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GOVERNMENT INTERVENTION IN
U. S. AGRICULTURE AND MANUFACTURING

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I. Introduction

In 1984 the Reagan Administration proposed a 1985 Farm Bill that would have greatly reduced government price subsidies on the major exported farm commodities. Impetus for such a proposal came from the record government outlays from 1982 to 1984. Congress eventually passed a farm bill which delays the price support cuts but ultimately will result in price supports being tied to market prices. The budget deficit crises may quicken the timing of the cuts.

At the same time that the new farm bill was being passed, both Congress and the administration advocated measures to protect industries in competition with foreign imports. Proposed protection measures have usually been import quotas. Quotas are a favorite policy to adopt and implement as they do not involve any government expenditures. This lack of drain on the U. S. Treasury does not mean that quotas are costless, however. It is the purpose of this paper to examine the relative costs of policies used to protect domestic industries in competition with foreign imports vs. protection measures to help domestic industries which are export oriented. To accomplish this, the theories of import quotas and support prices are first reviewed. Then, numerical estimates of the economic costs of farm policies which subsidize producers of corn, wheat, and rice are calculated. The same is done for the import quotas on steel, cars, and sugar. Finally, a comparison of the economic costs is made. The cost of deficiency payment schemes is shown to be relatively small compared to those associated with quota protection.

II. Theory

A. Export Goods

Consider a pure deficiency payment, target price program as depicted in Figure 1. With a target price of P^T, farmers respond by producing Q^T (given a supply curve S) with a resultant market-clearing price of P^W (given a total demand curve of D^t). Without a program, equilibrium price and quantity would have been P^F and Q^F. The net social cost of this program is calculated by subtracting the increases in producer and consumer surplus, given by the areas P^FabP^T and P^FacP^W, respectfully, from program costs, namely, the deficiency payments given by the area $(P^T - P^W)\ Q^T$. The triangle abc is the deadweight loss of this program.

This net social cost is not the relevant American social cost, if this is an export commodity, as some of the program benefits accrue to foreign consumers. Demand, D^t in Figure 1, is the horizontal summation of domestic demand, D^d, and foreign demand facing U. S. producers. American social cost is obtained by adding the increase in foreign consumer surplus, area aedc in Figure 1, to the deadweight loss triangle abc.

This pure deficiency payment program yields potentially large Treasury exposure. The U. S. Department of Agriculture (USDA) attempts to limit this exposure by requiring farmers to set aside a certain percentage of their normal planted acreage. Such a diversion rotates the supply curve to the left, represented as the movement from S to S' in Figure 1. If enough acreage is taken out of production and/or supply is inelastic, such a program feature may reduce total output below the free trade quantity thereby resulting in a market price increase. This is the case drawn in Figure 1. Output is Q' and price is P'. Deficiency payments are $Q'(P^T - P')$. The change in producer surplus is equal to area $P^F gfP^T$ less area $P_o ga$. American consumers in this case are worse off, losing area $P'heP^F$, resulting in a net American social cost of area fji plus area $P_o ga$ less area ehjg.

It is interesting to note that, with a pure deficiency payment program, the resulting market price is always lower than the free trade price as U. S. producers respond to the high target price. Some of the surplus generated by the deficiency payments accrues to foreign consumers via the lower price, thus increasing the net American social cost over what it would be if all the good was consumed domestically. The situation is reversed if effective diversion is obtained. In this case foreign consumers are taxed, and the American cost is lower the more the good is exported. It could be the case that the surplus transferred to American producers is greater than the domestic cost of the policy thereby creating the potential for a net domestic surplus from the program.

It is clear, however, that the extent to which this could happen depends on whether the program is mandatory or voluntary. In general, participation in such programs is voluntary. Farmers can choose either reduced production and high prices or increased production and lower prices. Since 1980, rarely has it been the case that participation has been either zero of 100 percent for any major commodity.

For this reason, the acreage reduction model presented in Figure 1 must be slightly modified to obtain an accurate estimate of farm program costs. With a participation rate between 0 and 100 percent, there are two separate supply responses--those from participating producers who respond to the target price and those from nonparticipating producers who respond to market prices. Total supply must be disaggregated into these two components to calculate total production and the change in producer and consumer surplus due to the farm programs.

