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## AN OVERVIEW OF SOME SOURCES AND CONSEQUENCES OF VARIABILITY IN WORLD TRADE IN GRAINS

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**An Overview of  
Some Sources and Consequences  
of Variability in World Trade in Grains**

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An Overview of  
Some Sources and Consequences  
of Variability in World Trade in Grains<sup>a</sup>

Philip M. Raup<sup>b</sup>

Two major trends have characterized world trade in grains over the past two decades: A rapid and almost uninterrupted doubling in volume in the 1970's, accompanied by a growing concentration among a few exporters and importers. Figure 1, tracing the growth in volume of trade in wheat and coarse grains since 1970, shows the steady growth to 1980 and the erratic fluctuations around a much higher annual average level of trade in the 1980's.

This dramatic increase in trade volume was associated with a high degree of concentration among a few trading units, both on the export side and to a lesser degree on the import side. For wheat, the major traded grain, the two top exporters, the United States and the European Community, accounted for 56.5 percent of total exports in 1989/90, and the top five exporters accounted for 91.6 percent (Table 1).

For coarse grains, the dominance of the two top exporters was even more pronounced, with the U.S. and the E.C. accounting for 77.2 percent of total exports, and the top five for 89.3 percent.

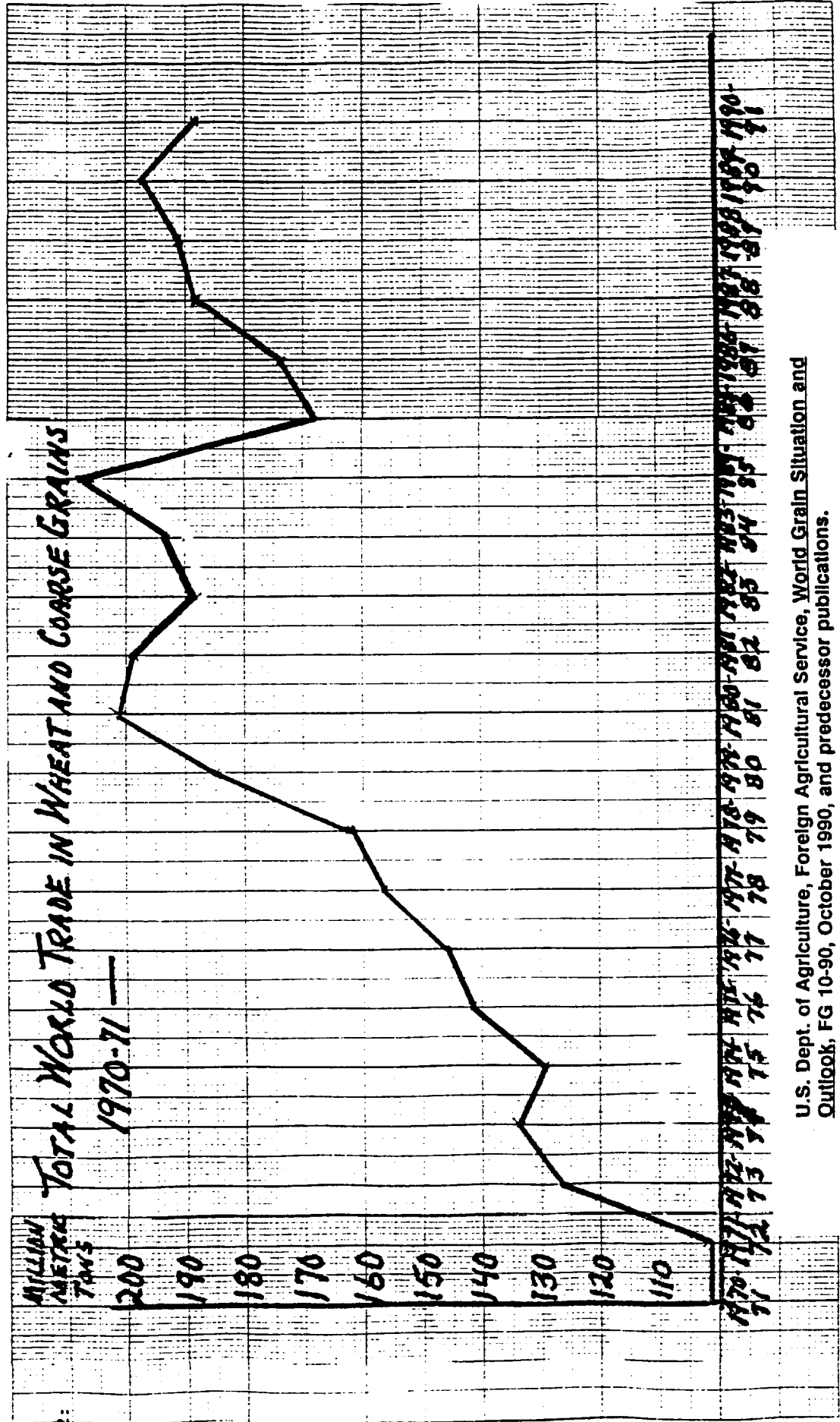
Among importing countries the concentration is substantial but less dramatic. The USSR and China were the top wheat importers in 1989/90, buying 28 percent of all wheat entering international trade. The top five importers

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<sup>a</sup>Paper No. 18,651, Miscellaneous Journal Series, Minnesota Agricultural Experiment Station, University of Minnesota, prepared for conference on The World Field Crops Economy: Scope and Limits of the Liberalization of Agricultural Policies, sponsored by the French Growers Organizations, Paris, 4-5 December 1990.

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Figure 1



U.S. Dept. of Agriculture, Foreign Agricultural Service, World Grain Situation and Outlook, FG 10-90, October 1990, and predecessor publications.

**Table 1:                    Leading Grain Exporters  
   1989/1990a/**

<b><u>Product and Country</u></b>	<b><u>Exports</u></b>	
	<b><u>Volume</u></b>	<b><u>As Percent of World</u></b>
	<b>Thousand M.T.</b>	<b>%</b>
<b><u>Wheat, incl flour</u></b>		
United States	33,516	34.7
EC-12	21,000	21.8
Canada	17,000	17.6
Australia	10,850	11.2
Argentina	<u>6,000</u>	<u>6.2</u>
Total, Top 5	88,366	91.6
Total, World	96,500	100.0
<b><u>Coarse Grains</u></b>		
United States	69,225	67.8
EC-12	9,640	9.4
Canada	5,050	4.9
Argentina	4,150	4.1
China	<u>3,100</u>	<u>3.0</u>
Total, top 5	91,165	89.3
Total, world	102,050	100.0

**a/ USDA, World Grain Situation and Outlook, FG 9-90,  
September 1990.**

together bought 46.1 percent (Table 2). The import concentration is greater for coarse grains, with the USSR and Japan importing 43.7 percent and the top five importers accounting for 63.3 percent of total coarse grain trade.

