Market Concentration and Implicit Grants in the Energy Industry: Some Observations*

By Christian Marfels

After a brief assessment of the dominance of the large international oil companies, both from an international and a domestic perspective, their generous tax treatment is analysed. Oil companies benefit to a great extent from generous tax subsidies in terms of the U.S. corporation income tax. Furthermore, external growth is stimulated by the provisions of Sec. 368 IRC.

I. Introduction

It seems no wonder that in a country where some six percent of the world's population account for 35 % of world energy consumption[1], energy policies are a pacesetter ranging from Project Independence to proposed divestiture legislation of large oil companies. Statistical evidence shows that the seven international oil companies, five of which are U.S. firms, dominating the oil market in the Free World controlled 45 % of the Free World's crude oil production and 40 % of the U.S. production in 1979 (vid. Table 1). There is also growing concern that a tightly knit network of tax subsidies, concessions, etc. — a system that may be labeled as 'implicit grants' in terms of the study of the grants economy — has fostered and cemented the position of the large oil companies.

II. The Evidence of Dominance

The energy scenario in the Free World is clearly dominated by the international oil companies with integrated operations on four levels — reserves and crude oil production, refining, transportation (pipelines and tankers), and marketing. The infamous 'Seven Sisters' are American firms — Exxon, Texaco, Gulf, Standard Oil of California, and Mobil — or are affiliated with American firms — British Petroleum

* Revised version of a presentation to the Panel on "Market Concentration and Implicit Grants in the Energy Industry" at the American Economic Association Meetings, Atlantic City, N.J., September 18, 1976. Research support from the Institute for Studies of International Aspects of Competition at the University of Rhode Island is gratefully acknowledged.

[1] *Corporate Information Center* (1974), 3 D.

Table 1

Shares of Crude Oil Production (b/d) of the Seven Dominant International Oil Firms, Various Geographical Areas, 1979

Area	Share of the Seven	
	Total	of which: 5 U. S. Firms
United States	40.2 %	29.2 %
Free World outside U. S.	45.7 %	29.4 %
Total Free World	44.6 %	29.4 %
Total World	34.8 %	23.0 %

Sources: Company Reports; BP statistical review of the world oil industry 1979, London 1980.

with Standard Oil of Ohio and Royal Dutch/Shell with Shell Oil. This group is the hard nucleus of what has been labeled as the "Energy Industrial Complex"[2]; in 1979, they controlled 40 % of the crude oil production of the United States, 45 % of the Free World's production and 35 % of the world production in crude oil. The five American companies took the lion's share of 29 %, 29 %, and 23 %, respectively (vid. Table 1).

Turning to the domestic scene, at a first glance, the oil industry does not seem to be one of the highly concentrated industries (vid. Table 2). Other key industries such as, *e. g.*, automobiles and steel show significantly higher levels of concentration. However, this is the conclusion when assessing concentration in *horizontal* perspective. A closer exami-

Table 2

Concentration in the U. S. Petroleum Industry at Various Levels of Production and Distribution, 1979

Level	Top 4	Top 8
Proved Domestic Crude Reserves	35.7 %	53.2 %
Crude Oil Production	31.0 %	55.0 %
Refining Operating Capacities	29.7 %	50.3 %
Transportation of Refined Oil[a]	30.5 %	54.6 %
Motor Gasoline Sales	28.8 %	49.8 %

a) Barrel-miles handled in trunk lines.

Source: American Petroleum Institute, Market Shares and Individual Company Data for U.S. Energy Markets: 1950 - 1979, Discussion Paper No 014R, Washington, October 30, 1980.

[2] *Corporate Information Center* (1974), 3 D.

Table 3: **Rankings of the 8 Largest U. S. Oil Firms at Various Levels of Production and Distribution of the U. S. Petroleum Industry, 1979**

Firm	Net Crude Prod.	Crude Oil Reserves[a)]	Crude Oil Ref. Cap.	Pipeline Transp.	U. S. Motor Gasoline Sales
Exxon	1	2	1	2	1
Texaco	2	8	5	4	5
Shell Oil	3	4	4	8	3
Standard Oil of Indiana	4	5	3	1	2
Standard Oil of California	5	7	2	19	7
Gulf	6	9	6	5	4
Atlantic Richfield	7	3	7	6	8
Mobil	8	10	8	7	6

a) Largest reserves held by Standard Oil of Ohio.

