PERCENT)						
CANADA	0.00	0.00	3.24	5.56	7.43	5.10	5.33
AUSTRALIA	0.00	-0.38	2.09	-1.48	0.28	-3.07	-0.54
EC	0.00	-1.76	-12.13	-36.67	-40.68	-27.39	-29.21
ARGENTINA	0.00	-2.56	-26.98	-37.60	-22.37	-30.00	-29.24
TOTAL NON-U.S.	0.00	-0.77	-3.82	-12.40	-9.87	-10.47	-9.14
UNITED STATES	0.00	7.04	4.56	16.68	16.89	33.65	17.95
EXPORT SHARE (%)	0.00	3.81	3.96	15.64	15.34	24.67	14.90
WORLD TOTAL	0.00	3.11	0.58	0.90	1.35	7.20	2.51

TABLE 4. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON WHEAT NET IMPORTS BY IMPORTERS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
JAPAN	5.49	5.70	5.60	5.80	5.90	5.60	5.73
INDIA	-0.48	0.00	2.26	2.39	2.50	0.15	1.83
USSR	11.60	15.50	19.00	19.70	20.00	27.10	21.45
CHINA	8.90	13.80	13.20	13.00	9.60	7.40	10.80
E. EUROPE	5.00	3.40	4.30	2.20	1.50	-1.50	1.63
AFRICA & M.E.	17.08	17.04	18.27	16.99	22.85	24.99	20.78
OTH. ASIA	12.56	11.19	11.17	12.09	12.98	14.21	12.61
OTH. LAT. AMERICA	8.54	7.57	8.30	8.19	8.52	8.97	8.50
OTH. W. EUROPE	1.28	0.45	1.29	-0.52	0.34	-0.46	0.16
ROW*	7.35	8.25	8.51	9.93	8.60	10.29	9.33
WORLD TOTAL	77.32	82.90	91.90	89.77	92.79	96.75	92.80
MACRO ALTERNATIVE							
JAPAN	5.49	5.71	5.60	5.84	5.95	5.66	5.76
INDIA	-0.48	0.00	2.26	2.39	2.50	0.15	1.83
USSR	11.60	18.29	22.98	23.40	23.67	30.55	25.15
CHINA	8.90	12.72	12.36	10.90	6.85	6.94	9.26
E. EUROPE	5.00	3.83	4.61	2.61	1.91	-1.14	2.00
AFRICA & M.E.	17.08	17.73	19.19	18.27	24.80	28.89	22.79
OTH. ASIA	12.56	11.15	10.44	11.48	12.57	14.10	12.15
OTH. LAT. AMERICA	8.54	7.65	7.83	7.70	7.79	8.53	7.96
OTH. W. EUROPE	1.28	0.41	0.57	-0.98	0.05	-0.94	-0.33
ROW*	7.35	8.00	6.60	8.98	7.95	10.97	8.63
WORLD TOTAL	77.32	85.49	92.44	90.59	94.04	103.71	95.20
PERCENT CHANGE	(PERCENT)						
JAPAN	0.00	0.18	0.00	0.69	0.85	1.07	0.65
INDIA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
USSR	0.00	18.00	20.95	18.78	18.35	12.73	17.70
CHINA	0.00	-7.83	-6.36	-16.15	-28.65	-6.22	-14.34
E. EUROPE	0.00	12.65	7.21	18.64	27.33	-24.00	7.29
AFRICA & M.E.	0.00	4.05	5.04	7.53	8.53	15.61	9.18
OTH. ASIA	0.00	-0.36	-6.54	-5.05	-3.16	-0.77	-3.88
OTH. LAT. AMERICA	0.00	1.06	-5.66	-5.98	-8.57	-4.91	-6.28
OTH. W. EUROPE	0.00	-8.89	-55.81	88.46	-85.29	104.35	12.93
ROW*	0.00	-3.03	-22.44	-9.57	-7.56	6.61	-8.24
WORLD TOTAL	0.00	3.12	0.59	0.91	1.35	7.19	2.51

* Rest of World

Corn

Estimated U.S. corn exports during the last four years under the more favorable macroeconomic assumptions increase an average of 35 percent over the actual levels (Table 5). Ending stocks are drawn down by more than a third from actual levels and prices on average increase by nearly 16 percent. The larger stock drawdown compared with wheat is due to the fact that corn release trigger prices for the farmer-owned reserve and government-owned stocks are quite a bit lower relative to loan rates than those of wheat. Total supply increases slightly--more than one percent on average during the period--but there is a substantial increase in production which is offset by the declining inventories. Feed demand was up, in spite of higher prices, because of the more rapid income growth in the United States and the consequent livestock demand expansion.

The average increase in net exports of the major exporting countries for the period is about 15 percent (Table 6). This is larger than is the case for wheat, since the income elasticity for feed grains is larger than that for wheat. The United States also gains market share as a result of higher incomes and increased domestic consumption in other exporting countries. As is the case with wheat, the U.S. export share, instead of declining by 10 percentage points over the period, remains on average near the peak level in 1979/80.

The 15 percent average growth in imports comes primarily from the EC, Spain, and the USSR (Table 7). For the other regions, the effect of higher income growth is choked off by the higher prices. The most dramatic story on the import side is the European Community. Instead of moving from a net import position of 9 million tons in 1979/80 to a net export position in 1984/85, EC net imports remain relatively stable around the 9 million ton level. Since EC internal prices are fixed and are not affected by the changes that are occurring in international prices, the income growth effects are not at all dampened by increases in world market price levels.

Soybeans

Estimated soybean exports of the United States under the more favorable macroeconomic assumptions increase on an average of over 20 percent in the last four years of the period (Table 8). Part of this increased export volume is drawn from domestic crushing use and stocks, but a larger amount comes from a more than 4 percent increase in domestic supplies. Price is driven up by about 20 percent on average during this period as a result of the increased export demand.

The exports of major exporting countries increase by nearly 13 percent on average during the period (Table 9). The exports of Brazil and Argentina decline due to increases in domestic use. In Brazil, soybean exports drop to nearly half their actual levels, but most of Brazil's exports are in the form of soymeal. The United

TABLE 5. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. CORN DOMESTIC SUPPLY AND USE

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
SUPPLY	234.51	209.71	232.50	264.40	185.30	213.30	223.88
DOMESTIC USE	131.64	123.63	127.32	137.65	119.56	131.53	129.02
EXPORTS	61.80	59.82	49.96	47.50	47.37	46.69	47.88
END STOCKS	41.07	26.26	55.22	79.25	18.37	35.08	46.98
PRICE ($/MT)	99.21	122.43	98.42	106.29	129.91	104.33	109.74
MACRO ALTERNATIVE							
SUPPLY	234.51	209.71	229.63	246.24	200.97	223.72	225.14
DOMESTIC USE	131.64	120.97	130.26	138.60	124.16	129.78	130.70
EXPORTS	61.80	65.53	58.50	62.11	65.99	71.30	64.48
END STOCKS	41.07	23.21	40.87	45.53	10.82	22.64	29.97
PRICE ($/MT)	99.21	126.90	105.01	125.60	157.53	121.79	127.48
PERCENT CHANGE	(PERCNET)						
SUPPLY	0.00	0.00	-1.23	-6.87	8.46	4.88	1.31
DOMESTIC USE	0.00	-2.15	2.31	0.69	3.85	-1.33	1.38
EXPORTS	0.00	9.55	17.09	30.76	39.31	52.71	34.97
END STOCKS	0.00	-11.61	-25.99	-42.55	-41.10	-35.46	-36.27
PRICE ($/MT)	0.00	3.65	6.70	18.17	21.26	16.74	15.71

TABLE 6. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON FEEDGRAINS NET EXPORTS BY EXPORTERS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
ARGENTINA	5.13	13.88	10.14	11.41	10.67	10.42	10.66
CANADA	3.64	3.35	6.62	5.80	6.61	3.22	5.56
AUSTRALIA	3.89	2.84	3.38	1.24	5.75	6.66	4.26
THAILAND	2.34	2.40	3.51	2.33	3.11	3.35	3.08
SOUTH AFRICA	3.72	4.93	4.57	-2.33	0.80	0.97	1.00
TOTAL NON-U.S.	18.72	27.40	28.22	18.45	26.94	24.62	24.56
UNITED STATES	71.07	69.21	58.40	54.00	55.80	55.50	55.93
EXPORT SHARE (%)	79.15	71.64	67.42	74.53	67.44	69.27	69.67
WORLD TOTAL	89.79	96.61	86.62	72.45	82.74	80.12	80.48
MACRO ALTERNATIVE							
ARGENTINA	5.13	13.66	9.37	6.98	7.23	6.29	7.47
CANADA	3.64	2.96	6.62	4.65	6.96	1.89	5.03
AUSTRALIA	3.89	2.89	3.53	1.57	6.10	6.79	4.50
THAILAND	2.34	2.30	3.18	1.80	2.36	2.41	2.44
SOUTH AFRICA	3.72	5.34	4.72	-2.54	0.32	0.20	0.68
TOTAL NON-U.S.	18.72	27.15	27.42	12.46	22.97	17.58	20.11
UNITED STATES	71.07	74.92	66.94	68.61	74.42	80.11	72.52
EXPORT SHARE (%)	79.15	73.40	70.94	84.63	76.41	82.00	78.50
WORLD TOTAL	89.79	102.07	94.36	81.07	97.39	97.69	92.63
PERCENT CHANGE	(PERCENT)						
ARGENTINA	0.00	-1.59	-7.59	-38.83	-32.24	-39.64	-29.57
CANADA	0.00	-11.64	0.00	-19.83	5.30	-41.30	-13.96
AUSTRALIA	0.00	1.76	4.44	26.61	6.09	1.95	9.77
THAILAND	0.00	-4.17	-9.40	-22.75	-24.12	-28.06	-21.08
SOUTH AFRICA	0.00	8.32	3.28	9.01	-60.00	-79.38	-31.77
TOTAL NON-U.S.	0.00	-0.91	-2.83	-32.47	-14.74	-28.59	-19.66
UNITED STATES	0.00	8.25	14.62	27.06	33.37	44.34	29.85
EXPORT SHARE (%)	0.00	2.46	5.22	13.55	13.31	18.38	12.61
WORLD TOTAL	0.00	5.65	8.94	11.90	17.71	21.93	15.12

