Factor Intensities and The Commodity Composition of U.S. Agricultural Trade

by

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Abstract

This study examines the role that factor endowments play in determining US agricultural trade. Findings indicate that US agricultural exports are more land-intensive than US agricultural imports. Land-scarce nations tend to import land-intensive commodities from the US while nations with land endowments similar to that of the US import less land-intensive agricultural products.

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I. Introduction

Agricultural trade plays an important role in the US balance of trade. Although total net exports of goods and services were negative throughout 1983-1987, net agricultural exports were positive. Thus agricultural trade has to some degree offset the trade deficit for non-agricultural products. More fundamentally, agricultural trade is important to the US economy because it provides employment and generates income for thousands of workers. In the process, the production of agricultural output for exports requires the use of land and capital. Each million dollars of agricultural exports directly and indirectly require significant amounts of land, labor, and capital.

This paper first provides estimates of the land and labor used to produce US agricultural exports in 1977, 1982 and 1987. It then examines how factor endowments and income elasticities of demand determine the commodity composition of US agricultural exports. We examine the commodity composition of agricultural exports to several countries and regions. We chose regions that are important markets for US agricultural products. Finally, we explore the implications of these commodity compositions for factor use in US agricultural production.

II. Theoretical Considerations

According to the well known Heckscher-Ohlin theorem, relative factor endowments are the basis for trade. A nation will export the good that requires the intensive use of the nation's relatively abundant factor and import the good that requires the intensive use of that nation's relatively scarce factor [Heckscher],[Ohlin]. Although Heckscher-Ohlin cast the theorem for a two-good, two-factor model, Vanek extended the basic results to the n-good case. By itself however, Heckscher-Ohlin cannot explain why counties with similar factor endowments should engage in trade or why nations should trade commodities with similar factor requirements. Yet these types of trade are a major portion of actual trade flows. Further developments in trade theory have attempted to address these issues.

Linder emphasizes the role of demand, noting that nations with similar per capita incomes consume similar bundles of goods. Manufacturing firms in one country, responding to demand will export to consumers in other countries with similar income levels, resulting in two-way trade in manufactured goods between countries. Formal models by Krugman and others derive this trade pattern as a result of scale economies, imperfect competition, and product differentiation. Such models together with the Heckscher-Ohlin theorem can explain the existence of trade between countries with similar factor endowments and between nations with different factor endowments.

Partitioning the world into two regions, North and South, with the North being relatively capital abundant and the South relatively labor abundant, we can explain trade between them as consistent with the Heckscher-Ohlin theorem. Then partitioning the North into identical East and West regions, trade between them will be in differentiated manufactured goods. However, the two approaches to explaining trade have little to say about the volume of East-West relative to North-South trade.

Markusen provides an explanation for the relative volume of these two types of trade by emphasizing the role of nonhomothetic preferences. He assumes that the income elasticity of demand for capital-intensive manufactured goods is greater than one, and that for a labor-intensive homogenous good, the income elasticity is less than one. As a result, the South will specialize in the production of the labor-intensive good and because of its lower per capita income also specialize in the consumption of that good. The greater the difference in income elasticities, the smaller the volume of trade will be between North and South relative to East-West trade.

Unlike most of the trade literature discussed, this paper focuses on agricultural trade. Trade in agricultural goods is primarily in food products. In general, as per capita income increases, a nation spends a smaller share of its income on food. The income elasticity of demand for food is positive but less than unity. However, different types of food have different income

elasticities. Income elasticities are lowest for roots and tubers, higher for coarse grains such as corn for human consumption, and higher still for fruits, vegetables, and animal products [USDA, 1974]. At low income levels, a country is likely to spend a large share of its income for direct consumption of grains such as wheat, rice, and corn. A low income country would have higher income elasticities for food grains than would higher income nations. In contrast, high income nations spend a small share of the food budget on direct grain consumption and have low income elasticities for these goods. Elasticities for meat and animal products are relatively high (though still less than one), which indirectly causes feed grains and oil crops used for animal feed to have relatively high income elasticities as well. The net result of these income elasticities is that the share of income spent for food declines as income rises (Engel's Law). The commodity composition of food consumption changes as well.