One of the supply curves is simply the aggregation of nonparticipating producers' marginal cost curves. Therefore, if they experience a change in price from the program, their producer surplus change can be read directly off this supply curve. A price increase will come about, for example, if participation rates and diversion requirements are set high enough to cause a net reduction in output from participants. Two factors cause the actual reduction in output to "slip" below what would be predicted by looking soley at diversion requirements and program participation. The first type of slippage is caused by farmers diverting less than average quality land, thereby reducing output by less than if the average productive land were taken out of production. The second slippage effect is from participating farmers increasing per acre yields in response to high target prices. If these two effects are strong enough, output from program participants may actually increase over the level without a program. In any case, nonparticipants must take these factors into account when deciding what price they are likely to receive and their consequent level of output.

The other supply curve is analogous to the shifted supply curve S' in Figure 1. The change in participant producer surplus consists of two parts. The first is a positive change due to high target prices. The other effect is negative, however. Participating farmers are producing with an inefficient mix of inputs. Part of the surplus they would receive by not joining the program is no longer obtainable. Although the net effect must be positive (or they would not have joined the program), both effects must be taken into account to accurately determine the net social cost of the program.[1]

B. Import Goods

The main point of emphasis above is that the cost of U. S. farm programs for export goods is not the amount of Treasury expenditure; the costs are much smaller. However, for import goods, which include both agricultural products (e.g., sugar) and manufactured goods, the associated quota costs can be very high even though there are no Treasury costs. Quotas give domestic producers hidden subsidies.

In Figure 2 above, the hidden cost of the quota can be easily shown. If the free trade price is P^F and a quota is imposed which raises price to P^Q, the cost of the quota is area cade. For example, U. S. sugar producers receive a subsidy directly through the high price of sugar, not from a government deficiency payment.

In terms of Figure 2, if a deficiency payment were to replace a quota, the net cost would be abc which is substantially below the cost of quotas. The costs of replacing quotas with tariffs are not presented; but, under the small country assumption, the net cost (abc plus def in Figure 2) would be roughly twice that of a deficiency payment scheme.

III. Empirical Results

A. Deficiency Payment Programs

A brief description of the commodity programs follow next. The 1984 marketing year was chosen for analysis for all three grain commodities.

1. Corn

The 1984 corn marketing year is well representative of a deficiency payment scheme along with acreage diversion, substantial program participation, and a nonbinding loan rate. Although corn stocks grew by 656 million bushels (mbu) to 1,379 mbu, it can be assumed that this growth in stocks would have occurred without the program as stocks were at record low levels after the payment-in-kind program of 1983.

2. Wheat

In many respects the 1984 wheat marketing year was similar to the 1984 corn market in that wheat stocks did not dramatically increase indicating that the 1984 price cleared the market. The relatively large diversion requirement of 30 percent meant that there was a potentially large price increase enjoyed by the farmers owning 39 percent of the wheat acreage not enrolled in the program. One interesting aspect of the wheat market is that exports made up 55 percent of total use in 1984. Thus, because the no program price was below the program price, much of the costs of the program are borne by foreign consumers, effectively lowering the American net social cost.

3. Rice

In 1984, U. S. rice producers operated in a market further removed from world market conditions than any other major export commodity. The U. S. loan rate was almost double the export price of Thailand, the world's largest rice exporter; and the target price was almost 50 percent higher than the loan rate. It is not surprising that practically all rice grown in 1984 was eligible for government payments.[2] Given the relatively small U. S. share of world exports, the very low world price for rice, and the relatively high average production costs of U. S. rice producers of $7.47 per hundredweight (cwt), it seems likely that there would have been no U. S. rice production in 1984 without the rice program. All the producer surplus is due to the program and accrues to program participants. For the purposes of this analysis, it is assumed that rice would have been imported into the U. S. at an average cost of $6.50 per cwt. The isolation of domestic rice producers from world market conditions explains the relatively large net cost of the rice program.

A note about the rice calculations is necessary. The per unit deficiency payment of rice was so high in 1984 that many producers reached the $50,000 maximum deficiency payment limit imposed by USDA. This is not taken into account in the calculation of producer surplus or total Treasury outlays; hence, the empirical results overstate both. Consequently, the reported net cost figure is slightly larger than the true net cost.

The parameters used in the calculations are given in Table 1. The exact formulas used are given in the Appendix. The results of these calculations are summarized in Table 2.

B. Quotas

The net costs of quota protection are given in Table 3. A discussion of each subsidy follows.

