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Working Paper No. 206

THE FULL COSTS OF FARM EXPORTS

by

Otto Doering, Andrew Schmitz, and John Miranowski

California Agricultural Experiment Station
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In the last decade there has been a tremendous expansion of agricultural exports from the U. S. (Table 1). Generally, this has been viewed as a good thing for the nation as a whole. Expanded exports have improved incomes for farmers and have benefited consumers by providing foreign exchange for the purchase of more foreign goods, especially oil. The general belief in the benefits of expanded foreign trade is reflected in the current administration in its stress on export promotion to enhance farm incomes and help the national economy. However, the 1982 reality is one of large grain stocks, low commodity prices, stagnation of export demand, and the lowest expected farm incomes since the Great Depression.

Recent studies of U. S. agricultural production and export expansion have focused on physical resource use. One example is the comparison of energy resources required to produce grain with the petroleum resources that can be imported with the grain export earnings (1). In essence, these analyses establish an energy standard of value for judging whether such exports are in the nation's best interest. Other examples include studies of soil and water depletion linked to the expansion and intensification of agricultural production (2).

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Most of these resource-based studies implicitly or explicitly assume a declining efficiency of agricultural output. Farmers are viewed as being forced to expand crop production into less productive and more erosive land by economic circumstances that threaten their survival in farming. The implication is that farmer response to short-run economic phenomena do not reflect the long-run costs and benefits of resource use. In fact, there have been few attempts at economic analyses to parallel the physical studies of resource flow, depletion, and degradation. There have been even fewer economic analyses that cast these resource use decisions into a gains from trade framework, ensuring a broader look at societal costs and benefits from an agricultural export promotion policy.

Our objective is to provide an analytical framework beginning with an analysis of the private (individual firm's) cost of producing corn and wheat. These private costs will be compared with farm prices received and will provide one perspective for viewing resource use decisions at the firm level. This comparison is followed by the estimation of agricultural input subsidies, long-term social costs, tax advantages, and government program costs to arrive at a lower bound estimate of the social costs for corn and wheat production in the U. S. An analysis is then made of agricultural export policy to determine the net gains to U. S. and foreign consumers.

Costs of Production

For the most part, data limitations require the use of aggregate or average costs of production. However, it is most helpful if there is information about the marginal cost of production, the cost of producing one additional unit beyond the current level of production. Initially, the marginal cost of production is expected to decrease as a firm goes beyond its first unit of production and both start-up and fixed costs can be spread over more units. Ultimately, the marginal cost begins to level off and then increases as diminishing returns to one or

another limited resource sets in (3). The determination of where different levels of agricultural production are located along an aggregate marginal cost curve is especially important to the analysis of costs of production under an expansionist export policy.

Some analyses of the current agricultural situation see inflation and high interest rates as the primary cause of the current cost pressures that are expected to contribute to low levels of farm income in 1982 (4). Inflation is certainly a factor, but it only relates to the general price level by moving the whole set of cost curves upward. The focus here is not on general cost increases, but on changes in costs as the volume of agricultural production expands and bumps up against resource constraints causing diminishing returns to set in. This is what the physically based resource analyses focus on when they assume that there will be even higher costs for agricultural products if agricultural production is expanded further.

Cost of Production Data:

In 1974, the U. S. Department of Agriculture (USDA) carried out a nationwide cost of production survey on major agricultural commodities (5). Samples were taken in forty regions providing data from over four thousand farms. For a given commodity, farms were surveyed in those regions accounting for the bulk of the production of that commodity.

The cost reporting in this survey involved four major cost components: "total direct, overhead, management and alternative allocations to land. The total direct costs, shown in detail in the report, include labor, power and machinery costs, seed, fertilizer and chemicals, custom services, irrigation, interest on operating capital and other materials. Overhead costs include all costs that must be paid such as personal property taxes, electricity, sales taxes, insurance, and farm auto costs, but are not directly related to a specific crop's

production. A charge for management was computed at the rate of 7 percent of the gross farm sales allocated to a crop in proportion to value of production of one crop to total value of production on the farm. Land allocations have been computed by six alternative methods: 1. Owned land valued at current prices for agricultural purposes; 2. owned land valued at an average acquisition price; 3. net share rent; 4. cash rent; 5. composite basis reflecting actual combinations of cash rent, share rent and owner-operator arrangements with owned land valued at current land prices; and 6. composite as in 5 above except owned land valued at the average acquisition prices." (6)

The 1974 cost of production survey provided average cost information nationally and regionally according to the six different categories of costs. In addition, the average per unit costs of the sample producers were arrayed, and cumulative cost curves were constructed to indicate what proportion of the crop was produced below a given cost. Such cost curves were constructed for the total direct costs by themselves for all costs including land at current value on a composite basis (as in case 5 above) and for all costs, but including land at acquisition value on a composite basis (as in case 6 above). While these cost curves are not really marginal cost curves, they do give us something better than an aggregate industry average for total costs for a given commodity.

Three cost distributions have been constructed from the survey data for the purposes of this study. First is a 'Direct' cost distribution which includes the total direct, overhead and management costs. Second is a cost curve designated as 'Total 1' which includes Direct costs plus land costs at current value on a composite basis. Finally, there is a 'Total 2' cost curve which includes Direct costs plus land costs at acquisition value on a composite basis. These distributions are illustrated in Figure 1 for U. S. wheat production in 1974. This is done on a per bushel unit basis where a bushel of wheat weighs 27.2 Kg. (a bushel of corn weighs 25.4 Kg.).

