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BY THE COMPTROLLER GENERAL



Report To The Congress

OF THE UNITED STATES

The Economic And Energy Effects Of Alternative Oil Import Policies

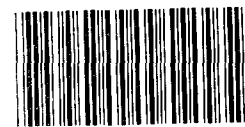
Increasing reliance on imported oil leaves the United States vulnerable to abrupt price increases and supply disruptions, threatening our economy and national security.

This report examines alternative ways to reduce oil imports. GAO compared the economic and energy effects of continued price controls, price deregulation (including the administration's decontrol plan), import fees, domestic crude oil taxes and quotas.

Overall, phased price deregulation appears to result in the best combination of costs and benefits for the Nation. It is the most effective at reducing oil imports by stimulating domestic production while avoiding the higher economic costs imposed by quotas.

The administration's decontrol plan should lower imports, but will cause additional inflation over the next 3 years. GAO estimates the impacts of decontrol, on both oil imports and on inflation, will be higher than the administration suggests.

The administration's proposed tax on windfall profits arising from deregulation of previously discovered oil will collect a small amount of revenue. The part of the tax on profits arising from future OPEC price increases, however, may collect considerably more revenue from the industry because the administration plans to establish a low base price from which profits are calculated.



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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the energy and economic effects of alternative policies to reduce oil imports, and examines the administration's deregulation proposal.

We are sending copies of this report to the Director, Office of Management and Budget; and the Secretaries of Energy and the Treasury. Due to the timeliness of the subject, we are also sending copies to all Members of the Congress.


Comptroller General
of the United States

D I G E S T

GAO examined alternatives for dealing with one of the Nation's most serious problems--excessive reliance on imported oil. Three alternatives are pricing policies: Price deregulation (including the administration's decontrol plan), import fees, and domestic crude oil taxes. The fourth policy--import quotas--is a quantitative limit on imports and so does not work directly through the price mechanism.

Comparing the energy and economic effects each policy would have between 1978 and 1990 showed that deregulation of oil prices results in the best combination of costs versus benefits for the Nation.

Increasing import dependence

The U.S. has become increasingly dependent on oil imports, especially from the Organization of Petroleum Exporting Countries (OPEC). Our high dependency level makes us economically vulnerable to abrupt price increases imposed by OPEC, as was demonstrated in 1973-74 and as is being repeated now. The worst effects of price increases are on inflation and unemployment, but there are also significant negative effects on economic growth and the balance of trade.

Oil imports also limit U.S. freedom of action in world affairs. Although the Government has studied the problem several times and has officially concluded that high oil

imports are a threat to national security, very little has been done to date to lower them. Indeed, the U.S. is the only major western nation whose imports are significantly above 1973 levels. Since our well-being is jeopardized by increasing oil imports, the question is what policies can be used to lower them and what price those policies will impose.

GAO's analysis

GAO constructed scenarios corresponding to each of these policy alternatives and used the Wharton Annual Energy Model to compare the energy and economic effects each policy would have between 1978 and 1990. The main energy effects examined are changes in:

- The amount of oil imported.
- Domestic oil production.
- Oil prices.
- Oil demand.

GAO also examined how the alternatives affected the following economic variables:

- Economic growth.
- Inflation.
- Unemployment.
- Balance of Trade.
- Health of particular industries.

POSSIBLE IMPORT POLICY ALTERNATIVES

Oil price control, now beginning to be phased out, has been U.S. policy since 1971. Basically, price

control has kept domestic oil prices substantially below world levels. This policy has resulted in higher oil consumption and imports, and probably lower domestic production than would have been the case without controls. The four alternatives to continued price controls which GAO modeled are:

--Deregulation. Domestic oil prices are permitted to gradually rise to world levels by the end of 1981. The scenario was specified for analytical purposes and is slightly different from the administration's proposal. The administration's decontrol proposal, which was revealed while this study was already underway, is analyzed separately.

--Crude oil equalization tax. This plan taxes price controlled domestic crude up to the world price. A new high priced category of oil is established to promote exploration.

--Import fees. Imported crude and products are taxed in order to raise prices paid by the consumer to world levels.

--Quotas. Two quotas are specified to increase oil import savings above those achieved by deregulation. Minimum (1 million barrels per day) and maximum (3.6 million barrels per day) quotas are imposed, and U.S. product prices are permitted to rise until excess oil demand is eliminated.

ENERGY IMPLICATIONS OF ALTERNATIVE
OIL IMPORT POLICIES

F/C

(Deregulation is the most effective of the three pricing options at cutting oil imports, reducing them between 20 and 100 percent more than the crude

✓ oil equalization tax and import fees. The quota options were designed to build on deregulation and so, of course, lower imports further.

✓ Deregulation is more successful at reducing imports than the crude oil tax and fees because it stimulates more domestic production. Deregulation may increase domestic production by about 500,000 barrels per day in 1985 and 1 million barrels per day in 1990 over continued controls.

✓ The analysis shows that import fees will not stimulate domestic production. The crude oil equalization tax does stimulate production, but less than half as much as deregulation.

ECONOMIC IMPLICATIONS OF ALTERNATIVE OIL IMPORT POLICIES

The alternative policies have the most significant impact on inflation, with less serious costs in terms of unemployment and economic growth. Generally, the impacts of import fees, the crude oil equalization tax, and deregulation are similar. (Impacts are higher under the minimum quota and quite serious under the maximum quota.) Overall, most policies have small to moderate effects on the economy.

Specifically:

✓ --Inflation. The tax alternatives and deregulation add 0.3 to 0.4 percentage points to the inflation rate in 1980, 0.2 to 0.3 points in 1985, and zero by 1990. Quota impacts are 1.5 to 3 times larger.

✓ --Unemployment. The tax options and deregulation have almost no effect. While the minimum quota raises the

unemployment rate 0.1 to 0.3 percentage points, the maximum quota raises it by as much as 0.6.

- ←Economic growth. No scenario lowers the level of real GNP by even 1.0 percent in any year. Only the maximum quota causes appreciable losses in real GNP.
- ←Balance of trade. All policy alternatives improve the trade balance by lowering imports in the first several years. Later, lower export growth brings the net balance back to price control levels except in the maximum quota case. There, a net surplus is reduced to nearly zero by 1990.
- ←Industrial impact. The non-quota scenarios change output significantly only in petroleum and related industries. Deregulation and the crude oil equalization tax raise domestic oil output while import fees do not. All three lower output in the refinery sector because of lower demand for oil products. Industrial chemicals output is also reduced since that sector is heavily dependent on oil for both feedstock and fuel.
- ←Petroleum product prices. The GAO deregulation and tax scenarios cause gasoline and heating oil prices to rise \$.06 to \$.07 per gallon in 1980 and \$.20 to \$.24 per gallon by 1990. This is in addition to increases of \$.75 to \$1.00 per gallon we estimated under continued controls. The quotas result in much bigger increases, with the maximum quota raising the price of gasoline as much as \$1.46 per gallon over price controls in 1990.

✓
--Consumer income and oil prices.
Although petroleum product prices increase throughout the 1978 to 1990 period, the deregulation and tax cases cause these prices to rise faster than personal income only through 1981. Thereafter, incomes and oil product prices rise at about the same rate. The quota scenarios drive product prices up faster than incomes through 1985.

GENERAL EVALUATION OF COSTS AND
BENEFITS OF ALTERNATIVE POLICIES

Overall, GAO believes that deregulation holds about the right combination of benefits versus costs for the Nation. Clearly, the Nation can lower oil imports by any desired amount, but as imports are radically reduced the economic costs become great. Thus, the problem is to balance oil import advantages with economic disadvantages. The quota scenarios reduce imports considerably, but at high economic cost. The maximum quota could leave more than half a million jobless, add 1 percentage point to the inflation rate and lose \$15 billion in real Gross National Product above the costs of deregulation in 1985. The costs of the minimum quota are less, but still substantial.

While this report takes into account the main economic and energy costs, several other factors might well be considered in making a final decision on import policy. Some of these factors include the policies' effects on the world oil market and oil exporters; impacts on the oil companies; and environmental, national security, and quality of life considerations. The two tax options turn out to have economic costs similar to deregulation

when the 1978 to 1990 period is considered as a whole. The economy suffers slightly more under deregulation during the early years, but these small disadvantages are rapidly made up in the mid to late 1980s. Deregulation, moreover, is more effective at stimulating domestic production than the tax options, and thus lowers imports considerably more. For about the same economic price the Nation can improve its import position considerably more under deregulation.

The last alternative is to preserve price controls. Controls temporarily keep economic disruption lower than deregulation does, although in the long run controls lead to substantially higher imports, increasing American vulnerability to economic disruption.

Ever higher imports hold the potential for more serious damage. The tightened world oil market brought about by the withdrawal of Iranian exports has led to rapidly rising prices. Steadily rising imports under continued controls cannot help but add to these price pressures and therefore may be self-defeating. By raising demand for imports, controls may cause greater price increases than would have been the case under deregulation. And these price increases would mean pure transfers of American wealth to the exporting nations.

(OBSERVATIONS ON THE ADMINISTRATION'S DECONTROL PLAN

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GAO also examined the effects of the administration's decontrol plan, incorporating the administration's decontrol schedule and base case prices but using higher world price projections which GAO considers more realistic.

Energy and economic effects

The administration's plan should lower imports considerably. Imports should be reduced by about 100,000 barrels per day this year; around 500,000 barrels per day in 1981 and about 1 million barrels per day by 1985.

The decontrol plan will have little effect on economic growth and unemployment. The inflation rate should be about 0.1 percentage points higher in 1979, 0.2 points higher in 1980, and 0.4 points higher in 1981. Inflation is only slightly higher than the base case thereafter.

The GAO simulations of the administration's plan foresee heating oil and gasoline prices \$.03 per gallon higher under deregulation in 1980 than if controls had been kept. Prices would be \$.06 to \$.07 per gallon higher in 1981, and \$.07 to \$.08 per gallon higher in 1982.

The impacts of the administration's decontrol plan are consistently lower than the impacts under GAO's assumptions. These can be traced to different oil price increases allowed under the respective base cases. Under the administration's base case, domestic crude oil prices increase at considerably higher rates than they had during the past 5 years. By permitting base case prices to rise quickly, the negative economic and positive oil conservation impacts of the administration's decontrol plan are less than those under the GAO scenario.

For example, inflation rates are 0.2 percentage points higher in the GAO scenario during 1980 and 1981. Gasoline prices range from \$.04 per gallon

to \$.09 per gallon higher between 1980 and 1985. At the same time, the GAO decontrol scenario shows greater oil savings. In 1980, imports would be 400,000 barrels per day lower in the GAO case. In 1981, imports would be 500,000 barrels per day lower and in 1985, 700,000 barrels per day lower. These and other differences between the administration's and GAO's scenarios are summarized in Table 8 (p. 39) of this report.