TABLE 7. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON FEEDGRAINS NET IMPORTS BY IMPORTERS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
EC	9.30	6.56	5.45	1.79	1.24	-4.04	1.11
JAPAN	18.89	18.86	18.32	18.70	20.51	20.41	19.49
SPAIN	5.90	3.72	7.79	6.72	4.80	3.42	5.68
USSR	18.40	18.00	25.50	11.30	11.50	27.00	18.83
E. EUROP	8.80	9.76	4.85	0.78	0.97	0.58	1.80
HI INCOM E ASIA	6.18	6.79	7.88	9.23	8.69	8.72	8.63
ROW*	22.32	32.92	16.83	23.93	35.03	24.03	24.96
TOTAL	89.79	96.61	86.62	72.45	82.74	80.12	80.48
MACRO ALTERNATIVE							
EC	9.30	6.79	10.14	10.11	10.92	6.36	9.38
JAPAN	18.89	18.83	18.44	19.09	20.94	20.72	19.80
SPAIN	5.90	4.03	8.66	7.95	6.33	5.27	7.05
USSR	18.40	19.87	28.16	13.79	15.19	29.79	21.73
E. EUROPE	8.80	12.34	4.54	0.13	0.48	0.33	1.37
HI INCOME E ASIA	6.18	6.77	7.47	8.25	7.73	7.85	7.83
ROW*	22.32	33.44	16.96	21.80	35.80	27.39	25.49
TOTAL	89.79	102.07	94.37	81.12	97.39	97.71	92.65
PERCENT CHANGE	(PERCENT)						
EC	0.00	3.51	86.06	464.80	780.65	-257.43	268.52
JAPAN	0.00	-0.16	0.66	2.09	2.10	1.52	1.59
SPAIN	0.00	8.33	11.17	18.30	31.88	54.09	28.86
USSR	0.00	10.39	10.43	22.04	32.09	10.33	18.72
E. EUROPE	0.00	26.43	-6.39	-83.33	-50.52	-43.10	-45.84
HI INCOME E ASIA	0.00	-0.29	-5.20	-10.62	-11.05	-9.98	-9.21
ROW*	0.00	1.58	0.77	-8.90	2.20	13.98	2.01
TOTAL	0.00	5.65	8.95	11.97	17.71	21.95	15.14

* Rest of World

TABLE 8. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. SOYBEANS DOMESTIC SUPPLY AND USE

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
SUPPLY	66.30	58.68	62.65	66.54	53.90	55.43	59.63
DOMESTIC USE	32.72	30.45	30.44	32.53	28.91	30.55	30.61
EXPORTS	23.82	19.71	25.28	24.63	20.21	16.28	21.60
END STOCKS	9.76	8.52	6.93	9.38	4.78	8.60	7.42
PRICE ($MT)	230.75	278.15	221.93	209.07	286.97	213.11	232.77
MACRO ALTERNATIVE							
SUPPLY	66.30	58.68	60.33	68.50	57.55	61.72	62.03
DOMESTIC USE	32.72	30.37	27.83	32.60	25.00	31.15	29.14
EXPORTS	23.82	21.15	26.83	27.90	26.03	21.78	25.63
END STOCKS	9.76	7.16	5.68	8.00	6.52	8.79	7.25
PRICE ($/MT)	230.75	276.68	271.16	252.80	355.31	237.36	279.16
PERCENT CHANGE	(PERCENT)						
SUPPLY	0.00	0.00	-3.70	2.94	6.77	11.35	4.34
DOMESTIC USE	0.00	-0.27	-8.59	0.23	-13.54	1.97	-4.98
EXPORTS	0.00	7.31	6.12	13.26	28.82	33.76	20.49
END STOCKS	0.00	-15.96	-18.03	-14.75	36.39	2.21	1.46
PRICE ($/MT)	0.00	-0.53	22.18	20.92	23.82	11.38	19.57

TABLE 9. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON SOYBEAN NET EXPORTS BY EXPORTERS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
BRAZIL	1.06	0.56	-0.37	1.23	1.59	3.10	1.39
ARGENTINA	2.73	2.19	1.88	1.42	2.97	3.29	2.39
CHINA	-0.60	-0.40	-0.38	0.29	0.73	1.05	0.42
TOTAL NON-U.S.	3.19	2.35	1.13	2.94	5.29	7.44	4.20
UNITED STATES	23.82	19.71	25.28	24.63	20.21	16.28	21.60
EXPORT SHARE (%)	88.19	89.35	95.72	89.34	79.25	68.63	83.24
WORLD TOTAL	27.01	22.06	26.41	27.57	25.50	23.72	25.80
MACRO ALTERNATIVE							
BRAZIL	1.06	0.59	-0.13	1.06	0.40	1.50	0.71
ARGENTINA	2.73	2.19	1.88	1.35	2.65	3.19	2.27
CHINA	-0.60	-0.37	-0.36	0.32	0.86	1.08	0.48
TOTAL NON-U.S.	3.19	2.41	1.39	2.73	3.91	5.77	3.45
UNITED STATES	23.82	21.16	26.83	27.88	26.04	21.80	25.64
EXPORT SHARE (%)	88.19	89.81	95.11	91.38	86.57	79.14	88.05
WORLD TOTAL	27.01	23.57	28.22	30.61	29.95	27.57	29.09
PERCENT CHANGE	(PERCENT)						
BRAZIL	0.00	5.36	-64.86	-13.82	-74.84	-51.61	-51.29
ARGENTINA	0.00	0.00	0.00	-4.93	-10.77	-3.04	-4.69
CHINA	0.00	-7.50	-5.26	10.34	17.81	2.86	6.44
TOTAL NON-U.S.	0.00	2.55	23.01	-7.14	-26.09	-22.45	-8.17
UNITED STATES	0.00	7.36	6.13	13.20	28.85	33.91	20.52
EXPORT SHARE (%)	0.00	0.52	-0.64	2.29	9.23	15.30	6.55
WORLD TOTAL	0.00	6.84	6.85	11.03	17.45	16.23	12.89

States gains on average 5 percentage points in export share. During the last two years the gains are over 7 and 10 percentage points, respectively.

The major source of growth in imports, again, is in the developed countries (Table 10). Europe, Japan, and the USSR all increase imports, with the EC being the major growth area in volume. In the rest of the world the increased demand for soybeans is choked off by the higher prices.

Industry Performance Measures

The higher prices and the removal of PIK and paid diversion programs under the alternative scenario combine to increase acreage planted in all three crops, especially during the last two years of the period (Table 11 and Figure 4). The largest increases are during the PIK year (1983/84) for wheat and corn, and the following year for wheat, when there is a large paid diversion program. The estimated planted acreage path looks much like the acreage path of the mid-1970s.

A combination of higher prices and higher acreage planted increase the estimated value of crop production by an average of 30 percent over the last four years (Table 12 and Figure 5). Corn gains a value of over $5 billion per year and wheat and soybean each gain over $3 billion a year. Wheat gains slightly more than the other two crops in percentage, because of the larger acreage gains in wheat.

The estimated value of exports increases because of rises in the volumes and the price levels resulting from the alternative scenario (Table 13 and Figure 6). On average, the value of exports gains nearly 50 percent for these commodities during the last four years of the period. Corn and soybeans gain relatively more than wheat, since their demand response to world income growth is larger.

Estimates of the net farm income impact of the macroeconomic alternative scenario are derived in a standard farm sector balance sheet. Since these are usually done on a calendar year basis, only calendar years 1981-84 are covered by this analysis. Increases in cash receipts from marketings grow from about $1.3 billion in 1981 to over $15 billion in 1984 (Table 14). Most of these increases come from crop marketings, since livestock receipts under the macro alternative decline slightly in the first two years and increase slightly in the last two. Government payments to producers for target price support, paid diversion (including PIK), and disaster payments decline under this scenario by $0.9 to $1.4 billion in the first two years and by $6 to $7 billion in the last two years. The large reduction in payments the last two years reflects the removal of the PIK program for acreage reduction. The increase in total receipts ranges from $0.5 to $10.5 billion and averages $5 billion per year.

TABLE 10. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON SOYBEAN NET IMPORTS BY IMPORTERS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION METRIC TONS)						
ACTUAL							
EC	11.98	10.01	12.35	11.89	9.69	9.81	10.94
SPAIN	3.10	2.79	3.20	3.04	2.60	2.00	2.71
JAPAN	4.40	4.21	4.49	4.87	4.73	4.61	4.68
E.EUROPE	0.85	0.52	0.48	0.78	0.84	0.59	0.67
USSR	1.47	1.39	1.48	1.05	0.95	0.85	1.08
ROW*	5.21	3.14	4.41	5.94	6.69	5.86	5.73
WORLD TOTAL	27.01	22.06	26.41	27.57	25.50	23.72	25.80
MACRO ALTERNATIVE							
EC	11.98	10.92	13.84	14.17	12.72	12.29	13.26
SPAIN	3.10	3.26	3.67	4.07	4.09	3.13	3.74
JAPAN	4.40	4.25	4.52	4.91	4.84	4.72	4.75
E.EUROPE	0.85	0.58	0.55	0.85	1.19	0.85	0.86
USSR	1.47	1.43	1.52	1.08	0.98	0.87	1.11
ROW*	5.21	3.15	4.10	5.52	6.15	5.70	5.37
WORLD TOTAL	27.01	23.59	28.20	30.60	29.97	27.56	29.08
PERCENT CHANGE	(PERCENT)						
EC	0.00	9.09	12.06	19.18	31.27	25.28	21.95
SPAIN	0.00	16.85	14.69	33.88	57.31	56.50	40.59
JAPAN	0.00	0.95	0.67	0.82	2.33	2.39	1.55
E.EUROPE	0.00	11.54	14.58	8.97	41.67	44.07	27.32
USSR	0.00	2.88	2.70	2.86	3.16	2.35	2.77
ROW*	0.00	0.32	-7.03	-7.07	-8.07	-2.73	-6.23
WORLD TOTAL	0.00	6.94	6.78	10.99	17.53	16.19	12.87

