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A WELFARE ANALYSIS OF PORT USER FEES: THE CASE OF GRAIN AND SOYBEAN EXPORTS

E. Wesley F. Peterson, Hector Viscencio-Brambila, and Stephen Fuller

Abstract

User fees have become a popular means of financing public services, including certain transportation facilities. The Water Resources Development Act of 1986 includes provisions for user fees to finance part of the costs of operations, maintenance, and new construction of the U.S. port system. The purpose of this paper is to evaluate the welfare implications of this legislation. An analytical model is developed and used to estimate the impact of port user fees on grain and oilseed producers, consumers, and the government. The results of the analysis indicate that the user fee has a relatively small effect on producer welfare and that the efficiency gains resulting from the replacement of the government subsidy for port operations, maintenance, and new construction with a user fee are negligible.

Key words: user fee, transportation costs, social welfare, international trade.

The Water Resources Development Act (WRDA) of 1986 substantially alters the financing of the U.S. port system. Title XIV (section 4461) of this act establishes a harbor maintenance tax to be paid by all users. This revenue is to be credited to a Harbor Maintenance Fund used to finance a portion of port operations and maintenance costs. In addition, the WRDA includes provisions which authorized non-Federal interests to recoup their share of construction costs in the form of harbor dues on vessels and cargoes.

The port user fees, as authorized by the Water Resources Development Act of 1986,

have generated considerable concern among agricultural groups whose commodities are dependent on foreign markets. Most vocal are U.S. grain and soybean producers. Since the fee is charged to ocean-going vessels exiting or entering U.S. ports, the user fee, in effect, increases transportation costs between U.S. grain producers and their foreign markets. This increases the price that foreign buyers pay for U.S. grain and reduces trade flows and potentially producers' income. Since price competition is an important characteristic of the world grain market, concern about port user fees seems substantiated.

The introduction of user fees shifts the burden of financing port infrastructure from the general public to ship operators. The purpose of this paper is to explore the implications of this change for U.S. grain (corn, sorghum, and wheat) and soybean exports and the effect of port user fees and cost-sharing provisions included in recent legislation. Of particular interest are the expected welfare impacts on grain and soybean producers.

The Water Resources Development Act of 1986 was the result of six years of debate (Hammon). Issues related to user fees and cost-sharing that arose during this debate included the costs to be recovered (operational, maintenance, new construction), the degree of cost sharing, and the way in which user fees would be assessed (weight-based versus *ad valorem*). Most of these issues were resolved in the 1986 legislation. Operational, maintenance, and new construction costs will be subject to recovery.¹ A cost sharing

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¹Operational and maintenance costs involve U.S. Army Corps of Engineers' dredging and channel maintenance activities which total approximately \$337 million per year. New construction costs are incurred when the Corps deepens or widens an existing channel or develops a new channel.

formula has been developed to cover new construction costs.² A maintenance fund will be established to help defray the costs of operation and maintenance. This fund will be financed by assessing a 0.04 percent *ad valorem* user charge on cargo loaded or unloaded at U.S. ports. It is not clear how the money will be raised to finance the non-federal share of new construction costs, however, provisions allow for harbor fees.

Although there were no efforts to evaluate the welfare effects of earlier user fees, agricultural economists made considerable efforts to evaluate some of the anticipated impacts of the inland waterway user fee (Binkley et al.; Baumel et al.; Casavant and Thayer). All of these studies focused on grain, and in most cases, research evaluated changes in flows that would result from the imposition of various forms and levels of inland waterway user fees. Binkley et al. evaluated the effect of a uniform and a river segment tax on barge wheat movements on the Mississippi River system and also estimated the impact of various user charges on location of the grain-dependent broiler industry. Baumel et al. carried out a comprehensive evaluation of user fees and their effect on national and export grain-flow patterns. Using a similar methodological framework, Casavant and Thayer analyzed the effect of user charges on grain flows on the Columbia-Snake River System.

