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# Vertical Integration by Oil-exporting Countries

by Horst Siebert and Michael Rauscher, Konstanz\*

**Most oil-producing countries have now nationalised their oil reserves and are pursuing their own pricing and marketing policies; in recent years some of them have attempted to extend their influence over the oil market by undertaking processing activities downstream from oil production. What motives underlie this strategy of vertical integration? What is its economic justification? What effects will it have on oil-importing countries?**

The last fifteen years have seen far-reaching changes in the institutional structure of the world oil market. Whereas at the end of the sixties the major oil companies still controlled the bulk of world oil reserves under the system of concessions then prevailing, most oil-exporting countries have since nationalised their reserves and are now pursuing their own pricing and marketing policies. Concessions have been largely replaced by newer forms of contract, such as production sharing or service contracts that give the resource-owning country power over its own oil reserves. In recent years some of these countries have attempted to extend their influence over the oil market by undertaking processing activities downstream from oil extraction. This entails the construction of refineries and the development of a basic chemicals industry. They have also tried to spread their influence to the distribution field; examples in this respect are the formation of their own tanker fleets and shareholdings in foreign distribution networks.

In all of these fields, oil-exporting countries are expanding into shrinking markets. Nowhere is this more true than in refining, where there is around 30 % overcapacity worldwide and plants are being closed, including some that only came into operation in the mid-seventies. It also applies, however, to other oil and energy-intensive fields in which overcapacity was created in expectation of constant or even accelerating growth in demand; certain parts of the petrochemicals industry, such as ethylene production, provide examples of this.<sup>1</sup> In the transportation field too there is

excess capacity that is being only partly offset by premature scrapping and "slow steaming".

Against this background, the question arises as to the motives behind such a strategy of vertical integration and the economic factors that justify the oil-exporting countries' venture into downstream activities. Finally, the effects that these more recent developments will have on oil-importing countries must also be examined.

The oil-exporting countries' processing capacity in oil and energy-intensive sectors has increased substantially in recent years and a further leap forward in the industrialisation drive is scheduled for the second half of the eighties. The OPEC countries owned 7.6 % of worldwide refining capacity in 1977 and 8.9 % in 1982; their share is expected to be around 12 % or even more in 1987, depending partly on the number of plants closed in other countries. In reading the figures in Table 1, it should be noted that capacity of 700,000 b/d, represented by the Abadan refinery in Iran, has fallen victim to the Gulf War.

Some countries can already process a considerable proportion of their domestic oil production in their own refineries; the figure is 70 % in Algeria and Venezuela and around 60 % in Kuwait. On average, OPEC countries are able to process one-third of their production themselves, although these figures are admittedly affected by the current low production levels.

Most of the expansion in capacity serves to meet rapidly rising domestic demand. "High absorbers" such as Mexico and Nigeria are having difficulty meeting domestic requirements for petroleum products. If they

\* University of Konstanz. This paper was produced as part of the research project "Resources policy for industrial countries" by Special Research Division 5 (Sonderforschungsbereich 5) "State resource allocation policies in market economies".

<sup>1</sup> See M. Quinlan: World Survey, Chemicals: Profits Continue to Decline, in: *Petroleum Economist*, No. 50, 1983, pp. 261-263.

**Table 1**  
**Refining Capacity in Selected OPEC Countries**  
 (in thousands of barrels per calendar day)

	1977	1982	1987 <sup>a</sup>
Algeria	116	471	471
Iran	995	560	560
Iraq	184	306	556
Kuwait	594	594	799
Libya	130	130	350
Nigeria	57	247	247
Saudi Arabia	703	1,028	2,023
Venezuela	1,445	1,323	1,323
<b>Total OPEC</b>	<b>4,822</b>	<b>5,416</b>	<b>7,916</b>

<sup>a</sup> Assuming planned plant comes into operation on schedule. Sources: Data on planned additions to capacity from F. Fesharaki, D. Isaak: OPEC and the World Refining Crisis, Economist Intelligence Unit Special Report No. 168, London 1984. Source for 1977 and 1982 data: OPEC Annual Statistical Bulletin 1982, Vienna.

**Table 2**  
**OPEC Export Refining Capacity**  
 (in thousands of barrels per calendar day)

	Dec. 1984	Dec. 1987
Saudi Arabia	840	1,665
Libya	329.8	549.8
Kuwait	668.6	824.6
United Arab Emirates	0	170
<b>Total</b>	<b>1,838.4</b>	<b>3,209.4</b>

Source: Oil and Gas Journal, Vol. 83, No. 9 (4th March 1985).

did not expand their processing facilities, some oil-exporting countries would find themselves in the embarrassing position of having to import petroleum products. Truly export-oriented oil refining is the aim of only a few countries whose consumption is small in relation to production. The countries likely to make the largest impact are listed in Table 2. On the basis of their export refining capacity, the OPEC countries are probably at present able to export around 15 % of their oil exports in the form of finished products.