Thus, there are two different forms of cost data which will be utilized here. One is the set of three per unit average costs of production for a given crop on a national aggregate or regional basis, and the other is the set of three per unit cost distributions for a given crop on a national basis. No comprehensive cost of production survey has been made for all the commodities since the original 1974 survey. The national and regional average cost figures for major crops have been updated annually by USDA using a budget generator and less comprehensive cost surveys. The Food and Agriculture Act of 1977 required the establishment of national average cost figures for major commodities in succeeding years because it linked government price supports to changes in production costs (excluding land). These annual average costs of production are given in Table 2 for wheat and corn.

The cost distributions have been updated by USDA occasionally for internal use and analysis. Because of their importance as some form of approximation for a total industry cost curve, the 1974 cost curves for wheat and corn have been updated for this study on the basis of the original distribution (7). The shape of the 1974 distribution was thus maintained for each commodity for succeeding years as the distribution was shifted to match the change in value of the average per unit cost of production from one year to the next and the scale of the distribution was proportionally adjusted to the changes in the value of the average. The general shape of the distributions of costs for wheat production from 1975 through 1980 is thus the same as that for 1974 (Figure 1).

Having constructed a set of cost distributions for wheat and corn, one can locate on each distribution the average price farmers received in a given year. As an example, this is done for wheat in 1974 by locating the seasonal average price for wheat for that year, $4.09, on the cost scale (Figure 1). The same thing can be done for both corn and wheat from 1974 through 1980. In each year the seasonal average price becomes a dividing point on each cost distribution of Direct, Total 1 and Total 2 costs and allows the estimation of that proportion

of the crop produced at a cost greater than the average seasonal price. This information is presented in Table 3 for wheat and corn. It indicates that at various times large proportions of the corn and wheat crops have been produced at costs that are higher than the seasonal average farm level prices.

Concerns About the 1974 Cost Base:

Before interpreting the information in Table 3, it is important to consider whether the shape of the 1974 cost distributions for corn and wheat makes sense for later years. Weather is a most important concern with respect to both the average cost figure and the shape of the distribution. The 1974 figures were based upon actual yields, and the cost projections made for later years were based upon projections of normal yields. In 1974 the weather was worse than normal for most crops and resulted in lower yields and higher per unit costs than would have been the case with normal or trend yields. The USDA estimates that national average Total 2 costs for a bushel of wheat in 1974 would have been $2.42 with normal yields as opposed to the $2.94 based upon actual reduced yields. This weather effect may also have made the distribution of costs broader and more skewed towards the high costs than otherwise. It is expected that this skewing effect would have been more severe for wheat than for corn given the greater proportion of wheat grown on marginal lands that are highly sensitive to weather. The average costs and the distributions presented here may be different from the actual situation because of weather impacts upon yield levels and the leverage that exerts upon costs.

In order to try and double check the Table 3 results of the 1974 distribution for a later year, a regional cumulative cost curve was compiled for winter wheat from the 1980 cost of production estimates, and this was then matched with the 1974 based distribution for 1980 in its estimation of the proportion of the wheat crop produced at a cost above the seasonal average farm level price (8). This is done in Figure 2, which represents the Total 2 (Direct plus land at acquisition

value on a composite basis) costs for winter wheat in 1980. The USDA cost of production estimates for each region were taken and assigned a percentage weight on the basis of the proportion of the total winter wheat crop produced in that region. In Table 3, which is based upon the 1974 distribution, 84 percent of the 1980 wheat crop was produced at a Total 2 cost greater than the seasonal average price of $3.88 a bushel. In Figure 2, the Central Plains was the low-cost region for producing winter wheat with an average cost of $4.02 per bushel in 1980. That region was also the largest producer, contributing 41 percent of the total winter wheat crop. Even assuming some broad distribution of Central Plains costs around the $4.02 average, it appears from Figure 2 that 80 percent or more of the winter wheat crop was produced at a cost greater than the seasonal average price of $3.88 a bushel. In this case the cumulation of the regional cost data for winter wheat tends to support the results given by the 1980 estimated cost curve based upon the 1974 distribution.

Using Total 2 Costs:

Total 2 costs will be used for our analysis and comparisons. The Direct costs do not include land, and this has become an increasing factor in total production costs given inflation of land values and higher interest costs. Total 1 costs, which include current land values, probably overstate the land cost component actually faced by most farmers as only 3 percent of U. S. farmland changes hands in any given year, so most farmers purchased the bulk of their land some years ago at lower prices. The Total 2 costs include Direct costs and land costs based upon acquisition value. In addition, the Total 2 costs used here are calculated with land cost on a composite basis reflecting the actual tenure status, cash lease, share rent, etc. Costs on the basis of actual tenure arrangements are lower than costs figured on the basis of current interest rates applied to land values. The Total 2 cost thus represents the lowest cost estimate in the USDA series that still includes land costs.

Costs Beyond the Firm

A number of production costs for corn and wheat are borne by others not involved in the actual production of the commodities. These social costs may take the form of transfer payments or commodity programs for producers whose cost is borne by taxpayers, tax concessions to producers with the needed tax revenue ultimately made up by other taxpayers, intertemporal costs of production not borne entirely by today's producers, and input subsidies that lower the cost of production or increase the price received by the farmer.

Input Subsidies:

Over the years, public and private investment in agricultural research has yielded high rates of return through increases in productivity. The primary beneficiaries of such research investment have been consumers, both domestic and international, and to a lesser extent early adopters of new technology who benefit from a period of reduced per unit production costs relative to price.

