

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 8672
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optimal tariff are approximately \$12 billion dollars per year. In the low price case, i.e., at \$15 a barrel, when oil imports tend to be high, the benefits of the optimal policy are about \$26 billion dollars per year. Hence, by imposing the optimal tariff, the United States will realize a savings that is one-third to one-half of the expenditures it makes on imported oil.

International Distribution

Imposing the optimal oil import tariff increases the net economic welfare of the United States. Part of the increase in welfare comes from the improvement of the performance of the macroeconomy during normal times and during interruptions. The tariff, by inducing lower oil imports, lessens the impact of higher oil prices and thereby avoids the pressures to maintain a depressed economy in order to wring out the pressures of inflation. Similarly, reducing oil imports in advance of an interruption lowers the impact of the disruption with the attendant economic recession that imposes such great costs on the nation.

These macroeconomic savings are a straight plus. The benefits accrue to the United States, but they do not come at the expense of other nations. The improved U.S. economic performance flows a more efficient and fuller use of our capital stock and labor force, and this improved performance can only help bolster general economic health in the world. Hence, the avoidance of the costs of disruptions is a positive sum game.

Of course, not all the benefits flow with no costs to others. A significant part of the savings from a tariff comes from a reduction in the payments to oil exporters. In short, both the lower volume of purchases and the expected reduction in the world price contribute to the reduction in total cost to the United States, but at the expense of oil exporters. For many oil

exporters, their share in the reduced oil market, at lower prices, will present a significant economic problem. From one perspective, these losses represent only a twist in the competition for economic rents. After all, major exporters are interfering in the market by constraining production and inflating the world price of oil. The rents they would be losing are only the profits of their oligopolistic game. Consumers merely play the same game in the use of a tariff to constrain demand and depress the world price. Morality and fair play provide little guidance in the economic competition for rents. If the ability to exercise market power exists and is used by others, why not shift the losses back on the exporters restricting production?

However, given the broad interests of the United States in dealing with many of the oil exporting countries, ranging from Saudi Arabia to Mexico or even Canada, these losses may be unacceptable. If this is true, then the high payments to oil exporters must be viewed as a benefit to the United States. Or at least the cost must be justified, much like other defense or foreign aid expenditures, as worth the pursuit of larger goals and values. In this case, much as with the support for subsidizing domestic consumers, it might be better to make these payments an explicit part of our foreign policy rather than support the inefficient use of oil imports.

The international redistribution of wealth does not stop with oil exporters. Other importers of oil share in the costs paid by U.S. consumers. The higher the level of oil imports in one country, the greater the cost everywhere. Hence, the Europeans and Japanese are paying the cost of part of our oil imports, and we are paying the cost of part of their oil imports. If the United States imposes an oil import tariff, and reduces its demand, prices will fall for all oil importers. Hence Europe and Japan will enjoy a free ride on our account. This fact has often inhibited progress in capturing the

benefits of reduced oil imports. Apparently out of a sense of fair sharing of the burden, there have been arguments that the United States should not further reduce its imports without comparable action by other oil importers. But with cooperation among oil importers, our analysis would support an even larger tariff. A combined oil-importer tariff may well be twice as high as calculated above. However, because of a lack of agreement, no such action is possible, at least at present.

Although it is easy to understand the motivation for resenting the free riders, it is wrong to conclude that we should do nothing without a sharing of the burden. Our analysis of the optimal oil import tariff assumes that the United States acts alone. If it is in our interests to reduce our oil imports, it should not concern us that it helps others as well. In fact, since the other major oil importers are our allies in many other respects, we might view their free ride as an added benefit of our oil import reductions.

For those who fear that we might go too far in imposing an oil import tariff, an analysis of the effects of tariff policies in other countries only reinforces the analysis here. As shown in elsewhere,³¹ oil import tariffs in other countries tend to decrease the world price of oil and, therefore, to increase the demand for oil in the United States. Hence, the larger the tariff in other oil importing countries, the larger the optimal tariff for the United States. Consideration of the interactions with other oil importers only raises the estimate of the optimal tariff already at the bounds of political possibility. Hence the fact that other consumers gain something should not stand in the way of the pursuit of the optimum U.S. policy.

31 H.P. Chao and S. Peck, "Coordination of OECD Oil Import Policies: A Gaming Approach," Electric Power Research Institute, 1980.

Of course, it should be pointed out that many of our allies already have in place price instruments which reduce significantly their oil consumption, for example, steep gasoline consumption taxes. In this regard, they are ahead of any U.S. policy that imposes a tariff on imported oil.

Other Oil Reduction Policies

Given the existence of the premium, to the extent that the actual tariff falls short of the optimal level, there is room for additional policies to reduce the demand for imported oil.³² Conservation regulations, such as the automobile efficiency standards, or domestic subsidies for production of new (non-oil) energy technologies, may well be justified. To the extent that oil demand reductions or non-oil supply expansions cost less than the market price plus the premium, there is a case for government intervention to promote reduced oil import demand. The most direct route would be through the tariff, but to the extent that politics and institutions block the way, other approaches should be pursued, to the extent that they are demonstrably cost effective.

32 This discussion assumes the existence of an optimally-sized SPR, i.e., one devised in line with the premium.

V. IMPLEMENTATION ISSUES

Whatever tariff instrument is selected by the Congress and the President, there will be a variety of issues related to the best way to implement it. The most directly affected parties will raise a large number of questions in this regard. In an effort to anticipate these questions, we review the principal issues: the effect of a tariff on the U.S. competitive position, exemptions, transition costs, and use of the collected revenues.

COMPETITIVE POSITION

The most energy- and oil-intensive industries in the United States will face increased raw material costs following the imposition of a tariff. For example, petrochemical plants which depend upon oil as a primary feedstock will see a significant increase in the costs of their inputs. The increase in costs will reduce or eliminate any competitive advantage that these companies have in the international market. If producers of the same petrochemical products in other countries do not face a similar tariff, then they can sell their products at prices that will be lower than those that could be charged by U.S. petrochemical producers.

This evident fact will be characterized as a loss of competitive position for the United States. While true, the description of this as a "loss of competitive position" disguises the true problem. If these oil-intensive industries are now purchasing oil and paying a private cost which is less than the social cost, then the difference, — the oil import premium — amounts to a subsidy from society as a whole to this particular industry. In short, if a company is buying oil at \$15 and producing products which are competitive at \$15, but the cost to the country for the same oil is \$20 or \$25, then this is

a bad business for the nation as a whole.

In the process of internalizing the external social costs, the country will reduce the use of crude oil and related products. This will come in part because goods and services produced with those products are not worth the cost that has been internalized. As painful as this will be for the industries that need to adjust, the adjustment is part of the problem of eliminating the subsidy and lowering the total cost to society. Hence, proposals for granting exceptions for U.S. manufacturing exporters who face suddenly higher crude oil costs amount to no more than a request that the implicit subsidies for those exports now be made explicit. As a matter of national policy the country may decide to continue these subsidies. But it is better to make these subsidies explicit for the targeted industries rather than to continue the subsidies for all.

EXEMPTIONS FOR FOREIGN SUPPLIERS

U. S. oil imports come from a variety of sources. Not all sources of supply are equally vulnerable to disruption. Furthermore, many oil producing countries are our allies and depend heavily on oil revenues. It stands to reason, therefore, that there will be proposals to exempt certain sources from paying an import tariff to the United States. These separate arguments, the difference in supply security among foreign oil producers and the economic interests of these producers, have separate implications for the design of a U.S. oil tariff.

The differences in supply security matter relatively little. Oil is a fungible good. Hence, the particular source of supply to the United States has little impact on the cost or security of oil imports at the margin. Even if the United States had no direct imports from unstable sources of supply,

and all imports came from countries which would continue to produce no matter what the state of the market, the problem of security would remain. During an oil supply interruption the oil produced in secure countries would be diverted to other countries to replace oil lost as a result of the disruption. At the margin, therefore, all sources of supply in world trade can be thought of as subject to the same security risk. Hence, from the security perspective, all sources of supply should be subject to the same import tariff.

Although the security argument cuts against exempting certain suppliers from an oil tariff, the economic rent transfer argument could work the other way. To the extent that oil prices drop as a result of a fall in U.S. consumption, induced by a tariff, all oil in world trade would be affected by the imposition of a tariff. This transfer of wealth, in fact, is part of the gain for the United States. For many producers, this transfer of wealth could be significant, and it could create problems for the United States.

The effect of granting certain oil producing countries an exemption would be to transfer income from the United States to these countries. Foreign oil suppliers exempted from the tariff become similar to domestic oil suppliers.

Foreign suppliers favored with tariff-exempt oil would see the value and the price of that oil in the U. S. market rise to include the world price plus the tariff. Hence, just as domestic oil producers would enjoy higher prices and a transfer of wealth, so, too, would the exempt supplier to the import market. Since part of this transfer has been counted as a net gain to the United States, it is clear that any exemptions alter the calculation of the optimal tariff.

From one perspective, if we think of the transfer to the favored foreign supplier as a cost to the United States, the exemption reduces the bene-

fits of a tariff and correspondingly lowers the size of the optimal tariff. On the other hand, presumably the reason for the exemption is to transfer a benefit to the foreign supplier. In this case, the exemption is similar to starting with a lower assumed level of oil imports. In either case, however, the net effect of the exemption is to reduce the size of the optimal oil tariff. In the extreme case, where the exemptions are so large as to replace all oil imports, the tariff is ineffective. With smaller, inframarginal exemptions, there would be little effect on the measurement of the tariff at the margin.

As we noted above, our calculation of the optimal tariff assumes there will be no exemptions. Introduction of exemptions lowers the benefits of a tariff and creates problems in its implementation. But our analytic framework has the advantage of being able to accommodate such exemptions, and to provide guidance as to the necessary adjustments in the optimal tariff.

TRANSITION COSTS

Our calculation of the optimal U.S. oil tariff is a comparative static analysis. The calculations compare the average economic and security conditions with and without a tariff. Hence, the analysis focuses on long-run conditions and is silent on the transition. But imposition of any tariff will create costs during the process of adjustment to the selected tariff level. The addition of a tariff to the price of oil creates a one-time shock to the aggregate price level. Hence, although a lower level of oil consumption may reduce the impacts of higher oil prices on inflation in the long run, the tariff itself increases the effect of oil inflation in the short run.

The adjustment of consuming industries could lead to transition costs in the form of (unwanted) unemployment. If the petrochemical industry is not

competitive even at variable cost, then workers in that industry will be searching for new jobs. Our optimal tariff calculation makes the usual heroic assumption of a frictionless adjustment in which these workers find employment quickly and their wages reflect their productivity. Perhaps they shift to meet the expanding demand for labor in the domestic oil industry that will experience transition benefits in addition to long-run benefits that accrue from a tariff. Nonetheless, these costs are real and will create significant political pressures for modification of a tariff or exceptions as noted above. However, they are one-time costs as opposed to the continuing costs of a free market oil trade policy. Hence, the assumption underlying our analysis is that these transition costs are modest compared to the long-term benefits of a tariff.

In the short run, comparison with what might have been today may be less relevant than comparison with what was only yesterday. Given the natural tendency to compare current oil prices against those of the past, and not against foregone opportunities, this period of low prices offers the best moment to adopt a significant oil import tariff. With oil prices at a low level, and the economy adjusting to the change from higher prices, there should be relatively little transition problem if a tariff is imposed before oil prices would start to rise again. In the circumstances which motivate this appraisal of imposing a tariff, transition costs are a less significant problem than in previous years where the objection carried the day despite similar analysis about the long-run oil import premium.³³

33 See Harry G. Broadman, "Review and Analysis of Oil Import Premium Estimates," Discussion Paper D-82C, Energy and National Security Series, Resources for the Future, Washington, D.C., December 1981; and William W. Hogan, "Import Management and Oil Emergencies," in Energy and Security, David

REVENUES

Taxes and tariffs have an important revenue-raising function in addition to their policy impacts. For the most part, the assumption is that taxes and tariffs have negative incentive effects which should be moderated but nonetheless are necessary in order to raise revenues. Interpretation of the present analysis suggests that an oil tariff has the advantage of raising revenues and promoting optimal policies for maximizing the welfare of the United States. Hence, the revenues from such a tariff are an added benefit that can be applied to a variety of uses.

The sources and magnitudes of possible revenues present a separate, complicated analysis of the impacts of an oil import tariff. Such a tariff would raise tax payments of domestic oil producers, reduce tax payments of oil-consuming industries, cause shifts in employment patterns which would have short- and long-run effects on social security and other transfer payments, and so on. There are a number of possible uses for the revenues raised. One possibility is to finance further purchases of oil for the SPR. Another is to help alleviate U.S. federal budget deficits. The latter has generated the greatest interest.