More impressive than the expansion in refining capacity is the growth in the basic chemicals industry. Whereas by the end of this year ammonia production capacity will probably be double what it was in 1980, ethylene production will probably have increased tenfold. Ammonia is the feedstock for the production of nitrogenous fertilisers and ethylene is required for all manner of chemical products. It should be borne in mind, however, that in the base year these countries' ethylene capacity constituted a much smaller proportion of the world total than was the case in the refining sector; in 1980 OPEC accounted for less than 1 % of world

ethylene capacity. The export-oriented element in the expansion in these fields is aimed primarily at markets in the developing countries that lack the capital to establish their own basic chemicals industry. Exports by the oil-exporting countries will be confined largely to basic chemicals and intermediate products.

A comparable expansion has also occurred in the oil transportation sector. The tonnage of crude carriers sailing under OPEC flags trebled between 1975 and 1980; in 1983 these countries accounted for 5.9 % of the world tanker fleet.

Further downstream activities by oil-exporting countries consisted in the purchase of foreign refineries and shares in foreign chemical groups and distribution networks. Examples are Kuwait's 24.5 % stake in Hoechst and the purchase of Gulf Oil's refining and distribution network in Denmark and the Benelux countries. Kuwait is the oil-exporting country with the greatest commitments abroad; it is now even involved in oil exploration and production in the USA and the North Sea. Kuwait's strategy differs from those of other countries in other respects too. Whereas other states such as Saudi Arabia are seeking joint ventures with US, European and Japanese partners, Kuwait permits no foreign participation in domestic projects. The objective of this strategy appears to be one hundred per cent vertical integration: to refine Kuwaiti oil in the country's own refineries, to carry it in its own ships and finally to sell it through its own distribution network. The strategy appears to be working.

Saudi Arabia, which is also gearing its vertical integration strongly towards export markets, has adopted a different approach. It is seeking to set up joint ventures with selected partners, who will be expected to provide the necessary knowhow and also to guarantee the marketability of the products. Incentives such as guaranteed supplies of crude oil and very cheap loans are available for foreign partners to increase the attraction of such projects. In view of the worldwide crisis in the refining sector, subsidies would appear to be essential to ensure the success of vertical integration.

### Reasons for Vertical Integration

There are a number of possible explanations for vertical integration by the oil-exporting countries. It would seem natural to examine first the theory of vertical integration.<sup>2</sup> A monopolistic firm has an incentive to

<sup>2</sup> For a good synopsis, see R. D. Blair, D. L. Kaserman: Law and Economics of Vertical Integration and Control, New York and London 1983; M. Casson: The Theory of Vertical Integration: A Survey and Synthesis, Journal of Economic Studies, No. 11, 1984, pp. 3-43.

move into downstream activities if perfect competition obtains in that sector and if there are substitutes for the production factor provided by the firm. The price of the monopolistically controlled factor induces downstream firms' to substitute away from that factor, but the monopolist can prevent this by moving into the sector himself, in other words by integrating vertically. The question to be examined is whether the assumptions required to produce this result hold good for the world oil market. Over the medium term at least, the assumption of an upstream monopoly can be regarded as a valid approximation of the role of OPEC on the supply side of the market and the assumption of the competitive situation downstream can also be accepted.

However, the assumed substitutability of factors of production downstream is untenable as far as oil refining is concerned. The production processes here are subject to linear limitations: the ratio of inputs of crude to outputs of oil products or basic petrochemicals is constant. In that case, however, the OPEC countries could concentrate the entire monopoly rent in the crude oil sector by setting appropriate prices and volumes and vertical integration would be unnecessary. Moreover, the history of OPEC and the role played by suppliers on the periphery of the cartel show that even the assumption of an upstream monopoly is unrealistic in the long term.