The windfall profits tax

The administration has also recommended a two-part windfall profits tax. The first part would be levied on the revenues caused by decontrol of already discovered domestic oil (the "old-oil decontrol tax"). The second part would be on profits earned if OPEC raises world prices faster than the U.S. rate of inflation (the "OPEC price hike tax").

Because it is deductible in computing taxable income for corporate income purposes and does not apply to some types of income, the old-oil decontrol tax will be fairly small. Administration estimates are that it will take \$7 billion of the \$86 billion in additional gross revenues earned between 1980 and 1985. The companies will have earned \$50 billion in additional taxable income during those years.

Although the old-oil decontrol tax will collect a relatively small amount of revenue, the OPEC price hike tax may collect more money than one might expect. This is because while the tax is scheduled to be implemented at the beginning of 1980, the administration would set its base price at \$16 per barrel, the price reached in May 1979.

If that price were set closer to the price for the start of 1980--probably about \$20--tax collections would be considerably lower, roughly \$14 billion lower. While the OPEC price hike tax would accomplish the objective of denying the full benefit of OPEC price increases to oil companies, it may have an undesirable side effect. By taxing domestic oil, it would lower the effective price--the amount retained by the industry--below the world price. This might tend to increase imports at the expense of domestic production.

AGENCY COMMENTS

A draft of this report was reviewed by the Departments of Energy and the Treasury. Neither Department expressed significant criticisms of GAO's analysis or conclusions.

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ABBREVIATIONS

COET	crude oil equalization tax scenario
CPC	continued price control scenario
DEREG	crude oil price decontrol scenario
EPCA	Energy Policy and Conservation Act
FEE	import fee scenario
GAO	General Accounting Office
GNP	Gross National Product
MMB/D	million barrels per day
OPEC	Organization of Petroleum Exporting Countries
QUOTA	import quota scenario

CHAPTER 1

INTRODUCTION:

INCREASING IMPORT DEPENDENCE

Both the oil embargo of 1973-1974 and the less dramatic energy events precipitated by the Iranian revolution have brought home to Americans how disruption in the flow of imported oil threatens both our security and economy. In 1972, the Nation imported 29 percent of its oil; in 1978, we imported 43 percent. In 1978, over two-thirds (5.6 million barrels per day (MMB/D)) of U.S. oil imports came from the Organization of Petroleum Exporting Countries (OPEC), the Arab producer nations supplying 36 percent of imports (2.9 MMB/D). The Nation was vulnerable to supply disruption in the early 1970s and is more vulnerable now.

This report evaluates alternative Federal policies designed to reduce oil imports through the price mechanism and import quotas. We examined the effects these policies had on energy, especially oil imports and domestic production. We also looked at how the policies affect economic indicators such as inflation, unemployment, growth, consumer income, and energy prices. Chapter 6 contains our analysis of certain specifics of the administration's recent proposal to deregulate crude oil prices and levy a tax on the oil industry's windfall profits.

THE NATURE OF THE OIL IMPORT PROBLEM

OPEC can take any of three related actions which would affect the economic health and national security of the United States. It can embargo exports as it did in 1973-74, it can raise prices abruptly as was also done at that time (and also in 1979 in response to Iran's oil production shutdown and a tight world oil supply), and it and all other exporters can maintain high prices through restricting production.

High and rising oil prices-- their economic effects

Between 1971 and 1978, the price of OPEC marker crude increased almost sevenfold while prices of all

unfinished commodities rose by 90 percent. ^{1/} Much of the difference in growth rates of crude oil versus other prices is due to OPEC's oil embargo against certain Western nations and the associated large increase in crude oil prices in 1973 and 1974. On December 17, 1978, OPEC decided to raise oil prices 14.5 percent by the end of 1979, implying an average price rise of 10 percent for the year. However, OPEC ministers met again on March 26, 1979, and agreed to make the 14.5 percent increase effective for the second quarter of 1979, and to allow individual members to tack on to their prices whatever premiums the market would bear. In addition, some OPEC members' decisions to reduce compensatory production as Iran's production resumes will maintain the tightness of the oil market. Additional price increases at the June quarterly meeting have reinforced the trend toward ever higher prices. These present and probable future increases in real oil prices will have damaging effects on the U.S. economy.

1. Effects on inflation and unemployment

The most damaging feature of the oil price increase during 1973 and 1974 may not have been its final level, but the abruptness of the climb. That jump carried twin dangers of inflation and unemployment and was a main factor pushing the industrialized world into its worst post-war recession. The inflationary impact of the oil price rise was clear from the beginning. It inflated costs which were passed through as higher prices, in turn stimulating higher wage demands to catch up with the cost of the living. The unemployment effect was not so obvious. The price rise had caused a sudden and continuing outflow of funds to oil exporters, funds which they could not spend on imports as rapidly as they flowed in. Aggregate demand in the industrialized countries was consequently reduced, leading to lower sales, layoffs, further reductions in demand

^{1/}U.S. General Accounting Office, "More Attention Should Be Paid to Making the U.S. Less Vulnerable to Foreign Oil Price and Supply Decisions," EMD-78-24, Jan. 3, 1978, p. 12; "Economic Report of the President, Jan. 1979, Table B-55, p. 246.

and sales, further layoffs, and so on. Monetary policy also became more restrictive, causing interest rates to rise and, eventually, investment to fall, further augmenting the decline in aggregate demand. According to economists Edward Fried and Charles Schultze, the United States and other nations paid most attention to the inflationary effects during 1974 and 1975. They applied a number of measures which further reduced aggregate demand and thereby exacerbated the resulting unemployment. 1/

2. Effects on economic growth and well-being

A real increase in oil prices means a slower advance in living standards for Americans. This is because each imported barrel will cost more in goods and services than before, goods and services we otherwise would consume ourselves. While this is a true cost, it does not seem to be excessive. A Brookings Institution study put the losses stemming from a rise of \$3 to \$10 per barrel (real prices) as the difference between 20 and 22 percent improvement in living standards from 1973 to 1980. 2/ In terms of real Gross National Product (GNP), another Brookings study put the loss in 1974 caused by the OPEC price increase at \$35 billion, only 2 percent of the total. 3/

3. Balance of trade

In addition to slowed economic growth, rising oil prices have increased concern over international payments and the value of the dollar. A full analysis of our international trade position is beyond the scope of this report. However, there are certain basic facts which should be kept in mind concerning the dollar.

1/Edward Fried and Charles Schultze, "Overview", in Edward Fried and Charles Schultze, (eds.), Higher Oil Prices and the World Economy (Washington, D.C.: Brookings, 1975), p. 48.

2/Ibid.

3/George Perry, "The United States", in Fried and Schultze, op. cit., p. 103.

- First, the massive increase in our oil import bill does contribute to our balance of trade deficit and the decline of the dollar.
- Second, that increase is not presently the primary cause of our trade deficit. That cause is the faster growth and higher inflation in the U.S. economy compared with the economies of other industrialized nations, especially Germany and Japan. Between 1975 and 1977 oil imports accounted for only one-third of the growth in total imports. 1/ In 1978, oil imports actually dropped by \$2.4 billion while our trade deficit grew by \$1.9 billion. 2/ Therefore, the 1978 deficit increase was largely due to non-oil trade.
- Third, because we have flexible exchange rates, this problem should be self-correcting to some extent. Economic theory states that as U.S. exports become cheaper abroad, demand for them will increase. Imports will become more expensive here and demand for them will go down.
- Fourth, since our deficit comes primarily from fast economic growth, the simplest way to cut the deficit is to slow down growth. But slowing growth will mean lower output and higher unemployment, pushing the country toward recession.

Thus, the economic effects of high and rising oil prices are serious. Probably the greatest damage is done in the areas of inflation and unemployment. The damage to economic growth has been significant, but probably less serious. Finally, large oil imports contribute to our trade deficit and so to the decline of the dollar, even if they have not been the primary cause of larger deficits over the past few years.

1/Economic Report of the President, 1979, p. 296.

2/U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, Feb. 1979, pp. 522-523.

Oil supply disruptions

Crude oil supply disruptions may result from the following plausible events over which the United States has little control:

1. Oil embargo or production curtailments.
2. Oil production shutdown due to internal political strife (e.g., the Iranian situation).
3. Terrorist activities which cripple exporting capacity such as attacks on the terminals or sabotage in the Strait of Hormuz (the narrow entrance to the Persian Gulf).
4. Regional wars such as in 1967 and 1973.

The 1973 oil embargo against the United States and the recent extended loss of 5 MMB/D of Iranian oil exports vividly demonstrated the adverse economic effects and national security risks associated with oil import dependence.

An embargo threatens our national security by directly affecting our armed forces' ability to make war and by making the United States seem a less reliable ally and guarantor of other nations' security. An embargo would also severely damage the U.S. economy.

Our armed forces consume considerable oil, about 470,000 barrels per day of which one third is purchased overseas. 1/ Military requirements, in the event of general war, are estimated at 1.8 MMB/D and requirements would be somewhere in between during a local war or military alert. 2/ There is little doubt that enough oil could be diverted from civilian use to fill the gap, but diversion would, of course, exacerbate the disruption an embargo would bring to the civilian economy.

1/U.S. Department of Defense, Defense Logistics Agency, Fact Book, Fiscal Year 1977, Washington, D.C., p. 21.

2/Ibid.

No one can doubt that large oil imports raise both our and our allies' vulnerability and weaken U.S. influence on both the world in general and on those allies. This erosion of U.S. influence is partly real and partly a matter of perception. In any case, it is beyond quantification and may become stronger or weaker unpredictably.

Although an embargo is a political act, it has grave economic consequences. Indeed, those consequences are what make the embargo a potent policy weapon. The Congressional Budget Office (CBO) estimated recently that a "worst case" shortfall of 4 MMB/D for 1982 would result in GNP losses up to \$220 billion (1977 dollars) during that year. 1/ This is a serious loss. The CBO report also projected the same restriction would have increased the unemployment rate by 3.2 percentage points. 2/ By way of comparison, the recession year of 1975 saw a loss of roughly \$73 billion in 1977 dollars from potential GNP which was accompanied by an increase of 2.8 million unemployed. 3/ Obviously, the impact of an embargo would be severe.

While not as severe as the impacts of an embargo, the economic consequences of the loss of oil from a major supplier are disturbing. The General Accounting Office and others have assessed the economic impacts of Iran's oil production shutdown. In a March 1979 report, we determined that without compensating measures by the oil companies or conservation, the U.S. share of the Iranian shortfall was about 500,000 barrels per day of crude oil. At that time we estimated that prices would increase at least an additional 7 percent in 1979 due to other producers taking advantage of the tightened oil market. 4/ This price increase was estimated to result in a 1979 GNP loss (current dollars)

1/U.S. Congressional Budget Office, *The Economic Impact of Oil Import Reductions*, Dec. 1978, p. 14.

