

HORIZONTAL DIVESTITURE

**HIGHLIGHTS OF A CONFERENCE ON
WHETHER OIL COMPANIES SHOULD BE
PROHIBITED FROM OWNING
NONPETROLEUM ENERGY RESOURCES**

held in Washington, D.C.
on 27 January 1977

Edited by W. S. Moore

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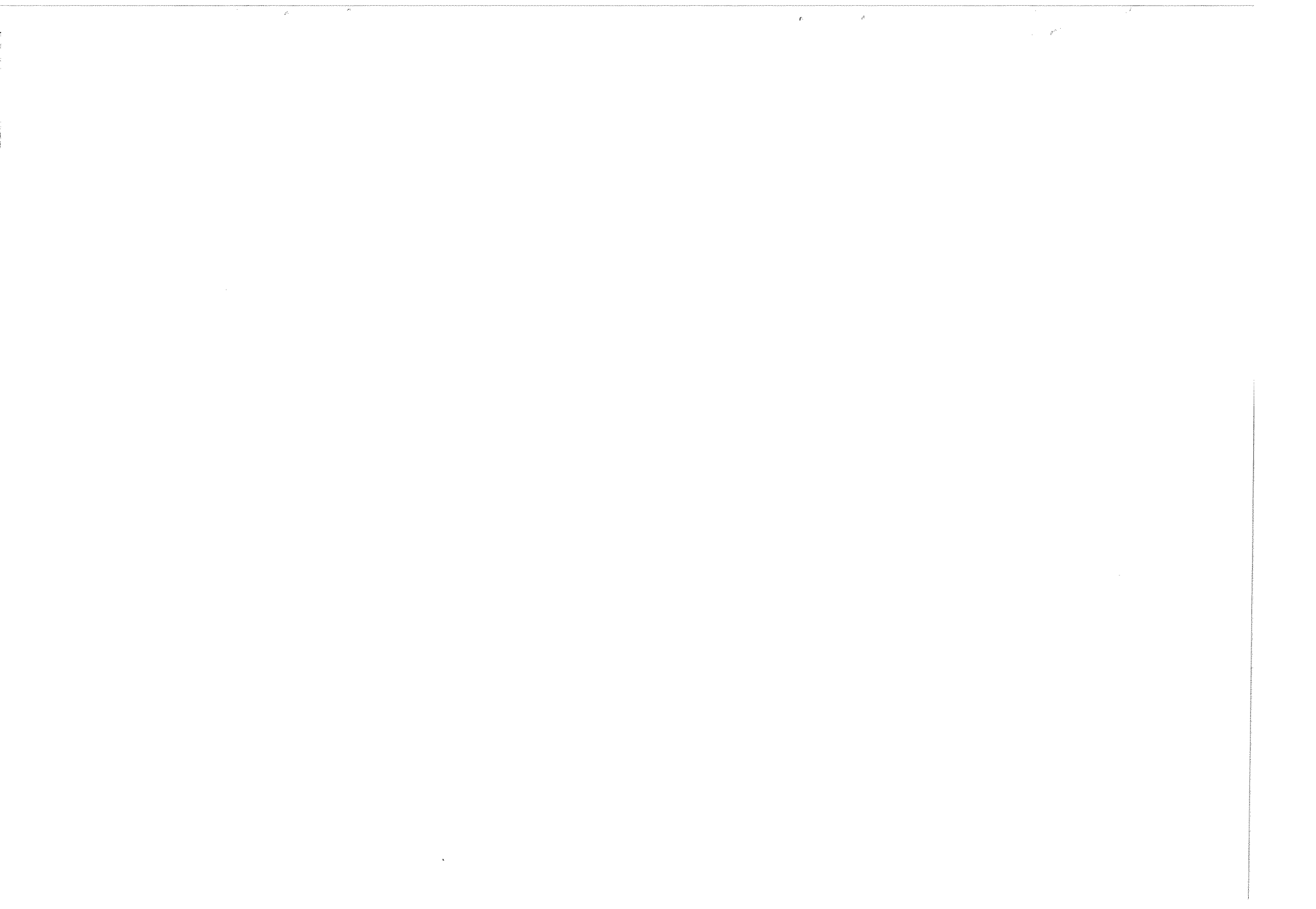
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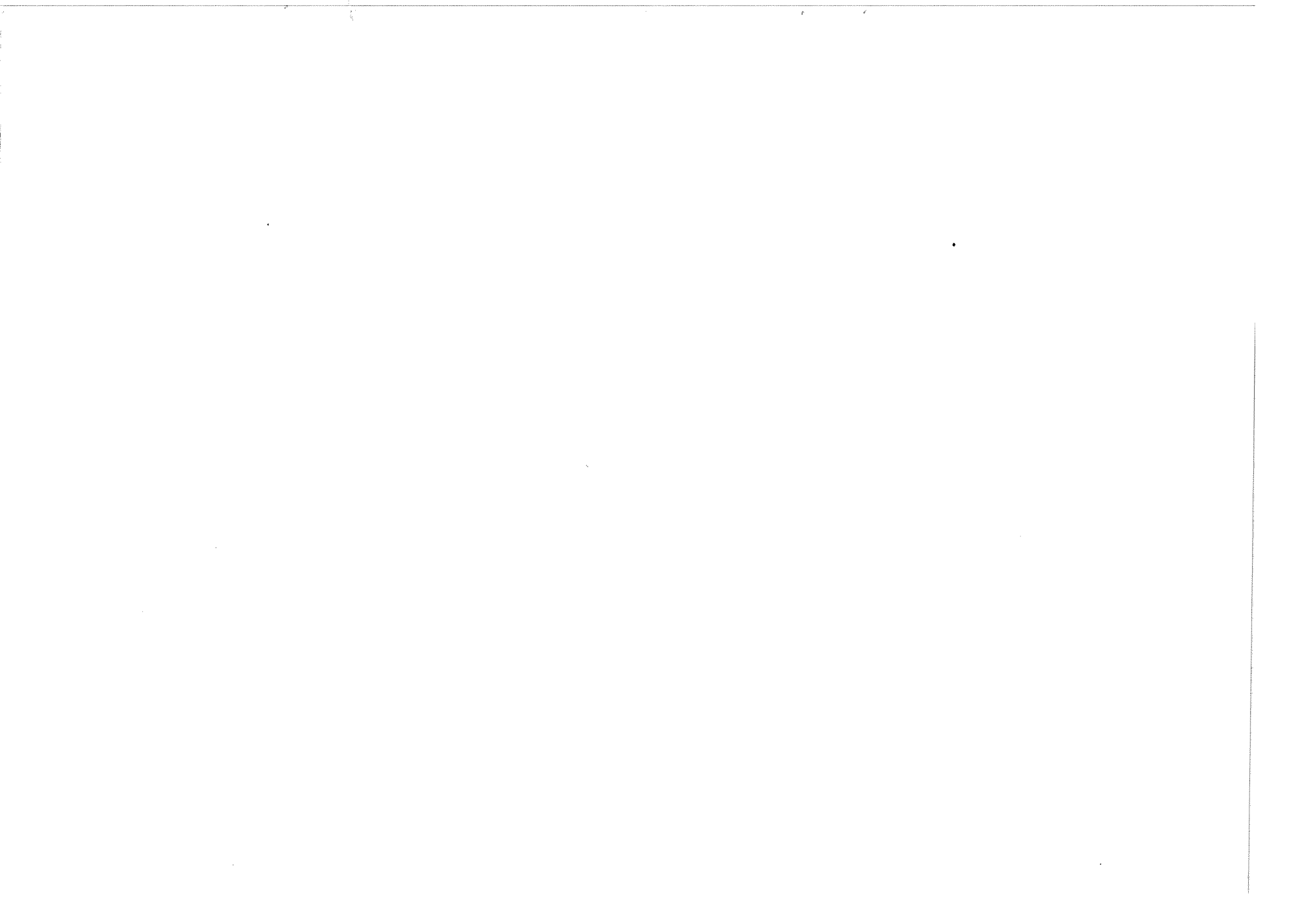


INTRODUCTION

This booklet presents a brief edited version of the highlights of the Conference on Horizontal Divestiture in the Oil Industry, held in Washington, D.C., on 27 January 1977, under the sponsorship of the American Enterprise Institute for Public Policy Research. The full proceedings of the conference will be published at a later date. The format of this booklet follows closely the chronology of the conference.

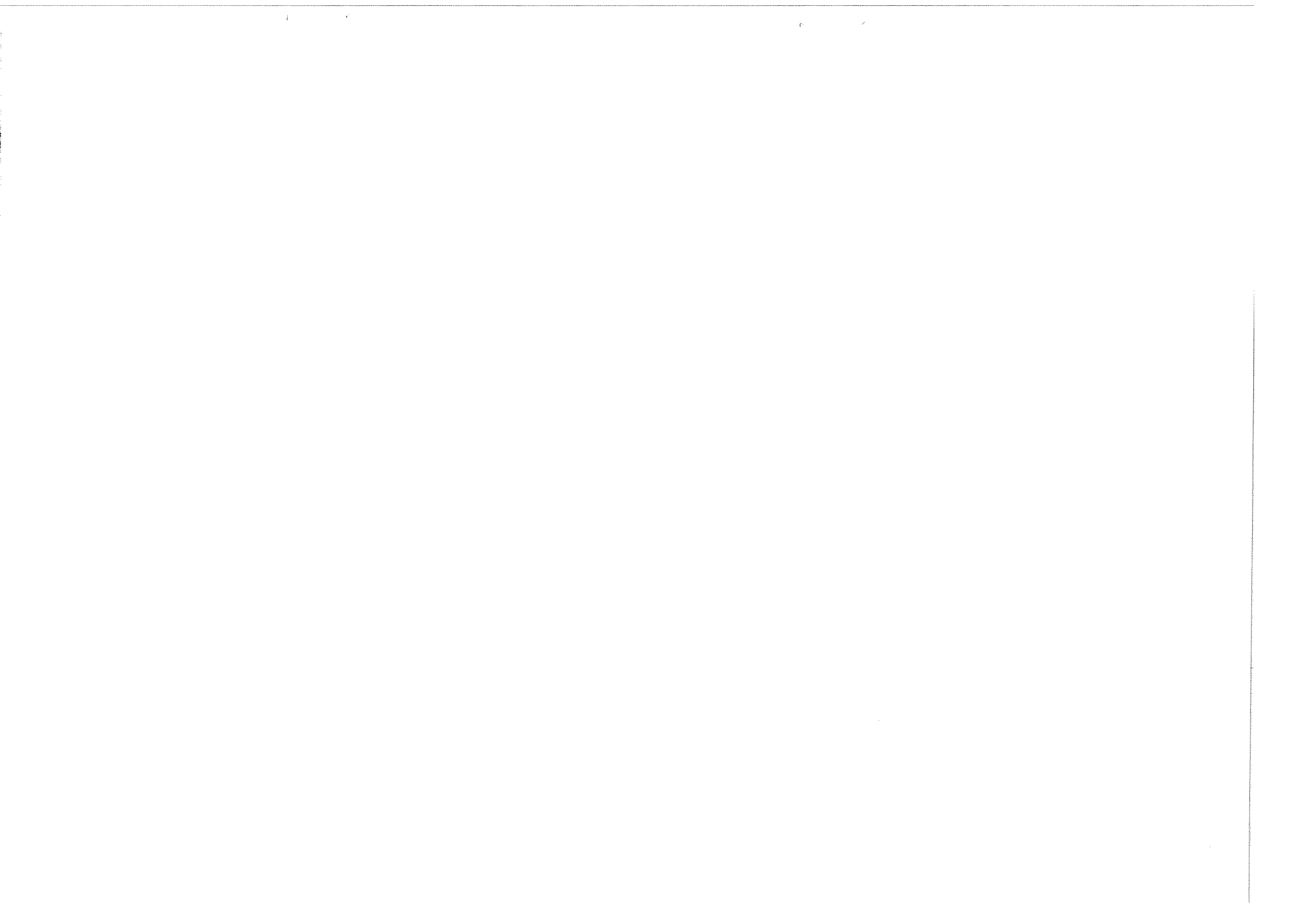
To present only the highlights from this conference has involved extensive editing of the papers, formal presentations, and commentaries. Rather than attempting to summarize the entire proceedings, the editor has chosen to present, as far as possible, excerpts that are both of general interest and representative of the variety of opinions expressed by the participants. Omissions are not indicated. The reader will find the full text of the conference papers in the forthcoming proceedings volume, together with material from the discussion periods and appropriate appendixes. The editor trusts that the highlights presented here will serve to introduce the major issues raised during the conference.

The question of prohibiting oil companies from acquiring coal companies or other nonpetroleum energy resources and requiring oil companies to divest themselves of any such resources they already hold was an active and controversial one during the last Congress. It is under serious consideration again this year. The purpose of this conference is to bring together persons with expertise and interest in this and similar questions from the academic world, government, business, and the public to exchange their views and thereby aid in the examination of horizontal divestiture and related issues.



PART ONE

COMPETITIVE ASPECTS



CHAIRMAN'S REMARKS

Thomas E. Kauper

On the issue of horizontal divestiture, as indeed on the issue of vertical divestiture, it is clear that, while we may talk in terms of competitive and economic aspects, we are also dealing with political and social issues. These will not be the major focus of this discussion, but they surely do play a major role in the present controversy.

An observation one might make is that the very title of this program assumes a conclusion. The program refers to *horizontal* divestiture. By my definition, that means relationships that are directly competitive, and we are, therefore, assuming a degree of interfuel competition since horizontal divestiture proposals seek only to confine particular energy companies to particular categories of energy production. Hence, the title does assume an answer to one important question—that there is considerable competition among the various fuels. Many of us do, indeed, assume that, but we may get some disagreement.

We should also keep in mind, as we go through the program, that horizontal divestiture really involves divestiture in part and something else in part. While it is true that the legislative proposals under discussion require divestiture of assets of companies currently operating in more than one fuel market, they also contain prohibitions on future entry into other fuel markets. Such prospective prohibitions cannot be characterized as divestiture and may raise somewhat different issues. We may want to draw some distinction between these two, since divestiture may involve some costs that a future ban might not.

Today we will not be directly discussing questions relating to vertical dissolution, though as we listen to some of the discussion, we may find that part of the case to be made for horizontal divestiture may rest on the presence of vertical integration.

HORIZONTAL DIVESTITURE IN THE PETROLEUM INDUSTRY: AN AFFIRMATIVE CASE

Walter Adams

Legislation was introduced in the 94th Congress to prohibit the integrated petroleum giants from extending their control into other energy fields. I believe that such legislation is necessary to preserve interfuel competition and to protect the public from an exploitative multinational cartel.

There are some who consider such legislation superfluous or undesirable. They contend that the petroleum industry is fiercely competitive and that the incursion of Exxon, Gulf, Texaco, and their fellow oligopolists into substitute fuels has no more social significance than the decision of a local hot dog operation to diversify into hamburgers. Also, they contend that only the petroleum giants command the technical know-how and the vast capital resources to develop petroleum substitutes like coal, shale, uranium, and geothermal and solar energy. They insist that only the petroleum giants can help the United States achieve the goals of Project Independence.