Transaction costs are seen as another justification for vertical integration.<sup>3</sup> In non-integrated markets, where successive stages of production are in different hands, costs are incurred for the use of intervening markets; these so-called transaction costs may take the form of information costs or transportation costs, for example. The significance of transportation costs is self-evident; oil-producing countries that do not have their own refineries must import oil products to cover their domestic energy requirements. Double transport costs arise here, as both crude and oil products have to be transported over fairly long distances. The desire to avoid this and to ensure independent supplies of energy is the decisive motive for many oil-exporting countries to develop or expand their refining sector. Saving transportation costs is no longer a motive if downstream activities are geared not to the domestic market but to exports, for it is far more costly to transport petroleum products than crude. Other types of transaction cost, such as the cost of obtaining information, can be shown to exist theoretically, but they are hardly quantifiable and

**Table 3**  
**Use of Natural Gas, 1982**

	World		OPEC		Non-OPEC	
	bn m <sup>3</sup>	%	bn m <sup>3</sup>	%	bn m <sup>3</sup>	%
Gross production	1,857	100	263	100	1,594	100
Net production	1,600	86	108	41	1,491	94
Reinjection	144	8	80	30	64	4
Flaring	120	6	75	28	45	3

Source: OPEC Annual Statistical Bulletin 1982.

are therefore incapable of empirical verification. Hence, the transaction cost approach provides no sound reason for the construction of *export-oriented* refineries in oil-exporting countries.

Another possible explanation is based on the standard model of the neoclassical foreign trade theory, whereby a country exports those goods produced by the intensive use of whatever factor of production is in relatively abundant supply. This assumes, among other things, that production factors are not internationally mobile, an assumption that holds good for the associated gas obtained in large quantities in oil-exporting countries as an accompaniment to oil production. There are several possible uses of such gas: it can be used to meet domestic energy requirements; it can be reinjected into the oilfield to maintain the pressure, greatly increasing the extraction ratio and hence expanding the resource base. A further alternative is liquefaction and export, though this presupposes the availability of liquefaction plant and liquefied gas tankers. The gas can be used as an energy input in both the refining and petrochemical sectors and as a feedstock in the production of basic petrochemicals. The last alternative is to flare the gas if no productive use can be found. The proportions of the various uses of natural gas are shown in Table 3.

In OPEC countries the proportion of gas reinjected or flared is very high, partly owing to the fact that export opportunities are limited by the lack of gas pipelines and liquefaction plant and partly owing to the very low domestic demand in the low absorber countries of the Arabian Gulf. Gas that is flared can be regarded as a free good. The proportion of gas disposed of in this way has fallen by about half since the mid-seventies (owing to the decline in oil production in OPEC countries and the growth in domestic demand for energy), but rising world demand for energy in the next few years can be expected to lead to an increase in OPEC oil production and hence in the volume of associated gas available.

<sup>3</sup> With regard to the transaction cost approach, see O. E. Williamson: *Assessing Vertical Market Restrictions: Antitrust Ramifications of the Transaction Cost Approach*, in: *University of Pennsylvania Law Review*, No. 127, 1979, pp. 1479-1496.

**Table 4**  
**Cost of Petroleum Refining**  
 (in dollars per tonne of product)

	Arabian Gulf refinery (new)	OECD refinery (new)	OECD refinery (old)
Capital costs	10.68	8.86	2.12
Energy costs	1.25	11.54	11.54
Operating costs	9.22	9.22	9.22
Transport of crude	—	9.30	9.30
Transport of oil products	13.00	—	—
Total	34.15	38.92	32.18

Source: F. Fesharaki and D. Isaak: OPEC and the Gulf: A Study in Government Policy and Downstream Operations, Boulder (Col.) and London 1983, p. 127.

If oil-exporting countries use associated gas as a production factor in downstream operations, they gain cost advantages over other countries. No opportunity costs for alternative uses need be taken into account. This has a particularly noticeable impact on the petrochemical industry, where gas can also be used as a feedstock in place of naphtha, a light petroleum product. Since the cost of feedstock and energy accounts for around 80 % of production costs, the advantages of using associated gas should at least cancel out other locational disadvantages, such as the lack of an appropriate infrastructure. In the refining field, on the other hand, the advantage of cheap feedstock does not apply, so that only the favourable energy costs enter into the equation (see Table 4).

It can be seen that the production costs of a distillation plant on the Arabian Gulf are significantly lower than those of a comparable new refinery in an OECD country. However, it is an artificial comparison, for no-one would build new refineries today in, say, Central Europe. The OPEC refinery should therefore be compared with an average OECD refinery that has already paid off most of its capital costs. Here the OECD refinery proves cheaper to run. Hence subsidies are often required to make petroleum products from the Middle East competitive in Europe and North America. Saudi Arabia, for example, pays such subsidies by granting particularly cheap loans to partners in joint ventures. Only a few absorber countries such as Saudi Arabia and

Kuwait have the possibility of directly or indirectly subsidising their refineries on a large scale. These are the countries that are pushing ahead with the construction of refineries geared to export markets. There is the danger that over the longer term they will undermine their own crude oil prices through cheap exports of oil products.<sup>4</sup>

### Capital Intensity

Conventional economic approaches based on the profit maximisation motive cannot alone explain the phenomena now apparent in the world oil market. A further reason for these strategies may lie in a development policy oriented towards the long term.<sup>5</sup> The oil producers aim to establish an industrial infrastructure based on an important raw material, along the lines of the growth model of the industrial countries. They want to exploit fully the advantages discussed in connection with the analysis of industrial complexes,<sup>6</sup> though the case in point presents certain special features.