Source: American Petroleum Institute, Market Shares and Individual Company Data for U.S. Energy Markets: 1950 - 1979, Discussion Paper No 014R, Washington, October 30, 1980.

nation of the four levels of production and distribution in the oil industry reveals an extraordinary high level of *vertical* concentration mainly caused by the almost perfect level of integration by the leading oil companies. In fact, the eight largest U.S. oil companies — among them the five international giants (vid. *supra*) — are the leaders in every segment of the industry from exploration to distribution (vid. Table 3). They virtually control the oil industry from the oil well to the gas station.

Beyond the high level of vertical concentration, major oil companies have recently increased the pace of penetrating into the non-oil energy industry and, thus, are trying to extend their control to competing energy sources via conglomerate integration. Apart from the natural gas industry which has been a domain of oil companies for a long time, prominent targets in this drive for control of substitute fuels are coal and uranium companies: in 1979, 19.3 % of the U.S. coal production was controlled by oil companies[3], and in the uranium industry, oil companies held 38.5 % of the production in 1979[4]. The financing of all of the mergers and acquisitions in the direction of combining already fully integrated companies, vertical integration, and conglomerate expansion would not have been possible without the implicit subsidies inherent in the Internal Revenue Code in its special tax provisions for the oil industry.

III. The Spectrum of Implicit Grants

Public concern about monopolistic practices in the oil industry and about the alleged manipulation of an energy shortage is fostered by the fact that oil companies are the beneficiaries of large amounts of implicit subsidies from public sources. Most prominent among these subsidies are special tax provisions such as the recently abolished oil depletion allowance and the foreign tax credit. Other implicit subsidies like the oil import quota and explicit subsidies such as concessionary credits and R & D grants boost the flow of public grants to the oil industry considerably.

To begin with, the magnitude of implicit subsidies from tax provisions to the oil industry is astounding. These internally created funds have been estimated to be in the range of $ 4 B annually[5]. Thus, it comes as no surprise that the leading oil companies paid an average effective rate of only 10.8 % in Federal income tax on $ 5,129 M in pre-tax income in 1970; corresponding figures for 1975 and 1979 read 19.6 % on $ 8,846 M

[3] *American Petroleum Institute* (1980), 157.
[4] *American Petroleum Institute* (1980), 181.
[5] *Adams* (1973), 145.

Table 4: **Net Income and Effective Federal Tax Rate of Major U. S. Oil Firms, Selected Years**

Firm	1970		1975		1979	
	Net Income[a] $ M	Tax Rate	Net Income[a] $ M	Tax Rate	Net Income[a] $ M	Tax Rate
Exxon	1,892[b]	12.7[b]	3,575	24.1	5,517	16.0
Standard Oil of California	185	16.0	824	6.3	2,460	18.7
Shell Oil	305	11.2	908	34.4	1,868	27.5
Standard Oil of Indiana	418	13.4	1,194	29.5	1,549	19.7
Texaco	921	8.0	934	3.4	2,312	21.1
Gulf	626	1.9	880	5.5	1,782	6.4
Atlantic Richfield	212	5.0	531	13.2	1,902	12.8
Mobil	570	16.8	n. a.	n. a.	n. a.	n. a.
Eight Firms	5,129	10.8	8,846	19.6	7,390	17.5

a) Net Income plus Federal Income Tax (current plus deferred) plus Income applicable to Minority Interests. — b) 1972.
Sources: Vanik (1973), 28; Company Reports.

and 17.5 % on 17,390 M, respectively (vid. Table 4). These rates have to be measured against the standard 48 % of the corporation income tax. To be sure, the oil industry does not take an exclusive lease of a high rate of tax avoidance[6], but the tax subsidy system for the oil industry is the most extensive one in the entire Internal Revenue Code. Siegfried has convincingly shown that the industry "Petroleum Refining with Extraction" (SIC 2912) had the third lowest effective average corporation income tax rate among 110 industries in 1963, *viz.* 19.8 %, or if allowance for foreign tax credit is made, a drop to 3.3 % in terms of the ratio of tax liability to total receipts less deductions[7]. And, perhaps even more interesting but not unexpected, he shows that the tax avoidance rate within the oil industry is apparently an increasing function of firm size[8]. This means that particularly the large oil companies having subsidiaries abroad and, thus, benefiting from the foreign tax credit are subsidized for being large. Since large oil companies are usually fully integrated firms, they also own most of the crude oil which they refine; thus, they could maximize the depletion allowance by allocating profits largely to production which necessitated a high "paper" posted price[9]. The smaller independent refiners did not have this choice.