In further contrast to previous studies, targeting agricultural trade makes investigating land endowments and land intensity a natural departure from the usual analysis of capital endowments. We examine the factor intensity of U.S. agricultural trade in relation to factor endowments, income levels, and income elasticities of demand. In keeping with Heckscher-Ohlin, we expect the United States to export agricultural products that are relatively more land-intensive than agricultural imports. For countries with land endowments substantially different from the U.S., we expect agricultural exports to consist largely of land

intensive commodities. For countries with similar land endowments, we expect agricultural exports to be similar in composition to U.S. agricultural imports. Finally, as a nation's per capita income increases, we expect the share in imports of products with low income elasticity, notably food grains to fall.

III. Estimation Procedures

This analysis uses an input-output (I/O) model of the US economy to examine the factor intensity of US agricultural trade. An I/O model traces the production flows required to produce output for purchase by consumers, government, businesses, and foreign buyers. The I/O model's usefulness lies in its ability to account for the production of goods and services generated directly and indirectly to meet the final demands of buyers. For example, to produce wheat for export requires the production of fertilizers, pesticides, and fuels. An I/O model facilitates estimating the supporting production required from each industry to produce the agricultural exports in a given year. Using information on land, labor, and capital requirements in each industry, one can derive estimates of the factor use required to produce those exports.

To estimate factor intensities, the computational procedure is as follows:

$$I = F\,[I - A]^{-1}\,X$$

where:

I is a 2 by 47 matrix of labor and harvest acres required economy-wide to produce agricultural exports.

F is a 2 by 47 matrix of labor and harvested acres per unit of output for each industry.

$[I - A]^{-1}$ is the Leontief inverse matrix of direct and indirect output requirements.

X is a 47 by 47 diagonal matrix of agricultural exports.

IV. Data Sources

Agricultural trade data are from USDA (FATUS). USDA defines agricultural commodities as nonmarine food products and farm products that have not gone through complex manufacturing processes. This definition includes commodities such as raw hides and skins, fats and oils, beer, and wine in addition to the raw commodities usually thought of as agricultural such as fruits, grains, and natural fibers. This definition, however, does not include manufactured products such as textiles, forestry products, cigarettes, and distilled alcoholic beverages. The export data include commodities produced domestically and commodities of foreign origin but modified in the USA.

Labor coefficients for each industry measure number of workers per dollar of output in 1977. The coefficients were derived using employment data from the Bureau of Labor Statistics, US Department of Labor To incorporate changes in labor productivity since 1977, we matched an index of output per worker to each industry to adjust the estimates of required labor use [USDL]. Employment estimates include wage and salary workers as well as unpaid family workers, an employment category important in farming. Similarly, land coefficients which measure harvested acres per dollar of crop output in 1977 were created using acreage data from Agricultural Statistics. Estimates of required acreage to meet exports for 1982

and 1987 were adjusted to account for differences in crop yields since the base year 1977, using yield data from Agricultural Statistics.

V. Empirical Analysis

(1) US Agricultural Exports

We group major US trading partners according to their land endowments (figure 1). Canada, Mexico and the USSR have arable land to labor force ratios similar to that of the US, while Japan, South Korea and the European Community have much smaller land endowments per worker (USDA, 1989.) By Heckscher-Ohlin, we would expect US agricultural exports to the latter group to consist primarily of land intensive commodities. Table 1 shows US agricultural exports to major purchasers by commodity group for 1977, 1982 and 1987 (FATUS). As expected, agricultural exports to Japan, South Korea, and Western Europe consisted primarily of land-intensive products such as food and feed grains, oil crops and cotton. For example, in 1977 and 1982 exports of these crops made up nearly 80 percent of US agricultural exports to South Korea, nearly 70 percent of the total to Japan, and 60 percent of the total to Western Europe.

In contrast, exports of these crops to Canada, the most land abundant of the regions considered, were under 20 percent of the total. Vegetables, fruits, and nuts, products among the least land intensive, figure prominently in agricultural exports to Canada.

The most notable exception to the pattern of endowment-based trade is the case of USSR. The USSR has a land endowment very similar to the US but nearly all of its agricultural commodity imports from the US are food grains, feed grains or oil crops. These imports reflect poor harvests, chronic supply shortfalls, and political and economic policies that strongly distort the pattern of trade.