I disagree. I submit that the petroleum industry is neither competitive in structure, nor competitive in behavior, nor competitive in performance. I submit that surrender of the substitute fuel industry to the petroleum giants will only solidify existing patterns of cartelization and retard rather than stimulate interfuel competition. I submit that our failure to assure effective competition in the energy industry will condemn that industry to private monopolization and eventual nationalization. I believe with Thomas Jefferson that in the economic as well as in the political arena "it is not by the consolidation or concentration of powers, but by their distribution, that good government is effected."¹

Horizontal Control

At first blush, the concentration ratios in crude oil production do not appear to be overwhelming (see Table 1). Even so, it is noteworthy that concentration has been steadily increasing since the mid-1950s, so that by 1973 the eight largest companies accounted for almost as big a share of crude oil production as did the twenty largest in 1955. This trend is largely explained by the massive mergers during this period—especially mergers between the very largest companies: In 1965, for example, Union Oil (assets of \$916.5 million) acquired Pure Oil (assets of \$766.1 million). In 1966, Atlantic Re-

Table 1
LARGEST COMPANIES' SHARE OF U.S. CRUDE OIL PRODUCTION
 (percentage)

	1955	1960	1965	1970	1973
4 largest companies	21.2	23.9	27.9	31.0	33.8
8 largest companies	35.9	38.2	44.6	49.1	53.8
20 largest companies	55.7	57.6	63.0	69.0	76.3

Source: Federal Trade Commission, Bureau of the Census, company reports.

fining (assets of \$960.4 million) acquired Richfield (assets of \$499.6 million). In 1968, Sun Oil (assets of \$1,598.5 million) acquired Sunray DX (assets of \$749.0 million). In 1969, Atlantic Richfield (assets of \$2,450.9 million) acquired Sinclair (assets of \$1,851.3 million). As a result, the twenty majors of 1955 have become the sixteen majors of today.

Moreover, as Professor Walter Measday points out, "concentration in reserve ownership is even more important, particularly for the future, than concentration in current production. And the largest companies control most of the proved reserves. The Federal Trade Commission staff found that in 1970 our sixteen major companies controlled 77 percent of the net proved oil reserves in the United States and Canada. The producer has effective control, however, over all of the oil he lifts including the shares for royalty owners and other nonworking interest holders. In terms of gross reserves, the sixteen majors may control more than 90 percent of existing proved reserves."²

Finally, and most important of all, the petroleum majors are intertwined with one another through a seamless web of interlocking control. They do not function as independent or competitive, but as cooperative entities at every strategic point of the industry's integrated structure. They are meshed with one another in a symbiotic relationship, which almost inevitably precludes any genuinely competitive behavior.

Joint ventures are one manifestation of this symbiotic relationship. A joint venture establishes a community of interest among the parents and a mechanism for avoiding competition between them. It provides the opportunity for foreclosing nonpartners from access to supplies and/or from access to markets. It is a forum in which ostensible competitors can meet to exchange information and coordinate plans with apparent impunity. Most important, perhaps, it is a device which (in the oil industry, at least) has so far remained immune from antitrust attack.

As Table 2 indicates, the major oil companies historically resorted to

Table 2
**INDEPENDENT AND JOINT BIDDING IN FEDERAL OFFSHORE
 LEASE SALES, 1970-72**

Company	Number of Independent Bids	Number of Joint Bids
Amerada Hess	0	168
Amoco	6	321
Atlantic Richfield	12	293
Chevron	79	108
Cities Service	7	372
Continental	27	384
Exxon	80	0
Getty	0	281
Gulf	17	32
Marathon	24	214
Mobil	8	103
Phillips	0	169
Shell	59	93
Sun	115	2
Texaco	15	32
Union	0	245

Source: Testimony of the author in *Horizontal Integration of the Energy Industry*, Hearings before the Subcommittee on Energy of the Joint Economic Committee, 94th Congress, 1st session (1975), p. 111.

joint ventures in bidding for federal offshore lease sales. Thus Amerada Hess submitted 0 independent and 168 joint bids during the period; Getty, 0 independent and 281 joint bids; Phillips, 0 independent and 169 joint bids; Union, 0 independent and 245 joint bids; and so on. This, according to Professor Walter Mead, was tantamount to bid rigging:

In any given sale, it is obvious that when four firms . . . each able to bid independently, combine to submit a single bid, three interested, potential bidders have been eliminated; i.e., the combination has restrained trade. This situation does not differ materially from one of explicit collusion in which four firms meet in advance of a given sale and decide who among them should bid (which three should refrain from bidding) for specific leases and, instead of competing among themselves, attempt to rotate the winning bids. The principal difference is that explicit collusion is illegal.⁵

Indeed, explicit collusion has been illegal per se ever since bid rigging was condemned in *U.S. v. Addyston Piper Steel Co.* in 1898.

Similar joint ventures are employed by the major oil companies in their control of interstate pipelines (see Table 3) and their overseas production and marketing properties (see Table 4). In all, according to some estimates, these joint ventures provide upwards of 12,000 occasions per year for so-called competitors—the joint venture parents—to meet to discuss their common problems and the means for resolving them. Reinforced by top-level

Table 3
TYPICAL JOINT VENTURES IN THE OIL PIPELINE INDUSTRY

Pipeline Company (assets in millions)	Co-owners	Percent Held by Each
Colonial Pipeline Co. (\$480.2)	Amoco	14.3
	Atlantic Richfield	1.6
	Cities Service	14.0
	Continental	7.5
	Phillips	7.1
	Texaco	14.3
	Gulf	16.8
	Sohio	9.0
	Mobil	11.5
	Union Oil	4.0
Olympic Pipeline Co. (\$30.7)	Shell	43.5
	Mobil	29.5
	Texaco	27.0
West Texas Gulf Pipeline Co. (\$19.8)	Gulf	57.7
	Cities Service	11.4
	Sun	12.6
	Union Oil	9.0
	Sohio	9.2
Texas-New Mexico Pipeline Co. (\$30.5)	Texaco	45.0
	Atlantic Richfield	35.0
	Cities Service	10.0
	Getty	10.0

Source: Testimony of the author in *Horizontal Integration of the Energy Industry*, p. 112.

Table 4
SELECTED INTERNATIONAL JOINT VENTURES OF
PETROLEUM COMPANIES

Petroleum Company (1971 crude production)	Co-owners	Percent Held by Each
Arabian American Oil Co. (1.45 bil. bbls.)	Texaco	30.00
	Exxon	30.00
	Chevron	30.00
	Mobil	10.00
Iranian Oil Participants, Inc. (1.3 bil. bbls.)	Mobil	7.00
	Exxon	7.00
	Chevron	7.00
	Texaco	7.00
	Gulf	7.00
	B. P.	40.00
	Shell	14.00
	Atlantic	1.67
	Signal	.83
Getty	.83	
Iraq Petroleum Co.	B. P.	23.750
	Shell	23.750
	Exxon	11.875
	Mobil	11.875
Kuwait Oil Co., Ltd. (1.27 bil. bbls.)	Gulf	50.00
	B. P.	50.00

Source: Testimony of the author in *Horizontal Integration of the Energy Industry*, p. 112.

financial interlocks,⁴ they are the cement which binds together a loose-knit cartel into a cozy system of mutual interdependence. Without joint ventures, the dominion of Big Oil might be subject to recurrent competitive disturbances.

Obviously, then, such concentration ratios as are shown in Table 1 seriously and systematically understate the pervasive horizontal control of the petroleum giants.

And, in my opinion, it is downright silly to parade the low concentration ratios as proof that this industry is competitive in structure.

The Role of Government

A word is needed about the role of government vis-a-vis the petroleum industry. Historically, the government has done for the oil companies what they could not legally do for themselves without clear violations of the anti-trust laws. Under the guise of conservation and national defense, the Bureau of Mines set national output quotas, the states authorized prorationing schemes, and Congress approved the Interstate Oil Compact, as well as legislating tariff protection and import quotas. In addition, it subsidized the multinational grants with special tax offsets, and both the domestic and the multinational producers with a magnanimous depletion allowance. It made the petroleum industry a government-sanctioned, government-protected, government-subsidized cartel, and enabled it to operate a finely tuned scheme to restrict output and maintain prices on a worldwide scale.

The Public Policy Challenge

Recent events, especially since the Arab oil embargo, have done little to diminish the market control of the petroleum giants. To be sure, the nationalization, tax, and royalty policy of some OPEC countries has had a devastating effect on the owned equity of the multinational giants, especially in the Middle East, but this has not loosened their worldwide grip on refining, marketing, and transportation. Indeed, it may be quite reasonable to view the multinational majors, as Morris Adelman has repeatedly pointed out, as the marketing agents and tax collectors for the OPEC cartel—doing for the cartel what it appears incapable of doing for itself, namely, to prorate output among the cartel members in order to maintain an exploitative price level on a worldwide scale.

Similarly, Project Independence, born in the wake of the oil embargo, is not likely to weaken the control of the petroleum giants. On the contrary, Project Independence will make us more dependent than ever on the firms now dominating the energy industry. It will not only assure the maintenance of exorbitant petroleum prices but also yield to the owners of petroleum reserves a windfall gain in the value of those reserves. Moreover, it will strengthen the bargaining position of the dominant firms in obtaining concessions from a government intent on procuring, at whatever cost, additional supplies for an energy-starved economy. And this project may result in ad hoc antitrust exemptions, the relaxation of environmental standards, special concessions with respect to the development of Alaskan and outer continental shelf deposits, deregulation of natural gas, and above all license to invade competing energy fields. In short, Project Independence may well become the pretext for a further consolidation of control by the petroleum giants—not alone in oil and natural gas but in substitute fuels as well. The trend, as Table 5 shows, has already begun.

Table 5
DIVERSIFICATION IN THE ENERGY INDUSTRY
BY THE 25 LARGEST PETROLEUM COMPANIES, 1974

Petroleum Company	1974 Assets (\$ millions)	Energy Industry				
		Gas	Oil shale	Coal	Uranium	Tar sands
Exxon	\$31,332.4	X	X	X	X	X
Texaco	17,176.1	X	X	X	X	
Mobil	14,074.3	X	X		X	
Gulf	12,503.0	X	X	X	X	X
Standard of California	11,640.0	X	X	X	X	X
Standard of Indiana	8,915.2	X	X	X	X	X
Tenneco	6,401.6	X			X	
Atlantic Richfield	6,151.6	X	X	X	X	X
Shell	6,128.9	X	X	X	X	X
Continental	4,673.4	X	X	X	X	
Sun	4,063.3	X	X	X	X	X
Phillips	4,028.1	X	X	X	X	X
Union of California	3,458.6	X	X		X	
Occidental	3,325.5	X	X	X	X	
Getty	3,003.6	X	X		X	
Cities Service	2,897.9	X	X		X	X
Standard of Ohio	2,621.5	X	X	X	X	
Amerada Hess	2,255.3	X			X	
Marathon	1,799.9	X	X		X	
Pennzoil	1,797.9	X			X	
Ashland	1,715.8	X	X	X	X	
Coastal States Gas	1,696.9	X		X		
Signal Companies	1,532.9	X				
Kerr-McGee	1,164.4	X	X	X	X	
Murphy	1,041.6	X				

Source: National Economic Research Associates.

This is a problem not just in economics but in political economy as well. Against this background, is it in the public interest to permit the major oil companies to move into those energy fields which, after 1985, will be increasingly vital to the nation's independence from foreign supplies? Specifically, should we, by a major policy decision today, permit the petroleum

giants to play a significant role in determining what energy substitutes shall be developed, at what rate, at what cost, and at whose expense? In other words, shall we delegate to a private power complex—subject neither to the discipline of competition nor to effective government regulation and with a record of public service that is not reassuring—the right to plan our industrial future?

In shaping public policy, we must be mindful of two central principles: first, no person can serve two (or more) masters and be equally loyal to each; and second, no person can reasonably be expected to compete with himself.

If this be so, can we place our faith in private profit maximization by the petroleum giants as the mechanism for promoting the public interest and protecting the general welfare? When a giant business firm is engaged in multidimensional operations and can choose among its various investments, retarding or suppressing some while favoring others, will its price and product policy be the same as that of many independent competing firms immune from any conflicts of interest? When investment strategies and price policies are shaped not by vigorous and independent marketplace competition but rather by committees of top executives of Exxon, Gulf, Texaco, Mobil, SoCal, and the others, what guarantees are there that energy scarcities will not be intensified rather than moderated? Can we really expect these giant firms to undermine their stake in depletable oil and gas resources—the value and profitability of which are enhanced by their progressive scarcity—by investing the huge sums required to promote the rapid development of economically viable substitutes? Can these firms be realistically expected to unleash those Schumpeterian gales of creative destruction which would signal an end to their market dominance?

Before we convey control over the new, untested, and yet to be developed energy sources to the same giants which have geared their corporate policies to domestic and international cartelization, let us reexamine their track record. Have these firms fought against prorationing and similar output limitation schemes in the United States? Have they waged war against the tariffs and import quotas that raised the price of oil to American consumers? Did they try to undermine or subvert the Arab oil embargo? During the years when they were undisputed masters of overseas production, did they maximize output in those areas where the American taxpayer subsidized their concession rights?

Or did they do precisely the opposite? Did not these firms which now pose as the new champions of competition in energy dedicate themselves to production limitation by private means where possible, and by manipulation of governments where necessary, in order to maintain the price structure they considered palatable? Have they not come as close to cartelization, under government sponsorship, as any U.S. industry? Finally, what is there in the habits, history, temperament, and experience of these mammoth enterprises to lead one to predict a reversal of these monopoloid proclivities?

In conclusion, I do not deny that substitute fuels will demand tremendous investments. But is the petroleum industry prepared to make these investments in the form of private risk taking? Or, is it not asking the government to do so, while it invests in the promotion of interfuel and intrafuel mergers, and in such nonenergy, conglomerate ventures as Marcor, Ringling Brothers, and the New York Knickerbockers? And, most important of all, where is the competition upon which we would have to rely if the patterns of cartelization and monopolistic exploitation are to be avoided?

I respectfully submit that the Exxons of this world will not suddenly or voluntarily surrender their market control. Nor will they start competing against themselves in defiance of the laws of profit and power maximization. If the public interest is to be protected by competition in the energy market, some form of horizontal divestiture legislation will have to be enacted to assure effective interfuel rivalry.

¹*The Writings of Thomas Jefferson*, ed. Paul Leicester Ford (New York: G. P. Putnam's Sons, 1904), vol. 1, p. 122.

²See Walter Measday, "The Petroleum Industry," in *The Structure of American Industry*, ed. Walter Adams, 5th ed. (New York: Macmillan, 1977).

³Walter Mead, "The Competitive Significance of Joint Ventures," *Antitrust Bulletin*, Fall 1967, p. 839.

⁴See Stanley Ruttenger, *The American Oil Industry: A Failure of Antitrust Policy* (New York: Marine Engineers Beneficial Association, 1973).

MARKET STRUCTURE AND HORIZONTAL DIVESTITURE OF THE ENERGY COMPANIES

Jesse W. Markham

From the point of view of the economics of the oil industry, the present preoccupation of Congress with wholesale horizontal divestiture of multienergy firms is at best obscure. Divestiture has long been understood as the logical means of breaking up a firm that has attained monopoly power by actions judged to be less than honestly "industrial" or by business *modus operandi* described variously as "conscious parallelism," "conjectural interdependence," "competitive forbearance," and "oligopolistic rationalization." Such practices are usually associated with highly concentrated industries consisting of a few large rivals. The conventional wisdom on the subject postulates that at some high level of concentration in a market, the firms will become aware that any price-competitive strategy they employ to their own advantage and to the disadvantage of their rivals will prompt counterstrategies, making all firms worse off. Once all the participants recognize this fact, they adopt only those strategies that are advantageous to all—in short, they function very much like a monopoly.