To supplement this already ample supply of internally generated funds available for financing mergers and acquisitions, oil companies like firms in other industries can benefit from another generous source of implicit subsidies in the Internal Revenue Code, *viz.* the tax exemption of Sec. 368 in a statutory merger, *i.e.* the non-recognition of any gain or loss in a business combination. Since it seems to be the rule rather than the exception that the acquiring firm has to pay "a significant premium over the pre-merger market value of the acquired enterprise"[10], the avoidance of capital gains tax can be safely regarded as the foremost tax incentive for merger. This incentive is boosted even further by the provision that in a tax-free reorganization according to Sec. 368 IRC the acquiring firm will succeed to the tax attributes of the acquired firm. Among these attributes, the carryovers of net operating losses, of capital losses and of investment credits are of paramount importance. During 1963 - 68, the Federal Trade Commission has recorded some 350 tax-free acquisitions in mining and manufacturing, representing 85 % of all 'large' acquisitions where the acquired firm had assets of more than $ 10 M[11]. In 1967 - 68 alone, 14 out of a total of 18 largest

---

6 *Vanik* (1973), 22 - 26.
7 *Siegfried* (1974), 255 - 257.
8 *Salamon* and *Siegfried* (1976), 1039.
9 *Joint Committee on Public Domain of the California Legislature* (1975), 95.
10 *United States, Federal Trade Commission* (1969), 143.
11 *United States, Federal Trade Commission* (1969), 145.

acquisitions, where the acquired firm had assets of more than $ 250 M, received tax-free treatment[12]. Thus one can safely assume that the majority of the 32 large mergers and acquisitions in the oil industry from 1965 - 1979 where the acquired firm had assets of more that $ 100 M benefited from this generous implicit subsidy (vid. Table 5). Apart from the absorption of formerly independent refiners and of fully integrated companies (horizontal) and acquisitions in the field of crude oil and natural gas production (vertical), the diversification of oil companies into the competing energy sources coal and nuclear power has increased steadily in the past decade[13]. In order to asses the impact of this conglomerate penetration, new avenues in concentration measurement had to be paved.

IV. The Prospectus of Measurement

Horvath's comprehensive industrial concentration index has proven to be perhaps best suited to cope with the indicated problem of measurement[14]. Admittedly, it is analytically inferior to an axiomatic measure such as the E-Index based on the entropy measure[15] but it has the clear advantage among the commonly used summary measures of concentration of presenting a perspective view of the entire size distribution of firms in an industry: the index combines both aspects of discrete measures and of summary measures inasmuch as the share of the largest firm is treated as a concentration ratio and the shares of the remaining firms are a Hirschman-Herfindahl-Index reinforced by a multiplier. This weighting system leads to the more intuitive reflection of the magnitudes involved than with other concentration measures.

Traditionally, concentration measures have been applied *within* an industry and, thus, taking horizontal mergers and acquisitions into account only. On that basis, it has been shown that implicit subsidies in terms of the tax incentives for merger do have an immediate and direct

---

[12] *United States, Federal Trade Commission* (1969), 144.

[13] *United States, Department of the Treasury* (1976).

[14] The formula for the Horvath-Index reads

$$CICI = p_{\max} + \sum_{j=2}^{n} p_j^2 (2 - p_j)$$

where $p_{\max}$ is the market share of the largest firm, p_j is the market share of the j-th non-largest firm ($j = 2, \ldots, n$) and n is the number of firms in an industry (cf. *Horvath* (1970)!).

[15] The formula for the E-Index reads

$$E = \prod_{i=1}^{n} p_i^{p_i} = 1 / \text{antilog}\, H$$

where H is the entropy measure $[H = \sum_{i=1}^{n} p_i \cdot \log (1/p_i)]$ (cf. *Marfels* (1972)!).

