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AND TRADE POLICY IN EGYPT
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Some Welfare Implications of the Wheat Subsidy and Trade Policy
in Egypt*

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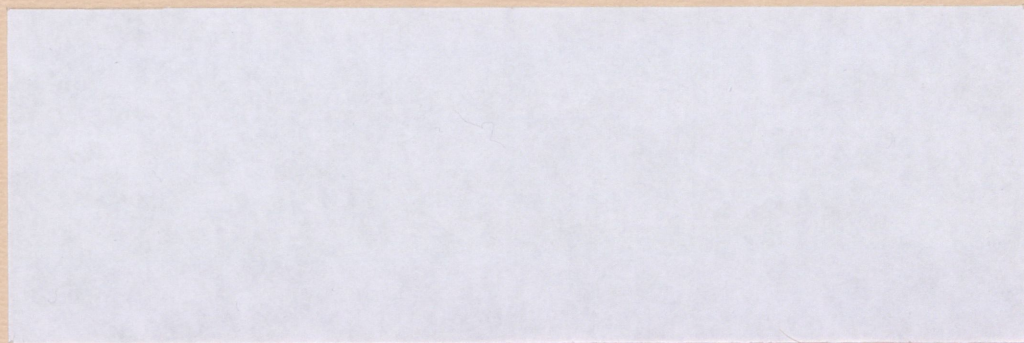Ministry of Agriculture, Cairo, Egypt

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Introduction

The purpose of this paper is to examine the subsidy structure of wheat and wheat flour in Egypt and explore the significant economic implications. The institutional framework associated with the distribution and pricing of wheat, wheat flour and bread is described in some detail. These institutional aspects are then incorporated into an analytical model to evaluate the economic efficiency implications of the government's intervention policies in the wheat market. Estimates are made of the subsidies received by the consumers of wheat products and of the welfare costs to the Egyptian economy of the government's policies.

Cereals are the basic staple in the Egyptian diet, and wheat is not only the most important cereal but primarily because of price policy is gradually displacing other grains. The country is increasingly dependent on imports, and presently approximately three-quarters of consumption requirements are acquired from abroad. Thus, food security is of great national concern.

Several studies have attempted to measure social gains and losses associated with the existing distribution and pricing policies for various commodities in Egypt.[1,2] These studies, however, do not consider in depth the specific market structure and institutional constraints related to wheat and its products. This paper attempts to improve understanding of the factors affecting production, consumption, and imports of wheat and wheat flour. Price elasticities of supply and demand are critical to the analysis and more work needs to be done to improve estimates of these elasticities as better data become available.

The Wheat Sector

Wheat is normally planted as a winter crop in Egypt, with a growing season from November to April. It is cultivated to some extent in all governorates. Approximately 1.39 million feddans were planted in wheat in 1979, representing about 29.0 percent of the total area in winter crops. Wheat production was about 1.86 million metric tons (M.T.) in that year.

Since newly reclaimed land is mostly unsuitable for wheat, the crop is grown only on old lands. Expansion of wheat plantings requires reductions in the area devoted to other major crops such

as barley, beans, and cotton[3] in lower Egypt and onions, beans, lentils, and barley in upper Egypt.

Wheat bread is the most important staple food for the urban population, whereas in rural areas maize and sorghum flours are the major raw materials for bread making. In 1978, domestic production met only 34 percent of total domestic consumption requirements for wheat and wheat flour--a percentage which is expected to decrease even further in the future as population grows and the best land is used for other more profitable crops. This assumes, of course, no basic change in policy affecting domestic production and consumption.

In Egypt, bread is either "native" or "French." Native bread is made from flour of various textures ranging in extraction rates from 82 to 95.5 percent, and was marketed in flat loaves weighing 135 grams from 1974 to 1979, but increased to 169 grams in 1980. French bread is made of "fine" flour with a 72 percent extraction rate and is similar to traditional loaves of white American bread. Most flour thus utilized is imported.[4] Fine flour is also used for pastries and macaroni.

Because the demand for raw wheat is derived from the demand for such diverse final products, it would be useful to estimate more than one demand function. Some of these commodities, such as native bread may be inferior goods (with an income elasticity less than zero), while others are no doubt superior goods. Accordingly, the price and income elasticities of demand for each of several commodities might be quite different.[5]

On the other hand, all wheat commodities are produced from the same basic raw material. If reliable supply and demand elasticities can be estimated for wheat itself, basic welfare analysis may then be made in terms of raw wheat equivalents used in the various wheat commodities. Analytically, what is required is an estimate of total wheat demand at the average raw wheat price that exists in the face of subsidies offered to consumers of various wheat products. We make this estimate later on in the paper.