Estimates of how much revenue would be raised for the federal budget have been the subject of several detailed studies. For example, the Congressional Budget Office prepared an extensive analysis of a \$5 and \$10 oil import tariff that could have been applied starting in 1982.³⁴ More recently, in light of the changed economic conditions and lower world oil prices, the CBO

34 Congressional Budget Office (CBO), "Oil Import Tariff's: Alternative Scenarios and Their Effects," Staff Working Paper, Washington DC, April 1982.

prepared a new analysis of these same revenue effects.³⁵ These studies suggest that a tariff could raise a significant amount of revenue. However, the total amount would be much less than might be expected. For example, with approximately 6 million barrels per day of oil imports and a \$10 tariff, we might expect that this would produce about \$22 billion per year, by multiplying the tariff times the volume of imports. However, as estimated by the CBO, the net revenue benefits for the federal budget come after deducting other compensating effects and impacts on transfer payments. As a result, net revenue would be in the range of about \$8 billion to \$12 billion.³⁶

Overall, our analysis is silent on the use of tariff revenues. They are included as part of the aggregate welfare calculation, and the implicit assumption is that they will be used in the best interests of the country.

35 Congressional Budget Office, The Budgetary and Economic Effects of Oil Taxes, April 1986. See also the Department of Energy, The Impact of Lower World Oil Prices and Alternative Energy Tax Proposals on the U.S. Economy, Energy Information Administration, April 18, 1986.

36 Congressional Budget Office, The Budgetary and Economic Effects of Oil Taxes, April 1986, p.15.

VI. HISTORY OF U.S. OIL TARIFF POLICY

U.S. imports of oil actually have been subject to a tariff for more than fifty years.³⁷ In 1932, to raise general federal revenues, Congress passed the Revenue Act.³⁸ Among the taxes introduced into the Internal Revenue Code by the Act was a flat "excise tax" of \$0.21 per barrel of all imported crude oil.

In 1940 a crude oil quota system was established that was linked to the excise tax schedule. This reflected a trade agreement with Venezuela, which reduced the tax on crude to \$0.105 per barrel, provided that imports did not exceed a quota of 5 per cent of the previous year's refinery runs. Above the quota, the \$0.21 per barrel rate still applied. This quota system prevailed through 1942.³⁹

Beginning in 1943, as a result of a trade agreement with Mexico, the tariff rate on crude oil was reduced to a simple \$0.105 per barrel. This lasted until 1950, when the quota system employing a rate of \$0.21 per barrel on imports above 5 percent of the prior year's refinery runs was reintroduced. In late October 1952 another trade agreement was reached with Venezuela, which established a two-tier tax rate: for crude with an API gravity below 25°, it was \$0.0525; for crude with a rating above 25° (so called "high test" crude)

37 See Bernard Gelb and Salvatore Lazzari, "Oil Import Taxes: Revenue and Economic Effects," Report #86-572E, U.S. Congressional Research Service, Library of Congress, Washington, D.C., May 28, 1986.

38 Public Law 154.

39 William H. Peterson, American Enterprise Association, The Question of Governmental Oil Import Restrictions, 1959, pp. 14-17.

the rate remained at \$0.105.⁴⁰ It should be noted that following such trade agreements the revised tax rates were applicable to virtually all oil exporting nations under "most favored nation" clauses.

The two-tiered tax on crude oil of \$0.105 above 25°, and \$0.0525 below 25°, remained unchanged until the Kennedy Round of trade agreements and the resultant Trade Expansion Act of 1963. As part of a general reorganization of the U.S. tariff schedules that occurred during this period, the taxes on crude imports were replaced by customs duties. The customs duties were the same as the previous tax rates.⁴¹

Crude oil import duties remained unchanged until President Nixon, by Presidential proclamation, eliminated the Mandatory Oil Import Program in the spring of 1973 and suspended crude oil duties.⁴² A system of license fees was introduced in their place. These fees began at \$0.105 per barrel, and in gradual steps, were increased to \$0.21 per barrel by May 1975. It should be noted, however, that this policy was a de facto reduction in the applicable duties.⁴³ The license fee system initially excluded all crude for which quota allocations still existed, the legacy of the MOIP. Only crude imported above

40 National Petroleum Council, Report of the National Petroleum Council Committee on Petroleum Imports, May 5, 1956, p.12.

41 See Douglas R. Bohi and Milton Russell, Limiting Oil Imports: An Economic History and Analysis (Washington, D.C.: Resources For the Future/Johns Hopkins University Press, 1978), p.231.

42 Message to Congress (April 18, 1973) and Proclamation 4210 (April 18, 1973) (Federal Register vol. 38, p. 9645, April 19, 1973). The MOIP began in 1959. See Douglas R. Bohi and Milton Russell, Limiting Oil Imports: An Economic History and Analysis (Washington, D.C.: Resources For the Future/Johns Hopkins University Press, 1978).

43 "Nixon's Energy Medicine: Will It Cure the Patient?" Oil and Gas Journal, April 30, 1973, pp.81-85.

outstanding quota allocations incurred a fee. Previously every barrel imported was dutiable. Hence the net effect, at least until a gradual phase out of exempt allocations could be completed, was a reduction in the duties paid.

In 1975 President Ford added a supplemental oil import fee to the existing license fees. The supplemental fee began at \$1.00 per barrel in February 1975 and was scheduled to increase in steps to \$3.00 by April 1975.⁴⁴ As a result of a court challenge, however, a \$2.00 per barrel supplemental fee was instituted in June instead. Following the passage of the Energy Policy and Conservation Act in December 1975, the supplemental fee was removed.⁴⁵

In April 1979, President Carter temporarily suspended the license fees and customs duties on crude oil. In their place he instituted an import quota regime which restricted imports to the 1977 level. However, since that limit was never exceeded, the quotas were never effectively binding. Early in 1980, citing energy and national security reasons, Carter issued an Executive Order⁴⁶ imposing an import fee of \$4.62 per barrel. A suit by members of Congress, however, resulted in a court decision voiding the Order.⁴⁷

Since July 1980 only the two-tiered customs duty (\$0.0525 per barrel below 25° and \$0.105 per barrel above 25°) has been applicable. While a license is still required to import crude oil, no license fees are currently

44 Petroleum Intelligence Weekly, February 3, 1975, p.12.

45 Bohi and Russell (1978), p.235.

46 Presidential Proclamation 4744, April 2, 1980.

47 INDEPENDENT GASOLINE MARKETERS COUNCIL, INC., et al., Plaintiffs, v. Charles W. DUNCAN, Jr., Secretary, Department of Energy, et al., Defendants; MARATHON OIL CORPORATION, Plaintiff, v. James Earl CARTER, President of the United States, et al., Defendants., Cit. A. Nos. 80-1116, 80-1181., United States District Court, District of Columbia., 492 F. Supp. 614, May 13, 1980; As Amended May 14, 1980.

has ranged between 3 and 30 percent of the import price. By comparison, current tariff proposals of \$5.00 to \$10.00 per barrel would account for between 30 and 65 percent of today's price (of \$15.00 to \$18.00 per barrel).

TABLE 3
US OIL TARIFFS AND IMPORT PRICES

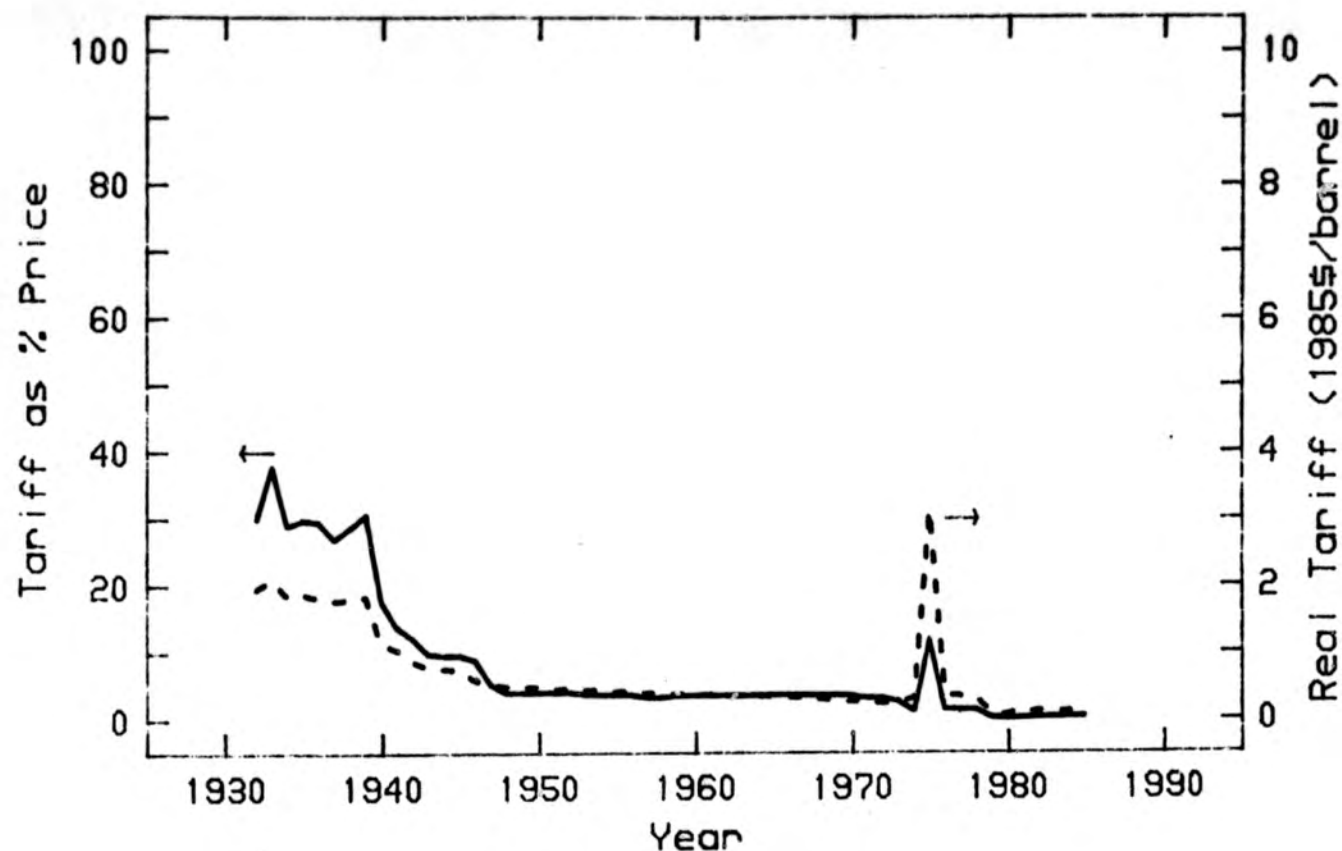
Year	Real ^a Tariff \$/bbl	Real ^b Price \$/bbl	Year	Real ^a Tariff \$/bbl	Real ^b Price \$/bbl
1932	\$1.96	\$ 6.505	1959	\$0.39	\$10.662
1933	\$2.10	\$ 5.550	1960	\$0.38	\$10.397
1934	\$1.86	\$ 6.407	1961	\$0.38	\$10.358
1935	\$1.88	\$ 6.295	1962	\$0.37	\$10.140
1936	\$1.83	\$ 6.174	1963	\$0.36	\$ 9.966
1937	\$1.79	\$ 6.615	1964	\$0.36	\$ 9.763
1938	\$1.81	\$ 6.302	1965	\$0.35	\$ 9.439
1939	\$1.84	\$ 6.009	1966	\$0.34	\$ 9.201
1940	\$1.15	\$ 6.457	1967	\$0.33	\$ 9.097
1941	\$1.05	\$ 7.516	1968	\$0.31	\$ 8.580
1942	\$0.88	\$ 7.174	1969	\$0.29	\$ 7.865
1943	\$0.78	\$ 7.874	1970	\$0.28	\$ 7.872
1944	\$0.77	\$ 7.971	1971	\$0.26	\$ 7.985
1945	\$0.74	\$ 7.589	1972	\$0.25	\$ 7.740
1946	\$0.60	\$ 6.672	1973	\$0.25	\$ 9.210
1947	\$0.53	\$ 9.747	1974	\$0.32	\$25.921
1948	\$0.50	\$12.322	1975	\$3.13	\$26.234
1949	\$0.50	\$12.095	1976	\$0.37	\$23.858
1950	\$0.49	\$11.729	1977	\$0.35	\$24.096
1951	\$0.47	\$11.244	1978	\$0.33	\$22.554
1952	\$0.46	\$11.096	1979	\$0.08	\$30.781
1953	\$0.45	\$11.552	1980	\$0.07	\$44.185
1954	\$0.45	\$11.830	1981	\$0.12	\$44.002
1955	\$0.43	\$11.352	1982	\$0.12	\$37.486
1956	\$0.42	\$11.071	1983	\$0.11	\$31.539
1957	\$0.40	\$11.839	1984	\$0.11	\$29.835
1958	\$0.39	\$11.316	1985	\$0.11	\$27.030

^aWeighted tariffs on imported crude oil in constant 1985 dollars.