This proposition has emerged as the basic tenet of oligopoly theory and the central hypothesis of empirical tests in a spate of industry studies since the early 1930s.¹ As an active participant in these endeavors, I am no detached and unbiased judge of the extent to which it advanced the frontiers of knowledge. I shall therefore confine myself to a rather uncontroversial summary appraisal of these empirical works. They provided factual evidence that the probability of cooperative behavior among oligopolists, at least on price, generally increased as the four-firm concentration index approached its upper limit of 100. They also demonstrated, however, that considerable variation in competitive behavior characterized different industries at the same level of concentration. In short, the variation in behavior at high levels of concentration was much too great to accept the level alone as evidence of a need for divestiture generally, as was envisaged in the proposed Industrial Reorganization Act (the Hart bill), or for divestiture in specific Sherman Act cases. By analogy, it would violate the principles of statistical science, as well as our sense of justice, to declare a healthy seventy-five-year-old man dead because the actuarial tables show that, on average, the life expectancy of the U.S. male is seventy-three. To some extent, each industry must be judged on its own demerits before resorting to the harsh remedy of divestiture.

This caveat notwithstanding, students of industrial organization and

various congressional committees appear to have reached a somewhat uneasy consensus on the range of market concentration that might be of public policy concern. Professor Joe Bain, synthesizing much of the empirical work on the issue over the past several decades, found the probability of conjectural interdependence to be as follows:²

<u>Four-Firm Concentration</u>	<u>Probability of Conjectural Interdependence</u>
71-100	High
51-70	Moderately high
26-50	Moderately low
0-25	Very low

Bain's conclusions are reasonably consistent with others who have studied the issue. Under President Johnson, the White House Task Force on Anti-trust Policy, a distinguished group of economists and lawyers, recommended a study of the possible restructuring by means of divestiture of industries in which four or fewer firms had had a combined market share of 70 percent in at least seven of the past ten years and four of the last five years.³ Earlier, Carl Kaysen and Donald Turner, on whose work the task force relied heavily, had proposed a similar guideline for divestiture.⁴ The standards for divestiture set forth in the proposed Industrial Reorganization Act would make industries with concentration at the four-firm level of 50 percent presumptively subject to divestiture, but profits had to be at least 15 percent for four of the most recent five years and evidence of price competition must be lacking. The presumptively unlawful high concentration could be rebutted, however, by a showing of economies of scale.

None of the yardsticks in these voluminous analyses would indicate that large oil companies engaged in other energy sources are likely candidates for divestiture. If all U.S. industries were ranked by their concentration indexes in domestic production, the oil industry would be found well down in the bottom half of the list. The average concentration ratio for all manufacturing has been calculated to be between 40.0 percent and 46.2 percent, depending upon the particular weighting system used.⁵ This means that approximately one-half of all U.S. industries have four-firm concentration ratios of 43 percent or higher. According to a Federal Trade Commission investigation of the petroleum industry,⁶ as of January 1, 1972 there were 129 independent crude oil-refining companies in the United States, with the largest four accounting for 33 percent of total refinery output. Concentration ratios for crude oil production and marketing were respectively 26 percent and 31 percent. The level of concentration in crude oil reserves depends on whether government-held reserves are included in total reserves. Since the reserves in fact exist, and the government has a wide range of options in recovering them, there would appear to be no particular reason for excluding

them from total proven reserves. If included, the largest four petroleum companies account for 27.3 percent of total reserves; if excluded, they account for 35.1 percent. But the important fact is, no matter how the level of concentration in the domestic oil industry is calculated, it falls measurably below the 43 percent level for U.S. industry as a whole. Moreover, since imports of both crude oil and refined products account for a significant share of total U.S. consumption (40 percent in the case of crude), the data in Table 1 tend to obviously overstate the market control implicit in the level of concentration.

Since profitability is at least as much a function of good management as of market structure, it is a highly unsatisfactory measure of monopoly. Since the Industrial Reorganization Act would establish profitability as one criterion of market power, however, we may as well subject the petroleum industry to this standard on the pragmatic grounds that, while it rewards us little, it costs us nothing.

Data appearing in the report of the FTC investigation cited earlier show that the weighted average rate of return on stockholders' equity for the eight largest petroleum companies over the twenty-one-year period from 1951 to 1971 was a scant 1 percent above the comparable average for all manufacturing. Percentage differences of this small magnitude indicate more than the obvious proposition that, in the compilation of any average, approximately one-half of all the items will lie above it. But more to the point, in no year

Table 1
CONCENTRATIONS IN THE PETROLEUM INDUSTRY, 1974
 (percentage of total)

	Crude Oil Production	Crude Oil Reserves		Refinery	Marketing
		Private	Private and government		
4 Largest Companies	26.0	35.1	27.3	33.0	31.0
8 Largest Companies	41.7	54.2	42.2	58.0	55.0
20 Largest Companies	61.4	73.1	56.9	86.0	79.0

Note: Not adjusted for royalty oil.

Source: Management Analysis Center, Inc., Cambridge, Mass., computed from 1974 company annual reports and totals as reported by the companies to various government agencies.

after 1951 did the eight largest oil companies earn the 15 percent rate of return set forth in the proposed Industrial Reorganization Act as indicative of undue market power.

Since the proposed legislation implies that oil and nonoil energy under the same corporate roof constitutes horizontal integration, the level of concentration in the energy industry as a whole becomes pertinent to the need for such a radical divestiture program. Concentration indexes for various alternative definitions of the energy industry are shown in Table 2. As would be expected, the broader the definition of the relevant market, the lower the level of concentration turns out to be. The share of market accounted for by the four, eight, and twenty largest firms declines perceptibly as the market definition is enlarged to include gas and coal as well as oil, with the four-firm concentration ratio declining to less than 20 percent. Under this definition of the relevant market, the level of concentration in energy lies in the 0 to 25 percent range, where Bain and others have concluded that tacit cooperation among rival firms becomes an extremely remote possibility.

All this may suggest that I view it to be my role to aid the defenseless energy companies in their struggle with an all-powerful and obdurate element in Congress. My response is that I have done neither more nor less than

Table 2
CONCENTRATION RATIOS OF THE ENERGY INDUSTRY, 1974
 (percentage of total)

	Energy Industry Definition				
	Oil ^a	Oil and gas	Oil, gas and coal	Oil, gas, coal and uranium ^b	Oil, gas, coal, uranium and geothermal
4 firms	26.0	25.1	19.1	18.4	18.4
8 firms	41.7	39.2	31.5	29.7	29.7
20 firms	61.4	59.0	49.6	47.8	47.8

Note: This table is based on production in B.t.u. equivalents as follows: oil, 5,620,900 B.t.u./barrel; natural gas, 1,102,000 B.t.u./thousand cubic feet; coal, 24,580,000 B.t.u./short ton; uranium (U_3O_8), 430 billion B.t.u./short ton; geothermal, 3,412 B.t.u./kilowatt hour. B.t.u. equivalents taken from Federal Trade Commission, *Concentration Levels* report.

^aNet crude oil, condensate, and natural gas liquids.

^bUranium concentration (yellowcake) production.

Source: Calculated from raw data from: Federal Trade Commission, *Concentration Levels and Trends in the Energy Sector of the U.S. Economy* (Washington, D.C., 1974), p. 452; selected corporate annual reports; *U.S. Coal Production by Company—1974*, published by Keystone Coal Industry Manual (New York: McGraw-Hill, 1975); unpublished data from House Interior Subcommittee on Mines and Mining provided to author.

to apply standards of economic analysis historically accepted by congressional committees and antitrust agencies to the structure of the energy industry and its components. This analysis has led to the conclusion that divestiture by industry-specific legislation cannot be squared with these standards. My search of the public record for the views of recognized antitrust authorities on the issue has proved both rewarding and consoling.

The FTC's 1974 report, *Concentration Levels and Trends in the Energy Sector of the U.S. Economy*, reached the following conclusion:

The information reported in this study appears to suggest that petroleum company acquisitions into coal companies up to 1970 may not have had a severe impact on energy production concentration. Consequently, this study does not provide any positive support to the proposal that petroleum companies be banned from acquiring coal or uranium companies; nor does it suggest that petroleum companies be banned from acquiring coal or uranium reserves.⁷

In an appearance before the Joint Economic Committee, Frederic M. Scherer, then chief economist of the Federal Trade Commission and the author of one of the most widely used industrial organization textbooks, stated that the levels of concentration in the combined energy market "do not yet approach the peril point."⁸

And, Thomas E. Kauper, head of the Department of Justice Antitrust Division, stated before the Senate Committee on the Judiciary in June 1976:

the petroleum industry appears to be one of the least concentrated of our nation's major industries. This data calls into question the propriety of massive structural reorganization. If the present structure of the industry does not exhibit the characteristics associated with excessive market power, then a solution based on that premise may be both unavailable and counterproductive.⁹

I attach considerable importance to these conclusive statements not simply because they are broadly consistent with my own analysis. Leading antitrust officials may on occasion, like the rest of us, make pronouncements that do not entirely square with an objective analysis of all the pertinent facts. Now and again they too remind us that the old saw "to err is human" applies even to experts. But it is reasonably safe to conclude that neither the Federal Trade Commission nor the Antitrust Division has become a sanctuary for apologists for monopoly. Nor has either of them been placed under the leadership of those predisposed to err in favor of the large oil companies.

Indeed, those identified with the sponsorship of the Interfuel Competition Act have publicly recognized that their single-minded preoccupation with divestiture of the oil companies is fraught with ambiguities. The late

Senator Philip Hart in his luncheon speech at the Airlie House Conference on Concentration on March 2, 1974, observed with his characteristic candidness that, by most standards with which he was familiar, the oil industry was not among our more concentrated industries. Dr. Walter Measday, staff economist for the Senate committee sponsoring the legislation, stated in his address to the Stanford University Conference on Divestiture in September 1976 that "available statistics provide a surface appearance of moderate concentration . . . far less, for example, than we can find in a number of other industries."

Since virtually everybody agrees that no persuasive case can be made for the Interfuel Competition Act on *economic* grounds, it may very well be that we all, including the act's strongest supporters, are using irrelevant language. The language of politics, rather than more quantitative analytics of economics, may provide the *raison d'être* for the single-minded preoccupation of Congress with divestiture. The divestiture movement followed quickly on the heels of the October War in the Middle East. The OPEC oil embargo on the United States, which increased gasoline and home fuel oil prices and resulted in long waiting lines and Sunday closings at service stations, left the American public with a sense of frustration. Politicians generally welcome the opportunities popular issues afford; they can promise solutions. In this case the root cause was obviously OPEC, but our antitrust laws cannot be applied to cartels beyond our shores. A culprit had to be found. Why not the oil companies? In comparison with motorists, they are few in number, and, in any popularity poll, they would rank at least as low as they do in the order of concentration of U.S. industries.

I would like to add a few comments on Walter Adams's paper. Much of what he said reflects the ineffectiveness of government. It is not the role of the oil industry to persuade the government to lower tariffs on oil any more than it is the role of the milk producers' association to persuade the relevant government bodies to lower the price of milk. We should insist that government officials operate in the public interest. If they cater to special interests, that is the fault of the government officials and not of those who may benefit by such public action.

I would also like to say something about the trend in concentration. Professor Adams happened to pick 1973. The data from 1955 through 1974 would have developed a somewhat different picture. It is quite true that concentration rose, largely for the reasons he gave, through mergers from 1955 to 1970. There was a perceptible decline in concentration between 1970 and 1974.

As the Du Pont-General Motors antitrust case clearly indicates, there is nothing wrong in reexamining any one of those acquisitions. As far as I know, the statute of limitations does not hold on any of them. They can be challenged, if the merger violated Section 7 of the Clayton Act. Perhaps the preventive law has not been used as forcefully as it might have been, but that

would not be sufficient grounds for the wholesale dismemberment of the present entities in the energy industry.

¹See Edward H. Chamberlin, *The Theory of Monopolistic Competition* (Cambridge: Harvard University Press, 1933).

²Joe Bain, *Industrial Organization*, 3rd ed. (New York: John Wiley and Sons, 1972), p. 136.

³The task force report is reproduced in *Journal of Reprints for Antitrust Law and Economics*, Winter 1969, pp. 633-828.

⁴*Antitrust Policy: An Economic and Legal Analysis* (Cambridge: Harvard University Press, 1959), pp. 266-72.

⁵Frederic M. Scherer, *Industrial Market Structure and Economic Performance* (Chicago: Rand McNally Co., 1970), p. 63.

⁶*Investigation of the Petroleum Industry*, report of the Federal Trade Commission to the Permanent Subcommittee on Investigations of the Senate Committee on Government Operations, Committee Print, 93rd Congress, 1st session, 1973.

⁷Federal Trade Commission, *Concentration Levels and Trends in the Energy Sector of the U.S. Economy*, Washington, D.C., 1974.

⁸*Horizontal Integration of the Energy Industry*, Hearings before the Subcommittee on Energy of the Joint Economic Committee, 94th Congress, 1st session, p. 75.

⁹*The Petroleum Industry*, Hearings before the Senate Committee on the Judiciary, 94th Congress, 2nd session, p. 60.

COMMENTARY

Morris A. Adelman

The two papers constitute a hard act to follow, but I would like to carry out the rather pedestrian, pedantic task of defining the areas of agreement and of disagreement.

The area of agreement is that competition consists in independent actions by individual firms, each seeking its own advantage even if that costs something to the group as a whole.

In a competitive industry, no individual firm can do anything to serve the group as a whole. It cannot, for example, do anything about the prices. It must take a price as given and outside of its power. If the price of a product exceeds the cost of putting a little more of it on the market, then the firm, in order to increase its own profits, will expand toward that point. For this kind of independent action to occur (again, I think there would be agreement here), numbers are a sufficient condition, though, Professor Markham would add, not a necessary condition. Hence the importance of canvassing the numbers. Numbers are a rough and imperfect measure of both true market dimensions and true market shares. Hence, Professor Markham is orthodox enough in defining the market in a number of alternative ways—the narrowest possible, the widest possible—to see what difference it makes. The truth perhaps lies in that famous area somewhere between the extremes.

The disagreement centers on how good these numbers are as a representation of the underlying reality. Here, I will contribute my own thoughts, and I will confine them to just one area—crude oil production in the United States.

The true concentration ratios are really considerably less than what is indicated in Professor Markham's table. The reasons for this are, first, imports, and, second, joint ventures. Imports are provided by independent owners—namely, the governments of the oil-producing states. There has been a rather substantial vertical divestiture since about 1970 in the Persian Gulf and other such unsalubrious places, and, not unconnected with this, there has been an increase in price by a factor of ten. If our foreign policy makers continue to be ruled by myths, those prices will keep going up.

There are governments that receive \$11 a barrel in return for just about nothing, and there are companies in this country with profit rates that

hardly diverge from the average. Yet such fury is directed at one and not at the other that I am reminded of that notorious rabbi who marveled how some folks strain at a mosquito and swallow a camel.

Getting back to numbers, however, if 40 percent of American oil consumption is imported, that means the true concentration ratio must be reduced from around 34 percent to around 20 percent.