Until 1977, wheat producers delivered a mandatory quota to the government amounting to 25-40 percent of their production;[6] the remainder was kept for home consumption or sold in village markets within the governorate territory. The fixed price of wheat under the quota was often lower than import prices, especially during the mid-1970's (see Table 1). The quota system for wheat was abolished in 1977, however, and delivery of wheat to the government became voluntary. Two reasons for this policy change were: (1) the quantity procured domestically was becoming less and less important when compared with total consumption of wheat over time, and (2) the domestic procurement price was higher in 1977 than average import prices so the government had no reason to impose mandatory quotas since farmers would voluntarily sell their wheat at the favorable government price.

The average prices for imported wheat (see Table 1) are derived by dividing the total annual expenditures for wheat imports by the quantity imported. Wheat is imported under a

variety of arrangements, from government purchases under U.S. Public Law 480 at "low" prices to purely commercial purchases at world market prices. The most significant importing countries to Egypt are the United States, France, and Australia. Prices of commercial imports in 1979 were about $182.93 per metric ton, nearly twice the average price as calculated in Table 1.[7]

Wheat imports are handled by the Ministry of Supply. They reach consumers after processing in government mills, and flour is distributed to bakeries at subsidized prices. The price of a loaf of bread is fixed by the government and has remained unchanged at the current equivalent of U.S. 0.61 cents per loaf, although the weight and flour extraction rate have changed over time. As indicated earlier, fine grade flour of 72 percent extraction rate is imported for use in pastries, French bread, and macaroni. The General Company for Silos delivers fine flour at highly subsidized prices to milling companies for resale to bakeries which produce French bread and pastries and to macaroni producers.

The institutional and administrative framework for wheat subsidies and allocation, discussed above, has evolved over a number of years. Many different ministerial decrees and laws have been applied to the production and distribution of wheat and wheat flours.[8]

Wheat and wheat flour are both heavily subsidized by the government in order to keep bread prices low. Subsidies are paid for both local production and imported wheat and wheat flour. The subsidy system allows the government to fix prices and to leave a

reasonable profit margin for wheat, flour, and bread distributors.

Subsidies for consumers of native bread made with flour milled at an 82 percent extraction rate have been estimated for 1979 from the numbers in Tables 2 and 3. The subsidy analyzed here is the difference between the costs incurred by the government and the price paid by Egyptian consumers for the final product. Two methods of calculating the subsidy were employed. First, starting with the wheat price, costs of wheat procurement, flour milling, and baking bread are presented in Table 2. The per loaf costs were compared with the official price of bread in order to calculate the per loaf subsidy. The per-ton-of-wheat equivalent subsidy was then calculated for locally grown and imported wheat. The subsidies per ton were $49.92 for local wheat and $69.02 for imported wheat. Second, in Table 3, wheat procurement costs and costs of milling were used to arrive at a flour cost per 100 kg, which was compared to the official subsidized price of flour to the bakeries. The second method yielded subsidies of $51.06 per ton for local wheat and $70.14 per ton for imported wheat. Using local procurement and wheat import figures of 43,392 tons and 2,251,934 tons, respectively, as provided by the Ministry of Agriculture (see footnote b, Table 2) the subsidy calculated by the first method is $157,594,609 while by the second it is $160,166,254.

In addition to the subsidy to consumers of native bread calculated above, a subsidy is captured by consumers of wheat

products made of more refined flour of 72 percent extraction rate. These products are mainly French bread, pastries, and macaroni, although this flour is also sold directly to households, hotels, restaurants, etc. Unfortunately, data on flour prices were not available for 1979; neither were flour quantities going to these various uses. Therefore, an exact calculation of the subsidy to flour consumers was impossible for 1979. We can make a rough estimate, however, by using 1980 price data supplied by the Ministry of Supply.

Refined flour prices to various users in 1980 were the following: $101.00 per ton to the bakeries; $117.29 per ton to macaroni manufacturers and retail shops; $172.57 per ton to pastry manufacturers; and $314.29 per ton to tourist shops and hotels.

