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POLITICAL-ECONOMIC PROBLEMS OF ENERGY—A SYNTHESIS

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Economic research concerned with the “energy crisis” of the 1970’s has increasingly indicated that the primary problems of energy are best understood in a long-lost discipline called “political economy.” From a purely economic point of view, solutions to the energy crisis are relatively simple—remove government controls and tax subsidies, except in those few instances where large externalities are clearly present. Most of the existing subsidies and regulations were introduced as a result of strong political pressure from beneficiary groups. Economic evidence demonstrating that particular subsidies or regulations waste scarce resources and do not serve the general welfare is not enough. While the beneficiary economic interests and their associated administrative bureaucracy may be limited to a few thousand people, the concentrated power of these beneficiary groups is clearly greater than the dispersed and usually disinterested power of 220 million people who pay the bill. It is increasingly obvious to students of energy economics that the problems are broader than economic analysis and require a broader approach in terms of political economy.

In purely physical terms, there is no energy crisis. While the United States has only 4.5 percent of the world’s crude oil reserves and consumes 29.4 percent of world production, this nation is extremely well endowed with fossil fuel resources. United States coal reserves are 28 percent larger than crude oil reserves in the entire world (measured in terms of Btu content). In addition, U.S. oil shale resources¹ are 65 percent greater than world wide crude oil reserves.

The problem of the “energy crisis” is not that this nation lacks fossil fuel resources. Instead, the problems are economic and political. Thus for fully a half-century, the power of government has been used by dominant economic groups to indirectly promote energy consumption. Two tax subsidies, percentage depletion allowance and provisions for expensing intangible drilling costs, have artificially

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1. These energy resources are not currently producible under prevailing price, cost, and technological conditions.

stimulated capital flows into oil and gas exploration and production, thereby increasing supplies and lowering prices. This low price policy has resulted in the well-known American "love affair" with big cars and other forms of wasteful consumption of nonrenewable energy resources. After a half-century of tax subsidies favoring oil and gas production, the nation has virtually exhausted its low cost oil and gas reserves. We may still have large undiscovered resources of oil and gas plus known but currently uneconomic shale oil resources. These future energy sources will not be cheap.

The historic low price policy is not dead. President Carter, in his National Energy Plan (April 1977) noted that under Federal Power Commission price controls, natural gas "is now the nation's most underpriced and oversold fuel." One would expect, following this observation, that the President would have called for decontrol of new natural gas supplies. Instead, for political reasons, he recommended the opposite, namely that wellhead price controls be extended to include intrastate gas. The President correctly noted that both oil and natural gas are "priced domestically below their marginal replacement costs, and, as a result, the nation uses them wastefully, with little regard to their true value." Economists can take pride in the President's comprehension of this important economic principle. However, in the next paragraph of his statement, he yielded to political reality and stated that "the residential sector is sheltered as the Plan would keep natural gas prices to residential users down and provide tax rebates for home oil use." Once again, political expediency nullifies valid economic principles.

The authors who have been asked to contribute to this volume have been selected because of their well established expertise in energy research. Many of them have been involved in economic analysis of energy problems for more than a decade. Most of the important areas of energy policy are covered in the papers contained in this volume. However, because of the limits of space, a comprehensive treatment of all energy policy problems was not possible. For example, there is no specific treatment of nuclear energy economics. The multitude of environmental issues arising out of energy development have not been given systematic treatment. Also, solar power potential plus other exotic energy forms are not evaluated. These gaps notwithstanding, the papers cover a broad spectrum of pressing energy problems.

The purpose of this first chapter is to attempt a synthesis of the several authors' findings and conclusions. The papers have been arranged in such a way that a story emerges.

A SYNTHESIS

The major areas of interest in international oil concern: (1) forecasts of future oil supplies available to the United States, (2) the probable world demand for oil in the future, (3) the probable behavior of world oil prices under the impact of both competitive market forces and potential cartel policies of the Organization of Petroleum Exporting Countries (OPEC), and (4) the important issue of oil import dependence. The dependence issue is paramount for reasons of military security and also the potential for economic instability and reduced economic growth due to a boycott or substantial price increases.

Forecasting supply, demand, and price for international oil is both difficult and easy. Based partly on personal experience, McKie acknowledges that the uncertainties in forecasting energy supply and demand are legendary and he confesses that "Ouija boards could hardly have done worse than some of our models." Forecasting future oil prices is said to be difficult, primarily because both demand and supply functions are highly inelastic in the short run. Thus any small shift in the supply function can bring about relatively large changes in price. This fact was clearly demonstrated in the Arab oil embargo.

At the same time, forecasting oil prices is said to be easy because there are relatively long lead-times affecting changes in market supplies. Large new discoveries are known from one to ten years before such supplies reach the market. Similarly, existing oil fields decline under rather precisely known decline rates. Unlike hula hoops and television sets, output cannot be suddenly doubled and redoubled with consequent price effects. And unlike computers and calculators, major technological changes bringing forth significant cost and price reductions are unlikely to occur.