2/U.S. Congressional Budget Office, *Ibid.*, p. 14.

3/*Economic Report of the President*, 1977, pp. 188 and 220.

4/U.S. General Accounting Office, "Analysis of the Energy and Economic Effects of the Iranian Oil Shortfall," EMD-79-38, Mar. 5, 1979, pp. II-1 and IV-1 through IV-3.

of \$8.5 billion and a 1980 GNP loss of \$14 billion. The inflation rate would increase by 0.7 percent in 1979 and 0.4 percent in 1980, while unemployment would rise by 100,000 a year through 1980. The additional price increases are permanent in that as Iran resumes production, the price of oil will not drop. Thus, a short-term supply disruption will have long-term effects.

Vulnerability to embargoes and other supply disruptions obviously depends on how much oil we import and particularly how much we import from OPEC. There should be some level where we can consider ourselves in jeopardy. The Government has studied this question several times. A multi-agency review in 1975 concluded that an oil import level of 7.4 MMB/D (with OPEC accounting for 5.6 MMB/D) was a threat to national security. 1/ A recent U.S. Treasury Department report concluded that the monetary repercussions and threat to our national security of our present import dependence (43 percent) are greater now than ever before. Rising energy demand, a dramatic increase in the amount of imports and cost of oil since 1975, and an increased risk that oil imports will be interrupted by civil disturbances, terrorist acts, war, and a variety of other causes all contribute to our vulnerability. 2/ We are clearly vulnerable now and have remained so because of our inability to reduce imports.

The national interest, then, is clearly served by reducing oil imports. The question the rest of this report addresses is: What price should we pay to reduce imports?

1/Secretary of the Treasury, "Memorandum for the President--Report on Section 232 Investigation on Petroleum Imports", Jan. 14, 1975, pp. 1 and 5.

2/Secretary of the Treasury, "Memorandum for the President--Report of Section 232 Investigations on Oil Imports," Mar. 14, 1979.

CHAPTER 2

POSSIBLE OIL IMPORT POLICY ALTERNATIVES

The purpose of energy policy is to help achieve two broad national goals: adequate national security and economic prosperity. Oil imports above a certain level are certainly injurious to our economy and national security, and this report assesses alternative ways to reduce them. Of course, prices can continue to be controlled so that prices paid by the consumer are lower than world oil prices. This policy was implemented as part of the Government's 1971 inflation control program and is in effect as of this writing. By keeping prices low, this option encourages imports, but helps consumers and has other economic benefits.

In this report we compare the effects of continued controls with four broad policy options designed to reduce imports. First, domestic oil prices can be decontrolled, a policy which would cause domestic prices to rise to OPEC-determined world levels. The administration has started to phase in deregulation. Such a policy is designed to lower consumption by causing consumers to economize and raise production by making investments in the oil business more profitable.

There are two other ways to raise prices to capture the conservation effects without increasing industry revenues--taxing domestic or foreign oil. A version of the domestic tax, called the crude oil equalization tax (COET), was proposed in the administration's National Energy Plan of April 1977. The idea was to tax the two categories of oil whose price had been held down by controls until they reached world prices as of that time. This would have brought prices to consumers up to world levels while avoiding windfall profits to oil producers. The proposal also permitted newly discovered oil to receive higher prices. These provisions would both reduce consumption and increase production. Taxing foreign oil would also increase prices to the consumer and thus lower demand, but such taxes would not encourage additional domestic production.

The last policy is to directly limit the amount of oil imported. While a quota is not a pricing option, it is included in this analysis because it is a frequently mentioned alternative for reducing imports

and may be utilized to reduce imports below the level obtained under the pricing options. A quota could reduce imports to any desired level to enhance national security. The more restrictive the quota, however, the greater the disruption to the economy, which would be deprived of oil it ordinarily would have consumed. Two mechanisms could be used to satisfy the excess demand. Oil could be allocated--rationed--by coupons so that all consumers were limited to so much oil and no more, or oil prices could be left to rise to the level at which supply and demand balanced. The former system would use a standard which would not necessarily take account of individual needs while the latter system would satisfy the needs of those able to pay what would undoubtedly be very high prices. Others would be priced out of the market.

These measures, then, encompass a broad range of direct policy options for reducing imports. This study examines the major economic and energy effects of these options, allowing the Congress to better assess the relative merits of alternative oil import policies.

The main energy effects examined are:

- Changes in the amount of oil imports.
- Changes in domestic oil production.
- Changes in oil prices.
- Changes in oil demand.

Policies are also evaluated in terms of the following economic effects:

- Economic growth.
- Inflation.
- Unemployment.
- The balance of trade.
- The health of particular industries.

We used the Wharton Annual Energy Model to quantify and systematically compare the energy and economic effects

of alternative policies through 1990. The energy model is a modified version of the better known annual model, a large econometric simulation model of the U.S. economy. The Energy Model has a considerably more detailed breakdown of output by industry, particularly the energy industries.

Model results depend on forecasts of the future economic and energy climate under continued price controls. Since it is difficult to precisely predict this climate, the value of this study lies more in the measurement of relative impacts of alternative policies than in the determination of the future economic situation or an absolute level of energy supply or demand. We do not forecast the future; we do compare alternative futures. Thus, a middle-of-the-road economic forecast--described further in the technical appendix--was used as a benchmark and combined with recent OPEC price increases. The economic projection we used and the energy supply and demand associated with it are consistent with several recent forecasts.

In addition to examining policies on a consistent basis, the model allowed us to examine the costs and benefits of policies accruing over different periods of time. All policies, of course, are implemented over time, and the effects of each are likely to change considerably as time passes. Price controls and quotas tend to engender higher economic costs over time as they introduce distortions into energy markets that can lead to problems elsewhere in the economy. While price deregulation avoids these long-term distortions, it can have significant short-term negative impacts. Rapidly rising decontrolled prices contribute to inflation and unemployment and tend to depress economic growth. Taxes may have any number of long- and short-term impacts depending on their specific characteristics.

Most econometric models, including the Wharton Energy Model, determine fuel supply and demand by the relative prices of fuels, the level of economic activity, and the composition of output. Modeling the effects of different policies is primarily accomplished through price changes implicit in the policy. Although other important aspects of policies are presented, the following discussion of the different policy scenarios focuses on how the policies affect oil prices.

CONTINUED PRICE CONTROLS

Our continued price control (CPC) case extends the current regulatory regime to 1990. The basic parts of the regulatory program are the multi-tier pricing system and the Entitlements Program. The multi-tier pricing system has undergone a number of revisions since its inception under the 1971 Economic Stabilization Program, but the basic policy was to price "old" oil at considerably less than "new" oil. The result is that the composite price of old oil plus new oil was kept substantially below world levels.

The price difference between domestic and foreign oil became quite large after the 1973-74 OPEC price increases, and so the Federal Energy Administration instituted the Entitlements Program to equalize oil acquisition costs among refiners irrespective of the amount of low-cost domestic oil refined. Those refiners having more old oil than the national average must purchase "entitlements" (i.e., permits) to refine their excess domestic oil from those refiners having less than average amounts of old oil. Thus, refiners using more foreign oil are compensated. These Federal oil-pricing regulations were further refined by the Energy Policy and Conservation Act of 1975 (EPCA). This act phases out price controls over a 40-month period ending in May 1979, although they can be continued by the President through September 1981. Thus, congressional legislation would be required to extend price controls through 1990 as our scenario suggests.

In modeling our continued price control case, we assume that the world price of oil will rise 23 percent in 1979. This large price rise results from OPEC's official price increases and premiums tacked on by certain OPEC members in response to Iran's oil production shut down. After 1979, we assume the world price of oil will increase by 7 percent per year, a rate slightly above predicted long-term inflation rates. Domestic oil prices are allowed to increase at a 7-percent rate in each year.

For purposes of modeling our base case, we also had to assume a level of domestic oil production. On the basis of our extensive work on this topic, we assumed

that in 1985 domestic crude oil production will be 8.5 MMB/D. 1/

We also made an assumption about the responsiveness of oil production to oil prices for all cases modeled. Since there is no consensus on this relationship (the price elasticity of supply), we modeled and compared results of a high-elasticity case (value of 1) and a low elasticity case (value of .5). 2/ The high-elasticity case gave the expected results, which were marginally more optimistic. We ultimately used the low-elasticity case in our belief that restrictions and delays in oil leasing, along with increasing resource depletion will limit the responsiveness of domestic supply to price increases. The technical appendix discusses supply elasticities in greater detail.

Aspects of the National Energy Act of 1978 that are included in our CPC case include natural gas price deregulation, conservation, and fuel switching.

The level of economic activity is an important determinant of demand and investment in future energy supply. We used a number of current Wharton economic assumptions which we deemed reasonable. The most important ones concern Federal, State, and local government receipts and expenditures, monetary policy, government employment,

1/In late 1977, we projected that 1985 crude output would fall to between 7.8 to 10.9 MMB/D and that a prudent planning estimate would be 8 to 9 MMB/D. This figure does not include natural gas liquids.

2/Numerous theoretical and econometric difficulties lie in the way of a true estimate of the price elasticity of oil supply. To make matters worse, there are no reliable data which can be used. This is because there has been no free market in oil since the 1930s and so the observed data reflect the peculiar institutional relationships which existed during various periods in the past. Thus, the "true" relationship is masked both by time and circumstances. While we make no claim to know the "true" elasticity, making an explicit assumption has the advantage of informing the reader about precisely what our results reflect.

population, and international trade. The specific assumptions are given in the technical appendix.

PRICE DEREGULATION

Deregulation is a simple concept--prices are free to find their market level without Government interference. Since the United States has little influence over world prices, this would presumably be the world price as set by OPEC. We specified the deregulation scenario presented here prior to the deregulation plan recently instituted by the administration. The administration's plan is analyzed in chapter 6. There are three difficult issues connected with deregulation: when to deregulate, determining how much of the cost will be passed through to consumers, and whether or not to tax the windfall gains which would be captured by the oil companies.

Both the administration's and our deregulation scenarios call for domestic price increases to commence in 1979 and reach world levels in 1981. Thus, deregulation is phased in over a 2-year period and coincides with the expiration of price control authority in 1981.

We assumed that 100 percent of the increased price of crude due to deregulation will be passed through to consumers. The Congressional Budget Office also used this assumption in its analysis of deregulation. The administration apparently also assumed pass through close to 100 percent.