Ruttan estimates that public research performed by the USDA and the state agricultural experiment stations (SAES) totaled $1.2 billion in 1979 while private agricultural research expenditures exceeded $2 billion (9). Private research costs are assumed to be recovered in the marketplace and are reflected in farm input prices or other costs. In contrast, the expenditure on publicly supported research does not get included in private cost of production estimates.

Current Research Information System (CRIS) data, providing USDA and SAES research expenditures, are available from 1967 to 1979 and indicate that the public sector was spending over $55 million on corn and wheat research in fiscal 1979. To permit comparison with the cost of production data, these research costs can be expressed as an average cost per bushel of corn and wheat produced. Because there is delay between research outlays and the associated productivity impacts, a seven-year lag is used in calculating the average public research cost per bushel of corn and wheat for 1974 through 1980 (10). These estimates indicate

that the average annual expenditure per bushel was $.002 for corn and $.006 for wheat. These estimates understate the total public costs involved because similar estimates of public expenditures on extension and education are excluded, and public expenditures on basic management and marketing research may not have been included in the commodity estimates.

A more comprehensive accounting of research, extension and education expenditures might show substantially higher costs. If these costs are not much higher than our estimates, then critical questions should be raised concerning the relatively low funding of research, extension and education relative to our subsidization of other aspects of production.

Transportation is another area where there have been public subsidies that have either reduced the cost of inputs or increased the price of commodities at the farm level by reducing the price differential to market. A recent study of transportation subsidies for Canadian wheat indicates an average government subsidy of $0.27 per Canadian bushel of wheat for the period 1975 through 1979 (11). The most conservative estimate of U. S. transportation subsidies is based upon an examination of current and future operating cost subsidies for water transportation (12). This does not include anything for past capital subsidies and amounts to roughly $0.03 per bushel for the transportation of wheat and corn by water. The subsidies for truck and rail are slightly less.

Long-Term Societal Costs:

A national concern about the impact of export expansion on soil erosion has accompanied the increase in the volume of American farm exports. The impact of increasing soil erosion is felt in terms of decreasing soil productivity and declining environmental quality, especially water quality. The amount of land cropped in the U. S. has increased from under 300 million acres (121 million hectares) in 1970 to over 350 million acres (143 million hectares) in 1980. The increase in cropland acreage during the decade was due almost exclusively

to satisfying export demands. Much of the cropland expansion occurred on soils more prone to erosion.

Although data are not available to determine the specific contribution of farm exports to the soil erosion problem, the USDA's 1977 National Resource Inventory (NRI) quantifies the seriousness of soil erosion. Based on a 'tolerable rate of soil erosion' (T-value) of five tons per acre per year, which may overestimate or underestimate the actual rate of topsoil genesis in specific cases (13), 23 percent of U. S. cropland was suffering sheet and rill (water) erosion above this level. Disaggregating these numbers, 16 percent of the cropland was suffering moderate threats to long-run productivity (5 to 14 tons per acre per year) and 7 percent was suffering serious threats (greater than 14 tons). Similar estimates were reported for wind erosion. As these numbers indicate, a relatively small portion of cropland, which would not be needed under a more modest export scenario, suffers a serious erosion threat.

If we assume that export demand is the residual claimant for farm commodities and thus the source of excess cropland soil erosion (greater than 5 tons), excess sheet and rill erosion from corn and wheat production are 500 million and 100 million tons, respectively (NRI). This is about 4 million acre inches per year, or 3.33 and .73 million acre inches for corn and wheat, respectively. Although the implicit value of an acre inch of topsoil is highly variable, preliminary estimates indicate a value of $60 per acre inch for Iowa. Using this value for the nation, the annual soil productivity foregone in corn production would be about $200 million, or an average cost per bushel exported of $0.10. The estimates for wheat production are $44 million and $0.14 per bushel. Taking these costs against the total crop would give costs of $0.03 per bushel for corn and $0.02 for wheat.

Two qualifications of these estimates are in order. First, these estimates may overstate the productive value, and thus the erosion costs, of many of the

more erosive soils. Second, wind erosion was ignored in deriving these estimates; it may be an important factor in the productivity of cropland for wheat. Finally, even though the productivity costs of soil erosion are largely incurred by the private landowner, consumption of the soil capital stock is a long-term cost that will have to be borne by consumers as well and should be included in our total cost.

The externality costs of soil erosion, which are borne by the public through reduced water and air quality, are even more difficult to quantify. Again, because of the more nebulous impacts of wind erosion on environmental quality as well as on soil productivity, our attention is concentrated on the water quality impacts of sediment associated with water-caused soil erosion. These external costs include reduced reservoir capacity, impaired recreational opportunities, and increased potable water purification. Although a wide range of costs have been attributed to these and other water quality impacts (14), the cost estimates generally range from $1 to $5 per ton of sediment delivered to the stream. Not all eroded soil is deposited as sediment in the stream. Depending upon the soil type, topography, and watershed size, the soil delivered to the stream as sediment is typically estimated to range from 10 to 40 percent (15).

When considering external costs, all soil erosion (not only that portion above the T-value) has the potential to inflict environmental damage. The NRI data place total sheet and rill erosion from corn and wheat production at approximately 870 million tons per year, or about 90 to 350 million tons of sediment entering the nation's waters. Given the tenuous nature and range of estimates involved, further interpretations and conclusions are left to the reader. However, these external costs are significant, of greater magnitude than the productivity costs, and pertain to production for domestic consumption as well as for export.

