The Determinants of Oil Prices

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Three factors work together to determine the price of oil: in the short term, the balance between supply and demand; in the medium term, the structure of the oil industry; and in the long term, the marginal production cost consistent with world oil demand. Using this analytical framework, one can forecast that, in the year 2000, oil prices will not be significantly different from those of today.

Trois mécanismes contribuent à déterminer le niveau des prix du pétrole: dans le court terme, le degré d'équilibre existant entre offre et demande; dans le moyen terme, l'état des structures de l'industrie pétrolière; et dans le long terme, le niveau du coût de production du pétrole nécessaire à couvrir la demande mondiale. Lorsque l'on utilise ce cadre analytique, on peut prévoir qu'en 2000, les prix du pétrole ne seront pas significativement différents de ceux qui prévalent aujourd'hui.

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In recent years, swings in oil prices have been of unprecedented severity and frequency. In earlier times they were "producer prices," set unilaterally by a group of major players on the petroleum scene. This role fell first to the large British and American oil companies, which set posted prices between 1928 and 1973, and then to OPEC, which imposed official prices from 1973 to 1987. Today oil prices, like the prices of virtually all other bulk commodities, are determined by the marketplace. The sharp swings in these prices have left many observers perplexed as to the underlying mechanisms involved.

In fact, the explanation for this increased variance is not so much that the determinants of oil prices have changed, but that the conditions which feed into these mechanisms are now different. Indeed, the three basic processes that collectively determine prices continue to be a central part of the functioning of the oil industry: in the short term, prices are determined by the equilibrium between current demand and supply; in the medium term, the structure of the industry determines how closely prices conform to the competitive price; and, over the long run, prices tend to approximate oil production costs.

The conditions under which the price-setting mechanisms operate are determined by oil marketing practices. Because an international mar-

ket for crude oil did not exist until 1973,[1] after which there was a single official market controlled by OPEC, the attention of observers has tended to focus on the structure of the international petroleum industry, while the roles of the other two mechanisms were generally ignored. However, the introduction of a free market for crude in 1987, with its price now serving as a benchmark for virtually all international transactions, has made the other two determinants of oil prices more apparent. This is especially true because they have resulted in price fluctuations which are unprecedented in the oil industry, although such price swings are the norm in most other commodity markets.

The first section of this paper will describe the three mechanisms that collectively determine oil prices. Each of these determinants operates within the bounds of a particular time frame: the short term for supply and demand equilibrium, the medium term for industry structure, and the long term for production costs.[2] Using this analytical framework, the second section maps the probable future course of oil prices, proceeding from the assumption that prices are determined by the interaction of the three mechanisms described earlier.

1. Three Factors in Oil Price Determination and their Time Horizons

In the short term, the interaction of supply and demand produces oil price fluctuations of severity and frequency largely determined by current marketing arrangements for crude oil. In the medium term, the structure of the industry may allow a dominant group of players to implement a strategy aimed at insulating the market from competitive forces, leading to a rise in oil prices. Finally, in the long term, the price of oil will tend to reflect the real cost of producing enough oil to satisfy demand.

1.1 Short-Term Equilibrium Between Supply and Demand

The short term may be defined as a period short

enough to preclude any significant change in either supply or demand capacities. During this period the demand for oil is inelastic with respect to price; a change in price will produce a less than proportional change in demand. There are several reasons why this is so.

First, on average the price of crude oil accounts for no more than 40% of the total price of all refined products delivered to the final consumer (in 1990, for the OECD countries taken together, total value added amounted to approximately $45, of which $18 is the price of crude).[3] Some of the other components of the final price are fixed costs (transportation, refining and distribution costs, and certain taxes), which to some extent dampen price fluctuations for the final consumer and so increase the price inelasticity of oil demand.

The inelasticity of demand is also explained by the fact that non-durable final consumption accounts for a large proportion of the demand for oil.[4] The consumer generally pays little attention to the price of non-durables, or may make decisions in this domain in a manner that is not strictly rational. Motor vehicle fuel, for instance (which accounts for one-half of all petroleum products consumed by the OECD countries), is perceived as relatively cheap compared with the cost of the vehicle. Hence, owners tend not to modify the way they use their vehicles no matter what the price of its fuel.