* Rest of World

TABLE 11. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. PLANTED ACREAGE OF WHEAT, CORN, AND SOYBEANS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION ACRES)						
ACTUAL							
WHEAT	71.6	80.6	88.9	87.4	76.4	79.2	83.0
CORN	81.4	84.0	84.1	81.9	60.2	80.5	76.7
SOYBEANS	71.6	69.9	67.5	70.9	63.8	67.7	67.5
TOTAL	224.6	234.5	240.5	240.2	200.4	227.4	227.1
MACRO ALTERNATIVE							
WHEAT	71.6	80.6	88.1	90.7	97.9	96.3	93.27
CORN	81.4	84.0	84.2	80.8	85.3	84.5	83.70
SOYBEANS	71.6	69.9	66.4	74.7	71.0	73.8	71.48
TOTAL	224.6	234.5	238.7	246.2	254.2	254.6	248.44
PERCENT CHANGE	(PERCENT)						
WHEAT	0.0	0.0	-0.9	3.8	28.1	21.6	13.15
CORN	0.0	0.0	0.1	-1.3	41.7	5.0	11.36
SOYBEANS	0.0	0.0	-1.6	5.4	11.3	9.0	6.01
TOTAL	0.0	0.0	-0.7	2.5	26.8	12.0	10.14

Figure 4.

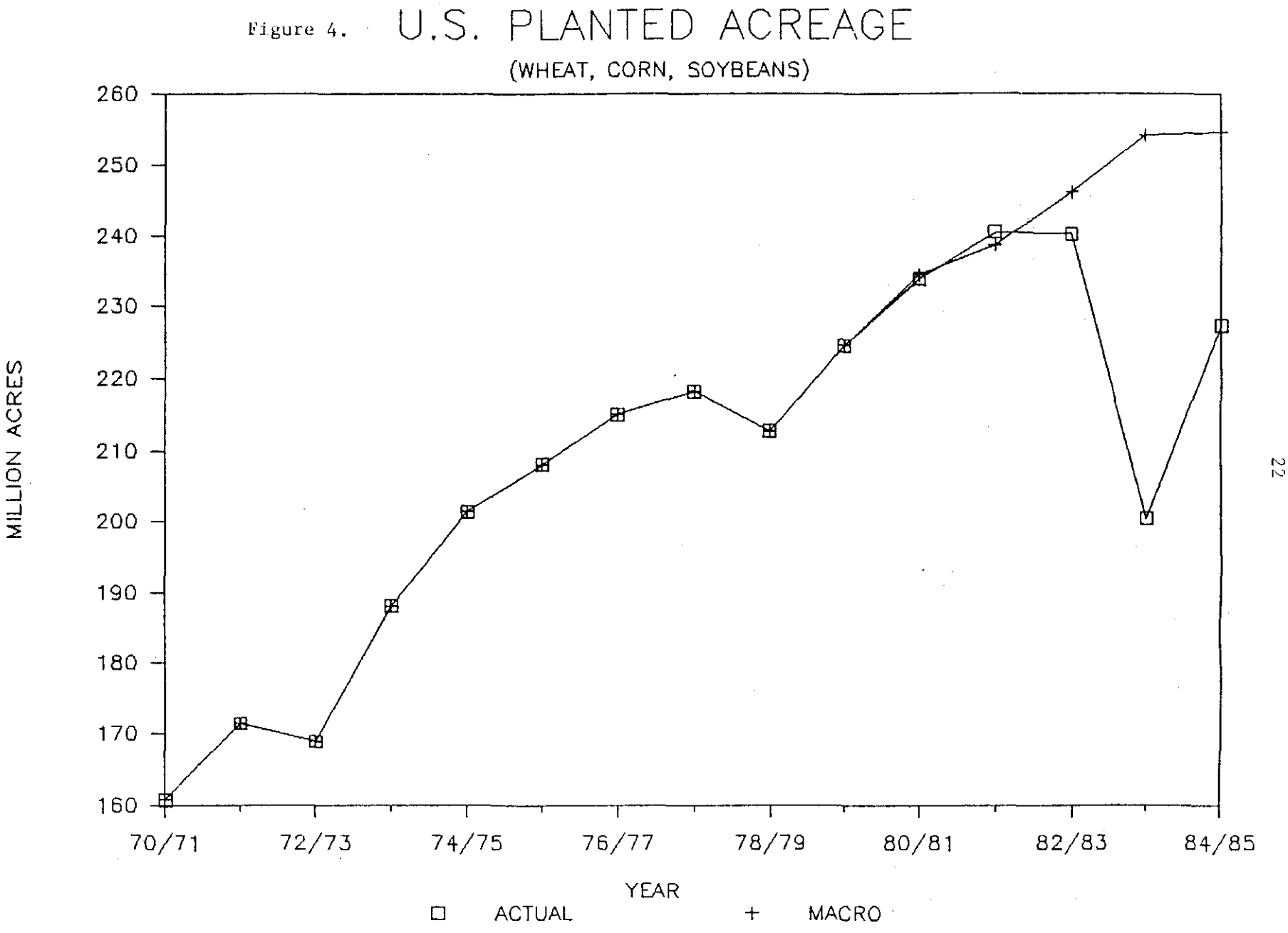
U.S. PLANTED ACREAGE
(WHEAT, CORN, SOYBEANS)
MILLION ACRES
260
250
240
230
220
210
200
190
180
170
160
70/71
72/73
74/75
76/77
78/79
80/81
82/83
84/85
YEAR
ACTUAL
MACRO

TABLE 12. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON VALUE OF U.S. PRODUCTION OF WHEAT, CORN, AND SOYBEANS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION DOLLARS)						
ACTUAL							
WHEAT	8070	9310	10166	9822	8548	8768	9326
CORN	19979	20647	20297	22234	13777	20337	19161
SOYBEANS	14199	13611	12013	12461	12777	10794	12011
TOTAL	42247	43567	42476	44517	35102	39898	40498
MACRO ALTERNATIVE							
WHEAT	8070	9028	11930	12098	13449	12143	12405
CORN	19979	21395	21661	25962	24292	25876	24448
SOYBEANS	14199	13542	14407	15839	17570	13114	15233
TOTAL	42247	43965	47998	53898	55310	51134	52085
PERCENT CHANGE	(PERCENT)						
WHEAT	0.0	-3.0	17.4	23.2	57.3	38.5	34.1
CORN	0.0	3.6	6.7	16.8	76.3	27.2	31.8
SOYBEANS	0.0	-0.5	19.9	27.1	37.5	21.5	26.5
TOTAL	0.0	0.9	13.0	21.1	57.6	28.2	30.0