A further issue is whether the Congress will impose a windfall profits tax to capture some or all of the windfall gains. Our deregulation scenario does not include a windfall profits tax. The administration has suggested a windfall profits tax which imposes a 50-percent tax on the additional revenues generated by decontrol and OPEC price increases. The administration proposed that tax proceeds be applied to an Energy Security Fund in which funds would be divided between low-income assistance, mass transit, and energy investments.

CRUDE OIL EQUALIZATION TAX

The crude oil equalization tax proposed in the original National Energy Plan had three purposes: to raise the price of oil to the consumer to world levels, to simplify

domestic price controls, and to encourage the production of additional domestic oil by permitting high--but not uncontrolled--prices for newly discovered oil. COET was to be phased in between 1979 and 1981 until both first and second tier oil were priced at the level of 1977 world oil plus domestic inflation. The tax would remain in effect through the forecast period (1979 to 1990). As the administration proposed, we assume all COET tax collections would be fully rebated. Thus, once COET was fully implemented, the results would have been conceptually similar to deregulation--consumption would have been discouraged by high prices and production encouraged by high prices for the tier of newly discovered oil. Heating oil prices are exempt from the effects of the tax in both the administration's proposal and our scenario.

IMPORT FEES

Like COET, import fees (FEE) are designed to raise the price of petroleum products to the consumer through the tax mechanism. Fees are applied to both foreign crude and products to avoid a flood of untaxed imported products. As with COET, FEE is introduced in 1979 and remains in effect through 1990. FEE is also rebated. The most noteworthy difference between COET and FEE is that fees are levied on foreign oil while COET is levied on domestic oil. Because there would be an even greater difference in the prices paid by refiners, the Entitlements Program would have to be retained to equalize refinery costs. The other main difference is that fees do not affect the price of domestic crude and so do not encourage more domestic production than continued price control. Thus, import fees, which raise oil costs to the same level as COET, will have the same influence on demand but, because they do not change domestic crude prices, will have no effect on domestic production.

QUOTAS

The most radical policy option is import quotas, a quantitative ceiling on the amount of foreign oil entering the country. Scarce oil can be allocated either through an administrative rationing scheme or by letting prices rise to a level equilibrating supply and demand. If prices do not rise and formal rationing is not instituted, excess demand would cause a kind of rationing by inconvenience through long gasoline lines. Since the model we used is

designed to measure impacts of price changes, we chose to focus on the latter or "market allocation" type of quota. Thus, we modeled quotas by permitting prices to rise until demand was reduced to the available supply.

Since quotas limit imports strictly, imports can be reduced to any desired level. Quotas will entail large economic and social costs, and so should be viewed as a last resort to be used when pricing measures do not reduce imports enough. Deregulation, on the other hand, would provide import savings at lower cost than simply instituting a quota while maintaining price controls. Thus, our quotas are implemented only after deregulation has been put into effect, their purpose being to further enhance security by reducing import dependence. We subtracted successively larger amounts of imports from deregulation levels in order to see their energy and economic effects. Specifically, we posited a level of 1 MMB/D fewer imports in 1985 than in the deregulation case. We also modeled a reduction of 3.6 MMB/D by 1985. This was to achieve the 1985 import level specified in the administration's 1977 National Energy Plan. That level was 6 MMB/D. All reductions are implemented gradually, reach their designated levels in 1985, and are maintained at approximately those levels through 1990.

We applied an excess profits tax to profits above those which would have been received as U.S. prices rose above world levels. Thus, one would expect quotas to result in domestic production responses similar to those under deregulation.

CHAPTER 3
ENERGY IMPLICATIONS OF ALTERNATIVE
OIL IMPORT POLICIES

OIL IMPORTS

One of the least desirable features of price controls is that they encourage imports by keeping U.S. consumer prices lower than world prices. The main purpose of changing this policy is to reduce import dependence. Logically, then, the first question we ought to ask is: How effective are the alternative policies at reducing imports?

All main policy options except quotas rely on the price mechanism to reduce imports. They do this by raising prices to consumers, causing consumers to use less oil over time. Furthermore, some policies also reduce imports by raising the prices that domestic producers receive. The intent is to increase the amount of domestic production. The policies which both lower the quantity of oil demanded and raise the quantity supplied are deregulation and COET. Import fees work only on the demand side. Imports under quotas, of course, are established administratively, although prices to consumers are permitted to rise in order to equilibrate supply and demand.

Table 1 summarizes changes in oil imports, domestic production, and consumption caused by the policies. Taxing schemes yield small decreases in imports; deregulation cuts imports further by both increasing domestic supply and decreasing demand; quotas, of course, are used to limit imports to the amounts specified in the scenario.

If reducing oil imports is our only concern, quotas are the best means to accomplish this. Of the pricing schemes, deregulation is the most effective method of reducing imports, since it works to both lower demand and increase supply. However, all policies have other energy and economic impacts which must be considered before their overall desirability can be properly assessed. This is especially important because as import policies become stronger the negative economic impacts also increase. The remainder of this report discusses these other impacts and attempts to balance them against the policies' effectiveness in reducing oil imports.

TABLE 1
Changes from Continued Price Controls
in Oil Production, Imports, and Consumption
Caused by Alternative Policies

	<u>COET</u>	<u>FEE</u>	<u>DEREG</u>	<u>QUOTAS</u>	
				<u>Minimum</u>	<u>Maximum</u>
----- (MMB/D) -----					
<u>1980:</u>					
Impact on total consumption	-0.5	-0.5	-0.6	-0.7	-2.0
Impact on domestic production	0.0	0.0	0.0	0.0	-0.1
Reduction in imports	-0.5	-0.5	-0.6	-0.7	-1.9
<u>1985:</u>					
Impact on total consumption	-1.0	-1.1	-1.2	-2.3	-5.2
Impact on domestic production	+0.1	-0.1	+0.5	+0.4	+0.2
Reduction in imports	-1.1	-1.0	-1.7	-2.7	-5.4
<u>1990:</u>					
Impact on total consumption	-1.0	-1.1	-1.2	-2.0	-4.8
Impact on domestic production	+0.4	0.0	+1.0	+1.0	+0.9
Reduction in imports	-1.4	-1.1	-2.2	-3.0	-5.7

OIL PRICES

Domestic oil supply, consumption, and the amount of oil imported are sensitive to the price domestic producers and exporters charge for their crude oil. Tables 2 and 3 summarize estimated domestic wellhead and refiners acquisition composite prices of crude oil. The various alternative policies change the price of crude oil considerably.

Domestic wellhead prices under the FEE scenario are the same as under CPC since the fee is placed on foreign oil only. All the windfall gains from quotas are taxed away and so the revenue received by the crude producer under quotas is the same as under deregulation.

TABLE 2

Estimated Wellhead Prices of Domestic Crude Oil

<u>Policy</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1985</u>	<u>1987</u>	<u>1990</u>
	----- (dollars per barrel, 1978 = \$8.90) -----							
CPC/ FEE	\$9.50	\$10.20	\$10.90	\$11.70	\$12.50	\$14.30	\$16.40	\$20.00
COET	10.10	11.50	13.30	14.50	15.90	19.00	22.60	29.50
DEREG/ QUOTA	11.80	15.50	20.50	21.90	23.50	26.90	30.80	37.70

Note: All prices are rounded to the nearest \$.10 to avoid creating a spurious impression of accuracy. Prices are for lower-48-States crude, and represent the average for all categories of oil.

TABLE 3

Estimated Refiners' Acquisition
Cost of Crude Oil (note a)

	<u>1980</u>	<u>1985</u>	<u>1990</u>
	----- (dollars per barrel) -----		
<u>Refinery crude oil acquisition cost</u>			
CPC	\$15.50	\$22.20	\$31.90
COET, FEE, DEREG (note b)	18.50	28.70	40.00
QUOTA:			
Minimum	19.30	37.10	46.20
Maximum	28.90	66.40	78.70

a/Refiners' acquisition cost includes foreign and domestic oil.

b/There are minor variations among these cases, but an average was used because the differences were small.

The CPC and FEE cases do not give different prices at the wellhead, but the FEE case raises consumer prices by raising the "acquisition cost" (the price paid for crude by a refiner) of crude oil. The same thing happens between DEREG and QUOTAS where the quota raises acquisition costs above DEREG levels.

Price controls keep both crude oil ("refiner's acquisition cost") and product prices relatively low. Prices in the COET, FEE, and DEREG cases will be about the same since the purpose of all three policies is to raise prices to world levels. The QUOTA case, because it limits the amount of oil, causes prices to rise higher than DEREG. The differences are certainly significant, but are not very large except in the QUOTA cases. Refiners' acquisition costs increase at a rate of 10.2 percent per year under DEREG. However, they would have increased at an 8.2-percent rate under price control. The larger differences occur in the earlier years as decontrol is being phased in. For example, decontrol raises refiners' acquisition costs by \$9.60 between 1978 and 1981 (the end of the phase-in period) while continuing control holds the rise to \$4.10. Since both quotas are phased in so that they reach their intended levels in 1985, prices increase most rapidly during the 1978-1985 period and level off thereafter. The economic impacts of these price changes are roughly proportional to their size and are discussed in detail in the following chapter.

DOMESTIC PRODUCTION

Increasing the price producers can receive should result in increased domestic oil production. The extent to which this occurs is predicated on the amount of price increase producers receive and the sensitivity of exploration and development drilling to crude oil price changes. Since deregulation provides domestic producers with a greater wellhead price increase than the other pricing policies, deregulation should increase domestic production more than the other policies.

In chapter 2, we mentioned that we assumed a moderate sensitivity of domestic production to price increases (.5 elasticity of supply) because limits on leasing and resource depletion are lowering the probability of finding large amounts of oil. Further, in already developed areas such as Texas, Louisiana, and the Gulf of Mexico, large new strikes are unlikely. Thus, the total responsiveness

of domestic supply to price increases is likely to be only moderate.

The numerical results for domestic production follow the outline suggested by economic theory. Table 1 confirms that deregulation is the most effective policy for enhancing domestic oil output, or perhaps more accurately, most effective at arresting its decline. COET is somewhat effective since it provides greater incentives than does CPC. The supply response under COET should be similar to the effects of deregulating only newly discovered oil. This is because the administration's original COET proposal included a provision which came quite close to decontrol of newly discovered oil. The FEE case follows CPC since domestic oil remains under price control, and the QUOTA scenario includes deregulation along with an excess profits tax.

ENERGY CONSUMPTION

The primary impact of alternative oil import and pricing policies will, of course, be on oil consumption. Different oil-pricing policies also change the price of oil relative to the prices of other energy forms. Consequently, the use of other fuels will also change as their prices relative to oil change. The influence each policy has on oil consumption is given in table 1. Of course, consumption is influenced by more than the price of oil. The level of economic activity in particular is a major determinant. However, the COET, FEE, and DEREG cases cause relatively little change in economic activity, and so the effects in table 1 are due mostly to oil price changes.