Among the more pessimistic forecasts is one by the U.S. Central Intelligence Agency which foresees world energy demand exceeding supply by the early 1980's, bringing about rapidly rising prices in a crisis atmosphere.² Similarly, a recent MIT report concludes that "The supply of oil will fail to meet increasing demand before the year 2000, most probably between 1985 and 1995, even if energy prices rise 50% above current levels in real terms."³

A more recent report by Lichtblau and Frank, commissioned by

2. CENTRAL INTELLIGENCE AGENCY, *The International Energy Situation: Outlook to 1985*, ER 77-1024 OU (April 1977).

3. REPORT ON THE WORKSHOP ON ALTERNATIVE ENERGY STRATEGIES, *ENERGY: GLOBAL PROSPECTS 1985-2000*, 3, 4 (1977).

the Electric Power Research Institute (EPRI), reaches more optimistic conclusions: "An oil shortage before the late 1980's is unlikely, an oil shortage before the end of the century is a possibility but not a probability, and a gradual transition, accompanied by moderate real price increases, over the next 25-35 years from oil to non-oil sources to meet incremental world energy requirements is more likely than an extended oil shortage of crisis proportions."⁴

The Adelman paper concerned with international oil is more in accord with the EPRI report. He classes the CIA forecast as a doomsday scenario and a distorted version of the problem. Adelman concludes that "We can probably look forward to a decade of rising real oil prices. . . ." The idea of a shortage in which oil selling nations are assumed to hold oil prices below market clearing levels is appropriately ridiculed by Adelman. Those who forecast a "shortage" implicitly assume but rarely explain why oil exporting countries would hold oil prices at artificially low levels, thereby creating a shortage. McKie also doubts the CIA scenario. He writes that "The world does not seem to be confronted with early exhaustion of liquid hydrocarbons." Instead, potential supply appears to be "about a 75-year supply at current rates of production. Much additional oil might become available at higher cost horizons consistent with expected OPEC prices. . . ."

As a result of what he calls his "small experiment," Adelman concludes that we cannot possibly explain current and prospective international oil price levels by scarcity, present or foreseen." His explanation instead is in terms of an imperfect cartel system tested in terms of two conventional cartel theories. Adelman sees some characteristics of a conventional cartel in which members control prices through either a market sharing mechanism or a dominant-firm price-leadership model led by Saudi Arabia.

In his "small experiment" he assumes that the nearest alternative to conventional oil supplies could be installed in very large amounts after the year 2000 and could supply apparently unlimited amounts of energy at \$16 per barrel of oil equivalent (1975 constant prices). He concludes that the "competitive" price of oil in 1975 should have been about \$2.25 per barrel. However, at that time the observed price was around \$12.70 per barrel. In reaching this conclusion, Adelman apparently used a ten percent *real* discount rate. This is an inordinately high discount rate, given the real opportunity cost of capital in Saudi Arabia and other leading oil producing countries.

4. J. LICHTBLAU and H. FRANK, *The Outlook for World Oil into the 21st Century, With Emphasis on the Period to 1990* S-1, EA-745 SOA-76-328 (May 1978).

Further, the possibility that unlimited supplies of an oil substitute will be available at a real price of \$16 after the year 2000 appears to be unduly optimistic.

Following Adelman's methodology, if one uses a three percent real discount rate and a \$20 (1975 prices) oil substitute price in the year 2000, the national 1975 price becomes \$9.55 per barrel. This is a reasonably close approximation to the observed \$12.70 per barrel cited by Adelman.⁵

Some new research by Johany, recently completed as part of a Ph.D. dissertation at the University of California at Santa Barbara has shown that crude oil price movements from approximately \$3 per barrel in the early 1970's to approximately \$12.50 per barrel in 1974 after the Arab embargo ended are rational in terms of individual oil producing countries maximizing the present value of their resources.⁶ Johany has joined two relevant principles of economics, capital theory and property rights theory, to shed new light on rational price behavior for nonrenewable oil resources.

Johany pointed out that during the 1950's and 1960's there was a progressive awareness on the part of international oil companies holding oil concessions in the Middle East that their property rights were in jeopardy. Nationalization, or its euphemism, "participation," was the wave of the future. But as the concessionaire companies became increasingly fearful concerning their property rights, they naturally reacted by raising their discount rates. This means that production was shifted from the future to the present. This fear of loss of property rights resulted in rapid increases in oil production from Middle Eastern sources. From 1950 through 1970 the compound annual growth rate in oil production from the Middle East was 10.9 percent. From 1970 through 1973, the compound annual growth rate was 15.0 percent.

Reflecting these output increases, world crude oil prices were relatively stable during the two decades from 1950 through 1970. Output increases were matched by world-wide growth in demand with only modest increases in nominal prices. Real prices for crude oil in the United States actually declined 6 percent from 1950 through 1970.

By the end of 1973, a complete shift in property rights had, in

5. A much more elaborate experiment was performed by Pindyck which concluded that the rational price for world oil in 1977 was between \$12.50 and \$13.00 per barrel. PINDYCK, *Gains to Producers from the Cartelization of Exhaustible Resources*, Rev. Econ. Stat. (May 1978).

6. Ali D. Johany, *OPEC is not a Cartel: A Property Rights Explanation of the Rise in Crude Oil Prices*, (unpublished dissertation, University of California, Santa Barbara) (1978).

fact, occurred. Host countries were in complete control of output within their borders by year-end 1973, and they were either unilaterally determining the terms of sale for their crude, or nationalization had been completed.

