Staff Papers Series

P83-10 April 1983

Self-Help Price Support:
Assessing Producers for Costs of Product Removals

by

Jerome W. Hammond

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

SELF-HELP PRICE SUPPORT:

ASSESSING PRODUCERS FOR COST OF PRODUCT REMOVALS

BY

JEROME W. HAMMOND*

April 1983

University of Minnesota

*Professor, Department of Agricultural and Applied Economics, University of Minnesota.

SELF-HELP PRICE SUPPORT:

ASSESSING PRODUCERS FOR COSTS OF PRODUCT REMOVALS

Introduction

A number of mechanisms are used to increase producer prices for farm products, supply control, government purchases, and direct payments. These often lead to substantial government cost to maintain prices above free market levels. Proposals to assess farmers for some of the costs of price support removals from commercial markets in the U.S. dates to the 1920's. The September 1982 amendment to the farm price support legislation introduced this feature into the dairy program. If not determined to be unconstitutional by the courts, (currently a possibility), some of the costs of the dairy price support program will be offset by an assessment on each hundredweight of milk sold by producers. The technique has been part of the Canadian federal milk pricing program since the 1960's and in Europe for sugar and milk for the last few years. The approach is interesting not only because it transfers some of the costs of price support from the government to producers whose prices are being supported but, because for most farm commodities, it has the potential to raise producer prices substantially without any infusion of government funds. The purpose pf this paper is to illustrate how assessments impact on net producer prices in the absence of other price support mechanisms. Using the dairy sector as an example, the consequences of alternative supply and demand elasticities for price gains will be illustrated.

The first proposals for industry self-help price support in the U.S. appeared in the McNary-Haugen bills in the 1920's (the first really

significant attempts by Congress to develop domestic farm price supports). The proposal was basically a two price plan. However, bills provided for assessment either at the first assembly point or at the first procesor. In one of the bills the assessments were called "equalization funds", in another "stabilization funds" (1, pp. 225-229). These assessments were to be used to help defray the costs of handling and disposing of product in excess of domestic needs at the domestic price support levels. The disposal method was to be sales in foreign markets at whatever price was necessary to move the product.

The Agricultural Adjustment Act of 1933 which set the stages for all our federal price programs to date, also provided for "processing taxes to be paid by processors of the commodities" (1, pp. 283, 348). These funds were to be used to pay for reducing supply and for subsidy payments on allotted production. That particular feature of the AAA of 1933 was declared unconstitutional in the famous Hoosac-Mills decision.

Canada's government milk program which is a multiple pricing scheme has provided for assessment on producers milk sales (called "in-quota holdbacks") since 1967 pp. 8-9). Originally the holdback was applied only to industrial use milk. Since 1977, it has been applied to all milk. For 1978-1979, the hold-back was about $1.00 per hundredweight of milk. These funds are used to offset some costs of acquiring and disposing of milk products that cannot be sold at domestic price support levels. Obviously, these may be price discrimination gains from sales of the acquired product. However, gains may be possible if no secondary market exists for the acquired commodity.

The European Economic community has imposed a levy on its milk producers for the past 3 or 4 years. It is called a "co-responsibility