While concentration among grain exporters and importers is not new, the degree of concentration on the import side has been especially marked in the past two decades. From the end of the Napoleonic Wars to the outbreak of the Second World War, the growth in grain imports was in large part a demonstration of the classical economic principle of comparative advantage. Countries imported grain when they had other more rewarding uses for their labor and land.

Since the Second World War much of the world's trade in grain cannot be explained by a conventional use of the idea of comparative advantage. The principle is still useful, but it must be interpreted to include least comparative disadvantage, and political and ideological goals must be given heavy weight in analyzing trade flows. The outstanding examples are provided by the USSR and China. They have become by far the world's largest wheat importers. Their rise to this dominant position began in the mid-1960's, and accelerated in the 1970's and 1980's (Table 3).

Variability is the noteworthy feature of this growth in import grain demand by the USSR and China. This emerges clearly in Figures 2 and 3, showing imports of wheat and coarse grains since 1970/71 for the USSR, China, and Japan. The example of Japan is striking, since that country has been a remarkably stable element in world trade in grain for the past two decades. In contrast, in several years since 1970/71 the year-to-year variations alone in demand by the USSR and China have exceeded the total amounts imported by the third or fourth largest importers.

**Table 2:                   Leading Grain Importers  
1989/1990a/**

<b>Product and Country</b>	<b>Imports</b>	
	<b>Volume</b>	<b>As Percent of World</b>
	<b>Thousand M.T.</b>	<b>%</b>
<b><u>Wheat, incl flour</u></b>		
USSR	14,000	14.5
China	13,000	13.5
Egypt	7,000	7.3
Japan	5,400	5.6
Iran	<u>5,100</u>	<u>5.3</u>
<b>Total, Top 5</b>	<b>44,500</b>	<b>46.1</b>
<b>Total, World</b>	<b>96,500</b>	<b>100.0</b>
<b><u>Coarse Grains</u></b>		
USSR	22,700	22.2
Japan	21,900	21.5
Mexico	7,550	7.4
S. Korea	6,950	6.8
Taiwan	<u>5,550</u>	<u>5.4</u>
<b>Total, top 5</b>	<b>64,650</b>	<b>63.3</b>
<b>Total, world</b>	<b>102,050</b>	<b>100.0</b>

**a/ USDA, World Grain Situation and Outlook, FG 9-90,  
September 1990.**



**TABLE 3: Import Market Shares of Wheat,  
USSR and China  
Selected Years<sup>a</sup>**

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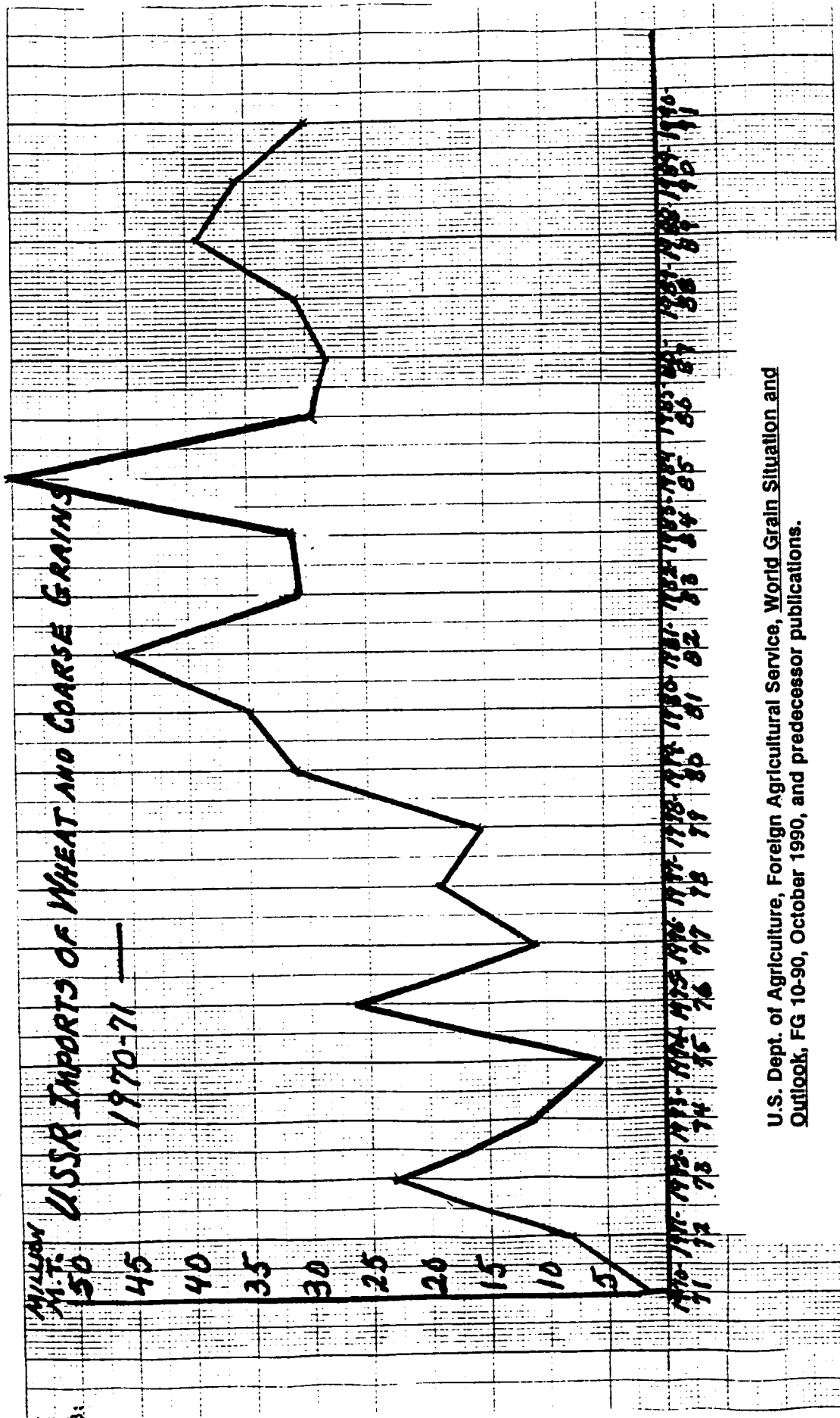
	1970/71	1975/76	1980/81	1985/86	1990/91 <sup>b</sup>
	<b>Million Metric Tons</b>				
<b>USSR</b>	0.5	10.1	16.0	15.7	14.0
<b>China</b>	<u>3.7</u>	<u>2.2</u>	<u>13.8</u>	<u>6.6</u>	<u>12.5</u>
<b>Subtotal</b>	4.2	12.3	29.8	22.3	26.5
<b>World Trade</b>	54.8	66.5	94.1	85.0	97.2
	<b>Percent</b>				
<b>USSR-China as Percent of World Trade</b>	7.7	18.5	31.7	26.2	27.3