With property rights shifted from companies to host countries, security of property rights was reestablished. The relevant discount rate became that of the host country rather than the concessionaire company. Discount rates declined not only because property rights became secure in the hands of the host country, but also because the opportunity cost of money for the host country was relatively low. Investment opportunities for large sums of money in Saudi Arabia are relatively unattractive. Investments abroad yield only competitive rates of return, but were further jeopardized by exchange rate losses. With secure property rights, the most attractive investment for some countries was simply leaving their oil in the ground. The oil minister for Kuwait has stated that, "We have the capacity to produce 5 million barrels daily but are producing at a maximum rate of only 2 billion barrels daily and are endeavoring to spread our oil resources evenly over 80 years."⁷ This policy is rational for Kuwait given (1) secure property rights and (2) relatively low discount rates. It is a rational policy independent of a cartel. Oil producing countries with the exception of Saudi Arabia appear to take the price of oil in the long-run as market determined and unaffected by their own behavior.

Given firmly established property rights and lower discount rates, one would expect reduced output growth rates and sharply higher prices. The record shows that from 1973 to 1977 Middle Eastern oil output increased at a compound annual rate of only 0.7 percent. This is in contrast to an 11.4 percent compound annual rate from 1950 through 1973 under insecure property rights and correspondingly high discount rates. As a consequence, crude oil prices in world markets rose sharply, from 1970 to date, a fact which can be explained without the aid of a cartel theory.

The Johany thesis stands in sharp contrast to the conventional wisdom which explicitly or implicitly assumes that the world price of oil is fixed by an effectively collusive OPEC cartel. Adelman clearly shares this latter viewpoint, and other authors in this volume refer to cartel pricing. McKie asks whether the U.S. energy economy should adjust to the world price of oil as if it were a competitive price or should the government intervene to offset the monopoly element in the cartel price? In discussing oil shale, McDonald asserts that "[shale

7. Vol. XX Middle East Econ. Survey No. 42, at 2 (August 1977).

oil's] price is effectively set by OPEC. . . ." Hudson and Jorgenson refer to "the establishment of the OPEC oil cartel in late 1973 and early 1974" without claiming that OPEC is an effective cartel today. However, in another recent paper, Jorgenson says that "Although the OPEC cartel is not a perfect monopoly, it comes sufficiently close. . . ." ⁸

In the international area the import dependence issue is dealt with specifically by McKie and peripherally by several other authors. Continuation of the present U.S. consumption pattern requires a high level of oil imports. McKie estimates that oil imports in the mid-1980's will exceed nine million barrels per day. In 1977, imports amounted to 8.7 million barrels per day. He notes that "national security is ostensibly the overriding objective of import policy." Economic impact is an important but secondary consideration. Given important external effects of oil imports, he concludes that "the free market is an inadequate instrument for handling questions of national security. . . ." Brannon concurs and argues on behalf of an import tax to internalize security costs.

The import dependence issue has been an important element of U.S. policy for approximately two decades and was used as a rationale for the oil import quota program instituted by President Eisenhower in 1959. But this program collapsed largely of its own weight in 1973. This country, having produced more domestic oil as a result of tax subsidies and import quotas was even more vulnerable than it would have been in the absence of such interference with market forces.

In McKie's view, optimum policies for solving the national security issues of oil and import dependence are fairly obvious. He holds that the most important step is one currently being taken by the U.S. government, that of establishing a Strategic Petroleum Reserve System (SPRS). This System would provide protection against short-run interruptions with obvious benefits for consumers. Brannon proposes that the costs of the petroleum reserves system should be financed by import taxes. His argument rests on the proposition that consumers of imported oil are the beneficiaries and should bear the cost of reducing import dependency hazards.

McKie suggests that the SPRS might be supplemented by greater reliance on relatively secure import sources. He might have recommended another policy, that of nourishing mutually interdependent and lasting relations with crude rich nations. This approach unfor-

8. JORGENSON, *The Role of Energy in the U.S. Economy* (a paper presented at the National Tax Association—Tax Institute of America, Symposium on Energy Taxation, Washington, D.C., May 17, 1978) (forthcoming in *National Tax Journal*).

tunately involves conflicting alliances between the United States and Israel, on one hand, and Arab oil producing nations, on the other hand.

Moyer points out that the national commitment to reduce import dependence "must necessarily favor coal, at least for the remainder of the 20th Century." United States coal reserves are vast and constitute a secure energy source. However, as the nation learned in the winter of 1977-78 energy supply interruptions are not limited to imported sources. At its worst, the prolonged bituminous coal strike reduced domestic coal production to one third of its normal level. This reduction in Btu supplies was greater than occurred during the Arab oil embargo, but its consequences were relatively minor.

Given the import dependence problem, consideration must be given to policies for finding new domestic oil and gas reserves as well as for use of other energy sources including our abundant coal and oil shale resources. Concerning federal oil and gas leasing policies, McDonald offers a valuable contribution in his identification of appropriate objectives from an economic analysis point of view. Where more than one land management objective is established, the possibility of conflicting goals immediately arises. The present law states three objectives: (1) to assure orderly and timely resource development, (2) to protect the environment, and (3) to insure the public a fair return on the disposition of its resources. The law provides no standard by which conflicts between these objectives are to be resolved. Given this obvious confusion, land administrators have wide latitude in reacting to political pressures brought to bear on them. The history of U.S. leasing policy suggests that the stated goals are secondary and mitigating political pressure is primary. The annual volume of oil and gas leasing will be accelerated under pressure from the petroleum industry (and occasionally out of government budgetary considerations), or will be reduced under pressure from environmentalists. This is a serious problem for the nation inasmuch as the Federal government owns most of the remaining potential oil and gas resources.

