TAXATION AS A TOOL OF NATURAL RESOURCE MANAGEMENT: OIL AS A CASE STUDY

A reliable supply of natural resources is essential to a modern society. The importance and finiteness of these resources require that they be consumed at rational rates and for their best purposes. Oil is one of the most vital of these resources. This Comment uses oil as a case study of the impact of tax rules on resource consumption rates, arguing that existing tax rules encourage far too high a rate of consuming limited oil supplies.

The management of our natural resources is an important part of environmental law. The quality and durability of the environment is largely dependent upon wise use of our natural resources. Squandering those resources will deny later generations the high quality of life we enjoy today. The primary method of controlling the development of these resources is through direct regulation. However, because resource development is undertaken by economic entities, policymakers have another powerful tool—taxation. This Comment is a study of natural resource management—and mismanagement—by taxation in the oil industry. The conclusions drawn for the oil industry are an important part of this Comment, but the method of analysis used is even more important as an example of how the problem should be approached in considering the tax treatment of other resources.[1]

The first step in formulating a rational tax policy toward a natural resource should be an analysis of the physical characteristics of the resource—a determination of total supply, uses, and rate of consumption. These determinations form the basis for a preliminary policy decision on whether the current rate of use of the resource is satisfactory. This policy decision is an essential first step that is too often hastily made or altogether neglected. The next step is an analysis of existing tax policy affecting the resource in question, using the previously determined policy goal as a criterion. The last step is formulating changes in tax policy which will facilitate the previously adopted policy goal.

1. The scope of this Comment is restricted to the impact of tax rules on the narrow issue of resource use rates. It is recognized that the use of natural resources, particularly petroleum resources, involves significant questions concerning environmental pollution, and that any decision-making scheme must include a consideration of pollution effects. However, because the pollution issue has been extensively discussed in recent years the author feels a narrow consideration of the issue of resource use rate is appropriate. For a discussion of the pollution aspects of our dependency on petroleum fuels see Baldwin, *Public Policy on Oil—An Ecological Perspective,* 1 ECOLOGY L.Q. 245 (1971).

The preceding framework is essentially the scheme which this Comment attempts to follow in analyzing tax policy toward the oil industry.

I

OIL—AN ESSENTIAL BUT STRICTLY LIMITED RESOURCE

Oil is one of our scarcest resources. Although nature does replenish the oil supply, it takes several million years to create new oil. For this reason the oil supply must be treated as fixed and strictly limited, but unfortunately this strictly limited resource is absolutely essential to industrial society. In addition to providing the raw material for the petrochemical industry which reaches into nearly all facets of modern life, it also serves as the primary energy source for contemporary high energy society.

A. Petroleum as an Energy Source

Most of the energy that man has used in the past has been produced by burning hydrocarbon fuels, such as wood, coal, oil, or food. For most of the history of mankind, the per capita consumption of energy was very low, consisting mainly of the energy released from food consumed and from cooking fires.[2] Gradually man harnessed other sources of energy to work for him. First, man domesticated animals to pull plows or carts. With the development of the steam engine a major threshold was crossed. With this invention man learned to convert heat energy derived from burning carbon fuels to mechanical energy which allowed him to build a society dependent on high per capita energy consumption. When viewed against the whole span of man's history, the increase in per capita energy consumption since the Industrial Revolution has been astounding in its magnitude and abruptness.

Since 1800 the world's principal sources of industrial energy have been water power and fossil fuels.[3] The initial source of fossil fuel was coal, but since 1900 coal as an energy source has met with increasing competition from the second of the two major fossil fuels, petro-

2. In the hundreds of thousands of years of history prior to the Industrial Revolution, man had only managed to increase his per capita energy consumption from 2000 Kcal/day to 10,000 Kcal/day. In the comparatively brief period since the beginning of the Industrial Revolution per capita energy consumption in the most advanced countries has increased to 220,000 Kcal/day. Cook, *Energy Sources For a Steady-State Society* in SELECTED READINGS ON ECONOMIC GROWTH IN RELATION TO POPULATION INCREASE, NATURAL RESOURCES AVAILABILITY, ENVIROMNENTAL QUALITY CONTROL, AND ENERGY NEEDS 594-596 (SENATE COMM. ON INTERIOR AND INSULAR AFFAIRS, 92ND CONG., 1ST SESS., Comm. Print 1971).

3. Hubbert, *Energy Resources*, in RESOURCES AND MAN 161 (Comm. on Resources and Man, National Academy of Sciences—National Research Council 1969).

leum. Over the last century the growth rate of oil production has been consistently higher than that of coal. Today the petroleum fuels—crude oil derivatives, natural gas, and natural gas liquids—provide seventy-six percent[4] of the total energy supply of the United States. Recent predictions indicate that this dependence on petroleum as an energy source will increase rather than decrease. [5]

A study based on 1955 data demonstrates the importance of oil and gas as an energy source in all sectors of our economy.[6] This study divided the economy into six sectors: industry, commercial, households, transportation, government, and agriculture. Each sector drew the following percentages of its energy requirements from oil, natural gas, or natural gas liquids:[7]

Industry	50.4%
Commercial	49.4%
Households	70.5%
Transportation	95.0%
Government	66.5%
Agriculture	88.8%

The significance of petroleum-group fuels to all sectors of the economy suggests the importance of petroleum to our high-energy lifestyle.

Attempts to estimate the total reserves of oil and gas are difficult because of the random distribution of oil and gas deposits over the face of the earth. However, because of the importance of these minerals to our society, several such attempts have been made. Most studies seek to determine the amount of oil which will ultimately be recovered in the United States. *Energy in the American Economy*[8] lists thirteen different studies completed during the 1950's; with one exception, no estimate exceeded 250 billion barrels, and most estimates were in the 150 billion barrel range.[9] In a recent study, M. King Hubbert calculates the ultimate recovery of crude oil at 165 billion barrels from the continental United States plus 25 billion barrels from Alaska.[10] At the time the estimate was made, 81 billion barrels had already been produced.[11]

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4. U.S. BUREAU OF CENSUS, DEP'T OF COMMERCE, STATISTICAL ABSTRACT OF THE UNITED STATES 496 (1971).

5. Bachman, *Forecast for the Seventies*, OIL & GAS J., Nov. 10, 1969, at 164.

6. S. SCHURR & B. NETSCHERT, ENERGY IN THE AMERICAN ECONOMY 1850-1975, at 264-92 (1960).

7. This table is compiled from data contained in S. SCHURR & B. NETSCHERT, *supra* note 6, at 264-92, tables 80, 82, 84, 86, 88, & 90.