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**a** USDA, FAS, World Grain Situation and Outlook, FG 9-90, September 1990 and predecessor publications.

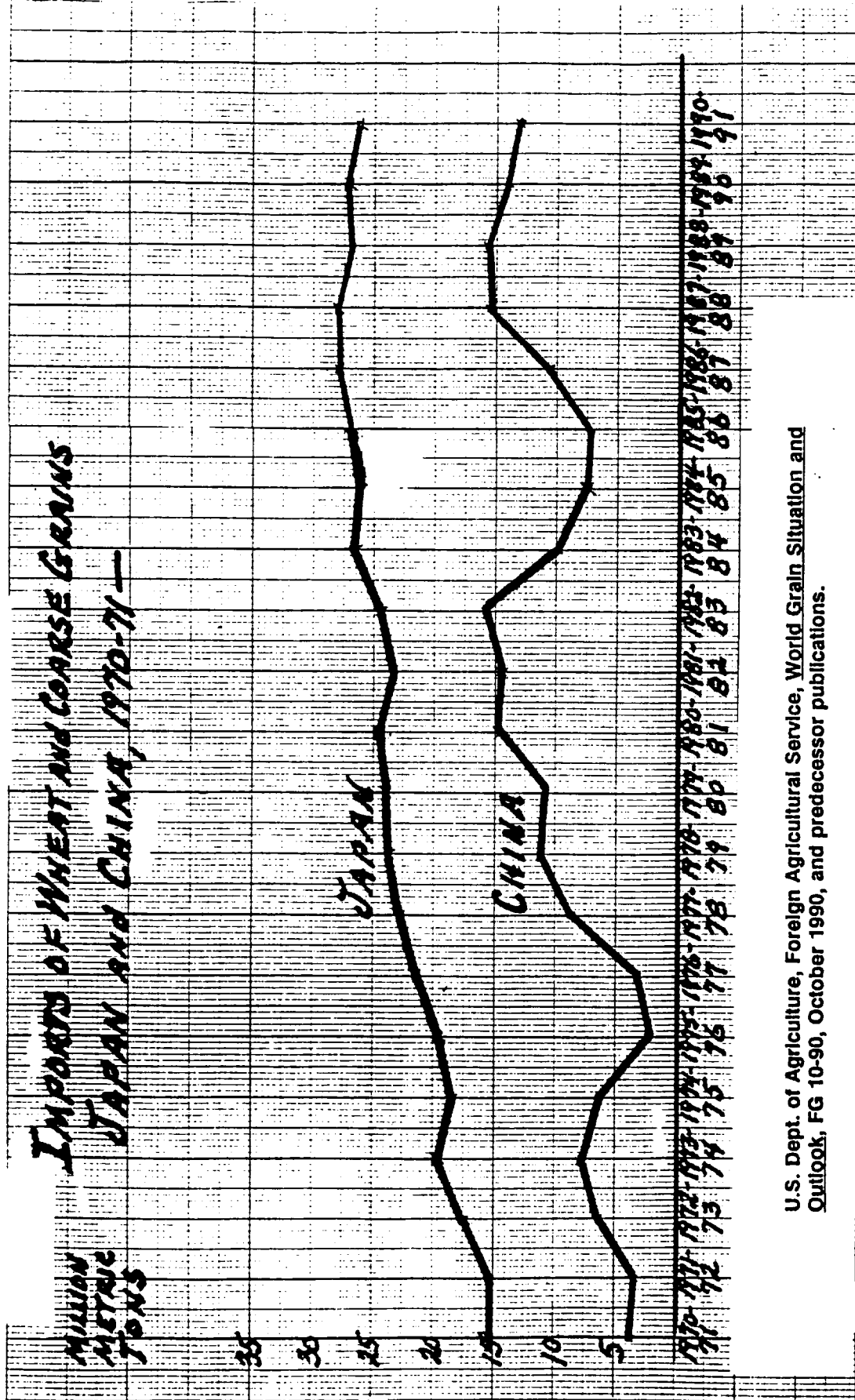
**b** Forecast.

Figure 2



U.S. Dept. of Agriculture, Foreign Agricultural Service, World Grain Situation and Outlook, FG 10-90, October 1990, and predecessor publications.