Figure 5. VALUE OF U.S. PRODUCTION

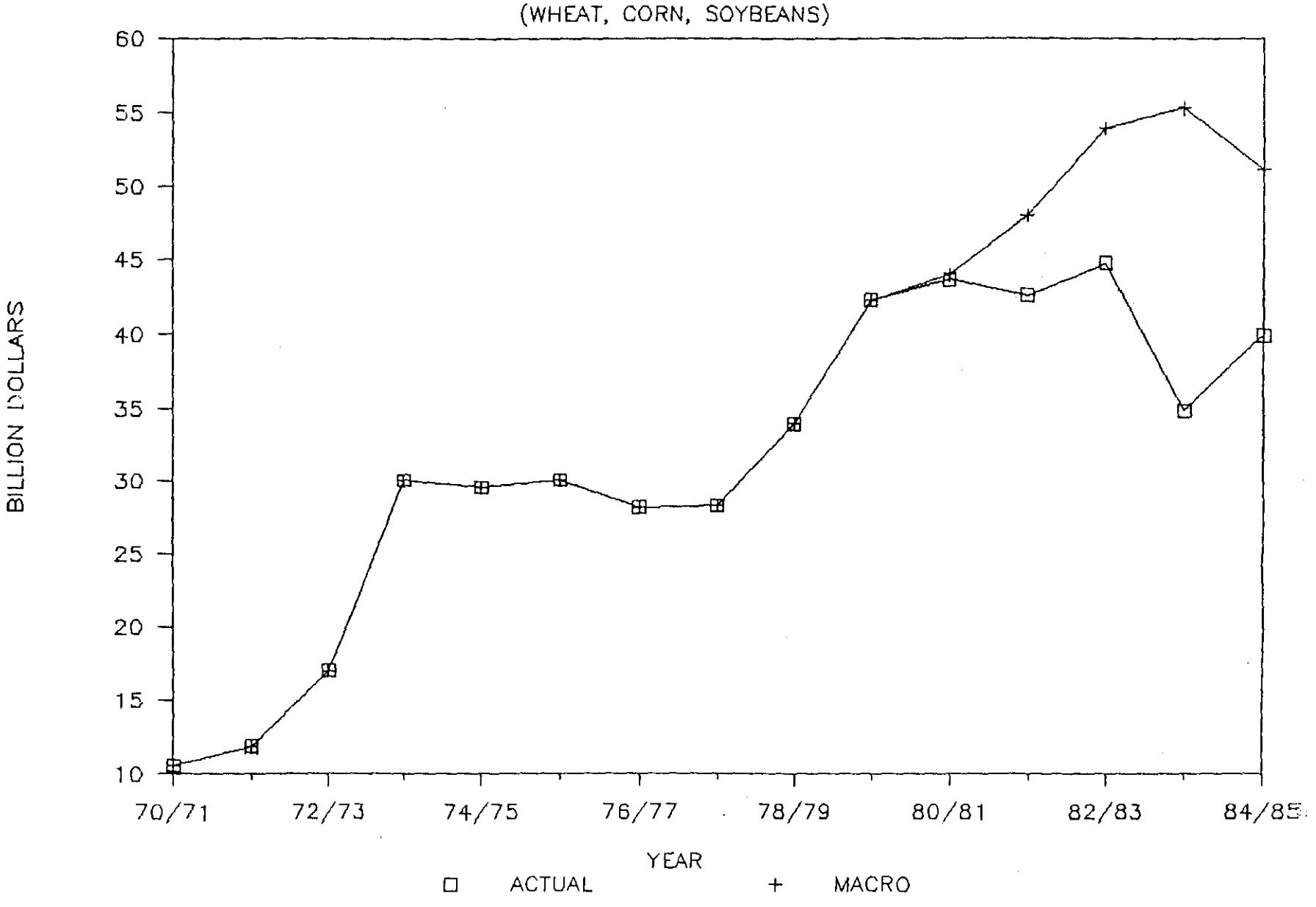

TABLE 13. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON VALUE OF U.S. EXPORTS OF WHEAT, CORN, AND SOYBEANS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION DOLLARS)						
ACTUAL							
WHEAT	5197	5919	6464	5357	5044	4812	5420
CORN	6131	7324	4917	5049	6154	4871	5248
SOYBEANS	5496	5482	5610	5149	5800	3469	5007
TOTAL	16825	18725	16992	15555	16998	13153	15674
MACRO ALTERNATIVE							
WHEAT	5197	6144	7996	7366	7391	7487	7560
CORN	6131	8281	6099	7767	10353	8646	8216
SOYBEANS	5496	5860	7301	6994	9213	5163	7168
TOTAL	16825	20285	21396	22127	26957	21296	22944
PERCENT CHANGE	(PERCENT)						
WHEAT	0.0	3.8	23.7	37.5	46.5	55.6	40.8
CORN	0.0	13.1	24.0	53.8	68.2	77.5	55.9
SOYBEANS	0.0	6.9	30.1	35.8	58.9	48.8	43.4
TOTAL	0.0	8.3	25.9	42.2	58.6	61.9	47.2

Figure 6.

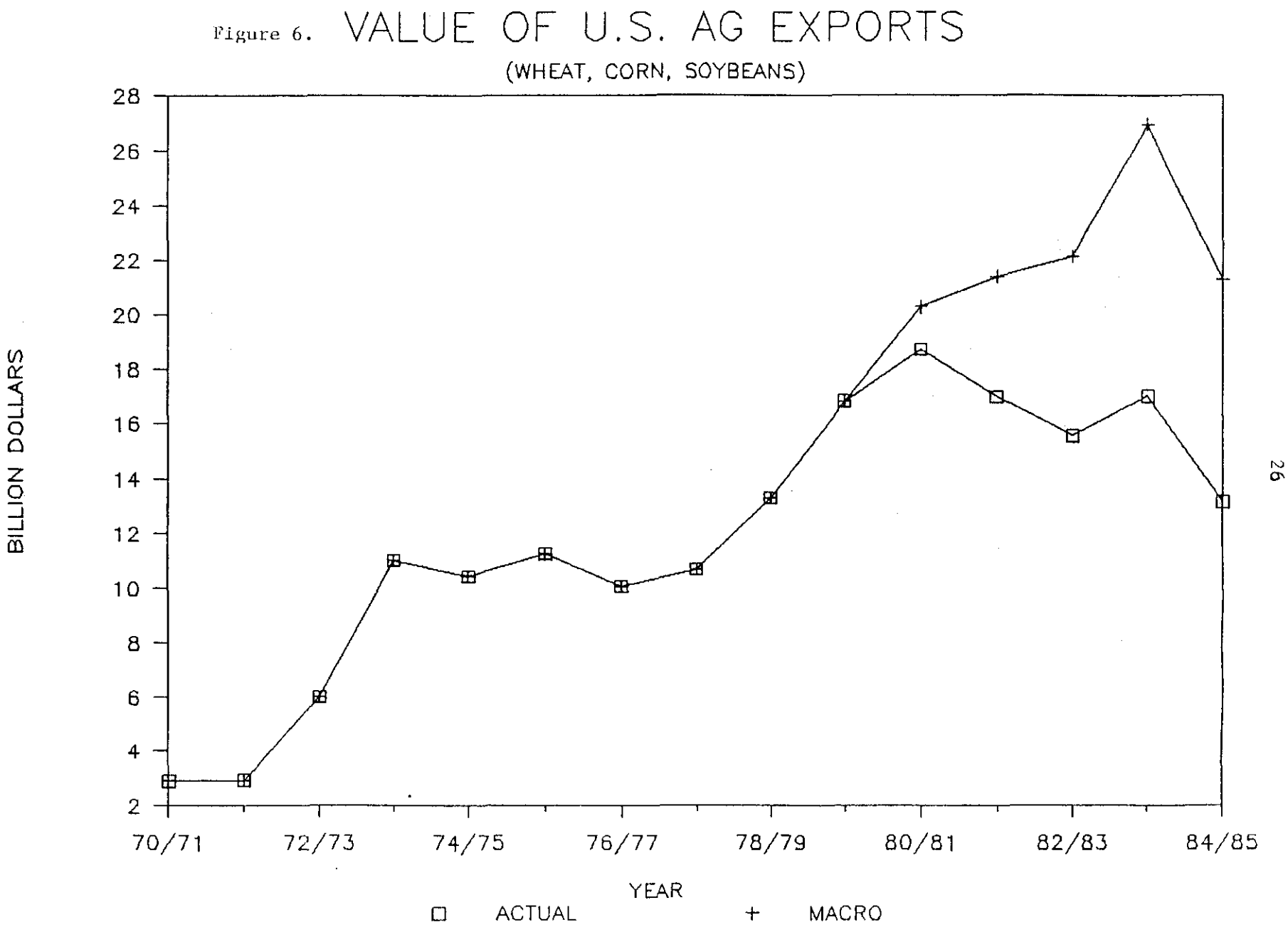
VALUE OF U.S. AG EXPORTS
(WHEAT, CORN, SOYBEANS)
BILLION DOLLARS
28
26
24
22
20
18
16
14
12
10
8
6
4
2
70/71
72/73
74/75
76/77
78/79
80/81
82/83
84/85
YEAR
ACTUAL
MACRO

TABLE 14. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. CASH RECEIPTS, PRODUCTION EXPENSES, AND NET FARM INCOME

YEAR	1981	1982	1983	1984	81-84 AVE
			(BILLION DOLLARS)		
ACTUAL					
CASH RECEIPTS					
CROPS	72.9	72.7	66.8	69.1	70.4
LIVESTOCK	69.2	70.3	69.4	72.7	70.4
TOTAL	142.1	143.0	136.2	141.8	140.8
GOV. PAYMENTS	1.9	3.5	9.3	8.4	5.8
TOT RECEIPTS BEFORE INV. CHANGE	160.2	163.0	161.2	166.2	162.6
PRODUCTION EXPENSES	136.1	136.9	135.6	139.5	137.0
NET INCOME BEFORE INV. CHANGE	24.1	26.1	25.6	26.7	25.6
VALUE OF INV. CHANGE	5.8	-1.4	-10.6	7.8	0.4
NET FARM INCOME	29.9	24.7	15.0	34.5	26.2
MACRO ALTERNATIVE (CHANGE FROM ACTUAL)					
CASH RECEIPTS					
CROPS	2.0	4.7	12.3	14.8	8.5
LIVESTOCK	-0.7	-0.6	0.3	0.5	-0.1
TOTAL	1.3	4.1	12.6	15.3	8.3
GOV. PAYMENTS	-0.9	-1.4	-7.1	-6.0	-3.9
TOT RECEIPTS BEFORE INV. CHANGE	0.5	3.0	6.1	10.6	5.1
PRODUCTION EXPENSES	-1.6	-1.4	12.0	11.4	5.1
NET INCOME BEFORE INV. CHANGE	2.1	4.3	-5.9	0.8	0.3
VALUE OF INV. CHANGE	0.8	0.2	3.6	-0.6	1.0
NET FARM INCOME	2.9	4.5	-2.3	-1.4	0.9
PERCENT CHANGE OVER ACTUAL			(PERCENT)		
CASH RECEIPTS					
CROPS	2.74	6.46	18.41	21.42	12.26
LIVESTOCK	-1.01	-0.85	0.43	0.69	-0.19
TOTAL	0.91	2.87	9.25	10.79	5.96
GOV PAYMENTS	-47.37	-40.00	-76.34	-71.43	-58.79
TOT RECEIPTS BEFORE INV. CHANGE	0.31	1.84	3.78	6.37	3.08
PRODUCTION EXPENSES	-1.18	-1.02	8.85	8.17	3.72
NET INCOME BEFORE INV. CHANGE	8.71	16.48	-23.05	3.00	1.17
VALUE OF INV. CHANGE	13.79	-14.29	-33.96	-7.69	-10.38
NET FARM INCOME	9.70	18.22	-15.33	-4.06	3.44

Production expenses are influenced both by the changing macroeconomic assumptions and by the increases in crop area planted and harvested. Estimated expenses change less than one percent in the first two years but rise sharply in the last two years when planted area is from 12 to 27 percent higher. The final element of net farm income is the inventory change. This impact is positive in most years and is especially high during 1983, because the changed commodity market conditions mean farmers do not store as much of their commodities under loan.

The result of these changes in receipts, expenses, and inventories is that the macro alternative assumptions increase net farm income by $3 to $4.5 billion in the first two years and reduce it by $1.4 to $2.3 billion in the last two years (Figure 7). Over the four year period net farm income on average is higher by about $1 billion per year. The indicators, however, that the more favorable macro alternative would cause net farm income to decline in any year at first seems like an anomaly. It appears that the results of the last two years are unusual largely because of the PIK program. The foregone PIK payments of $6 to $7 billion the last two years are apparently larger than the profits farmers could have earned by putting the land into production.