CONCEPTUAL APPROACH, PRODECURES, AND DATA

A two-country trade model provides the analytical framework to evaluate the market and welfare effects of port user fees. Prior to the imposition of user fees, port operations, maintenance, and new construction were

financed from general tax revenues. This arrangement constituted a subsidy to port users by reducing shipping rates. This is illustrated in Figure 1 by the excess supply curve labeled ES. Transportation costs and exchange rates are not specifically shown in Figure 1 to keep it from becoming unduly complicated. It is assumed that the prices measured on the vertical axes include transportation costs and that exchange rates are constant. The excess supply curve is shifted down in relation to a free-trade excess supply relationship to reflect the presence of the subsidy. With these assumptions, the difference between the two excess supply curves in Figure 1 is simply the presence or absence of the subsidy.

Imposition of the user fee removes the subsidy. This is illustrated in Figure 1 by a shift of the excess supply from ES to ES*. The excess supply curve, ES*, represents complete elimination of the subsidy. In other words, the user fee illustrated in Figure 1 is set to cover all operational, maintenance, and new construction costs. The actual user fees may not recover all of these costs and can be seen as measures to reduce the subsidy rather than to eliminate it altogether. In terms of Figure 1, user fees designed to recover only part of the costs would result in an excess supply curve located somewhere between ES and ES*. Prior to imposition of the user fee, the subsidy reduced ship rates and established the U.S. price at P^0 with the rest-of-the-world price at P^* . Removal of the subsidy increases ship rates, lowering the U.S. grain price from P^0 to P and increasing the world price from P^* to P . The benefits of the subsidy and the burden of the recently introduced user fee are shared by U.S. producers and foreign consumers.

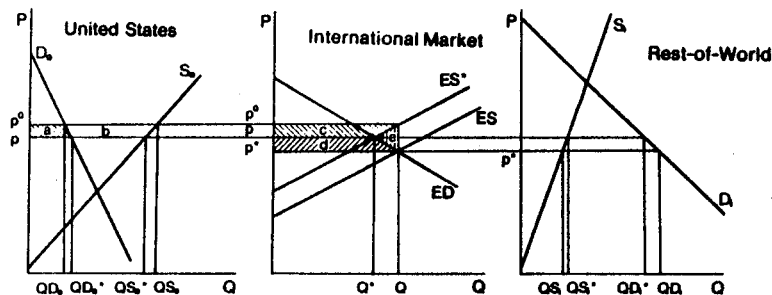


Figure 1. A Two-Country Trade Model.

²The WRDA includes provisions which require non-federal sources to pay for (a) 10 percent of harbor construction cost for that portion of the project which has a depth not in excess of 20 feet, plus (b) 25 percent of harbor construction cost for that portion of the project which has a depth in excess of 20 feet but less than 45 feet, and (c) 50 percent of the cost of harbor construction for that portion of the project which has a depth in excess of 45 feet.

TABLE 1. EXPRESSIONS TO ESTIMATE MARKET EFFECT OF AN AD VALOREM PORT USER FEE

International Trade Market

$$\Delta P = P - P^* = \left[\frac{Eg}{E - N(1+g)} \right] P$$

$$\Delta Q = Q - Q^* = |N| \left[\frac{Eg}{E - N(1+g)} \right] Q$$

U.S. Domestic Market

$$\Delta P = P^o - P = \frac{|N|}{E} \left[\frac{Eg}{E - N(1+g)} \right] P$$

$$\Delta QS_e = QS_e - QS_e^* = \frac{a|N|}{E} \left[\frac{Eg}{E - N(1+g)} \right] QS_e$$

Elasticity of U.S. Excess Supply

$$E = a + (a - n) \frac{QD_e}{Q}$$

Variable Definitions

E and N	= elasticities of excess supply and excess demand, respectively.
a and n	= elasticities of U.S. domestic supply and demand, respectively.
P	= post-user-fee price.
P ^o and P [*]	= before-user-fee prices in U.S. and international trade markets, respectively.
Q and Q [*]	= before-and after-user-fee quantities traded in international market, respectively.
QS _e and QS _e [*]	= before-and after-user-fee quantities supplied in the U.S. market, respectively.
QD _e	= before-user-fee quantity demanded in U.S. market.
g	= <i>ad valorem</i> user fee (percent).