^bCrude oil price in constant 1985 dollars: 1932-1946 is FOB price; 1947-1967 is US wellhead price; 1968-1985 is US Refiner's Acquisition Cost of imports.

FIGURE 7

US Oil Tariffs Have Been Low



APPENDIX

OIL IMPORT TARIFF CALCULATION

A SUMMARY

This appendix summarizes a model for the oil import tariff calculation. Evaluating the critique in Broadman¹, which examined at least seventeen different analyses of the oil import premium, we conclude that the approach developed in Hogan² is as complete a taxonomy of the premium components as is necessary to capture the main direction of oil tariff policy. We summarize the arguments of that analysis and borrow the model, with minor extensions, as the framework for our revised estimate of the optimal oil import tariff. The model addresses the case of a long-run tariff imposed to correct oil market imperfections, including the effect of oil supply disruptions.

In this model there are five channels of market failure that add to the social cost of U.S. oil imports. Here we characterize each of

1 Broadman, H. G., "Review and Analysis of Oil Import Premium Estimates," Discussion Paper D-82C, Energy and National Security Series, Resources for the Future, Washington DC, December 1981. H.G. Broadman, "The Social Cost of Imported Oil," Energy Policy, June 1986.

2 Hogan, W., "Import Management and Oil Emergencies," in Energy and Security, D. Deese and J. Nye (eds.), Ballinger Publishing Company, Cambridge MA, 1981.

these elements of the oil import premium, the gap between social cost and the market price. The premium consists of two main categories, the "economic component" and the "security component."

ECONOMIC COMPONENT

Market imperfections associated with oil imports arise for both traditional economic reasons and as a result of the special problems posed by supply interruptions. The economic component of the premium, that which would exist even in the presence of a secure supply of oil, reflects the contribution of oil to inflation, the attendant shifts in the balance of trade and the judgment that a change in U.S. oil demand could have a significant effect on the world price of oil.

Inflation

Control of inflation has been a persistent problem in the United States. Even in the mid-1980's, with inflation at relatively low levels, there is a fear of higher inflation and the restrictive monetary or fiscal policies that would follow. Nordhaus³ was the first to observe that the impact on inflation might be a significant externality associated with

3 William D. Nordhaus, "The Energy Crisis and Macroeconomic Policy," Energy Journal, Vol.1, No. 1, January 1980.

oil price movements.

According to the conventional wisdom⁴, the high cost of controlling inflation arises from the combination of market rigidities in the economy and the difficulty of predicting the course of prices, especially oil prices. With perfect anticipation of prices and complete flexibility, the economy could adjust to any level of inflation, in the long run. But in the short run, with price shocks and inflexibility, the economy adjusts slowly. The policy response is to constrain the economy in order to wring out part or all of the inflation. The cost of this adjustment can be substantial.

Our characterization of the cost of adjustment combines two rules of thumb from macroeconomics. The first is the short run Phillips curve, which relates the change in 'inertial' inflation to the change in unemployment above the 'full employment', or 'natural', rate. Inertial inflation refers to the anticipated rate of inflation that gets built into contracts and pricing policies. Without shocks, the economy can sustain a given inertial rate, but price shocks can change the inertial rate, and induced unemployment is the policy tool for moving from one inertial rate

4 The analysis of the high cost of inflation follows from the summary of the arguments and evidence presented by William D. Nordhaus and Paul A. Samuelson in Economics, Twelfth Edition, 1985, pp. 437-439. The principal dissent from this analysis comes from the 'rational expectations' school which argues that macroeconomic policy is fully anticipated and recessions results from voluntary unemployment. Nordhaus and Samuelson summarize the dissent as well as the conventional theory.

to another. Although the estimate is uncertain, the consensus is that it takes two points of increased unemployment for a year to eliminate one point from the inertial rate of inflation⁵.

The second rule of thumb, known as Okun's law, summarizes the changes in operations that affect output and are correlated with a change in the level of unemployment. Firms take many other steps before or in conjunction with changing their number of employees, e.g. altering the use of over time. These other actions have effects on output, at the margin, that imply that each percentage point change in the unemployment rate has more than a one point impact on the level of output. Again, there is some uncertainty. In the 1960's, "Okun's law" was as high as three points of GNP lost for each point of unemployment⁶. The more recent estimates put the ratio at closer to two to one.⁷

With a short run Phillips curve implying a two to one link between unemployment and inflation, and Okun's law implying a two to one link between unemployment and output, there is a four to one link between output and reduction of inertial inflation. In a \$4000 billion economy, the cost of eliminating one point from the inertial rate of inflation would be \$160 billion. Nordhaus and Samuelson estimate the range as between \$100 and

5 Nordhaus and Samuelson, 1985.

6 Sherman J. Maisel, Macroeconomics, W.W. Norton Company, New York, 1982, p. 447.

7 Nordhaus and Samuelson, 1985.

\$270 billion!⁸

The price of oil is determined by the price of oil imports. Because oil is an important commodity, a long-run trend of rising (falling) oil prices will increase (reduce) the general inflation rate. The large reduction (increase) in GNP needed to reduce (increase)⁹ inflation is an externality not recognized by individual buyers of imported oil. Hence it adds a (potentially) significant externality to the use of imported oil. The size of this externality depends on how the level of imports and changes in the price of oil affect the inertial rate of inflation, and on how much of the inertial rate is accommodated (removed) by expansionary (contractionary) macroeconomic policy.

If oil prices follow a smooth upward (downward) path, then virtually all of the increase (decrease) should be anticipated and incorporated in the inertial rate of inflation. However, because of full anticipation, we could assume that there would be full policy accommodation, and therefore, no change in GNP. But if oil prices follow an erratic path, both up and down, some of the price changes will be incor-

8 Nordhaus and Samuelson, 1985.

9 Of course, the policy would not be to increase inflation when oil prices fall. But falling oil prices would eliminate the need to reduce inflation caused by other shocks. Assuming that in the dynamic economy there are plenty price shocks, the directional effect of policy will be to expand output and increase inflation from what it would have been otherwise, whenever blessed with falling oil prices.

porated in the inertial rate and the policy response will allow for only partial accommodation. Therefore, in the case of rising prices, only a fraction of the oil induced addition to inflation will be removed from the inertial rate through induced unemployment.

The history of oil prices has been one of erratic price movements, usually associated with unexpected shocks to the system. The future will be no different, with a volatile market disguising an uncertain long run trend.¹⁰ In this world, the ups and downs of price will not be neutral, and policy can be expected to constrict the economy to remove part of the oil induced inflation. An approximation to the sequence of short run responses is to calculate the long run impact on inertial inflation, assuming full anticipation and accommodation, and then apply a judgment as to the percentage of incremental oil inflation that will be eliminated from inertial inflation through macroeconomic policy actions.

Long-run inflation in the price of oil will create similar inflation in the price of natural gas and other oil substitutes. If the policy is to accommodate the inflation, the resulting impact on the general price level will be in proportion to the value share of oil and related products. Let:

10 For a review and analysis of uncertainty in the oil market, see William W. Hogan and Paul N. Leiby, "Oil Market Risk Analysis", Discussion Paper, Energy and Environmental Policy Center, Harvard University, December 1985.

- r = oil inflation rate in real (nominal - inertial) terms,
- s = oil import price,
- q_d = domestic oil demand (millions of barrels per day, mmbd),
- q_n = domestic demand for oil substitutes (mmbd),
- q = oil import level (mmbd),
- p = domestic price of oil and its substitutes,
- t = $(p-s)$ the implicit tariff,
- w = value share of oil and its substitutes,
- π = inflation impact from oil.

Then the contribution to inflation from oil is

$$\pi = r(s/p)w.$$

Now,

$$w \approx pQ(0.365)/\text{GNP},$$

where

$$Q = q_d + q_n.$$

Therefore,

$$\pi = rs(Q(0.365)/\text{GNP}).$$

The change in the inflation trend caused by a change in the level of oil imports is

$$\frac{\delta\pi}{\delta q} = (0.365/\text{GNP}) \left[\frac{\delta r}{\delta q} sQ + r \frac{\delta s}{\delta q} Q + rs \frac{\delta Q}{\delta q} \right]$$

Our Phillip's curve ratio (estimated above as requiring two points of unemployment for one year to eliminate one point of inflation) is uncertain and is treated as a parameter ϕ . Similarly, Okun's law (requiring two points in output lost for each point of unemployment) is denoted by the parameter β .

As Nordhaus¹¹ observed, full accomodation of this inflation is not likely; nor is no accomodation at all. The former would impose politically unacceptable burdens, for example, in the redistribution of wealth. The latter would cause a great reduction in real output. This is essentially a policy matter, without a clear empirical guide. If we let U represent the fraction of inflation that will be eliminated through real output reductions, then the loss in real output per barrel of incremental imports is

$$t_1 = \phi\beta U \left[(r's + rs')Q + \frac{\delta Q}{\delta q} rs \right],$$

where,

11 Nordhaus, 1980.

- ϕ = Phillip's curve ratio of unemployment to inflation reduction,
- β = Okun's law ratio of output loss to unemployment,
- U = unaccommodated portion of inflation,
- r = oil inflation rate in real terms,
- r' = $\delta r / \delta q$,
- s = oil import price,
- s' = $\delta s / \delta q$,
- Q = domestic demand for oil and for oil substitutes (mmbd),
- q = oil import level.

The large costs of this inflation come from the unsought redistribution of income and from government attempts to prevent the redistribution by slowing economic growth and dampening the price increases. As long as the policy response to high inflation is to induce unemployment and a slack economy, we cannot ignore this expensive costs of oil imports.

Balance of Payments

Higher oil imports at higher prices increase the need to export goods and services or to receive investment payments in anticipation of future exports. The change in the balance of payments will lead in part to a change in the terms of trade through adjustments in exchange rates,

which impose a real economic burden on each oil importing country.

Whether or not a significant externality arises turns on a number of factors. For example, if oil exporters immediately recycle all their funds in the form of increased purchases of our products, or investments in our assets, then there is no externality.

Following Nordhaus (1980) we assume that an increase in oil imports will lead to a partial increase in exports as foreign oil producers recycle their revenues and a partial depreciation of the dollar to restore a balance of payments. Let:

P_d = domestic price level;

P_f = foreign currency price level;

e = exchange rate (P_f/P_d);

s = dollar price of imported oil;

X = quantity of exports

M = quantity of nonoil imports;

q = quantity of oil imports in (MMBD);

n_E = price elasticity of exports demand;

n_I = price elasticity of imports demand.

A balance of payments (with units on a daily basis) requires,

$$P_d X(P_d e) - (P_f/e) M(P_f/e) - sq = 0.$$

At a given aggregate price level¹², and with perfectly elastic supply functions, the change in the balance of trade caused by a change in the exchange rate, Δe , is

$$P_d \frac{\delta X}{\delta(P_d e)} \cdot P_d \Delta e + (p_f/e) \frac{\delta M}{\delta(p_f/e)} (p_f/e^2) \Delta e + (p_f/e^2) M \Delta e - \frac{\delta s}{\delta e} \Delta e q.$$

Suppose that B percent of any increase in oil import payments is returned by oil foreign producers through higher U.S. export purchases. Then, at the margin the change in exchange rates must satisfy $\Delta e = (\delta e / \delta q)$ and the unrecycled oil payments must just balance the shift in the balance of payments for other goods, i.e.,

$$P_d \frac{\delta X}{\delta(P_d e)} \cdot P_d \frac{\delta e}{\delta q} + (p_f/e) \frac{\delta M}{\delta(p_f/e)} (p_f/e^2) \frac{\delta e}{\delta q} + (p_f/e^2) M \frac{\delta e}{\delta q} - \frac{\delta s}{\delta e} \frac{\delta e}{\delta q} q - (1-B) \left[s + \frac{\delta s}{\delta q} q \right] = 0.$$

or

$$[n_E P_d X + (n_I + 1) P_d M] \frac{\delta \ln e}{\delta q} - \frac{\delta \ln s}{\delta \ln e} \frac{\delta \ln e}{\delta \ln q} s - (1-B) \left[s + \frac{\delta s}{\delta q} q \right] = 0.$$

The first term is the change in imports and exports valued at the domestic dollar price. The last term is the real resource cost of incremental oil

12 Assuming a fixed dollar price level in the United States, then changes in the price of foreign goods must be accompanied by changes in other domestic real prices in order to adjust relative prices and maintain the same price level.

imports (excluding the percent recycled immediately and not adding to the balance-of-payments deficit). The middle term, therefore, is the balance-of-payments externality, which consists of the elasticity of real dollar oil prices as a function of the exchange rate and the elasticity of the exchange rate as a function of import levels.¹³

From this last equation we obtain

$$\frac{\delta \ln e}{\delta \ln q} = \frac{(1-B) \left[s + \frac{\delta s}{\delta q} q \right] q}{n_E p_d X + (n_I + 1) p_d M - \frac{\delta \ln s}{\delta \ln e} q s}.$$

Hence, if the elasticity of demand for exports or imports is high, or B is close to 1, then the elasticity of exchange rate with respect to import quantity is low. But if B, n_E , and n_I are small, then the reverse holds true.