The Ministry of Supply also indicated that import prices (CIF) for refined flour were $248.69 per ton in 1980 and that $57.55 per ton of additional costs were incurred in handling and distributing the flour. Since most of the flour would probably be used in bakeries, retail shops and macaroni manufacture, let us assume a price to consumers of $108.57 per ton. The per ton subsidy would be $306.24 minus $108.57 or about $197.14 per ton.

In 1979, 934,465 tons of refined flour were imported. Thus, the estimated total refined flour subsidy would be $184,223,100. If this is added to the wheat subsidy for native bread as calculated in Table 2 above, the total for all wheat products would be $343,069,907.

The annual budget of the General Authority of Food Supply includes funds for balancing the cost of purchasing food items, especially wheat and wheat flour, the income from wheat and wheat flour sales, and the income from sales of bread at fixed prices (direct subsidy). Table 4 presents the direct subsidies for wheat and wheat flour as estimated by the Ministry of Supply compared to the total subsidy for all commodities. It is apparent that except for 1977, more than half of all agricultural product subsidies to consumers have arisen from wheat and wheat products.

The Ministry of Supply estimate of the subsidy to consumers of wheat and wheat flour for 1979 is $793,614,143. This is more than twice as much as our estimate, even though we are confident that our own assumptions may have overestimated the flour subsidy. There are three rather apparent reasons why the Ministry's estimates are larger than ours: (1) The point made in the footnote of Table 2 that Ministry of Supply estimates for wheat utilized for making native bread were much larger than ours which came from the Ministry of Agriculture; (2) In calculating the subsidy, the Ministry apparently uses the CIF commercial import prices for both imported wheat and flour, whereas we use the average import price for wheat which includes those imports under PL-480 and other concessionary programs; and (3) In the case of the flour subsidy, the Ministry uses a price of $96.86 per ton as its revenue source, whereas we use a more representative price of $108.57 per ton that users of the flour paid. In all three cases, the figures selected by the Ministry increase the amount of the

subsidy compared to those we calculate. Even in the case of flour, much of the imported quantity came to Egypt under concessionary arrangements, so even our estimates appear to be too high. It is our belief that the Ministry's subsidy estimates are far too high.

There is quite another issue related to the subsidy issue that should be briefly discussed. Perhaps the most important reason for a food subsidy is to provide basic food requirements at low and affordable prices and thus contribute significantly to the standard of living of Egyptian consumers. The problem is that consumers may not receive all of the intended subsidy. The reasons are attributable to administrative rules associated with the use of the subsidized flour and the ability of the bakers to circumvent them.

A Ministerial Decree requires the bakers to use 75 percent of the subsidized flour for making bread, which has a controlled price, and 25 percent in pastries and like products which do not. The price bakers pay for flour depends on its ultimate use and they pay more for flour used in pastry and macaroni manufacture than for bread. In 1981, for example, the subsidized flour prices were $101.00 per ton for bread, $117.28 for macaroni, and $172.57 per ton for pastries. The bakers can capture part of the subsidy intended for consumers by shifting flour that is supposed to be used for bread to pastries and macaroni. So far as we know, no studies have been made that quantify this practice, but it is alleged to be a problem of some significance.

Another way the bakers may diminish the subsidy intended for bread consumers is to not have supplies of bread on hand when shoppers call for it. Shoppers then shift to products whose prices are not controlled rather than use scarce search resources trying to find available bread. There are also widespread but largely unsubstantiated allegations that bakers divert supplies of bread from the shops where the price per loaf is controlled at 1.43 cents per loaf to the streets where it may be sold for as much as 2.44 cents. (These prices are for a heavier loaf whose weight was set in 1980.) A final way that bakers can capture some of the subsidy is to cheat on the weight of the loaf that is sold at controlled prices.

The conclusion is that the subsidy is likely divided among the Ministry of Supply, the traders dealing with wheat products, the bakers, and consumers. More study is required to determine the final distribution of the subsidy.

The Analytical Model and Estimates of Welfare Costs

To assess the economic efficiency implications of the government intervention scheme for wheat and wheat flour, some welfare measure is needed.

An analytical device is specified in this section to measure social losses and gains. The model takes into consideration the structural and institutional interrelationships of the wheat market discussed in previous sections.