Figure 3



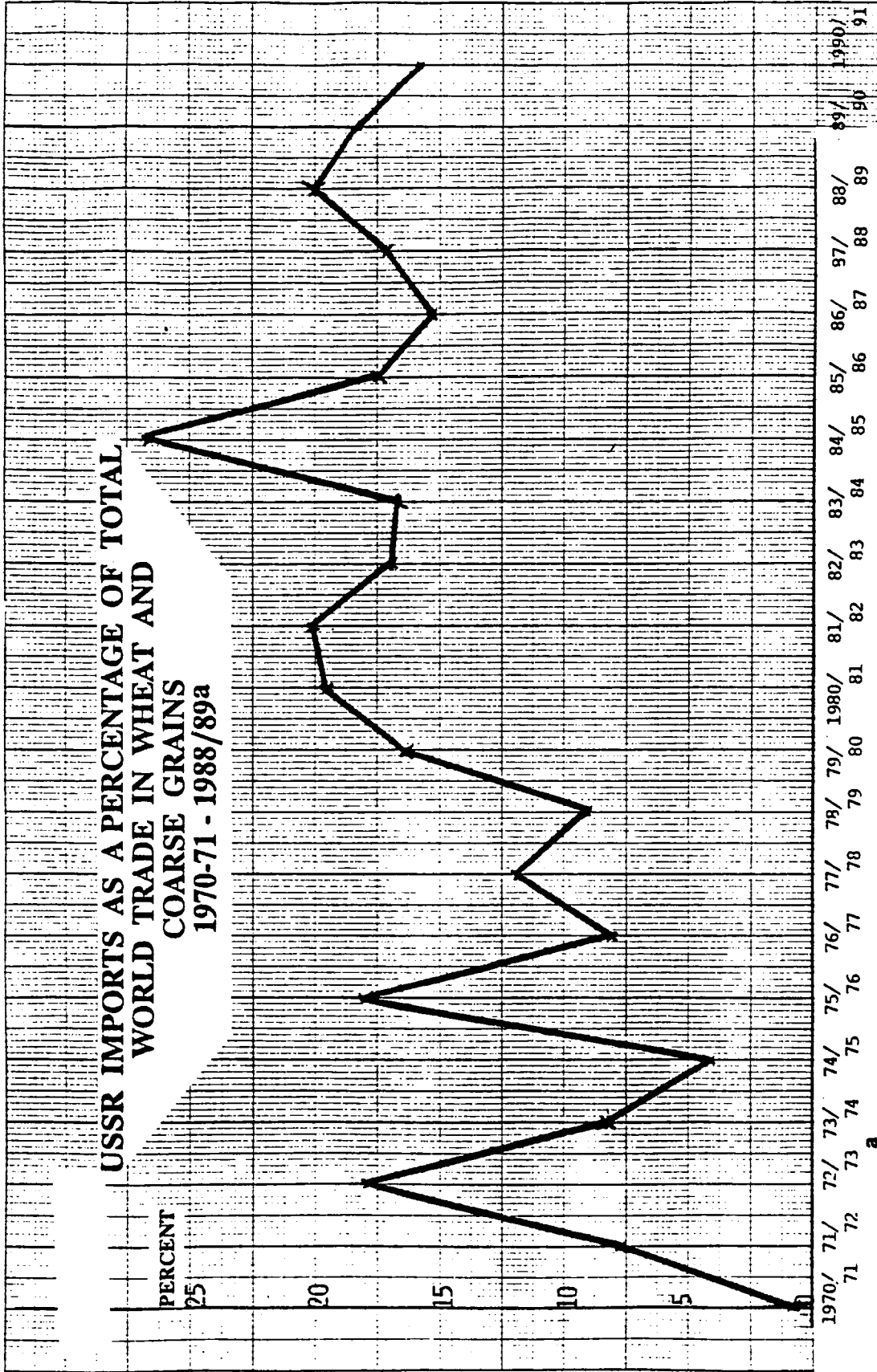
U.S. Dept. of Agriculture, Foreign Agricultural Service, World Grain Situation and Outlook, FG 10-90, October 1990, and predecessor publications.

This is especially true of the USSR. Figure 4 and Table 4 show imports of wheat and coarse grains by the USSR as a percent of total world trade since 1970/71. For wheat, Soviet imports as a percent of world trade increased more than three-fold in a single year, from 1971/72 to 1972/73, only to fall back almost to the 1971/72 level the next year, in 1973/74. In percentage terms, Soviet wheat imports increased almost four-fold from 1974-75 to 1975/76 and were cut in half in 1976/77. They doubled from 7 percent to 14 percent of world trade from 1978/79 to 1979/80, rose to 26.3 percent of total world trade in 1984/85 and dropped back to 15.9 percent of trade by 1990/91.

Soviet demand for coarse grains has been especially volatile in the 1980's. In five of the ten years since 1980/81 Soviet imports of coarse grains were 13 percent or less of world trade and in two years they ranged from 24 to 27 percent, with tonnages ranging from 10.9 million tons in 1981/82 to 27.2 million tons in 1984/85.

Variability on this scale, in both quantity and percentage terms, is extremely unsettling to world markets, especially when it characterizes the world's largest importers. It underscores the fact that grain problems in the Soviet Union, and in China, are more than national problems. Of immediate interest is the fact that the magnitude of this variability reduces the significance of estimates of prospective benefits of a reduction in agricultural trade distortions through the Uruguay round of GATT negotiations. With variations of the demand side on the scale recorded in the 1980's by the Soviet Union and China there can be little confidence in any refined analysis of potential benefits from an improvement in institutional constraints on world agricultural trade.

**Figure 4**



<sup>a</sup> US Dept. of Agriculture, Foreign Agricultural Service, World Grains Situation and Outlook, FG 10-90, October 1990, and predecessor publications.

Table 4: **USSR Imports as a Percentage of Total World Trade in Wheat and Coarse Grains 1970/71 - 1990/91<sup>a</sup>**

Trade Year <sup>b</sup>	Total World Trade in			USSR Imports of			USSR Imports as Percent of World Trade in		
	Wheat <sup>c</sup>	Coarse Grains <sup>d</sup>	Wheat and Coarse	Wheat	Coarse Grains	Wheat and Coarse	Wheat	Coarse Grains	Wheat and Grains
	(Million Metric Tons)			(Percent)					
1970/71	54.8	46.3	101.1	0.5	0.3	0.8	0.9	0.6	0.8
1971/72	52.4	48.7	101.1	3.5	4.3	7.8	6.7	8.8	7.7
1972/73	67.4	59.4	126.8	15.6	6.9	22.5	23.1	11.6	17.7
1973/74	62.6	71.1	133.7	4.5	6.5	11.0	7.2	9.1	8.2
1974/75	63.9	63.7	127.6	2.5	2.7	5.2	3.9	4.2	4.1
1975/76	66.5	76.4	142.9	10.1	15.5	25.6	15.2	20.3	17.9
1976/77	62.8	82.6	145.4	4.6	5.7	10.3	7.3	6.9	7.1
1977/78	72.9	83.3	156.2	6.9	11.7	18.6	9.5	14.0	11.9
1978/79	72.0	90.2	162.2	5.1	9.9	15.0	7.1	11.0	9.2
1979/80	86.0	100.9	186.9	12.1	18.4	30.5	14.1	18.2	16.3
1980/81	94.1	108.3	202.4	16.0	23.5	39.5	17.0	21.7	19.5
1981/82	101.3	97.8	199.1	19.5	20.4	39.9	19.2	10.9	20.0
1982/83	98.7	90.0	188.7	20.5	11.3	31.8	20.8	12.6	16.9
1983/84	102.0	93.3	195.2	20.5	11.9	32.4	20.1	12.8	16.6
1984/85	107.0	100.4	207.3	28.1	27.3	55.4	26.3	27.2	26.7
1985/86	85.0	83.2	168.1	15.7	13.6	29.3	18.5	16.3	17.4
1986/87	90.7	83.3	174.0	16.0	10.8	26.8	17.6	13.0	15.4
1987/88	105.0	83.2	188.2	21.5	10.4	31.9	20.5	12.5	17.0
1988/89	96.9	94.5	191.4	15.5	22.5	38.0	16.0	23.8	19.9
1989/90	96.5	102.1	198.6	14.0	22.7	36.7	14.5	22.2	18.5
1990/91 <sup>e</sup>	97.2	90.8	188.0	14.0	15.9	29.9	14.4	17.5	15.9