McDonald proposes a single decision rule for allocating scarce resources over time. He proposes that the government seek to "capture a maximum of the present value of pure economic rent arising from mineral production on its lands." This rule gives paramount consideration to the economic meaning of conservation. If future generations "need" oil and gas resources more than present generations, then research will show the *in situ* value of such resources increasing faster than the opportunity cost of money. Under Mc-

Donald's proposed decision rule, administrators would be required to reduce their rate of leasing in favor of future generations.

Having determined a single land management objective, McDonald reviews alternative leasing methods. He concludes that given the extent of competition for oil and gas leases and the character of the market, sealed bidding is preferable to oral auction bidding. Further, he finds the existing method of cash bonus bidding is more efficient than any alternative systems.

The United States alone, among the nations of the world, has elected to use a pure competitive system for leasing its mineral lands. Other nations appear to believe that competition for leases would be inadequate and therefore they resort to a variety of forms of administrative discretion.

The Jones-Mead-Sorensen paper reports on a study of competition for Federal oil and gas leases over the period 1954 through 1962. Analysis of this record shows that competition under the cash bonus bidding system has been overly effective. In 839 lease sales, bidding has been sufficiently intense that the internal rate of return earned by lessees has been driven down to 9.5 percent *before taxes*. This rate of return is less than a competitive norm. It indicates that the government has received more than fair market value for its leases.

McDonald wisely sets forth the objective of maximizing the present value of pure economic rent. An inefficient bidding system causes dissipation of economic rent even though competition for such leases may be effective. Thus, under a royalty bidding system an additional marginal cost (payment of the royalty) is imposed on each additional barrel of oil produced under the lease. Because the royalty is a transfer payment and not a social cost, this leads to premature abandonment of a lease. Socially valuable oil or gas is left in the ground and may never be recovered. Further, with high royalty payments, cost-justified investments in secondary and tertiary recovery will be discouraged, again leading to a loss of socially valuable resources.

Similarly, profit share bidding introduces inefficiencies. Profit share payments are approximately the same as additional income taxes (depending on how profits are defined). The higher the profit share bid, the lower the incentive for an operator to manage his lease efficiently. The nation has experience with high corporate income taxes under the excess profits tax system prevailing during the Korean War and World War II. The decision-making structure under very high marginal tax rates leads to wasteful expenditures and underinvestment. In addition, the nation has experience with profit

share bidding in Long Beach, California leases. This experience shows that efficiency incentives are lacking and that litigation costs are excessive. Both factors cause a dissipation in available economic rents.

Despite convincing evidence of the effectiveness of the present system of leasing Outer Continental Shelf oil and gas lands (as shown in the Jones, Mead and Sorensen paper), Congress is proposing to move the nation away from the present system of cash bonus bidding with a small fixed royalty, and toward the use of other bidding systems which McDonald shows to be inferior.

In addition to developing new oil and gas reserves from lands not yet explored, the nation must consider developing energy from alternative domestic sources. Moyer presents (in his Table 2) estimates of recoverable energy reserves from alternative energy sources. This table shows that 79 percent of the estimated recoverable energy reserves in the United States are in the form of coal.⁹

In 1920 "King Coal" accounted for 78 percent of the primary energy used in the United States. But oil and natural gas were cheaper, easier to handle and cleaner to use. By the early 1950's, rising oil production replaced coal as the nation's primary energy source. The decline of coal in percentage contribution to U.S. energy supply has been virtually uninterrupted from 1920 to date. After discussing the comparative disadvantages of coal, Moyer concludes that "the intrusive hand of government" overwhelms all other burdens which cloud coal's future. Government restraint comes in the form of legislation, regulations, and court interpretations. But government is both pushing and pulling on coal. The Carter National Energy Plan proposes forced conversion to coal by industry and utilities through both regulation and the imposition of new taxes on the use of oil and natural gas.

In the absence of any government interference either to restrain coal or to encourage it, the fourfold increase in the price of crude oil since 1973 should have restored some of coal's past glory. Moyer's Table 3 shows the Btu cost advantage of coal relative to oil and gas in all regions of the United States except the South Atlantic.