Table 5

Large Acquisitions[a]) by Oil Companies in the United States, 1965 - 1979

Year	Acquiring Co.	Acquired Co.	Assets $ M	Tax Conse-quences
1965	Union Oil Calif.	Pure Oil	766.1	n/t
1966	Continental Oil	Consolidation Coal	446.1	t
1966	Atlantic Refining	Richfield Oil	499.6	n/t
1967	Kerr-McGee	American Potash	117.7	n/t
1967	Signal Oil & Gas	Mack Trucks	303.0	n/t
1967	Getty Oil	Tidewater Oil	1,001.1	n/t
1967	Tenneco	Kern County Land	435.3	n/t
1968	Universal Oil	Calumet & Hecla	101.8	n/t
1968	Tenneco	Newport News	305.3	n/t
1968	Sun Oil	Sunray DX Oil	749.0	n/t
1968	Occidental Petroleum	Hooker Chemical	366.5	n/t
1968	Occidental Petroleum	Island Creek Coal	115.2	n/t
1969	Amerada Petroleum	Hess Oil & Chemical	491.5	n/t
1969	Atlantic Richfield	Sinclair Oil	1,851.3	n/t
1970	Standard Oil (Ohio)	BP Holdings	657.3	n/t
1974	Burmah Oil	Signal Oil & Gas	340.1	t
1974	Murphy Oil	Storm Drilling & Marine	101.4	t
1975	Standard Oil (Calif.)	AMAX (20 %)	1,780.4	n/t
1975	Signal	Universal Oil Prod.	443.1	n/t
1976	Mobil Oil	Marcor	2,847.5	t
1976	Marathon Oil	Energy Corp. of Louisiana	223.9	t
1976	Marathon Oil	Pan Ocean Oil	139.5	t
1977	Atlantic Richfield	Anaconda	2,050.9	n/t
1977	Gulf Oil	Kewanee Inds.	389.0	t
1977	Getty Oil	Skelly Oil	1,013.0	n/t
1977	Union Oil (Calif.)	Molycorp	163.6	n/t
1977	Tenneco	Monroe Auto Equ.	190.3	n/t
1978	Cons. Oil & Gas	R. L. Burns	154.3	t
1978	Tenneco	Philadelphia Life	644.8	n/t
1979	Standard Oil (Ind.)	Cyprus Mines	602.0	n/t
1979	Mobil Oil	W. F. Hall Print	152.0	t
1979	Exxon	Reliance Electric	541.6	t

a) Acquired company had assets of $100 M and more.

Sources: U.S. Federal Trade Commission, Statistical Report on Mergers and Acquisitions, Washington (1980); id., Economic Report on Corporate Mergers, Pt. 8A of Economic Concentration Hearings, U.S. Senate Subcommittee on Antitrust and Monopoly, Washington (1969), 144, 674; Moody's Industrial Manual; Commerce Clearing House, Capital Changes Reporter.

effect on the level of concentration in an industry[16]. But what about the quantitative assessment of the competitive impact of a conglomerate merger or acquisition? Translated into the present context, how did, *e.g.*, the acquisition of Consolidation Coal by Continental Oil or of Island Creek Coal by Occidental Petroleum affect the structural pattern of the coal industry?

As has been shown by Horvath, a reformulation of his comprehensive industrial concentration index, tailored to the needs of measuring conglomerate expansion, may provide the answer[17]. Unfortunately, the lack of appropriate empirical data does not yet permit a full scale testing of the operationality of the approach. Consequently, only a sketch of the measurement procedure is presented.

First of all, the reformulated index incorporates a booster that transmits the potential force of the conglomerate parent[18]. Bearing in mind the rationale of a concentration measure of serving as an indicator of the degree of departure from competitiveness in an industry, the index

---

16 *Marfels* (1976).

17 *Horvath* (1972).