Our results indicate that consumption of other fuels taken together is relatively unchanged by oil policy alternatives. Consumption of other fuels increases somewhat as oil gets more expensive, but does not make up very much of the difference.

CHAPTER 4
ECONOMIC IMPLICATIONS OF
ALTERNATIVE OIL IMPORT POLICIES

Oil imports and oil prices affect the economy in a number of significant ways. At the same time the actual effects may be less than a casual observer would expect. Because energy costs are a small part of total economic costs, large changes in oil prices lead to small changes in economic aggregates.

It is a bit like making a stew of chicken and beef in order to taste the combination--just take one chicken and add one steer. Obviously, the taste will be nearly identical to beef stew.

We will point out a number of exceptions, but most oil pricing policies turn out to have only modest effects on the economy. Among these effects, the most serious is increased inflation. Charting the size of these impacts may, hopefully, add a more useful perspective to the oil policy debate.

INFLATION AND UNEMPLOYMENT

The model results indicate that all policies raise oil product prices, contributing to inflation. Impacts on unemployment are less serious. Numerical results for both are given in table 4.

These results bring out how the impacts of policies change over time. For example, while the inflationary impact of deregulation is worse during the early years, this impact dissipates rapidly so that by 1990 (actually by 1988) there is no differential impact at all. The QUOTA cases show very large impacts to 1985, but the additional inflation tapers off rapidly after 1985. This is because the quotas reach their authorized levels in 1985 and are kept approximately constant thereafter, giving the economy time to adjust to a basically stable situation.

Except for QUOTAS, the unemployment impacts are modest. Modeling the COET, FEE, and DEREG cases shows no or small impacts in any year. The QUOTA cases have, as usual, larger

TABLE 4

Additions to the Inflation and
Unemployment Rates Caused by
Alternative Oil Policies

	<u>1980</u>	<u>1985</u>	<u>1990</u>
	----- (percent) -----		
<u>Additions to CPC</u>			
<u>inflation rates</u> (note a)			
COET	.3	.2	0.0
FEE	.3	.3	0.0
DEREG	.4	.2	0.0
QUOTA:			
Minimum	.6	.3	0.0
Maximum	.8	.9	.1
 <u>Additions to CPC</u>			
<u>unemployment rates</u>			
COET	0.0	0.0	.1
FEE	0.0	-.1	0.0
DEREG	.1	0.0	0.0
QUOTA:			
Minimum	.1	.3	0.0
Maximum	.5	.6	.3

a/Rate of change in the GNP price deflator.

effects. The maximum quota also brings out the point that above a certain level the economic damage increases more rapidly than the amount of oil saving. In 1985, the addition to the inflation rate for the maximum quota is triple that of the more moderate quota. In that year, however, the maximum quota is saving only twice the amount of imported oil. A similar phenomenon is present in the case of GNP growth.

ECONOMIC GROWTH

The policies outlined in chapter 2 had the expected quantitative impacts on growth. The larger the shock to the economy dealt by higher oil prices, the larger the loss in real GNP. Table 5 shows the GNP loss--in constant 1972 dollars--for 1980, 1985, and 1990. Not even the maximum quota reduces GNP by more than 1 percent from the CPC case. Thus, the economic growth costs of alternative policies are low, with the possible exceptions of substantial quotas. These results confirm the view that despite oil's obvious role in our economy--especially transportation--significant price increases in oil should not have very great impacts on GNP. Oil makes up a very small part of the cost of doing business so the Nation's output is not greatly changed.

TABLE 5

GNP Losses

	<u>1980</u>	<u>1985</u>	<u>1990</u>
	--(billions of 1972 dollars)--		
<u>Changes from CPC</u>			
COET	\$ 0	\$ -1	\$ -3
FEE	+1	+3	0
DEREG	-3	-1	-1
QUOTA			
Minimum	-4	-6	0
Maximum	-11	-15	-14

BALANCE OF TRADE

All policy alternatives raise net exports during the early 1980s because of a decrease in imported oil. These additions to net exports gradually decline and turn slightly negative in the latter part of the decade as oil imports stabilize. The model indicates that exports continually decline slowly from CPC levels, probably because export prices go up somewhat faster under the alternative policies due to higher oil and other costs. Overall, however, the impacts are not large except in the QUOTA cases. By 1990, the maximum quota reduces a net export surplus to nearly zero. However, none of the other policies affect net exports by much more than 10 percent in any other year. In fact, deregulation causes a change of only 3 percent in total net exports over the entire 12-year period.

INDUSTRIAL IMPACTS

According to our simulations, COET, FEE, and DEREG have significant impacts on only five industries, and three of them are closely related to petroleum. Those three are petroleum and natural gas production, industrial chemicals, and petroleum refining. DEREG raises oil output by 5 percent over CPC by 1985, and 11 percent by 1990. COET raises production 4 percent by 1990. Import fees, of course, have no effect on domestic oil output.

The industrial chemical sector uses a large amount of oil, both as a fuel and a feedstock. With prices of both rising rapidly, chemical prices rise and demand for the products falls off. The experience of that industry under the three policies is similar--around a 4-percent drop in output in 1985 growing to a 5-percent drop from CPC levels by 1990.

Refinery output is also affected similarly under the three scenarios. Output drops in all three by about 6 percent in 1985 and stays about 6 percent below CPC levels in 1990. This is due to both higher costs and reduced product demand as total consumption falls. Two other industries undergo modest changes in output. One is cement with slightly more than a 1-percent increase over CPC. Cement output is partially dependent on housing investment, which undergoes a modest increase. The other is metal mining

and quarrying--where output drops by 1 to 2 percent, presumably because investment is transferred to the oil and gas sector.

As usual, the quotas have greater effects on output, nearly all of them negative except on domestic crude production. The negative impacts on industrial chemicals and petroleum refining are less severe under the 1.0 MMB/D quota. The maximum (3.6 MMB/D) quota causes drops of about 25 percent in both industries in 1985. The impacts of the minimum quota are less than half as great. In addition, the maximum quota causes small to moderate declines in construction, steel, aluminum, furniture, transportation, and wholesale and retail trade. There is still a small positive effect on cement. Thus, only the maximum quota can be said to have significant output effects outside the petroleum and related industries.

We did not investigate the precise employment effects of these changes in output. However, none of the five industries whose output is significantly affected by COET, FEE, and DEREG employs more than half a million workers. All five together employ only 1.3 percent of all U.S. workers. Consequently, the number of jobs to be gained or lost through those policies would not be large relative to total employment. The effects of the maximum quota scenario would be considerably larger, with the greatest impact being a reduction from CPC employment levels for petroleum refining and industrial chemicals of something in the neighborhood of 10 to 30 percent. This is a "worst case." Impacts under the other scenarios would be only a small proportion of this.

Thus, except under QUOTA policies, alternative pricing schemes should have modest to no employment impact outside the petroleum and related sectors.

Of course, some of these industries are fairly concentrated in one or two regions of the Nation. Oil and gas production has nearly two-thirds of its workers in Texas, Louisiana, and Oklahoma; but these are States which also account for many petroleum refinery workers, so there would be both gains and losses that somewhat compensate each other. The chemical industry is fairly well diffused throughout the country. Cement and other mining are both quite small.

CONSUMER IMPACT

Oil import policies may affect consumers' standard of living in two important ways--they can change prices of oil products and other consumer goods, and they can affect consumers' income.

During the period in which alternative policies would be instituted, price increases for oil products outpace increases in personal income. However, after 1981, personal income increases help maintain consumers' purchasing power.

COET has the least adverse effect on consumers, while quotas, which induce the largest price increases and have the highest inflationary and unemployment impacts, have the most adverse effects. Fees appear to have less adverse effects on consumers than deregulation.

Price increases

All oil import reduction policies examined result in price increases for gasoline, heating oil, and other goods and services. Prices rise considerably under continued controls. The CPC scenario leads to gasoline prices about \$1.00 per gallon higher in 1990 than 1978; heating oil prices rise around \$.75 per gallon. Table 6 shows the changes in average national gasoline and heating oil prices implied by the various policies. With the exception of quotas, gasoline prices in 1980 are \$.07 higher than they would have been under continued price controls, \$.17 higher in 1985, and \$.24 higher in 1990.

While all policies increase heating oil prices, COET again results in the smallest increase, with prices increasing \$.02 to \$.11 cents over the base case during the forecast period. This is because we shield heating oil prices from the tax, as the administration proposed to do in its COET proposal. While the import fee and deregulation scenarios show moderate increases, the low and high quotas show substantial increases in 1985 and 1990. As expected, the maximum quota has a dramatic effect on heating oil prices. In 1985 the maximum quota causes a \$1.05 increase over the base case price.

Consumers will spend more on oil products under all alternative policies. However, since the policies cause oil product prices to rise, people may consume slightly

fewer oil products and consume them more efficiently. Higher prices cause people to cut back, retrofit their homes or buy efficient new ones, and buy more fuel-efficient cars. At the same time, the entire auto fleet becomes more efficient as cars built under stricter miles-per-gallon standards make up an ever greater part of the total fleet.

The various import policies push petroleum product prices up considerably faster than prices of goods and services in general, and even continued controls permit faster price increases for oil products. Gasoline and heating oil prices under the non-quota import policies grow from about 12 to 17 percent annually between 1978 and 1981. During this same period, the alternative policies contribute to inflation rates of 7 to 9 percent for goods and services in general. Since alternative oil-pricing policies raise the price of oil relative to prices of other commodities, consumers purchase relatively less petroleum and more household services, food and beverages, automobiles, and other consumer goods. Thus, the net effect of price increases for oil and other commodities is that consumers will spend more on oil, but these expenditures will be a slightly smaller percent of their total budget.

Consumer income and oil prices

Consumers' income increases under all alternative oil-pricing policies. However, in the transition years 1978 to 1981, most policies increase petroleum product prices faster than current income.

Nominal disposable personal income growth occurs under all policies and helps to maintain consumers' ability to afford increased oil prices. Both real and inflationary effects are responsible for the growth in nominal personal income. Real income growth comes from normal growth in the economy and with productivity gains resulting from technical change and improving worker skills. Nominal income is also increased by inflation. Table 7 shows that with the exception of quotas, personal income grows faster than energy prices between 1981 and 1990. However, between 1978 and 1981, oil product prices grow substantially faster than personal income. During this period, alternative oil import policies push gasoline and heating oil prices up at rates 1 to 7 percent faster than the growth of personal income.