The loss of coal markets in transportation (railroad locomotives) and in home heating is probably permanent. The growth market for

9. The next largest energy source according to this listing is oil shale. The estimate is made by the National Coal Association, which includes only oil shale reserves that are "considered recoverable by demonstrated methods and include oil recoverable from higher-grade oil shale in Utah and Colorado, in beds 25 ft. or more thick, yielding about 30 gals. of oil per ton of rock and lying at depths less than 1,000 ft. below the surface. Assumed recovery is 60 percent of the oil content of the shale in place." This definition is more restrictive than the one drawn upon by the present writer in an earlier paragraph.

coal in the foreseeable future appears to be in electric power generation. The Federal government is moving in the direction of mandating natural gas out of electric power production, and residual fuel oil already appears to be priced out of this market. This leaves the field of new large-scale electric power production available almost exclusively to coal and nuclear. According to a Federal Energy Administration study based on 1975 dollars, the fuel cost alone at \$13 per barrel was more than the total cost of electricity generation by nuclear power (and nearly as high as the total costs of coal, without scrubbers). The FEA estimates are as follows:

Base Load Electricity Generation Costs (mills/kwh, 1975 dollars)

| | <i>Nuclear</i> | <i>Coal</i> | | <i>Oil</i> |
|---------|----------------|----------------------|--------------------|------------|
| | | <i>w/o scrubbers</i> | <i>w/scrubbers</i> | |
| Capital | 13.45 | 9.30 | 11.74 | 7.58 |
| Fuel | 1.80 | 10.11 | 6.85 | 20.70 |
| Other | 3.00 | 2.00 | 3.50 | 1.88 |
| Total | 18.25 | 21.41 | 22.09 | 30.16 |

Source: F.E.A., National Energy Outlook, 1976 pp. 187, 191.

Moyer points out that amendments to the Clean Air Act of 1977 require that new manufacturing plants as well as utilities using coal must use the "best available control technology" to reduce SOx emissions. This legislation not only reduces the advantage of low sulfur western coal relative to eastern coal but also impairs the ability of coal to compete with nuclear power. A more recent study based on mid-1976 costs shows that if scrubbers are required on coal fired generating plants, the generating cost is five percent higher than without scrubbers and 19 percent above the cost of generating electricity from nuclear power. The data are as follows:

Midwestern U.S. Base Load Electricity Generation
Cost (mills/kwh, 1976 dollars)

| | <i>Nuclear</i> | <i>Coal</i> | |
|------------|----------------|----------------------|--------------------|
| | | <i>w/o scrubbers</i> | <i>w/scrubbers</i> |
| Total Cost | 23.9 | 27.2 | 28.5 |

Source: Report of the Nuclear Energy Policy Study Group, *Nuclear Power Issues and Choices* (1977).

Moyer reviews the problems facing coal in the form of water pollu-

tion, conflicts concerning the allocation of water resources, environmental and other lawsuits over the implementation of the Energy Supply and Environmental Coordination Act, Surface Mining Control and Reclamation Act of 1977, and the Federal Coal Mine Health and Safety Act of 1969, and the breakdown of authority of the United Mine Workers Union. He concludes that the future of coal depends as much on "actions in the legislative halls and court rooms as it does on decisions flowing from coal company boardrooms."

Shale oil, unlike coal, has never reigned. Instead it seems to be a perpetual threshold industry. In 1973 spokesmen for the Oil Shale Corporation (TOSCO) informed the Ford Foundation Energy Policy Project that their company was ready to proceed with production of oil from shale. Their calculations indicated that a \$250 million capital investment would produce 50,000 barrels per day of oil which, when upgraded, would sell in California markets as virtually zero sulfur content fuel oil at about \$5.30 per barrel, yielding the company a 13 percent rate of return on its investment. Since 1973 the price of low sulfur fuel oil has increased nearly fivefold and there is no oil shale industry.¹⁰

The cost data presented by Schanz and Perry in their Table 3 both confirm the threshold character of the oil shale industry and also help to explain the cost problems encountered by the industry. Companies may have persistently underestimated the capital costs of plant construction. However, Schanz and Perry point out that environmental constraints enforced by Federal and State governments added substantially to both capital and operating costs. Direct and indirect costs of investments in community support facilities were also factored into capital requirements. Environmental roadblocks thrown in the path of oil shale development also added both procedural and legal problems requiring from two to three additional years for the construction process. The authors estimate that a two year delay is equivalent to a 20 percent increase in the price required for an oil shale plant to be deemed economic. According to Schanz and Perry the price of oil in 1976 would have had to equal \$18.30 per barrel in order to yield an acceptable minimum rate of return on an investment in oil shale production. However in 1976, the price of oil was about \$13 per barrel. They conclude that current uncertain-

10. The history of oil shale in the United States is partly folklore. According to one story, a pioneer Colorado settler by the name of Mike Callahan built a log house in Rio Blanco County in Colorado, then invited friends in for a housewarming. The fireplace was built of an attractive grey stone later known as marlstone. According to legend, when Callahan built his first fire, the fireplace and the house burned down. MONROE, *Introduction* to H. SAVAGE, *THE ROCK THAT BURNS* (1967).

ties do not justify the required investment for oil shale production and therefore "shale oil production continues to be a game of watchful waiting."

The distant future for oil shale is probably more easily predicted than its near term prospects. Oil shale suffers from high production costs but its basic problem is competition from crude oil. As long as abundant reserves of crude oil exist in the world, the U.S. oil shale industry will probably remain on the threshold, except for pilot plant production. When crude oil production declines sharply under pressure of economic exhaustion and its price permanently rises to new high levels, only then will large scale U.S. shale oil production begin. But that point is probably at least a half-century away. At lower levels of crude oil production, present members of OPEC will probably reserve their own crude oil for high valued uses, primarily petrochemical production, within their own borders. At that time, perhaps 75 years from now, there is likely to be only one surviving member of OPEC. That survivor is likely to be the United States, producing and exporting oil from its immense resources in oil shale, supplemented perhaps by synthetic crude oil from its large coal reserves.