My second correction cannot be made into a numerical correction. Joint ventures in the United States reduce the impact of any given degree of concentration. (In anticipation of what Darius Gaskins will say, I will bypass the question whether the bidding process shows much divergence from purely competitive behavior.) But, if we stay at the oil production stage, the pattern of ownership in these joint ventures is scrambled, with each producing lease managed as though it were an individual pure competitor. The partners really have no options either economically or legally except to push output to the point where marginal cost is equal to price. Past that point, drilling more wells or trying to pull more out of the reservoir would simply raise costs above price. There is nothing else they can do legally, because the landowner has a right to sue. More important, there is nothing else they can do economically because there is no way they can tailor production to serve the interests of any of the individual owners or even the industry as a whole. The reason for state prorationing—the sort of thing Walter Adams has very properly drawn attention to—is that oil companies could not do it for themselves. The state had to do it.

I want to make just one more point, about the basic purpose of competitive independence. It touches on the diversified ownership of coal and uranium. Any individual company in, say, the coal industry benefits by expanding its own output. Assume a company has 10 percent of the coal and 10 percent of the oil markets, and suppose it puts an advantageous new property into operation. It gains by taking business away from other companies—it will profit, and the others will lose, without necessarily lowering the price level throughout the industry.

Professor Adams's question was quite relevant: Can we trust these companies to unleash the gales of creative destruction? First, they have to find the key to the closet where those winds are kept. If they can find the key, it is in the interest of their pocketbook to unleash them before somebody else does. Let's define the issue not as a question of fact but rather as follows: Can integrated companies restrain competition? The answer has to be no.

Would a prohibition on integration increase competition? Apart from the transition costs, such a prohibition would block entry into the field and would not do much else. Maybe that is not quite all—passing a law like this would make a lot of people feel better, and that is a public good that I do not take lightly. I am reminded of Lord Chesterfield's remarks about sex, that the position is ridiculous, the pleasure is momentary, and the expense is prohibitive. [Laughter.]

First, I would like to make a disclaimer: I am speaking for myself and not for the Federal Trade Commission today. And, second, I would like to apologize to the illustrious people who have spoken before me, because I disagree in some way with almost everyone here. I will make a couple of major points and then some minor points about the two papers.

My first major point is that, over the intermediate period, there will be no meaningful interfuel competition between coal and oil. For that reason, Professor Markham's concentration ratios for all energy are unimportant and insignificant and tell us nothing.

If we calculated all the resources in the world on a B.t.u. basis, we would find that North America has 49 percent of all the B.t.u.'s in the world. Asia, Africa, South America, and Oceania—which include all the countries that are currently in OPEC—have only 27.5 percent of all the B.t.u.'s. If the competition is between different fuel sources, we should have those nations over the B.t.u. barrel rather than vice versa. Obviously, there is some problem with that kind of simple analysis.

Beyond that I will make the following proposition: In the intermediate future in the United States, the prices of coal and uranium will not be determined by the price of oil, but by the costs of extracting those minerals from the ground.

My second major point concerns withholding, which is implicit in this whole discussion. If the owner of a natural resource can benefit by withholding a unit of production, even when the cost of its extraction is less than the current market price, then we have reason to be concerned.

Since the speakers have misstated or misunderstood the argument about withholding, I would like to make this general proposition. Whenever there is a rising supply curve involving energy resources and someone holds a finite portion of the reserves and also a unit at the margin, he will benefit by withholding the marginal unit. The reason he will benefit is that, by withholding the marginal unit, he drives up the price. And that price, of course, will be the price he will get for the production from his finite resources. With a rising supply curve, there is always the theoretical possibility of withholding.

The important point is that there is a rising supply curve. If we could assume that the Arabs or others would sell all the oil we wanted at \$11.50 per barrel or \$3 or some other price, then, of course, we would not be faced with a rising supply curve and withholding would not profit anyone. Withholding the marginal unit would have no effect on domestic prices.

It is my contention that, because of the vast reserves and resources in coal and uranium held by the federal government and other landholders, we have an essentially horizontal supply curve for the intermediate future, and the withholding argument has no merit. But the withholding argument may or may not have merit with regard to the oil industry because we recognize—

and Professor Adelman made this point strongly—that the price of oil in the world market is artificially held up by the OPEC cartel. Most statements about limiting our dependence on foreign sources through Project Independence or other means implicitly assume that domestic production of oil has something to do with the stability of that cartel. As I interpret that, the domestic production of oil is related to the expected future selling price of oil.

If that is true, the withholding argument is theoretically possible once more, because withholding oil at the margin from domestic production may affect the selling price of all the rest of the resources in a company's portfolio. Theoretically at least, withholding is possible, though I will not discuss whether or not it is empirically relevant.

If it is theoretically possible, Professor Adelman is mistaken because a large number of producers is no longer sufficient to assure competition. In fact, numbers are irrelevant. The key to withholding is the holding of finite reserves. The characteristics of all natural resources is that they occur in large lumps. Finding them is a stochastic process, and individual producers have substantial reserves.

When people hold lumps of reserves, withholding is theoretically possible as long as an upward sloping supply curve prevails. I am very uncomfortable with the idea that, if there are enough firms in any resource business, there is no potential for withholding. I am even more uncomfortable, as I indicated before, with citing concentration ratios as indicia of competition.

Those are my two major points. I would also like to make some specific comments about the two papers.

Professor Markham discusses concentration ratios with some skepticism, and then he cites the low profitability of the oil industry over the past twenty years as evidence of competition. My question for Professor Markham is, Is that the right issue? We are discussing not past wrongs but rather what the future holds. The question then is, What about profitability for oil companies over the next twenty years? And the issue is, Are the past twenty years a good precursor? Do they tell us what will happen? I would say they do not. The world energy situation has changed dramatically, and profitability in the future will be quite different from profitability in the past.

Without making any predictions about excess profits, I want to point out that looking backwards from this particular time in history tells us very little about the future.

Regarding Professor Adams's paper, I feel beholden to make several points. The first point concerns his discussion of joint bidding. The question here is the effect of joint bidding on the disposition of the economic rent—whether the government gets more or less for the property it sells. This is an extremely complicated problem. I think the following three things are true. First, the total effect of joint bidding on the disposition of the economic rent for all property sold—that is, how much the government gets—is un-

clear. It is not known whether the government benefits or loses in total from joint bidding.

Second, I would argue that joint bidding may have a pernicious effect on the price received for specific properties sold. The empirical evidence is muddier than I once thought, and it remains an unsettled issue.

Finally, it should be clear that a total ban on joint bidding activity cannot be justified. There are obvious benefits in allowing companies that lack the geophysical expertise or financial resources to participate in this auction. If we want resources held in small portions in many hands, then joint bidding should not be totally prohibited.

My second point concerns the significance of government policy in terms of resource leasing. In the coal and uranium markets, the federal government has an enormous hold on unexplored territory, the regions where we may find vast quantities of uranium and coal. Leasing policy is really important to future competition in coal and uranium.

Unfortunately, some people in the public sector seem to believe that, if the government leases substantial portions of this land, it benefits major oil companies or the major bidders. Probably just the opposite is true. If the government withholds its vast holdings from the market, it actually increases the profits of the existing holders of reserves. The general public has this story upside down. Personally, I think there are many good reasons to allow *de novo* entry by oil companies into coal and uranium mining, but I will leave that to the afternoon session because there are strong proponents of those arguments then.

Professor Adams's disapproval of investment by oil companies in non-energy business strikes me as inconsistent with his basic position. If there really is strong substitutability between these energy sources and if it really is undesirable for oil companies to buy coal and uranium, then they should be encouraged to buy other properties. Put another way, they should buy properties whose risks are negatively correlated with the price of oil. An oil company that owned a large ranch in Southern California or a major retail chain would have an attitude towards the future price of oil more like that of the nation as a whole. Ideally, the financial incentives of the oil companies should be aligned with those of the American public, if they have the ability to influence the future price of oil. It would be an erroneous policy to prevent them from investing outside the energy area.

When Professor Adams discussed Project Independence, I thought he said that it would result in a windfall to owners of existing reserves in the United States. I do not understand the logic of that argument. If Project Independence causes us to produce more oil and gas in this country, or to use less and thereby reduce our imports, it should lower the future price of oil. If so, the value of the oil reserves would also be lowered.

My final point is the general conclusion that a horizontal divestiture bill or some restriction on entry by major oil producers into coal and uranium

production as a whole would be a serious mistake. I have an open mind, however, about restrictions on oil companies that would prevent them from investing heavily or dominating coal liquefaction or shale oil. There is direct substitutability between both liquefied coal and shale oil and oil. Since the withholding argument may have merit, I would not categorically rule out any restriction on entry into those activities.

Robert Pitofsky

As the only antitrust lawyer on this panel other than our chairman, I will look at this question of horizontal divestiture in the oil industry from that viewpoint. As I would frame the issue, any policy of barring or discouraging oil company ownership of alternative energy sources must turn on the prediction that oil companies would develop those resources in a different way from other owners. That could be measured in terms of output decisions, in research and development, and perhaps even in the way prices are established for these competing or marginally competing energy products.

The question an antitrust court would immediately ask is, How do we make that prediction? Is it on the basis of theoretical probability, that is, a prediction on the basis of market structure? Or, should we compare the way oil companies have handled their coal companies and other energy resources with the way nonoil companies have handled their coal companies and other energy resources?

Professor Adams relies on structural inferences, though he does point to some elements of historic behavior. But when he says no one can reasonably be expected to compete with himself, and when he questions whether an oil company's price and product policy will be the same as that of an independent competing firm, immune from any conflicts of interest, he suggests a kind of inference based on structure — that is, based on the simple conflict of interest within a company owning both oil and coal resources in the market.

Professor Markham raises some useful warning flags about whether or not there is concentration in the oil industry, and also whether profits in the oil industry are excessive. But Professor Teece's paper in Part Two of this conference approaches the question in the alternative way. He looks at what the oil companies have actually done with their coal holdings in terms of investment, production, research and development, and so forth, compared with companies that own such resources and are not in the oil business, and he concludes that there is not much difference. I am not as interested in the conclusion as in the formulation of the issue.

I searched the antitrust literature to find out how the courts would look at this question if it were in an antitrust context. I found some loose language in a few Supreme Court cases—for example, in *Penn-Olin* (United

States v. Penn-Olin Chemical Co., 378 U.S. 158 [1964]), which involved the legality of joint ventures—to the effect that a parent can never be expected to compete with its progeny. But the Court was not really focusing on the issue.

The case that comes closest, in my mind, to the issue as I have framed it here was a merger case which began in 1956 involving Continental Can and Hazel Atlas (United States v. Continental Can Co., 378 U.S. 441 [1964]). Continental Can, the second largest producer of metal containers, acquired Hazel Atlas, the third largest producer of glass containers. The Supreme Court concluded that metal and glass containers competed across a broad range of uses and then addressed the question of whether competition was likely to lessen if a glass company fell into the hands of a can company.

The district court approached the question on the basis of proof of whether competition was likely to lessen. In finding no lessening of competition, the trial court saw no evidence that as a result of the merger, Continental would lose the incentive to push can sales at the expense of glass. The government had introduced no evidence showing that there either had been or was likely to be any slackening of effort to push can sales. In the light of the record and competitive realities, the court later concluded it was patently absurd to expect Continental to cease to innovate in either line.

The approach of the district court was to ask what the companies actually did. The Supreme Court, however, reversed the lower court's findings and its conclusion. First of all, it made the fairly sensible point that the lower court was influenced by evidence of the way the new company actually conducted its business after the merger, but the company was under the gun during that period. The company knew the merger would be challenged under Section 7. Therefore it would be unwise to draw any inferences from the way the can company and its glass company were run at that time.

But that left the record in a neutral state on the question of how the combined company would be run. The next question was how the government would prove there was a lessening of competition. The Supreme Court answered that question as follows: It would make little sense for one entity within the Continental empire to persuade the public of the superiority of metal over glass for a given end use while the other entity plans to increase glass container output for that same end use. Thus, at least during the period of the Warren Court, there is powerful authority at the Supreme Court level to support the approach Professor Adams has taken here.

I would add, however, that I am troubled by that approach. I would like to raise several points in regard to whether it should be pursued in connection with oil company divestiture of coal and other energy resources.

First, it is not difficult to compare the way an oil company runs a coal company with, for example, the way Kennecott (a nonoil company) ran Peabody Coal. Often, critics of antitrust enforcement who demand evidence on the record rather than theoretical inferences really do not want any en-

forcement at all. For example, with respect to a merger of two 10 percent companies, the government could scarcely prove a likelihood of a lessening of competition because a lessening of competition is such an elusive notion. But that is not true here. Investment, output, research and development, and so forth can be examined for evidence of how oil companies run their energy subsidiaries compared with how nonoil companies handle the same management decisions.

Second, these conglomerates, in two or three fields of energy, have existed long enough so that no one could say they were "under the gun" in the sense that they were running their subsidiaries in an uncharacteristic way. That disposes of the issue that was influential in the Continental decision.

Finally, as Professor Markham's paper indicated, concentration is not high in either of these industries. The oil companies appear to own only 20 percent, for example, of coal companies. Therefore, there is no solid theoretical reason to expect the oil companies to run their coal companies not to advance their competitive interest in coal but to protect their oil investment.

My conclusion is not to answer the question of whether or not oil companies should be denied the right to own competing energy sources. I do not know how oil companies have run their subsidiary energy companies. But I do believe, contrary to existing legal authority in some adjacent areas, that this question should be addressed on the basis of evidence, and that it would be very dangerous to address it on the basis of inferences from structure.

Richard Mancke

I have three points. The first is on the significance of joint ventures by oil companies on a firm's market conduct. The only reason oil companies engage in joint ventures is to share risks. When bidding for rights on the outer continental shelf, oil company joint ventures have frequently spent tens of millions of dollars more than necessary (that is, their top bids have sometimes been much higher than the second highest, or to use the industry expression, they have left a lot of money on the table). That fact confirms that joint ventures have not given rise to monopolistic behavior. In this context, the story of the Destin anticline is well known. A consortium that included Exxon and the Union Pacific Railroad bid something like \$600 million for petroleum rights to part of the Destin anticline. About \$300 million of that was money "left on the table." If they had been engaged in some kind of conspiracy, they would not have left \$300 million on the table. The other interesting thing about the Destin anticline is that it shows how risky the oil business can be—oil was never found there. Indeed, after drilling about fourteen dry wells, the whole drilling program was simply abandoned. The failure

to find oil at Destin has justly been called a debacle. It led to a sharp fall in the price of stock of at least one company, the Union Pacific Railroad.

The only area where oil company joint ventures may raise a monopoly problem is in pipelines. That is an area that probably should be investigated further. But oil pipelines are already regulated by the Interstate Commerce Commission.

I would like to pose to Professor Adams a hypothetical situation about oil company joint ventures. Suppose the majors did not engage in joint bidding for the expensive and risky rights to outer continental shelf properties, such as the Destin anticline and Alaskan North Slope oil lands. Then only the very largest oil companies—the top eight or nine—could afford to bid for such rights, and oil company critics like Walter Adams would then complain that the large oil companies—by refusing to take part in joint ventures—were foreclosing smaller companies from this part of the oil business.