Tax Advantages:

There has been enough discussion of tax advantages to certain kinds and

scales of farming that many regard these tax provisions as a kind of subsidy to agricultural production. However, they really are not the same as direct government expenditures upon commodity support programs, even though the benefits from the tax provisions can be substantial.

As an example, to get a rough estimate of the potential advantage to a farm firm, we can compare the tax-based advantage to farms using cash accounting compared with the accrual accounting required of most other businesses. Cash accounting gives the farmer more flexibility to choose when costs and profits will be accounted for and thus allows a balancing out of enterprise costs and profits resulting in a lower average tax obligation over the multi-year period than would otherwise be possible. Based upon a 5-year income and cost analysis of large Iowa farms (sales between $100,000 and $200,000 annually), the annual after-tax income advantage of cash over accrual accounting is almost $30,000 per farm or $0.30 per bushel of corn that might be raised on such a farm (16). There is also an increase in the value of the net worth amounting to almost $33,000, equivalent to $0.43 per bushel. It is critical to note that the magnitude of the advantage is dependent upon the tax rate which reflects the income level of the farm. A smaller farm with sales between $20,000 and $30,000 annually has an income advantage of cash over accrual accounting of only $0.14 per bushel of corn and an increase in net worth of only $0.13 per bushel. According to the 1978 Census of Agriculture, almost half of the grain from the nation's cash grain farms came from farms with sales in excess of $100,000. Thus, we might expect an average tax benefit for all grain production to be a bit less than that for the group with sales from $100,000 to $200,000.

No estimates were made for farms in regions where the bulk of the nation's wheat is produced. As wheat tends to be more extensively produced with a lower cash flow per acre, it was estimated that the per bushel tax advantage would be lower for wheat--about half of that for corn.

In situations where there was little or no profit from farming over a period of years, the provisions allowing farms to utilize cash accounting would be of substantially less value; perhaps on the average this would amount to a bit less than the advantage to small farms already at low income and tax rates.

When it is difficult to understand what keeps firms in farming because private costs appear to be higher than farm level returns, tax policy may provide a partial answer. This is especially true in cases where producers or outside investors may have income from other activities which can be enhanced on an after-tax basis with cash accounting. The tax advantage has the most impact during times of high commodity prices, which imply strong demand and little need for government intervention in the marketing of commodities. It would reward those already in agriculture, encouraging both additional investment and new entrants.

Costs of Government Commodity Programs:

Since 1933 there have been a number of federal programs aimed at influencing the supply and demand of wheat and corn in the U. S. During the chronic surpluses of the 1960s, such programs involved diversion or set-aside payments and storage programs with loans to reduce or even out the supply. Non-recourse loans, export subsidies and marketing certificates were used to enhance price or stimulate demand along with several domestic and foreign food assistance programs. In the 1970s, programs involved direct payments to farmers, crop disaster payments, and a grain reserve program in addition to some earlier mechanisms, such as diversion payments. The late 1970s did not include the large buildup of crop surpluses that occurred during the 1950s and 1960s. Increasing demands from export markets prevented the continuing accumulation of surpluses.

An analysis of the costs of support programs for wheat and corn from 1965 through 1969 indicates government costs of $0.26 per bushel for corn and $0.65 per bushel for wheat for all wheat and corn produced over that period (17). Adjusting these amounts by the increase in commodity prices from 1965-1969, as

compared with 1975-1979, gives subsidy costs of $0.25 per bushel of corn and $1.35 per bushel of wheat. These might be considered upper bounds of such subsidy costs during periods of surplus.

An analysis of the costs of the farmer-owned reserve program covering 1978 through 1980 gives a per bushel program cost of $0.04 per bushel for corn and $0.06 per bushel for wheat (18). These may be considered lower bound program costs during periods of good cyclical demand for these commodities. Actual total program costs for wheat for the 1975-1979 period amounted to $0.24 per bushel.

The Total Costs of Production:

The total costs of production are given in Table 4. The starting point is an average of private costs for 1978 through 1980 taken from Table 3. To this are added the additional costs discussed so far. Three sets of total costs are presented. The first two indicate the trade-off between tax advantages for farmers in years of strong demand for commodities as compared with the high costs of government programs during years of continuing surplus production. The third category under total costs includes private costs from some high-cost producing regions and adds to these the additional non-private costs. This is the closest we can come conceptually to the full marginal cost of producing for export, and it is much higher than the average farm level prices (19).

Analysis

Whatever the nature of those factors which have allowed farmers to produce at an apparent loss, they relate to a general policy decision taken many decades ago to provide relatively inexpensive food to the American public. This policy has been politically supported on progressive grounds and has resulted in tax revenues being utilized to encourage agricultural production at volumes above those that would be achieved on the basis of comparing only private costs with average prices received. Thus, some of the difference between private costs

and total costs acts to reduce the actual and perceived private costs of producers. One of the results has been a measure of overproduction and a reduction of commodity prices in the marketplace. This has made political sense given the lower prices that American consumers have paid for these agricultural commodities. Prior to the early 1970s there was no compelling political reason to analyze this public spending from tax revenues to enhance consumer welfare because most of the consumers were American. The issue changes when an increasingly high proportion of the consumers benefiting from commodities being marketed below private and total costs are Japanese, European, Chinese or Soviet. It also changes if resource constraints and a reduction in the rate of technological change result in increasing marginal costs for agricultural production.