Patterns of agricultural trade also reflect the different income levels of purchasing nations. Exports to Africa clearly display the tendency for low-income nations to devote a large share of their food budget to food grains. Food grain imports accounted for 40 percent of agricultural imports from the US in 1982 and 1987. In addition, poor weather conditions contributed to domestic supply shortages, increasing the need for food imports [Shapouri, Dommen, and Rosen]. The effects of changing income levels on food purchases are also present. Deteriorating per capita incomes in African nations during the 1980s caused agricultural imports to fall between 1982 and 1987 and the share of food grains to rise. The experience of South Korea demonstrates the effects of income elasticities on demand when a nation's income rises. As a share of agricultural imports from the US, food grains fell from 22 to 12 percent between 1977 and 1987, while the meat products share increased from 12 to 33 percent. Finally, nations with income levels comparable to the US import large shares of fruits, vegetables, and meat products. Canada is a notable example. For high-income countries with small land endowments, feed grains and oil crops used to support domestic livestock

production are also likely to make up large shares of their agricultural imports. These crops were 52 percent of US agricultural exports to Western Europe in 1982 and 45 percent of those to Japan.

(2) Factor Intensity of US Agricultural Exports

Tables 2, 3 and 4 show estimates of land and labor used to produce US agricultural exports in 1977, 1982, and 1987. These estimates confirm the relationship between factor endowments and the commodity composition of agricultural trade predicted by Heckscher-Ohlin. Land to labor ratios for exports to land-scarce Japan, South Korea, and Western Europe are well over 100 harvested acres per worker (Table 5), while that for exports to land-abundant Canada is under 40 acres per worker. Using the same calculation as for exports, we estimated the factor content of imports as if they were produced domestically. US agricultural imports are also consistent with the Heckscher-Ohlin pattern of trade with an overall land to labor ratio of 26 compared to 118 for agricultural exports in 1982. The US land to labor intensity of agricultural imports is strikingly similar to that of the US's agricultural exports to Canada.

(3) Income Elasticities and Factor Intensity

A critical assumption of Markusen is that demand for capital-intensive goods is income elastic. This is a reasonable relation between factor intensity and income elasticity given the nature of most capital-intensive goods. In the context of the present study

however, is there a clear relationship between land intensity and the income elasticity of agricultural products? We have noted the tendency of low-income nations to spend a large share of income on food grains, the most land-intensive commodity group. Exports to Africa for example, are the most land-intensive of the regions presented. As income grows, imports of fruits and vegetables, meat products, and other processed foods increase, products that are relatively less land-intensive. However, imports of land-intensive feed grains and oil crops are also likely to rise to support livestock production. As a result, the net effect on land intensity is ambiguous. Further research is needed to provide a clearer picture of the relation, if any, between land intensity and income elasticity.

VI. Summary and Conclusions

This study reveals several interesting aspects of US agricultural exports. First, our basic results are consistent with the Heckscher-Ohlin theorem, US agricultural exports are land-intensive relative to US agricultural imports. Land-scarce customers such as Japan, South Korea and Western Europe import primarily land-intensive goods such as feed grains and oil crops while land-abundant Canada imports goods such as fruits, vegetables, and processed foods that are not land-intensive. As Lee, Wills, and Schluter show, US agriculture has a comparative advantage in producing and trading land and capital intensive rather than labor intensive commodities. Thus, relative factor endowments are an important determinant of US agricultural trade. Second, the land intensity of agricultural exports to Canada which has land endowments comparable to the US, was similar to that of US agricultural imports. Third, we noted that the importance of food grains falls as incomes rise while fruits, vegetables, meat products, and other processed foods become more important. The nature of the relationship between land intensity and income elasticity of a product remains uncertain.