8. S. SCHURR & B. NETSCHERT, *supra* note 6, at 361-62.

9. *Id.* at 361.

10. Hubbert, *supra* note 3, at 184.

11. *Id.* at 174, fig. 8.11.

Estimates of world oil reserves are even more difficult to make than those for the United States because of less thorough exploration. The basic technique for world estimates is geological analogy. Throughout the world oil is found in similar geological formations, nearly all of which have been charted by geologists. Estimates on ultimate recovery for a given area are made by comparing the unexplored area with geologically similar areas with known capacities.[12] Hubbert has selected the estimates of L. G. Weeks and W. P. Ryman, which both conclude that the total recoverable world oil supply is about 2,100 billion barrels.[13] Hubbert notes that the Weeks-Ryman figure is based on an estimate of the United States supply at 270 billion barrels, a figure approximately fifty percent larger than Hubbert's 190 billion barrel estimate for the United States and Alaska. For this reason he reduces the world estimate to 1,350 billion barrels and bases his calculations of exhaustion dates on both figures; stating that because of the uncertainty involved in world estimates, he feels the range type approach is the best available.[14]

Although the world estimates were made by geological analogy, the United States estimates were made by the decline curve technique. This approach consists of plotting total production against time and then describing certain basic characteristics of the curve. Production in any given field begins at zero, rise to a peak, and then falls off toward zero in a gradual decline as the field approaches depletion. The decline curve technique assumes that total United States production will follow a similar pattern. On the basis of past production data, the total decline curve is plotted.[15] Several significant projections can be derived from it. First, the peak of the curve gives the year at which peak production will occur and the rate of that production. Secondly, the area under the curve represents the total supply of oil which will be recovered. Thirdly, by computing the integral of various portions of the curve, one can predict the dates at which a given percentage of the oil supply will be exhausted.[16]

By means of the foregoing method, Hubbert derives some pessimistic predictions of the size of oil supplies. His forecast for the United States, exclusive of Alaska, indicates that eighty percent of the total recoverable reserves will be consumed between 1934 and 1999, a period of sixty-five years.[17] Applying a similar analysis to the world

12. *Id.* at 170.
13. *Id.* at 195.
14. *Id.*
15. *Id.* at 170-87.
16. For criticism of the decline curve method see S. SCHURR & B. NETSCHERT, *supra* note 6, at 366-67.
17. Hubbert, *supra* note 3, at 183.

supply figures discussed above, he derives two decline curves. Using the smaller estimate of 1,350 billion barrels, he predicts that eighty percent will be consumed between 1961 and 2019. Peak production on this curve will be 25 billion barrels per year. The larger figure of 2,100 billion barrels indicates a peak production rate of 37 billion barrels per year occurring in 2000 and eighty percent consumption between 1968 and 2032.[18]

One of the most disconcerting aspects of existing statistical data on the oil industry is the excessively high exponential growth rate the industry has consistently maintained. For instance, in the period prior to 1930 United States oil production maintained a steady growth rate of 8.3 percent per year.[19] Implicit in this growth rate is a doubling of output every 8.4 years and a doubling of cumulative production every 8.4 years.[20] With a resource as limited as oil such growth cannot be maintained. Cumulative production can only be doubled a few times before half the resource base is expended and it becomes physically impossible to maintain the growth rate. Actually the exponential growth rate will fall off long before the halfway point is reached. The post-1930 experience in the United States corroborates this analysis. Rapid growth rates obtaining prior to 1930 have been supplanted by more moderate growth rates as production nears a peak.[21]

Although physical necessity will soon force curtailment of traditional exponential growth rates of world petroleum production, the demand for energy can be expected to continue its exponential growth, particularly as the underdeveloped nations of the world become industrialized. The result will be an acute energy shortage felt long before the petroleum supplies approach exhaustion. Given the importance of gas and oil to energy supplies, it is apparent that some alternative energy source must be found, if our high energy consumption culture is to be maintained.

B. *Non-Fuel Uses of Petroleum*

One of the most tragic aspects of dependence on petroleum fuels is that the use of petroleum primarily as an energy source results in consuming a scarce resource that has many valuable non-fuel uses. Today about forty-five percent of the output of the world petroleum in-

18. *Id.* at 195. Hubbert's estimates for natural gas and natural gas liquids are a little more optimistic than his estimates of United States oil supplies. He estimates that peak United States production of natural gas will occur in 1980 with eighty percent exhaustion occurring between 1950 and 2015. *Id.* at 189. Peak production of United States natural gas liquids will occur in 1980. *Id.* at 192.

19. *Id.* at 163.

20. *Id.* at 166.

21. *Id.*

dustry is gasoline for the internal combustion engine. Another forty-five percent is used for other types of fuel, such as kerosene, diesel fuel, jet fuel, heating oils, and bunker oils.[22] The remaining ten percent is used to produce a large number of items essential to industrialized society, the most important of which is lubricating oils. Other products which require petroleum derivatives include asphalts, inks, waxes, synthetic fibers, plastics, and many intermediate materials used in the chemical industry.[23] The significance of these non-fuel uses of petroleum is underscored by the rapid growth of the petrochemical industry in recent years. Fifteen years ago the petrochemical industry was embryonic. Now it stands as an important segment in any industrialized nation's economy. Experts predict it will continue to grow at eight to ten percent a year during the 1970's.[24] While petroleum may be replaceable as an energy source, it will be much more difficult to replace as a chemical feedstock.

Defenders of the use of petroleum as an energy fuel argue that the use of crude oil for fuels does not affect the supply of the other petrochemicals because the two are different chemicals. Crude oil is not a homogeneous product, but is instead a mixture of many different organic chemicals which are separated in the refining process and then put to their respective uses. Although it is true that energy fuels tend to be mixtures of smaller molecules found in crude oil and other petrochemicals such as lubricating oils are generally mixtures of larger molecules, modern technologists have discovered ways to convert large molecules into small ones. A barrel of crude oil normally will not be more than twenty percent gasoline.[25] Large molecules are converted into the smaller, more marketable gasoline types, thereby vastly increasing the proportion of fuel products. By this method, up to forty percent of each barrel of crude oil is converted into gasoline.[26] A recent projection for the 1970's indicated that by 1980 gasoline will increase to fifty-two percent of each barrel of crude oil.[27] The tragedy of this is that the same misused technology could be used to build a refinery which would convert one hundred percent of each barrel of

22. Souders, *Petroleum Products*, in 10 McGraw Hill Encyclopedia of Technology and Science 80 (3d ed. 1971).

23. For an extensive listing of the various products derived from crude petroleum see the chart in Souders, *supra* note 22, at 81.

