



**The Impact of Oil Prices on Demand, Supplies  
and the Petroleum Industry**

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## **POSITION PAPERS**

The Oxford Institute for Energy Studies from time to time publishes papers on topical oil and energy issues. These papers assess the state of informed opinion on the problem at hand, present alternative views and, whenever relevant, make policy suggestions. Their purpose is to contribute to the debate that surrounds issues of current importance.

This position paper is based on the proceedings of an Institute meeting of industrialists and experts, held in Oxford on 4th February 1986. The meeting addressed the following question: What is the impact of recent changes in the world petroleum market on the structural features of the oil industry? This paper is neither a summary of the debate nor a report on the different views expressed. Its author is entirely responsible for the contents and conclusions which reflect as much his own opinions as those of the participants.

## EXECUTIVE SUMMARY

The double squeeze on OPEC's oil output caused by a fall in the world demand for oil and a rapid growth in non-OPEC supplies is preventing this organization from performing a price stabilization role. The current oil price crisis is the consequence of these developments.

In the absence of output regulation, prices will continue to fall in the medium term towards marginal extraction costs and to fluctuate very erratically around this trend. There are no automatic and reliable price stabilizers in the short run.

Low oil prices (\$15-18) could rapidly induce substitution of fuel oil for coal in power stations. However, political and institutional factors (the protection of coal) may reduce the significance of this impact.

In the longer term low oil prices would stimulate demand through both substitution and income effects. The most optimistic forecast estimates a maximum increase in oil demand by 1990 of 3-4 mb/d (substitution) and 1.0 mb/d (GDP effect). A more pessimistic view about elasticities puts the increase at 2-3 mb/d (substitution) and 1.0 mb/d (income). Thus the increase in demand by 1990, over and above any increase expected to have taken place in that year without a price fall (2.0 mb/d), would range from a minimum of 3.0 mb/d to a maximum of 5.0 mb/d.

The introduction of an import levy in the US and higher excise taxes in other OECD countries is a distinct possibility. If tariffs and taxes are introduced in major importing countries the increase in oil demand by 1990 is unlikely to exceed 2-3 mb/d.

Non-OPEC supplies are generally expected to rise by 1.0 mb/d in 1990 compared with 1985. The price fall has little immediate effect on non-OPEC supplies except in the US. The imposition of a tariff would leave this supply outlook unchanged. Non-OPEC supplies in 1990 may be 1.0 mb/d lower than in 1985 if prices are low and consuming countries do not introduce new taxes and tariffs.

The main conclusions are:

(a) A low oil-price strategy may prove costly for OPEC in the medium term, because the revenue losses incurred through low prices will not be recouped through demand increases and reduction in non-OPEC suppliers until the early 1990s.

(b) A strategy aiming at bringing the price of oil into the \$22-25 range would be the least attractive. It would involve revenue losses and provide no stimulus to demand.

(c) Non-OPEC countries and those OPEC countries following an output maximization policy would lose most from a low price strategy. The revenue loss would not be mitigated by future increases in output.

**THE IMPACT OF LOW OIL PRICES ON DEMAND,  
SUPPLIES AND THE PETROLEUM INDUSTRY**

Robert Mabro

**1. THE ORIGINS AND CAUSES OF THE FALL IN OIL PRICES**

The recent collapse of oil prices on spot and futures markets for crudes and products is the result of important structural and economic developments which began to unfold in the late 1970s, and which have radically transformed the features of the world oil industry. It is useful to describe very briefly these main developments, familiar as they may be to observers of the energy scene.

First, world oil consumption began to decline in 1979 and the downward trend continued to assert itself over a number of years. This phenomenon was not well perceived at its start because everybody's attention was then concentrating on the supply interruptions and the price rises brought about by the Iranian Revolution. The price rises of 1979/80 did not initiate this demand fall but contributed to the continuing decline in subsequent years; they provided renewed inducements for energy conservation and for substitution of coal and gas for oil.

Secondly, there was a considerable expansion of non-OPEC oil supplies beginning in the mid-1970s and continuing unabated to date. This growth was partly due to the re-emergence of Mexico as a major world producer and to the development of the large North Sea oil reserves, and partly to new smaller scale

production in a large number of countries all round the world. Declining world demand for oil and growing non-OPEC supplies were accommodated by a considerable reduction in OPEC's output. The aggregate production of OPEC's member countries fell by about 45 per cent between 1979 and 1985.