The patterns of fuel consumption for industrial and home heating purposes are determined by existing equipment rather than price. Only

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1/ Apart from some marginal settlement trading among the major oil companies, each company refined the crude it produced.

2/ Defining the duration of these time frames in real time is quite problematic. However, because the distinction in the present context is analytical at a general level, their exact length is not critical. On the subject of the role of time in the determination of commodity prices and oil prices in particular, see Calabre (1991), immediately following in this issue of ESR.

3/ Prices in this article are in US dollars.

4/ See, for example, Bidault (1988).

when the time comes to make investment decisions is it possible to switch from one form of energy to another in accordance with relative prices, or to endeavour to improve energy efficiency in light of the capital investment required and the expected cost savings. However, investment decisions of this kind, in which demand changes in response to prices, are medium- rather than short-term phenomena.

In industry, few plants are equipped with machinery that can be readily converted from one substitutable energy source to another. The capital investment required to convert quickly and easily to the currently least expensive fuel is very high, and such a strategy only makes sense for extremely energy-intensive activities. Consequently, demand remains relatively stable, even when oil prices change.

Indeed, demand is influenced by factors other than price, such as climate and the current level of economic activity. Another important variable that mediates between price and demand is the size of inventories. Large inventories make the demand for oil more upwardly rigid; conversely, low inventories reduce that rigidity.[5] The most important point, however, is that the demand for oil is generally inelastic relative to price.

The supply of oil is also price-inelastic. The structure of producer prices is one of the main reasons — variable costs represent only a small fraction of total production costs, the bulk of which is composed of fixed capital depreciation. Consequently, supplying oil is profitable as long as its variable costs are covered by the market price, even when the producing company is running an accounting deficit (it will write off depreciation costs in its profit-and-loss statement, charges that are not covered by market prices in an accounting deficit situation). For example, it would probably be economic to exploit 99% of North Sea oil even if market prices for crude fell as low as $10/b (Mimouni, 1987).

Oil supply is inelastic also because the volume available depends largely on the decisions of the oil producing countries. Countries do not manage their resources the way a firm does; that is, with an eye to how production will affect the

return on capital investment. Governments treat the oil industry primarily as a source of tax revenue, and cutting spending is something they find extremely difficult to do. Consequently, the main effect of a decline in the price of crude is to incite producing countries to increase their short-run production in order to keep revenues constant.

In most oil exporting countries, the very oil rents that have brought them wealth have caused their industrial and agricultural bases to decline (Angelier, 1988). As a result, their economies have become heavily dependent on oil revenues. These funds, once earmarked for capital investment or luxury spending, are increasingly needed to pay for essential imports, to meet debt service obligations, and to maintain the system of patronage that often underpins the political power of the governments concerned. The result is to further reinforce the price inelasticity of oil supply.

Because both oil demand and supply are price-inelastic, price is an ineffectual market adjustment tool; a large price shift is required to elicit any change in supply and demand. Yet the marketing of oil requires price-based adjustment processes. Although supply and demand have long been inelastic (P.H. Frankel (1948) pointed this out more than 40 years ago), short-term fluctuations in oil prices did not appear until 1987. It is no coincidence that new crude oil marketing arrangements were instituted in that year.

In the early 1970s, a number of industry observers voiced concern about rising tension as a result of the gradual decline in oil supply capacity relative to demand.[6] However, prices remained stable because at the time there was no international oil market as such, meaning that prices were not free to fluctuate in response to underlying market tensions. The 1973 oil shock was essentially a price adjustment between sup-

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5/ See, for example the econometric studies presented in Bacon et al (1990).

6/ See, for example, the Commissariat Général du Plan (1971).

ply and demand made possible by the implementation of new crude oil marketing arrangements: long-term contracts between producing states and buyers. The second oil price shock also coincided with the appearance of a new crude oil marketing mechanism — the spot market. While the spot market had existed for some time, it played only a very limited role internationally until 1979. By that year, it accounted for 10% of international oil trading by volume, and the stage was set for a price upsurge on this market in response to the alarmist reactions of traders to the prospect of severe shortages due to the Iranian revolution and the Iran-Iraq war. Consequently, spot oil prices began to fluctuate in 1979, although the phenomenon was obscured by the fact that the bulk of international oil flows was still governed by official contracts with exporting states.