Algebraic expressions to approximate the effect on various markets resulting from an *ad valorem* user fee are presented in Table 1. The procedure to derive these expressions is similar to that presented by Kreinin (p. 466). Because removal of the subsidy involves a change from two prices (P^o and P^{*}) to one (P), these expressions should actually include the two original prices on the right-hand side. As will be shown later, however, the actual user fees and therefore the differ-

ences between P, P^o, and P^{*} are fairly small. Thus, the inaccuracies due to using the simpler expressions in Table 1 are minor. These expressions essentially partition the user fee into its foreign and domestic incidences. The estimated welfare effects of port user fees are based on standard definitions of producer and consumer surplus.³ Changes in these surpluses are shown by the labeled areas in Figure 1. The loss in producer surplus in the United States is given by area (a+b). U.S. consumers gain area (a), as a result of the lower price in the domestic market. The U.S. government realizes savings equal to the area (c+d+e), the cost of the subsidy which is transferred from taxpayers to port users. Areas (c) and (d) are equal to the surplus losses of U.S. producers and foreign buyers, respectively. The dead-weight loss occasioned by the subsidy is recovered by its replacement with the user fee. This efficiency gain is represented by area (e). The overall effect of replacing the subsidy with a user fee for the United States is the sum of government savings and the gain in consumer surplus less the loss in producer surplus.

An alternative approach to modeling the user fee would be to treat the historical subsidy as implicit. In this case, the initial excess supply curve, including the "implicit" subsidy, would coincide with the schedule labeled ES^{*} in Figure 1. The imposition of the user fee would result in a new excess supply schedule driving a wedge between the domestic and foreign market prices. In other words, rather than a change from two prices (P^o and P^{*}) to one (P) as shown in Figure 1, the user fee would cause a change from a uniform initial price (assuming zero transportation costs) to differentiated prices in the domestic and foreign markets. While this approach differs slightly from the framework set out above, it should be noted that the price movements are identical. In both cases, domestic prices are lowered while foreign market prices are increased.

There are several reasons why it is more accurate to treat the user fee as a case of subsidy removal rather than as a case of tax imposition. First, the original subsidy was not truly implicit in that it involved actual

³As shown by many economists, consumer surplus is a non-unique money measure of consumer's welfare changes in prices and income (Silberberg). Willig showed, however, that measures of consumer surplus and either compensating or equivalent variation may be similar in magnitude if the proportion of income that a consumer allocates to purchases of a given commodity is small. Since consumers' expenditures on grain are a small part of their income, it was assumed that consumer surplus provided a reasonable approximation of changes in consumer welfare. Producer surplus, based on the concept of producer quasi-rent, is not subject to the same measurement problems as consumer surplus.

government expenditures. More importantly, the imposition of a tax leads to a dead-weight loss. This would be a peculiar outcome in an analysis where the initial distortion occasioned by the subsidy is, in a sense, being corrected by the user fee. For these reasons, we have chosen to represent the change as a case of subsidy removal with an associated recovery of the dead-weight loss caused by the subsidy. The quantitative results would not be changed if the alternative approach were adopted, but the efficiency gain would have to be labeled a dead-weight loss.

Due to the assumption of linear relationships, measurement of the welfare effects is reduced to calculating rectangular and triangular areas above and below supply and demand curves that are bounded by price lines. This is accomplished with the following formulas:

- (1) U.S. producers' loss = $1/2 (P^o - P) (QS_e + QS_e^*)$,
- (2) U.S. consumers' gain = $1/2 (P^o - P) [(QS_e + QS_e^*) - (Q + Q^*)]$,
- (3) U.S. government's savings from user charge = $Q [(P - P^*) + (P^o - P)]$,
- (4) net effect on U.S. agents balance = (2) + (3) - (1), and
- (5) efficiency gain = $1/2 (Q - Q^*) [(P - P^*) + (P^o - P)]$.