The development of their own industrial base and the formation of physical capital have the advantage that the invested oil revenues are not exposed to external political risks, a fact that appeals particularly to the sparsely populated countries in the Arabian Gulf that have financial capital. The oil-exporting countries initially tried to solve the problem of the high earnings from oil sales by acquiring assets in Western industrial countries, but they have now begun to invest their free resources at home. Most of the investments that oil-exporting countries are still making abroad are in oil refineries or distribution networks, so that they constitute an extension of the strategy of vertical integration. These are activities over which the oil-exporting countries can exercise direct influence via their marketing policy. The strategy of vertical integration therefore enables them to gain more direct control over their investments.

The high capital intensity of industries downstream from oil production is of great importance to some of the oil-exporting countries, particularly the low absorbers, whose high receipts from sales of crude have to be distributed among a small population. The capital-intensive sector is able to absorb a large part of the petrodollars. The demand for labour remains relatively small, so that the recruitment of foreign workers can be restricted. Finally, it is possible to keep this high-technology sector separate from other parts of the economy that still operate along traditional lines. In this way they hope to contain Western influences and thus

<sup>4</sup> This has been investigated by Razavi and Fesharaki by means of an econometric model. Cf. H. Razavi, F. Fesharaki: OPEC's Push into Refining: Dilemma of Interactions between Crude and Product Markets, in: Energy Policy, No. 12, 1984, pp. 125-134.

<sup>5</sup> H. Siebert: Economics of the Resource-Exporting Country, Greenwich (Conn.) 1985.

<sup>6</sup> W. Isard: Methods of Regional Analysis: An Introduction to Regional Science, Cambridge 1960, pp. 375 f.

avoid a culture shock that might destroy the traditional fabric of society and its power structure.

However, this desire to contain the spillover effects does not apply to high absorbers like Mexico, which are reliant on the impact that the development of one sector has on other areas of the economy. These forward and backward linkages stem from the fact that upstream sectors producing factors of production generate demand and that intermediate products are provided that can be used in sectors further down the chain. For example, Nigeria hopes that the expansion of the basic petrochemicals industry will stimulate downstream industries and have beneficial effects on the labour market.<sup>7</sup>

The final explanatory factor has a psychological basis; the desire to "beat the industrialised nations at their own game" should not be underestimated as a motive for vertical integration.

### Consequences for Oil-importing Industrial Countries

In the foreseeable future oil-exporting countries will ship increasing quantities of cheap products to markets suffering from overcapacity and plant closures.<sup>8</sup> Worst affected will be the European and Far Eastern markets, in which the bulk of the products of export refineries in the Arabian Gulf are to be sold. 1985 will be a critical year, for export refineries in Libya and Saudi Arabia with a combined capacity of just over 1 million barrels a day have just come into operation or will do so in the course of the year.

The world petroleum market displays volume and structure imbalances, though there are differences from one region to another. The imbalance in the size of the market is the result of overestimating future demand and expanding capacity accordingly in the seventies. In addition, demand has shifted towards lighter petroleum products. Heavier oil products were displaced by gas and coal after the oil price rises, so that their share of the industrial countries' petroleum consumption has more or less halved over the last decade and their price has fallen below that of crude oil.

Overcapacity in the refining sector has led to numerous plant closures in the last five years. Although capacity has been reduced by a quarter in that time, the plant utilisation rate is only about 70 %. Worst hit have been the "balance refining centres", that is to say countries that import crude and export large quantities

of refined petroleum products; for example, refineries in the Caribbean and Italy are running at only just over 50 % of capacity. Similar figures are predicted for the end of the decade in Singapore, where the utilisation rate up to now has been above the world average.

The oil market in the Federal Republic of Germany faces special problems. As market access is freer than in other regulated Western European markets and processing costs are high owing to the relatively stringent pollution controls, the German oil market acts as a safety valve for other countries' surpluses. In spite of large-scale plant closures, the capacity utilisation rate of West German refineries in 1984 was still below the average for the European Community. Further planned closures will mean that by the end of this year refining capacity will be below the volume of domestic sales for the first time.