The elasticity of the price of oil with respect to the exchange rate is uncertain. If oil producers are willing to fix the price of oil in dollars or to make purchases only in the United States, possibly later, then this term should be near 0. If oil producers' dollars are converted

13 We have ignored the second-order effect of partial recycling.

to other currencies, and producers wish to maintain the purchasing power of their oil, then this elasticity is -1.

In summary, the balance-of-payments import externality per barrel is

$$t_2 = sn_{se}n_{eq},$$

where,

$$n_{se} = \frac{\delta \ln s}{\delta \ln e} = \text{elasticity of oil import price to the exchange rate,}$$

$$n_{eq} = \frac{\delta \ln e}{\delta \ln q} = \text{elasticity of exchange rate to oil import level.}$$

According to these definitions, we assume that (1-B) of the marginal oil revenues end up in the Eurodollar market where they cause a marginal devaluation of the dollar. The decrease in the exchange rate of other currencies for the dollar affects the balance of trade in other goods and services, and presents a problem to oil producers because the oil they sell is priced in dollars. The elasticity n_{se} summarizes a subjective judgment about producer response in terms of the effect on the price of oil.

Price Reduction

As we've argued in the text, for a country like the U.S. that purchases a significant volume of oil on the world market, the price of those purchases will depend in part on the volumes taken. Thus, the U.S. can affect the world oil price by changing the volume of its oil purchases. Since the resulting price difference would be paid on all oil imported into the U.S., the true cost of the incremental barrel to the nation as a whole is higher than the market price.

The direct cost of oil imports purchased by the U.S. is simply the import price times the import volume, or

$$sq .$$

Given the sizable share enjoyed by the U.S. in the world oil market, an increase in the volume of import purchases, over the long run, will change this direct cost by the amount

$$s + s'q .$$

The first term is just the price, s , which is the private cost. The incremental buyer of imported oil will pay this cost directly and thus internalize one component of the increased oil import bill. But the incremental buyer does not see how its purchase increases the cost for everyone else. The second term reflects this market imperfection and

enters the calculation of the economic component of the premium as

$$t_3 = s'q.$$

SECURITY COMPONENT

When an interruption comes, the damage to our economy will depend in part on the level of oil imports. Even if changing the preinterruption level of imports has no effect on the size of the shortage during the interruption, the burden of suddenly higher oil prices and the attendant shocks on our economy will be reduced if imports are lower. Here we separate the security component of the premium into two elements. The first captures the economy's vulnerability to damage for a given oil price shock. The second captures the link between imports and the size of the price shock. For both of these contributions to the security component of the premium, the use of a Strategic Petroleum Reserve can reduce the effective size of the supply interruption and lower the optimal tariff.

Vulnerability

The long-run level of imports defines a reference point for short-run supply and demand curves in an interrupted market. Following the analysis in Hogan¹⁴, we incorporate a model of short-run macroeconomic

14 Hogan, W. "Oil Stockpiling: Help Thy Neighbor," Energy Journal, Volume 4, Number 3, July 1983.

shock that employs a GDP elasticity with respect to sudden increases in the price of oil.

Let,

q_t = quantity of oil imports that would be demanded with reduced GDP and no price change,

q_s = quantity of oil imports during interruption.

We assume that the real GDP during an interruption is

$$GDP = GDP_0((\Delta p + p)/p)^{-u},$$

where,

GDP_0 = the normal GDP at price p ,

Δp = shock induced change in domestic oil price,

u = elasticity of GDP with respect to oil price,

and the unemployment caused by higher oil prices is spread uniformly across the economy. We assume that this shock-induced unemployment will

reduce the demand for oil in the same percentage as the reduced GDP, and this will be a principal (expensive) means of adjusting to the oil shortage.

Therefore,

$$q_t = q - q_d u \Delta p / p .$$

We assume the interruption lasts for one year. The short-run supply function during an interruption is determined by the size of the interruption, s , and a short-run response relative to the import price, s . The short run supply of imports is very inelastic; a large change in price produces a small increment in curtailed supply. We further assume that the tariff implied by the pre-interruption price difference, $p - s$, is maintained during the interruption; hence, the short-run supply curve with slope b is

$$q_s = q - s + b \Delta p ,$$

where,

s = ex ante size of the disruption, and

b = slope of the linear short-run import supply curve,

The short-run import demand curve for quantity q_r at price w , relative to pre-interruption price $p(q)$ and quantity q , is assumed to be linear with slope c ; that is

$$q_r = q_t - c\Delta p.$$

where,

c = slope (minus) of the short-run oil demand curve.

These short run supply and demand equations yield the shock to oil prices, up to linear approximation, as

$$\Delta p = s/[b+c+q_d u/p] .$$

With these definitions, the market clearing quantity during an interruption is q_u . Hence, the social cost of interruption is equal to

$$(q_t - q_u)[.5\Delta p + (p - s)] + q_u\Delta p + uGDP(\Delta p/p) .$$

Taking the derivative with respect to the oil import level yields the change in the social costs as a function of the import level:

$$\begin{aligned} & [(q_t - q_u)(p' - s') - uGDP(\Delta p)p'/(p^2) + .5(\Delta p(\delta(q_t - q_u)/\delta q)] + \\ & [(.5(q_t - q_s) + uGDP/p)\delta(\Delta p)/\delta q] \end{aligned}$$

The terms in the first set of brackets capture the social cost given a price shock Δp . These costs reflect the vulnerability to economic disruption caused by a given level of imports. The terms in the second set of brackets capture the impact of a possible change in the size of the

interruption and the resulting price shock.

Focusing on the first, the size of the externality depends in part upon the probability of a supply interruption of given size. Hence, the first element of the security component is

$$t_4 = \sum v^j [(q_t^j - q_u^j)(p' - s') - uGDP \Delta p^j p' / (p^2) + .5(\Delta p^j (\delta(q_t^j - q_u^j) / \delta q)] .$$

where,

v^j = probability of disruption state j .

Price Shock

Reducing the level of oil demand during normal times is likely to leave excess capacity in the total oil market, capacity that could be brought to market during an oil interruption and lessen the effective size of the supply loss. The extent to which any one country can count on this gain is problematic. Adjustments in capacity over time, sharing of benefits under the International Energy Program (IEP) formulas, or the possibility of losing capacity as well as production all mitigate against the efficacy of reducing oil imports as a means of lowering the size (or likelihood) of an oil supply interruption.

Hence there are several judgmental parameters that must be in-

cluded in the analysis to capture the possibility of reducing the size of an interruption and, therefore, reducing the size of the price shock. With the adjustments described above for dealing with macroeconomic costs of a disruption, this second element of the security component is

$$t_5 = \sum v^j [(.5(q_t^j - q_s^j) + uGDP/p) \delta(\Delta p^j) / \delta q] .$$

In order to calculate this element of the premium, we need to provide

$\delta s / \delta q$ = the change in interruption size induced by a change in imports.

In Hogan [1981], the likely range for this value is established as .13 to .48. With proportional IEA sharing of shortages according to demand, and a complete elimination of a barrel of shortage for each barrel of reduced demand, we would have for the United States $\delta s / \delta q = 0.33$.¹⁵

Finally, in calculating several of the derivatives we will need
the fact that

15 The United States consumed an average of 15.9 mmbd out of a world consumption of 47.2 mmbd between 1980 and 1983. Hence, with proportional sharing of disruptions, each barrel reduction in the short run demand for imports would have a 33% impact on the size of the effective disruption.

$$\delta q_d / \delta q = n_d q_d / (n_d q_d - n_s (q_d - q)) ,$$

where,

n_s = long-run elasticity of domestic supply.

Hence, the change in the price shock induced by a change in the level of imports is

$$\frac{\delta \Delta p}{\delta q} = \frac{s}{[b+c+q_d u/p]^2} \left[\frac{\delta q_d}{\delta q} (u/p) - q_d (u/p^2) \frac{\delta p}{\delta q} \right] + \frac{\delta s}{\delta q} \left[\frac{1}{[b+c+q_d u/p]} \right]$$

STRATEGIC PETROLEUM RESERVE

Oil supply disruptions create substantial costs for the economy. The principal protection from these losses, short of preventing the disruption per se, would be to provide substitute supplies of oil. This fact suggests the need for a substantial supply of oil that can be injected in the market in large volumes on short notice, i.e., for a strategic petroleum reserve. Every analysis of energy security problems has pointed to the need for a substantial oil reserve.¹⁶ Its prompt use would be the

16 For example, Teisberg, T.J., "A Dynamic Programming Model of the U.S. Strategic Petroleum Reserve," Bell Journal of Economics, Vol. 12, No. 2, Autumn 1981, presented an analysis of the link between a strategic oil supply and a tariff. Although partial substitutes, the optimal result

most effective means for mitigating the damages of a supply interruption.

Whatever the size of the such a reserve, however, the volume of imports will affect the economic cost of a disruption. The greater the volume of oil imports at the start of the interruption, the greater the cost of the interruption. It follows that a tariff, which would reduce the volume of imports, and a strategic oil reserve, which would substitute for the lost supply, are complementary. The larger the reserve, the smaller the optimal tariff, but the need for a tariff remains. Our purpose is to capture the effects of a significant reserve on the size of the optimal tariff.

For a given size of the U.S. Strategic Petroleum Reserve, the size of the optimal tariff depends on the use of the SPR during an interruption. The studies of the best use of the SPR suggest both the complexity of the optimal drawdown policy in particular disruption scenarios and a reasonable general rule of thumb for purposes of the present analysis.¹⁷

called for both a large reserve and a significant tariff. See also Alm, A. and E. Krapels, "Building Buffer Stocks in a Bear Market: Policy Choices for Emergency Reserves," Discussion Paper Series, H-82-01, Energy and Environmental Policy Center, Kennedy School of Government, Harvard University, March 1982. Chao, H.P. and S. Peck, "Coordination of OECD Oil Import Policies: A Gaming Approach," Electric Power Research Institute, Palo Alto CA, September 1980. National Petroleum Council, Emergency Preparedness for Interruption of Petroleum Imports into the United States, Washington DC, April 1981.

17 See Teisberg (1981) and Hogan (1983).

If there is a reasonable possibility that a disruption will last for more than one year, then part of the SPR should be used immediately and part should be held for contingencies. Furthermore, given the value of the SPR for later emergencies, part of the disruption should be met from the SPR and part should be met with demand reductions. Our rule of thumb is to meet the disruption up to half the total interruption or half the size of the SPR. The drawdown from the SPR reduces the effective size of the disruption, s , and the resulting price increase and economic loss. Therefore, we set

$$s = \text{MAX}\{0.5s_{\text{ex ante}}, s_{\text{ex ante}} - 0.5(\delta s / \delta q)(\text{SPR}/365)\},$$

where $s_{\text{ex ante}}$ is the interruption size expected without the use of the SPR. Since the use of the SPR will benefit everyone in the world market, the drawdown affects the interruption only in proportion to the assumed derivative of the interruption size for each barrel change in the size of import demand.

COMBINED PREMIUM

As we argued in the text, the individual components of the premium are not additive. Moreover, we have argued that, taken together, they are equivalent to the optimal tariff only at the optimal level of the premium; that is, for the premium associated with the level of oil imports that internalizes all externalities. As shown in Hogan (1981), the optimal premium can be found by maximizing an appropriate objective function over

the total level of oil imports. This objective function combines the annualized benefits of oil use, cost of inflation and balance of payments adjustments, payment for oil imports, and the expected loss during oil interruptions. Using linear approximations for several derivatives, the objective function is:

$$\begin{aligned} \text{OBJ} = & \int_0^q [p(x) \delta x] - (t_1 + t_2)q - sq \\ & - \sum v^j [(q_t^j - q_u^j)(.5\Delta p^j + (p-s)) + q_u^j \Delta p^j + u \text{GDP} \Delta p^j / p] . \end{aligned}$$

The solution to the optimization of OBJ over q yields

$$W(p - s) = t_1 + t_2 + t_3 + t_4 + t_5 ,$$

where W is a scaling factor that adjusts for losses in tariff payments during an interruption:

$$W = 1 - \sum v^j [\delta(q_t^j - q_s^j) / \delta q] .$$

Therefore, we refer to the five elements of the economic and security components of the premium, $p-s$, as

$$T_k = t_k / W ,$$

$$k = 1, 2, \dots, 5.$$

These equations can be solved numerically to identify the five elements of the optimal oil import tariff. The basic model includes constant elasticity long-run supply and demand curves, with linear short-run supply and demand curves with a traditional analysis of consumer and producer surplus to calculate welfare changes. Disequilibrium during an interruption reduces GDP and the demand for oil. And the long-run inflation and balance of payment contributions are incorporated simultaneously in the solution of the model. Hence, we impose consistency of assumption across the premium components and recognize the interaction in the quantitative estimates of the total optimal premium and optimal tariff.