Erickson, Peters, Spann and Tese have presented a case study of the dominant present form of regulation prevailing in the U.S. oil industry—crude oil price controls. The authors attempt to provide an economic rationale for multi-tier crude oil controls based upon the concept of "regulatory monopsonization" of U.S. crude oil producers. Under this concept the regulatory power of the Federal government might conceivably be used to create monopsony results thereby capturing monopsony profit.

A decision-making rule to accomplish this result would be deceptively simple. Controlled prices for categories of U.S. crude oil production must be set such that the marginal cost of each source is equal to the price of imported oil. The authors identify the necessary conditions for such a system to be efficient in both a static and a dynamic framework. They then find that these conditions are sufficiently formidable and perplexing that efficient monopsonization by the government is unlikely to occur.

While the rationale for crude oil price controls is weak, the fact that controls have reduced prices of some classes of crude oil cannot be denied. Erickson *et al.* conclude that the long term effect of this erosion of incentives to produce oil has been to reduce domestic crude oil supply. The authors give two reasons for this conclusion. Lower prices than would occur in the absence of control lead to a reduction in investments in oil recovery and thus to sub-optimal

levels of oil production. Second, in the absence of normal investment incentives, the decline rate in old oil production will be higher than normal. Since the regulated crude oil price is a weighted average of lower and upper tier crude prices, a more rapidly declining volume of lower tier oil necessarily reduces upper tier prices. The authors conclude that "The result, under composite price controls, is to reduce the price incentive for discovering and developing new oil resources."

Erickson and his colleagues also provide a short analysis of how crude oil price controls might affect petroleum product prices. Their analysis indicates that crude oil decontrol would cause product prices to increase approximately 5 cents per gallon for gasoline.

In sum, Erickson *et al.*, like McKie, find that U.S. crude oil price controls have contributed to lower domestic crude oil production, to higher consumption, and to increased U.S. dependence upon imported oil. A phase-out of price controls in May of 1979, as provided by the Energy Policy and Conservation Act of 1975, would "simplify the regulatory environment in which the U.S. petroleum industry operates, increase domestic supplies of oil and reduce reliance upon imports." The economic effects are relatively clear. All that remains is a political question as to whether this economic policy is acceptable at all, and if so, how price controls are to be phased out.

Deacon conducts a more detailed analysis of the effect of price controls on motor gasoline. This paper reports on two hypotheses. First, based on a study of imported versus domestic wholesale gasoline prices under price controls, the author finds that in the two year period 1975-1976 U.S. price controls resulted in domestic gasoline prices significantly lower than would be expected on the basis of uncontrolled gasoline imports. However, for the year 1977 he finds no significant differences and no evidence that price controls were effective in reducing U.S. gasoline prices.

Deacon's second hypothesis examines the increase in wholesale gasoline prices in the U.S. and the Netherlands between 1970-71 and 1977, after adjustments for taxes, transportation, import duties, and the present entitlements subsidy to imports. He finds results "inconsistent with the proposition that U.S. price increases (as of 1977) have been abnormally low when judged against an uncontrolled foreign situation." Again, he finds that price controls resulted in lower U.S. prices only through the year 1976. As a consequence of his analysis, he concludes that "competition, not regulation, is enforcing the current structure of gasoline prices in the U.S." Further, "it is difficult to see why controls should continue; they appear to do little more than impose an administrative burden on government and industry."

Part of the argument in favor of price controls and other forms of regulation in the energy sector is based on an assumption that competition is not effective in this industry. The Jones-Mead-Sorensen paper is based on the theory that free access to crude oil and an effectively competitive crude oil lease sale market makes monopolization in downstream sectors of this market impossible in the long run. This paper examines the extent of competition at various levels of the oil industry. Evidence is presented showing that the structure of the crude oil lease market is competitive and that concentration ratios in lease acquisition are relatively low for big-four and big-eight firms. Entry into the lease market is shown to be relatively free. An analysis of performance in the Outer Continental Shelf lease sale market shows no evidence of monopsony profits. To the contrary, the rate of return earned by lessees on 839 leases issued between 1954 and 1962 is less than a competitive norm. Free entry into crude oil lease markets, plus demonstrated low concentration ratios in oil refining and marketing, lead the authors to conclude that collusive behavior to restrain output and increase prices is unworkable in the long-run. "Successful collusion would require either (1) storage of crude oil or products, or (2) control over access to crude oil supplies. The former is prohibitively expensive; the latter does not exist."

Kneese joins Brannon in pointing out that in the energy and environmental areas there may be important externalities resulting in resource misallocation where decisions are made purely on the basis of private costs and benefits. Kneese believes that the market introduces a "systematic bias" and this bias leads to excessive rates of resource use. In his examination of the evidence he considers only the well-known instances of external costs and gives no consideration to the possibility of offsetting external benefits. There is probably widespread agreement in the economics profession that market failures exist and, as a consequence, there is a distortion of resource flows. But a *systematic* distortion has not been demonstrated and probably is not subject to widespread agreement.

Kneese specifically refuses in his paper to define the term "conservation" and examines instead the economic justification for slowing down the use of natural resources by means of deliberate public policies and their implementation instruments. The implementation instruments cited by Kneese are (1) economic incentives in the form of taxes or fees on certain activities or release of controlled prices, and (2) administratively enforced standards, e.g., prohibitions on certain acts.