<sup>a</sup> US Dept. of Agriculture, Foreign Agricultural Service, World Grain Situation and Outlook, FG 9-90, September 1990, and predecessor publications.

<sup>b</sup> July-June through 1979/80; thereafter July-June for wheat, October-September for coarse grains.

<sup>c</sup> Includes wheat flour and products in wheat equivalent.

<sup>d</sup> Includes corn, sorghum, barley, oats and rye.

<sup>e</sup> Forecast.

Although they are now the dominant individual players on the demand side, the USSR and China are not the only sources of grain trade variability. Major shifts in trade relations in the 1980's also involved the European Community, North Africa, and the Middle East. The most dramatic role reversal was accomplished by the European Community.

The twelve nations of the present EC, considered as a group, have been recurring grain importers since the Napoleonic wars. In the mid 1970's they were net importers of approximately 20 to 25 million tons of wheat and coarse grains annually. This reversed rapidly after 1976/77 and for the three years 1988/89-1990/91 the EC averaged net exports of 22 million tons. The world market currently available to other exporters is thus some 45 million tons smaller than it would have been had the net trade position of the EC remained unchanged (USDA, 1989).

The shock effect of the appearance of the USSR as an importer in world grain markets in the 1970's focused attention on that source of market instability. In magnitude, the shift from a net exporter to a net importer by the USSR is of secondary importance relative to the reverse shift by the EC from an importer to an exporter.

Using three-year averages, from 1970/71-1972/73 to 1988/89-1990-91, the USSR added approximately 33 million tons net to world demand for wheat and coarse grains. In a similar period, the EC-12 reduced import demand by some 23 million tons and added 22 million tons to export supplies, for a net change of 45 million tons. The role reversal by the EC has clearly outweighed the effects of the USSR's shift to a major grain importer in accounting for instability in world grain markets in the past two decades.

One additional demand-side shift has assumed new importance since the attack by Iraq on Kuwait in August 1990. Although North Africa is not a trading entity, in the sense that the term applies to the EC, it comprises a contiguous region with a high degree of environmental homogeneity. Almost unremarked in the 1970's, it has become a larger importer of wheat than either the USSR or China.

This is even more true of the countries of the Middle East (Table 5). If we re-rank leading wheat importers to include contiguous regions, then the Middle East is now the major wheat importer, followed by North Africa, with the USSR and China in third and fourth place.

This shift has been rapid. North Africa increased its wheat imports by over 40 percent in the 1970's, and imports by the Middle East more than doubled. The driving force here is clearly demand, in its most basic sense. Taken together, North Africa and the Middle East have rates of population growth that are among the highest in the world. Soil and climate endowments are poor, and prospects for food output increases low. Wheat exporting nations must reckon with the fact that 30 percent of total wheat trade is now accounted for by a band of nations from Morocco to Iran with a high potential for internal and regional unrest, and escalating import instability.

Not all instability in world grain trading is demand-driven. World production of wheat and coarse grains more than doubled from 1960/61 to 1990/91 (686 to 1416 million metric tons), and wheat output alone increased from 238 to 592 million metric tons, or almost two and one-half times (USDA, 1986 and 1990C).

The increase in world wheat production from 1989/90 to 1990/91 was especially dramatic, jumping from 537 to 592 million tons or 10.2 percent.



**Table 5: Imports of Wheat By  
North Africa and the Middle East  
1979/80 and 1989/90**

<u>Region and Country</u>	<u>Imports 000 Metric Tons</u>	
	<u>1979/80<sup>a</sup></u>	<u>1989/90<sup>b</sup></u>
<u>North Africa</u>		
Egypt	5,200	7,000
Algeria	1,959	4,300
Tunisia	856	1,100
Morocco	1,613	1,000
Libya	<u>424</u>	<u>750</u>
Total, N. Africa	10,052	14,150
<u>Middle East</u>		
Iran	1,250	5,100
Iraq	2,300	3,400
Turkey	0	3,000
Syria	521	1,200
Yemen	425	900
Israel	524	650
Jordan	355	600
Lebanon	366	325
Saudi Arabia	<u>1,374</u>	<u>100</u>
Total, Middle East	7,115	15,275

<sup>a</sup> USDA, FAS, Foreign Agricultural Circular, Grains, FG 28-83, September 15, 1983.

<sup>b</sup> USDA, FAS, World Grain Situation and Outlook, FG 10-90, October 1990 (forecast).

Each of the top 5 wheat producers recorded all-time record yields in 1990/91, and for China and India total output was also an all-time record (Table 6). The price effects have been equally dramatic, with the largest one-year percentage price decline in U.S. export prices for wheat since the early 1930's (Figure 5). Deducting Export Enhancement Program (EEP) bonuses, the export price of U.S. wheat at Gulf ports (which can be regarded as a proxy for the world price) had been cut in half from Fall 1989 to Fall 1990 (USDA, 1990C).

These global effects on the supply side mask major and contrasting trends for individual producing countries. The high variability of import demand by the USSR was stressed above, but this requires a closer look.

Any time series of data since 1960 on Soviet production or import of grains that runs through 1984/85 will reveal extreme instability. Using a data set covering grain output, consumption, and imports for the period 1960-1987, Brada concluded that the coefficient of variability in Soviet wheat production was approximately the same as that for Canada, and significantly greater than in the United States (Brada, 1990, pp. 65-67).