18 The booster is given by

$$b_k = 10\,\{\log\,(K + 1)] \cdot [p_k\,(1/1 + p_k)]\}$$

where K is the market share of the penetrating conglomerate in its "original" market, and p_k is the market share of the acquired subsidiary. For the formula of the conglomerate Horvath-Index, $CICI_K$, two cases have to be discerned because of the dual weighting system of *CICI* which assigns a weight of unity to the market share of the largest firm and weights of $p_j\,(2 - p_j)$ to the market shares of the non-largest firms:

(i) The acquired subsidiary, k, is the largest firm, *i.e.*, $p_k = p_{\max}$. The adjusted market shares after the penetration of the conglomerate are

$$p^*_{\max} = (p_{\max} + b_k)/(1 + b_k)\ ,\quad \text{and}$$

$$p^*_j = p_j / 1 + b_k$$

and the index is

$$CICI_K = p^*_{\max} + \sum_{j=1}^{n} (p^*_j)^2\,(2 - p^*_j)$$

(ii) The acquired subsidiary is *not* the largest firm, *i.e.*, $p_k \neq p_{\max}$ $(j = 2, \ldots, n)$. The adjusted share are

$$p^*_{\max} = p_{\max}/1 + b_k\ ,$$

$$p^*_{j \neq k} = (p_j + b_k)/(1 + b_k)\ ,\quad \text{and}$$

$$p^*_{j \neq k} = p_j/1 + b_k\ ,\quad \text{and}$$

$$CICI_K = p^*_{\max} + \sum_{j=2}^{n} (p^*_j)^2\,(2 - p^*_j)$$

(cf. *Horvat* (1972)!).

also provides a logical explanation inasmuch as it indicates an increase in concentration if a larger firm has been acquired by a conglomerate parent, whereas the reverse is true if a smaller firm has been the target of acquisition. A completely fictitious but illustrative example may supply the perspective view. Suppose American Motors were acquired by IBM. Would concentration rise or decline in the automobile industry? According to Horvath's index, it would decline (vid. Appendix). From a structural point of view and excluding collusion, this represents a logical assessment of the new situation: AMC would be better equipped financially — and perhaps managerially — to be able to challenge the 'Big Three' and, by that token, competitiveness in the automobile industry has increased. If, on the other hand, IBM had singled out General Motors instead, the index would increase, as was to be expected since GM would be still further ahead of its competitors as it already is (vid. Appendix).

Appendix

Worksheet for the *Fictitious* Example of Conglomerate Penetration into the U. S. Automobile Industry

Company	Market Share[a)]	*CICI*	IBM Market Share[b)]	Boost	Weight Bulk	Weight Adjusted	$CICI_K$
Case 1							
GM	0.5375	0.5375			0.5375	0.5042	0.5042
Ford	0.2630	0.1201			0.2630	0.2467	0.1067
Chrysler	0.1693	0.0525			0.1693	0.1588	0.0464
AM	0.0295	0.0017	0.7	0.0660	0.0955	0.0896	0.0153
Checker	0.0007	0			0.0007	0.0007	0
	1.0000	0.7118			1.0660	1.0000	0.6726
Case 2							
GM	0.5375	0.5375	0.7	0.8054	1.3429	0.7438	0.7438
Ford	0.2630	0.1201			0.2630	0.1457	0.0394
Chrysler	0.1692	0.0525			0.1693	0.0938	0.0168
AM	0.0295	0.0017			0.0295	0.0163	0.0005
Checker	0.0007	0			0.0007	0.0004	0
	1.0000	0.7118			1.8054	1.0000	0.8005

a) In terms of 1969 automobile production.
b) Assumed to be 70 % in the computer industry.

Summary

Statistical evidence shows that the seven international oil companies dominate the oil market in the Free World. This group is the hard nucleus of what has been labeled as the Energy-Industrial Complex with virtual control ranging from the oil well to the gas station. Beyond the high level of vertical integration, major U. S. oil companies have recently increased the pace of penetrating into the non-oil energy industry and, thus, are trying to extend their control to competing energy sources via conglomerate expansion. Apart from the natural gas industry, prominent targets are coal and uranium companies.

Both vertical integration and conglomerate expansion would not have been possible without the implicit subsidies inherent in the Internal Revenue Code in its special tax provisions for the oil industry. To supplement this already ample supply of internally generated funds available for mergers and acquisitions, oil companies like firms in other industries can benefit from another generous source of implicit subsidies in the Internal Revenue Code, *viz.* the tax-free re-organisation according to Sec. 368 IRC. Consequently, it is not surprising to learn that from the 32 large acquisitions of oil companies during 1965 - 1979 only 10 were taxable.