After 1987, the increasingly widespread use of formula contracts led to wider price swings (Angelier, 1990). These contracts, based on stable quantities over the long term, proved attractive to many buyers and sellers, who began to turn away from the spot market. At its peak in 1985, this market accounted for as much as 50% of international trading volumes, although today it represents only about 20%. And since volume adjustments occur in this relatively narrow market, price fluctuations can be quite substantial. For example, a one-time 1% supply deficit on the world market will be reflected on the spot market, which represents 5% of the volume; since demand and supply are both price-inelastic, the deficit can only be reabsorbed by a price increase greater than 5%. Because formula contracts are based on prices tied to the benchmark price in the spot market, oil prices as a whole fluctuate according to instantaneous adjustments on the narrow spot market.

At the same time as the spot market was developing, oil futures markets appeared. These were strictly financial markets. Some observers have argued that the tremendous popularity of futures markets in international oil dealings has tended to amplify the price swings observed since 1987. However, this hypothesis has yet to be convincingly demonstrated.[7]

In the short run, therefore, the price inelasticity of oil demand and supply, and particularly the new marketing arrangements implemented since 1987, explain why oil prices fluctuate so sharply in the short term in response to supply and demand imbalances.

1.2 Medium-Term Equilibrium and the Structure of the Oil Industry

The medium term is a time period during which significant adjustments in production and consumption capacity are possible. The structure of the oil industry may remain stable in the medium term, particularly if a group of dominant players emerges that is capable of insulating itself from or muting the industry's characteristic competitive forces (as, for example, the "Majors" were able to do between 1928 and 1950). But first let us define what is meant by the structure of an industry.

In the theory of industrial organization, the concept of structure is used to describe the nature and intensity of the competitive forces within a given industry. In this analytical framework, the structure of an industry is largely determined by the basic conditions in which the industry operates — the nature of the supply and demand relations for the product involved and the institutional, legal and socio-political environment. Firms select their strategies according to the current structural situation; these strategies in turn affect the industry's performance, particularly the prices and product volumes delivered to the marketplace. These are the basic tenets of industrial economics.[8] The analysis of industrial structure gradually evolved from these premises, passing through three main historical stages in the process (Angelier, 1991).

Originally, market theory proposed that the structure of an industry could be understood in terms of the number of firms in it. An industry

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7/ On the subject of futures markets and their effects on prices, see Badillo and Daloz (1985).

8/ Among the major textbooks on industrial organization are Tirole, (1988), Waterson (1984), and Scherer (1980).

with a large number of suppliers is typically highly competitive, with little likelihood that one or more suppliers could exercise market power. With fewer firms, the situation more closely resembles an oligopoly or monopoly. High concentration in the industry means that a handful of firms are able to exercise some degree of market power, by reducing supply and increasing prices relative to what they would be in a competitive environment. This theory has gained wide acceptance, and it can be applied to explain the two oil shocks as the result of the concentration of supply in the hands of OPEC and the internal cohesion of this small group of suppliers.

During the 1980s there were a number of important developments in the analysis of industrial structure. First, the advocates of the theory of contestable markets (Baumol, 1982; Baumol, Panzar and Willig, 1982) argued that competition is actually common in markets with only a few firms, and that it is rather the presence or absence of *potential* competitors that determines whether or not market power can be exercised and prices can be set above the competitive price. In an industry with no barriers to entry and exit, competition is the rule, regardless of the number of firms. This approach provides an explanation for OPEC's loss of market power following the first oil price shock: rising oil prices made many sites in the North Sea, North America, Latin America, Africa and South-East Asia profitable, and these were developed either by the major multinational oil companies, or locally by new public or private oil companies. Thus, in a period of rising prices, the barriers to entry into the oil industry are apparently quite low. This forced OPEC, which sought to maintain high prices, to reduce its supply volumes to such an extent that it could no longer dominate the oil market, and so it lost its former power.