Data for the full decade of the 1980's now permit a disaggregation of production statistics by decades since 1960 (Table 7). Taking the average of year-to-year percentage changes in production, by decades, the data in Table 7 show a continuing high variability in Canadian wheat production, and an increase in U.S. variability over the three decades. The most significant trend has been a sharp drop in Soviet variability in wheat output, to a level in the 1980's that was actually lower than the level for the United States.

This differential is even more remarkable when wheat and coarse grains are combined. The trend is sharply up in the U.S., toward increased

**Table 6**  
**Comparative Wheat Production and Yield,**  
**Top Five Producers, 1990/91**

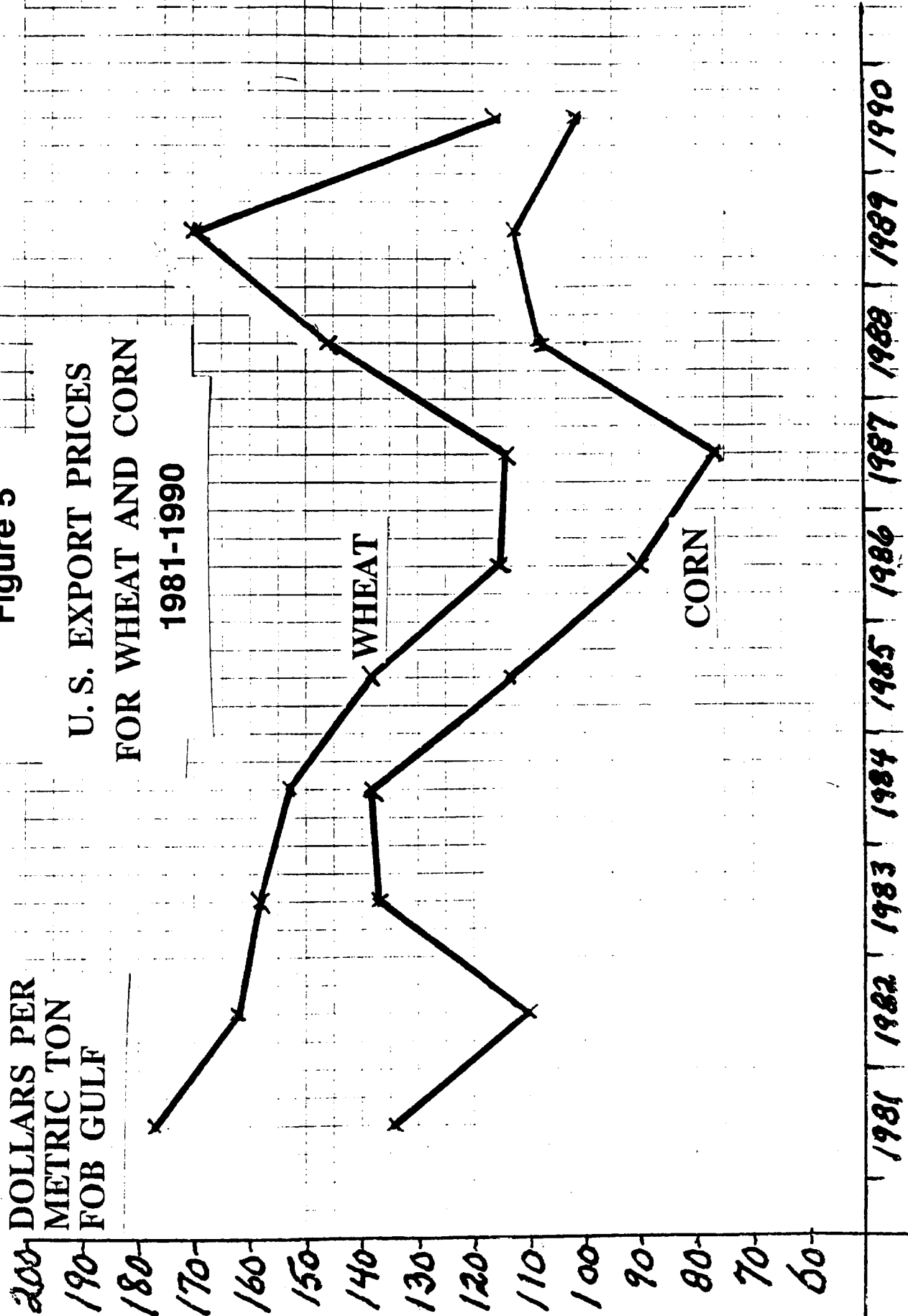
	<u>Production</u>	<u>Yield</u>	
	<u>Million M.T.</u>	<u>Metric Tons/Ha.</u>	<u>Bushels Per Acre</u>
USSR	108.0	2.27a	34.6
China	96.0a	3.17a	47.1
EC-12	80.8	5.19a	77.2
USA	74.7	2.66a	39.6
India	54.0a	2.28a	33.9
Total, Top 5	413.5		
World	592.1a	2.57a	38.2
Top 5 as % of World	69.8%		

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**a All-time record.**

**Source: USDA, FAS, World Grain Situation and Outlook, FG 10-90, October 1990.**

**Figure 5**  
**U.S. EXPORT PRICES**  
**FOR WHEAT AND CORN**  
**1981-1990**



U.S.D.A., FAS, World Grain Situation and Outlook, FG 10-90, October 1990.  
 Prices are calendar year averages for 1981-89, for No. 2 Hard Winter Wheat and  
 No. 2 Yellow Corn. Prices for 1990 are for October 10.

**Table 7**  
**Average Year-to-Year**  
**Percent Change in Grain, Production**  
**By 10-Year Periods for Selected Countries,**  
**1961/62 to 1990/91<sup>a</sup>**

Country	10-Year Periods		
	1961/62- 1970/71	1971/72- 1980/81	1981/82- 1990/91
Average Annual Percentage Change, Plus or Minus			
<b>Wheat</b>			
Canada	31.8	20.9	22.6
EC-12	10.8	9.6	7.7
USA	7.3	10.9	12.1
USSR	26.13	20.3	10.5
<b>Wheat and Coarse Grains</b>			
EC-12	b	b	6.7
USA	6.8	9.7	22.3
USSR	18.5	20.7	9.3

**a U.S. Dept. of Agriculture, Foreign Agricultural Service,  
World Agricultural Grain Situation and Outlook, FG9-90,  
 September 1990 and preceding publications.**

**b Time series unavailable.**

variability, and sharply down in the USSR. In the 1980's the average annual percentage change in the USSR was less than half as great as in the US or Canada. The major contributors to instability in world supply of wheat and coarse grains in the past decade include Canada and the United States but not the Soviet Union.