AGGREGATE COST SAVING

An estimate of the combined premium allows a further estimate of the aggregate cost of oil market imperfections. Since the premium measures the difference between price and social cost, the import supply curve plus the premium captures the full social cost of oil imports. The demand curve measures the corresponding social value of the same imports. At the market level of imports — with no tariff — the social cost is above the social value. At the optimal level of imports — by definition at the optimal tariff — marginal social cost just equals marginal social value. Hence the excess of cost over value, as imports increase from the optimal to the market level, is cost of the oil import externalities.

(See Figure 4 in the text.)

Let q^* be the optimal level of imports and q_0 be the market level. Let T^* be the premium at the market level. Then the aggregate net cost of oil import market imperfections, or the saving engendered by imposing the optimal tariff, is given by

$$C = T^*(q_0 - q^*)/2 .$$

Calculation of C requires only that we estimate the premium and import volume at the market level, where $p = s$, and at the optimum import level, where $T^* = p - s$.

OPTIMAL TARIFF ESTIMATES

With this technical summary complete, we can turn to the quantification and sensitivity analysis. An estimate of the optimal oil import tariff depends upon many assumptions. In Broadman¹⁸ there is a discussion of the uncertainties that result in a very wide range of estimates from \$2 to \$124 per barrel. To be sure, this range encompasses all arguable values for input assumptions. However, we can narrow it considerably by choosing more plausible parameter values. For present purposes we will not discuss all possible combinations of parameters. Ra-

18 Broadman (1986).

ther, we shall establish a base case of most likely values, and then examine excursions that seem of most interest in the light of the nature of the oil market in 1986.

Base Case Parameters

The basic model provides simultaneous estimates of the optimal tariff, prices, and oil import quantity. Implementation of this model requires assumptions about a range of inputs. One of the principal difficulties in preparing optimal tariff estimates is the uncertainty surrounding the parameters. Many of the essential elements, such as demand elasticities and behavioral responses of suppliers, are not known with certainty. In order to proceed, therefore, it is important to prepare sensitivity analyses to examine the likely range of alternative tariff estimates.

The first sensitivity analysis focuses on a base case and the implications of changes in prices. The second sensitivity test examines the importance of the security component by calculating the optimal tariff under the assumption of a secure world oil market with no threat of interruption. Finally, the uncertainties surrounding the full range of inputs enter in a risk analysis that calculates the probability distribution for the optimal tariff.

The base case includes the nominal assumptions for each of the inputs specified in the development of the model. The most likely values

draw on the literature and the authors' judgment. These most likely values provide the first estimate of the optimal tariff and the cost of a free market policy. The base case assumptions include:

- U = 30%, unaccommodated portion of inflation;
- r = 3%/yr, oil inflation rate in real terms. The rate of real price increase between 1970 and 1985 averaged 6.9%/yr. At 3%/yr, the real price would double in 24 years;
- r' = 0.1%/mmbd, derivative of oil inflation rate with respect to changes in the level of imports. According to the usual theory of depletable resources, r is the same as the nominal interest rate, independent of the level of oil production or imports. Even under the opposite extreme case of production targets, r is independent of oil imports. For our sensitivity analysis, we assume that imports have a small effect on the rate of oil price change, implying a small, positive value for r'. For our base case assumptions, we take $r = 3\%$ and $r' = 0.1\%$;
- $\phi = 2$, Phillips curve derivative ratio of excess unemployment to inflation, as described in Nordhaus and Samuelson, 1985;
- $\beta = 2$, Okun's law, ratio of lost output to unemployment, as described in Nordhaus and Samuelson, 1985;
- p = \$27/bbl, base domestic oil price,
- s = \$27/bbl, base oil import price;
- s' = \$.50/bbl/mmbd, derivative of normal oil import supply curve;

- q_d = 16 mmbd , base domestic oil demand, approximately the level in 1985;
- q_n = 5.4 mmbd, domestic demand for oil substitutes, the level in 1985;
- q_s = 10 mmbd, base domestic oil production, the level in 1985;
- n_d = -0.5, long-run elasticity of US demand for oil. Estimates drawn from the Department of Energy and an independent analysis of the data imply a long run elasticity of -0.9 with respect to the crude oil price¹⁹. The lower value used here is intended to capture an approximation of the decade long horizon reasonable for design of tariff policy;
- n_s = 0.5, long-run domestic oil supply elasticity. The Department of Energy's oil market model uses an elasticity of 0.9.²⁰ Again, the smaller value used here reflects the average over a decade;
- n_{se} = -1., elasticity of oil import price to the exchange rate;
- B = 25% , fraction of marginal oil revenues recycled to US;
- n_x = -2., elasticity of demand for exports;
- n_m = -1.5, elasticity of demand for imports other than oil. This figure and the elasticity for exports are drawn from the surveys reported in Corden, Caves and Evans²¹;

19 Hogan and Leiby, 1985.

20 Hogan and Leiby, 1985.

21 W.M. Corden, Trade Policy and Economic Welfare, Clarendon Press, Oxford 1974, pp. 183-184; R. E. Caves, World Trade and Payments, Little, Brown and Company, Boston 1981, p. 283; M. K. Evans, Macroeconomic Activity, Harper and Row, New York, 1969, pp. 227-228.

- X = \$227. billion, value of exports, the value in 1985;
- M = \$285. billion, value of imports other than oil, the value in 1985;
- GDP_0 = \$4525. billion, the normal GDP, the value in 1985;
- u = 0.05, elasticity (minus) of GDP with respect to oil price shock. Several studies have used similar estimates drawn from the analysis of past supply interruptions and simulation with more detailed macroeconomic models²²;
- $\delta s/\delta q$ = 0.36, the change in interruption size induced by a change in long-run import demand, based on the evaluation of the U.S. share of the world market, see Hogan²³;
- A_d = 0.1 adjustment rate for domestic oil demand²⁴;
- A_s = 0.1 adjustment rate for domestic oil supply²⁵;
- $\eta_{i:short}$ = 0.1 short-run imported oil supply elasticity;
- SPR_Size = 500 million barrels.

In addition to these parameters, the base case specifies the probability distribution for oil supply interruptions over the possible interruption sizes, s . For purposes of the sensitivity analysis, we consider

22 See Murphy et al 1986; Rowen and Weyant 1986.

23 Hogan 1981.

24 Hogan and Leiby, 1985.

25 Hogan and Leiby, 1985.

four different views of the world about the probability of one-year long interruptions of 1 mmbd, 3 mmbd, and 6 mmbd, for the United States. For each of these world views we characterize the decade probabilities of one or more such interruptions:

Table A.1

Decade ProbabilitiesOne Year Interruptions²⁶

World View	1 mmbd	3 mmbd	6 mmbd
W0	.0	.0	.0
W1	.50	.10	.05
W2	.75	.30	.05
W3	.95	.50	.20

The last three world views correspond to increasingly pessimistic views of the likelihood of oil supply interruptions. The zero (W0) case provides a benchmark from which to separate the disruption effects from the other constituents of the oil import premium. The nominal assumptions adopt world view two (W2).

²⁶ Values for ex ante, i.e., before use of the Strategic Petroleum Reserve.

High Price Estimation

The combination of these base case assumptions produce estimates of the individual components of the premium and the optimal tariff as well as the cost of the free market policy. Using a price of \$27 per barrel to represent the high price case, the estimates are:²⁷

27 Calculation of the optimal tariff includes a number of intermediate calculations. For the high price case, for instance, these include:

Hi Price Case \$27

OPTIMAL TARIFF CALCULATION INTERMEDIATE CALCULATIONS

q:base	6.00 base oil import level
b	0.022 derivative of the short run import supply curve
c	0.048 derivative (minus) of short run import demand curve
$\delta q_d / \delta p$	-0.19 derivative of long run domestic demand for oil
$\delta q_s / \delta p$	0.185 derivative of long run domestic supply of oil
n_d :short	-0.05 short-run elasticity of US demand for oil
n_s :short	0.05 short-run domestic oil supply elasticity
n_{eq}	-0.03 elasticity of exchange rate to the oil import price 1e
$\delta Q / \delta q$	0.53 derivative of Q with respect to q
p'	-2.66 derivative of domestic inverse demand curve
W	0.97 scale factor for tariff loss during interruption

OPTIMAL TARIFF CALCULATION INTERRUPTION WORK CALCULATIONS

Decade_p	Prob_j	GDP_j	s_j	Δp_j	$\delta \Delta p / \delta q_j$
0.75	0.129	4478	0.75	8.42	3.82
0.30	0.035	4388	2.75	30.79	3.29
0.05	0.005	4300	5.75	64.33	2.49

**OPTIMAL TARIFF CALCULATION High Price Case
(\$/Barrel)**

s		25.08	IMPORT PRICE	
T ₁	1.45			
T ₂	0.69			
T ₃	1.11			
		3.25	ECONOMIC PREMIUM	
T ₄	2.82			
T ₅	4.96			
		7.78	SECURITY PREMIUM	
T		11.03	TOTAL PREMIUM	
P		36.10	DOMESTIC PRICE	
q:d	13.84	DEMAND		
q:s	11.69	SUPPLY		
q	2.15	IMPORTS		
	Optimum	Economic Tariff	3.25	
		Security Tariff	7.78	
		Combined Tariff		11.03
	Base	Economic Premium	7.31	
		Security Premium	10.40	
		Combined Premium		17.71
	Cost of Free Market Policy			34.07
		(\$million/day)		

Low Price Estimation

The first sensitivity test takes the base case parameters but changes the assumption for oil prices. We continue to assume that the benchmark level for energy demand is 16 mmbd at \$27 per barrel, with a 10 mmbd domestic supply, implying a 6 mmbd demand for imports. However, now we assume that imports can be supplied for \$15 per barrel. Starting at this new price, we solve for the equilibrium levels where the domestic demand, domestic supply and import supply balance. The solution produces

a higher premium, a higher tariff and a higher cost of a free market policy:

OPTIMAL TARIFF CALCULATION Low Price Case
(\$/Barrel)

s	11.76	IMPORT PRICE	
T ₁	0.98		
T ₂	0.68		
T ₃	3.82		
	5.48	ECONOMIC PREMIUM	
T ₄	1.77		
T ₅	5.30		
	7.07	SECURITY PREMIUM	
T	12.55	TOTAL PREMIUM	
p	24.32	DOMESTIC PRICE	
q:d	16.86	DEMAND	
q:s	9.33	SUPPLY	
q	7.53	IMPORTS	
Optimum	Economic Tariff	5.48	
	Security Tariff	7.07	
	Combined Tariff	12.55	
Base	Economic Premium	11.24	
	Security Premium	9.16	
	Combined Premium	20.40	
	Cost of Free Market Policy	70.60	
	(\$million/day)		

The increased demand, associated with the lower price, raises the expected level of imports and increases the economic component of the premium more than it decreases the security component, leading to a higher cost for a free market policy. Hence, although some of the externalities are reduced with lower oil price, under the base case assumptions the effect of lower oil prices is to raise the size of the premium and the cost

timal tariff.

Secure Imports Estimation

The estimate of the optimal tariff includes both economic and security components of the premium. Naturally a reduction in the risk of oil supply interruptions should have a beneficial effect on oil consumers and, thereby, lower the optimal tariff. However, as we argued above, changes in one element of the premium can change the size of the other elements. There is a feedback effect. The interaction may cause the various elements to shift so that the aggregate change in the optimal tariff is less than the change in the individual components of the premium.

The optimal tariff under the condition of no oil supply interruptions is larger than the economic component of the tariff in the base case. With the high price case and the extreme assumption of no threat of supply interruptions, the optimal tariff, the premium and the cost of a free market policy, would change to include:

OPTIMAL TARIFF CALCULATION Secure Imports Case (\$/Barrel)

s	26.07	IMPORT PRICE
T ₁	1.52	
T ₂	1.49	
T ₃	2.07	
	5.08	ECONOMIC PREMIUM
T ₄	0.00	

T_s	0.00	0.00 SECURITY PREMIUM
T	5.08	TOTAL PREMIUM
P	31.14	DOMESTIC PRICE
$q:d$	14.90	DEMAND
$q:s$	10.77	SUPPLY
q	4.13	IMPORTS

Optimum	Economic Tariff	5.08	
	Security Tariff	0.00	
	Combined Tariff		5.08
Base	Economic Premium	7.12	
	Security Premium	0.00	
	Combined Premium		7.12
Cost of Free Market Policy			6.65
(\$million/day)			

It is clear that the simultaneity and complementarity between the economic and security components of the premium imply a significant optimal tariff even if security problems are eliminated.