24. Aalund, *Forecast for the Seventies—Petrochemicals*, Oil & Gas J., Nov. 10, 1969, at 172.

25. McKetta & Hoffman, *Petroleum Processing*, in 10 McGraw Hill Encyclopedia of Technology and Science 77 (3d ed. 1971).

26. *Id.*

27. Stormont, *Forecast for the Seventies—Refining*, Oil & Gas J., Nov. 10, 1969, at 169. We are technologically capable of doing even worse. Humble Oil Co. now has a plant in Benicia, California which produces ninety percent gasoline, jet fuel and diesel fuel. The only other important product is coke. *Id.* at 170-71.

crude into non-fuel petrochemicals, but because of the demand for petroleum as a fuel, such a refinery is not economically sound at this time.[28]

C. *Alternative Energy Sources*

The tragedy of this misuse of oil is heightened by the ready existence of alternative energy sources. The immediate question becomes what energy sources will replace petroleum as the supply is exhausted.

Historical studies show that energy sources have undergone two major changes since the Industrial Revolution.[29] The first was the change from wood to coal. In 1850 wood supplied all but ten percent of United States energy consumption, but by 1910 wood supplied approximately ten percent while coal was carrying the bulk of the load.[30] After World War I, oil and gas began to capture progressively larger shares of the market until in 1970 the petroleum group fuels accounted for seventy-six percent of the nation's energy supply, with coal providing only twenty percent.[31] Given the impending critical limitations on petroleum supplies in the next few decades, it appears that another transition must occur. The fact that major oil companies are now investing heavily in coal and uranium resources may be indicative of the direction the shift will take.[32] Therefore, it would seem prudent to examine the potential of coal and uranium as future energy sources.

1. *Coal*

The most significant fact about coal is its relative abundance when compared with oil. Estimates of total reserves vary, but are generally larger than those of oil. Landsberg uses a figure of 1.7 trillion tons for the United States.[33] Hubbert cites a somewhat more conservative figure of 1.5 trillion tons.[34] Hubbert's estimate for the total world supply is 7.6 trillion tons with eighty percent consumption requiring 400 years.[35] As Hubbert points out,[36] however, this 400-year figure

28. Walker, *Product Optimization in Petrochemical Refinery* in REFINING PETROLEUM FOR CHEMICALS 137 (R. Gould ed. 1970).

29. H. LANDSBERG & S. SCHURR, ENERGY IN THE UNITED STATES: SOURCES, USES, AND POLICY ISSUES 30 (1968).

30. *Id.* at 31.

31. STATISTICAL ABSTRACT OF THE UNITED STATES, *supra* note 4, at 496.

32. Domestic oil companies reportedly now control forty-five percent of known United States uranium reserves. Three large oil companies—Continental, Occidental, and Standard of Ohio—produced one fifth of the nation's coal. Other oil companies are acquiring extensive reserves of coal in the West. Mayer, *Why the U.S. is in an "Energy Crisis,"* FORTUNE, Nov., 1970 at 159.

33. H. LANDSBERG, *et al.*, RESOURCES IN AMERICA'S FUTURE 414 (1963).

34. Hubbert, *supra* note 3, at 203.

35. *Id.* at 205.

36. *Id.*

becomes only a brief instant when plotted against the whole background of man's history and his future. If a high energy consumption society is to become a permanent condition for mankind another source of energy besides fossil fuels must be found.

2. *Nuclear Energy*

Although nuclear power provides only a small portion of United States power needs,[37] existing nuclear power facilities and those under construction must be viewed as only the first step in a technological revolution which may provide limitless energy. Current reactors are the type known as burner reactors. Their fuel is the naturally fissionable Uranium-235 (U-235) isotope. Unfortunately, less than one percent of naturally occurring uranium consists of U-235. Conversely, the U-238 isotope makes up 99.28 percent of all naturally occurring uranium.[38] By using U-235 for a starter to provide the high energy particles necessary to cause U-238 to undergo fission, a reaction can be conducted in which U-238 is converted to Plutonium-239 (P-239) which can be used just as U-235 is used. Similarly, the Thorium-232 (T-232) isotope can be converted into the fissionable isotope U-233. These breeder reactors not only generate heat which is used to produce electricity but also generate more fissionable fuel than is consumed out of the otherwise useless U-238 and T-232. Although there are no breeder reactors operational yet, there are a number of prototypes in the planning stages.[39]

The development of a breeder reactor would be essential to a successful solution to the power problem. Because the fissionable isotope U-235 forms such a small part of naturally occurring uranium deposits, continued use of burner type reactors will exhaust the supply of U-235 in less than a century.[40] The development of breeder reactors will permit the use of nearly one hundred percent of a uranium deposit rather than the present less than one percent. This of course extends the life of current energy supplies by a factor of one hundred.

This technological improvement, however, has another important effect on fuel supplies. It makes it economically feasible to mine much lower grades of uranium than are presently mined.[41] Breeder

37. Nuclear power provides approximately one percent of United States power demands. N.Y. Times, July 7, 1971, at 6, col. 3.

38. Hubbert, *supra* note 3, at 219.

39. The AEC recently announced that the TVA and AEC will soon begin construction of America's first large-scale breeder reactor. N.Y. Times, Jan. 15, 1972, at 1, col. 6.

40. Hubbert, *supra* note 3, at 226.

41. The critical factor in determining the economic feasibility of developing a given uranium deposit under today's technology is the ratio of U-235 to the total mass

reactors will also allow the use of abundant low grade thorium deposits as a fuel source. Hubbert's estimates indicate that conversion to breeder reactors will allow access to a sufficient supply of fissionable fuels to provide several thousand times more energy than that available from all fossil fuels combined.[42]

Another solution to the energy problem is the fusion reactor. In this reactor the heavy isotopes of hydrogen, deuterium, and tritium are fused into helium, accompanied by a tremendous energy release. In its uncontrolled form this is the basic theory of the hydrogen bomb. Today scientists are working toward controlling the fusion reaction as a source for generating electrical power. If this can be achieved, the supply of power is almost limitless because water contains one deuterium atom for every 6,500 hydrogen atoms.[43] Unfortunately, a large number of technical hurdles remain to be cleared before the fusion reactor becomes a reality.[44]

D. *Suggested Oil Policy*

The result of the importance of oil to our economy combined with its scarcity has been the creation of many millionaires rather than a rational plan for its conservation. It is essential that all policies which affect the oil industry be designed to encourage conservation of the oil supply rather than consumption. Discouraging the use of petroleum as an energy source would conserve the oil supply for important non-fuel uses and would encourage the development of alternative energy sources, particularly safe, efficient nuclear energy.