This may of course be a result of long-wave shifts in climate, and could be reversed in the 1990's. It may also be the result of more fundamental shifts in productive capacities. Some evidence that the declining instability in Soviet grain output has a solid root in improved production practices is provided by Figures 6 and 7.

The pronounced upward trends since the mid-1980's in Soviet yields of wheat and barley are difficult to explain by weather alone. For the five years, 1986/87-1990/91, average Soviet wheat yields (1.93 tons/ha.) were above those of Canada (1.87 tons/ha.) and were approximately 90 percent of U.S. yields of comparable wheats (hard red winter, hard red spring, and durum.) They must be doing something right (USDA, 1990A, 1990C).

Supply side variability in the 1980's has been heavily influenced by fluctuations in U.S. corn output. Production was cut in half from 1982 to 1983, and dropped by 31 percent from 1987 to 1988. These were composite results of weather and policies to reduce planted areas. Only the availability of large carry-over stocks in the U.S. prevented variability of this magnitude from being transmitted to world markets. But the experience does raise two worrisome questions.

The first concerns the dependence of stability in world grain markets on carry-over stocks in the U.S., especially in coarse grains. Figure 8 illustrates the degree to which stock build-up in 1981 and 1982 preceded

**Figure 6**  
**USSR WHEAT YIELDS**  
**Metric Tons Per Hectare**

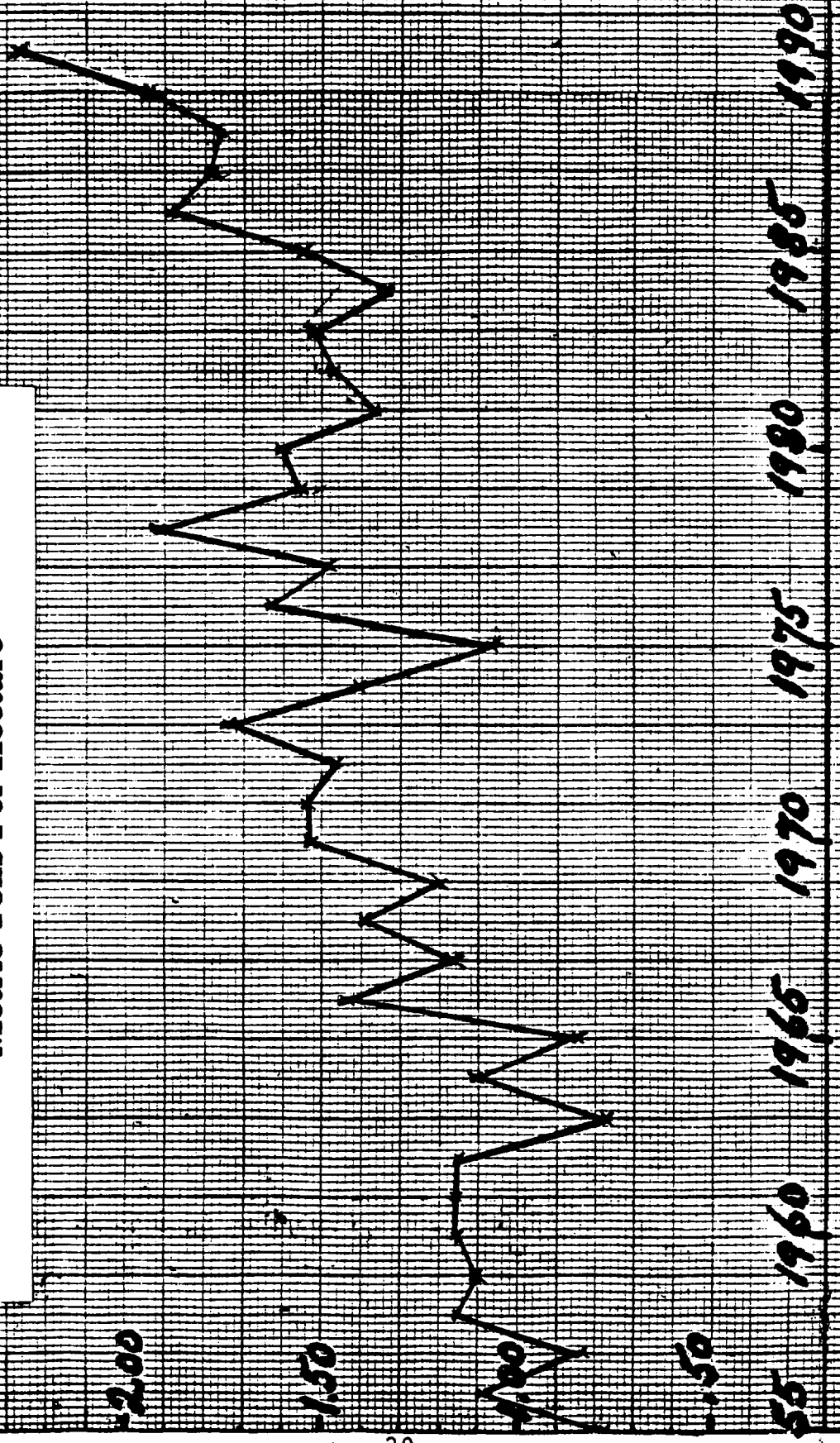
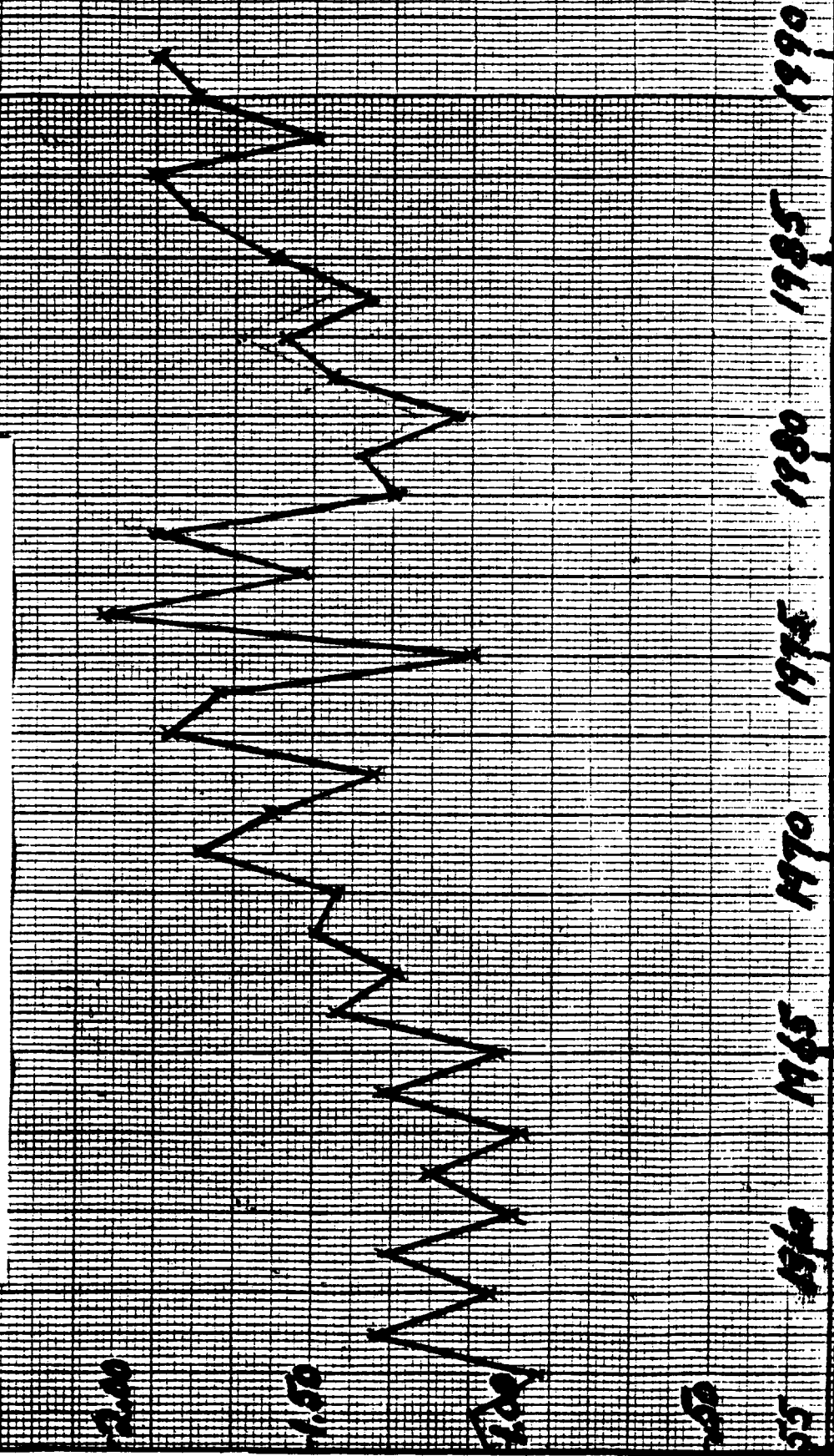