1. Cars

The annual quota on U. S. imports of Japanese cars from April 1, 1981, through March 31, 1984, was 1.68 million units. For the period April 1, 1984, through March 31, 1985, it was increased to 1.85 million units. Assume that the Voluntary Export Restraint (VER) raised car prices by $400 per car in 1984. This would be a 3.27 percent increase. If the price elasticity of demand in the United States is -0.44 (Petri), the VER reduced consumption by 1.44 percent from 10,541,800 to 10,390,000. Assume, also, that Japanese imports would have been 2,300,000 in 1984 without restraints instead of 1,850,000 with restraints; thus, the Japanese market share would have been 21.8 percent without the restraints compared to 17.8 percent with them. The VER reduced the Japanese market share by 18.3 percent. Using a price elasticity of the Japanese market share of -2.5 (Petri), the increase in the price of Japanese cars due to the VER was 7.3 percent. Using a cross-price elasticity (percent change in market share of the rest of the world exports divided by the percent change in the price of Japanese exports to the United States) of 1.1 (Petri) means that the VER increased the rest of the world share of the U. S. market to 5.67 percent from 5.25 percent or by 8 percent from 553,444 to 588,500.

The average price of new U. S. General Motors cars was $12,637 in 1984 and $13,225 in 1985 (Automotive News). The number of cars imported from Japan with the VER was 1,850,000 from April 1, 1984, through March 31, 1985; from April 1, 1985, through March 31, 1986, the number estimated without the VER is 2,300,000. This estimated increase reflects an administrative decision by the Japanese government at the end of March, 1985, and does not necessarily reflect production costs. However, it can be used to calculate the number of cars kept out of the United States during 1984 due to the VER. This increase of 24 percent (450,000 cars) compares with the estimated increase due to the removal of the VER before the decision was announced by the Japanese government as follows: Chase Econometrics, 15 percent; Data Resources, 20 percent; Japanese government, 20 percent; Ford Motor Co., 30 percent; and U. S. Trade Representatives Office, 40 percent (Business Week). The total U. S. car sales in 1984 were 14,500,000. The total of the new domestic and imported cars sold in the

United States was 10,390,000 (domestic, 7,951,517 and imported, 2,438,735). In the rest of the world, the total of the new imported cars sold in 1984 was 588,753.

Based on the above, which imply a U. S. supply elasticity of 1.04, the results shown in Table 3 were obtained. It is interesting to note that the net costs of a deficiency payment scheme to protect car manufacturers would be approximately 5 percent of the quota protection cost or $52 million compared to $1.06 billion.

2. Steel

The U. S. steel market has been segmented. The restrictions effective from 1985 to 1990 are: Japan, 5.8 percent; Korea, 2.9 percent; Brazil, 0.8 percent; Mexico, 0.3 percent; Spain, 0.67 percent; Australia, 0.18 percent; and South Africa, 0.42 percent. These restrictions, combined with an existing quota for the European Common Market countries and an informal agreement with Canada, can be expected to reduce imports from the 1984 share of 26 percent to the 1985 share of 20 percent.

With the restraints, the U. S. market in 1985 is projected at 95 million tons of steel (New York Times). At current levels of U. S. consumption, each percentage point change (about 1 million tons) represents a sales volume of $500 million.[3] A rough estimate of the producer benefit due to the restraints is 0.8 • $18 billion = $14.4 billion over five years or $2.88 billion = $14.4 billion over five years or $2.88 billion per year. Because imports are not perfect substitutes for domestic production and because foreign steel producers will have no reason to undercut U. S. prices aggressively, the price increase of exports is expected to be larger than the price increase of domestic production. Also, because the quotas are on quantity, foreign steel producers will have more incentive to ship high-priced products. The price elasticity of the import share for iron and steel has been estimated by Stone as 1.67. Based on this elasticity, the 23 percent reduction in the import share can be expected to increase import prices by 15 percent. Given a U. S. demand price elasticity of -0.47 (Petri), a 7 percent price increase implies a 3.3 percent reduction in demand. The U. S. production of 76 million tons in 1985 with the restraints (80 percent share of 95 million tons) would have been 73 million tons without restraints (74 percent share of 98 million tons). These estimates imply a U. S. supply elasticity of 0.59, and the costs of the steel quotas were estimated and given in Table 2. As with cars, the net quota cost is high when compared with a deficiency payment scheme for protection; a deficiency payment scheme has an associated net cost of less than 10 percent of the import quota cost.