Exports and Marginal Analysis:

What is the importance of the numbers in Table 4 with respect to the cost and value of U. S. exports of corn and wheat? The numbers show clearly that the price per bushel of the good sold in the export market is too low to cover the full production costs. For wheat, the price received from exports covers only 65 percent of the high cost of production.

Economic theory can help explain the above phenomenon that the value of exports is insufficient to cover production costs. Figure 3 uses the notion of an excess supply and excess demand framework for this purpose. The excess supply curve with full costs included is ES, which shows how much output would be produced for the export market at different prices. The excess demand curve is ED, which shows the demand for exports by importers at different prices. Thus, without government interference, Q* would be exported at a price P*. Input subsidies, such as transportation subsidies, lower the private costs of production to ES1, driving a wedge between ES and ES1. With only input subsidies in place, exports would be Q1 and price would be P1. If in addition, however, price supports are used (listed under program costs in Table 4), producers would receive price P* for exports Q2.

From Figure 3 it becomes clear that input subsidies and/or price supports create a divergence between the cost of exports and the average price received from their sale. In Figure 3, at the export amount Q2, a price of Pf is needed to cover the marginal cost of producing the last unit. However, the average price received for the last unit of exports is only Ps. Referring back to Table 4 and the high-cost producing region for wheat, an approximation for point A (price Pf) is between $5.17 and $5.96 per bushel, while an approximation for point B (price Ps) is $3.57 per bushel.

Now it may well be that at times producers receive prices which are adequate to cover their private costs but not full costs. In Table 4, the three-year average price for corn exceeds private costs; however, it does not cover full costs. Thus, importers in essence obtained an export subsidy (over $1.00 per bushel for corn and over $1.50 per bushel for wheat) even though prices received may have covered private production costs. These are the implicit export subsidies; explicit subsidies, such as PL 480 sales and credit subsidies for export sales, are not included here. If the prices that producers received had to cover both private and social costs, output would be less than it has been in past years, exports would be less, and the marginal acres in crop production would be returned to less intensive use. This is because the value of an additional unit of output sold on the export market does not cover the cost of producing it.

There is an important point to stress in Figure 3. The price Ps is an average price received for the amount of exports Q2. However, a more interesting economics question is: what is the value of the marginal export sale? This schedule is represented in Figure 3 by the marginal export revenue line, MER. This shows that the expansion of export sales (by the use of export subsidies and/or price supports) beyond Q1 may cause the value of total export sales to decrease. In other words, for exports Q2 as compared to Q1, the revenue generated by additional sales is negative (total revenue P1, Q1 exceeds Ps, Q2). Thus, the

prices received by farmers (Table 4) represent an upper bound of the revenue generated from trade since the value of exports at the margin is below the average price received by farmers and may well be negative! In other words, the marginal output cost to produce exports versus the marginal export revenue exceeds the distance AB in Figure 3 (point B in Figure 3 actually represents the average price from total export sales).

Concluding Observations

Upon examining the distributions of costs for producing corn and wheat in the U. S., there appears to be a trend of increasing costs relative to average prices received by farmers, and a large proportion of these crops is produced at private costs greater than the average price received by farmers. Even if there are problems with the data so that the proportion of farmers producing at private costs above prices received is only half as many as indicated, both the trend and the proportion of farmers in such a situation would be alarming. This is especially so given the current large stocks of corn and wheat, the high costs, and the crop and income projections for 1982.

Private costs are not the only ones that are important. The additional costs in the form of input subsidies, social costs, tax advantages, and various government programs are borne by a broader segment of society. These have been borne in the past because they resulted in lower food costs for domestic consumers when most of the nation's corn and wheat was consumed at home. The recent trend has been to export an increasing proportion of our corn and wheat. Under these circumstances it appears reasonable to view these quantities exported as the marginal units produced after domestic demand is satisfied. On this basis the gains from trade from further expansion of exports, or even the maintenance of the current high level of exports at current farm level prices, are marginal at best and may well be negative.

The problems outlined here are based primarily on average costs and average revenue calculation. The situation is even less favorable to the expansion of production and exports when considering increasing marginal costs and decreasing marginal export revenues. Over time, technical change may alter the shape of the cost curves and lower them as well. If costs are lowered, the principal beneficiaries will be consumers. However, if our bag of technical tricks continues to depend upon resources like energy and water, which are becoming relatively more expensive, it seems unlikely that we will again realize a declining cost situation.

Our basic problem is distorted market signals caused by input subsidies, output price supports, and environmental factors external to the private firm decisions. These distorted prices have caused the flow of excess resources into agricultural production and export expansion. Likewise, the fixity of resources committed to production during periods of higher output prices further aggravates the problem.

If we cannot get out of this dilemma by lowering the set of cost curves, we may be forced to slide back down the marginal cost curve to address the structural problem, increase the prices received by farmers to address agriculture's financial problem, or devise some combination of the two. We must recognize that our current agricultural problem relates to our level of production and the position of our level of production along what may well be an increasing cost curve. The policy alternatives are very different from many that might be suggested if our problem were primarily one of inflation involving a level of production located near the lower section of the cost curve.

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19. We note that if, over the long run, subsidies become reflected in private costs (primarily through land price increases), then there should be a convergence between the total cost in Table 4 and the Total 1 cost in Table 3.

20. We wish to thank the staffs of the Food Research Institute at Stanford and the Agricultural Engineering Department at the University of California, Davis, who participated in seminars on this topic and made many helpful suggestions.