Figure 7

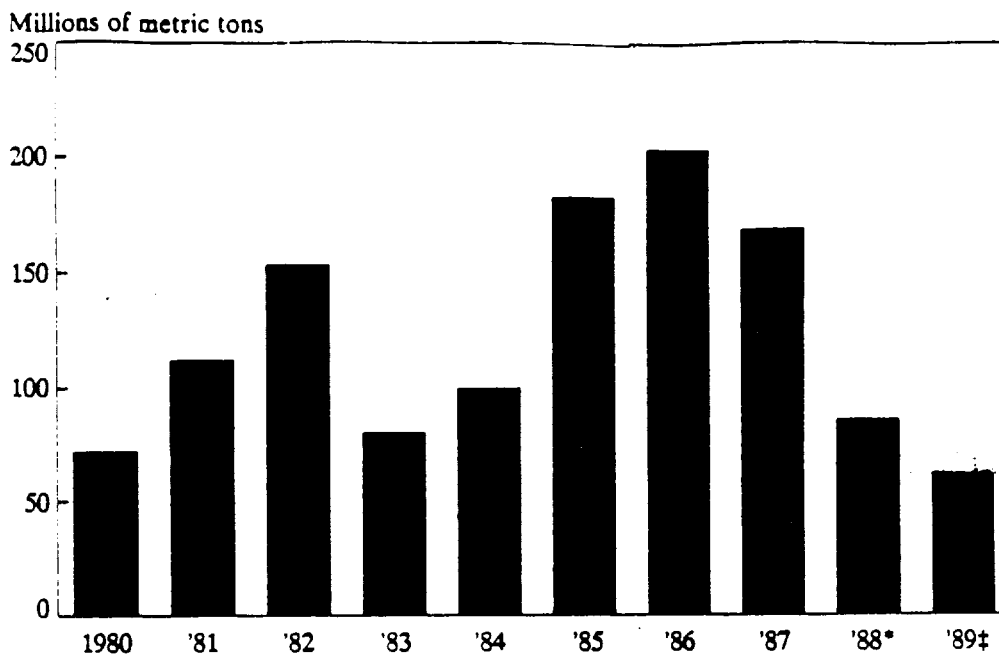
USSR BARLEY YIELDS

Metric Tons Per Hectare





**Figure 8**  
**U. S. Inventory of Total Grains**  
**1980 - 1989**



\*Estimated.  
‡Projected.

Source: U.S. Department of Agriculture. *World Agricultural Supply and Demand Estimates*.

From: Economic Review, Federal Reserve Bank of Kansas City,  
January/February 1990

the fall in grain production in 1983. The much larger build-up of U.S. stocks in 1985-87 provided a safety net for shortfalls in corn production in 1988 and in wheat production in 1989. Can this luck last?

This introduces the second and more disturbing question. World production of wheat and coarse grains is increasingly dependent on heavy use of fertilizers in rain-fed environments and on a decreasing mix of seed varieties. These prove to be wonderfully responsive when moisture is plentiful, but vulnerable to disease and drought. The two major exporters in world grain markets, the U.S. and the E.C., are now more heavily dependent on fertilizers and therefore on the weather than ever before. What will happen in years of deficient rainfall? Is it possible that variability in world grain trade in the 1990s will be driven by the supply side? Without international coordination in stock carry-over policies and costs, this seems the most likely prospect.

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