After criticizing a "systematic bias" in the unregulated market, Kneese notes that past public policies have aggravated the problem of

excessive resource usage. His solution to the problem is to "replace [bad policies] with better ones."

It is not clear from the Kneese paper why future public policies utilizing taxes, fees and direct regulations would be an improvement over the past record. The paper by political scientist Daniel Ogden suggests that the principles of national policy making have not changed and that the "power clusters" which dominate policy making and the administrative agencies which guard their "turf" will continue to be successful in constraining and modifying legislation.

Economists are receptive to the idea advanced by Kneese of correcting for market failures by internalizing externalities. However, attempts to apply this principle are confronted with difficult problems.

First, where fees or taxes are levied to offset net external costs, the externality must be evaluated. Once evaluated, legislation must be enacted by Congress. Second, where Ogden's "market clusters" and administrative agencies exercise their customary rights to be heard, any similarity between what economists conclude is an appropriate fee to internalize externalities, or a proposed regulation as a means of avoiding external costs, may be only coincidental. Third, the cost of administering taxes, fees, and regulations must be considered. If the social costs of administration exceed the social costs of the net externality, then society is worse off than in the presence of the net externality. Fourth, once legislation emerges it must then be administered. The process by which a regulatory agency is captured by the group to be regulated has been well documented by political scientists and is well known. As Bernstein has said, "The history of [regulatory] commissions indicates that they may have survived to the extent that they served the interests of the regulated groups."¹¹ Thus what economists may agree is desirable and what they may collectively urge upon Congress is not necessarily what Congress will legislate. What is administered is a further modification. The record of administering oil import quotas provides an excellent example of the progressive deterioration and ultimate collapse of a program that from the beginning never advanced the general welfare.¹² Fifth, legislation is notoriously inflexible, but the real world is dynamic. Regulation once introduced is extremely difficult to

11. M. BERNSTEIN, REGULATING BUSINESS BY INDEPENDENT COMMISSIONS, 73 (1975).

12. For a description of the oil import program and its operation, see D. BOHI & M. RUSSELL, LIMITING OIL IMPORTS: AN ECONOMIC HISTORY AND ANALYSIS (1978).

change or remove even though conditions prevailing at the time of its introduction may have changed radically.

The Kneese paper discusses several of "the greatest possibilities" for reducing the rate of growth of *energy* usage without drastic reduction of the quality or quantity of production and consumption services which would otherwise occur. All three of the author's illustrations speak of measures which improve *energy* usage. But surely any economic definition of conservation would emphasize not a single resource but conservation of all resources. It would indeed be simple to introduce fees, taxes and regulations which would reduce energy usage, but at the expense of accelerated consumption of other resources. Buildings can in fact be constructed to reduce the energy needed for space heating and air conditioning, but at the expense of more insulation, labor and other resource usage. Reducing consumption of a particular resource or even reducing consumption of all resources at one point in time should not be the objective of a national policy which seeks both static and dynamic efficiency in resource use.¹³

Having argued that the market has a "systematic bias" and underprices energy resources leading to accelerated energy usage, and then having noted that past public policy has aggravated the problem, Kneese's faith that new public policies can correct this situation should be severely shaken. Several observations will support charges of failure of past and present policy. Price controls still exist on both natural gas and petroleum. Thus, after nearly a decade of the well publicized energy crisis, Federal policy is still aggravating the situation. The Carter National Energy Plan calls for a continuation and extension of natural gas price controls while price controls over oil are to be made permanent in the Carter plan. Regarding tax incentives, percentage depletion allowance is still accorded to all but a handful of integrated oil companies and provisions for expensing intangible drilling costs remain intact.

Brannon in his review of the use of taxation to correct for externalities in the energy sector, takes a broad view of the public choice problem, viewing it as a matter of both politics and economics. While conceding the presence of net externalities, he asserts that "a great deal, but not all, of an efficient solution for allocating energy re-

13. In another context and with a co-author, Kneese and Herfindahl wrote, "*The optimum sequence of outputs will reflect the impossibility of increasing the present value of total revenue minus outlays by transferring a unit of output from one period to another. This will be the case only if the present value of price minus long-run marginal cost is equal in all periods of production.*" See, O. HERFINDAHL and A. KNEESE, *Economic Theory of Natural Resources*, 117 (1974).

sources could be achieved by simply letting markets work, which means that the market prices for energy resources would rise sharply in the U.S." This process would of course immediately raise the political problem of burdens on consumers and windfalls for energy producers and resource owners.

The policy maker must contend with the political realities, the power of those who gain versus that of those who lose by removing old tax subsidies or introducing new taxes. Brannon points out that Congress "bought off" some opposition to continued crude oil price controls by the simple expedient of exempting a multitude of oil producers—the stripper well producers (those wells producing less than 10 barrels of oil per day). Also, opposition to price controls was reduced by creating a substantial beneficiary interest. Small refiners are largely exempt from the cost of price control but share in the benefits. Refiners that receive less than an average input of price controlled old oil are entitled to receive cash payments from other refiners receiving more than the average share of old oil.