Substitution of algebraic expressions from Table 1 into these formulas provides the means to approximate the relevant welfare effects of the user charge.

The elasticities of demand for U.S. exports (N) used in this study were derived following the procedure described by Bredahl et al. Excess demand elasticities for importing countries or regions are computed using assumed supply and demand elasticities in these areas and data on the share of imports

in total demand. A similar procedure is used to compute excess supply elasticities for exporting countries. The difference between the sum of the excess demand elasticities weighted by their respective trade shares and multiplied by the elasticity of price transmission (a factor reflecting the degree to which a particular market is insulated by policy interventions) and the sum of the excess supply elasticities weighted by their trade shares and multiplied by the appropriate elasticity of price transmission is the computed foreign demand elasticity facing the United States. Policies such as the European Community's variable levy prevent price variations from being transmitted to the internal market. In these cases, the elasticity of price transmission is set at zero. In addition, it has been assumed that competing exporters do not respond to world prices, so the elasticity of demand for U.S. exports is determined by the responses of importing countries that do not fully insulate their internal markets from world price variation.

The computed excess demand elasticities used in this study are shown in Table 2. These elasticities are based on trade share data and supply and demand elasticities (following Bredahl et al., assumed to be -0.2 and -0.4 for grain and soybean demand, respectively, and 0.2 for supply of all commodities) for 24 countries or regions. Large countries, such as the USSR or Japan, are treated separately, while smaller ones, such as the Central American countries, are aggregated to form a region.⁴ The estimated elasticities are similar to those reported by Bredahl et al. and, in line with their discussion, are assumed to reflect long-run adjustments to price changes.⁵ In a recent comprehensive survey of export demand elasticities, Gardiner and Dixit report long-run elasticities of export demand for U.S. coarse grains ranging from -0.41 to -10.18, for soybeans from -0.47 to -2.80, and for wheat from -0.23 to -6.72. If one eliminates the extremes from these ranges, most

⁴The countries or regions are: Scandinavia, North Central Europe, Southwest Europe, European Islands, Adriatic, USSR, Eastern Baltic, Eastern Mediterranean, North Africa, Red Sea, East Africa, West Africa, Persian Gulf, Western Asia, Southeast Asia, Taiwan, Korea, Japan, China, Canada, Mexico, Western South America, Eastern South America and Caribbean (see Viscencio-Brambila for details on the specific countries included in each group).

⁵These elasticities correspond to what Bredahl et al. labeled the maximum restricted case and are considered to be more realistic than free trade. They are assumed to reflect long-run adjustments to changes in prices. The estimated welfare effects should therefore be interpreted as static long-run changes. No allowance has been made for cross effects. If changes in the price of corn, for example, shift the supply and demand curves for soybeans, the welfare effects for the soybean market would be altered. However, the difference would be quite small because cross-effects are not as large as the direct effects and the direct effects have been shown to be fairly minor.

of the reported estimates are consistent with those computed for this study. An expression to estimate elasticities of U.S. excess supply was derived and is included in Table 1. Elasticity estimates obtained from this expression are shown in Table 2.

Data to estimate elasticities in the international trade market were obtained from a tape provided by the National Technical Information Service (U.S. Department of Commerce) which contains grain supply and distribution data on a country basis. C.I.F. Rotterdam prices⁶ were used to represent prices in the international grain markets and were obtained from various *Outlook and Situation* issues for feed grains, oilseeds and fats, and wheat published by the U.S. Department of Agriculture. Data used in this study are averages for the period 1977/78 - 1982/83 (Table 2).