II

FEDERAL TAX POLICY AND OIL CONSUMPTION

The decision to discourage consumption of oil as an energy source should be implemented by an appropriate tax policy. The first step is to analyze the nature and impact of current federal tax policy.

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of the ore. Many ores contain too little U-235 to justify the excavation and processing of the tons of rock involved. When a breeder technology is used the critical ratio will be the total amount of U-235 *and* U-238 to the total mass of ore. Thus many heretofore uneconomical deposits of ore would become available. It should also be noted that the expansion is not merely a linear one. The amount of ore available expands as the quality required decreases: low grade ore is much more abundant than high grade ore. *Id.* at 226-27.

42. *Id.* at 228.

43. *Id.* at 230.

44. Other potential energy sources include geothermal, hydroelectric, solar, and tidal. None of these sources have the potential of nuclear energy. For a brief discussion of the magnitude of these resources and the technical problems involved *see* Hubbert, *supra* note 3, at 206-18.

A. Federal Tax Law

Traditionally one of the most controversial issues in federal tax law has been the special treatment accorded the oil and gas industry. Reliable estimates indicate that the oil and gas industry receives a tax supplement each year of at least $1.3 billion, which is given in the form of special deductions.[45] The most notorious of these are the percentage depletion allowance and the expensing of intangible drilling.

1. Depletion Allowance

The long-standing policy of United States tax laws has been to allow a deduction from gross income equal to the consumption of the taxpayer's capital required to produce the income in question. The basic theory is that one of the costs of producing any product is a gradual deterioration of the plant and equipment used to produce those goods. This cost, like salaries or any other cost, is an allowable deduction. Normally this cost is known as depreciation and is allowed and measured under § 167 of the Internal Revenue Code and the regulations promulgated by the Treasury thereunder. In the cases of mines, oil and gas wells, timber, and other natural deposits, the deduction is called depletion and governed by §§ 611-17. Section 611 states that "[i]n the case of mines, oil and gas wells, other natural deposits, and timber there shall be allowed as a deduction in computing taxable income a reasonable allowance for depletion and for depreciation of improvements."[46] Section 612 provides that the basis upon which cost depletion is allowed is the adjusted basis of the property provided by § 1011. These sections indicate that the depreciation and cost depletion schemes are essentially parallel.[47] In both schemes the taxpayer is allowed to deduct a part of his capital cost from the income produced by that capital. In both schemes the amount of the deduction is a function of the cost of the asset, and is limited in cumulative amount to the total cost of the asset.

Section 613, however, is a radical exception to the cost basis approach of §§ 611, 612 and 167. Section 613(a) provides that, for the mineral deposits listed in § 613(b), the depletion shall be calculated by applying the percentage indicated for each mineral in § 613(b) to the gross income of the property exclusive of rents or royalties. Thus, in the case of oil and gas wells, the depletion deduction

45. HOUSE COMM. ON WAYS AND MEANS & SENATE COMM. ON FINANCE, 91ST CONG., 2D SESS., TAX REFORM STUDIES AND PROPOSALS pt. 1, at 101 (Comm. Print 1969).

46. INT. REV. CODE of 1954, § 611(a).

47. Note the parallel language in sections 167(a) and 611(a) of the Internal Revenue Code. Sections 167(g) and 612 are also parallel.

shall be equal to twenty-two percent[48] of the gross income of the property. While § 613(a) does provide that the amount of percentage depletion taken in any year may not exceed fifty percent of the taxable income from the property,[49] it is critical to note that there is no limit on the total amount of depletion that can be taken over the life of the well. Often the total depletion deduction claimed over the producing life of an oil field is many times the original cost of the property. Furthermore, if the taxpayer finds that cost depletion would be more advantageous, he may take cost depletion[50] instead.

The history of percentage depletion[51] dates back to the original Revenue Act of 1913. At that time the law provided for a yearly depletion allowance of up to five percent of the gross value of the well. The 1916 Revenue Act made no distinction between depreciation and depletion and provided for cost depreciation of all assets acquired after March 1, 1913. Assets held prior to that date were assigned a basis equal to their value on March 1, 1913. The beginnings of percentage depletion made their appearance in the Revenue Act of 1918. The provisions of the 1916 Act were repeated, but it was also provided that in the case of mines and oil and gas wells, if the cost were materially disproportionate to the value at time of discovery, then discovery value would be adopted as the basis for computing depreciation. Because of the great disparity commonly found between the cost and value of newly discovered oil deposits, the new provision was eagerly embraced by the oil industry. Unfortunately the alternative standard proved impossible to administer because of the immense litigation it spawned on the issue of the value of the property at the time of discovery. Because of this difficulty, in 1927 Congress adopted a rule of thumb that the depletion allowable on oil and gas deposits would be 27½ percent of the gross income of the taxation period no matter what the cost or value of the deposit. This rule was adopted as an approximation of the actual value-depletion being taken by oil producers at that time. It was reduced to 22 percent by the 1969 Tax Reform Act.[52]

This departure from cost-based depletion cannot be justified theoretically. The rationale for the depletion concept is to recognize that

48. Percentages allowed by INT. REV. CODE of 1954, § 613(b) range from five percent to twenty-two percent for various minerals.

49. If other deductions are sufficient to reduce taxable income (calculated without a depletion allowance) to less than twice the allowable percentage depletion, full advantage may not be taken of the percentage depletion allowance. INT. REV. CODE of 1954, § 613(a).

50. INT. REV. CODE of 1954, § 613(a).

51. The historical material in this paragraph is taken from S. MCDONALD, FEDERAL TAX TREATMENT OF INCOME FROM OIL AND GAS 12-14 (1963).