Risk Analysis Estimation

These few sensitivity tests illustrate the principal responses of the optimal tariff calculation to changes in the input assumptions. The high and low oil price cases, or the secure world oil market scenario, produce changes in the estimate of the optimal tariff. However, the optimal tariff still continues to be a large fraction of the price of oil and large relative to any tariff that might be considered politically acceptable. Unfortunately, the few sensitivity tests do not exhaust the major uncertainties that could affect the size of the optimal tariff. Higher or lower assumptions about inflation could have a significant impact on both the quantity of oil imported and the estimate of the optimal tariff. Similarly, changes in elasticity estimates, alternative views about the probability of interruptions, or uncertainties in any of the other parameters could alter the optimal import tariff estimate.

It is not possible to examine all potential combinations of the long list of important input parameters. The number of scenarios would quickly exhaust our capacity to absorb the data. As an alternative, therefore, a "risk analysis" of the optimal tariff estimate captures a range of possible tariff policies that should be considered given our uncertainty in the input parameters.

Under risk analysis, the analyst specifies the uncertainties in terms of probabilities for different values of the input parameters. For instance, the most likely estimate of the aggregate demand elasticity is

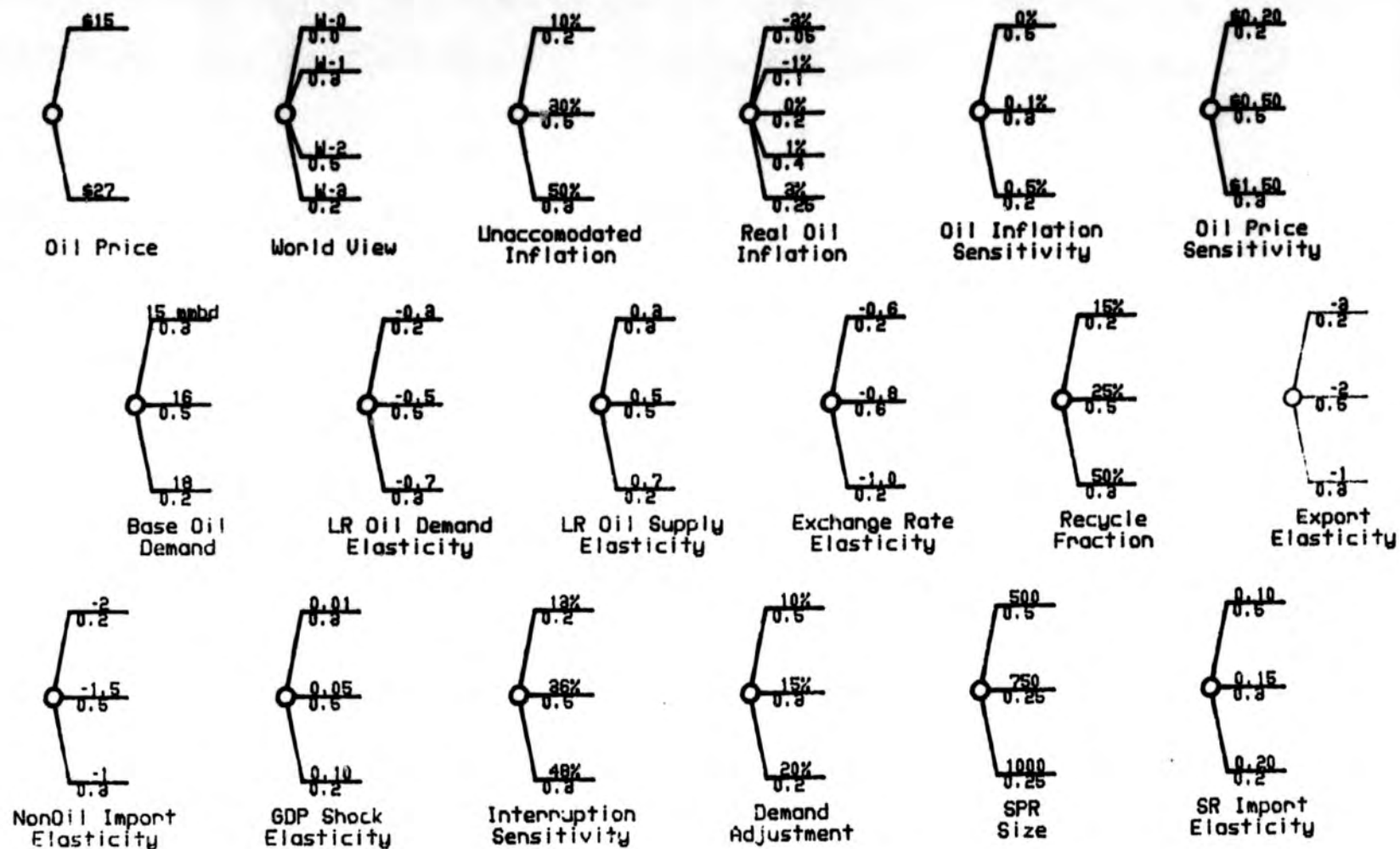
0.5. This demand elasticity reflects the estimates from a variety of studies, some of which produce higher values and some of which produce lower values. For purposes of the sensitivity analysis, it is easy to argue that there is a significant chance that the elasticity could be as high as 0.7 or low as 0.3. A wider range is possible but the principal range of uncertainty should be captured by these values. The probability that the elasticity will be as high as .7 or as low as .3 is not as great as the probability that the most likely case is correct. Using our judgment, we assign probabilities of 30% to the elasticity of 0.7, 50% to the elasticity of 0.5 and 20% to the elasticity of 0.3.

A similar probabilistic analysis across the range of possible values for the other key inputs establishes a probability distribution for all of the uncertain parameters. An event tree summarizes these probability judgments as shown in figure A.1. This event tree assigns one node to each uncertainty and the branches describe the possible alternative values for the respective input parameters. The probability represent the judgments on the uncertainty that should be applied to the sensitivity analysis.

Given the event tree, it is a straightforward matter to apply the optimal tariff model to calculate the probability distribution of the tariff components and the cost of a free market policy. This simulation also provides the probability distribution for the optimal tariff. Application of the event tree to the optimal tariff model produces the probability distributions shown in figures A.2 through A.4. Each probability distrib-

FIGURE A.1

Oil Premium Inputs are Uncertain

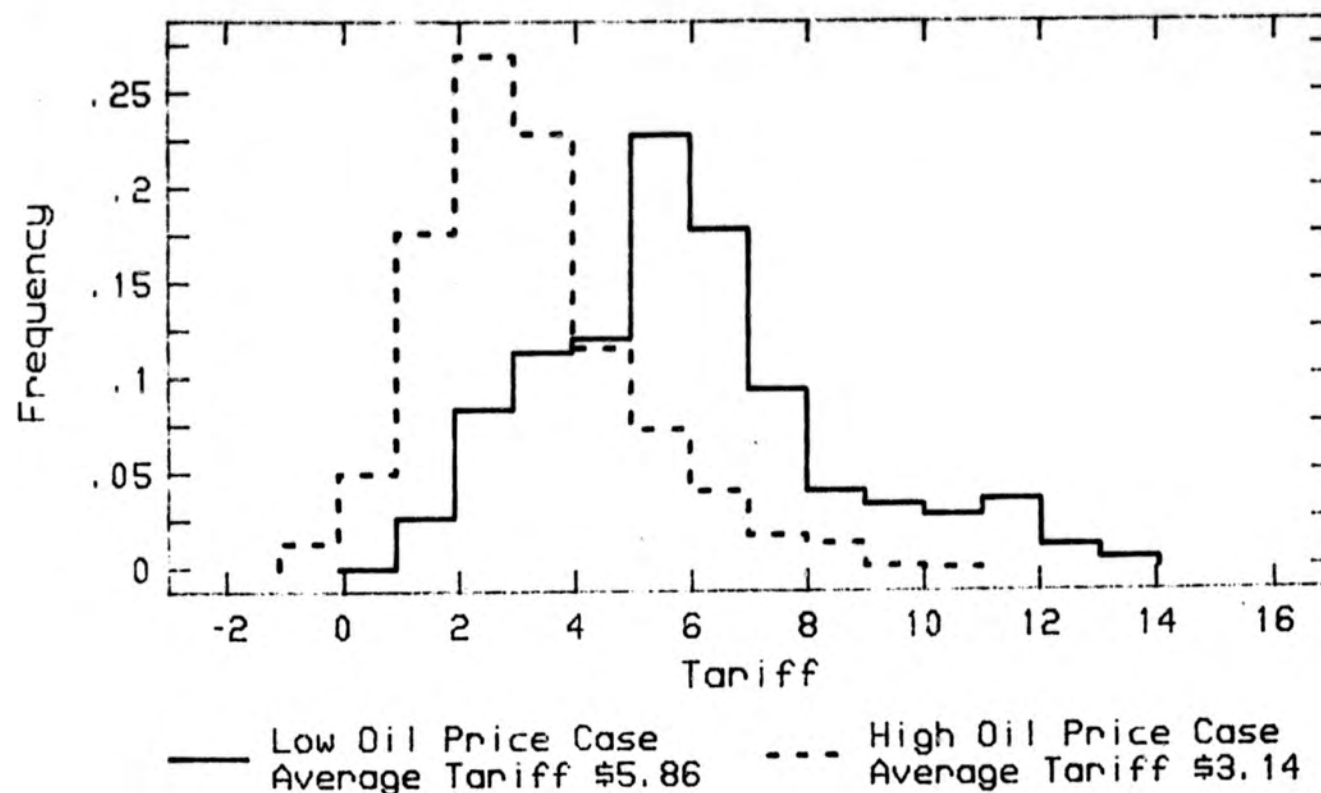


Prices in 1985 dollars per barrel.

FIGURE A.2

Lower Oil Prices Produce a Higher Economic Tariff

ECONOMIC TARIFF

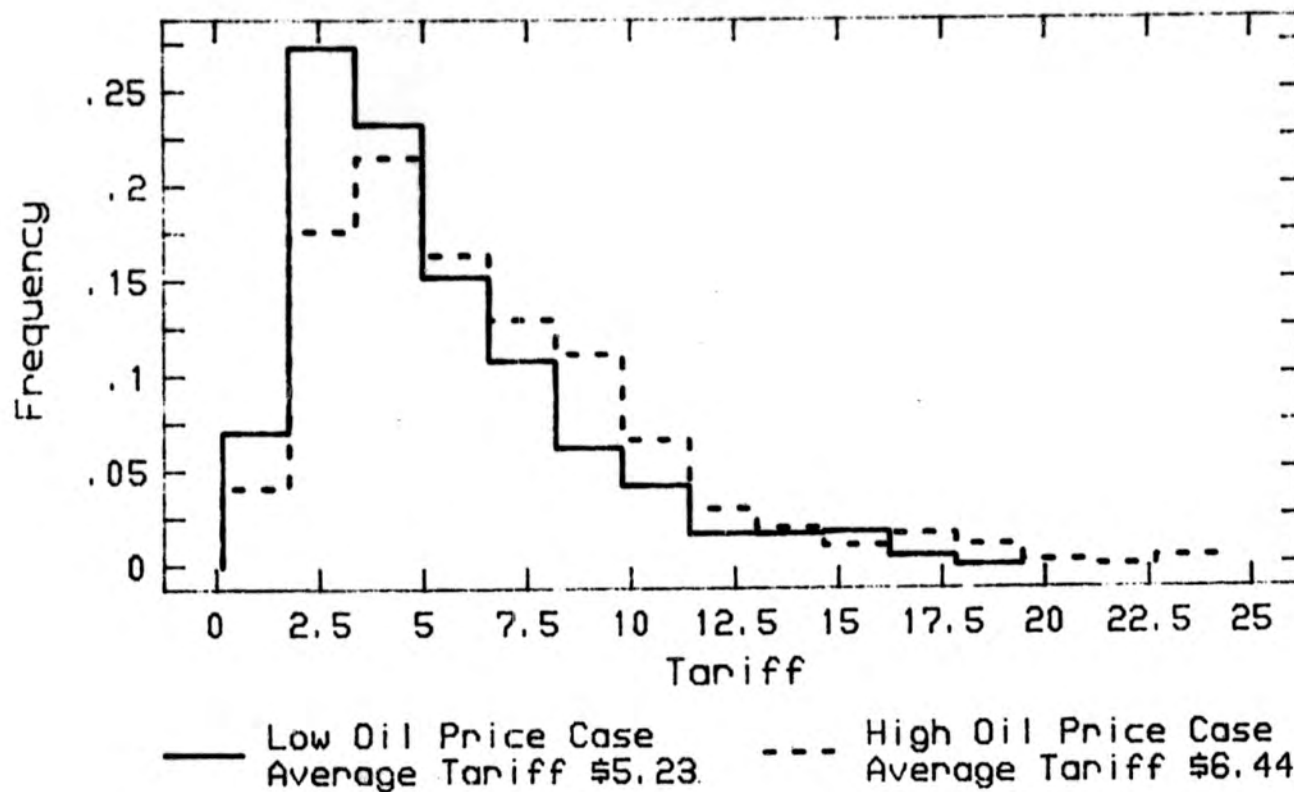


Prices in 1985 dollars per bannel.