TABLE 1

EXPANSION OF FARM EXPORTS

(Index of Quantity of Grains and Feeds Exported)

(1967 = 100)

Year	Index	Year	Index
1950	30	1974	179
1955	28	1975	156
1960	60	1976	184
1965	92	1977	182
1970	97	1978	216
		1979	225

Note: Most of the expansion was in feed rather than in food grains.

Sources: USDA, Agricultural Statistics for 1972, 1976, 1980 and 1981 (USDA, Washington, D.C., 1973, 1977, 1981 and 1982), Tables 818, 772, 774 and 773 respectively.

TABLE 2

USDA COST OF PRODUCTION ESTIMATES

Year	CORN			WHEAT		
	Direct	Total 2	Total 1	Direct	Total 2	Total 1
	(dollars per bushel)			(dollars per bushel)		
1974	$1.62	$2.39	$2.65	$2.04	$2.95	$3.35
1975	$1.60	$2.23	$2.48	$2.36	$3.15	$3.50
1976	$1.62	$2.15	$2.46	$2.55	$3.37	$3.88
1977	$1.60	$2.12	$2.50	$2.43	$3.10	$3.67
1978	$1.49	$1.98	$.235	$2.48	$3.29	$4.06
1979	$1.63	$2.12	$2.64	$2.79	$3.72	$4.47
1980	$2.36	$3.07	$3.94	$3.62	$4.82	$6.25
1981	$2.38	$3.11	$3.86	$4.13	$5.32	$6.77

Sources for Table 2:

Economic Research Service, USDA, Costs of Producing Selected Crops in the United States - 1974, Committee on Agriculture and Forestry, U.S. Senate, 94th Congress, 1st Session, Committee Print (Washington, D.C., 1976).

Economic Research Service, USDA, Costs of Producing Selected Crops in the United States - 1975, 1976, and Projections for 1977, Committee on Agriculture and Forestry, U.S. Senate 95th Congress, 1st Session, Committee Print (Washington, D.C., 1977).

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Economics and Statistics Service, USDA, Costs of Producing Selecting Crops in the United States - 1978, 1979, 1980, and Projections for 1981, Committee on Agriculture, Nutrition and Forestry, U.S. Senate, 97th Congress, 1st Session, Committee Print (Washington, D.C., 1981).

TABLE 3

PROPORTION OF WHEAT AND CORN PRODUCED AT A COST GREATER THAN THE AVERAGE SELLING PRICE FOR THAT SEASON

	Wheat				Corn			
Year	Seasonal Average Price	Greater Than Direct	Greater Than Total 1	Greater Than Total 2	Seasonal Average Price	Greater Than Direct	Greater Than Total 1	Greater Than Total 2
1974	$4.09	4%	18%	11%	$3.02	4%	18%	11%
1975	$3.55	9%	34%	24%	$2.54	6%	32%	23%
1976	$2.73	29%	88%	70%	$2.15	11%	60%	41%
1977	$2.33	42%	93%	77%	$2.02	11%	73%	48%
1978	$2.97	20%	85%	53%	$2.25	8%	43%	24%
1979	$3.78	10%	80%	35%	$2.52	6%	45%	18%
1980	$3.96	24%	99%	81%	$3.27	6%	85%	28%

Source: Seasonal average price from USDA, Agricultural Statistics 1981 (USDA, Washington, D.C., 1982), Tables 2 and 39.

TABLE 4

TOTAL COSTS OF PRODUCTION
AND FARM LEVEL PRICES

		Corn	Wheat
		(dollars per bushel)	
Private Costs:	1978 - 1980[1]	2.39	3.94
Input Subsidies:	Transportation	.03	.03
	Research	.002	.006
Social Costs:	Erosion	.10	.14
Tax Advantage:	Profitable Period	.60 - .90	.30 - .50
	Unprofitable Period	.15 - .25	.07 - .12
Program Costs:	Surplus Purchases	.26 - .52	.61 - 1.35
	Managing Reserves	.04	.06
Total Costs:	Assuming Profitable Period and Managing Reserves	3.16 - 3.46	4.48 - 4.68
	Assuming Unprofitable Period and Surplus Purchases	2.93 - 3.29	4.80 - 5.59
	Assuming High Cost[2] Region Producing Unprofitably With Surplus Purchases	3.68 - 4.04	5.17 - 5.96
Farm Level Prices:	1978 - 1980 Average	2.68	3.57

(1). These are Total 2 costs from Table 3.

(2) Three year (1978 - 1980) cost for highest regions producing 9 percent of U.S. corn and 14 percent of U.S. wheat.