In order to assess the impact of this conglomerate expansion, new avenues in concentration measurement had to be paved. As is shown in two fictitious case studies, Horvath's comprehensive industrial concentration index has proven to be perhaps best suited for that purpose.

Zusammenfassung

Die sieben internationalen Mineralölunternehmen beherrschen den Erdölmarkt der Freien Welt. Mit ihrer buchstäblich von der Ölquelle bis zur Tankstelle reichenden Kontrolle kann diese Gruppe als der harte Kern des sog. energiewirtschaftlich-industriellen Komplexes angesehen werden. Über den hohen Grad an vertikaler Konzentration hinaus haben die großen amerikanischen Mineralölunternehmen in neuester Zeit verstärkte Anstrengungen unternommen, durch konglomerate Expansion ihre Kontrolle auf andere Energieträger auszudehnen. Neben Erdgas handelt es sich hierbei insbesondere um Kohle und Uran.

Das Ausmaß an vertikaler Konzentration und konglomerater Expansion wäre ohne die impliziten Steuerhilfen des amerikanischen Einkommensteuergesetzes mit seinen speziellen Bestimmungen für die Mineralölindustrie nicht möglich gewesen. Um den schon recht stattlichen Katalog verfügbarer Finanzmittel bei Fusionen und Unternehmensaufkäufen noch zu ergänzen, können Mineralölunternehmen von den allen Industriezweigen zustehenden steuerfreien Unternehmensreorganisationen gemäß § 368 des amerikanischen Einkommensteuergesetzes profitieren. So ist es denn nicht verwunderlich, daß von den insgesamt 32 großen Unternehmensaufkäufen der Mineralölunternehmen im Zeitraum von 1965 - 1979 nur 10 steuerpflichtig waren.

Um das Ausmaß dieser konglomeraten Expansion quantitativ in den Griff zu bekommen, sieht sich die Konzentrationsmessung vor neue Aufgaben gestellt. Als operationaler Ansatzpunkt hat sich hier das von Horvath entwickelte konglomerate Konzentrationsmaß erwiesen, wie es an Hand zweier instruktiver Fallbeispiele gezeigt wird.

References

Adams, W. (1973), "The Antitrust Alternative", Corporate Power in America, ed. by R. Nader and M. J. Green, New York, 130 - 147.

American Petroleum Institute (1980), Market Shares and Individual Company Data for U. S. Energy Markets: 1950 - 1979, Discussion Paper # 014 R, Washington.

Corporate Information Center (1974), "The Energy Industrial Complex", CIC Brief, March 1974.

Horvath, J. (1970), "Suggestion for a Comprehensive Measure of Concentration", Southern Economic Journal 36, 446 - 452.

— (1972), "Measuring Conglomerate Concentration: A Proposal", The Antitrust Bulletin 17, 885 - 909.

Joint Committee on Public Domain of the California Legislature (1975), "Report on the Pipeline Transport System in California", Industrial Reorganization Act Hearings, Pt. 9, Senate Subcomittee on Antitrust and Monopoly, Washington, 83 - 152.

Marfels, C. (1972), "On Testing Concentration Measures", Zeitschrift für Nationalökonomie 32, 461 - 486.

— (1976), "Implicit Grants and Industrial Concentration", Grants and Exchange, ed. by M. Pfaff, Amsterdam, 131 - 155.

Salamon, L. M. and J. J. *Siegfried* (1977), "Corporate Political Influence and American Public Policy", American Political Science Review 71, 1026 - 1043.

Siegfried, J. J. (1974), "Effective Average U. S. Corporation Income Tax Rates", National Tax Journal 27, 245 - 259.

United States, Federal Trade Commission (1969), Economic Report on Corporate Mergers, Pt. 8 A of Economic Concentration Hearings, Senate Subcommittee on Antitrust and Monopoly, Washington.

United States, Department of the Treasury (1976), Implications of Divestiture, Washington.

Vanik, C. A. (1973), "Corporate Federal Tax Payments and Federal Subsidies to Corporations", Tax Subsidies and Tax Reform Hearings, Joint Economic Committee, Washington, 3 - 28.