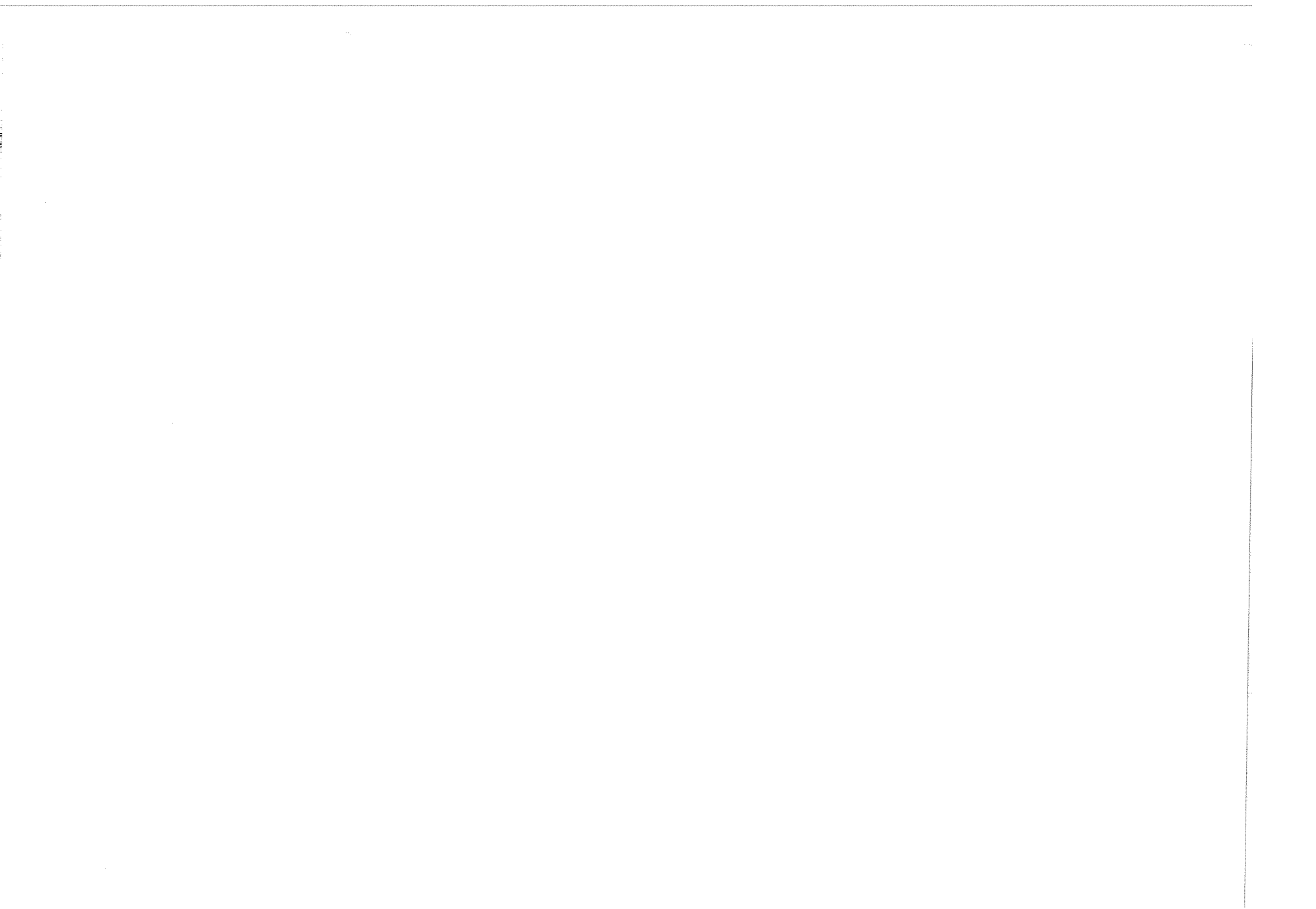
My second point is, I agree with Dr. Gaskins that the key unit for analyzing monopoly issues is the marginal unit. That is something we too often ignore when we analyze markets. However, it is important to emphasize that—certainly in coal and probably in uranium mining—no firm or cohesive group of firms has control over the marginal unit. Hence, it is hard to make a case that either industry is (or can be) monopolized.

Dr. Gaskins would probably agree that the key empirical issue in the oil area is whether or not one firm or group of firms can control the marginal unit and thereby determine the price of crude oil. I would like to discuss with him the empirical plausibility of that. Given the inability of academics to predict oil price behavior over the past twenty years, would any oil company seriously believe that it could control the market's marginal unit?

Professor Pitofsky raised a third issue: Will oil companies operate their coal or uranium businesses or investments differently from nonoil companies engaged in these businesses? The only way oil companies either can or will operate their coal or uranium businesses differently is if they have monopoly power, and so one should first address the issue of whether they can have monopoly power. If one looks at coal and uranium mining, it is very hard to make a case that there is a monopoly. There are many nonoil companies that are in coal and uranium, and they are not just coal or uranium companies. They are companies such as U.S. Steel and Bethlehem Steel—which I believe run the nation's sixth and seventh largest coal companies—and American Electric Power. All three of these companies are very large coal consumers, and all have an interest in lower rather than higher coal prices. Also, all of these companies have expertise in the coal business. In short, it seems obvious that there is no monopoly case in these nonoil energy businesses. Hence, I would concur with the sentiment of three of the panelists that we should encourage any firms willing to invest in coal and uranium. The more firms that invest in these businesses, the more competitive they will be.

PART TWO

ECONOMIC EFFICIENCY
ASPECTS



CHAIRMAN'S REMARKS

Edward J. Mitchell

The primary new issue for attention in this session is whether the energy industry becomes more efficient and has lower costs if horizontal integration takes place. Even if one concludes that the industry would become less competitive if horizontal integration is permitted, it is still possible to decide on public policy grounds that horizontal integration should be allowed because of the cost savings that would result from improved efficiency. This other side of the issue, the economic efficiency side, is a separate matter, although we may find the discussion going back and forth between competition and efficiency. The papers by Professor Teece and Mr. Swenson reflect this orientation toward questions of economic efficiency, as opposed to competition.

HORIZONTAL INTEGRATION IN ENERGY: ORGANIZATIONAL AND TECHNOLOGICAL CONSIDERATIONS

David J. Teece

If we really wish to come to an understanding of the evolving structure of the energy industry, then we must identify the driving forces at work. I do not believe that the evidence supports the monopoly power interpretation Professor Adams presented earlier. However, besides showing that the monopoly argument is contrived, I wish to present an alternative explanation of horizontal integration, one based on efficiency considerations, and one that I believe is more firmly substantiated by the available evidence.

This task is clearly an important one, because divestiture proposals are based upon the implicit assumption that horizontal integration is a vehicle used by the oil companies to spread an already entrenched monopoly position from oil and gas to alternative fuels. The alleged behavioral consequence is the withholding of alternative fuels in order to drive up (or at least maintain) prices for oil and gas, thereby enhancing the value of the firms' oil and gas reserves. If this implicit assumption is incorrect, then divestiture could not be expected to provide the benefits that its advocates anticipate. Let me present, therefore, an efficiency interpretation of horizontal integration, and let us see to what extent it squares with the facts.¹

In an imaginary world of frictionless markets, complex forms of business organization — such as vertical and horizontal integration — could well be devoid of a compelling efficiency rationale. Frictionless markets with complete information and zero transactions costs could handle every conceivable kind of transaction. However, the nonexistence of many markets and the high transactions costs of using others provide opportunities for the displacement of markets by hierarchies, of which the modern corporation is a particular example. Coase made this point explicit in his well-known article in 1937.² Because markets and hierarchies can perform similar functions, it is important that their relative efficiencies be appreciated. The integrated energy companies can, I believe, be examined in this context. Divestiture proposes to expand market exchange where currently internal exchange prevails, so focusing on the comparative efficiency properties of firms and markets seems entirely relevant.

I wish to argue that market failure considerations, together with certain institutional features of the U.S. economy, and the changing national resource base explain, in large measure, the incentives for conglomerate or "horizontal" integration as it is known in this context. The market failures

to which I refer occur in the market for capital and technological know-how. Clearly, I do not wish to present a blanket indictment of market processes for transferring technology and for allocating capital; nor do I wish to present a blanket endorsement of conglomerate business organization, as some conglomerates cause genuine public policy concern. However, the evidence suggests that the energy conglomerates do not fall into that category.

In order for conglomerates to have the potential for important efficiency properties, they must be “appropriately” organized. By this I mean the following: first, responsibility for operating decisions must be assigned to operating divisions or quasi firms; second, an elite staff must be attached to headquarters to perform both advisory and auditing functions; third, headquarters, not the divisions, must be responsible for strategic decision making, planning, appraisal, and control, including allocation of capital between the divisions; fourth, the research establishment must be centralized or there must be close formal ties between separate laboratories. The resulting structure can display both rationality and synergy. Following Williamson, firms organized in this fashion are denoted as “m-form” firms.³

I wish to argue that conglomerates organized as m-forms have the potential to improve the functioning of the capital market by more assuredly assigning cash flows to high-yield users. The reasons why this is possible is that conglomerates can offer a wide spectrum of investment opportunities, and the corporate headquarters typically has more detailed information on some potential investments than the external capital market has. (The firm’s managers excel with respect to possessing depth of information whereas the external capital market excels with respect to breadth of information.) Management can make detailed evaluations and audits of each of the firm’s operating parts, and can make adjustments to the operating parts in response to performance failure. This is particularly important when we realize that the differential tax treatment of dividends tends to create a strong reinvestment bias.

Of course, for this reassignment capacity to be beneficial, cash flows must be subject to an internal competition, and investment proposals from the various divisions must be solicited and evaluated by general management. In this way conglomerates can act as miniature capital markets. Grabowski’s and Mueller’s empirical work on rates of return to plow-back suggest that reassignment is particularly important for firms with a maturing product portfolio.⁴ Such firms tend to generate a low return on plow-back because external capital market discipline tends to weaken. Assuming that reinvestment proclivities cannot readily be changed, efficiency considerations dictate the establishment of a competitive internal capital market, and this in turn indicates the desirability of including new products and new ventures within a maturing firm’s investment portfolio. Hence, the conglomerate, appropriately organized, might be viewed as capitalism’s creative response to the evident limits which the capital market experiences in relation to the firm.

I extend the hypothesis to include failures in the market for technology. While synergy in a conglomerate need not depend on technological considerations, as the above discussion indicates, technology transfer considerations can breed additional sources of synergy. Integration can facilitate the technology transfer process by improving the coupling between user and supplier, and by overcoming contractual problems involved in the buying and selling of technological know-how. The information asymmetry which necessarily exists between the buyer and the seller of technology means that the sale of technology must take place under conditions which do not satisfy the assumptions of the competitive model. For this and other reasons, the market for technology is often faulted.⁵ Under such conditions, internal technology transfer, by checking opportunistic proclivities, can be a superior mode for technology transfer.

The above are essentially affirmative statements that can be made on behalf of appropriately organized conglomerates. They must be balanced against potential anticompetitive effects, such as reciprocity, predatory cross-subsidization, and interdependence. This last factor implies that competition is restrained out of a mutually recognized interdependence, and could result in less aggressive competition in markets where interfaces exist, or in a reduction in potential competition in markets where entry might otherwise occur. In the context of the energy industries, the first aspect has been emphasized.

I have outlined a theory of conglomerate business organization in which the superiority of appropriately organized conglomerates over specialized firms is indicated. The relevance of the theory to the energy companies depends on the occurrence of a number of factors: first, a maturing product portfolio within the firm which is generating a substantial cash flow, second, attractive investment opportunities in allied industries, third, technology transfer opportunities from established to allied activities, and fourth, a multidivisional structure in the oil companies. These factors are sequentially examined below in the context of the U.S. energy industries. I wish to make apparent that the new endeavors embraced by the oil companies appear to be quite consistent with the competitive theory of conglomerate development that I have advanced.

Consider, first, the nation's changing natural resource base. Reserves in the lower forty-eight states have been declining since about 1966, and the Prudhoe Bay discoveries, which have added almost 10 billion barrels, amount to only three extra years supply at current rates of production. Future discoveries will most probably involve more steeply increasing costs than some alternative fuels, such as coal. Hence, it is to be expected that even aside from the effect of anticipated government policy changes designed to reduce dependence on oil, the shares of alternative fuels in U.S. energy consumption will increase as the price of energy increases. This implies that resources must flow into alternative fuels if risk corrected rates of return to investment are

to be equalized across fuels. It is predictable that the oil companies will be among the first to respond to these new investment opportunities, assuming that the managerial and technological synergies are greater for the oil companies than they are for firms with no experience in the energy business.

Horizontal integration can be viewed as a vehicle to assist in the resource allocation process by permitting a quick response to new investment opportunities on the part of firms that already possess the requisite capabilities. The FEA estimates that between 1975 and 1984 an additional \$44 billion of investment will be needed in coal, synthetic fuels, and the nuclear fuel cycle. The oil companies, because of their large cash flows and low debt-equity ratios, are well placed to respond. By investing in the coal industry, for instance, the oil companies can help moderate price increases, augment production, and assist in driving imported OPEC oil out of the United States.

The oil companies can also bring technological know-how and an R & D capability to the alternative fuels activities. It is also worthy of note that the exploration and drilling for geothermal resources are not altogether unlike those processes for oil. Pipeline technology from the oil industry has been important in bringing about the coal-slurry pipeline. Discoveries of minerals such as uranium are facilitated by knowledge of sedimentary basins. The oil companies have such knowledge because of their exploratory activities in oil and gas. Coal liquefaction technology under development by the oil companies is being based on catalytic processes similar to those developed for refining petroleum. Retorting shale similarly involves processes like those used in refining. Of course, once oil is produced from coal or shale, the storage and transportation problems are just the same as those encountered with conventional crude.

The importance of the management skills which can also be committed by the oil companies should not be underestimated. The oil companies — like the chemical companies and the steel companies — have had experience managing and coordinating huge, capital-intensive investments that require a long gestation. These skills will become increasingly critical to the coal and synthetic fuels industries. For instance, it is estimated that plants to produce oil from shale could well cost over \$1 billion. It is hard to identify firms currently in the alternative fuels industries which possess the relevant resources.

Consider, finally, the organizational structure issue. A prerequisite of my theory is that the energy conglomerates display a multidivisional structure of the variety I described earlier. R & D must also be centralized in some fashion. It is into these divisionalized structures that the new ventures are absorbed, eventually as separate divisions. A life-cycle process may be involved if entry is via internal growth rather than acquisition since the new ventures may be located first within existing divisions and become separate divisions only after these operations exceed threshold proportions. All of the major companies on which I have data, with the exception of Texaco, are organized in this fashion. Furthermore, all of the majors have some central-

ized R & D with the exception of Atlantic Richfield, which is decentralized but has strong linkages among its various laboratories.

Thus the case for oil company participation in other segments of the energy industry rests upon competitive principles and the important contributions the oil companies can bring. Imposing barriers to entry via legislative restrictions would seem to be an entirely inappropriate policy. What objections, then, are raised against horizontal integration? As I mentioned earlier, to the extent that an economic rationale has been articulated to support horizontal divestiture, it has been predicated on the argument that monopoly power results in the withholding of supplies of alternative fuels and the retardation of their development. The basis of the argument is that an energy conglomerate will suffer opportunity costs if production of alternative fuels reduces potential profits from its oil reserves. Energy conglomerates internalize costs that in a competitive economy would be external to an independent producer of a substitute energy source, to paraphrase Professor Davidson, an active proponent of this theory.⁶ Or to quote from the paper Walter Adams presented earlier: "Can we really expect these giant firms to undermine their stake in depletable oil and gas resources. . . by investing the huge sums required to promote the rapid development of economically viable substitutes?" I interpret this argument to mean that horizontal integration results in the production of substitutes being withheld below levels that would be generated with an economy of independent rather than integrated firms. Let us examine the logic of this argument.