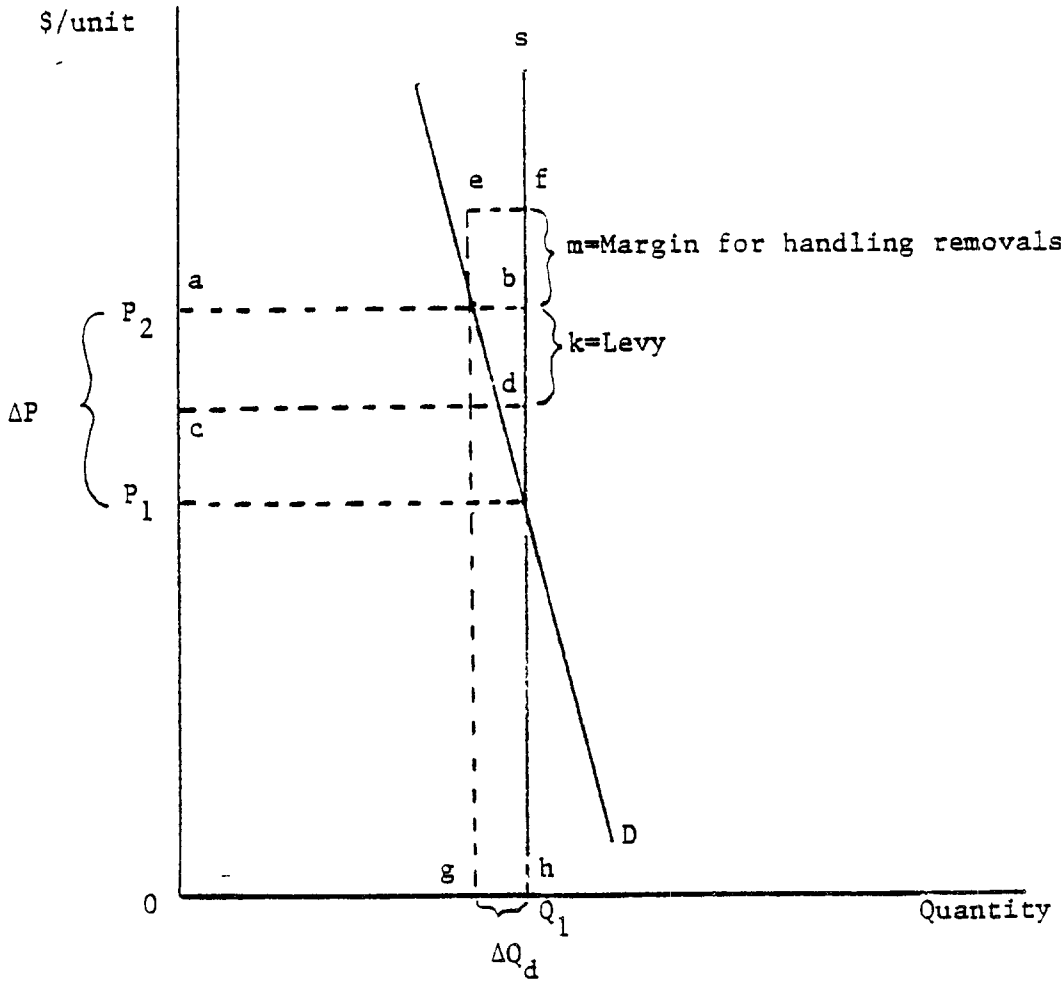
levy". Recently a similar type of levy has been applied to sugar beet producers. Proceeds from the assessment go into the general farm price support fund of the EEC. For dairy, some of the funds are used for dairy product promotion. In the spring of 1982, the assessment was 2.5% of the EEC target price for milk or about $.35 per hundredweight.

A model for estimating impacts of self-help price support.

The operation of self-help through producer assessments to raise producer prices is illustrated in Figure 1. This depicts a short-run situation where supply is completely inelastic at Q_1. Given a demand function D, a free market price, P_1 would prevail. If producers are assessed a fixed levy, k, per unit of product sold, the funds generated can be used to remove products from markets. The removal causes market prices to rise. Thus, the levy is deducted from a higher price than P_1. Since there are costs of acquisition, handling, processing (if the product must be purchased in processed form) and storage, the authorized buying agency's purchase price will exceed the producers selling price, net of the levy. Nevertheless, if demand is highly inelastic, as it is for most farm products, the gain in market price should exceed the per unit levy.