Brannon evaluates a number of energy tax systems in terms of their economic rationale (resource allocation efficiency) and in terms of political feasibility. He concludes that the energy crisis itself is a political crisis which cannot be resolved through economic policy instruments. In another recent paper evaluating the record of tax policy in dealing with energy issues, Brannon wrote that "the whole collection of income tax incentives [relating to energy] must be written off as failures."¹⁴ The Brannon evaluation of the use of taxes to correct for market failure stands in sharp contrast with the more optimistic view of Kneese.

Ogden's view of the problems encountered by government as it attempts to deal with the energy crisis is quite similar to those of Brannon, although Ogden writes from the perspective of a political scientist. He reminds us that policy must pass through a system of "power clusters" representing various interest groups. Further, administrative agencies jealously guard their turf and yield jurisdiction only after a major struggle and only in the face of overwhelming political force.

The progress of legislation creating the new Department of Energy (DOE) is used by Ogden to illustrate his point. The politically naive among us might have assumed that the DOE would be *the* government agency exercising the lawful power of government in the energy area. Ogden cites a large number of illustrations to show that "more of energy is left out of the new Department than is included," and further that "the Department of Energy emerges as a paper tiger to wrestle with the foremost problems besetting the United States

today. It has virtually no authority to conserve energy. . . . It is virtually powerless to expand the nation's production of domestic energy . . . and several other agencies have the authority to check or stall energy development."

The shortcomings of DOE authority do not reflect Congressional failure to respond to the President's wishes. As Ogden puts it, "the stark truth is, the President did not ask for a Department of Energy which would assemble all Federal responsibilities under one roof. He really asked for very little more than he got." This apparent anomaly is explained in terms of political reality. Ogden observed that the President utilized a task force of experienced natural resource administrators who wrote "the strongest bill they thought could be passed." Being well aware of the strength of the power clusters and of the propensity of all agencies to protect their turf, they wrote a bill which would avoid antagonizing the most effective of these clusters." For those readers who might still believe that government could legislate a "comprehensive national energy policy" which would alleviate or solve the energy crisis, the Ogden paper should come as an enlightening lesson in political reality.

An unrestrained free market suffers from its well known externalities. But governmental attempts to correct for these market failures introduce their own shortcomings. What is in the interest of the general welfare but in conflict with dominant power clusters and administrative agencies is not likely to become public policy. The political approach to economic problems obviously has its own externalities. Political decision-makers rarely bear the costs of their collective decisions. Costs are borne by taxpayers and consumers, present and future. This is the classic externality case.

The final chapter by Hudson and Jorgenson is an empirical study showing the adjustments in energy inputs in production, changes in the composition of final demand, and reductions in economic activity as a result of increased energy prices occurring between 1972 and 1976. The authors utilize a dynamic general equilibrium model which they initially developed for the Ford Foundation Energy Policy Project. Using their revised model, they simulate two economic growth paths over the 1972-1976 period. In the first simulation, actual values of the exogenous variables, including world oil prices, are employed as the price basis for the growth path. In the second simulation, 1972 energy prices are used in order to determine the growth path which would have occurred in the absence of the actual higher energy prices.

The results measured by Hudson and Jorgenson reflect the combined forces of the market and government intervention. The authors

assume that increases in energy prices were the principal forces leading to moderated growth rates in energy consumption. They note that non-price energy conservation measures were not of overwhelming importance up to 1976.

The authors find that higher energy prices have caused energy use to decline from a projected level of 81 quadrillion Btu's (quads) based upon historical growth patterns, to an actual 74 quads in 1976, a reduction amounting to 8.6 percent. This reduction in energy use is accounted for by a redirection of final demand—consumption, investment, government, and export purchases—away from energy and energy-intensive goods and services, restructuring of patterns of inputs into production that is not energy intensive, and by a reduced scale of economic activity.

Interesting patterns of change in economic activity are revealed by the analysis. With higher energy prices, the demand for capital is reduced leading to a reduction in investment levels and a slower rate of growth of capital stock and productive capacity. Higher energy prices also lead to increased demand for labor as consumers shift spending toward labor intensive services, with labor substituting for energy as an input in production. But greater demand for labor is more than offset by the adverse employment impacts of the reduced scale of economic activity. As a result, actual 1976 employment is estimated to be adversely affected by higher energy prices to the extent of 500,000 jobs (0.6 percent of the labor force) and real GNP in 1976 is estimated to be 3.2 percent lower than would have been the case under a continuation of 1972 energy prices. In sum, Hudson and Jorgenson conclude that the oil price rise "imposed a significant and continuing cost on the U.S. economy."

It is clear that market forces performed their expected function of moderating energy demand. One might further infer from this study that in the absence of oil and gas price controls, the consequent higher energy prices would have led to even further reductions in demand growth rates. This would have resulted in lower oil imports and moderated balance of payment pressures in 1976 and after.

This synthesis has attempted to relate the twelve papers and to emphasize broad areas of agreement and disagreement. If one general view pervades among most of these authors, it is that resource conservation would be better served and the nation would be better off if markets had been allowed to allocate energy resources and if past government intervention had been avoided. On the other hand, some of the writers express confidence in the ability of government, through new and better regulatory policies, to improve society's wel-

fare in areas relating to energy. The reader is now urged to determine by means of a careful reading of all of the papers, whether the analysis and evidence supports either of these positions.