Thirdly, the demise of the old oil concession system in the OPEC region, timidly begun in the late 1960s but virtually completed by 1979-80, transformed the structure of the world petroleum market. The large volume of internationally traded oil that used to move through the internal channels of vertically integrated companies is now traded at arm's length in external markets. These markets involve a large number of participants on both the supply side (national agencies of OPEC member countries) and the demand side (major and minor oil companies, independent refiners, oil traders and other trading houses).

The demise of the old concession system in the OPEC region coincided with the emergence of the North Sea, a new oil province explored and developed under a competitive, free-enterprise regime involving a large number of licensees. The North Sea made a significant contribution to the expansion of an open market in international oil. A very big proportion of North Sea oil output is traded at arm's length. This partly reflects the role of fiscal factors, and partly the significant involvement in the North Sea of firms with no downstream interests in North West Europe.

Fourthly, the deregulation of US oil completed by the Reagan Administration in the early 1980s strengthened the links between the vast domestic oil market in the US and the world petroleum

market. Spot and futures trading in WTI became closely influenced by trading in Brent and vice versa. Through the mediation of Brent, an international crude, changes in the conditions of the US oil market are now being transmitted to the markets for African, Mediterranean and Gulf crudes.

In short, the current situation is characterised by a huge imbalance between potential supplies and actual demand for oil and by the externalization of oil trade in dynamic and competitive markets.

Supply/demand imbalances were, of course, important in the past, during the concession era; but they were then absorbed internally by oil companies and their host countries. The concession system and the integrated structure of the industry enabled companies to respond to changes in demand by varying almost automatically the extraction rates from their prolific Middle Eastern fields. In the subsequent period, which we may call the OPEC era, any excess of potential supplies over demand was also absorbed fairly passively by OPEC member countries as was perfectly evident in 1975-78 and in 1981-85. The behaviour of oil companies in the 1950s and 1960s and that of OPEC in later years caused prices to remain fairly stable during the relevant episodes; it also limited the amplitude of price variations in open markets.

Today the situation is radically different. The major oil companies have long ceased to perform a price stabilization role because of a fundamental change in circumstances. OPEC, which took over from the companies in the 1970s, is now finding itself

unable to stabilize the market. Whether this is a temporary situation or not is a moot point. And, if temporary, whether it will take OPEC (or some new association of oil exporters) a few weeks or several years to regain control over the price of oil is also a very complex question.

So long as an imbalance between potential oil supplies and demand at any price persists, and so long as producing countries remain unable to agree on an output regulation mechanism, oil prices will continue to fall in the medium term towards marginal extraction costs and to fluctuate very erratically around this declining trend in both spot and futures markets.

There is no doubt that we are facing today a situation of falling oil prices in weak, volatile and nervous markets. For the purpose of this paper, let us assume that oil companies, governments and all relevant economic agents will soon begin to perceive future energy developments in terms of low and volatile oil prices. We would then like to address a number of fundamental questions about the effects of these expected price movements on the demand for oil, the supply of non-OPEC oil and the structure of the petroleum industry.



## 2. THE FALL IN OIL PRICES AND THE DEMAND FOR OIL

Low oil prices could induce a substitution of fuel oil for coal in power stations equipped with dual burner facilities, or a switch from coal-fuelled power stations to idle oil-fuelled power stations in countries with excess capacity in electricity generation. Today the spot price of coal in Rotterdam is approximately \$50/t. Allowing for calorific differences, transport and handling differentials, the equivalent fuel oil price is \$100/t. This suggests that crude oil could begin to displace coal in power stations and in steam-raising industrial plants when its price falls towards \$15-18/b. Some observers believe that at these prices the room for substitution against coal is significant, even in the short term, and particularly in the OECD region where many power stations have fuel-switching facilities. They believe that these effects tend to be underestimated; and they argue that the substitution of fuel oil for coal would rapidly stabilize crude oil prices at around \$17-18/b without any outside intervention.