To determine quantity and price impacts of the assessment, assume the total funds generated by the levy, ($k \times Q_1$.) in figure 1, are used to remove product from commercial markets. The removals raise market price to buyer of the product by ΔP to P_2. Graphically, the change in price, ΔP, and the removals, ΔQ_d, made possible with these funds for a given levy, k, is determined where the total value of the assessment, area abcd, equals the total costs of removals, area efgh. In this case, area efgh includes not

Figure 1. Impact of assessment on producers to remove product from commercial markets, supply fixed.



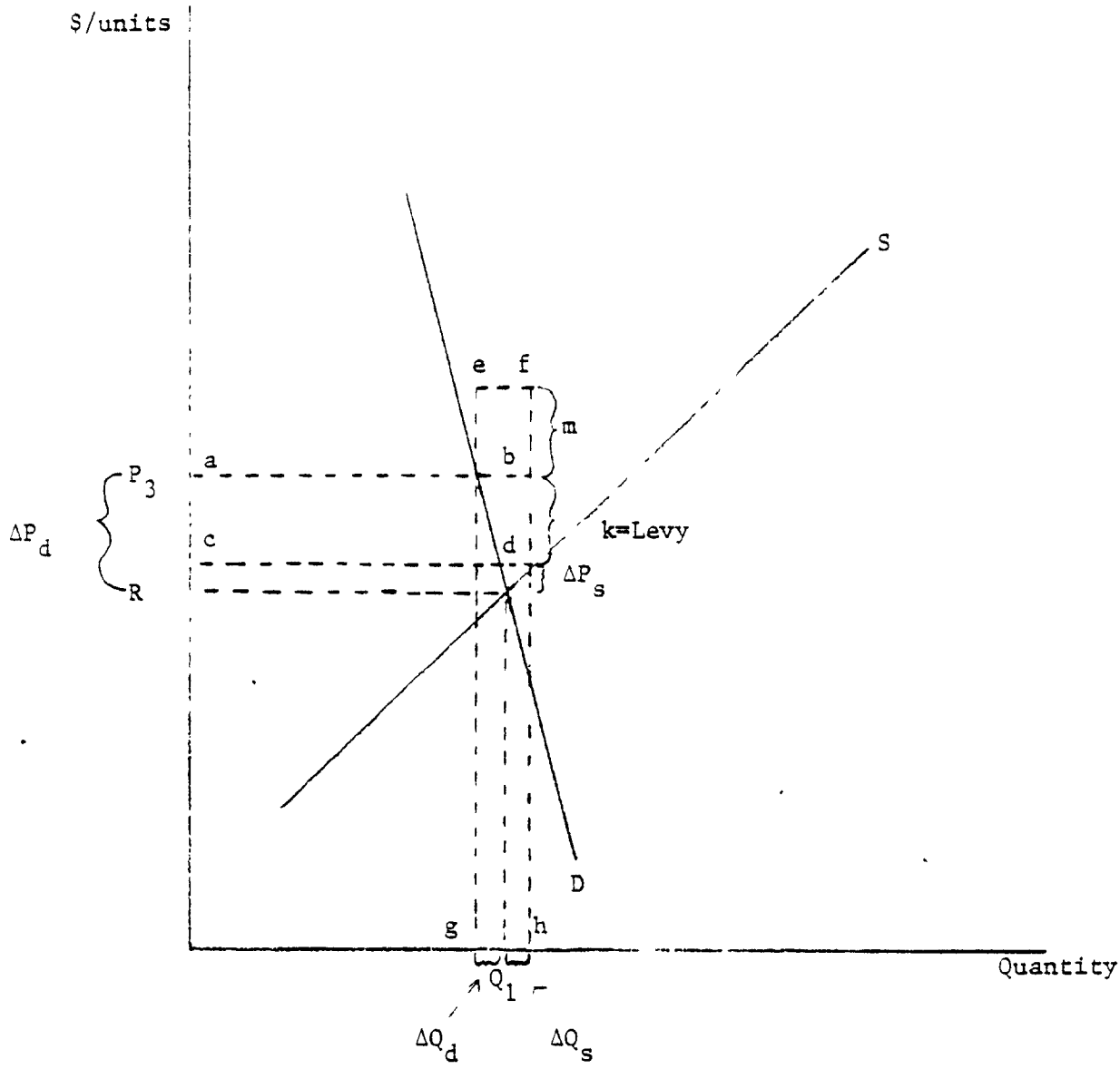


Figure 2. Impact of assessment on producers to remove product from commercial markets, variable supply.