Consider the determination of the optimal private rate of resource extraction. A rational resource owner will compare the expected profits of selling a unit of the resource today with expected profit, appropriately discounted, of selling the same unit at some future date. Thus if a resource owner expects the difference between the price and the cost of production to increase at an annual rate which exceeds the resource owner's rate of discount, there is an incentive to reduce current production and keep the resources in the ground as inventory. The seminal question is how the state of competition and the degree of horizontal integration influence the firm's optimal rate of resource extraction. I wish to argue that whereas the state of competition affects the resource extraction decision, the level of integration has essentially a neutral effect in a competitive market.

Assume, to begin with, that there is no horizontal integration. Now under competitive conditions all firms are, by assumption, price takers. Accordingly, no matter their individual production decisions, resource owners have absolutely no influence on the price of their own resource or its substitute. On the other hand, if monopoly power is imputed to the resource owners, then by changing the level of production, the current price, can, by assumption, be manipulated.

Professor Davidson has claimed that even without monopoly power, the withholding of production could take place, arguing that "it does not re-

quire covert collusion. What is required is that they all view the future the same.” Two points should be noted about this. First, it is not an indictment of horizontal integration since there is no reason to believe that independent companies will view the future any differently from conglomerates, as both presumably have the same information. Second, it is not clear that the withholding so generated is socially undesirable.⁷ Nevertheless it is apparent that, in order to argue that horizontal integration affects the rate of resource extraction, both interfuel substitution possibilities and monopoly power must be assumed. Otherwise, the source of differing expectations between independents and conglomerates must be specified. All of these conditions must hold before the argument makes theoretical sense.

For the withholding theory to have any empirical validity, the above analysis suggests that at a minimum the following conditions must hold: (1) There must be strong interfuel substitution possibilities. (2) There must be monopoly power in the energy market. (The requirement of interfuel substitution implies that the relevant market is the energy market and not the market for individual fuels. Note that Jesse Markham’s concentration statistics show that concentration declines as the market is broadened to include alternative fuels. Hence to be internally consistent, advocates of this theory cannot logically draw implications from concentration in the crude oil market.) (3) Despite OPEC, U.S. oil companies must be able to control the world price of oil. If this control cannot be established, then how can the integrated firms change the value of their reserves of oil by manipulating the production of alternative fuels?

The validity of each of these assumptions must be established before the withholding theory can provide a viable explanation of production behavior. I do not believe that they can be supported. The third is clearly incorrect. The critical assumption is of course the first assumption. In my longer paper⁸ I examine competition in the energy markets and find no evidence of monopoly power. Furthermore, on the demand side, interfuel substitution possibilities are essentially limited to the electric utility sector.

By laying out the assumptions of the withholding theory in this fashion, the contrived nature of the argument is made apparent. Its assumptions do not seem to be relevant to the situation currently prevailing in the U.S. energy markets. The relevance of the theory is further brought into question when the performance of the oil companies in alternative fuels is examined. Consider the coal industry. The withholding theory would predict that after acquisition by oil companies, the output of coal companies would be “withheld.” By contrast, the alternative theory of integration I have advanced in this paper would predict that after the completion of a merger, investment — and hence production — will increase in the acquired company over the level that would have occurred had the new subsidiary remained independent. This prediction is difficult to verify, as the investments and production levels which would have taken place without the merger are not available.

Table 1
OUTPUT OF COAL COMPANIES BEFORE AND AFTER
ACQUISITION BY OIL COMPANIES

(comparison of 5-year averages before and after dates of acquisition)

	Output (000 tons, 5-year average)	Company Percentage Increase	U.S. Percentage Increase ^a
Consolidation (Conoco—9/15/66)	43,858 (1962-66) 59,218 (1967-71)	35.0	16.6
Island Creek (Occidental—1/29/68)	22,514 (1963-67) 26,293 (1968-72)	16.8	12.2
Old Ben (Sohio—8/30/68)	8,287 (1964-68) 11,372 (1969-73)	37.2	10.3
Pittsburg & Midway (Gulf—late 1963)	4,869 (1959-63) 8,465 (1964-68)	73.9	24.6

^aIn each case the U.S. percentage increase is measured over the same time period as the oil company affiliate. The U.S. percentage increase also refers to a comparison of averages over five-year periods.

Source: *Keystone Coal Industry Manual* for respective years.

One way to approach the problem is to assume that investment and output in the independent companies would have followed the national trend. On this assumption, increases in production and investment greater than the national average would indicate support for the theory. The relevant production data is available for the coal industry. Table 1 presents production data for the four largest coal firms acquired by oil companies: Pittsburg & Midway (Gulf), Old Ben (Sohio), Consolidation (Conoco), and Island Creek (Occidental). The production statistics indicate that in each case the five-year increase after acquisition was *greater* than the overall U.S. increase. This does not square with the prediction of the withholding theory, but it is consistent with the alternative theory I have advanced.

With respect to capital investment it is hard to argue that the effect of acquisitions has been to curtail investment, at least in coal. The absolute level of investment has increased for each of the four major acquisitions. The percentage increase in investment for the five-year post-acquisition period as compared with the five previous years was 267 percent for Pittsburg & Midway, 139 percent for Old Ben, 325 percent for Consol, and 460 percent

for Island Creek. These sizable increases in investment are also inconsistent with the allegation that the oil parents attempt to withhold production. Rather, the data support the capital reallocation argument that I advanced.

With respect to research and development, the theory I have advanced predicts that oil firms integrating into alternative fuels will engage in R & D projects related to the further development of those fuels. (By contrast, the withholding theory would imply that the integrating firms would not engage in any R & D activity in alternative fuels, since their interest is allegedly in restraining production, not enhancing it.) The top four oil firms (ranked by their coal reserves) spent an average of \$6,119,800 on coal R & D in 1975; the next spent \$2,318,800 on average; and the remaining five spent an average of \$755,800. R & D expenditures per ton of coal reserves were almost constant for the reserve classes identified. Since the independent coal companies are spending practically nothing on coal R & D, how can one entertain the notion that the oil companies are retarding the development of coal?

Let me conclude by discussing what I believe would be the most likely consequences if horizontal restructuring were imposed. I wish to abstract from short-run adjustment costs and simply focus on industry performance after divestiture. I begin by pointing out that divestiture essentially involves a redefinition of the legitimate boundaries of the firm. The consequences are determined by the behavioral responses of the firms involved. These behavioral responses cannot be predicted unless an understanding of the determinants of firm behavior and industry structure and the firm's internal organization are first established. My discussion so far has been directed to this end. This framework will now be used to examine some probable effects on research and development, competition, investment, production, and import dependence. I discuss the impact on R & D at some length simply because I have not heard much attention given to it by others.

Changes in the structure of R & D and in the total amount of R & D performed in the economy can be predicted, and technology transfer among the various energy industries would most likely be hampered by restructuring. Corporate research—that component of R & D which is centralized and involves long-range pioneering efforts—would be substantially eliminated. Corporate R & D laboratories possess equipment and perform services which divestiture would render too expensive for the individual divisions to support; or, if they could support them, it would only be at higher cost. These corporate laboratories also conduct the long-range, high-risk projects that make sense only as part of a diversified portfolio of research activities. Forced to stand alone, the divisions would find less merit in sponsoring the long-range, high-risk R & D projects. This would be especially unfortunate in that the externalities from this type of research are greater than for the kinds of problem-solving R & D that could be performed in the divested remnants.

R.C.O. Mathews and Kenneth Arrow have both remarked that the degree of appropriability is less for major innovations than for minor ones because major innovations are more likely to be imitated quickly.⁹ With respect to appropriability, Edwin Mansfield has shown, using a very conservative methodology, that the lower bound on the social rate of return from a large energy company's R & D was 23 percent for new products, and 55 percent for new processes. (The private rate of return was closer to 15 percent.)¹⁰ Hence any decline in R & D expenditures and innovation activity should be viewed with far greater concern than might be indicated by whatever dollar reduction in R & D spending might take place.

Of course, a legitimate question to ask is whether R & D activities could be sustained after divestiture by licensing arrangements in which the divested oil companies would maintain essentially the same commitment to R & D and support it by offering innovations for sale under licensing arrangements. While this may not be impossible, several problems are likely. First, as Arrow has remarked, the sale of technology under license seldom yields a return equivalent to that which can be obtained through internal use.¹¹ Second, incentives for R & D are greater if an ownership position can be obtained in those resources which would be enhanced in value by the innovation. Preventing resource ownership could therefore reduce incentives for R & D.

An additional reason why oil company R & D in energy would be jeopardized relates to the complementarity between production and R & D. It is tremendously difficult to transfer technology before first commercialization. My Ballinger study showed that the cost of transfer is often halved after at least one manufacturing start up.¹² Another problem is that the market for technological know-how, as I mentioned earlier, works inefficiently because of information impaction and informational asymmetries between the parties.

Perhaps these debilitating effects could be overcome by allowing the oil companies to engage in production of synthetics while prohibiting them from holding a reserve position. This reduces to a vertical integration question, and on the basis of preliminary information on the nature of coal-synthetics technology, it appears that vertical integration could well provide important efficiency advantages, at least for coal. The incentives for vertical integration stem from the high degree of coal variability and the high transportation costs involved in moving coal. The variability in coal feedstocks is much greater than it is for the crude streams which a petroleum refiner encounters. The ash content in coal typically varies from 2 to 50 percent, the oxygen content from 3 to 10 percent, and the water content varies from 1 to 50 percent. The caking qualities also differ markedly. These variations are so great that major process changes would be required to accommodate them; hence the possibility of substituting alternative coal supplies in a synthetics plant will be very limited, since a coal-fed synthetic fuels plant will probably be tailored to the characteristics of a specific coal deposit.

High transportation costs will further constrain the availability of feedstocks. As a result the most likely location of a synthetic fuel plant will be at the mine mouth. If the synthetic producer does not own the coal, a bilateral monopoly situation could emerge once the plant is in place. Contractual risks suggest the prudence of vertical integration.

The effects which divestiture would have on competition are somewhat easier to identify. First, barriers to entry would be erected by the legislation. Second, interfuel competition would not be enhanced, since synthetic development would be retarded because of a reduction in the R & D effort. As a result, divestiture would tend to fossilize the current structure of the alternative fuels markets by keeping out the winds of competition.

With respect to investment responses, it is predictable that the oil companies would invest in the next most profitable investment. Oil and gas are unlikely to benefit unless the current investment climate improves. Increased investments outside the energy sector are a strong possibility. Another possibility is that rather than reinvest, the oil companies might increase dividends to stockholders if the firms' searches for attractive alternative investments are unsuccessful. The stockholders could in turn reinvest their dividends in other companies, including independent coal and shale companies. However, because the cost structure of the divested alternative fuels companies (many of which will be fledglings) will be higher than otherwise (by virtue of the loss of managerial and technological spillovers from oil), opportunities for investment will be diminished, and the capital costs to the fledgling firms will be higher.

The net result would seem to be that the production of coal and synthetics will be lower than otherwise and the dependence on imports and OPEC will increase. The demand curve facing OPEC will be more inelastic than otherwise, and the OPEC cartel will have thereby been strengthened. Since I know of no policy maker prepared to embrace this scenario with enthusiasm, I recommend much closer attention to the economic rationale underlying the divestiture proposals. We must diligently pursue the study of complex business organization lest we are tempted to impute monopoly interpretations and advocate policies to restructure socially beneficial organizational developments that we do not quite understand.

¹ A fuller treatment of the issues can be found in my paper, "Horizontal Integration in the Energy Industries: Towards a Markets and Hierarchies Analysis," Research paper no. 352, Graduate School of Business, Stanford University, 1977.

² Ronald Coase, "The Nature of the Firm," *Economica*, November 1937.

³ Oliver Williamson, *Markets and Hierarchies* (New York: Free Press, 1975).

⁴Henry Grabowski and Dennis Mueller, "Life Cycle Effects of Corporate Returns on Retentions," *Review of Economics and Statistics*, November 1975; and Dennis Mueller, "A Life Cycle Theory of the Firm," *Journal of Industrial Economics*, July 1972.

⁵I elaborate on these arguments in "Horizontal Integration in the Energy Industries."

⁶Paul Davidson et al, "Oil: Its Time Allocation and Project Independence," *Brookings Papers on Economic Activity*, 2, 1974.

⁷How is it different from a wheat farmer who withholds this year's harvest in storage in anticipation of a future shortage?

⁸"Horizontal Integration in the Energy Industries."

⁹R.C.O. Mathews, "The Contribution of Science, Technology to Economic Development," in B. R. Williams, ed., *Science and Technology in Economic Growth* (London: Macmillan, 1973), p. 14, and K. Arrow, "Economic Welfare and the Allocation of Resources for Invention," in National Bureau of Economic Research, *The Rate and Direction of Inventive Activity* (Princeton: Princeton University Press, 1962), p. 622.

¹⁰See Edwin Mansfield et al., "Social and Private Rates of Return from Industrial Innovations," *Quarterly Journal of Economics*, forthcoming, 1977.

¹¹See Kenneth Arrow, "Comments," in Universities National Bureau of Economic Research, *The Rate and Direction of Inventive Activity* (Princeton: Princeton University Press for NBER, 1962).

¹²See D. Teece, *The Multinational Corporation and the Resource Cost of International Technology Transfer* (Cambridge, Mass.: Ballinger, 1976).

THE IMPLICATIONS OF DIVESTITURE ON INVESTMENT IN THE COAL INDUSTRY

Gary L. Swenson

From my perspective as an investment banker concentrating on companies in the energy field, I believe that limiting, or eliminating, oil company participation in alternative forms of energy would seriously delay the development of our domestic coal reserves.

Most knowledgeable people would agree that the following goals are critical to a sound national energy policy:

- to increase production of steam coal (the kind of coal used as boiler fuel for generating electricity and other basic energy needs);
- to keep steam coal prices as low as possible;
- to make coal more competitive with oil and gas as boiler fuel;
- to preserve natural gas and oil for “higher” end uses; and
- to reduce dependence on foreign energy sources.

As is well known, our country has significant coal reserves. They constitute 90 percent or more of our domestic energy reserves. The U.S. government owns approximately 30 percent of these coal reserves.

The problem our country faces is not a shortage of coal, but a potential shortage of capital to develop new mines to meet increased demand. To achieve the goals I have mentioned, without massive government and costly taxpayer support, we obviously must have a coal industry capable of raising the large amounts of capital necessary to increase coal production.

However, as I will seek to demonstrate, I believe the legislation proposed to curtail oil company alternate energy development will reduce the capital available to the coal industry: (1) by limiting entry into this important industry; (2) by eliminating the considerable financial support which oil companies can provide; and (3) by creating smaller, less well capitalized, and hence less efficient units.

As a result, such legislation would:

- delay expansion of production capacity;
- impair ability to meet future production goals;

- raise coal prices beyond what they would be otherwise;
- make coal less competitive with other energy sources;
- increase reliance on oil and gas for boiler fuel;
- increase dependence on foreign energy sources; and
- slow the development of coal gasification and liquefaction.

Ambitious Production Goals Require Large Capital Outlays

Our country's coal production goals for the next ten years are, by all measures, ambitious. Most demand estimates for coal in 1985 are in the range of 900 million to 1.2 billion tons per year, an increase of 50 to 100 percent over 1975 production of 600 million tons. This is a 4 to 7 percent compound annual growth rate, substantially above the ten-year historical compound annual growth rate for coal production of about 2 percent.