3. Sugar

Historically, sugar producers have been protected from foreign competition with import quotas. As a result, the U. S. domestic price has been substantially higher than the world price. Estimates have been made for the cost of sugar import quotas (Leu, Schmitz, and Knutson). The results are given in Table 3. As with cars and steel, the consumer cost is quite large. Also, savings would result if the current quota program were replaced by a deficiency payment scheme.

IV. A Comparison

The previous analysis of corn, rice, and wheat illustrated that the key element for increasing farmer income is the deficiency payment scheme. As the results show, in the case where the loan rate is not binding, the Treasury cost is essentially an income transfer and, hence, the net cost of the deficiency payment scheme is small. For example, for corn, it is approximately $78 million, or a 5.1 percent loss per dollar spent. Interestingly, if the deficiency payment scheme were used in car manufacturing and steel production, the budget outlay would be $3.18 billion for cars and $2.66 billion for steel annually, with corresponding net welfare costs of less than 5 percent loss per dollar spent.

In absolute amounts, the net cost of the steel and car quotas is much larger than the deficiency payment schemes for wheat, rice, and corn. This is due to the nature of the policy instrument. As the results show, deficiency payments are less costly than are quotas. However, quotas are popular because there are no associated Treasury expenditures. Quotas result in hidden but large economic costs; deficiency payments result in visible but small economic costs.

In terms of agriculture itself, it is interesting that the economic cost of the 1983 sugar program is much higher than the costs of the corn, wheat, and rice programs combined, even though sugar producers benefit less from the program than do corn and wheat producers. In spite of this, the U. S. sugar program does not receive the attention in the Farm Bill debate as do the major export crops.

V. Conclusions

This paper has shown that the net cost to society to assist certain key agricultural sectors appears to be quite small when compared to the cost of protecting agricultural commodities of much lesser importance. More importantly, the net cost of farm programs for major export-oriented commodities (corn, rice, and wheat) is much less than the cost of quota protection for manufactured goods (cars and steel). These quota costs are not visible costs because, unlike deficiency payments for corn, rice, and wheat, no Treasury expenditures are involved.

Policymakers should focus not only on the magnitude of Treasury expenditures to determine if a policy is good or bad. As this paper shows, the true economic cost associated with these types of deficiency payment programs is usually quite small. On the other hand, hidden costs, brought about by industry quota protection can be quite large. Quotas should receive increased attention from policymakers since they are associated with hidden costs. Ironically, it may well be that, in an attempt to balance the U. S. budget, the least costly programs (i.e., deficiency payments) will be eliminated or greatly reduced while the more costly programs (i.e., quotas) will remain intact.

APPENDIX

The formulas used to calculate the net social cost of U. S. agricultural export commodity programs are presented here. Throughout this Appendix, P, Q, and η represent price, quantity, and an elasticity, respectively; the superscripts p,np,d and s denote with a program, without a program, and demand and supply, respectively; the subscripts j and nj denote program joiners and nonjoiners, respectively; and finally, the lack of a subscript on an elasticity indicates total demand elasticity facing U. S. producers.

A. <u>Changes in Domestic Consumer Surplus</u>

$$\Delta CS_d = \frac{1}{2} (P^p - P^{np}) (Q_d^p + Q_d^{np}).$$

Both P^p and Q_d^p are observable while P^{np} and Q_d^{np} must be calculated from the following formulas:

$$Q^{np} = Q^p/[1 + dq_j + (1 - d)\, q_{nj}]$$

where d is the participation rate and q_j and q_{nj} are the fractional changes in output from program participants and nonparticipants, respectively. These two quantities are calculated as

$$q_j = \delta(1 - E)$$

$$q_{nj} = \frac{d\, q_j \eta_{nj}^s}{\eta^d}$$

where δ is the diversion requirement ($0 < \delta < 1$) and E is the total effective slippage rate ($0 < E < 1$, $E = 1$ implies complete slippage, and $E = 0$ implies zero slippage). It is assumed here that nonparticipants do not take into account the price effect of their own output decisions. By the definition of an arc elasticity, the no program price is calculated as

$$P^{np} = P^{p} \left[1 - \left(\frac{Q^{p} - Q^{np}}{Q^{p}\ \eta^{d}} \right) \right],$$

and the domestic quantity consumed without the program is calculated as

$$Q_d^{np} = Q_d^{p} \left[1 - \eta_d^{d} \left(\frac{P^{p} - P^{np}}{P^{p}} \right) \right].$$