only the cost of the farm product to buyer, it includes the cost of acquisition, handling, storage, etc. The unit cost in excess of the buying price assumed for this example is m perunit of farm product. No salvage value is assumed for disposal of the product in non-competing uses. (Salvage cost or roles in secondary markets would reduce net purchase costs and permit greater price gain for a given levy.) The net producer price P_2-k, exceeds the initial free market price. Producers, obviously, would be interested in such a program only if P_2-k>P_1. For this to be the case, demand must be inelastic and costs of handling of market removal and storage must not be large enough to offset price gains.

The situation where supply response is possible within the period being analyzed, is illustrated in Figure 2. Here, production in the current period responds to the net price change brought about by assessment. The net producer price, P_1 + ΔP-k is greater than P_1. Consequently producers expand supply by ΔQ_s. To increase market price by more than the levy, finds generated from the levies must be sufficient to remove the increased supply, ΔQ_s, and reduce quantity sold to commercial buyers. If demand is inelastic, the program will lead to a net gain in producer price. Again, the price changes and product removals for a given levy are those that equate rectangles abcd and efgh in Figure 2.

Algebraically, the determination of the price changes and product removals for a given assessment can be derived in terms of demand and supply elasticities, the levy, the margin for processing and operation, and initial prices and quantities (P. and Q. in Figure 1 and 2). The total value of the levies where both supply and demand adjust, R, is

(1) $R = k(Q_1 + \Delta Q_s)$ where

k is the per unit levy,

Q_1 is the initial quantity supplied and demanded, and

ΔQ_s is the supply response to the change in producer price.

The total cost of product removals, C, is:

(2) $C = (\Delta Q_s - \Delta Q_d)(P_1 + \Delta P + m)$ where

ΔQ is the change in quantity of commercial demand as a result of the change in buying price

P_1 is the initial price,

ΔP is the price change generated by the removals and

m is the unit cost of handling the removals.

The new purchase price for buyers for the situation depicted in Figure 2, is $P_3 = P_1 + \Delta P$, and the new producer price is $P_3 - k = P_1 + \Delta P - k$. The change in the supply price is $\Delta P_s = \Delta P - k$. Equating of total value of the levy, R, with total cost of removals, C, yields:

(3) $k(Q_1 + \Delta Q_s) = (\Delta Q_s - \Delta Q_d)(P_1 + \Delta P + m)$

By solving the general supply and demand elasticity relation in terms of the ΔQ's and substituting these into equation (3), a polynominal equation is obtained. This polynomial can be solved for ΔP with the quadratic formula as follows:

(4)
$$\Delta P = \frac{\left[\frac{EQ_1P_1 + EmQ_1 - 2EkQ_1 - \eta Q_1P_1 - \eta mQ_1}{P_1}\right] \pm \sqrt{\left[\frac{EQ_1P_1 + EmQ_1 - 2\,EkQ_1 - \eta Q_1P_1\ \eta mQ_1}{P_1}\right]^2 - \left[\frac{EQ_1 - \eta Q_1}{P_1}\right]\left[\frac{Ek^2Q_1 - kQ_1P_1 - EkQ_1P_1 - EkmQ_1}{P_1}\right]}}{2\left[\frac{EQ_1 - \eta Q_1}{P_1}\right]}$$

The equation permits estimation of the producers price impacts of any given assessment on producers given initial price and quantity, and costs of acquiring and handling of removals. Note also that equation (4) could also be solved for the levy necessary to obtain a specified price change for either producers or buyers of the product.