Government Stocks and Costs

The higher prices generated under the macroeconomic alternative make it possible to release some government-owned and farmer-owned reserve stocks during the period of analysis. As indicated in Table 15, relatively few farmer-owned reserve stocks and no CCC stocks are released for wheat. By contrast, farmer-owned reserve stocks of corn are completely emptied in 3 of the 5 years and government stocks are emptied in the last two years. This difference exists because the release price for corn is not as high relative to the loan rate as it is for wheat. The very small amounts of government soybean stocks are also emptied out during this period.

The lower stock levels, in addition to the elimination of PIK and paid diversion programs and the reduction or elimination of deficiency payments in many years, lead to a substantial decline in government program costs during this period (Figure 8). Costs in 1982/83 to 1984/85 are 43 to 54 percent lower and the average savings over the last four years are over $7 billion per year.

More detail on these estimated cost reductions is provided in Table 16. Deficiency and diversion payments are eliminated completely in the first five years and reduced by over 70 percent in fiscal year 1984/85. All the PIK payments for acreage reduction are also eliminated. Net loan activity costs are lower because when market prices are higher fewer loans are taken out and a higher proportion are repaid. The lower FOR and government stock levels also mean lower storage costs and producer storage payments. These estimated savings are probably conservative, since it was not possible to estimate interest cost savings.

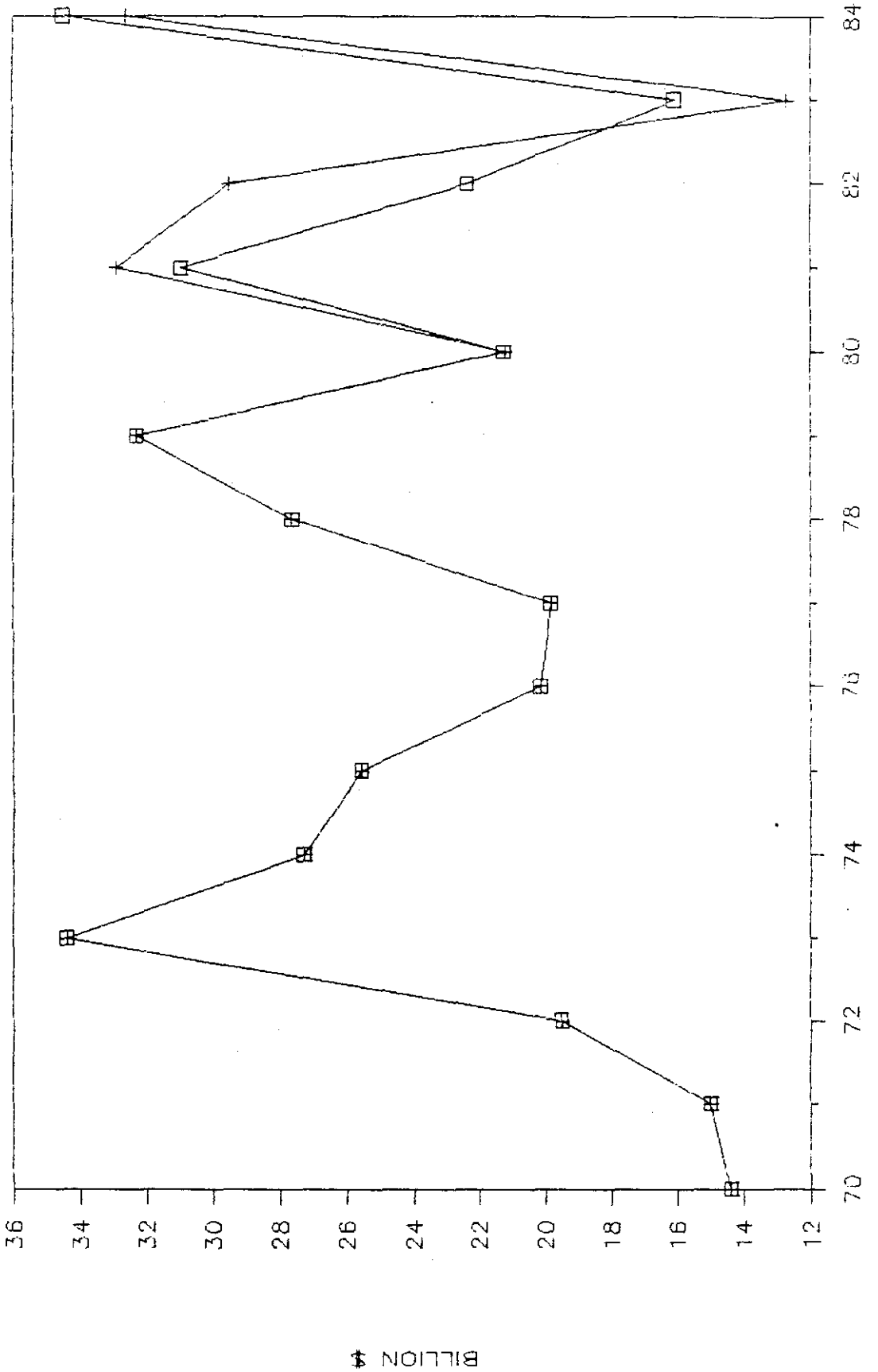
NET FARM INCOME
BILLION $
36
34
32
30
28
26
24
22
20
18
16
14
12
70
72
74
76
78
80
82
84
YEAR
ACTUAL
MACRO

Figure 7.

TABLE 15. EFFECTS OF MACRO ALTERNATIVE SCENARIO ON U.S. GOVERNMENT STOCKS OF WHEAT, CORN, AND SOYBEANS

YEAR	79/80	80/81	81/82	82/83	83/84	84/85	81-84 AVE
	(MILLION BUSHELS)						
ACTUAL							
WHEAT							
FOR	260	360	560	1060	1010	654	821
CCC	188	200	190	192	188	378	237
CORN							
FOR	619	180	1274	1508	425	437	911
CCC	249	232	294	1134	201	240	467
SOYBEANS							
CCC	0	0	3	21	0	32	14
MACRO ALTERNATIVE							
WHEAT							
FOR	260	360	370	853	857	654	684
CCC	188	200	190	192	188	378	237
CORN							
FOR	619	0	671	865	0	0	384
CCC	249	232	232	232	0	0	116
SOYBEANS							
CCC	0	0	0	0	0	0	0
PERCENT CHANGE	(PERCENT)						
WHEAT							
FOR	0.0	0.1	-33.9	-19.6	-15.1	0.0	-17.2
CCC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORN							
FOR	0.0	-100.0	-47.3	-42.6	-100.0	-100.0	-72.5
CCC	0.0	0.2	-21.0	-79.5	-100.0	-100.0	-75.1
SOYBEANS							
CCC	0.0	0.0	-100.0	-100.0	0.0	-100.0	-75.0

Figure 8. GOVERNMENT EXPENDITURES

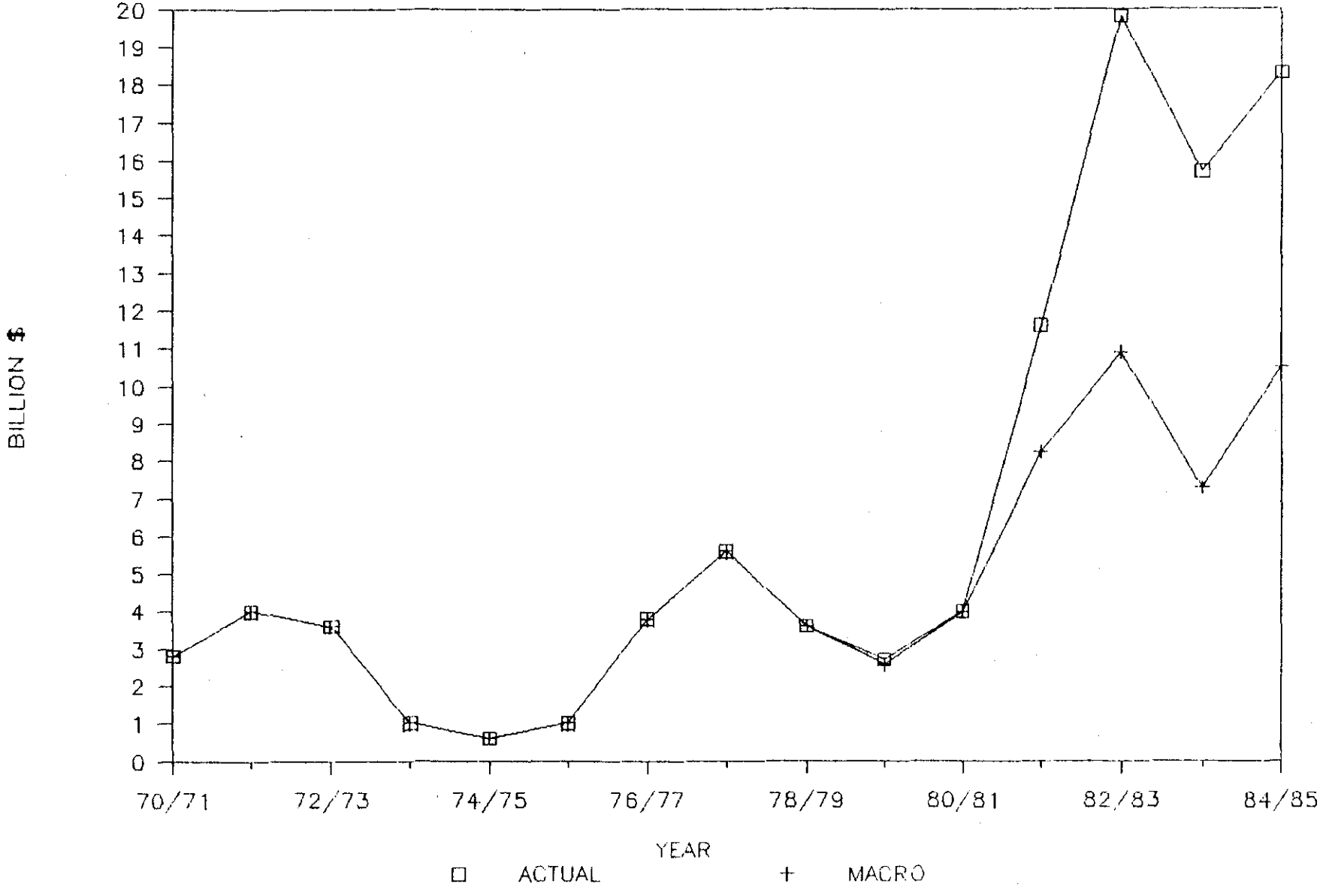

Table 16. CCC Outlay Changes for Wheat, Feedgrains and Soybean Programs under the Alternative Macro Scenario.