B. <u>Change in Nonparticipant Producer Surplus</u>

$$\Delta PS_{nj} = \frac{1}{2} (P^{p} - P^{np}) (Q_{nj}^{p} + Q_{nj}^{np}).$$

Prices are calculated from above. Quantities are calculated by

$$Q_{nj}^{np} = (1 - d)\ Q^{np}$$

$$Q_{nj}^{p} = Q_{nj}^{np} (1 + q_{nj}).$$

C. <u>Changes in Participant Producer Surplus</u>

$$\Delta PS_{j} = \frac{1}{2} (P^{T} - P^{np}) (Q_{j}^{p} + S^{s}) - a$$

where P^T is the target price.

$$Q_j^p = Q^p - Q_{nj}^p$$

$$Q^s = Q_j^{np} [1 - \delta(1 - r)]$$

$$Q_j^{np} = Q^{np} - Q_{nj}^{np}$$

where Q^s is the quantity that would have been produced by program joiners if they had diverted their acreage and obtained the no program price; r is the amount of total slippage, E, due to diversion of lower than average quality land ($0 < r < E$); and a is the producer surplus lost due to the diversion of productive land. No accurate formula for this area can be derived with the assumption of linear supply functions. The values used in the calculations (shown in Table 1) are based on an estimate of what the diverted acreage would have been worth to participating farmers without the program. Total deficiency payments are calculated as

$$DP = (P^T - P^P)\, Q_j^p,$$

and the net American social cost is given by

$$NASC = DP + \Delta_d CS + a - \Delta_j PS - \Delta_{nj} PS.$$

With rice, storage costs are also added on. They are calculated as total quantity put into storage times the difference between the loan rate and what the rice could have brought on the open market.

FOOTNOTES

1. One last modification in the model of Figure 1 must be made if the floor price created by the U. S. loan rate is above the market price that would occur from the other program components. In this case, storage costs and the decrease in domestic consumer surplus must be added to the program costs, and the decrease in deficiency payments must be subtracted. Participant producer surplus does not change as it is set by the diversion requirements and the target price. Nonparticipant producer surplus may change, however, since they will receive the loan rate rather than the potentially lower market price. In the three commodities examined here, it is assumed that only rice has a binding loan rate. And, since it is assumed that there were no nonparticipants growing rice in 1984, this last difficulty does not arise.

2. Although 81 percent was the official participation rate in 1984, leaving nonparticipants to plant up to 500,000 acres of rice, the actual acreage planted was about equal to 81 percent of the rice base less the required land diversions. This suggests that nonparticipants chose not to grow rice in 1984.

3. The Congressional Budget Office has recently estimated that U. S. steel prices will be 7 percent higher during the five-year life of the restraints and that the five-year cost will be $18 billion (Wall Street Journal).

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TABLE 1

Program and Crop Parameters Used to Calculate
1984 Farm Program Economic Costs

	Corn	Wheat	Rice
Target price	$3.03 per bushel	$4.38 per bushel	$11.90 per cwt.
Market price	$2.65 per bushel	$3.38 per bushel	$8.25 per cwt.
Diversion requirement	10%	30%	25%
Participation rate	54%	61%	100%
Total slippage	50%	50%	not needed
Slippage due to diversion of low quality land	25%	25%	not needed
Domestic demand elasticity	-.5	-.4	-.15
Total demand elasticity	-1.33	-.8	not needed
Nonparticipant supply elasticity	.3	.5	not needed
Producer welfare loss due to acreage diversion	$154 million	$158 million	0

Source: Calculated.

TABLE 2

The Economic Costs of the 1984 Farm Programs

	Corn 1984	Wheat 1984	Rice 1984
U. S. producer benefit	$1.732 billion	$1.615 billion	$301 million
U. S. consumer cost	$282 million	$186 million	$104 million
Treasury outlay	$1.528 billion	$1.485 billion	$286 million
Net welfare cost	$78 million	$56 million	$89 million
Net cost as a percentage of Treasury outlay	5.1%	3.5%	36%

Source: Calculated.