In order to measure the social costs of the Egyptian government's intervention policies for wheat, consider the

supply-demand model for wheat in Figure 1. Let D stand for the domestic demand curve for wheat and wheat products for Egyptian consumers. It represents the marginal valuations for various quantities of raw wheat consumed in various forms by Egyptian consumers. S is the supply curve for raw wheat and represents the real opportunity costs to the Egyptian economy of producing various quantities of wheat.

Let us assume that P_c is the price of the raw wheat equivalents incorporated in various products demanded by consumers and that the quantity consumed at that price is Q_c. P_p is the price of raw wheat paid to producers at the farm gate and is set annually by the government. Q_p is the quantity of wheat produced domestically.

P_w is the border (world) price of wheat paid for imports, and it is assumed that an unlimited amount could be available to Egypt at that price. P_w represents the per unit costs to Egyptian economy for importing various quantities of raw wheat. In reality this function is a step function reflecting the fact that some imports such as PL-480 purchases, are available at concessionary terms below P_w.[9] The total quantity imported is $Q_c - Q_p$, or the difference between domestic consumption and production.

The minimum-cost supply curve facing the Egyptian economy is O'AB, assuming that foreign exchange is available to pay for imports.

Resource misallocation results from two sources: (1) the policy of subsidizing wheat consumption by offering wheat and

wheat products to consumers at prices below the costs to the
economy of acquiring those supplies, and (2) paying producers of
wheat lower prices than the costs of importing wheat.

The first type of misallocation is shown by Area 1 in
Figure 1. This area represents the accumulated costs of wheat
equivalents to the economy above the accumulated valuations of the
consumers as reflected in the demand curve. So long as imports
are brought in at commercial prices, the marginal cost to the
economy would be the commercial border price or P_w which, in 1980,
was an average of $216.43 per metric ton.

We can also observe quantity Q_c, the total amount of wheat
consumed. The American Embassy in Cairo estimated the domestic
consumption in 1980 at about 7.22 million metric tons. The wheat
equivalent price of subsidized flour going to the mills in Cairo,
Giza, and Alexandria was $58.71 per metric ton--our estimate of
P_c.

Area 1 in Figure 1 can be calculated as:

$$1/2 \ (P_w - P_c) \ (Q_c - Q_e).$$

where P_w, P_c, and Q_c are as defined, and Q_e is the quantity that
would be demanded at the commercial border price if that were the
market price.

We have numerical estimates for all but Q_e, which can be
estimated with the P_c and Q_c values, if we know the elasticity of
demand. The procedure involves the simple extrapolation of a
linear demand curve upward from the equilibrium position at price
P_c and quantity Q_c, using the formula for arc elasticity:

$$\eta = \cfrac{\cfrac{Q_c - Q_e}{Q_c + Q_e}}{\cfrac{P_c - P_w}{P_c + P_w}}.$$

Under various assumed values for η, the formula was solved for Q_e and the estimates appear in Table 5.[10]

The welfare losses represented by Area 1 range from $253,914,280 at an assumed price elasticity of -0.50 to $59,913,415 at an assumed price elasticity of -0.10. This welfare loss will be greater: (1) the greater the disparity between the border price and the subsidized consumption price and (2) the more elastic the demand curve.

The second type of misallocation results from the fixed price offered to producers and is shown as Area 2 in Figure 1. This area represents a deadweight loss to the economy because it suggests that at the margin domestic producers could supply wheat to the economy at lower real costs than those of commerical imports. Area 2 is computed as: $1/2 (P_w - P_p) (Q'_p - Q_p)$. Using the Ministry of Agriculture estimates of the price paid to wheat producers in 1980 (P_p), $91.43 per ton, and of domestic production (Q_p), 1.796 million tons, leaves only the unknown Q_p'. This is the quantity of wheat which would be forthcoming from domestic farmers at the border commercial price. This quantity is estimated by using the elasticity of supply to extrapolate the supply curve beyond the existing supply Q_p at price P_p.

These supply-side welfare losses which are presented in Table 5 at various assumed elasticities of supply range from $84,937,142 at an elasticity of supply of 0.66 to only $9,818,571 at an elasticity of 0.10. It is obvious that this welfare loss to the economy is greater: (1) the greater the disparity in world price and producer price, and (2) the more elastic the supply curve.

These results make intuitive sense because an elastic function, demand or supply, means that there are good substitutes available. When a given price disparity occurs of the kind analyzed here, the response in reallocation of resources is larger the more elastic the functions.