Given the low transport costs, the Far East and countries in southern Europe will be most directly affected by exports of petroleum products from the Gulf and North Africa. The situation will be exacerbated by the fact that European and Japanese oil companies are committed to taking petroleum products under the terms of their participation in joint ventures in OPEC countries. Exports of oil products from OPEC countries to Europe and the Far East may increase from 5 to 10 % of domestic sales by the end of this decade. The American market is little affected by the downstream activities of North African OPEC countries and the Gulf states because of the higher transport costs. Latin American oil exporters do not plan any significant expansion in their export refining capacity.

The structural imbalance aggravates the situation in the downstream market. Since the first oil crisis, the industrial countries' demand for heavy petroleum products as a proportion of their total demand has more or less halved. The British miners' strike admittedly led to a temporary reversal of this trend, at least as far as the European market was concerned, but there is still a need to adjust to the changed structure of demand. It should also be borne in mind that OPEC countries will initially market a high proportion of heavy oil products, as their domestic demand for these products is small and they still do not have the necessary cracking plant.

<sup>7</sup> With regard to the following remarks, see F. Fesharaki and D. Isaak: OPEC and the World Refining Crisis, Economist Intelligence Unit Special Report Nr. 168, London 1984; R. Vielvoye: Future Gloom for Refining Industry in Western Europe, in: Oil and Gas Journal, 18th March 1985, pp. 41-46; V. Baum: West Germany: Oil Industry's Continuing Troubles, in: Petroleum Economist, No. 52, 1985, pp. 125 f.; H. K. Schneider, D. Schmitt, H. J. Schürmann: Daten zur Kosten- und Ertragslage der Mineralölindustrie in der Bundesrepublik Deutschland im Jahre 1984, in: Zeitschrift für Energiewirtschaft, Special Issue 1/1985.

<sup>8</sup> Cf. M. Quinlan, op. cit., p. 261.

Nonetheless, upgrading programmes are being carried out to increase the flexibility of the refineries on the Arabian Gulf. In the countries to which these oil products are to be exported – Western Europe and above all Japan – the proportion of conversion capacity is too small. Refinery operators who have been making losses for many years have difficulty raising the necessary investment capital. In the case of vertically integrated companies, refining operations are being subsidised by profits from oil extraction.

Since the oil-exporting countries' downstream activities are coinciding with a fall in demand of unforeseen severity, the European and East Asian oil markets are facing serious adjustment problems. This is particularly true of the balance refining centres, where the very existence of an important industry is in jeopardy. In other countries that were not previously dependent on imports of refined products the question of the security of supply arises if the adjustment process

causes refining capacity to fall below the level of domestic sales.

Similar though less serious problems are looming for the basic petrochemicals industry. A distinction should be made here according to product: oil exporters' exports of nitrogenous fertilisers are aimed primarily at Third World markets, while other chemical products such as ethylene derivatives and methanol are also intended for the European market. The industrial countries will therefore face keener competition in export markets and additional supply at home, though in contrast to the refining sector they do have other options, such as switching to the production of specialist chemicals, as the oil-exporting countries confine themselves to basic chemicals. Here too there is a need for large-scale investment at lower rates of return, but the prospects are far better than for oil refining as companies can bank on rising demand, though the rate of growth is expected to be slower than in the late seventies.

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EUROPEAN COMMUNITY

## Can the EC Mediterranean Policy Be Revitalised?

by Roland Siebeke, Frankfurt\*

**The enlargement of the European Community to include Portugal and Spain has focussed public attention on the EC's relations with certain other states bordering the Mediterranean; Israel, Morocco, Tunisia and Cyprus in particular fear that the competitiveness of their exports to the European market will be prejudiced. In view of this and other threats to the EC's ties to her Southern neighbours the future of the EC's external Mediterranean policy is at stake.**

Discussions have been going on for some time in Brussels on the European Community's "global Mediterranean policy";<sup>1</sup> like the Community's relations with the ACP countries<sup>2</sup> embodied in the Third Lomé Convention, the Mediterranean policy is a component of the Community's preferential trade and development policy. However, in contrast to relations with ACP countries, the Mediterranean policy is based not on one multilateral treaty but on a collection of individual association or co-operation agreements concluded between the EC and almost all states bordering the

Mediterranean except Albania and Libya. Nevertheless, since the EC summit in Paris in October 1972, these agreements have followed a uniform pattern providing broadly for:

□ *globality*, in other words the agreements cover the fields of trade, economic, scientific and technical co-operation and in some cases the social security of migrant workers;

<sup>1</sup> Not to be confused with the "integrated Mediterranean programmes" also currently under discussion, which should benefit the Mediterranean areas *within* the Community.

<sup>2</sup> ACP stands for Africa, the Caribbean and the Pacific.

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