If supply is completely inelastic, as in Figure 1, all of the terms with an E in equation (4) become zero. In this case, equation (4) reduces to:

$$(5)\quad \Delta P = \frac{-\left[\frac{\eta P_1 Q_1 + \eta m Q_1}{P_1}\right] \pm \sqrt{\left[\frac{\eta P_1 Q_1 + \eta m Q_1}{P_1}\right]^2 - 4\,\frac{(\eta Q_1)}{P_1}\,(kQ)}}{2\frac{(\eta Q_1)}{P_1}}$$

Solution of this model can be used in an iterative manner to estimate price and quantity adjustments in successive periods. If supply adjustment is lagged, supply in period 2 adjusts to price change in period 1. This quantity is the initial quantity for the solution and for period 2.

An application of self help for price support

The preceding model was used to illustrate possible consequences of self-help price support for the U.S. dairy industry for several assumed levels of supply and demand elasticities. Baseline price and quantity data for these illustrations are estimated the average U.S. free market price and quantity that would have prevailed in the U.S. in 1981 had there been no government price support program; see Table 1.(6). This table also includes the actual price and quantity for that year. Although the dairy industry has a two price plan administered under state and federal order programs, for purposes of illustration it was assumed that the average "all milk" price

in the table approximates the average market price if there was no multiple price system.

Estimated impacts were made using free market baseline data as the initial price and quantity, a producer assessment of $.50 per hundredweight, and an average cost of processing, handling, and storing product removals of $1.47 per hundredweight. Zero salvage value was assumed. Buyer prices, producer prices, supplies, commercial demand and product removals were computed for four assumed supply elasticities; 0, .15, 1.0, and 1.5 and three assumed demand elasticities; -.3, -1.0 and -1.5 (Table 2). The estimates for alternative elasticities illustrate how demand and supply responsiveness influences the industry impacts. The demand elasticity of -.3 and the supply elasticity of .15 are the approximate elasticities estimated in many studies of the U.S. dairy industry (2, 3, 4).

Table 1

Actual and Estimated Free Market

U.S. Milk Prices and Quantities, 1982

	Actual Prices and Quantities	Estimate Free Market Prices and Quantities
All milk price	$14.10/wt.	$11.11/cwt.
Milk supply	134.2 bil. lbs.	129.9 bil. lbs.
Commercial use	121.3 bil. lbs.	129.9 bil. lbs.
Gov't. purchases	12.9 bil. lbs.	0

Table 2

Price and Quantity Impacts of a $.50 per cwt

Levy for Self-Help Price Support for the Dairy Industry

Demand Elasticity η=	Change in buyer price	Change in producer price	Removals bil. cwt.	Removals % of supply	Change in buyer price	Change in producer price	Removals bil. cwt.	Removals % of supply
	For Fixed Supply, E=0				With Variable Supply, E=.15			
-.3	+$1.33	+$.83	4.6652	3.6	+$1.08	$.58	4.79285	3.7
-1.0	+$.43	-$.07	4.9934	3.8	+ .44	-.06	4.9855	3.8
-1.5	+ $.29	-$.21	5.0475	3.9	+ .31	-.19	5.0271	3.9
	With Variable Supply, E=1.0				With Variable Supply, E=1.5			
-.3	.71	.21	4.9792	3.8	.65	.15	5.0970	3.8
-1.0	.46	-.04	4.9626	3.8	.47	-.03	4.95665	3.8
-1.5	.37	-.13	4.9421	3.8	.39	-.11	4.9335	3.9

The data in Table 2 show that net producer prices are increased by the levy only for inelastic demand. With completely inelastic supply and inelastic demand at -.3, a $.50 assessment raises buyer price by $1.33 per hundredweight, leaving producers with a net price gain of $.83 per hundredweight. If there are no costs of handling, processing, and storage of market removals and no salvage value of removals (m), unit elastic demand with fixed supply will result in the self-help programs being simply a break even proposition for producers. If supply can adjust in the short-run with an elasticity of .15, price gains are less, but producers still gain $.58 per hundredweight.