FIGURE 1

DISTRIBUTION OF ALL WHEAT PRODUCTION BY COST LEVELS, UNITED STATES, 1974

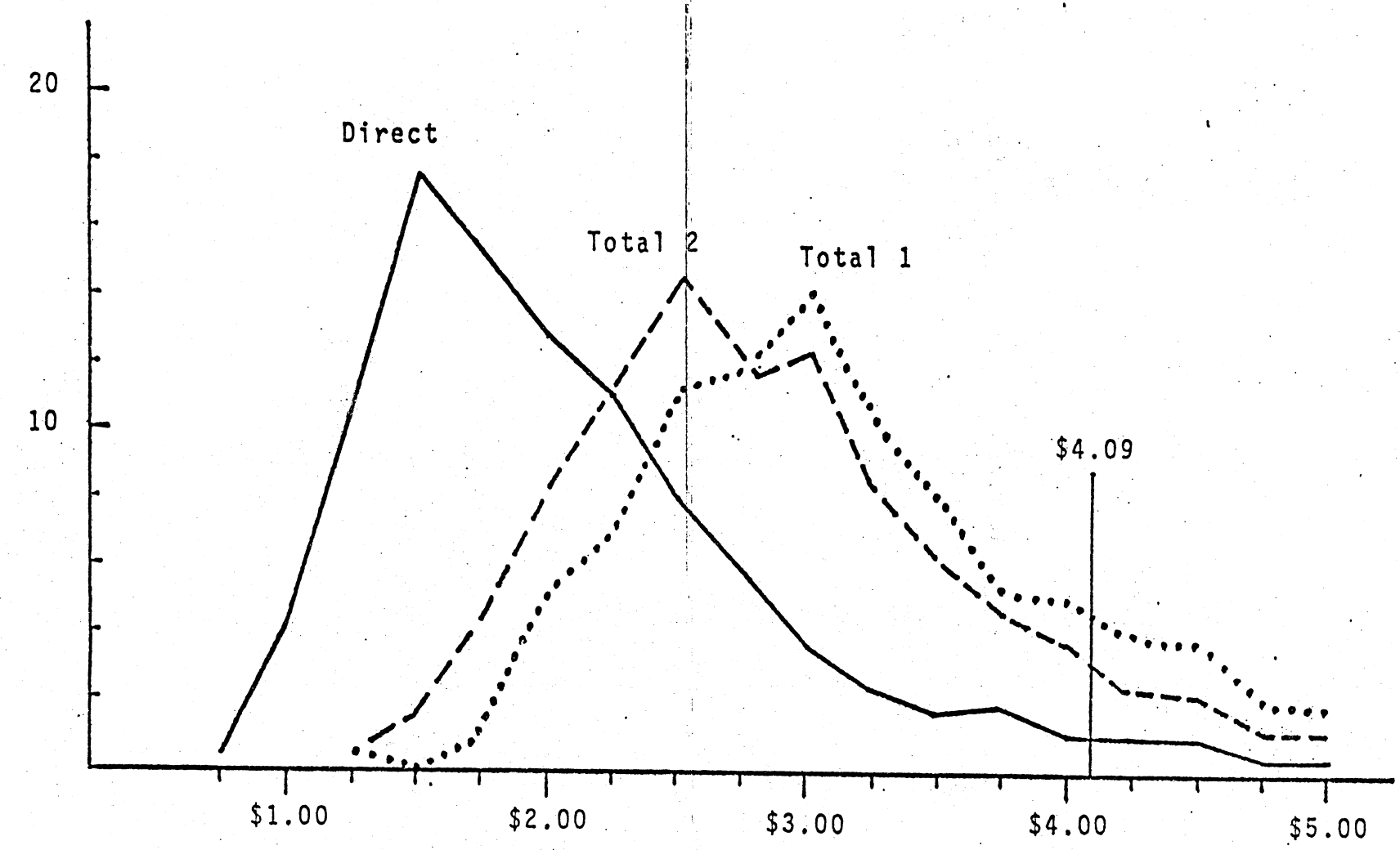


FIGURE 2

CUMULATIVE U.S. WINTER WHEAT PRODUCTION