TABLE 6

Changes in Gasoline and Heating Oil Prices
Caused by Alternative Oil Import Policies

	<u>1980</u>	<u>1985</u>	<u>1990</u>
	----- (cents per gal.) -----		
<u>Additions to CPC</u> <u>gasoline prices</u>			
COET	\$.07	\$.17	\$.24
FEE	.07	.17	.24
DEREG	.07	.17	.24
QUOTA:			
Minimum	.09	.40	.42
Maximum	.31	1.25	1.46
<u>Additions to CPC</u> <u>heating oil prices</u>			
COET	.02	.06	.11
FEE	.07	.16	.20
DEREG	.07	.16	.20
QUOTA:			
Minimum	.09	.35	.35
Maximum	.30	1.05	1.15

TABLE 7

Effects of Alternative Oil Import Policies on
Nominal Personal Income and Oil
Product Price Growth

Annual change	CPC	COET	FEE	DEREG	QUOTA	
					Minimum	Maximum
<u>1978 to 1981:</u>	----- (percent) -----					
Personal disposable income	10.1	10.4	10.5	10.3	10.3	10.8
Gasoline price	8.9	14.0	14.0	14.0	15.5	26.9
Heating oil price	10.0	11.5	16.5	16.5	18.4	31.6
<u>1981 to 1985:</u>						
Personal disposal income	9.0	9.2	9.2	9.2	9.4	10.4
Gasoline price	7.9	8.0	8.0	7.9	11.1	15.3
Heating oil price	8.2	8.8	7.9	7.8	11.2	14.7
<u>1985 to 1990:</u>						
Personal disposable income	7.2	7.3	7.4	7.3	7.5	7.9
Gasoline price	7.3	7.2	7.2	7.2	5.9	5.3
Heating oil price	7.2	7.6	6.9	6.9	5.3	4.8

The income of many individuals is also reduced by increased unemployment resulting from alternative oil pricing policies. However, increased Federal income transfers to individuals partially offset the increased unemployment and help maintain the purchasing power of the unemployed and other transfer payment recipients. Increased Federal transfers in the various import reduction policies are the result of the higher unemployment, brought about by several of the alternatives, inflation, and slower economic growth. Federal and State transfer programs such as unemployment insurance, supplemental unemployment benefits, welfare, and social security respond to inflation because many of them increase as the cost of living rises. Thus, increasing applications for assistance due to higher unemployment and higher payments due to increases in the cost of living are responsible for the observed increase in Federal transfers. Further, the more severe the unemployment and inflation effect of the policy, the greater the resulting Federal income transfers to individuals.

While consumers appear to be adversely affected by oil import reduction policies during the years that oil prices rise rapidly to world levels (1978 to 1981), the policies are far less burdensome to consumers after the economy has adjusted to the higher prices.

CHAPTER 5

GENERAL EVALUATION OF COSTS AND BENEFITS OF ALTERNATIVE POLICIES

The results we obtained using the modeling approach to contrast alternative policies point up a common policy problem: Gaining an advantage in one area (energy) means losing an advantage in another (the economy). Or, to quote a currently popular aphorism, "There ain't no such thing as a free lunch." This report clarifies the trade-offs so the question becomes how much prosperity should we give up in the short term to reduce oil imports and, hopefully, gain both greater prosperity and security in the longer run?

WHAT ENERGY POLICY IS "BEST"?

We can certainly achieve whatever level of oil imports we wish by imposing quotas. This approach, when combined with domestic price decontrol and taxes on additional company revenues also results in higher oil production. Simply decontrolling prices, of course, will give us at least the same domestic production benefit. Thus, the only part of QUOTAS which is distinctive is the further reduction in imports attributable to the barrel limitation. Of course, these import reductions are gained at the expense of our economic goals. For example, the moderate 1 MMB/D saved by the lower quota costs us an additional \$5 billion in lost real GNP in 1985 than does decontrol. The 3.6 MMB/D saved under the maximum quota costs the economy about \$15 billion in additional lost real GNP. The story is similar for inflation and unemployment. The moderate quota means the inflation rate would be one-tenth of 1 percent higher in 1985 than would be the case under DEREG. The maximum quota would add nearly a full percentage point to the inflation rate. For unemployment, 1985 would see an additional 300,000 jobless under the moderate quota, and the maximum quota would add about double that to the jobless roll. Is it worth it? Does saving the additional oil enhance our security enough to offset these economic costs? That is a fitting topic of debate. However, our first impression would be "no." Deregulation will involve appreciable costs, at least in the short run, and in our judgment those costs are sufficiently high and the import savings sufficiently large to make still higher costs relatively more undesirable than the benefits gained.

What about the less stringent policies, COET and FEE? DEREG lowers oil imports by about 600,000 barrels per day more than COET or FEE by 1985 (nearly 1 MMB/D more in 1990), largely through increasing domestic production. The prices consumers pay for petroleum products are similar. Of course, COET does result in more domestic oil through granting higher prices to newly discovered domestic petroleum than does FEE. This case is a bit less clear cut because DEREG policies usually result in higher short-term but lower long-term economic costs. For example, COET and FEE lead to better economic growth between 1980 and 1985, but by 1990 GNP losses under FEE are about the same as in DEREG and COET losses are larger than under DEREG. The same pattern holds true for inflation and unemployment--slightly lower rates than DEREG in the early years and equal or slightly higher rates in the later years. Overall, the differences between DEREG and the tax cases are much less than those between DEREG and the QUOTA cases. Thus, for roughly the same "price" we can have about 400,000 to 500,000 barrels per day more domestic oil in 1985 and 600,000 to 1 million barrels per day more oil in 1990. The somewhat greater economic discomfort of the early years seems worth the extra oil, especially since most impacts are about the same by 1985 and decontrol would reduce the amount of Government intrusion into the economy.

One more alternative is to preserve price controls. Continued controls do keep petroleum prices, inflation, and unemployment lower than deregulation in the short term, although losses on these fronts are eventually made up. These benefits, however, impose some heavy costs. Controls encourage oil consumption, discourage production, and lead to significantly higher imports. Thus, the disadvantages that controls have imposed on us to date would be exacerbated. The costs could go higher. U.S. imports account for the largest single slice of the international oil trade. Substantial expansion of U.S. imports cannot help but add significant strains to an already tight world oil market. The experience so far in 1979 has shown that the oil exporters will take advantage of tight supplies to raise prices. To risk more 1979s seems shortsighted.

Of course, this charting of the costs and benefits of alternative oil import policies is only partial. We did not examine the possible international implications of the various policies, especially OPEC's possible reactions. We did not analyze how the policies would affect the oil

companies' financial position. We also did not go into the environmental or quality-of-life implications that the various policies have. Finally, we did not do a great deal with detailed regional or industrial impact. All these are relevant and are fitting topics for further research.

Overall, our comparative analysis shows that a deregulation policy holds about the right combination of costs and benefits for the Nation. Reducing oil imports is an important national goal, but one that should not be pursued with no regard to cost.

CHAPTER 6
OBSERVATIONS ON THE
ADMINISTRATION'S DECONTROL PLAN

On April 5, 1979, several months after this study began, President Carter proposed an oil price decontrol and wind-fall profits tax plan. The specifics of that plan are somewhat different from the decontrol scenario we had analyzed. Consequently, we made a limited evaluation of the administration's proposal to contrast it with our scenarios.

Our study had compared the costs and benefits of continued controls versus alternative policies designed to raise the price of oil to world levels. Continued control purchases temporary relief from oil price increases and associated inflation. The cost, however, is higher consumption, lower domestic production, and higher imports.

There are other, more mundane problems with price controls. The program is complex, subject to fraud and manipulation, and is often administered ineptly. We have noted some of these problems in the past. For example, we have criticized the Department of Energy's failure to monitor and enforce price regulations adequately; its failure to resolve important regulatory issues; the inequities in crude oil prices paid by certain classes of refiners; the restraints price regulations have put on expanding domestic refining capacity; and the perverse effects associated with some aspects of the Entitlements Program. ^{1/} Although specific administrative or enforcement problems can be ameliorated, any complex program which clearly runs counter to the interests of those being regulated will be subject to chronic abuse and mismanagement.

^{1/}Letter Report to Congressman Randall on the Cost of Living Council Regulation of the Oil Industry, B-178205, June 24, 1974; Letter Report to Senator Ribicoff on FEA's Implementation of the Fuel Allocation Programs, OSP-75-15, July 23, 1974; "Domestic Crude Oil Pricing Policy and Related Production," OSP-75-3, Aug. 19, 1974; Letter Report to Senator Ribicoff on FEA's Enforcement and Compliance Efforts, OSP-74-7, Dec. 6, 1974; Letter Report to Senator Ribicoff on FEA's Progress (continued on next page)

Oil price controls exact significant economic, security, and social costs and are difficult to administer effectively. There are costs associated with all oil-pricing policies, but decontrol would probably minimize them better than the alternatives we have examined.

THE ADMINISTRATION'S DECONTROL PLAN

The administration has announced a series of actions which will progressively raise prices of domestic crude oil until they are equal to the world price by September 1981. The more than 2-year phase-in period was designed to spread out the negative economic impact of decontrol. Considering our current economic uncertainties, gradual is clearly preferable to sudden decontrol.

The effects of the administration's decontrol plan depend on several factors, three of the most important being the plan's implementation schedule, the base from which prices rise, and the final level of prices. The plan itself is actually the decontrol schedule, the rate at which first-tier oil is transferred to the second tier and the rate at which second-tier prices are raised to world levels. We incorporated the administration's schedule and base case prices into our simulations of the plan's effects. However, we chose to use our own world oil price projections because we are considerably less optimistic about the future of world oil prices

1/(continued from previous page) in Redirecting the Compliance and Enforcement Program and the Results of the Initial Crude Oil Producer Audits; OSP-75-12, Mar. 31, 1975; Letter Report to Senator Ribicoff on Problems of Independent Refiners and Gasoline Retailers, OSP-75-11, Apr. 4, 1975; Letter Report to Senator Ribicoff on FEA Efforts to Audit Domestic Crude Oil Producers, OSP-76-4, Oct. 2, 1975; Statement of Monte Canfield, Jr., Director, Energy and Minerals Division before the Subcommittee on Energy and Power, House Committee on Interstate and Foreign Commerce, on H.R. 2788 and FEA Compliance Activities, Apr. 4, 1977; 10 Members of the New England Senate Delegation on FEA's System for Monitoring Heating Oil Prices, EMD-77-63, Aug. 25, 1977; "Review of the FEA's Compliance Activities in the New England Area," EMD-77-71, Nov. 7, 1977; "U.S. Refining Capacity: How Much is Enough?," EMD-78-77, Jan. 15, 1979.

than the administration. Specifically, because of the premiums being charged by most oil exporters, our projection of 1979 world oil prices is about \$1 per barrel greater than the administration's. Because we foresee higher world prices, the impacts of the administration's decontrol plan are often higher in our simulations than in theirs. Given the current uncertainties, 1979 prices may well turn out to be considerably higher than our projection. Thus, the reader might consider our economic impact of decontrol as moderate and the administration's as optimistic.