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TABLE 1

U.S. Agricultural Exports by Region

	World			Canada			Mexico			W. Europe		
	1977	1982	1987	1977	1982	1987	1977	1982	1987	1977	1982	1987
Livestock	209,526	439,696	538,515	39,522	45,414	49,163	21,563	53,014	40,085	46,273	197,567	218,857
Food grains	2,732,232	6,698,159	3,051,070	1,182	1,026	713	41,252	72,624	13,470	210,669	552,282	94,090
Feed grains	4,912,549	6,487,406	3,974,575	36,339	44,220	27,782	247,828	204,481	342,435	2,072,751	1,826,558	227,339
Cotton	1,534,787	1,965,018	1,638,556	69,079	56,815	34,272	160	330	28,945	222,303	265,407	351,167
Veg., fruits, & nuts	975,599	1,744,838	1,965,952	376,146	536,589	454,359	13,102	107,984	40,260	250,552	392,796	571,782
Oil crops	4,791,941	6,802,370	4,589,803	149,549	116,315	71,744	115,699	270,873	263,340	2,751,069	4,137,652	2,184,619
Tobacco	1,094,283	1,546,541	1,039,990	3,677	8,898	1,670	0	8	37	480,591	754,477	523,724
Meat products	1,514,582	2,138,167	3,287,490	211,343	136,651	197,496	71,991	142,203	170,924	368,739	346,728	318,256
Feeds & flours	1,560,210	2,345,206	2,315,168	96,219	138,715	126,930	8,668	21,421	21,869	492,078	867,529	1,102,897
Vegetable fats & oils	2,334,085	2,998,347	2,204,718	122,101	108,608	189,241	92,936	121,710	102,424	813,988	1,189,371	625,655
Other processed foods	1,407,275	2,526,209	2,918,708	318,929	454,466	451,042	29,871	90,844	108,401	385,038	548,392	635,602
Other agricultural prods	569,087	930,642	1,062,848	110,389	172,155	205,087	21,333	70,708	68,383	264,217	384,659	409,744
Total agricultural exports	23,636,156	36,622,599	28,637,393	1,534,475	1,819,872	1,809,499	664,403	1,156,280	1,200,573	8,358,468	11,463,418	7,263,752

	Japan			Korea			USSR			Africa		
	1977	1982	1987	1977	1982	1987	1977	1982	1987	1977	1982	1987
Livestock	24,700	35,120	54,727	8,211	11,129	4,063	272	0	635	1,252	6,674	8,476
Food grains	374,516	563,681	352,338	202,224	300,153	213,531	427,897	802,182	392,491	396,338	877,044	713,852
Feed grains	1,065,621	1,515,787	1,221,625	159,475	378,716	357,077	387,642	834,626	393,230	118,662	273,678	225,409
Cotton	310,069	502,468	416,908	315,251	425,507	313,725	453	67	0	65,105	17,586	58,341
Veg., fruits, & nuts	123,825	247,374	441,051	128	1,468	5,012	13,349	7,680	20,247	19,796	31,121	31,772
Oil crops	964,673	1,003,987	809,511	44,280	142,255	232,637	159,031	171,265	42,705	36,359	40,956	21,225
Tobacco	259,953	309,920	300,766	21,159	4,183	845	0	1,262	0	96,375	76,890	29,034
Meat products	396,908	773,927	1,281,818	108,125	170,575	608,599	7,611	5,061	0	22,130	36,971	39,964
Feeds & flours	64,615	88,304	186,406	11,929	68,074	7,699	24,114	1	0	252,551	479,829	270,375
Vegetable fats & oils	130,002	111,899	56,408	40,116	50,488	45,726	1,599	40,571	76,356	262,829	281,559	235,888
Other processed foods	113,076	336,336	489,707	5,811	17,979	22,947	4,656	6,791	11,298	75,872	96,375	116,663
Other agricultural prods	28,831	66,210	88,570	3,576	10,833	22,273	9,959	1,768	1,145	15,017	19,092	15,362
Total agricultural exports	3,856,789	5,555,013	5,699,835	919,285	1,581,360	1,833,420	1,036,583	1,871,274	938,107	1,362,286	2,237,775	1,766,361

TABLE 2

Agricultural exports	Factor Use to Produce U.S. Agricultural Exports in 1977		Factor Use to Produce U.S. Agricultural Exports to Canada, 1977		Factor Use to Produce U.S. Agricultural Exports to Mexico, 1977		Factor Use to Produce U.S. Agricultural Exports to W. Europe, 1977	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	13,497	541,215	2,664	95,528	1,255	61,730	3,282	126,475
Food grains	126,191	28,947,020	55	12,523	1,905	437,050	9,739	2,234,082
Feed grains	197,727	30,242,048	1,463	223,706	9,975	1,525,649	83,427	12,760,022
Cotton	67,195	4,362,965	3,024	196,372	7	455	9,733	631,944
Veg., fruits, & nuts	64,316	787,582	23,641	266,986	828	10,239	17,084	253,503
Oil crops	122,722	22,504,891	3,830	702,343	2,963	543,369	70,455	12,920,131
Tobacco	39,438	127,054	133	427	0	0	17,320	55,800
Meat products	78,772	2,943,985	10,992	410,800	3,744	139,933	19,178	716,740
Feeds and flours	58,065	4,287,406	3,583	263,763	327	22,247	18,370	1,331,266
Vegetable fats & oils	79,114	5,779,622	4,139	302,344	3,150	230,127	27,590	2,015,583
Other processed foods	59,831	806,824	13,408	135,166	1,275	25,159	16,498	168,798
Other agricultural prods	25,490	250,929	4,977	43,769	1,068	25,097	11,222	75,595
Total agricultural exports	932,358	101,581,541	71,908	2,653,726	26,497	3,021,057	303,899	33,289,940