TABLE 3

The Economic Costs of Quota Protection in Cars, Steel, and Sugar

	Cars 1984	Steel 1985	Sugar 1983
	1	2	3
U. S. producer benefit from quotas	$3.13 billion	$2.61 billion	$1.40 billion
U. S. consumer cost from quotas	$4.19 billion	$3.38 billion	$2.82 billion
Net welfare cost of quota protection	$1.06 billion	$770 million	$1.42 billion
Net welfare cost of deficiency payment	$52 million	$53 million	$341 million[a]
Net cost as a percentage of Treasury outlay	5%	7%	8%

[a]Corresponds to a Treasury cost of $1.74 billion.

Sources:

Cols. 1 and 2: Calculated.

Col. 3: Gwo-Jiun Leu, Andrew Schmitz, Ronald D. Knutson, "Gains and Losses of Sugar Program Policy Options," University of California, Department of Agricultural and Resource Economics, Working Paper No. 381, Berkeley, September, 1985.

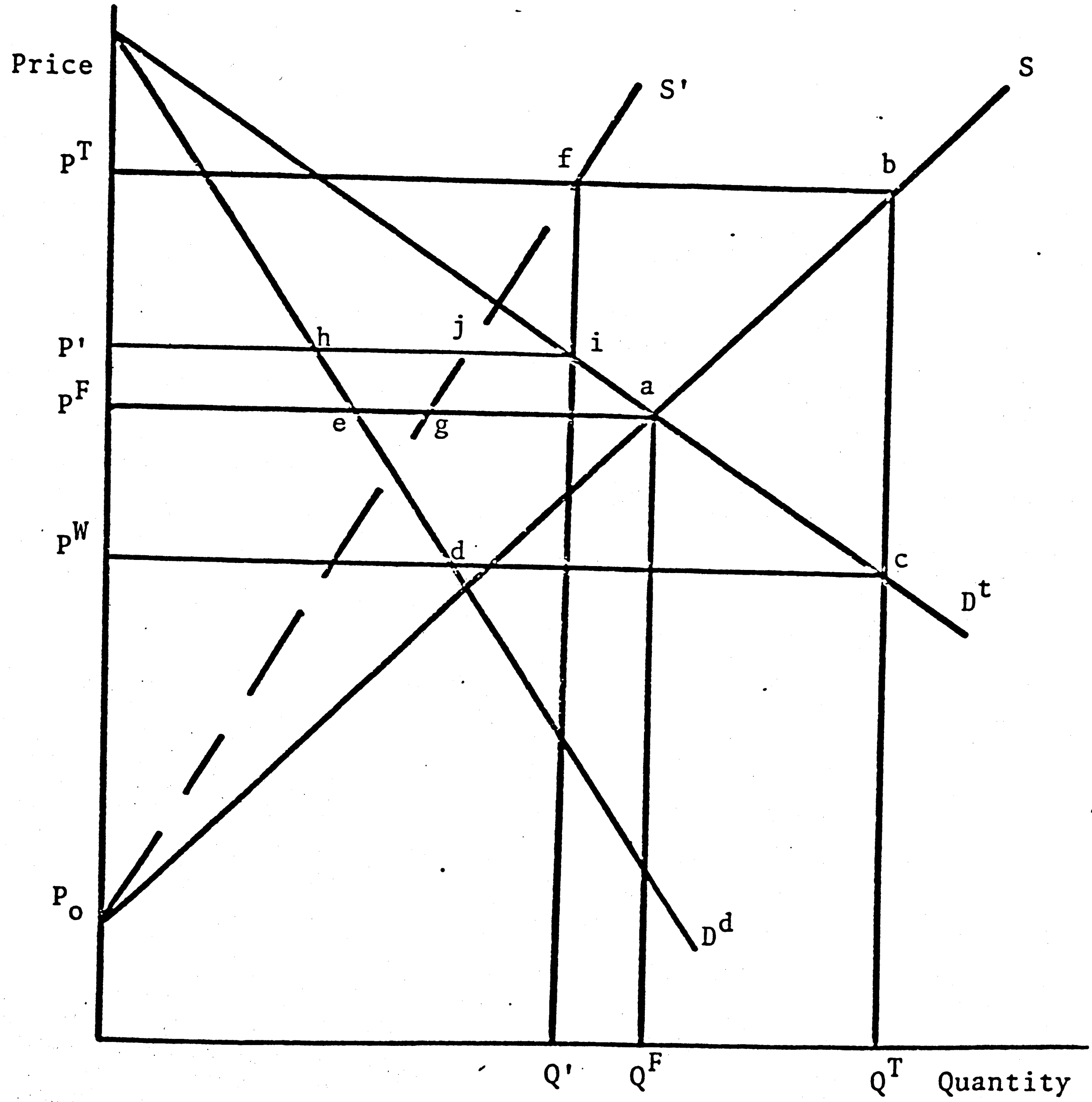

Figure 1. Net Social Costs of a Target Price/Deficiency Payment Program With and Without Acreage Diversion