Deregulation should also lower oil consumption and raise domestic production by increasing prices. Our simulations indicate that the administration's plan would not affect oil consumption in 1979; but by 1985 it would be around 500,000 barrels per day lower than under continued price control. Domestic production would rise slowly, showing little change in the first years but growing to a level about 500,000 barrels per day higher in 1985 than would have been the case under controls. The effects on production and consumption mean a progressive lowering of imports below what they would have been without decontrol. Roughly, 1979 would see imports reduced by 100,000 barrels per day; by 1981, imports would be about 500,000 barrels per day lower; and by 1985, imports would be about 1 MMB/D below the base case level. These import savings are quite similar to those projected by the administration.

Our decontrol scenario, as presented in chapter 3, showed import savings of 1.7 MMB/D in 1985. These higher projected savings stem from a lower rate of price increases under continued price controls. Thus, decontrol means a greater price difference and consequently greater import savings. The administration's base case embodies pricing decisions under continued controls which are quite different from past practice. Between 1974 and 1978 domestic wellhead prices were permitted to rise 7 percent annually. Under the administration's continued control scenario, wellhead prices would be permitted to increase 19 percent in 1979 and 12 percent in 1980. Table 8 illustrates the differences caused by differing base cases. As in the case of oil imports, the smaller oil price increases in our base lead to consistently greater price decontrol impacts. The higher administration base case minimizes the energy benefit and economic cost of decontrol.

Given rapid price increases in the administration's base case, our modeling results were very close to the administration's published estimates. If controls had been utilized as they were during the 1974 to 1978 period, the impacts of decontrol would be closer to the results of our decontrol scenario.

The administration's deregulation plan appears to have little effect on either economic growth or unemployment. The model simulations show the greatest GNP loss is \$2 billion in 1981 (1972 dollars) which is not significantly different from the base case projection. Unemployment under deregulation is the same as under the base in all years except 1981, when the rate is 0.1 percentage points higher.

Inflationary impacts are more serious. The modeling results show that decontrol adds 0.1 percentage points to the inflation rate as measured by the Consumer Price Index in 1979. In 1980 this rises to 0.2 points and in 1981 to 0.4. After 1981, inflation rates are generally 0.1 percentage points higher under deregulation. Our simulations indicate that the administration's decontrol plan would add about 1 cent per gallon to heating oil and gasoline prices by the end of 1979, about 3 cents by 1980, 6 to 7 cents by 1981, and 7 to 8 cents by 1982. While these impacts from deregulation are not very large, they come on top of high increases which would be experienced under continued controls. Using the administration's domestic "base case" and our world oil prices, gasoline prices would rise roughly \$.33 per gallon from 1978 to 1982 under continued control. Heating oil prices would rise about \$.27 per gallon. If OPEC increases its prices above the projection we made in March and used in this report, as now seems likely, the actual increase would be larger.

THE WINDFALL PROFITS TAX

The administration has presented the Congress with a proposal to tax away 50 percent of the additional revenues arising from decontrol beginning January 1, 1980. While the administration's "windfall profits tax" appears as a single excise tax levied on windfall revenues, it contains two distinct elements. The first element is a tax on the revenue generated by moving first and second tier oil to the world price. We will call this the "old-oil decontrol tax" because it is levied on oil discovered before

TABLE 8
Comparing the Impacts of GAO and Administration
Crude Oil Price Decontrol Scenarios

<u>Changes from continued price control</u>	<u>Impact of GAO's decontrol scenario</u>			<u>Impact of administration's decontrol scenario</u>		
	<u>1980</u>	<u>1981</u>	<u>1985</u>	<u>1980</u>	<u>1981</u>	<u>1985</u>
Additions to inflation rate (note a)	.4	.6	.2	.2	.4	.1
Additions to the unemployment rate (note b)	.1	.1	0.0	0.0	.1	0.0
GNP Losses (billions of 1972 dollars)	-3	-3	-1	-1	-2	0
Change in oil imports (MMB/D)	-.6	-1.0	-1.7	-.2	-.5	-1.0
Change in oil consumption (MMB/D)	-.6	-1.0	-1.2	-.2	-.4	-.5
Change in domestic oil production (MMB/D)	0.0	0.0	.5	0.0	.1	.5
Additions to gasoline prices (cents/gal.)	.07	.13	.17	.03	.06	.08

a/Percentage change in the Consumer Price Index.

b/Additional percent of labor force unemployed.

June 1979. The second element is a permanent tax on revenues which companies earn on domestic decontrolled oil if OPEC raises world prices faster than the U.S. rate of inflation. We will call this the "OPEC price hike tax" to differentiate it from the old-oil decontrol tax. The basic distinction is that U.S. Government action creates the revenues taxed by the old-oil decontrol tax through its decontrol schedule while OPEC action creates the revenues subject to the OPEC price hike tax.

The old-oil decontrol tax is being proposed as a matter of equity. As the President stated, the tax was "to prevent unearned, excessive profits which the oil companies would receive as a result of decontrol. 1/ The tax would be on additional revenues received from the sale of oil that would have been produced anyway under controlled prices.

Although the tax is labeled as a 50-percent tax, actual collections will be small. This is because the tax itself is deductible in computing taxable income for corporate income tax purposes and does not apply to various types of revenue. The administration projects that decontrol will generate \$17 billion in increased gross receipts to the oil companies and \$13 billion in additional taxable income in 1980 and 1981. The old-oil decontrol tax would take \$2 billion. The administration's figures show \$86 billion in gross revenue additions and \$50 billion in additional taxable income from 1980 through 1985. Seven billion dollars would be taken by the old-oil decontrol tax. However, oil companies and royalty owners will pay 61 percent of their additional net increase in oil receipts in combined corporate income and windfall profits taxes. Thus, they would keep about \$22 billion from 1980 to 1985. 2/

1/President's statement of Apr. 26, 1979.

2/All revenue and tax estimates from: U.S. Treasury Department, Office of Tax Analysis, "Summary of Additional Oil Receipts and Taxes Under Decontrol and the Windfall Profits Tax," Apr. 27, 1979.

If world prices turn out to be higher than the administration expects, revenues from decontrol would also be higher. For example, our price scenario averages 9 percent above the administration's between 1979 and 1982. Thus, total revenues coming from decontrol would average about 9 percent higher.

Like the old-oil decontrol tax, the OPEC price hike tax will be levied at a 50-percent rate. According to the administration, a real increase of 3 percent per year in world oil prices would result in additional gross tax receipts of \$14 billion from 1980 to 1985. We believe that the administration's OPEC price hike tax will collect more money than might be expected. This is because their base price above which windfall profits are calculated is unrealistically low. According to the administration's windfall profits tax bill (H.R. 3919), additional taxable revenues would be calculated from a \$16 per barrel base world oil price, a level reached during May. ^{1/} OPEC will have the opportunity to raise its official price in the two quarterly meetings it will hold before the end of 1979. Moreover, certain members continue to add premiums to the official price. Therefore, world crude oil prices may go on rising as they have during the first half of 1979 (about 19 percent). ^{2/} Thus, the price of crude oil at the end of 1979 may be closer to \$20 than \$16 a barrel. If this scenario is plausible, \$20 a barrel would be a more realistic base price for calculating windfall profits. If \$16 is used, gross windfall profits between 1980 and 1985 would be about \$29 billion higher than if \$20 were used. If the Federal government taxed away 50 percent of this, it would receive an additional \$14 billion, the approximate loss to the oil industry between 1980 and 1985 from setting a low world base price.

The OPEC price hike tax may have certain undesirable side effects. Specifically, by taxing domestic oil, it tends to give less of an incentive to companies

^{1/}U.S. Department of Energy, Weekly Petroleum Status Report, May 18, 1979, p. 3.

^{2/}Ibid.

to produce domestically. This is because the tax would lower the effective incentive price (selling price minus the tax) for producing domestic oil resulting in lower production and higher imports. Moreover, the tendency to invest abroad will be greater as the differential between OPEC and market incentive base prices increases.

If the windfall profits tax passes, the administration intends to spend the proceeds on assistance to low income households, mass transit, and energy supply and conservation investments. Low-income households would receive 18 percent of the spending, mass transit would receive 7 percent, and energy supply and conservation 75 percent. Thus, the great majority of trust fund revenues are to be spent directly on energy or on energy efficient mass transit.

Based on our prior work, we can suggest a number of areas where public funds can be usefully spent on energy if the windfall profits tax is approved. For example, we have criticized the present and former administrations for their lack of initiative on conservation. As we stated this past March,

"First, the Government needs to get its conservation act together. There is no reason to believe that the world is not going to continue to experience periods of tight supply and upward pressure on prices. The time is simply here to bite the bullet on conservation." 1/

Finally, we have pointed out the need to promote the use of coal and renewable energy resources to replace increasingly scarce oil and gas.

1/U.S. General Accounting Office, "Analysis of the Energy and Economic Effects of the Iranian Oil Shortfall," EMD-79-38, Mar. 8, 1979, p. 6.

TECHNICAL APPENDIXSCOPE OF REVIEW

We have attempted to include a broad range of oil import policy options in this study. However, the reader would be well advised to keep in mind both what we have included and what we have excluded. Our primary purpose was to compare the effects of alternative policies rather than forecast future levels of production, consumption, imports, etc. Furthermore, all our options rely completely or largely on the price mechanism--administrative actions such as rationing have not been considered.

As we mentioned in chapter 5, we did not address the international implications of the various policies. Detailed effects on oil company operations and profitability were not included. Environmental effects were excluded as were detailed regional analyses. Clearly, a truly comprehensive evaluation of U.S. oil policy should include these components. Hopefully, this study will be one step in that direction.

The various energy and economic assumptions used to model our base case CPC are presented here. The five other policy scenarios (deregulation, COET, FEE, minimum quota, maximum quota) are modifications of the base case. Changes necessary to base case assumptions were discussed under the presentation of the other cases in chapter 2. While we selected the most reasonable assumptions based on information available at the time of our modeling, we must again remind the reader that the purpose of this analysis is to compare a number of alternative policies and not to predict future oil supply and demand.

ENERGY ASSUMPTIONS

Modeling our base case required making assumptions about domestic oil production and domestic and world oil prices. Moreover, it was necessary to decide how much longer than the May 1979 expiration date to continue price controls. Further, alternative policies to continued price controls increase the price of crude oil and products. Thus, it was necessary to make assumptions about the relationships between domestic oil price increases and domestic production and consumption (elasticities of supply and demand) and how much of the additional oil costs will be passed through to the consumer.