BY REGIONAL TOTAL 2 COSTS FOR 1980

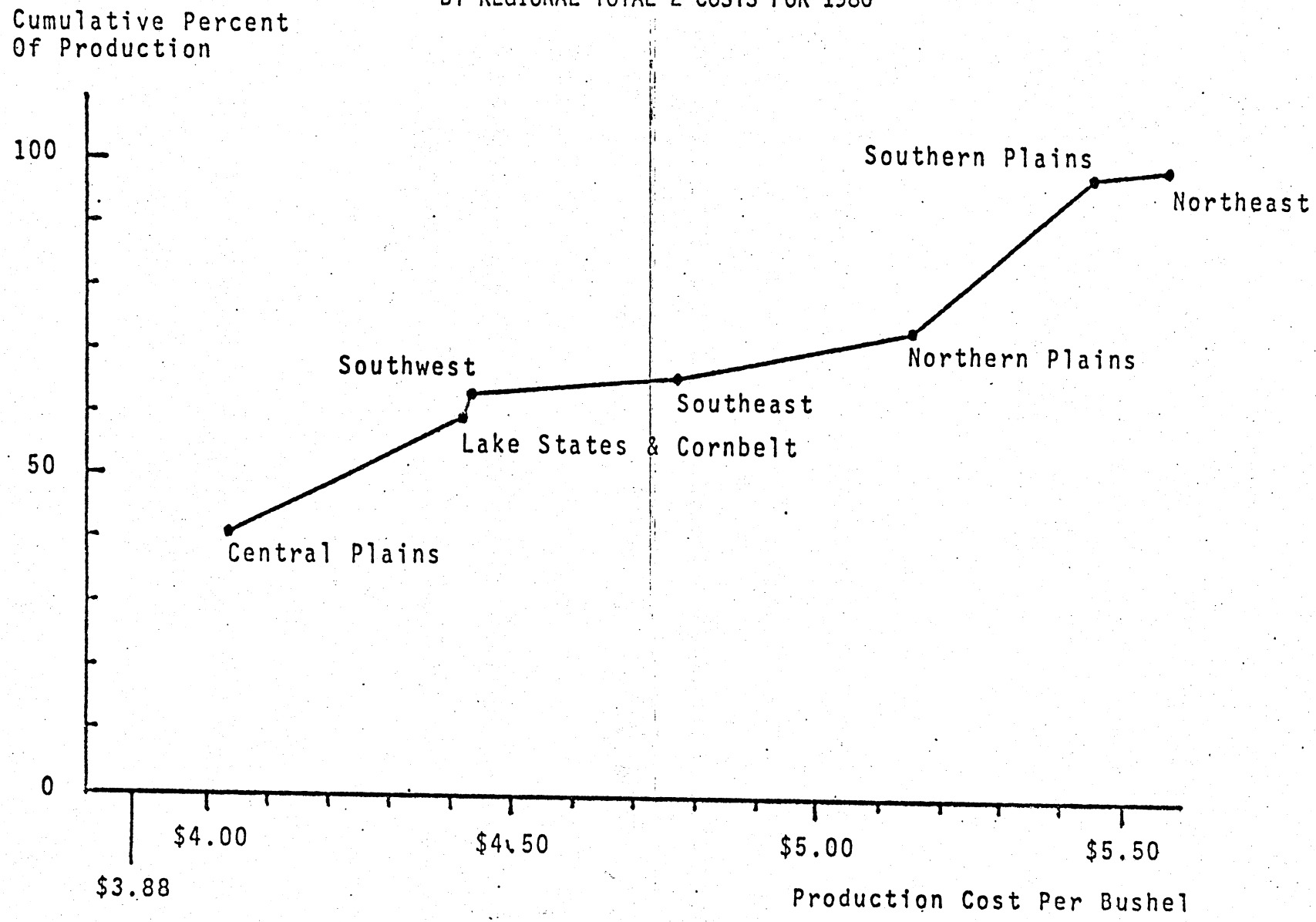
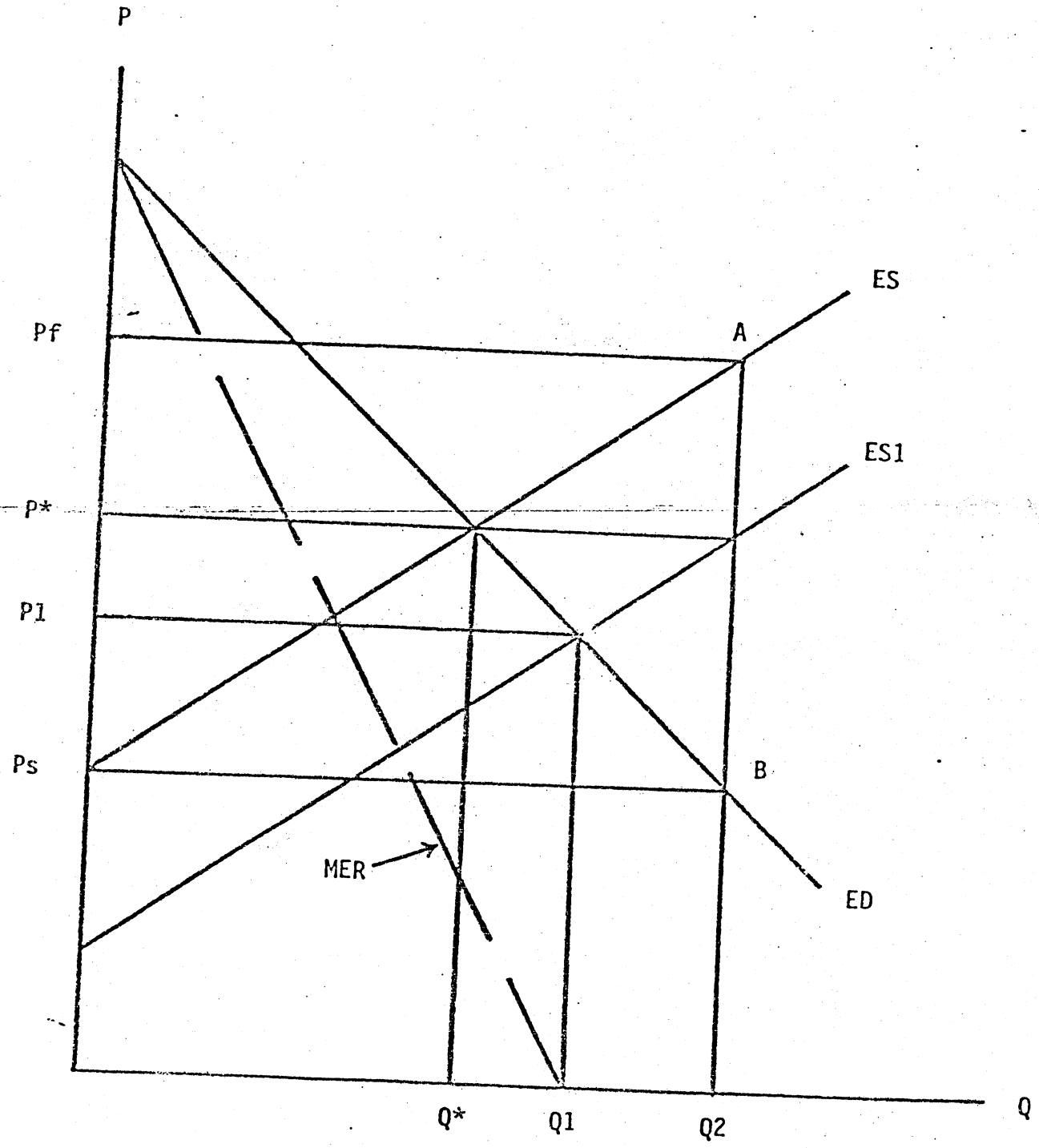


FIGURE 3

EXPORT ANALYSIS