FIGURE A.3

Lower Oil Prices Produce a Lower Security Tariff

SECURITY TARIFF

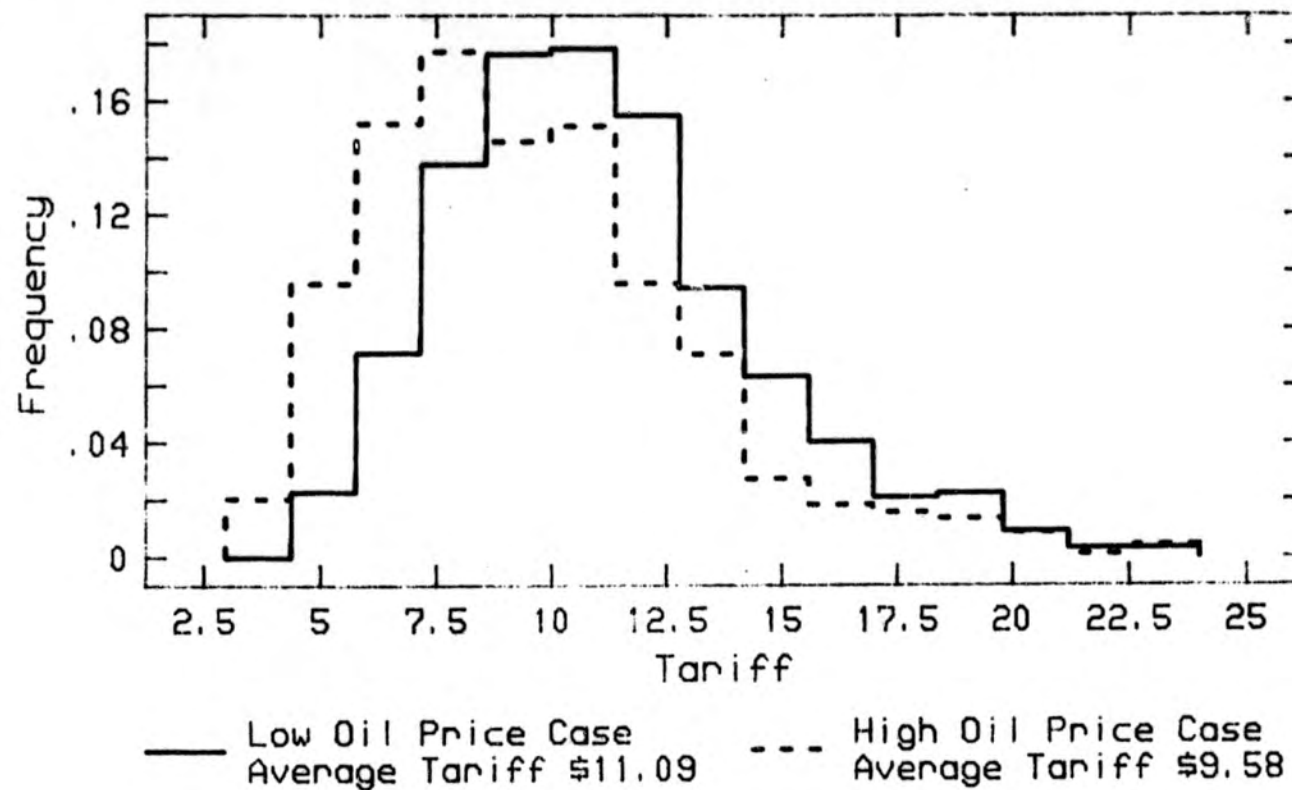


Prices in 1985 dollars per barrel.

FIGURE A.4

After Netting Out Compensating Effects Oil Prices Have Little Impact on the Optimal Tariff

COMBINED TARIFF



Prices in 1985 dollars per bannel.

ution summarizes the range of uncertainty in the optimal tariff estimates policy and the costs of a free market policy.

Focusing on the key sensitivity test between low and high oil prices, the probability distributions include:

Optimal Tariff and Cost Probability Distributions
(\$/Barrel)

High Price Case (\$27)

	Lower 25%	Median	Upper 25%	Expected Value
Economic Tariff	1.95	2.85	3.90	3.14
Security Tariff	3.63	5.64	8.52	6.44
Total Optimal Tariff	7.00	8.96	11.26	9.58
Cost of Free Market Policy (\$million/day)	12.71	22.58	36.11	29.03

Low Price Case (\$15)

	Lower 25%	Median	Upper 25%	Expected Value
Economic Tariff	4.03	5.68	6.87	5.86
Security Tariff	2.80	4.20	6.65	5.23
Total Optimal Tariff	8.71	10.81	11.89	11.09
Cost of Free Market Policy (\$million/day)	32.10	49.03	76.51	61.48

SUMMARY

The optimal import tariff balances all the costs and benefits of oil imports. Although any operational estimate of the tariff will depend upon an array of assumptions and judgments, it is possible to make these

judgments and organize them in an internally consistent set of calculations. These estimates quantify the several possible sources of market failure which prevent private actors from recognizing the true costs of the marginal barrel of oil imports. The resulting tariff estimates are sensitive to the assessment of market conditions, but this sensitivity appears to be much less than commonly believed. There is a significant amount of interaction among the tariff components. A change in assumption which reduces one element tends to produce a compensating increase in others, and the whole is less sensitive than the parts.

This complementarity and the numerical results provide a guide for action. The size of the tariff is large. Our preferred set of assumptions sets the optimal tariff about \$10 and \$11 per barrel. Under the High Price case, there is a 75% chance that the optimal tariff is at least \$7 per barrel. And under the Low Price case, this estimate to an optimal tariff of at least \$8.70 per barrel. When compared with the usual political discussions, where the most adventuresome conversation involves tariffs that are half this range, the direction of policy is clear: higher tariffs can be justified. Based on the estimates of market failure, a figure in the range of \$7 per barrel and \$9 per barrel is as low as can be supported by the analysis and the judgments on the range of uncertainty in the parameters.

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SJR

43

May 5, 1987

SJR 43, RELATING TO THE SHIPPING OF ALASKAN OIL

1) Review CDS Tanker issue

Four supertankers have been allowed to operate in the domestic trade on the condition that they repay their Construction Differential Subsidies (CDS)

In January, the U.S. District Court of Appeals vacated this rule, but allowed the ships to operate until July 16, 1987.

2) Update on U.S Department of Transportation Action

Maritime Administration has filed a Notice of Proposed Rulemaking on the CDS Repayment.

3) Update on Congressional Action

House Supplemental Appropriations Bill has language that would prevent U.S. Department of Transportation from adopting new rules.

Senate amendment was defeated last week by a 14-11 vote in the Senate Appropriations Committee. Could be reinserted on the Senate floor. It may be on the floor by the end of this week.

If its out of the Senate bill, it will be a conferenceable item.

TO TESTIFY:

JIM PALMER, Standard Alaska Production Company

VINCE WRIGHT, Chief of Research Section, Department of Revenue

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CHAND AND MASTERS

Arco battles smaller tankers in showdown for Alaska crude

By DON IRWIN
Los Angeles Times

WASHINGTON — Lobbyists and legislators are bracing for the showdown in a long-running contest for dominance in the seaborne traffic that moves Alaskan crude oil to the Lower 48 states.

The struggle, which is approaching a climax in Congress and the executive branch, involves millions of dollars in government and corporate funds, as well as some of the largest ships afloat. In the end, it may well decide whether a few supertankers are to replace smaller vessels as the principal haulers of North Slope oil.

In its current phase, the fight primarily involves Atlantic Richfield, the Los Angeles-based owner of two 262,000-ton tankers. To make the ships eligible for the Alaska trade, Arco has repaid the U.S. Maritime Administration \$86.4 million for federal subsidies that helped pay for their construction. The subsidies were granted originally on the condition that the vessels be used only for foreign traffic.

Working in Congress to scotch the deal are the owners of the smaller, less efficient ships that require crews almost as large as the supertankers and must charge higher rates per barrel of crude transported.

They have asked Congress to stand by the original terms of the subsidies and keep the supertankers out of the domestic market,

arguing that the competition would seriously harm all smaller operators.

The owners are also trying to force the Transportation Department to drop its approval of such payback arrangements. In accordance with the department's earlier clearance for two subsidized supertankers owned by other firms to enter domestic traffic, a federal court has ordered that the department issue a rule by July 16 that would allow all subsidized vessels to do the same. Arco is seeking to take advantage of the rule.

On Capitol Hill, the House Appropriations Committee has voted, 18 to 16, for a measure that would effectively bar completion of work on the rule.

The bill will go to the full House after Congress returns on April 21 from its Easter recess. If it becomes law, it may well require eventual return of more than \$100 million in subsidy repayments by shipping companies.

The tangled dispute began in the 1970s, when shipping companies first offered subsidy "buybacks" in exchange for permission to operate domestically. The construction of seven supertankers had been subsidized under a 1936 provision of the Maritime Act of 1920, which was designed to make U.S. vessels more competitive in world commerce.

After a court challenge, the Supreme Court ruled that such a reimbursement arrangement would be legal for tankers of at least 100,000 tons.

Why people quit

The Associated Press

NEW YORK — Saying no to nap breaks during work or to having a talking mynah bird in the office may seem reasonable, but those refusals were enough to make somebody walk off the job, according to a survey of why people quit their jobs.

An independent research firm, hired by Accountemps, a temporary personnel agency, asked personnel managers at 100 large corporations around the country for the most unusual reasons employees have given for quitting.

Here are some of the answers:

- "They said I couldn't take short nap breaks twice a day."
- "They wouldn't let me keep my mynah bird in a cage in my office."
- "My salary was so high, it made me uncomfortable."
- "My office did have a window, but I didn't like the view."
- "I got tired of driving to work, and the company wouldn't pay for taxis."
- "The job was fine, but it was no place to meet men. Too many of them were bald, with bow ties, suspenders and white socks."
- "I'm going to be happier as a dog trainer than as a management consultant."
- "I want to write poetry on the beach."

attempted murder, the latter
charge was scheduled to be
changed today to first-degree

said.
out-patient basis, troopers

Street and 10th Avenue. Time is 10 a.m. to 1 p.m. The
Workshop is offered by the Alaska Pro Bono Program.
For more information call 276-6282.

HOUSE JOINT RESOLUTION 33

HISTORY

On January 16, 1987, the U.S. Court of Appeals decision (First Attransco Tanker Corp. vs. Dole) vacated a Department of Transportation ruling. The DOT ruling permitted three very large crude carrier ships to repay the remainder of their construction subsidies in 1985/6. In doing so, they became Jones Act ships rather than just U.S. flag ships.

The Court ruled that the Secretary of Transportation was well within her authority to permit this repayment. However, the Court also ruled there were procedural defects in that she did not adequately explain the effect of this action on other Jones Act ships. Thus the ruling was unjustified. The decision requires all three ships to cease Alaskan service on July 16, 1987, unless the Department of Transportation explains the effect on other Jones Act ships to the Court's satisfaction.

Prior to repaying the subsidy, these three large, efficient U.S. flag ships were not allowed to carry Alaskan oil unless there were no suitable Jones Act ships available. Even under those circumstances these ships could only be used part time (no more than six months out of the year). A fourth ship which entered Jones Act trade under generally similar circumstances in 1983 is also vulnerable to the ruling.

In total these four ships are currently moving 200,000 barrels of Alaskan oil to market every day. If they are taken out of the fleet, then a large number of much smaller, less efficient and more expensive ships must take their place if the Alaskan oil is to get to market. This would raise the market price for all Jones shipping by an estimated 25 cents to \$1.00 per barrel.

An increase in the cost of transportation not only reduces oil company income and incentive in Alaska but also reduces the netback value of all Alaskan production. For example, each 50 cent increase in per barrel transportation cost would reduce state income by roughly \$75 million per year.

Given this situation, Alaska should support the DOT's intention to issue a new rule confirming that these vessels should remain Jones Act vessels as soon as possible because of the July 16, 1987 deadline.

Attached is further information regarding this "Repayment of Construction Differential Subsidies (CDS)".

Repayment of Construction Differential Subsidies (CDS)
(also called "CDS Sanitization")

DISCUSSION ISSUES:

The following information should be noted in discussion of CDS Sanitization:

- This is a significant economic issue for Alaska. Removal of the four large efficient ships will require using nearly all the smaller ships available, driving the market price for all shipping up by \$.25 to \$1 per barrel. Netback values on the crude oil will decline accordingly. Each \$.50 per barrel reduction in netback represents roughly \$75 MM per year in lost state revenues.
- Alaskan oil production has increased significantly in the last year, highlighting the need for efficient transportation. The Lisburne field (40-50 MBD) began commercial production in early 1986, Prudhoe Bay production increased with natural gas liquid (NGL) recovery in early 1987 (50 MBD). Kuparuk has reached peak production, and Endicott field is expected to begin production in the fourth quarter of 1987 (up to 100 MBD).
- Largely because of the increased Alaskan production the four large, efficient VLCC vessels in question have been in continuous service since repayment of their remaining subsidy: the BROOKLYN and the BAYRIDGE under charter to EXXON, and the ARCO INDEPENDENCE and the ARCO SPIRIT under long term charter to Standard Oil.
- Larger vessels make the transport of crude oil to the West Coast and Gulf Coast more economically efficient than smaller vessels. This is especially true to the Gulf Coast, which accounts for a substantial portion of the Alaskan oil delivered.