	Fiscal Years						81-84 Average
	79/80	80/81	81/82	82/83	83/84	84/85	
	(Million Dollars)						
Direct payments[a]	-136	0	-696	-2268	-1522	-3873	-2090
PIK program[b]	0	0	0	- 403	-7055	- 611	-2017
Loan Programs[c]	0	-23	-2665	-6232	148	-3331	-3020
Total	-136	-23	-3361	-8903	-8429	-7815	-7127

[a] Deficiency and diversion payments

[b] PIK payments

[c] Loans and purchases less repayments and sales plus storage and handling plus FOR storage payments.

Conclusions

It is clear that the continuation of the 1970s macroeconomic environment would have had a substantial positive impact on both domestic and foreign demand for these commodities. In the case of corn, the combined effects of these high rates of demand growth are strong enough to empty the farmer-owned reserve and the government-owned stocks in three of the five years of the analysis. Wheat reserve stocks are drawn down slightly and soybean government stocks are completely eliminated. All of the PIK and paid diversion programs are no longer needed in the 1980s, which results in additional substantial savings to the government treasury.

Under this hypothetical scenario the value of exports continues to grow during the period, though not as rapidly as it did during the 1970s (Figure 6). We cannot speculate as to how this hypothetical macroeconomic environment could have been brought about during the 1980s or even whether it would have been possible at all. We can strongly conclude from the impacts of continuing the 1970s environment, however, that the change in the macroeconomic environment that did take place at the turn of the decade had a powerful depressing impact on the U.S. agricultural sector. The slowing income growth in both developed and developing countries stunted the growth in total demand for these products and the strengthening of the U.S. dollar made U.S. products less competitive with other exporters. These are the two major factors that are at work in this analysis.

These results provide strong quantitative evidence in support of what many economists, legislators, and farm leaders have suggested: that the performance of the U.S. agricultural sector depends heavily upon the performance of the U.S. and international macroeconomies. This analysis concludes that the unfavorable macroeconomic environment in the 1980s substantially reduced the volume and value of exports and the level of farm prices. Since the commodity programs are designed to reduce price and income risk for farmers, a major impact of the general economic deterioration was a substantial increase in government costs associated with loan programs, income payments, and stock disposal through PIK. Thus in this analysis there was a much larger impact on government cost than on net farm income. The government programs, in effect, absorbed much of the market impact of the unfavorable macroeconomic conditions.

References

Chambers, Robert G. and Richard E. Just. 1982. "An Investigation of the Effect of Monetary Factors on U.S. Agriculture." Journal of Monetary Economics 9:235-47.

Devadoss, S., William H. Meyers, and Dennis R. Starleaf. 1985. "The Impacts of U.S. Monetary Policies on the Farm Sector." Presented at the American Agricultural Economics Association Meetings, Ames, Iowa, August 6.

Freebairn, John W., Gordon C. Rausser, and Harry de Gorter. 1982. "Food and Agriculture Sector Linkages to the International and Domestic Macroeconomics." In G. C. Rausser, ed. New Directions in Econometric Modeling and Forecasting in U.S. Agriculture. Amsterdam:North-Holland Publishing Co.

McCalla, Alex F. 1982. "Impact of Macroeconomic Policies upon Agricultural and International Agricultural Development." American Journal of Agricultural Economics 64:861-68.

Meyers, William H., R. Thamodaran, and Michael D. Helmar. 1985. "Impacts of EEC Policies on U.S. Export Performance in the 1980s." Chapter 6 in Confrontation or Negotiation:United States Policy and European Agriculture, Mellwood, NY:Associated Faculty Press.

Schuh, G. E. 1984. "Future Directions for Food and Agricultural Trade Policy." American Journal of Agricultural Economics 66:242-47.

Starleaf, Dennis R., William H. Meyers, and Abner W. Womack. 1985. "The Impact of Inflation on the Real Income of U.S. Farmers." American Journal of Agricultural Economics 67:384-89.

Figure A.4. Livestock Product Prices under Alternative Economic Conditions

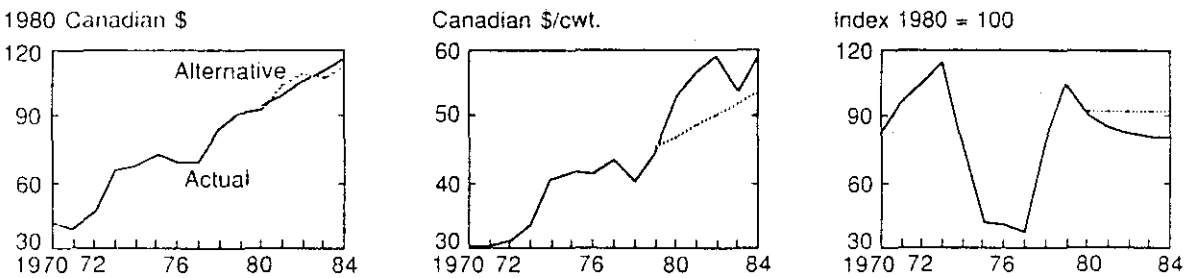

Figure A.3. Income Levels under Alternative Economic Conditions, cont...