Table 5 indicates that if the upper end of the ranges of elasticities of demand and supply are assumed, the sum of Areas 1 and 2 reflecting the total social cost is about $338.6 million or $8.57 per capita per year that could have gone into increased living standards. These results can be compared with those obtained by Bale and Lutz, cited in footnote 2. With upper values of demand and supply elasticities of -0.52 and 0.37, respectively, they estimated the total net social loss of price distortions for wheat in Egypt in 1976 to be $152,509,000. For lower values of demand and supply elasticities of -0.17 and 0.12, respectively, they estimated net social losses for wheat in Egypt to be $49,771,000. Thus, compared to theirs, our estimates of welfare losses appear reasonable, given the differences that exist in data bases, and especially the increasing welfare losses that occur

through time as imports are increased. Their estimates are for the year 1976 while ours are for 1979. But whether these losses are little or much depends on what benefits, if any, are achieved from the subsidies; a subject of great controversy in Egypt.

Equity (distributional) impacts are not quantified in this analysis, but it is not difficult to identify gainers and losers of the subsidy and price ceiling policies. Compared to a free market alternative, consumers of wheat and wheat products are benefitted, particularly urban consumers who grow no wheat. Producers of wheat are clearly losers. The country is more dependent on imports than would be the case if no price ceiling existed for producers, and in this sense food security is worsened. Only government decision makers with policy responsibility can assess the social importance of these various factors. Still, it is not unimportant to realize that the economic costs of such policies can run into the millions of pounds, and that if income redistribution tools were available, all Egyptians could enjoy higher standards of living if the policies were abandoned.

Complexities could be incorporated into the above analysis by considering the structure in more detail. For example, it may be appropriate to specify and estimate two supply response functions: one for upper and one for lower Egypt. Recall the differences in crops competing with wheat in the two regions. Also, on the demand side, each wheat commodity probably has a different income and price elasticity. Thus, it may be more appropriate to

estimate separate demand curves for bread, macaroni, and wheat flour and for wheat products in rural and urban areas. More refinement could also be achieved by better estimates of the costs to the economy of different import prices that are actually paid.

Footnotes

*This paper was written as part of the research activity of the Agricultural Development Systems Project, ARE-UC-USAID, June 1981.

[1]Cuddihy, B., "Agricultural Price Management in Egypt," World Bank Staff Work. Pap. No. 388, 1980.

[2]Bale, M. and E. Lutz, "Price Distortions in Agriculture and Their Effects: An International Comparison," American Journal of Agricultural Economics, Feb. 1981, pp. 8-22.

[3]The growing season for competing crops in lower Egypt (mainly cotton) extends from February to October, overlapping with the winter wheat season in the spring.

[4]The milling organization in Egypt stopped producing fine flour of 72 percent extraction rate in accordance with Ministerial Decree No. 388 of 1973, which requires the use of flour of 93.3 percent and 82 percent extraction rate in making native bread and French bread, respectively.

[5]El Sayed, R. M., "An Economic Study for Demand for Wheat in the ARE," Ph.D. Thesis, Ain Shams University, 1978.

[6]Goueli, A. A., "National Food Security Program in Egypt, IFPRI." CIMMYT Conference on Food Security. Mexico, 1978.

[7]All nominal values in this paper are denominated in U.S. dollars, converted from Egyptian pounds at the official exchange rate of $1 equals .70 Egyptian pounds.

[8]For a detailed discussion of these decrees and laws, see Moustafa, et al., "A Welfare Analysis of Price Policy for Wheat and Wheat Products in Egypt," ADS working paper, University of California, Davis, June 1981.

[9]Goueli, A. A. and D. K. Abdou, "Factors Affecting Imports of Major Food Commodities in Egypt," USDA - Zagazig University, Forthcoming.

[10]Lutz and Scandizzo believe that the elasticity of demand for wheat in Egypt ranges between 0 and -0.33 with elasticities of supply ranging from 0-0.66. Lutz, Ernst and Pasquale L. Scandizzo, "Price Distortions in Developing Countries: A Bias Against Agriculture," European Review of Agricultural Economics, Vol. 7, 1980, pp. 1-27. The USDA GOL model uses elasticity of demand of -0.35 and the elasticity of supply of 0.25.