If this view turned out to be correct, the system would be self-stabilizing at prices little different from those attained on spot markets for crude oil in late January/early February 1986. It should be noted, however, that the speed of adjustment,

and thus the time required for self-stabilization to take place, depend more on price expectations than on the level of prices actually attained at any given time. The short-term adjustment relates to long-term perceptions of price movements. If the current oil price crisis is perceived as a temporary anomaly, no attempt will be made to substitute coal or gas for oil, irrespective of the short-term advantages of such a process.

Can we really expect a large substitution effect from low oil prices in the short run? To answer this question it is necessary to review briefly the situation in OECD countries. In France, the EDF will switch to oil as soon as prices tilt the balance in favour of this fuel. There will be no political or institutional inhibition against such a move. Within a few months coal could be displaced giving rise to a new demand for 4 mt of oil. In Italy very little coal is used for electricity generation, and the coal/fuel oil substitution issue does not really arise. In Germany, the coal industry is a political "sacred cow". Some substitution against coal may take place but a significant shift is likely to be resisted by policy intervention. In the UK the scope for fuel oil substitution is significant but the Central Electricity Generating Board (CEGB) may be constrained by contractual arrangements with the National Coal Board (NCB). The financial and political impact on the NCB of a switch against coal could inhibit the adjustment. In the US it is thought that crude oil prices would have to fall below \$15/b to make fuel oil competitive with coal.

The picture is therefore patchy and uncertain because fuel oil substitution may be retarded by political and institutional

restraints in some of these countries. Furthermore, some experts point out that South African coal is extremely cheap and could compete with fuel oil at lower prices than those mentioned in this paper. Some also remark that the prices of substitutes - namely coal and gas - will themselves fall in response to a decline in oil prices.

The short-term impact of lower petroleum prices on the demand for oil may also come from an increase in motoring stimulated by lower oil prices and from some increase in petrochemical production in response to expectations of brighter economic growth. The growth in gasoline consumption is likely to occur this year for a variety of non-price reasons (for example, a change in holiday patterns in the US this summer). This would simply continue a trend begun last year: oil prices need not fall to produce this short-term and rather incidental effect. Finally, growth in petrochemical production, though probable, is unlikely to be very significant in the short term. In short, we may witness a small overall stimulus to the demand for oil in the short term (a year or eighteen months) but we should not expect too much.

It is evident that lower oil prices are more likely to stimulate demand in the longer term, that is after 3 or 4 years, than in the immediate future. The interesting questions are how, and how much? To approach these issues we need to assume that oil prices fall to a certain level (say \$15-18/b) and remain fairly stable for a substantial period of time. We shall also assume at this stage of the argument that the benefits to the

final consumer of lower prices are not cancelled by tariffs or excise taxes. These assumptions are required for the clarity of the analysis; they do not reflect our views about likely developments.

A 40 per cent reduction in oil prices from 1985 levels (allowing both for a fall in nominal dollars and for a drop in the exchange value of the dollar vis-a-vis the yen and European currencies) could increase the demand for oil by 1990 by as much as 3-4 mb/d through the substitution effect and by another 1.0 mb/d through the price impact on world GDP growth according to optimistic experts. If we assume that the price elasticity of demand is half as large on the way down as on the way up, then the substitution effect on oil demand will not be higher than 2-3 mb/d.

To these increases we must add the 2 mb/d rise in the demand for oil which was expected to obtain by 1990 had oil prices remained pegged at 27-28/b. In short, lower oil prices could add at most 5 mb/d and at least 3 mb/d to the level of expected demand for oil in 1990. There is a significant difference between the end-values of this range, but such are the state of the art and the effects of uncertainty.

The question of import levies and excise taxes, which was set aside for a moment, must now be addressed. In the US there is much talk about tariffs and taxes. There are lobbies in favour of an import levy and lobbies committed to free trade in energy which are staunchly against any intervention. The introduction of a tariff on oil now appears more likely than one would have thought in 1985 for the simple reason that the budget

deficit issue is becoming more pressing and the government is strongly tempted to find an easy source of revenue. Despite a strong US policy commitment to free energy trade, revenue considerations may prove over-riding. This is not to say that the introduction of an import levy (or some other tax) is a foregone conclusion; there is still a large but continually shrinking margin of uncertainty on this issue.