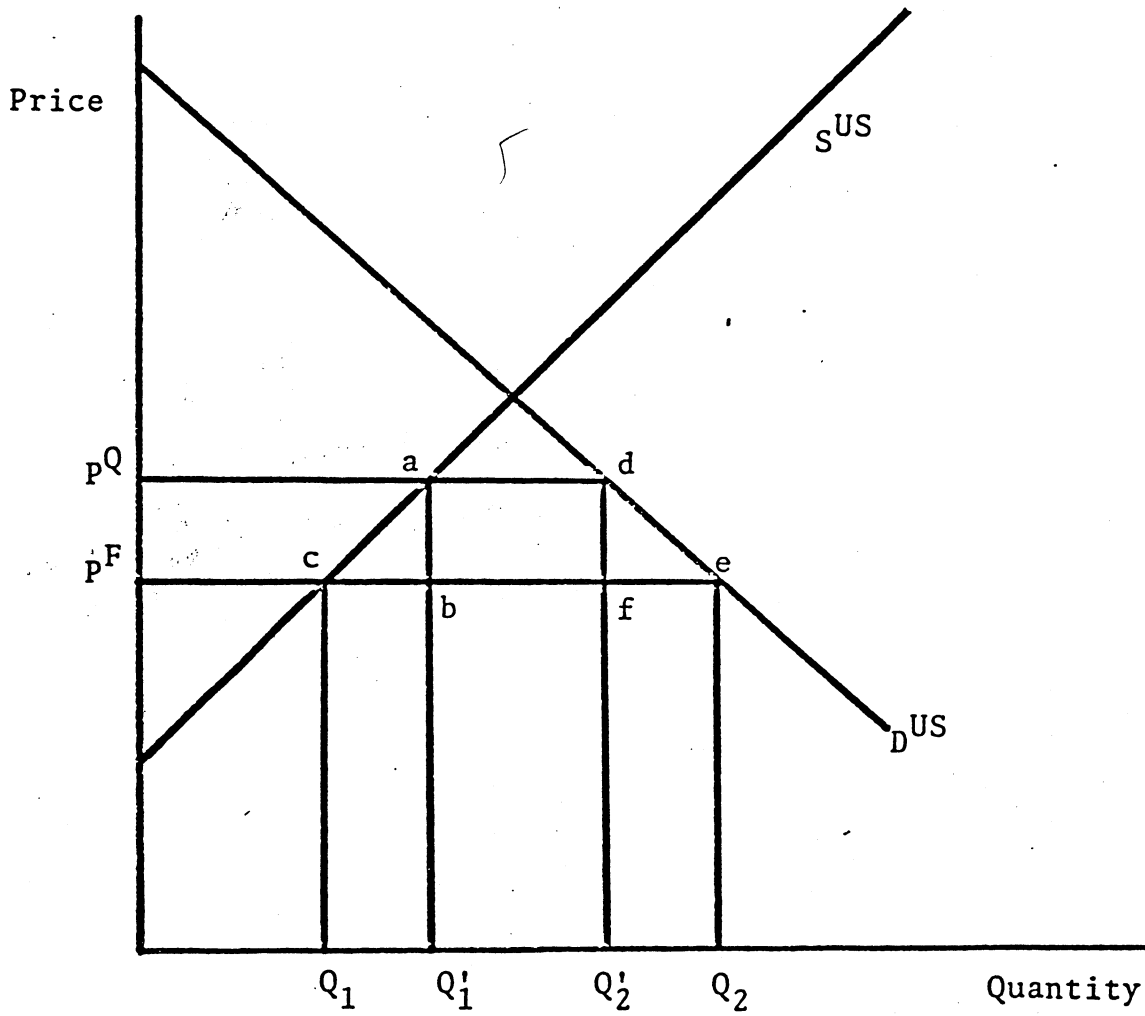

Figure 2. The Net Costs of Quotas