19

TABLE 1

Wheat Prices Per Metric Ton in U.S. Dollars

Year	Farm Prices[a]	Import Prices[b]
1960	40.86	30.00
1965	43.14	42.86
1970	55.14	41.43
1975	73.29	112.86
1976	67.29	92.86
1977	77.29	75.71
1978	88.00	80.00
1979	91.43	110.00

Source: [a]Ministry of Agriculture.
[b]Central Agency of Public Mobililzation and Statistics (C.A.P.M.A.S.).

TABLE 2

Estimation of Wheat Subsidy in Egypt, Per Loaf
of Native Bread, Per Ton of Wheat, and In Aggregate, 1979

	Domestic	Imported
Wheat price, dollars/ton	91.43	110.57
Additional Costs (transport, insurance, storage, etc.)	20.00	20.00
Wheat price, dollars/100 kg flour (122 kg wheat)	13.60	15.93
Cost of flour production, dollars/100 kg flour[a]	13.31	15.64
Cost of baking, dollars/100 kg flour	5.60	5.60
Cost of bread, dollars/100 kg flour	18.91	21.24
Number of loaves from 100 kg flour	921	921
Cost per loaf, cents	2.053	2.306
Official price per loaf of bread, cents	1.393	1.393
Subsidy per loaf, cents	.660	.913
Subsidy per 122 kg wheat, dollars	6.08	8.41
Subsidy per ton of wheat, dollars	49.82	68.92
Total subsidy, dollars[b]	2,161,789	155,203,290

[a]Cost of flour production equals the average price of wheat plus
the cost of milling ($.801/122 kg wheat) minus the value of bran
($1.094/122 kg wheat).

[b]In 1979, the Ministry of Agriculture estimates that 43,392 tons
of domestic wheat were procured by the government, and 2,251,934
tons were imported. If we assume that these figures are valid,
the total subsidy to consumers of native bread is that reported
in Table 2. The Ministry of Supply, on the other hand, assumed a
much larger number of tons of wheat were utilized in making
native bread, 5,177,000. If this were the correct number, and
the quantity above 43,392 tons were imported, the total subsidy
as calculated in Table 2 would be $358,960,829.

TABLE 3

Estimation of Wheat Subsidy in Egypt
Per 100 kg of Flour and Per Ton of Wheat

	Domestic	Imported
Wheat price, dollars/ton	91.43	110.57
Additional Costs (transport, insurance, storage, etc.)	20.00	20.00
Wheat price, dollars/100 kg flour (122 kg wheat)	13.60	15.93
Cost of flour production, dollars/100 kg flour[a]	13.31	15.64
Cost of flour to bakery, dollars/100 kg flour	7.14	7.14
Subsidy, dollars/100 kg flour	6.17	8.50
Subsidy, dollars/ton wheat	50.57	69.67
Total Subsidy	2,194,333	156,892,240

[a]Cost of flour production equals the cost of wheat plus the cost of milling ($.801/122 kg wheat) minus the value of bran ($1.086/122 kg wheat).

Table 4

Wheat and Wheat Flour Subsidies and Total Commodity Subsidies[a]

Year	Wheat and Wheat Flour Subsidies (In 000 dollars)[b]	Total Commodity Subsidies (In 000 dollars)[b]	Wheat and Wheat Flour as Percent of Total Subsidies (percentage)
1973	112,833	172,734	65
1974	315,847	497,601	63
1975	375,209	651,989	58
1976	254,347	460,000	55
1977	217,181	535,003	41
1978	361,943	650,906	56
1979	793,614	131,643	60

[a]Source: Ministry of Supply

[b]In thousands of U.S. dollars.

TABLE 5

Welfare Costs of Subsidy and Producer Prices Programs for Wheat, 1980

Assumed Price Elasticities of Demand	Estimate of Q_e (million tons)	Area 1 (thousand dollars)	Assumed Price Elasticities of Supply	Estimate of Q'_p (million tons)	Area 2 (thousand dollars)	Total Social Cost (thousand dollars)
-0.50	4.000	253,914	.66	3.215	84,937	338,851
-0.50	4.000	253,914	.50	2.802	59,062	312,977
-0.35	4.808	190,219	.25	2.275	26,206	216,424
-0.10	6.464	59,641	.10	2.013	9,819	6,946