52. Tax Reform Act of 1969, Pub. L. No. 91-172, § 501(a), 83 Stat. 629, *amending* INT. REV. CODE of 1954, § 613(b).

part of a flow of income is not income at all, but in reality a return of capital invested in that portion of the resource base which was consumed in producing the income. The measure of the capital thus returned must be its cost—a fraction of the total cost of the resource base. The value of the resource, on the other hand, is a function of its projected income. If the allowable depletion is calculated as a function of value, with total depletion over the life of the asset being equal to total value, the result is zero income. In a slightly more sophisticated and realistic model, which discounts future income in the calculation of value, the result is that the amount of income is always equal to the amount discounted by the application of an arbitrarily selected discount rate, a result that even the strongest defenders of the oil industry find absurd.[53]

The theoretical weakness of value depletion, suggests that the real reason behind Congressional action lies in sheer pragmatism. Congressional records indicate that the aim of the policy change in 1918 was to encourage exploration by means of a tax subsidy.[54] For this reason the option to use discovery value depletion was restricted to properties acquired through discovery by the taxpayer.[55]

This limitation was dropped by the 1926 revision of the tax law which converted the law from discovery value depletion to percentage depletion.[56] Furthermore, several decisions of the Supreme Court have sanctioned various arrangements in which investors are able to purchase a nonoperating interest in oil producing lands and take a percentage depletion deduction from their taxable incomes. The basic rule of the Supreme Court on these arrangements is that the taxpayer need not have a legal interest in the minerals. A bare economic interest will suffice to entitle the taxpayer to use the depletion allowance. In *Palmer v. Bender* the Court said, "[i]t is enough, if by virtue of the leasing transaction, he has retained a right to share in the oil produced."[57] In *Commissioner v. Southwest Exploration Co.*, the Court said

> a taxpayer is entitled to depletion where he has: (1) "acquired by investment, any interest in oil in place" and (2) "secured by legal relationships income derived from the extraction of oil to which he must look for a return of his capital."[58]

This language has been essentially paraphrased by the Treasury in § 1.611-1(b)(1) of the Regulations:

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53. S. McDonald, *supra* note 51, at 68.

54. *Id.* at 13.

55. Revenue Act of 1918, ch. 18, § 214(a)(10), 40 Stat. 1068; ch. 18, § 234 (a)(9), 40 Stat. 1078.

56. Revenue Act of 1926, ch. 27, § 204, 44 Stat. pt. 2, at 16.

57. Palmer v. Bender, 287 U.S. 551, 557 (1933).

58. Commissioner v. Southwest Oil Exploration Co., 350 U.S. 308, 314 (1956), *quoting* Palmer v. Bender, 287 U.S. 551, 557 (1933).

> An economic interest is possessed in every case in which the taxpayer has acquired by investment any interest in mineral in place or standing timber and secures, by any form of legal relationships, income derived from the extraction of the mineral or severance of the timber to which he must look for a return of his capital.[59]

Under the Supreme Court's economic-interest rule a large body of law has developed dealing with the devious schemes by which persons in high income brackets use the depletion allowance as a tax shelter. Percentage depletion, which began as a narrow exception to the general rule of cost depletion designed to supplement those individuals who actively search for oil because of a critical shortage during a period of war, has grown into one of the most effective tax shelters in the present United States tax system costing the Treasury more than a billion dollars per year.[60]

2. *Expensing of Intangibles*

Another source of favorable tax treatment of the oil industry is Internal Revenue Code § 263 which sets down the rules for treatment of improvements to property. Section 263(a)(1) enunciates the general rule that permanent improvements to property must be capitalized,[61] but § 263(c) contains an exception that has succeeded in swallowing most of the general rule for the oil industry. Section 263(c) requires the Secretary of the Treasury to promulgate regulations that authorize the immediate expensing of intangible drilling costs (IDC). The Regulations give the taxpayer an option either to deduct intangible drilling costs immediately in the period incurred or to capitalize them in the hope of recovery through depletion.[62] The latter is almost never elected.[63]

The option to expense intangibles was found in United States tax law prior to World War I.[64] Before the enactment of § 263(c) in the 1954 Code, the option was found only in the Regulations, but it has been consistently upheld by the courts.[65]

Intangible drilling expenses generally include all those which, by

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59. Treas. Reg. § 1.611-1(b)(1) (1971).

60. R. Byrne & R. Karg, CONSAD Research Corp., *The Economic Factors Affecting the Level of Domestic Petroleum Reserves,* in TAX REFORM STUDIES AND PROPOSALS, *supra* note 45, at pt. IV, 5.5 (Hereinafter cited as CONSAD).

61. Section 263(a)(1)(A) of the Internal Revenue Code provides an exception to the general rule of § 263(a)(1), but under § 616 which defines the mines and deposits excepted under § 263(a)(1)(A), oil and gas wells are excluded.

62. Treas. Reg. § 1.612-4(a) (1971).

63. S. MCDONALD, *supra* note 51, at 22.

64. T.D. 2447, 19 TREAS. DEC. INT. REV. 31 (1917).

65. Ramsey v. Commissioner, 66 F.2d 316, 318 (10th Cir. 1933), *cert. denied,* 290 U.S. 673 (1933).

themselves, have no salvage value.[66] Items included are labor, fuel, repairs, hauling and supplies which are used for (1) drilling, shooting and cleaning of wells, (2) ground clearing, draining, road making, and geological surveying required in the preparation for actual drilling, and (3) the construction of derricks, pipelines, tanks and other physical structures necessary for actual drilling.[67] In a recent study submitted by the Treasury Department in support of its proposed reforms for the 1969 Tax Reform Act, the Treasury characterized intangible drilling expenses as "all costs of drilling except for the cost of depreciable property used in drilling."[68] The "depreciable property" referred to in the Treasury statement consists of physical assets purchased by the developer and used by him in developing the oil field. Thus a derrick would not be an intangible while the labor used to install it on the site would be.

The option to expense intangibles is a significant deviation from the usual treatment given other industries. A comparison of the treatment accorded an oilman and a department store owner serves to illustrate the advantage given the oilman. If the oilman hires a geologist to determine the best placement of wells on a property, he can deduct the fees of the geologist as an intangible drilling expense.[69] If the owner of the department store hired an architect to design a new building for his business, the architect's fees would have to be capitalized.[70] There is nothing in the nature of either of the fees which will support such a distinction. The only difference lies in the type of businesses involved. Admittedly, both men eventually are allowed to write-off all of their investment, but the oilman is in a better position because the present value of an immediate $50,000 deduction is much larger than the present value of $50,000 of depreciation taken over a five-year period.

3. *Depreciable Versus Depletable Property*

Materials, which by their nature have a salvage value and are emplaced as a part of the process of drilling the well and preparing it for production,[71] are capitalized in a depreciable property account.[72]

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66. Treas. Reg. § 1.612-4(a) (1971).
67. *Id.*
68. TAX REFORM STUDIES AND PROPOSALS, *supra* note 45, pt. II, at 414.
69. Treas. Reg. § 1.612-4(a) (1971).
70. Treas. Reg. § 1.263(a)-(2)(d) (1971).
71. The Treasury Department considers the process of drilling to continue until the well head valve system is installed. Equipment installed after that point is no longer subject to the intangible drilling cost (IDC) option and both material costs and intangibles such as labor are capitalized. 1952-1 CUM. BULL. 30.
72. Treas. Reg. § 1.611-5(b)(4) (1971).