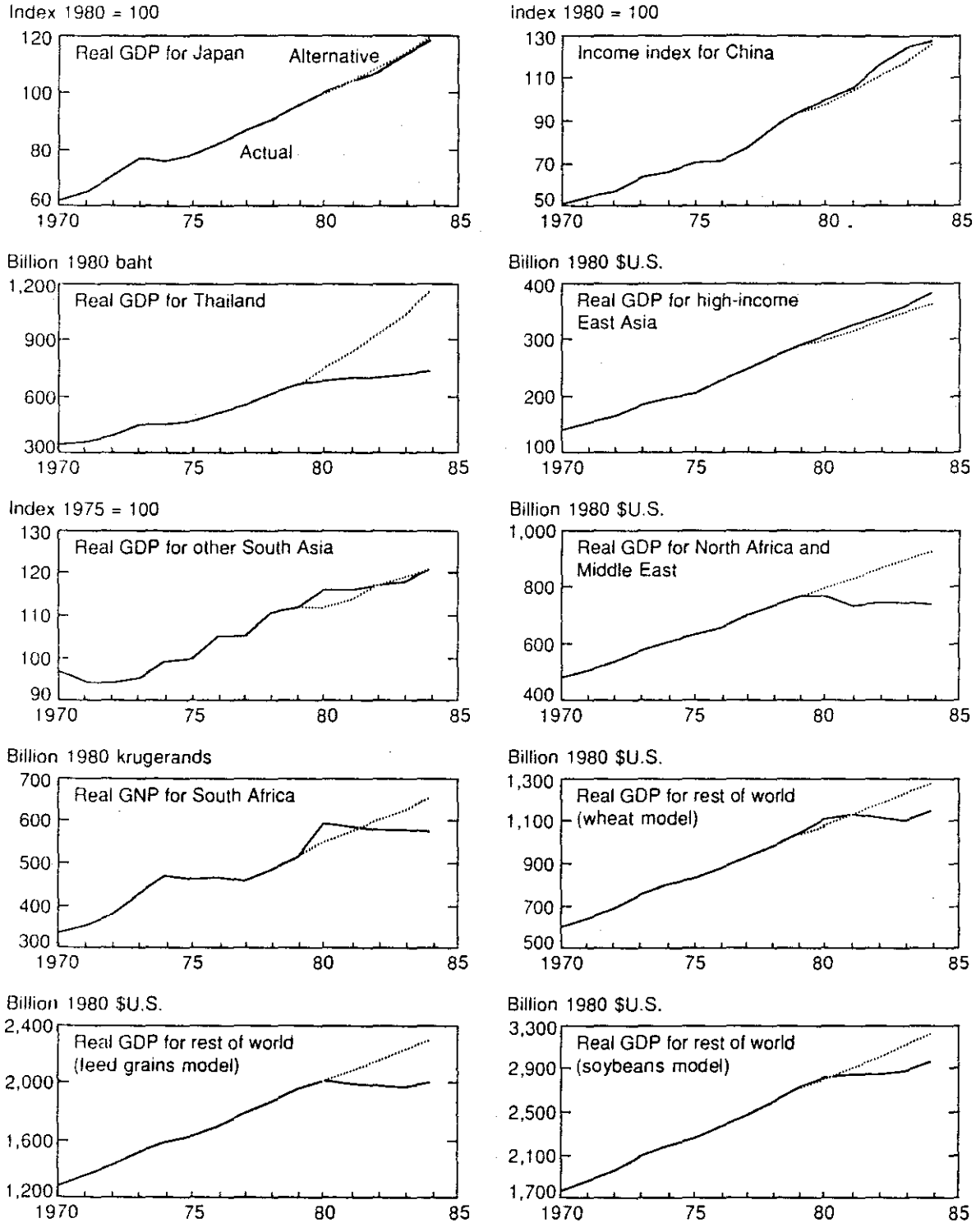

Figure A.3. Income Levels under Alternative Economic Conditions

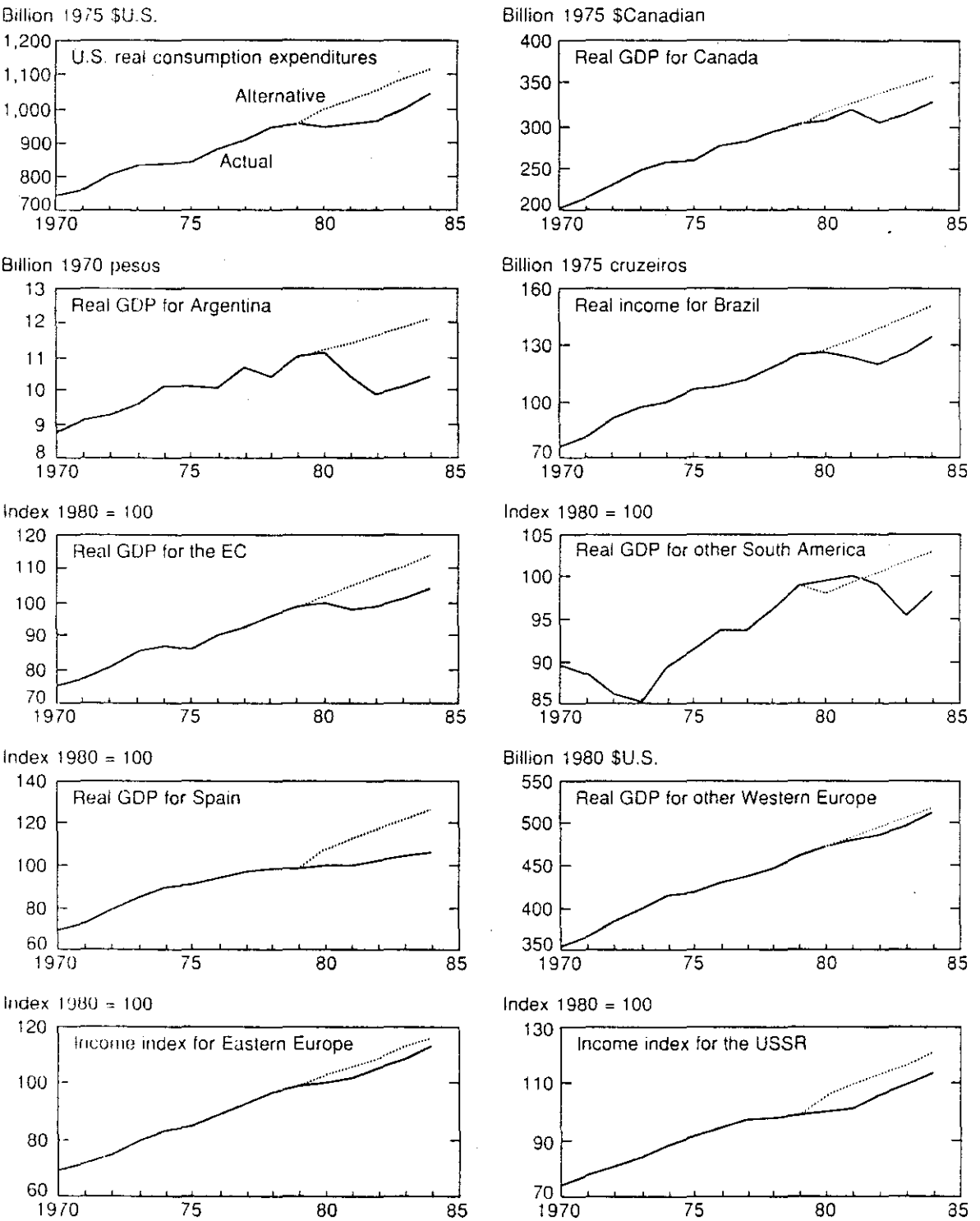

Figure A.2. Real Exchange Rates under Alternative Economic Conditions

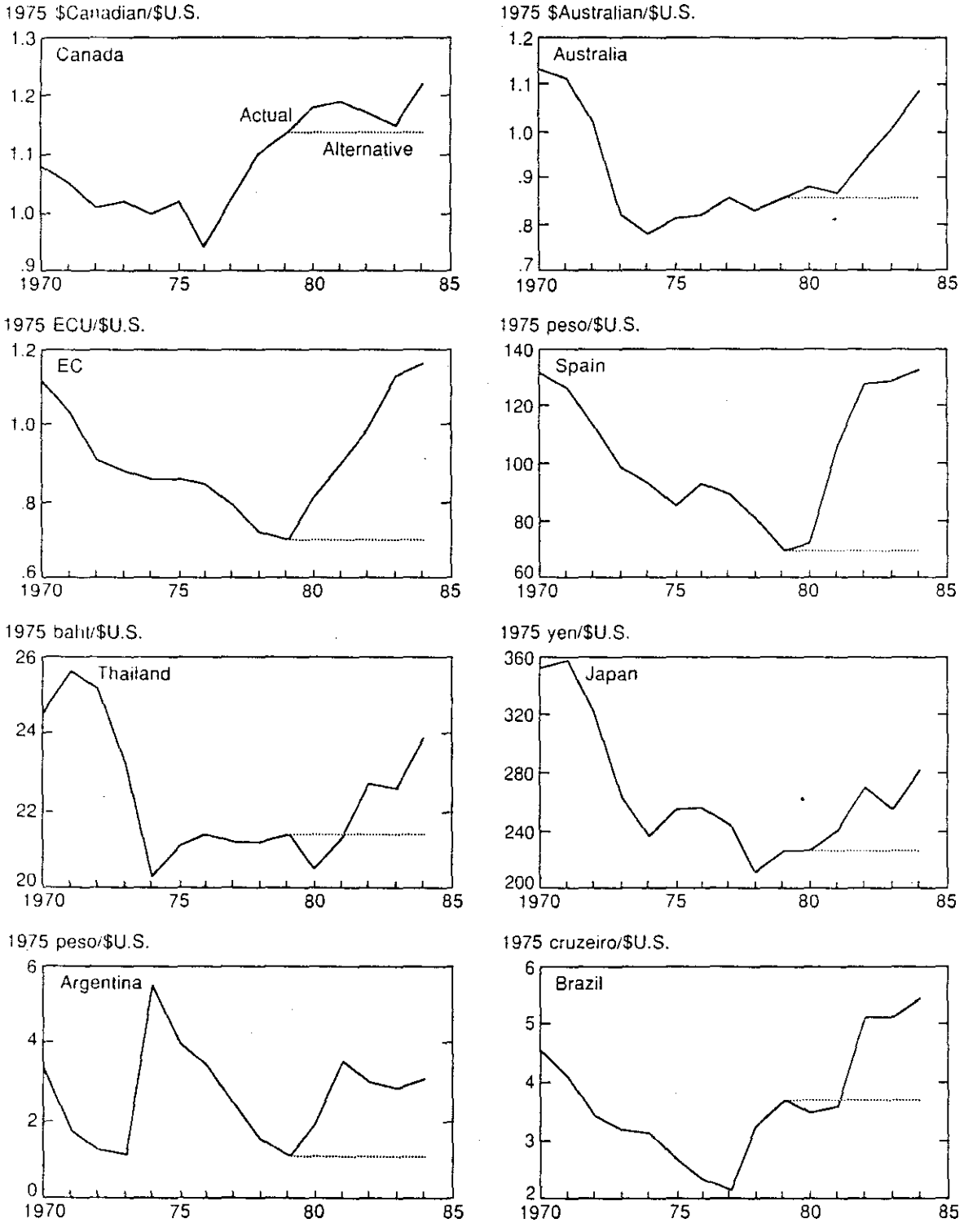

Figure A.1. Inflation Rates under Alternative Economic Conditions

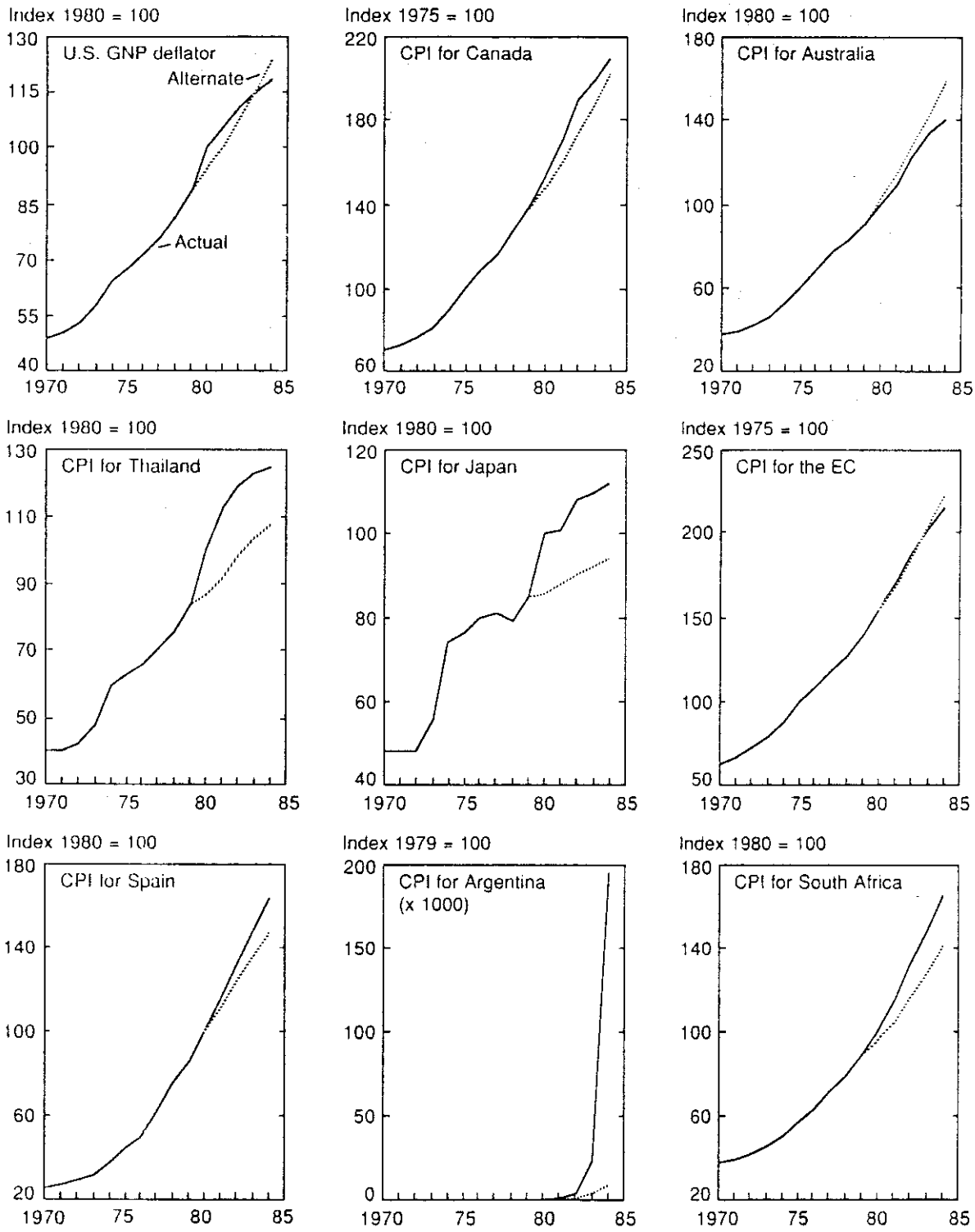

Table A.8. Computation of Price and Income Elasticities for Net Import Demand in Selected Regions Not Included in the Econometric Model