To reach the production level of 1.2 billion tons per year by 1985 means replacing depleted capacity of about 300 million tons annually, and adding new capacity of 600 million tons annually.

Most government and industry estimates of the total capital expenditures needed to reach the 1.2 billion ton annual production level are near the National Coal Association's estimates of \$18 to \$22 billion in constant dollars, as shown in Table 1.

For each individual project, "front-end" capital requirements are expected to continue to grow, because of the increased costs of capital equipment, larger mine size and a longer mine development period. Larger mines are becoming increasingly significant; there are more of them planned, and they will produce a larger percentage of total output. These larger mines take advantage of economies of scale, in mining and in power generation. The Bureau of Mines estimates that the optimum output of an underground mine is 3.8 million tons per year. There are increasing numbers of larger power plant projects. The average coal consumption for a 1,000-megawatt electric power plant is also around 3 million tons of coal per year. Front-end costs for these larger mines will require long-term outside financing.

Estimates of the costs required to bring a new deep mine into production vary from \$25 to \$40 per annual ton, and from \$12 to \$22 for a new surface mine. Thus, a new 3-million-ton-per-year deep mine would cost from \$75 to \$120 million, and a surface mine from \$36 to \$66 million.

The timing of capital investment is also important, since it now takes six to eight years to bring a large new mine up to capacity. In order to meet the ambitious production goals by 1985, expansion must commence as early as next year.

Table 1
PROJECTIONS OF AGGREGATE CAPITAL NEEDS
FOR COAL INDUSTRY, 1976-1985
(\$ billions)

AMAX Coal study cited in FEA Energy Outlook (same basis as FEA)	\$15.4 - 16.4
Bankers Trust Company, capital resources for energy through the year 1990 (includes \$11.1 for transportation)	\$22.6
Consolidation Coal Company, Speech by Jarvis B. Cecil, executive vice president, April 9, 1976, Phoenix, Arizona (excludes coal conversion plants, transportation)	\$40.0 - 50.0
FEA Energy Outlook Reference Scenario (includes mine costs only)	\$17.7
National Coal Association, C. Bagge, Address to the Southern Governors' Conference, St. Louis, Mo., June 15, 1976	\$18.2 - 22.1

Independent Coal Companies Alone Cannot Meet Production Goals

If coal companies are to invest \$18 to \$22 billion in new capacity over the next ten years, they will require outside financing. The capital required for single large coal-mining projects are beyond the resources an individual coal company can normally be expected to generate from earnings. There are only sixteen mines in the country producing more than 3 million tons per year; such a mine can require an initial capital investment of \$70 to \$100 million or more. Yet a typical independent, Rochester and Pittsburgh Coal Company, the fifth largest independent coal company, had capital expenditures in 1975 of only \$15 million, which was double its net income of \$7.5 million and greater than its \$13 million cash flow.

Even if coal company earnings were to remain at their 1975 record levels, as, in many cases, they have not, companies would be forced to seek large amounts of outside capital, by selling debt or equity securities, in order to expand capacity significantly by 1985.

Not every company, however, has access to the public capital market. The competition for investors' funds is intense, and only the strongest, most profitable, most promising companies are able to obtain funds in the public market. One reason for this is the important role quality-conscious institutional investors play. These institutions own approximately one-third of New York Stock Exchange equity securities (stock), and three-fourths of publicly held debt securities (bonds) of corporations and account for an even greater percentage of new capital raised. Because of their fiduciary responsibility, they are generally unwilling to invest in companies which are small, cyclical, and whose securities have limited marketability. Furthermore, state and federal laws such as "ERISA" (the Employee Retirement Income Security Act of 1974) limit investments by institutions to those of the highest investment quality.

Access to the public market can differ substantially from year to year depending on market conditions (supply and demand for funds). At times available funds are limited or investors perceive greater financial risk. For example, during periods of capital shortage when interest rates are high, even companies which normally have access to the public market are unable to raise new capital. This was the situation in 1973 and 1974.

Many investors believe that mining, particularly coal mining, is risky compared with other businesses, and that the expected return, in terms of dividends and price appreciation of the stock, is not sufficient to cover the perceived risks.

Investors are particularly concerned that earnings in the coal industry will continue to be volatile and unpredictable. Factors which are largely uncontrollable by coal companies, such as wide swings in coal prices, strikes, and operating problems inherent to the business, will probably continue to impact coal companies' profitability. Furthermore, the uncertain status of legislation concerning divestiture, surface mining, pollution standards, and other matters of vital importance to the coal industry make it extremely difficult to predict future earnings with any degree of confidence, and thus discourage investment. Oil company earnings, on the other hand, have been quite stable.

In order to raise money in the public bond market, it is generally necessary to obtain debt ratings from Moody's Investors Service, Inc., and Standard & Poor's Corporation, the two leading bond-rating agencies. These credit ratings largely determine the interest rate to be paid, and whether capital is available at all. The predominant purchasers of debt securities are financial institutions, many of which are prohibited from purchasing securities rated less than A. Issuers with unrated debt or debt rated below A thus have more limited access to the public debt market, as can be seen from Table 2.

Table 3 gives the debt and equity ratings of independent coal companies and oil companies involved in the coal industry.

Table 2
OUTSTANDING LONG-TERM INDUSTRIAL DEBT,
DECEMBER 31, 1976
(\$ billions)

Aaa	\$12.9
Aa	16.5
A	24.1
Baa	7.6
Other	<u>7.9</u>
Total	<u>\$69.0</u>

Source: Tabulated by First Boston's Fixed Income Research Department.

Among the independent coal companies, only Pittston and Eastern Associated Coal have rated debt. In contrast, the debt of all the major coal-producing oil companies is rated, with all but one A or above, and five receiving the highest triple A by both Moody's and Standard & Poor's. Standard & Poor's stock ratings and the Value Line rating of the safety of common stock issues show a similar preference for oil company common stocks.

In judging the credit of a coal company, the rating agencies, investors, and investment bankers try to determine how much money will be available in the future to pay interest and principal, and the certainty of such payments. They therefore place considerable weight on the predictability and stability of earnings levels.

They also consider the size of a company. Generally, the larger a company's equity base, the more money it can raise, other factors being equal. Pittston, a producer whose output is largely metallurgical coal, is the independent with the largest equity base at \$496 million on December 31, 1975, which is considerably smaller than the equity bases of the major coal-producing oil companies. By comparison, Continental Oil, which owns Consolidation Coal, has equity capital of \$2.1 billion.

As a result of the public market's preference for larger, more stable companies, only Eastern Gas and Fuel Associates, among the independent coal companies, has raised equity in the public market during the past ten years (in an offering managed by the First Boston Corporation), and only Eastern Associated Coal (also managed by First Boston) and Pittston have raised public debt.

Most coal companies owned by oil companies rely heavily on their parent for capital. Clearly coal producers can obtain more capital from parent oil companies than would be available to them through the public and private securities markets even under good market conditions. They also

Table 3
DEBT AND EQUITY RATINGS OF SELECTED
COMPANIES IN THE COAL INDUSTRY

	Moody's Debt Rating	S&P Debt Rating	S&P Stock Rating	Value Line Safety Rating (1-5, high to low)
<i>Independent Coal Companies</i>				
Pittston	A ^a	A ^a	A	3
North American Coal	NR	NR	B+	4
Westmoreland	NR	NR	B+	4
Eastern Gas & Fuel	A ^b	A ^b	B+	3
Rochester & Pittsburgh	NR	NR	NR	NR
Falcon Seaboard	NR	NR	B	5
Alabama By-Products	NR	NR	A-	NR
Carbon Industries	NR	NR	NR	NR
<i>Oil Companies Involved in Coal</i>				
Exxon	Aaa	AAA	A+	1
Gulf	Aaa	AAA	A	2
Mobil	Aaa	AAA	A+	2
Shell	Aaa	AAA	A+	2
Texaco	Aaa	AAA	A	2
Atlantic Richfield	Aa	AA	A	2
Continental	Aa	AA	A	3
Kerr-McGee	Aa	AA	A	2
Phillips	Aa	AA	A	3
Sun	Aa	AA	A	2
Ashland	A	A	A-	2
Quaker State	A	A	A	2
Standard of Ohio	A	AA-	A	3
Occidental	Baa	BBB	B	2
MAPCO	NR	NR	A-	3

NR—securities of the company are not rated.

^aConvertible bonds.

^bEastern Associated Coal Corp.

benefit from the ability of most parent oil companies to raise equity and debt on more favorable terms than the coal companies could obtain independently.

In fact, the recognition of capital requirements was a major contributing factor to the mergers in the industry in the late 1960s and early 1970s.

In 1968, I was involved on behalf of First Boston in advising Peabody Coal Company on its proposed acquisition by Kennecott Copper Corporation. At that time, Peabody was considering major investments in the coal mines associated with the Four Corners generating station and the Crows Nest project in Canada. Even though Peabody was the largest independent coal company at that time, it was concerned about its ability to raise sufficient capital to finance these and other projects under consideration. This concern led Peabody's management to seek the financial strength which Kennecott could provide.

Independent coal companies have come to rely increasingly on several forms of off-balance sheet and secured financing: leasing, project financing, and production payments. These techniques have been developed because investors needed more security than the projected earnings stream alone. Such borrowings, arranged through banks or insurance companies, tend to be more expensive than debt sold in the public market because of the tailor-made nature of the financing. They are usually of shorter maturity, or, in the case of leasing, tied to the productive life and dollar value of the equipment. These borrowings are generally secured by assets of the coal company or even the stock of the operating company, which may be forfeited if the company is unable to live up to the terms of the agreement.

Because of the risks involved in mining coal, creditors are rarely willing to provide capital based on the security of one mine's cash flow. They expect additional support for the financing, through the pledging of additional coal mines to secure supply, or through outside contractual credit backing. Such outside backing might be supplied by a guarantee from a parent company, from the purchaser of the coal, or from a third party.

In the past, electric utilities, the major users of steam coal, have on occasion provided credit backing to coal suppliers, through loan guarantees, advance payments, and "take or pay" contracts assigned as security for loans. I think it would be a mistake, however, to rely upon them to continue to provide substantial additional financial support to the coal industry. Most electric utilities prefer *not* to take on the substantial operating risks involved in coal production. Furthermore, the utilities' credit ratings and price-earnings ratios, and consequently their ability to finance, have been deteriorating, while their need for funds to finance their own heavy capital expenditures continues to grow.

Thus, independent coal companies alone cannot realistically be expected to raise the enormous amounts of capital which will be needed to reach national coal production goals, as long as their volatile earnings and relatively small capital bases prevent them from raising significant equity or debt capital in the public markets.

Effect of Divestiture on Coal Operations of Oil Companies

Legislation such as we are discussing today could have several effects, none of them consistent with our long-range national energy goals.

Perhaps the most critical result of horizontal divestiture legislation would be to jeopardize the future of a number of our major coal-producing companies which are owned by oil companies—including Consolidation Coal Company, Island Creek Coal Company, Arch Mineral Corporation, Old Ben Coal Company, and Pittsburg and Midway Coal Mining Company.

If it becomes apparent that these coal assets must be divested, the affected coal companies would immediately encounter serious difficulties in raising capital. Outside investors would be reluctant to invest in the coal subsidiaries of oil companies, particularly where it appeared that the funds might be used, not to increase productive capacity, but to substitute for oil company investment. Secured borrowing might be arranged in specific instances, but certainly in more limited amounts and on more onerous terms than previously encountered.

These coal companies would also find themselves cut off from parent funding, which historically has been their most important source of capital. Oil company parents would be understandably reluctant to put more money at risk in these subsidiaries without assurances that these amounts would be recovered in selling or spinning off their coal companies.

I believe that oil companies, if forced to divest themselves of their coal interests, would *not* recover their investment. With all the oil companies forced to divest their coal subsidiaries at or about the same time, they would probably be forced to divest at substantial discounts.

An American Petroleum Institute survey of oil companies last year came up with a value of over \$6.5 billion for coal assets which would have to be divested by oil companies under horizontal divestiture legislation. By comparison, total public industrial and utility equity financings in 1975 amounted to \$8.8 billion.

Again, I refer to my experience with Peabody Coal Company and the efforts made by Kennecott to divest Peabody under an order of the Federal Trade Commission. Only after several years of active search was a suitable buyer for Peabody found. Although it now appears likely that the Newmont Group will purchase Peabody for about \$1.2 billion, the transaction still awaits approval by the FTC.

Several points are particularly relevant to our discussion here. In the first place, we did not feel that Kennecott would come close to recovering its investment if it were to sell the Peabody stock to the public, or distribute its Peabody stock to Kennecott shareholders through a 100 percent "spinoff."

We judged that the public market price for the Peabody common shares would be significantly below the value a private buyer would be willing to

pay. For a public investor, the stock of Peabody was not particularly attractive, because of Peabody's poor earnings history and its limited ability to pay a dividend. In addition, the "near-term" profit prospects did not appear particularly favorable.

We also felt that it would be some time before Peabody, as an independent company, would have access to the public markets for the required outside capital necessary to expand production and profits. Furthermore, we were concerned that under the circumstances an independent publicly owned Peabody would be vulnerable to a takeover at a bargain price. We therefore advised Kennecott to seek out private purchasers with sufficient resources to make the capital investments necessary to expand production and increase profitability and to wait for the eventual cash flows from the expanded operations.

There were no individual companies in the final bidding for Peabody. In order to raise sufficient funds, purchasers had to join together in groups. The Newmont Group, for example, consists of Newmont Mining Corporation, Texasgulf, Inc., the Williams Companies, Fluor Corporation, Bechtel Corporation, Equitable Life Assurance Company, and the Broken Hill Proprietary Company, Limited.

There was also considerable concern that interpretation of existing anti-trust laws would rule out as purchasers other mining or oil companies, which would otherwise be logical candidates to purchase a coal company.

Public utility companies, another group of potential purchasers of Peabody, were concerned that a utility's purchase of a supplier coal company might be considered illegal vertical integration.

As a result of my experience with Kennecott and Peabody, I believe that if oil companies are forced to divest themselves of coal interests all at the same time, they will not find buyers willing to pay enough to allow the oil companies to recoup additional investments. Thus the threat alone of divestiture will act as a real deterrent to oil companies considering further capital investments to increase coal production.

At the moment coal companies owned by oil companies produce approximately 20 percent of our nation's coal. The *Keystone Coal Industry Manual* for 1976 shows that oil company coal subsidiaries plan to expand capacity by 119 million annual tons through 1983; this is 26 percent of the total announced expansion by all companies.

Some versions of horizontal divestiture legislation would prevent oil companies from even developing coal reserves on a start-up basis. It is worth noting that while entry into coal mining in the 1960s and early 1970s was through acquisition of companies already producing coal, more recently companies such as Exxon, Mobil, Shell, and Texaco have entered through the purchase of reserves, which will add to our nation's productive capacity when they go into production.

We need this coal-producing capacity, and, rather than discouraging

potential investors, we should be encouraging oil and other companies to follow through on plans to invest the large amounts of capital required by these projects.

Conclusion

At the present time many oil companies are participating in the coal industry either by owning coal reserves or by operating a coal company. Future entry is expected to be mainly on a start-up basis, with oil companies investing significant resources to develop new capacity.

Such investment in new coal capacity is critical to our country's ability to meet ambitious production goals. It will increase the supply of coal and thus keep prices low, increase the use of coal versus oil and gas as boiler fuel, and reduce our dependence on foreign energy sources. Oil companies are willing and able to make a substantial financial commitment to develop our coal resources.