The EEC will find it difficult to agree on a common external tariff for oil (or energy) imports. Such a measure would require the agreement of all member countries and their interests on this issue are sufficiently diverse to preclude an unanimous decision. However, governments can impose excise taxes on petroleum products (or vary their rates) independently of one another. This is the course European governments are likely to follow and their stated objectives will include the familiar lines on the long-term need to conserve "scarce" energy resources and to reduce dependence on oil imports. Of course, the revenue motive will also be attractive, and the need to protect coal in Germany or other energy elsewhere will play a role.

Japan is unlikely to change its fiscal or tariff regime in response to lower oil prices. It would gain a competitive advantage over Europe and the US if these countries pushed oil prices up domestically through taxation and Japan did not.

To sum up, lower oil prices will elicit a small demand response in the short term, and will contribute more significantly to demand growth in the medium and long term, if economic forces are allowed to operate without political or

fiscal intervention. As it is natural to expect some government intervention, at least in a few OECD countries, we can conclude that the long-term demand effects will be dampened. With tariffs and taxes, the drop in oil prices may not add more than 2-3 mb/d to the level of expected oil demand in 1990.

### 3. LOWER OIL PRICES AND NON-OPEC SUPPLIES

Lower oil prices will shut down stripper wells in the US but have little immediate effect elsewhere. In fact some companies may respond to lower prices by increasing their production from equity sources in order to improve cash flows. (Some observers believe that the opposite could happen with companies holding up production and waiting for prices to rise again.) Costs of production from existing oilfields are low in most parts of the world outside the US, even in the North Sea where they are below \$5/b for 90 per cent of UK and Norwegian output.

There is no doubt that some small firms will face the prospect of bankruptcy because of cash-flow problems arising from their indebtedness to banks and their huge tax bills. But bankruptcy need not affect production: in most cases it will only lead to a change in the ownership of assets.

At \$15/b, 70-100,000 b/d of oil production may be closed in US stripper wells; at \$10/b, 700-800,000 b/d could be lost on the assumption that there is no tariff. The loss of production could be fairly rapid within a 3-4 month time period. Yet such a volume of shut-in production might itself induce the US government to impose a tariff to protect the domestic petroleum industry. And a tariff that prevented oil prices in the US from

falling below \$17 or 18/b would cancel all these particular supply effects.

Lower oil prices may reduce the production of oil that depends on expensive secondary or tertiary recovery. This effect is difficult to calculate, but it is not always mentioned and tends to be underestimated when it is.

It is certain that lower oil prices will affect exploration and the development of new oilfields, thus reducing potential output after 1990 in most of the world, and perhaps before 1990 in the US. In the US the oil reserve base is small in relation to output, and production responds very rapidly to a decline in the rate of exploration and development.

The adverse impact on oil investment will be due to the following factors. (a) Lower oil prices will reduce the inventory valuation in balance sheets, thus reducing the equity base of companies and (other things being equal) their access to credit. Companies will have little option but to curtail investment budgets - even those already approved for 1986 or 1987 which were inevitably based on old assumptions about oil prices. (b) Large companies will be tempted to use some of their cash resources to purchase cheap assets relinquished by less fortunate competitors. They will increase their oil reserves by acquiring existing resources, and the likely trade-off is a reduction of investment expenditure for the discovery of new reserves. (c) Investors may feel that the costs of new investment in areas such as the North Sea or the Arctic cannot be justified at current prices and that they should delay or even scrap any plans for the development of high-cost oil.



The importance of these considerations should not be underestimated, but it is wrong to believe that they are the only determinants of the investment decision. Companies may take the view that the long-term prospects for oil demand require them to develop such additional sources of supply, or that prices will rise in the 1990s and yield a good rate of return on high-cost investment undertaken in earlier years. If these views are sufficiently widespread, and if they are shared by bankers, finance will be found and investment will continue. It is instructive to note in this context that companies have recently been paying very large sums for difficult acreage in the North Sea, an indication perhaps of buoyant expectations for the 1990s.