Region	Net Imports (1)	Domestic Consumption (2)	(2)/(1)	$\frac{(2)-(1)}{(1)}$	n Income Elast.	$n \times \frac{(2)}{(1)}$ Adj. Income Elast.	e_d Demand Elast.	e_s Supply Elast.	e_i Price Trans.	Adj. Net Import Elasticity
	1000 MT									
WHEAT										
North Africa and Middle East[a]	20026.0	48098.0	2.41	1.41	0.35	0.841	-0.2	0.2	0.4	-0.306
OWES Europe	220.0	9268.0	42.127	41.127	0.15	6.32	-0.2	0.2	0.25	-4.163
Oth. Asia[b]	12328.0	28505.0	2.31	1.31	0.40	0.925	-0.5	0.2	0.2	-0.362
Oth. Sou. America[c]	8312.0	12016.0	1.446	0.446	0.25	0.361	-0.2	0.2	0.5	-0.378
ROW**	10136.0	54939.0	5.42	4.42	0.40	2.17	-0.7	0.2	0.25	-1.170
FEEDGRAINS										
High Income East Asia	8263.0	9513.0	1.151	0.151	0.45	0.518	-0.7	0.2	0.6	-0.502
East Europe	3390.0	70891.0	20.912	19.912	0.35	7.32	-0.3	0.2	0.5	-5.128
ROW**	24543.0	173197.0	7.057	6.057	0.40	2.82	-0.5	0.2	0.35	-1.659
SOYMEAL										
China	475.0	1019.0	2.145		0.40	0.86				
USSR	1211.0	2358.0	2.00		0.30	0.58				
ROW**	8200.0	14920.0	1.820	0.820	0.40	0.73	-0.3	0.2	0.5	-0.355
SOYBEAN										
China	568.6	8775.0	15.433		0.2	3.09				
USSR	1269.0	1785.0	1.41		0.3	0.42				

*computed as $e_d e_i \left(\frac{(2)}{(1)}\right) - e_s e_i \left(\frac{(2)-(1)}{(1)}\right)$

**rest of world (includes all countries and regions not listed in Tables A.1 to A.8.)

[a]excludes Egypt

[b]excludes India

[c]excludes Central America

Table A.7. Price Transmission Elasticities of Feedgrain Prices with Respect to U.S. Feedgrain Prices

Country	U.S. Corn Price	U.S. Barley Price	U.S. Sorghum Price
Canada			
Barley		0.84	
Corn	0.96		
Australia			
Barley		1.12	
Argentina			
Corn	1.10		
Sorghum			1.14
Thailand			
Corn	1.12		
South Africa			
Feed grain	0.0	0.0	0.0
EC(10)			
Corn	0.0		
Barley		0.0	
Spain			
Corn	0.75		
USSR			
Feed grain	0.0	0.0	0.0
Japan			
Corn	0.97		

Table A.6. Summary of Estimated Domestic Demand Elasticities from the Feed Grains Model

Country	Elasticities of: Corn Price	Sorghum Price	Barley Price	Soymeal Price	Wheat Price	Cassava Price	Livestock Product Price	Income
U.S.								
Corn food	-0.19							
Corn feed	-0.18			0.18	0.20		0.13	
Corn stock	-0.67							
Canada								
Barley and corn total use		-0.08	0.14	0.05			0.25	
Australia								
Barley total use			-1.16		0.78			
Argentina								
Corn total use	-0.14	0.14						
Sorghum total use	0.98	-3.17						
Thailand								
Corn and sorghum total use	-0.14					0.14	0.25	
South Africa								
Feed grain net imports								2.00
EC(10)								
Corn feed	-0.05			0.05				0.88
Corn food	-0.70							
Barley feed			-0.26	0.02				0.06
Barley food			-0.39					0.58
Spain								
Corn	-0.21							
Soviet Union								
Feed grain total use								0.37
Japan								
Corn and sorghum total use	-0.20			0.16				
corn and sorghum stock	-0.46	-0.45					0.95	

Table A.5. Summary of Estimated Production Elasticities from the Feed Grains Model

Country	Elasticities of: Corn Price	Sorghum Price	Barley Price	Wheat Price	Soybean Price	Cassava Price	Rice Price
U.S.							
Corn	0.07				-0.13		
Canada							
Barley			0.74	-0.47			
Corn	0.26				-0.20		
Australia							
Barley			0.34	-0.29			
Argentina							
Sorghum		0.10					
Corn	1.10	-0.97					
Thailand							
Corn and Sorghum	0.30					-0.06	-0.28
EC(10)							
Corn	0.39						
Barley			0.70				

Table A.4. Price Transmission Elasticities of Wheat Prices of Other Regions with Respect to World Price[a]

Regions	RGULFUS U.S. Wheat Gulf Port Price
Canada	
Wheat export price	1.13
Australia	
Wheat export price	0.97
Argentina	
Wheat farm price	0.28
Japan	
Wheat resale price	0.28

[a]Price transmission elasticities for other regions--European Community, India, and Centrally Planned Economies are zero.

Table A.3. Summary of Estimated Domestic Supply and Demand Elasticities from the Wheat Trade Model

Country	Elasticity with respect to: Wheat Price	Barley Price	Sorghum Price	Rice Price	Soymeal Price	Income
U.S.						
Production	0.20					
Food demand	-0.14					0.55
Feed demand	-3.01		1.17			
Stock demand	-0.28					
Canada						
Production	0.38	-0.30				
Feed demand	-0.12					
Stock demand	-0.28					
Australia						
Production	0.01	-0.63				
Stock demand	-0.43					
Argentina						
Producton	0.50					
Food demand	-0.16					
EC						
Production	0.66					
Feed demand	-3.11	6.04			0.08	
India						
Production	0.44		-0.04			
Food demand	-0.45			0.48		0.73
Japan						
Total use	-0.12					0.22
USSR						
Food demand						0.23
China						
Total use						0.59
East Europe						
Total use						0.28

Table A.2. Price Transmission Elasticities of Soybean and Soymeal Prices of Other Regions with Respect to U.S. Soybean and Soymeal Prices

Regions	Soybean Price	Soymeal Price
Brazil	1.80	1, 0[a]
Argentina	0.97	0.96
European Community	0.90	0.88
Spain	0.86	0.84
Japan	0.91	0.53
Eastern Europe	0.88	0.88
Rest of World	--	1.00

[a]The domestic soymeal price is subject to government control and hence does not respond to U.S. soymeal price. The U.S. soymeal price is used for the Brazil soymeal export price and thus price transmission elasticity is 1.

Table A.1. Price Elasticities of Supply and Demand from the Soybean Trade Model

	Soybean Price	Soymeal Price	Soyoil Price	Value of Meal and Oil	Corn Price
U.S.					
Production	0.71				
Soybean crush	-2.08			1.96	
Soybean stocks	-0.69				
Soymeal demand		-0.41			0.19
Soyoil demand			-0.45		
Soyoil stocks			-0.13		
Brazil					
Production	0.08				
Soybean crush	-0.50			1.00	
Soymeal demand		-0.34			-0.21
Argentina					
Production	0.27				
Soybean crush	-2.26			2.50	
Soymeal demand		-0.18			
EC					
Soybean crush	-1.91			1.99	
Soymeal demand		-0.27			0.25
Spain					
Soybean crush	-4.87			5.05	
Soymeal demand		-0.32			0.44
Japan					
Soybean crush	-0.26			0.16	
Soymeal demand		-0.07			
Eastern Europe					
Soybean crush	-2.20			1.84	
Rest of World					
Soymeal demand		-0.30			

Appendix

FAPRI Regional Trade Model Specifications and Estimated Elasticities

The necessary components of this model are detailed in the following equations:

(1) $EDT = \Sigma DM_i - \Sigma SM_i = \Sigma f_i(P_i, X_i) - \Sigma h_i(P_i, Z_i)$ $\quad i = 1,..,n$ Importers

(2) $ESO = \Sigma SX_j - \Sigma DX_j = \Sigma h_j(P_j, Z_j) - \Sigma f_i(P_j, X_j)$ $\quad j = 1,..,m$ Exporters

(3) $ESUS = h_u(P_u, Z_u) - f_u(P_u, X_u)$ $\quad u$ = U.S., United States Exports

(4) $ESUS = EDT - ESO$ World Market Equilibrium

(5) $P_i = P_u e_i + M_i$ $\quad i = 1,..,n$

(6) $P_j = P_u e_j + M_j$ $\quad j = 1,..,m$

where

DM = importer demand

DX = exporter demand

e = exchange rate

M = trade margin (transport cost, tariff, subsidy, etc.)

P = domestic price

SM = importer supply

SX = exporter supply

X = vector of demand shifters

Z = vector of supply shifters

In most cases, the supply and demand relationships, f_i and h_i, are the estimated equations in the model. In a few instances net trade equations are estimated directly. The tables that follow outline the structural components of the model and report the estimated price and income elasticities.