The statutory basis for this treatment provides for both the depletion allowance and for "depreciation of improvements."[73] The regulations provide that the depreciation on such improvements shall be taken under the general rules of § 167 on depreciation methods.[74]

The critical question often is whether a given asset is depreciable property or depletable property. This question is important because items charged to a depletion account do not result in additional deductions when percentage depletion is used. If these same items could be charged to a depreciation account the taxpayer would get the same amount of depletion deduction in addition to a depreciation deduction. Recent Treasury Department statements[75] have indicated that almost every item which cannot be expensed as an intangible drilling cost can be assigned to a depreciation account.[76] Only acquisition costs and the value of the drill hole itself must be recovered through depletion.

4. *Interaction of the Provisions*

The extent of the privileges granted to the petroleum industry by the Code does not become apparent until the interplay between the provisions is examined. For instance it would appear that the value of the expensing provision is merely the difference in present value between an immediate deduction now and the same deduction spread out over the life of the well. This is true where cost depletion on the value of the well is used. If the operator elects percentage depletion, however, the decision whether or not to capitalize IDC is important. The amount of depletion is the same in either case, but when he expenses IDC, he receives an additional deduction. In another industry, an operator would have to capitalize a large part of his IDC because they are a true part of the cost of the well, which would be a permanent improvement under § 263. Then the operator would recover them under a cost depreciation scheme. In the oil industry, however, the operator recovers his IDC as a part of the percentage depletion after he has already taken a deduction for the same expenses under § 263(c).[77]

Similarly, the distinction between depreciable and depletable property becomes important only when percentage depletion is used. The

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73. INT. REV. CODE of 1954, § 611(a).

74. Treas. Reg. § 1.611-5(b)(1) (1971).

75. See text accompanying note 68 *supra*.

76. The well casing, even when cemented into the shaft and therefore having zero salvage value, is treated as depreciable property, and is therefore credited to the depreciable property account rather than to the value of the well itself. 1952-1 CUM. BULL. 30.

77. This argument is supported by the practice of most oil companies of capitalizing IDC in their accounting for their own purposes. S. MCDONALD, *supra* note 51, at 22.

Dakota-Montana[78] case illustrates this point. The taxpayer attempted to take a depreciation deduction on the value of the drill hole, which consisted of capitalized IDC. The Commissioner—and the Court—maintained that the value of the drill hole must be recovered through depletion along with the lease acquisition costs.[79] It was not accidental that the disputed taxable year was 1926, the year in which the percentage depletion provision was adopted by Congress. If cost depletion is used, the taxpayer's additional deductions from the capitalized IDC are the same whether a specific item is placed in the depreciation or depletion account. However, if percentage depletion is used, there is no increase in deductions resulting from adding capitalized IDC to the depletion account, while there is a positive increase if the capitalized IDC is put in a depreciation account.

B. *Size of the Subsidy*

Any analysis of the size of the benefits that the tax structure confers on the oil industry must be a differential one: the total amount of the depletion claimed is not the value of the depletion provision to the industry, because part of that amount would normally be claimed under cost depletion. The true value is the difference between cost depletion and percentage depletion. The CONSAD report found that Treasury data for the period 1958-1960 indicated that 80 to 97.5 percent of the percentage depletion claimed was in excess of the allowable cost depletion.[80] Applying this figure to the amount of depletion claimed in 1960, the study concluded that the amount of excess depletion claimed was $2.3 billion, which resulted in a cash saving to the industry of $1.2 billion.[81]

The CONSAD report also calculated the value of the expensing provisions of the tax treatment of the industry. The report arrived at two different figures by using different discount rates and life spans. The smaller of these figures was $211 million while the larger was $572 million.[82] Combining the lesser of these estimates we find the direct supplement given to the oil industry by the tax laws to be at least $1.4 billion. The significance of this figure becomes clear when we note the gross income from production of oil and gas for 1960 was only $10.7 billion.[83]

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78. United States v. Dakota-Montana Oil Co., 288 U.S. 459 (1933).
79. *Id.*
80. CONSAD, *supra* note 60, at 5.4.
81. *Id.* at 5.5.
82. *Id.* at 5.6.
83. *Id.* at 5.5.

C. *Justification of the Subsidy*

The oil interests have vigorously defended their privileged treatment against attempts to repeal the distinctive provisions of the tax law. Their primary defense has been that the subsidy is essential to our national security. The basic thrust of the national security argument is that the subsidy provides incentives for exploration and discovery which are essential to a maintenance of a steady domestic supply of proved oil reserves. Without such a reserve the United States might suffer from a strategic shortage of oil in the event of a major war.[84] The argument has met with considerable success despite its inherent weaknesses.

The first fallacy in the argument is its implicit assumption about the nature of any "next war." It is obvious that the argument assumes a war similar to World War II where petroleum products were essential to the functioning of the military machine, and extended supply routes were often vulnerable to submarine attack. These conditions are a thing of the past. A future major war would be fought and lost by both sides before any nation would experience a shortage of oil. The question of oil reserves will be irrelevant to the outcome.

Secondly, it appears that most of the subsidy may be counter-productive. As noted above most of the supplement is depletion. Leading economists have argued that since depletion can be taken only for oil actually pumped out of the ground, rather than for oil discovered, the result of the supplement is to encourage consumption rather than increased domestic reserves.[85] Such an incentive is counter-productive to national defense because it results in consumption rather than conservation of the strictly limited oil reserves.

The CONSAD study indicates that additional reserves attributable to the subsidy are minimal in comparison to the cost.[86] The study predicts that removal of the depletion allowance would result in a reduction in reserve levels of only three percent.[87] An elimination of the option to expense intangible drilling costs would decrease reserves by only four percent.[88] Thus taxpayers are losing $1.4 billion per year in foregone taxes to prevent a reserve drop of seven percent.[89] The

84. For a typical example of this argument, see the testimony and prepared statements of the American Petroleum Institute in *Hearings on H.R. 13270 (1969 Tax Reform Act) Before the Senate Comm. on Finance*, 91st Cong., 1st Sess., pt. 5, at 4397-483 (1969).

85. Prepared Statement of Arthur Wright, *id.* at 4665-66.

86. CONSAD, *supra* note 60, at 8.1-8.12.

87. *Id.* at 8.3.