D

BY FAHRENKAMP

1 IN THE SENATE

2 SENATE JOINT RESOLUTION NO.

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 FIFTEENTH LEGISLATURE - FIRST SESSION

5 Relating to the shipping of Alaskan oil.

6 BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

7 WHEREAS on January 16, 1987, the United States Court of Appeals for
8 the District of Columbia (vacated) a United States Department of Transporta-
9 tion rule under which three very large crude oil carrier ships were allowed
10 to operate in the United States domestic shipping market; these ships are
11 the Arco Independence, the Arco Spirit, and the Brooklyn; and

12 WHEREAS the court decision would require all three ships to stop
13 domestic shipping of Alaskan oil by July 16, 1987, unless the United States
14 Department of Transportation adopts another rule to allow the ships to
15 continue their domestic shipping; and

16 WHEREAS a fourth ship, the Bayridge, that is used in Alaskan oil
17 shipping may also be affected by the court decision; and

18 WHEREAS Alaskan oil production has increased significantly in the last
19 year, and these four ships currently move 200,000 barrels of Alaskan oil to
20 market every day; and

21 WHEREAS if the four ships are prohibited from engaging in domestic
22 shipping, a large number of much smaller, less efficient and more expensive
23 ships will be required to take their place to transport Alaskan oil to
24 market; this change would raise the ~~market price~~ ^{cost of transportation costs} for all Alaskan oil
25 shipped in these smaller ships by an estimated \$.25 to \$1.00 per barrel,
26 and netback values on the oil would decline accordingly; ^{approximately .50} each ~~\$32~~ per
27 barrel reduction in the netback value of the oil ^{transported by these four ships} represents roughly
28 ^{750,000} \$75,000,000 per year in lost revenue to the state; and

29 WHEREAS if the United States Department of Transportation ~~does not~~ ^{fails to}

adopt a rule by July 16, 1987, allowing these four ships to operate in the domestic shipping market ~~in the United States~~, the transportation of Alaskan oil ^{may} ~~will~~ be ~~severely~~ disrupted, the transportation costs will increase dramatically, and the state ^{and federal government} ~~will~~ ^{may} lose a significant amount of revenue;

BE IT RESOLVED that the Alaska State Legislature respectfully urges the Secretary of the United States Department of Transportation to adopt before July 16, 1987, a rule that would enable the Arco Independence, the Arco Spirit, the Bayridge, and the Brooklyn to continue to operate in the United States domestic shipping market without interruption.

COPIES of this resolution shall be sent to the Honorable Elizabeth H. Dole, Secretary of the U.S. Department of Transportation; and to the Honorable Ted Stevens and the Honorable Frank Murkowski, U.S. Senators, and the Honorable Don Young, U.S. Representative, members of the Alaska delegation in Congress.

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24 market; this change would raise the market price for all Alaskan oil
25 shipped in these smaller ships by an estimated \$.25 to \$1.00 per barrel,
26 and netback values on the oil would decline accordingly; each \$50 per
27 barrel reduction in the netback value of the oil represents roughly
28 \$75,000,000 per year in lost revenue to the state; and

29 WHEREAS if the United States Department of Transportation does not

adopt a rule by July 16, 1987, allowing these four ships to operate in the domestic shipping market in the United States, the transportation of Alaskan oil will be severely disrupted, the transportation costs will increase dramatically, and the state will lose a significant amount of revenue;

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COPIES of this resolution shall be sent to the Honorable Elizabeth H. Dole, Secretary of the U.S. Department of Transportation; and to the Honorable Ted Stevens and the Honorable Frank Murkowski, U.S. Senators, and the Honorable Don Young, U.S. Representative, members of the Alaska delegation in Congress.



ALASKA STATE LEGISLATURE

SENATE SPECIAL COMMITTEE ON OIL AND GAS

Senator Bettye Fahrenkamp
Chairman
Senator Jack Coghill
Senator Paul Fischer

P.O. Box V, State Capitol
Juneau, Alaska 99811
(907) 465-3834

MEMORANDUM

TO: Members, Senate Special Committee on Oil and Gas
FROM: Committee Staff
RE: Committee Meeting, May 5, 1987
DATE: May 4, 1987

On Tuesday, May 5, at 3:30 pm in the Beltz Room, the Senate Special Committee on Oil and Gas will hear SJR 43, Relating to the shipping of Alaskan oil.

Four of the supertankers currently used to transport oil from Valdez to the West coast and to Panama (for delivery to the Gulf and East coasts) are allowed to operate under a special waiver from the U.S. Department of Transportation. A recent U.S. Court of Appeals decision held that these rules were improperly drafted, but allowed the ships to operate until July 16, 1987. If new rules are not adopted by that date, these ships will have to be replaced with smaller, less efficient vessels. The resulting increase in the transportation costs for Alaska North Slope oil will decrease wellhead values and could result in a loss of revenue to the state of from \$18 - \$150 million annually.

These ships were built with federal construction differential subsidies (CDS), a program designed to help U.S. built ships to compete in foreign trade markets. To alleviate the shortage of suitable Jones Act tankers, the U.S. Department of Transportation has allowed these ships to enter the domestic trade after repaying the subsidy.

In response to the court decisions, the U.S. Department of Transportation is in the process of adopting new rules that would allow the four ships to remain in the domestic trade. However, pending amendments in Congress may prohibit such new rulemaking.

SJR 43 urges the Secretary of the U.S. Department of Transportation to adopt new rules by July 16, 1987.

STEVE COWPER
GOVERNOR



ALASKA DEPARTMENT OF REVENUE

APR 13 1987

STATE OF ALASKA OFFICE OF THE COMMISSIONER
OFFICE OF THE GOVERNOR
WASHINGTON, D.C.

April 8, 1987

MEMORANDUM

TO: BRAD GILMAN, U.S. Senate Commerce Committee

FROM: *EG* ERIC OSTROVSKY, Associate Director for Fisheries
and the Environment

THROUGH *JK* JOHN W. KATZ, Director of State/Federal Relations
and Special Counsel to the Governor

SUBJECT: 1) ALASKA REVENUE IMPACT CAUSED BY DENYING THREE
VLCC CDS SHIPS TO THE ALASKA TRADE
2) THE NUMBER OF NEW JOBS CREATED BY USING SMALLER
TANKERS

REVENUE IMPACT

The Alaska Department of Revenue, Petroleum Research Section (Research Section) in a recent analysis has indicated that if three CDS tankers owned by ARCO and Standard Oil were taken out of the Alaska trade, the direct economic loss to the State of Alaska would be \$18 - \$150 million annually. This revenue loss would result from a decrease in Alaska's oil royalty and severance taxes. The decrease would be caused by a decrease in the wellhead price of oil, which is calculated as the price of oil at its final destination minus pipeline shipping and other allowable costs.

Each CDS super oil tanker can carry significantly more oil than its smaller counterparts, and the CDS tanker transports oil at a cheaper rate. A study last year by the Research Section showed that CDS tankers could save an average of 45 percent in shipping costs over non-CDS tankers. This amounts to \$1.25/bbl for Gulf Coast shipments and \$0.57/bbl for West Coast shipments. Since the three CDS tankers were introduced into the Alaska trade in between July, 1985 and May, 1986, the average tanker rate overall to the Gulf Coast has dropped by \$0.75/bbl.

The three CDS tankers now engaged in Alaska North Slope (ANS) oil shipments are transporting about 60 million barrels annually. The following equation reflects the reason why the Research Section predicts that the State would lose at least \$18 million annually:

Royalty Effect

60 (million barrels of oil) x \$1.25 (\$1.25 savings) x 0.125 (12.5 percent royalty) = \$9.4 million.

plus

Severance Tax Effect

60 x 1.25 x 0.15 (severance rate) x 0.84 (economic life factor) x 1 - 0.125 (severance tax adjustment) = \$8.3 million.

TOTAL \$17.7 million

The severance tax adjustment is needed because this severance tax is levied only on non-royalty oil, ie., a tax on the oil left after the royalty oil is subtracted. The economic life factor, which reduces the effective severance tax rate as well productivity declines, is estimated to be 0.84 percent over the near term.

The reason why \$18 million is a conservative estimate is that the reduced competition from the removal of the tankers (the tanker market is currently fully extended) could raise the transportation cost for all ANS oil, so that, the State could lose over \$50 million annually if tanker rates on all shipments to the Gulf Coast returned to the previous level. The following equation shows how the \$50 million figure was derived:

Royalty Effect

300 (millions of barrels of ANS oil delivered to the Gulf Coast) x 0.75 (actual overall rate reduction when the three CDS vessels were introduced into the trade) x 0.125 = \$28.1 million

plus

Severance Tax Effect

300 x \$0.75 x 0.15 x 0.84 x (1 - 0.125) = \$24.8 million

TOTAL \$52.9 million

If the shipping rate on all ANS oil shipments both to the Gulf and West Coast were to increase the full 45 percent, Research Section estimates that the revenue impact on the State could go as high as \$150 million annually.

POTENTIAL JOBS CREATED BY THE CHANGE

The United States Maritime Administration (MarAd) predicts that about 500 new jobs would ultimately be created by

prohibiting the CDS ships in the Alaska trade. MarAd predicated this figure based on the assumption that the smaller tankers replacing the CDS tankers would hire about 800 crewmen. On the other hand, about 300 jobs would be lost on the three CDS tankers, reducing the new jobs created to 500.

With the tanker market in the Alaska trade currently fully extended, it is not certain whether new seafarer jobs would be created or that only transportation costs would rise due to increased demand. Moreover, if the wellhead price drops, ANS oil could not compete against the world market price, and ANS oil production would decrease, which is what happened recently when the Milne Point oil field shut down. This effect would also limit potential jobs. The ability of ANS oil to compete on the world market will become a greater factor as new, more costly methods are needed to extract ANS oil, and the cost of transportation may become an even more significant component in determining whether ANS oil can compete.

Finally, there would be a \$114 million direct and immediate loss to the Federal Treasury caused by denying the Alaska trade to the three CDS tankers. Part of the costs, \$105.8 million would come from the CDS repayments, and, the remainder, another \$8 million would be in interest. According to the U.S. Maritime Administration, the Federal government would also lose about \$44 million annually in Federal income taxes due to the less profitable trade caused by the use of non-CDS tankers. MarAd determined the tax loss by estimating that it would cost an extra \$128 million in shipping expenses to transport ANS oil in non-CDS ships.

Please let us know if you need further additional information on this subject.

cc: Greg Chapados
John Moseman
C.J. Zane
Bill Wolfe
Rod Moore
Rebecca Range

STATE OF ALASKA 1987 LEGISLATIVE SESSION
FISCAL NOTE

REQUEST _____

Bill Version: SJR 43

Publish Date: _____

Revision Date: _____

Agency Affected: Revenue

Title: Shipping State Oil

BRU: _____

Sponsor: Sen. Fahrenkamp

Components: _____

Requestor: Senate Oil and Gas

EXPENDITURES/REVENUES: (Thousands of Dollars)

	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92
OPERATING						
PERSONAL SERVICES	-	-	-	-	-	-
TRAVEL	-	-	-	-	-	-
CONTRACTUAL	-	-	-	-	-	-
SUPPLIES	-	-	-	-	-	-
EQUIPMENT	-	-	-	-	-	-
LANDS & STRUCTURES	-	-	-	-	-	-
GRANTS, CLAIMS	-	-	-	-	-	-
MISCELLANEOUS	-	-	-	-	-	-
TOTAL OPERATING	-	-	-	-	-	-
CAPITAL	-	-	-	-	-	-
REVENUE	(Revenue Impact \$17.7 Mil to \$52.9 Mil Per Year)					

FUNDING: (Thousands of Dollars)

GENERAL FUND	-	-	-	-	-	-
FEDERAL FUNDS	-	-	-	-	-	-
OTHER	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-

POSITIONS:

FULL-TIME	-	-	-	-	-	-
PART-TIME	-	-	-	-	-	-
TEMPORARY	-	-	-	-	-	-

ANALYSIS: Attach a separate page if necessary

See attachment.

Prepared By: Royce Weller

Phone: 465-2300

Division: Commissioner's Office/Revenue

Date: May 5, 1987

Approved by Commissioner: Hugh Malone

Date: May 5, 1987

Agency: Department of Revenue

Distribution (by Agency preparing fiscal note):

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