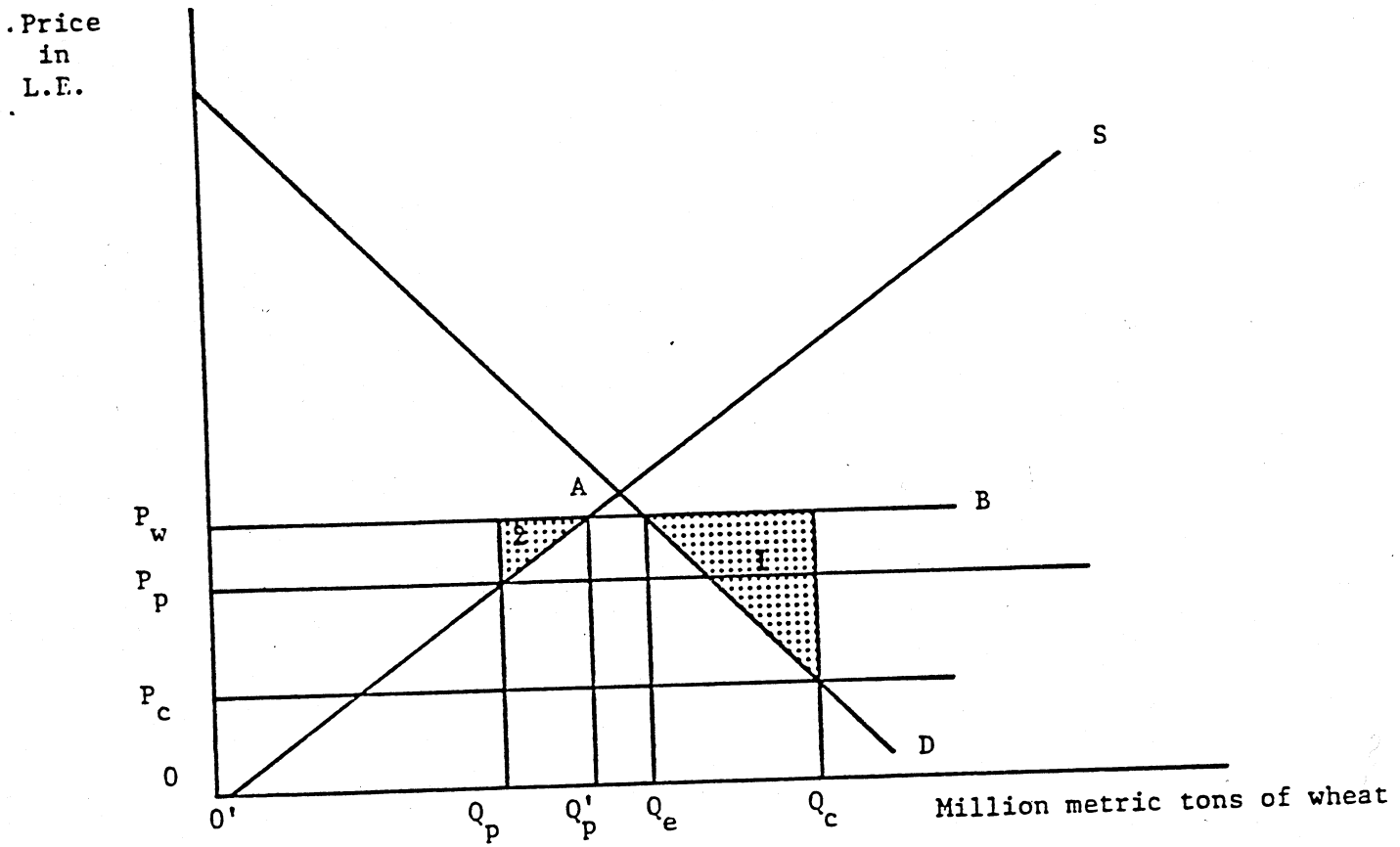Figure 1. Resource Misallocation Costs for Wheat and Wheat Products

FIGURE 1.   Resource Misallocation Costs for Wheat and Wheat Products

$$\eta = \frac{\dfrac{Q_c - Q_e}{Q_c + Q_e}}{\dfrac{P_c - P_w}{P_c + P_w}}$$

Under various assumed values for η, the formula was solved for Q_e and the estimates appear in Table 5.[10]

The welfare losses represented by Area 1 range from $253,914,280 at an assumed price elasticity of -0.50 to $59,913,415 at an assumed price elasticity of -0.10. This welfare loss will be greater: (1) the greater the disparity between the border price and the subsidized consumption price and (2) the more elastic the demand curve.

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