Continuation of price controls through 1990

Price controls became discretionary on June 1, 1979, and they expire in September 1981. However, for purposes of comparing deregulation and other policies to continued price controls, our base case extended controls throughout the length of the forecast period (1990). Lifting controls in 1979 would be the same as immediate deregulation, an alternative rejected by both the administration and Members of Congress. Lifting controls in 1981 would certainly show some differences from immediate deregulation and is based on current law. However, the results would be similar to our deregulation case. Modeling price controls throughout the forecast period provided a distinct base case through which the full impacts of alternative policies can be measured.

Domestic oil production

Domestic oil production was assumed in the base case and determined by the model in all other scenarios. We assumed that domestic oil output in 1985 would be 8.5 MMB/D.

We have done extensive work on projecting domestic production and are in the process of expanding that work. In late 1977, we projected that 1985 crude output would fall in the 7.8 to 10.9 MMB/D range. We further stated that a prudent planning estimate would be 8 to 9 MMB/D. Our 1985 output assumption (8.5 MMB/D) was thus a reasonable estimate. Once this assumption was made, we were able to observe how strongly and in what direction alternative policies push domestic oil production.

World oil price

We assumed that the world price of oil will rise 23 percent in 1979 and 7 percent thereafter. This means that average landed cost of imported oil will be \$17.90 for 1979.

The large price increase in 1979 results from OPEC's official price increases and premiums tacked on by certain OPEC members in response to Iran's oil production shutdown. By May 15, or less than half of 1979, the price of world crude oil already increased by nearly 19 percent. This results from a 10-percent increase in the average base price and premiums ranging from \$.90 to \$3.67 a barrel

added to the base price by certain OPEC members. 1/ Although Iran has resumed limited production, other OPEC members have reduced compensatory production. It is thus likely that 1979 will continue to see more increases in the world price of crude oil. Therefore, for 1979 the world oil price increase will undoubtedly be higher than 19 percent. Our 23-percent world oil price increase for 1979 might even be considered optimistically low, and we believe it is more realistic than the Department of Energy's apparent 16-percent world oil price increase over 1978. 2/

After 1979, we assume, as does DOE, that world oil prices will increase by 7 percent annually. This means that OPEC will be only marginally successful at raising prices after 1979 at rates only slightly above predicted inflation rates.

Domestic oil price

Domestic oil prices are also allowed to increase at the rate of 7 percent a year. While under price controls DOE could have raised domestic prices by up to a ceiling of 10 percent per year, actual rate increases have been about 5 percent per year since 1976. 3/ Some domestically produced oil (about one-third) can be sold at the world price under price controls (Naval Petroleum Reserve, North Slope, and stripper) and the world price has been increasing faster than 5 percent a year. Thus, we assumed that the price of domestically produced oil would also increase by slightly above the rate of inflation.

Supply elasticity

The relationship between the price of oil and supply (price elasticity of supply) is important to modeling the

1/U.S. Department of Energy, Weekly Petroleum Status Report, May 18, 1979, p. 3.

2/Derived by taking DOE price, surcharge, transportation, and quality differential data averaged for all 1979.

3/U.S. Department of Energy, Monthly Energy Review, Apr. 1979, p. 77.

production effects of alternative policies. Since there is no consensus on the supply elasticity, we modeled and compared results of a high-elasticity (value of 1) and a low-elasticity case (value of .5). We ultimately used the low-elasticity case in our belief that restrictions and delays in oil leasing, along with increasing resource depletion, will limit the responsiveness of domestic supply to price increases.

There is no consensus on the relationship of the price of oil and the supply response because of numerous theoretical and econometric difficulties in estimating oil supply elasticities. In addition, there has been no free market in oil since the 1930s and so the observed data reflect the peculiar institutional relationships which existed during various periods and not the unfettered interplay of supply and demand. Thus, the "true" relationship is masked by both time and circumstances.

The somewhat sparse and unsatisfactory econometric literature on the subject indicates a high elasticity. However, we feel the lower elasticity is more reasonable. A high elasticity is predicated on two factors--that there is a lot of oil to be found and that market forces will be allowed to work. Lower finding rates have caused our oil reserves to decline at an average rate of about 4 percent a year since 1970 despite the discovery of 9.5 billion barrels of oil in Alaska. ^{1/} While there probably is considerable oil left for the finding, many, if not most, of the areas where it may exist are either completely off limits or subject to indeterminate delays because of Federal regulation. For example, there is a wilderness area located between Prudhoe Bay and the MacKenzie Delta. Large finds have been made in the latter areas, but drilling is doubtful at best in the wilderness area. Despite considerable pressure, leasing activity on the Atlantic and Pacific Outer Continental Shelves has been limited (Baltimore Canyon, California) or non-existent (Georges Bank, Georgia Embayment). With limited or no leasing, elasticity is essentially irrelevant since the market force of price incentives cannot operate. In already-developed areas

^{1/}American Petroleum Institute, Basic Petroleum Data Book, 1975, updated through Apr. 1978, section II, tables 2 and 2a.

such as Texas, Louisiana, and the Gulf, where considerable drilling takes place in response to higher prices, large strikes are not likely. Thus, the total responsiveness of domestic supply to price increases is likely to be small.

Demand elasticity

The relationship between the price of oil and demand (price elasticity of demand) is crucial to modeling conservation effects of alternative policies. The Wharton Annual Energy Model contains short-run demand elasticities of -0.1 to -0.3 over the forecast period. The average is -0.2 over the period, peaking at -0.3 in 1983-1985. This reflects fairly inelastic demand in the short run.

Econometricians were able to measure the price elasticity of demand with some precision for the first time during the Arab oil embargo, when oil prices increased dramatically. Results of such studies show that while price is an important determinant of oil demand, short-run oil demand is fairly inelastic. ^{1/} There is little consensus on the exact magnitude of overall petroleum demand partly because elasticities differ over the range of products and sectors using petroleum. However, the literature suggests that demand elasticities for the residential, industrial, and transportation sectors generally range from -0.1 to -0.4. ^{2/} Further, in modeling the administration's deregulation proposal, the Congressional Budget Office used demand elasticities of -0.2 and -0.3 in 1985 for the various petroleum using sectors compared with our overall elasticity of -0.3 in that year. ^{3/} Thus, the demand elasticity used in our modeling is in line with what is suggested in the literature. Moreover, our slightly higher elasticity helps explain why we show a greater conservation effect of deregulation in 1985 than does the Congressional Budget Office.

^{1/}James Edmonds, A Guide to Price Elasticities of Demand for Energy: Studies and Methodologies, Oak Ridge Associated University, Aug. 1978, pp. 8, 9.

^{2/}Ibid., pp. 21, 22.

^{3/}U.S. Congressional Budget Office, The Decontrol of Domestic Oil Prices: An Overview, May 1979, pp. 15-17.

Pass-through of price increases
to consumers

The impact alternative oil import policies have on consumers is dependent upon how much of the price increases gets passed through to the consumer. For all alternative policies resulting in price increases, we assumed that refiners fully passed crude oil price increases on to consumers. The Department of Energy and the Congressional Budget Office used similar assumptions.

We believe there will be 100-percent pass-through because the oil industry is not fully competitive. Moreover, it would be institutionally difficult to have less than 100-percent pass-through because independent refiners could not absorb the unpassed costs as well as the integrated (both production and refining) companies. Being put at a competitive disadvantage, independent refiners would therefore be likely to employ political power and legal challenges in order to avoid absorbing these costs.

Since DOE originally chose a pass-through level of 66 percent, we modeled our deregulation case with both 100-percent and 66-percent pass-through. As expected, the 66-percent case lowered the effect deregulation would have on oil product prices substantially.

ECONOMIC ASSUMPTIONS

Energy supply and demand are greatly influenced by the state of the economy and Federal economic policies. We generally used Wharton projections for the state of the economy and Wharton assumptions for such important economic factors as Federal, State, and local government receipts and expenditures, monetary policy, government employment, population, and international trade.

Economic growth

The level of economic activity is an important determinant of demand and investment in future energy supply. We used a GNP projection which showed substantial but declining growth. For example, real GNP (1972 dollars) grew at an average annual rate of 3 percent between 1978 and 1987, ranging from 4.2 percent in 1978 to 2.2 percent in 1987.

In 1985, we projected real GNP (1972 dollars) will be 1,734.7 billion dollars. This is slightly higher than Wharton's most recent projection for 1985 (1,681.8) and lower than the Department of Energy's 1985 GNP projection used in modeling the impacts of deregulation (1,790 billion). ^{1/} Our slightly pessimistic projection resulted in lower oil consumption and import levels than the Department of Energy's. However, lowering economic growth in the base GNP level does not alter the relationship between alternative policies and the base case.

Inflation

The Wharton Annual Energy Model's GNP deflators were used for our base case projections of inflation. Our base case inflation rates were generally lower than those used by the Department of Energy deregulation modelers during the period in which deregulation would be phased in (1979 to 1981) and generally higher in the time period immediately following (1982 to 1984).

The Government policy and other assumptions used in the base case are presented below. They were all current Wharton assumptions at the time the base case was constructed.

Federal Government receipts

1. A tax cut of \$16 billion implemented on January 1, 1980.
2. Future personal income tax cuts designed to neutralize the tax rate increases caused by inflation.
3. No changes in excise taxes except a \$2-billion reduction in the telephone excise.
4. Social insurance receipts as projected in the current law. This means regular increases starting in 1979.

^{1/}The Wharton EFA Annual Model, Pre-Meeting Solution, Mar. 27, 1978, p. 1; Interview with Scientific Time-Sharing, the consulting firm that modeled the impacts of deregulation for the Department of Energy.

Federal Government expenditures,
1977 to 1988

1. Real defense spending--1.3 percent increase per year.
2. Real non-defense spending--3.1 percent increase per year.
3. Real transfer payments to persons--3.7 percent increase per year.
4. Nominal net interest paid--3.2 percent increase per year.
5. Nominal grants-in-aid to State and local governments--9.5 percent increase per year.

State and local government
expenditures and receipts

1. Expenditures grow an average of 2.7 percent per year.
2. Receipts grow at rates which maintain State/local government surpluses.

Government employment

1. Federal Government employment grows very slowly, from 2.758 million in 1978 to 2.850 million in 1988.
2. State/local government employment grows at a 2 percent rate over the forecast period.

Monetary policy

1. Monetary policy is restrictive through 1981, becoming slowly less restrictive thereafter.

Population

1. We used the latest Census Bureau projections of population and households. These were also Wharton's current assumptions.

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