Agricultural exports	Factor Use to Produce U.S. Agricultural Exports to Japan, 1977		Factor Use to Produce U.S. Agricultural Exports to Korea, 1977		Factor Use to Produce U.S. Agricultural Exports to USSR, 1977		Factor Use to Produce U.S. Agricultural Exports to Africa, 1977	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	1,613	62,790	437	24,861	14	824	74	3,060
Food grains	17,297	3,967,863	9,340	2,142,491	19,763	4,533,416	18,305	4,199,059
Feed grains	42,891	6,560,049	6,379	975,585	15,602	2,386,355	4,776	730,493
Cotton	13,575	881,438	13,802	896,169	20	1,288	2,850	185,075
Veg., fruits, & nuts	8,891	90,964	9	103	981	15,792	1,038	16,667
Oil crops	24,705	4,530,494	1,134	207,957	4,073	746,874	931	170,757
Tobacco	9,369	30,182	763	2,457	0	0	3,473	11,190
Meat products	20,643	771,494	5,623	210,169	396	14,794	1,151	43,015
Feeds and flours	2,468	154,344	442	33,603	892	68,291	9,345	713,866
Vegetable fats & oils	4,406	321,909	1,360	99,335	54	3,959	8,909	650,813
Other processed foods	4,891	51,861	237	2,658	175	1,836	3,285	73,236
Other agricultural prods	1,332	19,033	154	689	533	16,401	726	9,123
Total agricultural exports	152,082	17,442,422	39,679	4,596,075	42,503	7,789,829	54,863	6,806,353

TABLE 3

Agricultural exports	Factor Use to Produce U.S. Agricultural Exports in 1982		Factor Use to Produce U.S. Agricultural Exports to Canada, 1982		Factor Use to Produce U.S. Agricultural Exports to Mexico, 1982		Factor Use to Produce U.S. Agricultural Exports to W. Europe, 1982	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	20,944	670,770	2,073	61,939	2,268	83,993	10,281	318,172
Food grains	201,703	44,191,519	31	6,769	2,187	479,141	16,631	3,643,715
Feed grains	202,202	28,671,191	1,378	195,431	6,373	903,707	56,931	8,072,501
Cotton	80,986	5,257,663	2,342	152,016	14	863	10,938	710,131
Veg., fruits, & nuts	65,741	856,145	19,976	243,176	3,792	59,991	14,902	240,103
Oil crops	161,808	34,373,282	2,767	587,755	6,443	1,368,757	98,422	20,908,107
Tobacco	28,924	89,548	166	515	0	0	14,110	43,686
Meat products	72,140	2,519,791	4,610	161,041	4,798	167,584	11,698	408,613
Feeds and flours	65,306	4,739,529	3,885	274,318	602	41,841	24,143	1,757,193
Vegetable fats & oils	90,173	7,066,934	3,266	255,983	3,660	286,864	35,770	2,803,280
Other processed foods	68,225	831,666	12,163	111,057	2,471	52,757	15,083	155,446
Other agricultural prods	31,197	272,758	5,934	35,187	2,522	42,794	12,757	92,760
Total agricultural exports	1,089,349	129,540,796	58,592	2,085,187	35,131	3,488,313	321,666	39,153,707