The growth of non-OPEC supplies has been systematically underestimated by forecasters in the past ten years. Most predictions, made under old assumptions about oil prices, put the increase in non-OPEC supplies at 1.0 mb/d by 1990. Some observers, allowing for the underestimation bias, think that this increase could be as high as 3.0-3.5 mb/d; but this is a minority view which is significantly at odds with the bulk of informed opinion. Lower oil prices need not affect the growth of non-OPEC supplies until the end of this decade, particularly if the US introduces an import levy, which would inevitably protect stripper wells and advanced recovery. After 1990 potential supplies in the non-OPEC region will almost inevitably decline because of a fall in investment in the preceding period, but the size of the reduction may be overstated by the current conventional wisdom. Expectations of a rosier 1990s may sustain some investment activity.

Our quantitative forecast is that non-OPEC supplies will increase by 1 mb/d irrespective of what happens to the oil price. Should the US decide against the introduction of a tariff, non-OPEC supplies in 1990 might remain at their 1985 level or decline by up to 1.0 mb/d.

#### 4. THE SUPPLY AND DEMAND BALANCE

These various estimates of the impact of lower oil prices on demand and supply can be now brought together. Assume that WOCA demand for oil would have increased by 2 mb/d between 1985 and 1990 under previous price assumptions; that non-OPEC supplies would have increased by 1.0 mb/d; and that OPEC production in 1985 averaged 16.0 mb/d. This implies that OPEC production would have increased to 17 mb/d in 1990 compared with 16 mb/d in 1985.

Lower oil prices and unchanged fiscal regimes in the OECD countries would increase WOCA demand for oil in 1990 by an additional 3-5 mb/d and reduce non-OPEC supplies by up to 1.0 mb/d. This implies that OPEC production would rise in 1990 to 21-24 mb/d, compared with 16 mb/d in 1985.

Lower oil prices counteracted by tariffs and higher taxes in OECD countries (other than Japan) would increase WOCA demand for oil by a maximum of 2 mb/d above this base line and leave the initial forecast of non-OPEC supply increases unchanged (at 1.0 mb/d). In such a case total OPEC production would reach 19 mb/d in 1990, compared with 16 mb/d in 1985.

These results suggest that the benefits of lower oil prices to OPEC countries are subject to much uncertainty. It should be immediately stressed that non-OPEC exporting countries, being

output maximizers, suffer a straight revenue loss from any drop in oil prices. There is no mitigation from increased production. The situation is different for OPEC countries as they would eventually see their output rising in response to lower oil prices (here assumed to be in the range of \$15-18/b). Table 1 shows that in the most favourable case output will be 4-7 mb/d higher in 1990 than would be expected in the absence of a price fall. If industrial countries resort to protection, demand for OPEC oil in 1990 will be 2-3 mb/d higher than otherwise expected.

Assume that OPEC exported 12 mb/d of oil in 1985 and would have exported 12.5 mb/d in 1990 in the absence of price changes. The more favourable case involves a maximum increase in exports of some 56 per cent and a minimum of 32 per cent above expected levels in 1990. The increases would be smaller, though rising, in the intervening years. To achieve this result prices would have been slashed by 33-45 per cent. It is easy to infer that the break-even point would probably not be reached before 1989, and that OPEC would not be able to recoup the revenue loss incurred from lower oil prices until 1991 or 1992 at the earliest. Things would naturally be significantly worse if the demand for OPEC oil increased by the smaller amounts predicted by our less favourable case (price fall and tariffs or taxes).

The conclusions of this analysis are that a low oil price strategy is likely to prove costly for OPEC in the medium term, and that such a strategy is totally irrational for non-OPEC exporting countries, particularly for those belonging to the third world. It also follows that a strategy aiming at bringing the price of oil into the \$22-25 range would be the least

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Table 1 : Demand for OPEC Oil Under Different Assumptions

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Demand for OPEC oil 1985 16.0 mb/d

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Demand for OPEC oil in 1990  
(old price assumption):

1985 demand	16.0
increase due to GDP growth	2.0
displacement from non-OPEC supplies	- 1.0
	17.0 mb/d

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Demand for OPEC oil 1990  
(price fall and no tariffs)

1985 demand	16.0
increase due to GDP growth	2.0
substitution effect	2.0-4.0
additional GDP effect	1.0
displacement of non-OPEC supplies	0.0-1.0
	21.0-24.0 mb/d

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Demand for OPEC oil 1990  
(price fall and tariffs)