88. *Id.* at 8.4.

89. *Id.* at 8.11.

study concluded that it would be much cheaper simply to pay someone directly for the service of holding the extra reserves.[90]

III

IMPACT OF THE SUBSIDY

This review of the tax laws has shown that current tax policy results in a large supplement to the oil industry. The impact of this supplement must be analyzed in economic terms.

A. Previous Economic Studies and Debate

It is not surprising that any topic as complex and controversial as this would provoke debate among the nation's economists. The last fifteen years have seen extensive debate in the nation's economic journals revolving around the question of whether the tax treatment of the oil industry is a neutral tax. Neutrality as used here is not concerned with the issue of equity among taxpayers.[91] Neutrality refers instead to the concept of resource allocative neutrality. A tax is considered neutral if the after-tax distribution of goods and services is the same as the before-tax pattern.

1. The Harberger Position

The debate was initiated in 1955 by Professor Arnold C. Harberger of the University of Chicago.[92] Harberger argued that the tax structure caused investors to be willing to invest twice as much capital in the oil industry for a given income stream as they would for the same return in any other industry.[93] This induced investment resulted from the effect of the tax structure on the before and after tax return to capital. While the before-tax return to the oil industry would be much lower than that of any other industry, the excessive deductions allowed the oil industry would cause the after-tax return to be equal. The rational investor would undertake a number of investments in oil which he would otherwise forsake for more lucrative investments in other fields. Thus, the tax subsidy causes an actual shift in the market allocation of capital to the oil industry. The argument was amplified by Steiner who dealt solely with the resource allocative issue, adding a

90. *Id.* at 2.8.

91. For a discussion of the equity issue, which is beyond the scope of this Comment, see Statement of Arthur Wright, *supra* note 85, at 4656-58.

92. Harberger, *Taxation of Mineral Industries*, in JOINT COMM. ON THE ECONOMIC REPORT, FEDERAL TAX POLICY FOR ECONOMIC GROWTH AND STABILITY, 84th CONG., 1ST SESS., at 439-49 (Comm. Print 1955) (papers submitted by panelists appearing before the Subcomm. on Tax Policy).

93. *Id.* at 447-49.

number of variables to the analysis, but the core of the argument remained—the tax subsidies have a tendency to induce investment in the subsidized industry.[94]

An essential and troublesome part of the Harberger analysis is its assumption of no forward shift of the tax. Harberger assumes that the full impact of the tax is absorbed by capital with no attempt to recoup part of the tax from the consumer by a price increase. This assumption has been criticized as unreasonable by Harberger's opponents.[95]

2. *The McDonald Position*

Harberger's chief opponent has been Professor Stephan E. McDonald of the University of Texas. McDonald has defended the subsidy on the basis of a model which assumes a full forward shift of the tax and then analyzes the parameters which determine the size of the price change resulting from this forward shift of the tax.[96] The price change, of course, affects resource allocation because higher prices result in decreased consumption, lower production and decreased demand for capital. In the McDonald model the size of the price shift is a positive function of both the amount of the tax and the relative degree of risk inherent in the industry. In McDonald's model a flat rate income tax applied to all industries will result in a larger price increase in some industries than it will in others depending on the relative degree of risk inherent in the industry. The lower effective tax rate paid by the oil industry causes lower relative prices which merely offset the price effect of the high risk nature of the oil industry. A change in our tax policy to a flat rate corporate tax with no subsidy would be a step away from a neutral tax rather than a step towards one, according to the McDonald analysis.[97]

3. *Criticism of Previous Analyses*

The McDonald analysis is open to a number of criticisms,[98] but for the purposes of this Comment the most important objection is one that is applicable to the debate as a whole. This objection goes to the

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94. Steiner, *Percentage Depletion and Resource Allocation,* in 2 HOUSE WAYS AND MEANS COMM., TAX REVISION COMPENDIUM 949 (1959) (a compendium of papers on broadening the tax base submitted to the House Committee on Ways and Means in connection with a panel discussion conducted on November 16, 1959.).

95. S. MCDONALD, *supra* note 51, at 51.

96. *Id.* at 52-60.

97. *Id.* at 64.

98. The debate over the McDonald position raged throughout the 1960's. Its course is too long to pursue here. Those interested may find a listing of the various articles in Wright's Senate testimony *supra* note 85, at 4671.

underlying assumption of the whole debate rather than to the mechanics of either argument. A number of economists[99] and this author have concluded that the issue of tax neutrality is irrelevant to the formulation of a rational tax policy. Neutrality takes on significance only in the economists' ethereal world of perfect competition. This is because the entire concept assumes an optimal pre-tax mix of goods and services. In such a situation any resource-allocative effect of a new tax would shift the economy away from the optimum; however, in an imperfect and dynamic economy, the issue of neutrality is irrelevant because the economy has never achieved or even approached the optimum. Thus, any attempt to use neutrality as a basic criterion for evaluating alternative tax policies is folly.

The desire of neutrality for its own sake is double folly because it causes our tax policy to be evaluated against a criterion which, given economic reality, produces almost random results, and it causes policy values to ignore the criteria against which tax policy should be evaluated. Any policy decision should begin with a careful study of the area to be affected, and should be followed by a decision as to what policy objectives are desirable. Do we wish to increase production in the area, decrease it, or have no effect upon it? This decision is reserved for the policy-making body and should not be usurped by the economist speaking under the guise of expertise.[100] To argue for neutrality for its own sake is to usurp the policy-maker's power, because neutrality is only one of the policy choices which may be made. Once the policy-maker has made his decision about how to alter the distribution of goods and services, the economist again comes to the forefront. It is the role of the economist to advise the policy maker on the issue of what tax tools to adopt in order to achieve the distributional effect previously selected.

B. Impact of the Current Provisions on the Goal of Reduced Consumption

Given the policy goal of reducing consumption, the current provisions of the tax law are inadequate, because they tend to lower prices and increase consumption of petroleum fuels. A closer look at the economic models discussed earlier demonstrates how this improper result is achieved. The previous discussion was aimed only at questioning certain underlying assumptions which the author believes led an otherwise correct analysis to an improper conclusion. The failure of the underlying assumptions does not invalidate the mechanics of the analysis.

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99. Davidson, *The Depletion Allowance Revisited,* 10 NAT. RES. J. 4 (1970); Wright, *supra* note 85, at 4661.