As noted earlier, the new legislation includes an *ad valorem* user fee to recover part of the expenses associated with operations and maintenance as well as a cost-sharing formula to finance new construction. Several documents, each titled "Deep Draft Navigation Cost Recovery Analysis" (U.S. Army Corps of Engineers, 1982), provide information on operational and maintenance expenditures and tonnage and value of exports and imports at U.S. ports. Dividing the operational and maintenance expenditures by the value of exports and imports provides an estimate of the *ad valorem* fee required to recover all of these costs. The *ad valorem* fee rate was estimated to be 0.0836 percent, about twice the 0.04 percent rate established in the legislation. As shown in Table 3, these *ad valorem* fees represent fairly small charges when expressed in dollars per metric ton for the four crops studied. The actual charge ranges from about \$0.06 to \$0.12 per metric ton for a fee of 0.04 percent and from \$0.11 to \$0.24 for a fee of 0.0836 percent. The collected fee will be placed into a Maintenance Trust Fund which will be used to finance 40 percent of the operational and maintenance costs of U.S. ports and 100

percent of the St. Lawrence Seaway. The remaining costs will continue to be covered by the federal government (Hammon).

The legislation provides for only partial recovery of new construction costs and does not specify the way in which the non-federal interests are to finance their share of the costs. For this analysis, estimates of new construction outlays were obtained via a written memorandum furnished by the Chief of Engineers, Directorate of Civil Works, Office of Policy in Washington, D.C. (U.S. Army Corps of Engineers, 1986). Estimation of annual port outlays for repayment of new construction investment and the associated costs of capital were obtained by assuming that the projects would be funded by debt. The calculated interest rate was a weighted average of municipal and corporate bond yields for the period (Board of Governors of Federal Reserve System). The estimated annual outlay was treated as an annuity that involved equal payments over time.⁷ It was assumed that an annuity would appropriately reflect the callability and serial features of the involved bond types.

Based on these estimates of new construction costs, scenarios for the partial and total recovery of new construction expenditures in addition to the operational and maintenance costs are developed. For one scenario, the 0.04 percent fee actually imposed is

TABLE 2. INITIAL PRICES AND QUANTITIES (AVERAGES 1977/78-1982/83) AND ELASTICITIES USED IN THE ANALYSIS

	Corn	Sorghum	Wheat	Soybeans
Price (\$/metric ton)	136.43	137.21	290.09	189.80
U.S. Exports (million metric tons)	53.78	6.39	38.62	20.56
U.S. Production (million metric tons)	180.65	18.26	61.50	49.73
Excess Demand Elasticities	-2.5921	-1.2220	-1.2377	-0.9468
U.S. Excess Supply Elasticities	1.6155	1.3151	0.5259	1.2934

Source: USDA, *Outlook and Situation* Reports and authors' calculations.

⁶C.I.F. prices include costs, insurance, and freight charges. In this case, they are the price of commodities delivered to Rotterdam before imposition of any levies or tariffs.

⁷The annuity was obtained from the following expression:

$$A = \frac{I_0}{a_{r,m}}, \text{ where } a_{r,m} = 1 - \frac{(1+r)^{-m}}{r}$$

and A is the annual payment to service the debt, including interest and principle; I is the total amount of capital expenditures at the beginning of the planning horizon; a is the present value of an annuity for \$1; r is the interest rate; and m is the maturity of the bond.

added to a fee that would recover the same proportion of new construction costs as does the 0.04 percent fee for operational and maintenance costs. This scenario, thus, represents partial recovery of all costs. The partial recovery fee was set at 0.1283 percent giving rise to charges of between \$0.18 and \$0.37 per metric ton (Table 3). For the final scenario, the user charge is set at a rate that would completely recover all costs. Complete recovery of all costs is estimated to require a fee of 0.268 percent leading to rates ranging from \$0.37 to \$0.78 per metric ton (Table 3).

ANALYSIS

The welfare effects of the user fee and cost-sharing provisions of the 1986 legislation are estimated for four major grain crops exported from U.S. ports. The four fee levels described above are used as the basis for calculating the welfare impacts given the estimated elasticities and initial values for prices and quantities (See Table 2). The welfare effects of the four recovery scenarios as well as the fee rates are shown in Table 3.