Agricultural exports	Factor Use to Produce U.S. Agricultural Exports to Japan, 1982		Factor Use to Produce U.S. Agricultural Exports to Korea, 1982		Factor Use to Produce U.S. Agricultural Exports to USSR, 1982		Factor Use to Produce U.S. Agricultural Exports to Africa, 1982	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	1,618	56,395	357	17,339	0	0	299	9,593
Food grains	16,974	3,718,920	9,039	1,980,278	24,156	5,292,445	26,411	5,786,352
Feed grains	47,245	6,699,044	11,804	1,673,741	26,014	3,688,643	8,530	1,209,524
Cotton	20,709	1,344,419	17,537	1,138,500	3	179	725	47,054
Veg., fruits, & nuts	9,643	98,927	55	859	303	6,005	1,097	17,760
Oil crops	23,882	5,073,280	3,384	718,833	4,074	865,425	974	206,956
Tobacco	5,796	17,945	78	242	24	73	1,438	4,452
Meat products	26,112	912,059	5,755	201,020	171	5,964	1,247	43,570
Feeds and flours	2,546	154,952	1,886	140,150	0	2	13,292	988,548
Vegetable fats & oils	3,365	263,740	1,518	118,997	1,220	95,624	8,468	663,619
Other processed foods	9,047	92,775	500	4,817	181	1,643	2,589	49,384
Other agricultural prods	2,219	28,758	330	1,466	71	705	666	9,955
Total agricultural exports	169,156	18,461,214	52,242	5,996,243	56,215	9,956,707	65,736	9,036,766

TABLE 4

Agricultural exports	Factor Use to Produce U.S. Agricultural Exports in 1987		Factor Use to Produce U.S. Agricultural Exports to Canada, 1987		Factor Use to Produce U.S. Agricultural Exports to Mexico, 1987		Factor Use to Produce U.S. Agricultural Exports to W. Europe, 1987	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	21,462	742,730	1,844	67,010	1,169	54,811	9,553	324,485
Food grains	126,888	30,993,956	30	7,243	560	136,833	3,913	955,803
Feed grains	154,242	24,110,925	1,078	168,534	13,289	2,077,310	8,822	1,379,104
Cotton	73,107	4,198,066	1,529	87,807	1,291	74,159	15,669	899,759
Veg., fruits, & nuts	64,619	831,463	14,337	169,686	1,225	19,192	19,159	303,687
Oil crops	116,735	25,730,779	1,825	402,202	6,698	1,476,304	55,562	12,247,137
Tobacco	12,325	42,932	19	66	0	1	5,922	20,628
Meat products	100,605	3,615,441	6,044	217,198	5,231	187,975	9,739	350,004
Feeds and flours	56,828	4,247,284	3,135	226,862	537	40,190	27,011	2,042,599
Vegetable fats & oils	62,172	4,999,326	5,336	429,115	2,888	232,252	17,643	1,418,709
Other processed foods	63,476	797,205	9,532	93,246	2,544	62,584	13,909	135,364
Other agricultural prods	31,869	367,983	6,273	43,947	2,199	43,955	12,402	144,444
Total agricultural exports	884,327	100,678,087	50,981	1,912,916	37,631	4,405,566	199,306	20,221,724