In order to meet the objectives of coal production, legislation should be designed to encourage rather than prohibit the necessary investment in coal production capacity. Such legislation should focus on:

- decreasing the uncertainty and risk by resolving promptly issues such as surface mining restrictions and pollution control standards;
- supporting the development of new productive capacity; and
- encouraging entry into coal production by firms with substantial financial strength.

Legislation such as the proposed horizontal divestiture bill should be rejected as totally contrary to our nation's energy needs. Horizontal divestiture would cripple the coal industry, and do immeasurable harm to our country's energy goals.

COMMENTARY

Betty Bock

I want to begin by paying homage to Walter Adams because—although I am logically persuaded by Teece and Swenson—I know, as Walter says, that what happens in terms of public policy is going to depend to a very great extent upon how people feel. And it is easier for feelings to attach themselves to what Walter is saying than to what Teece and Swenson are saying.

I don't really know why this is so. Perhaps the Teece and Swenson arguments seem to be more difficult. But essentially David Teece is saying that there are real economies to be obtained if an oil company, or any other complex company, is managed in a decentralized way. But at the same time, a company that is putting up the major capital for decentralized businesses that it owns must engage in centralized decision making with respect to investment and R & D.

If the R & D patterns of the decentralized businesses are related and if there is wisdom in the investment judgments, this combination of decentralization and centralization will result in better national risks for the development of alternative energy sources than if we were to require each energy source to be developed independently.

Mr. Swenson seems to be backing up this reasoning with a set of facts concerning the bridging relationships that have grown up between oil and coal companies. He has looked carefully at the problems facing Kennecott Copper as it has sought to find a new partner for Peabody Coal.

I think that a major problem we face is the fact that many Americans have strong feelings about "bigness" and "power"—although I am not sure what either of these terms means in any precise sense. And these feelings have propelled us toward a divestiture and containment policy for the oil companies without careful analyses, such as those presented by Professor Teece and Mr. Swenson. We should focus on what can be gained—as well as lost—by horizontal integration and what real alternatives there are for the oil companies, or other companies, who must divest themselves of actual or potential energy resources in which they have already made substantial investments—at a time when their own energy bases are in jeopardy.

If you look at this problem squarely, what you find worrisome is that many people have not begun to consider to whom the oil companies would

sell or by whom alternative energy companies would be financed.

There is a spectrum of energy policy alternatives. At the one extreme, we could have one national energy company holding a monopoly position in all energy resources. Such a company could be organized and owned by the federal government. But if we set up such a company, it would have a wide range of responsibilities and no direct price indicators to guide it: it would have to establish prices; it would have to establish an allocation system for various stages of production; it would have to lay out a priority system for uses; and it would have to do all of this, not only on the basis of inadequate information, but in terms of standards which many observers would be bound to feel were arbitrary.

During World War II, we managed to have price control, allocations, and rationing because we had one clear goal—and, therefore, a single claimant for all scarce resources—the winning of the war. We don't have that kind of unitary goal now. In fact, one of the essential purposes of competition is to serve as a mechanism that will allocate scarce resources without the definition of a single specific goal.

There are, of course, other alternatives, if we do not intend to let the presently unsatisfactory energy situation go on and do not want the federal government to own and control all energy resources. We could, for example, regulate the energy industry. There are numerous possible patterns of regulation—but we know that regulation has given us today's railway system and today's airline problems.

Still another alternative would be to expand government control over energy investment, energy R & D, and energy wages and prices; we could then allocate crude, refined, and perhaps the most critical petroleum products, while leaving companies in private hands.

I don't know how viable this would be—because to go through such an exercise, we would need a bureaucracy dedicated to making, monitoring, enforcing, and modifying rules for the dollars to be invested, the amounts of crude to be produced, imported, and refined, and the amounts of crude and refined to be sold to various customers, or classes of customers, during specified periods, at specified prices. This does not represent a reassuring situation.

Or we might develop government trading in crude oil, in dollars or in kind—but after we had done this, we would still have to go through the same procedures with respect to allocations, priorities, rationing, and pricing, as well as exploration and R & D, and other forms of investment.

Or, of course, we could continue as we have, developing ad hoc solutions as problems appear. That is, we could let matters drift.

I don't know how many of you live in parts of the country where plants are now shut down because of problems in the supply of natural gas—and the difficulties of obtaining alternative fuels. For example, where the alternative is higher-cost propane, there still seems to be trouble in getting

the propane delivered in snowbound parts of the country. The trucks aren't getting through.

And so one comes out at the other end of the line of alternatives: if we are truly concerned with competition, I believe we must decide whether we are not in need of a more clearly articulated energy policy than we now have. It would be impossible to begin to make proposals for such a policy in this space, but I am hopeful that a policy will emerge and that it will be one in which the government and private companies are not adversaries, but collaborators, with respect to some of the most difficult problems that confront all of us.

We should want as much competition as we can get, but we must understand that competition will in some cases require consortia, collaboration, and guidelines. However we balance out our policies among our various trade-offs, I hope we will not start to destroy before we have considered appropriate alternatives and have analyzed the byproducts of destruction.

F. M. Scherer

I am essentially in agreement with the policy conclusions of Professor Teece and Mr. Swenson. Among various possible divestiture policies, the worst possible one is to limit new entry into alternative energy industries such as coal, uranium, oil shale, and the like. That is the worst possible policy.

The next-to-worst policy would be to shut off the flow of cash into the development of alternative natural resources from companies that happen to have a very large cash flow, such as the petroleum companies.

Some kind of vertical disintegration would be much more palatable. Even more palatable would be a traditional type of horizontal divestiture, for instance one that would break Exxon's refining operations into, say, five different segments.

In the present environment, however, it makes very little sense to limit the flow of funds into alternative energy resources. This belief embodies a couple of assumptions. One is that the most likely entrants into the field of alternative energy resources are, in fact, the petroleum companies. I agree with Professor Teece that they do have the kinds of expertise that make them much better qualified than, say, Procter and Gamble would be.

I do have some qualms regarding Walter Adams's problem about competitive repercussions. Some oil companies probably would like to try to work out a cozy arrangement together in coal. They tried that, for example, in oil shale. Most of the large petroleum companies went into a joint venture to develop oil shale processes, and it was a flop.

Occidental went in alone, having always been a maverick, and it may have a pretty good thing. That is what the oil companies would have in coal as well as in oil shale. There would be sufficient heterogeneity so that the kind

of coordination Walter Adams worries about would not be forthcoming. If any clear and present danger of such coordination did emerge, then the anti-trusters should do something about it.

In general it makes little sense either to impede the entry of most favored entrants into alternative energy resources or to impede the flow of capital into alternative energy resources.

Although I do not disagree with the basic conclusions of Professor Teece and Mr. Swenson, I would like to speak to what I think are the real problems. To some extent, Mr. Swenson has pointed them out quite well. Let us assume that in fact there is a good market for an expanded coal supply.

If that is true, why is it that the coal companies as coal companies cannot raise funds for capital investment and for expansion? There must be something fundamentally wrong in our capital markets. Mr. Swenson tells us that those wonderful people on Wall Street who gave us Ling-Temco-Vought, Automatic Sprinkler, Litton Industries, Funny Money, and all the rest cannot provide the funds to expand our production of coal. Maybe investors have been so burned by the conglomerate-merger antics of the 1960s that they will not go into new ventures. That is one possibility.

Professor Teece may be correct, however, in believing that there are many little investors who really lack the information that an Exxon or a Gulf or a Mobil has about alternative investments. These small investors may be afraid to put their money into a specialized coal company. But that should not defeat us. There are solutions to that problem, and we ought to be looking for those solutions.

One disturbing fact is that our capital market institutions do not follow the random portfolio selection theories that have been shown again and again to be the best way to choose securities. Instead, we have "go-go" mutual funds, high turnover, big fees, and other gimmicks that do the investor no good. Now the investor is gun-shy of risk-diversification opportunities too.

What is to be done about it? I would propose, very, very seriously, that Congress pass a law allowing any bank to sell shares in mutual funds, provided that those mutual funds engage in random stock-portfolio selection. That would open up the capital markets enormously. It would cause the little man on the street to pour his money back into common stocks. The little firm that cannot now go to Mr. Swenson for financing could then begin raising new equity issues again. I make this proposal in all seriousness because I think we have a radical failure in our capital markets.

A second thing that seems clear from Professor Teece's analysis is that the tax laws should be changed so that companies with big cash flow but with unattractive internal investment opportunities can pay that cash in dividends. Then it could be reinvested through the market. We should restructure the double taxation situation so that there is not a premium placed on companies that diversify in order to use those cash flows internally.

Finally, the federal government, the state governments, and the courts ought to make a basic policy decision that we really do need to plow resources into alternative energy sources, and, in particular, coal. We should stop wasting time arguing whether we should or should not begin exploiting rich coal deposits. We should simply go ahead and do it. If those three policy measures are adopted, many problems facing us today will evaporate.

Let me say just a few disagreeable words about Professor Teece's paper. I agree with his conclusions, but he does not argue his case very well. He forces questionable facts onto a Procrustean bed of shaky economic theory. It would be much more effective if the facts were simply laid out, rather than being forced into theoretical molds.

A number of his facts turn out not to be facts when looked at closely. He asserts that companies have to be m-form organizations if they are to exploit these new possibilities in an optimal way. That is inconsistent with the facts. Gulf recently reorganized itself into an m-form organization, and a recent issue of *Business Week* said that the reorganization threatened to become a disaster ("Gulf Oil Goes Back to What It Knows Best," *Business Week*, January 31, 1977, p. 78).

Organization alone does not solve such problems. Professor Teece also says a particular organization of research and development is necessary—that vertical integration is needed for the proper incentives for research and development. That, I would maintain, is nonsense. Joy Manufacturing Corporation has done a beautiful job of developing automatic coal-mining machinery. It is not integrated into coal mining. Universal Oil Products is not integrated into crude oil extraction and refining. It has done a good job in developing processes.

Professor Teece talks about the need for revolutionary research and development in oil companies. Maybe there is a need, but it surely is not being met. I attended a seminar in Washington two weeks ago which was addressed by the vice president of research of Mobil Oil Corporation, who made it very, very clear that Mobil had cut back sharply on its long-range research in recent years. Just saying that the oil companies must do it will not bring high-risk, revolutionary research and development.

Professor Teece has a case to make, but he could make it more effectively by sticking to facts, rather than by trying to force those facts into shaky organizational economic theories.

J. Fred Weston

Let me begin by addressing a couple of points in the area of financial markets. Professor Scherer asks why the capital markets cannot raise funds if there is a good market for an expanded coal supply. That is a good and fundamental question. No one has argued, however, that the capital markets

cannot do the job. Mr. Swenson's argument is that there are relative advantages in raising the funds under more favorable terms by some other segments of American industry than coal. In other words, it is simply cost-efficient for some other segments of the economy to fill a part of that need. That does not imply that the independent coal companies cannot fill the need from the capital markets.

If the need were solely financial, there would be no concern that the oil companies might achieve a dominant position over the other energy industries because there would be a wide range of competition from all other parts of industry. If the need is just for money capital, there is a big list of triple-A-rated companies that could be sources of financing.

With regard to the weaknesses of the capital markets—which I have argued do not exist—the proposal to make all mutual funds index funds would be self-defeating. There is great diversity in the way mutual funds operate. Different philosophies of investment are found, some succeeding in one period and some in another. It is through these processes of the free markets that the securities markets work.

Because thousands of people probe the market for information all the time, none of them has an advantage over the others. None really outperforms the market because they are the market, and they make index funds possible. A number of financial institutions have brought out index funds. If the public wants the opportunity to invest in index funds, it already has it.

I believe in free markets, particularly in the financial markets. Considerable empirical evidence has demonstrated them to be highly efficient. Government-imposed restrictions constitute the frictions in the financial markets. The Glass-Steagall Act limits entry into commercial banking and into savings institutions, and it creates an undue fear of failure among financial institutions. If government participation were limited, even these frictions would be removed.

My point is that, if the many triple-A-rated firms outside the energy industry constitute potential sources of capital, why has the oil industry become the actual supplier of funds? The answer is the carry-over of managerial and technological capabilities, which increases the confidence of investors that these large investments will be managed well. Something that emerges from all of our discussion is that the energy industry comprises high-risk areas. Many institutions have developed because of this high risk in the energy industry. These institutions limit the risk of individual participants and thereby stimulate the flow of capital into the energy field. To the extent that more than money is involved, Professor Teece has strengthened his argument for the transfer of managerial and technological capabilities from the oil industry into other energy segments.

The oil industry is scarcely the only source of advanced R & D in the energy field. In giving examples such as Joy Manufacturing and Universal Oil as sources of technological advance, however, Professor Scherer does not re-

verse the arguments that Professor Teece makes. The oil industry is also one source, not necessarily the only source but a useful one for augmenting the supply of resources. Of course, using Joy Manufacturing and Universal Oil as examples reinforces Professor Teece's point that companies with technological experience are likely to make the advances.

A pure conglomerate form of diversification may not be required for the advantages Professor Teece sets forth, but that fact strengthens Professor Teece's arguments rather than weakening them.

When Oliver Williamson developed the theoretical mode of the m-form, he was dealing with problems of effectively managing organizations that were growing larger and larger and involving greater spans of control. The conglomerate-merger movement, coming when it did, reflected a fundamental, technological revolution, in addition to the financial tricks that were a temporary aspect of the movement. This revolution, which occurred from the late 1950s through the 1960s, saw a shift in relative importance from specific management functions, such as production and marketing, to generic management functions, particularly in planning and control. This is the fundamental reason why there were opportunities for a greater degree of efficient diversification in the American economy than had ever existed in the past. There were excesses, and the markets again efficiently weeded out the good from the bad. There were spectacular successes among the conglomerates, but as financial theory would predict, the conglomerates as a group behaved no differently from any other broad group of firms in terms of market performance. Now they are just another part of the American business scene.

Elimination of double taxation might not diminish or eliminate the motive of diversifying when a firm's opportunities in its traditional lines of activity become less favorable. It is fundamental in organization theory that a firm has to offer an expanding environment for promotions and increased responsibilities to attract and retain able executives, so these motives for diversifying into new attractive areas would remain, even if double taxation were removed. It would be desirable, however, to remove double taxation which stimulates retention of earnings.

I see the movement of oil companies into the broader energy industry as part of a general phenomenon. The boundaries of industries are increasingly going beyond products. Strategic planning in business firms becomes increasingly important. Emphasis on the missions of the firm is also increasing, along with the recognition that a firm consists of a set of capabilities. Since firms are defined more by capabilities than by products, the broadened dimensions of industries must be recognized.

Tremendous developments in transportation and communication have made the world more interdependent. Economies have become more dynamic, but the institutions to manage these interdependencies have lagged in development. Breakdowns will probably occur before such institutions are

actually created. The basic factors that have led to proposals for horizontal divestiture in the oil industry will appear increasingly in other American industries. There are political factors involved here, and the issue of political power is a very important one. But the best way to test political power is to look at the legislation that is enacted. By that test, it is clear from all the punitive legislation against the oil industry in recent years that the political power does not lie there. When this power is extended to other industries, I see the decline of the free enterprise system in the United States. That concerns me. The proponents of horizontal divestiture in the oil industry have not addressed the fundamental questions, in terms of their broad historical perspectives. The new power centers in our American democracy must think carefully about their exercise of that power.