1985 demand	16.0
increase due to GDP growth	2.0
substitution effect and additional GDP effect	2.0-3.0
displacement from non-OPEC supplies	-1.0
	19.0-20.0 mb/d

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attractive: these prices involve revenue losses in the medium term and hardly any beneficial impact for OPEC in terms of higher demand and lower non-OPEC supplies. The gamble on low oil prices cannot benefit OPEC countries until the 1990s and the risk is that the time needed to recoup the initial losses may turn out to be too long. Contrary to common belief, all OPEC countries with excess capacity today would be able to increase their output in the 1990s above the low levels attained in 1985. All have sufficient reserves to keep them in the market in the next decade. The differences of views within OPEC on the appropriate price strategy has more to do with immediate revenue needs (time-preference) than with the size of the country's oil reserves.

## 5. LOWER OIL PRICES AND THE OIL INDUSTRY

We have assumed so far that oil prices will settle during the next five years within a definite range. This assumption was necessary for the analysis of the possible impact of lower prices on demand and supply.

Actual price movements will be more complex than assumed. So long as potential supplies exceed the demand for oil, price stability depends uniquely on producers' regulation. Otherwise prices will fluctuate: they will first tend to fall to very low levels, then bounce back, and then start declining again. On top of these cycles we may expect to see considerable day-to-day price volatility in both spot and futures markets. There are no automatic stabilizers for oil prices in the short term, no more than there are for copper, peanuts or foreign currencies. As the marginal extraction costs of oil are very low and as substitutes are not immediately available for the whole set of oil uses, petroleum prices could fluctuate over a very wide range. Of course, there is always a long-term equilibrium price, but its influence is slight and remote: long-term forces do not provide much short-term stability to oil prices.

The introduction of tariffs or other trade protection measures will segment the world petroleum market, restricting the

area where oil flows freely; and this segmentation will probably contribute to greater price fluctuations. The petroleum industry will have to live in a world where oil behaves like an ordinary primary commodity. Oilmen believe that they can learn to adjust and may will probably survive it all. Markets will continue to expand and diversify their functions; some like Nymex may have to adapt to the changed features of a protectionist world.

Low oil prices will ultimately increase demand and the industry will no doubt welcome this growth in the aggregate size of its market.

Low oil prices may inhibit investment as mentioned earlier, but the extent of this effect is difficult to ascertain. They will also lead to greater industrial concentration; some small firms may disappear and some mergers may take place.

The industry will be forced to become more efficient. There is much gold plating in upstream investment and, therefore, there are opportunities for cost reductions and improved technology. The incentive to ensure that the downstream operates as an effective profit centre, which is already there, will be enhanced.

The economics of conversion refining may be adversely affected by an increase in the demand for fuel oil resulting from the displacement of coal. New adjustments of the refinery stock will therefore be required.

The oil industry tends to put on a brave face when the energy world is subjected to shocks. This was noticeable in 1973 and in 1979-80 and there are no reasons to think that attitudes will be different in 1986. Companies with large cash balances



and favourable gearing ratios believe that their relative competitive advantage over others will improve. Cold comfort indeed: these relative gains must be set against an absolute fall in profits and a reduction in the valuation of companies on the asset side of the balance sheet.

## 6. CONCLUSION

The price shocks of 1973 and 1979 transferred income from oil-importing to oil-exporting countries. A price collapse in 1986 will operate just the same income transfer in reverse. The issue is essentially about the international distribution of income. There are no rights and no wrongs: all depends on which side one happens to be. The economic interests of a net oil exporter are at odds with those of a net oil importer and no amount of sophistry will change this basic fact. Non-OPEC exporting countries lose revenues when prices fall; OPEC members lose revenues for some years but may reap advantages some time in the 1990s. If they have a choice, non-OPEC exporters should try to arrest the price decline. OPEC countries have cause to stop and wonder whether rewards in the 1990s are worth the heavy income transfer of the 1980s.

The avid reader will want to know what will happen in the days to come. Will OPEC move first? Will non-OPEC countries lend their support to some OPEC plan? We shall simply state a general principle: as in all distributional issues, market power is all that matters in the end. To guess the outcome of future OPEC and non-OPEC deliberations on price stabilization it is important to know how much power oil exporters still wield. But this is a matter of judgement on which reasonable persons may reasonably be expected to differ.

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