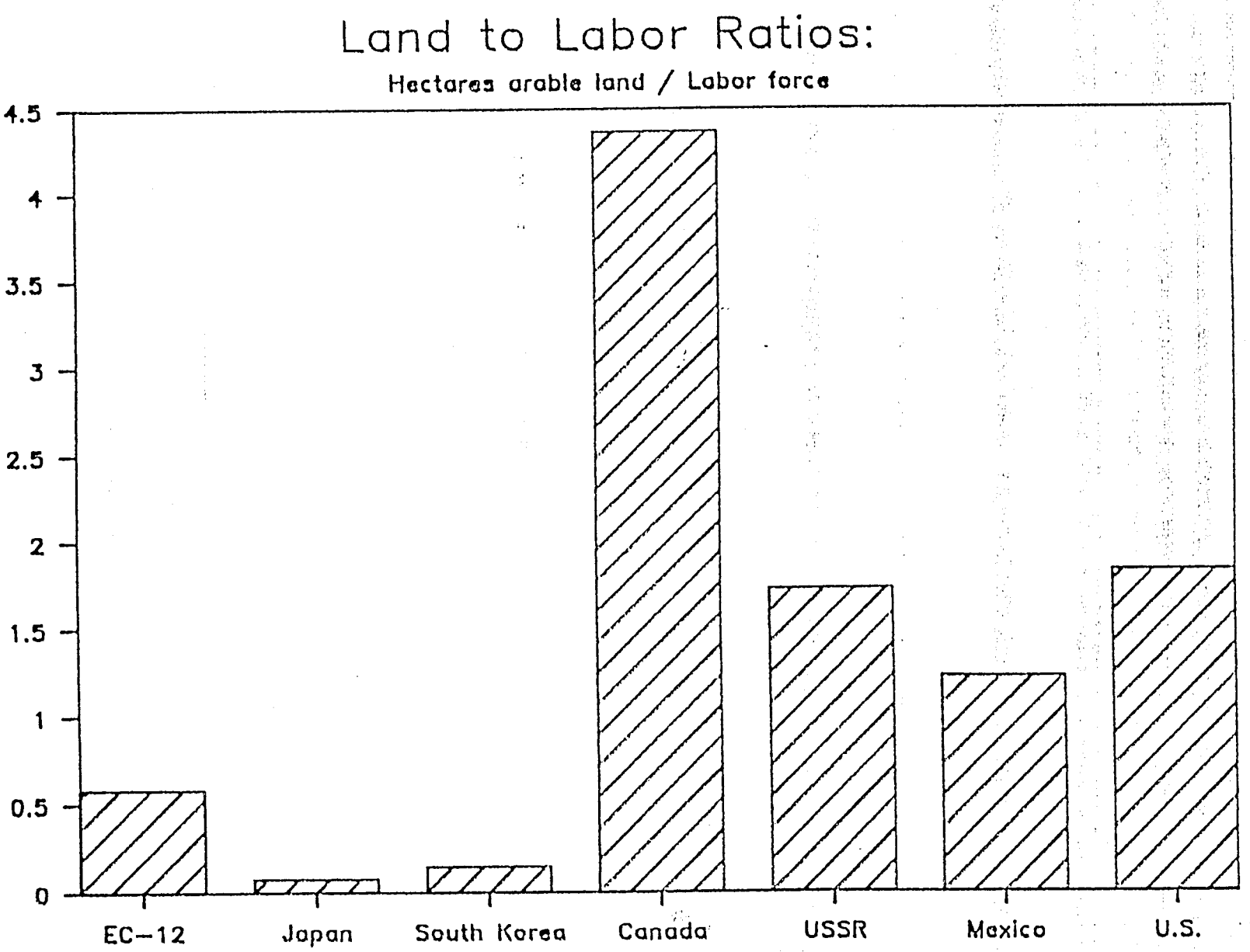
Agricultural exports	Factor Use to Produce U.S. Agricultural Exports to Japan, 1987		Factor Use to Produce U.S. Agricultural Exports to Korea, 1987		Factor Use to Produce U.S. Agricultural Exports to USSR, 1987		Factor Use to Produce U.S. Agricultural Exports to Africa, 1987	
	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres	Employment	Harvested Acres
Livestock	2,146	79,269	153	4,145	19	931	319	11,713
Food grains	14,653	3,579,186	8,880	2,169,131	16,323	3,987,076	29,688	7,251,586
Feed grains	47,408	7,410,732	13,857	2,166,102	15,260	2,385,447	8,748	1,367,396
Cotton	18,601	1,068,140	13,997	803,780	0	0	2,603	149,473
Veg., fruits, & nuts	15,006	154,843	171	2,564	706	13,605	904	14,423
Oil crops	20,589	4,538,179	5,917	1,304,180	1,086	239,407	540	118,989
Tobacco	3,401	11,846	10	33	0	0	328	1,144
Meat products	39,226	1,409,689	18,624	669,311	0	0	1,223	43,951
Feeds and flours	4,679	309,128	195	14,005	0	0	6,595	509,180
Vegetable fats & oils	1,591	127,908	1,289	103,686	2,153	173,142	6,652	534,890
Other processed foods	10,810	109,231	481	4,865	226	3,006	2,581	54,700
Other agricultural prods	2,705	42,034	603	3,605	32	31	504	10,362
Total agricultural exports	180,815	18,840,185	64,178	7,245,408	35,807	6,802,645	60,684	10,067,806

Table 5. Land/Labor* Ratios for Total US Agricultural Exports in 1977, 1982, and 1987

	World	Canada	W. Europe	Japan	Korea	Africa
1977	109	36	106	114	116	124
1982	118	36	121	109	114	137
1987	113	36	101	104	112	165

* Harvested acres of land per worker-year

FIGURE 1


Land to Labor Ratios:
Hectares arable land / Labor force
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
EC—12
Japan
South Korea
Canada
USSR
Mexico
U.S.