Self-help price support of this kind will always permit increases in buyer prices, but producer prices, net of the levy, are actually reduced when demand is elastic, rows 2 and 3 of each section of Table 2. The amount of the reduction, however, declines as supply becomes more elastic. This occurs because price declines cause greater reductions in supply. Thus, the larger supply reductions with the product removals have greater imports on commercial marketings. Conversely, when demand is inelastic so that net producer prices increase, the price effect increases as supply becomes more inelastic.

Problems in implementing a self-help plan

To date, producer assessments have been used, or proposed for use, in combination with other mechanisms of price support. Implementation of such a plan as the sole method of price support would require an

examination of other considerations than just supply and demand elasticities. Some of these factors are:

(1) What will be the method for disposing of price support removals? If prices are to be continuously maintained above market clearing levels, there will be continuing costs of handling and disposal of product removals. Domestic disposal necessarily impacts on domestic markets for some products. Foreign disposal runs into problems of trade agreements such as those under the GATT.

(2) Are accurate supply and demand forecasts available? There is a need for accurate forecasts of supply and demand to determine the necessary levy to obtain desired price.

(3) Is some government funding needed? Unavoidable error in forecasts will lead to surpluses or shortages of funds to obtain desired price. Some direct government funding on support may be needed to provide for shortfalls in levy collection.

(4) What restrictions should be placed on price enhancement? As long as prices are in the inelastic range of the demand curve, limits may need to be imposed on the amount of price enhancement.

(5) What is the advantage of this self-help program over producer price support at the same level with government product removals financed from tax revenues? It has the disadvantage that consumption of the product whose price is being supported by the producer levy program is discouraged to a greater extent than with simple government removals. On the other hand, the approach has the advantage that

government expenditure is not needed to achieve a price increase when demand is inelastic. This may make it appealing to the electorate and its representatives. Nevertheless, the support still amounts to a tax on the consumer of the affected commodity. The tax is paid only by users of the product, not the general taxpaying population.

Summary and conclusions

Use of assessments on producers sales to remove product from commercial markets can reduce government costs of price support for farm commodities. In this paper a model was developed to estimate price impacts of a specified levy per unit of the farm product. Given on initial market equilibrium and supply and demend elasticities, market price to buyers, net producer price and quotation demanded and supplied can be estimated.

Application of the model shows that if demand facing producers is inelastic and handling, processing for storage, and administrative costs are not high, net producer prices can be increased with no government funding. If secondary markets can be found for the removals, then producer price gains will be even greater.

Producer price gains from self-help increase as demand becomes more inelastic. For a fixed inelastic demand, producer price gains decline as supply becomes more elastic.

REFERENCES

(1) Benedict, Murray, Farm Policies of the United States, 1790-1950, The Twentieth Century Fund, New York, 1953.

(2) Brandow, George, "Interrelations Among Demands for Farm Products and Implication for Central of Market Supply." Agricultural Experiment Station Bul. 680, Pennsylvania State University, University Park, Pa. Aug., 1961.

(3) Hammond, Jerome, "Regional Milk Supply Analysis" Staff Paper 74-12, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, MN. July, 1974.

(4) Stonehouse, Peter, "Government Policies for the Canadian Dairy Industry", Canadian Farm Economics, Vol. 14, No. 1-2, Feb-April, 1979.

(5) Wilson, Robert, and Russell Thompson, "Demand, Supply, and Price Relationships for the Dairy Sector, Post World War II Period." Journal of Farm Economics, Vol. 49, No. 2, May 1967, pp. 360-71.

(6) Unpublished report of ERS, USDA.