If local port authorities finance new construction from local sources so that the only charge to be paid by shippers is the actual *ad valorem* fee of 0.04 percent, the impact is likely to be fairly small. For example, producer surplus in the corn market is reduced by

\$6.07 million while government savings in that market amount to only \$2.93 million. Consumers benefit from lower prices, and their gains when added to the government savings are slightly larger than the losses to producers. Because the value of corn exports is larger than that of the other crops, the change in producers' and consumers' surpluses are the largest in this market. A fee of 0.0836 percent leads to a greater impact on prices and the associated gains and losses. However, the magnitude of the net U.S. position still ranges from only \$0.38 million for sorghum to \$2.88 million for soybeans.

If some or all of the new construction costs are to be recovered through user fees, the impact on producers is somewhat larger. This is particularly true for the fourth scenario where the loss in producer surplus ranges from \$3.23 million for sorghum to \$40.64 million for corn. The third scenario is designed to represent only partial recovery of operational, maintenance, and new construction costs. The effects of this fee structure are more modest than the case where there is complete recovery of all costs. The net welfare position for the U.S. in this intermediate case varies from less than one million dollars for sorghum to over four million dollars for soybeans. Although the impact on corn producers and consumers is larger than in the other markets, the greatest improvement in the net U.S. position is found

TABLE 3. WELFARE EFFECTS OF AD VALOREM PORT USER CHARGE (MILLION DOLLARS)

Commodity	U.S. Producers' Loss	U.S. Consumers' Gain	U.S. Government Saving	Net U.S. Position	Efficiency Gain	Ad Valorem Fee \$/metric ton
----- million dollars -----						
1. partial recovery of operational and maintenance costs, fee = 0.04 percent						
Corn	6.07	4.26	2.93	1.13	0.0006	0.055
Sorghum	0.48	0.31	0.35	0.18	0.0001	0.055
Soybeans	2.44	1.43	2.38	1.38	0.0003	0.116
Wheat	3.27	1.22	2.93	0.87	0.0002	0.076
2. complete recovery of operational and maintenance costs, fee = 0.0836 percent						
Corn	12.68	8.91	6.13	2.36	0.0025	0.114
Sorghum	1.01	0.66	0.73	0.38	0.0002	0.115
Soybeans	5.10	2.99	4.99	2.88	0.0011	0.243
Wheat	6.84	2.55	6.12	1.83	0.0009	0.159
3. partial recovery of operational, maintenance, and new construction costs, fee = 0.1283 percent						
Corn	19.46	13.67	9.41	3.62	0.0060	0.175
Sorghum	1.55	1.00	1.12	0.58	0.0005	0.176
Soybeans	7.82	4.59	7.65	4.42	0.0027	0.372
Wheat	10.49	3.90	9.39	2.80	0.0022	0.243
4. complete recovery of operational, maintenance, and new construction costs, fee = 0.2681 percent						
Corn	40.64	28.55	19.64	7.55	0.0262	0.365
Sorghum	3.23	2.10	2.35	1.22	0.0020	0.368
Soybeans	16.32	9.58	15.97	9.23	0.0117	0.777
Wheat	21.92	8.16	19.62	5.86	0.0097	0.508

in the soybean market. This is true for all the scenarios analyzed because foreign demand for soybeans is less elastic than for the other commodities.

The results shown in Table 3 also provide insight on the dead-weight loss to society caused by the past subsidies. Even when users are required to pay for all operational, maintenance, and new construction costs, the efficiency gain in all four markets is less than \$50,000. This suggests that past distortions due to the public subsidization of port operations, maintenance, and new construction were not very important.