100. Davidson, *supra* note 99, at 5.

McDonald's analysis assumes a forward shift of the tax to the consumer.[101] Under this analysis the tax is passed on to the consumer in the form of price increases, which result in decreased consumption. The reduction in consumption must be a positive function of the size of the tax. Thus, if the oil industry were taxed at normal effective rates, prices would be higher and consumption lower than it is now.

Although the Harberger induced-investment analysis starts with a different assumption about industry's treatment of a tax, it compels a similar conclusion. Harberger assumes that the tax is not passed on to the consumer but is absorbed by the investor.[102] Thus, the after-tax return is the key to the investment decision. If an industry is given a lower effective tax rate, the result is to induce additional investment in that industry—investment that would not occur without the tax benefit. This is where the Harberger analysis stops. For him the reallocation of investment capital is enough to condemn the subsidy. However, if the analysis is pushed a few steps further, the immediate effect of this induced investment is additional production capacity. This excess capacity leads in turn to reduced prices followed by increased consumption. Over a long period of time this price effect tends to reinforce itself as society becomes technologically dependent on oil as an energy source.

Any analysis which considers consumption solely as a function of price contains certain inherent assumptions about the elasticity of the demand for the good in question. Rolph and Break[103] have indicated that when an excise tax is applied to a specific good—such as liquor or cigarettes—in an attempt to reduce consumption, the actual decrease in consumption is a function of not only the size of the tax but also the price elasticity of the good. In the case of a highly inelastic good, the consumer tends to pay the extra tax and reduce his consumption of all other goods and services because of the importance of the taxed good to him. Since the previous analysis indicates that the effect of a tax increase is eventually to increase prices, either through a direct forward shift of the tax or by means of the investment effect, the analysis of Rolph and Break would apparently also apply to any attempt to decrease consumption by increasing income tax levied on producers. The only result of removing the tax subsidy given the oil industry would be to increase prices paid by consumers with no resulting reduction in consumption. This is in complete opposition to the desired policy result.

Further analysis indicates that the inelasticity problem is not as

101. S. McDonald, *supra* note 51, at 52.
102. Harberger, *supra* note 92, at 447-49.
103. E. Rolph & G. Break, Public Finance 303-07 (1961).

serious as it might appear. There are two types of inelastic demand. First, there is the inelasticity resulting from basic human drives[104] which the individual must satisfy at any price. The Rolph analysis would seem quite valid for products with this type of demand schedule. There are certain other products, however, with highly inelastic demand functions which can be characterized as artificially or technologically inelastic. The demand for petroleum fuels is a prime example. No one needs petroleum in the sense that a heroin addict needs his fix, or a chain smoker his cigarettes. The demand for petroleum is inelastic because the entire technology has been designed around petroleum as an energy source.[105]

Although there may be no difference between these two types of inelasticity in the short run, there is a significant difference in the long run analysis. Generally, technological inelasticity would tend to disappear over long periods of time. The essence of technological inelasticity is the inability of our technology to respond immediately to price changes. Over long periods of time technology can respond to prices, while basic needs for items such as cigarettes cannot. A simple example is the demand for automobile fuels. Suppose a one hundred percent excise tax were imposed on all petroleum fuels to be used in transportation vehicles. Assume also that abundant sources of thermonuclear electrical power were made available at low rates for use in transportation by means of direct government subsidy and regulation. As Rolph's analysis indicates, the immediate effect would largely be to decrease consumption of all other goods and to increase government revenues. There would be little or no effect on consumption of petroleum transportation fuels. However, the long term effect would be dramatic. Assuming a delay of three years before the automobile industry could begin producing electric cars and an average life span of ten years for existing petroleum-fueled cars, there would be a drop in petroleum motor fuel consumption of roughly ten percent per year beginning in 1975 until in 1985 when substantially all means of transportation would be powered by the then far cheaper thermonuclear electric power.

As the preceding example indicates, the technology which, because of the phenomenon of technological inelasticity, would appear to frustrate the use of tax policy to decrease petroleum consumption, is

104. For example, the inelastic demand of the heroin addict, the cigarette smoker, and the chronic alcoholic.

105. This technological inelasticity is at least partially a result of unwise tax policies in the United States. By subsidizing petroleum production and thereby lowering the price of petroleum fuels relative to other energy sources the United States has encouraged the development of a petroleum-dependent energy technology and discouraged research into other sources of energy.

in the long run the very force which will make our tax policy succeed. The phenomenon of technological inelasticity should not deter tax increases to achieve a goal of decreased petroleum consumption. It should serve only as a warning that we cannot expect to see results overnight no matter what means we use to decrease consumption of petroleum fuels. With an economy as technologically ponderous as ours it takes time to make as substantial a change as this.

C. A Suggested Tax Policy for the Oil Industry

To achieve a tax policy designed to discourage the use of oil as an energy source, the tax treatment of the oil industry should be designed to create price increases in petroleum fuels. The basic idea is to make other power sources, such as nuclear energy, economically competitive with petroleum fuels.

The obvious first step is to repeal those sections of the law that now give supplements to the oil industry—especially the percentage-depletion allowance. The next step would be to enact an excise tax on petroleum fuels. The amount of the excise tax would be dependent on the size of the price rise caused by the repeal of the existing provisions. Although the results of these provisions will not be immediate because of the technological time delay inherent in the economy, price increases caused by these measures will cause decreased consumption in the long run.

While tax increases applied to the oil industry may tend to encourage the use of nuclear power, policies directly encouraging the development of efficient, safe nuclear power will also be required. These policies may take the form of tax subsidies, direct subsidies, direct regulation, or some combination of the three.

CONCLUSION—TAXES AND NATURAL RESOURCE MANAGEMENT

The petroleum industry is a classic example of mismanagement of a natural resource, and the primary tool of this mismanagement has been tax policy. The United States has consistently maintained a tax policy which has encouraged the use of a scarce natural resource as an energy source and the development of an economy technologically dependent upon petroleum as an energy source.

An analysis of the supply and uses of the resource in question is the essential first step in formulating a rational tax policy for any natural resource. The solution to this initial question does not lie with the economist and his models, but with the geologist's estimates of total recoverable supply and with the statistician's estimates of past, current, and future rates of use. Once the preliminary policy decision on ap-

propriate rate of use is made, the economist enters the picture to recommend tax rules designed to implement the policy decision. Any attempt to make the initial policy decision on the basis of the assumptions of an abstract economic model ignores reality and leads to random results.

Wise management of natural resources is essential to maintain our standard of living for more than a few decades. Because the present system is one in which ownership of these resources is essentially in the hands of private parties, tax policy towards the owners of natural resources is an important tool in our management of these resources.

David G. Gadda