It should also be noted that replacement of the subsidy by a user fee affects foreign economic agents as well as those in the United States. The benefits of the subsidy were shared between U.S. producers and foreign consumers who faced a lower price. Likewise, the burden of the user fee is shared between these two groups. No effort has been made to measure the welfare effects of the user fee on foreign producers and consumers. However, it is clear that these effects mitigate the consequences of the user fee. In particular, U.S. taxpayers are no longer subsidizing foreign consumers who share the burden of the user fee with U.S. producers.

In a separate analysis, the welfare implications of basing user fees on weight rather than value were examined (Viscencio-Brambila). The results of that analysis showed that the *ad valorem* user charge is less harmful to grain and soybean producers than a per unit fee based on weight. For example, the *ad valorem* fee designed to fully recover operations and maintenance expenditures (.0836 percent) on the current system creates annual producer losses in the four markets of \$25.6 million (Table 3). A similar weight-based fee (\$/ton) costs producers an estimated \$40.8 million – a 60 percent increase over the *ad valorem* fee. Because the value of grain is low as compared to other items involved in international commerce, the *ad valorem* fee is smaller than a weight-based fee and, thus, has less of an impact on welfare.

SUMMARY AND CONCLUSIONS

The purpose of this study was to assess the impact that the recently introduced port user fee will have on U.S. grain exports and the welfare effects of these charges for producers, consumers, and the treasury of the

U.S. government. It was based on four cost recovery scenarios. The first two were developed to show the effects of user fees designed to recover part or all of the expenditures related to operations and maintenance only. The other two scenarios were based on the assumption that the cost-sharing provisions for new construction would be financed by additional user fees.

In general, the analysis shows that port user fees, as specified in the Water Resources Development Act of 1986, have a small impact on U.S. grain producers and consumers. The actual and estimated user fees range from \$0.06 to \$0.76 per metric ton relative to grain prices ranging from \$130.00 to \$275.00 per metric ton. The almost imperceptible effect of these fees on prices and quantities means that the welfare changes in these markets are small relative to the value of trade in these commodities. The impact of the fees is further mitigated by the fact that foreign consumers share in the burden.

Further efforts were made to determine how agriculture would have fared under alternative user fee collection schemes. That analysis showed that the *ad valorem* based fee is less harmful for U.S. grain producers than a fee based on weight. It is estimated that producer losses would be about 60 percent greater if a weight-based fee had been adopted.

Imposition of the user fee essentially replaced the previous subsidy provided by the government and forces port users to bear part or all of the costs of their operations. Presumably, the rationale for shifting these costs from taxpayer to port users is that the original motivation for providing this service from public funds is no longer valid. Port maintenance has a public good characteristic in that, up to a certain level of congestion, the services of a smoothly functioning port are available to all users. Moreover, the benefits of free and open ports accrue to a much larger group than those who make direct use of the port facilities. Most U.S. citizens benefit from the unencumbered movement of goods through U.S. ports. In addition, these ports can be seen as part of the national defense system because the U.S. Navy, which, incidentally, is not required to pay the fee, is a major user of these facilities. If these public good aspects were part of the original motivation for subsidizing port operations, it is not clear what has changed that would justify shifting the costs from taxpayers to

certain users. Further, it should be noted that the estimated efficiency gain in the grain markets totals less than \$50,000. This suggests that the dead-weight loss due to the previous policy was of little importance.

While these results are suggestive, it is important to note that only four commodities have been included in the analysis. Evaluating the overall impact of the proposed user fee would require consideration of a much larger number of markets and necessitate measurement of the secondary and tertiary impacts of the fee. As an indication of the overall impact, one can consider the cost recovery analysis of the Army Corps of Engineers (1982). According to these anal-

yses, operational and maintenance costs at all ports amount to about \$337 million per year and new construction costs were estimated to total about \$740 million on an annual basis. The maximum amount that could be recovered by the user fee and cost-sharing would be about \$1 billion per year. Currently, the fees are not designed to recover all the costs associated with port operation, maintenance, and new construction, so the savings in government expenditure will be much less than that figure. In addition, the government savings could be insignificant if the administrative costs of collecting the fee are important.

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