Another advance in the theory of industrial structure was made by Michael Porter (1980 and 1985), who analyzed structure on the basis not of the number of actors, but rather of the linkages among the actors, and between the latter and their environment. Porter distinguished five competitive forces: competition among estab-

lished firms, the threat of new competitors, competition from substitutes, suppliers' negotiating power, and buyers' negotiating power. When competitive pressures are strong, existing firms cannot exercise market power, no matter how few their number.

Applying this theoretical framework to the oil industry yields a better explanation of events than market theory more narrowly conceived. OPEC constitutes an oligopoly in the sense that it is composed of a small group of suppliers who control a significant share of production (in 1973, OPEC supplied two-thirds of the oil on international markets). Assuming strong cohesion within this small group of suppliers (which was the case until 1979), it is clear that competition among established firms is weak. However, the other four competitive forces are strong.

1) *The Threat of New Competitors*: After prices began to rise in 1973, several non-OPEC nations began producing oil for the first time, and others increased their levels of production. Barriers to entry in the oil industry turned out to be weak, and hence there was a very real threat from new competitors, at least in a period of high prices.

2) *Competition from Petroleum Substitutes*: Thanks to low prices in the 1950s and 1960s, oil displaced coal as the dominant source of energy in the non-Communist world and hindered the development of natural gas consumption. Higher oil prices after 1973, however, enhanced the competitive advantages of coal, natural gas and, to a lesser extent, primary electricity (hydroelectric and nuclear), which were thus able to make inroads at the expense of oil. In 1973, oil represented 56% of primary energy consumption in the non-Communist world; by 1990, it accounted for only 44%. Oil substitutes are a serious source of competition.

3) *The Negotiating Power of Suppliers*: In the 1970s, it was generally assumed that most exporting countries had fully mastered oil exploration and development technology. Over the years this has proven not to be the case. Today virtually all OPEC countries have renewed their ties with western oil companies in exploration and development activities in order to draw on both their technological expertise and their financial re-

sources. A new kind of relationship is being forged between the oil exporting countries and the multinational oil companies. Service contracts, which originally replaced the concession system, have been supplanted in turn by cooperation agreements and partnerships. These new arrangements indicate that the oil exporting countries are in a weaker position than before.[9] It would appear, therefore, that the negotiating power of suppliers is a force to be reckoned with. 4) *The Negotiating Power of Customers*: Oil consumers reacted to the price increases of 1973 and 1979 by shifting their demand to non-OPEC crude and alternative energy sources, and by conserving energy. Indeed, despite the heavy dependence on imported oil in most of these countries — a legacy of the 1960s — an effective energy policy instrument lay close at hand in the form of petroleum taxes. Taxes account for some 40% of the price paid by the final consumer. By working with this taxation capacity, oil importing countries were able to shift their energy demand and thus reduce their dependence on oil. An interesting characteristic of the demand for oil is that between the end consumer and the producer there is a crucial middleman — the consuming country's government. From this perspective, then, customers' negotiating power is another major source of competition.

To sum up, then, only one of the five competitive forces characteristic of the oil industry can be considered weak. That weakness helped create the conditions that allowed OPEC to make unilateral decisions in 1973 and 1979. The four other forces have remained strong, and helped to frustrate OPEC's efforts to regain its market power between 1982 and 1986 through a coordinated round of quota-based production cuts.

Game theory can also shed some light on the analysis of industry structure (see Tirole, 1985; and Sherman, 1974). It indicates that even collusion among OPEC members would fail to stifle competition in the international oil market permanently. If we consider the industry as a game in which the players are the exporting countries, the OPEC countries as a whole will gain or lose in a particular situation depending on the strategies they adopt; in other words, it is a non-zero

sum game. In this situation, the best *collective* strategy is cooperation in the form of coordinated supply cuts; implementing this strategy will produce an increase in the coalition's overall revenues, because the price elasticity of demand will ensure that the price increases are proportionally larger than the decline in demand. At the same time, the best strategy for each player *individually* is to agree to the coordinated reduction in supply and then ignore the quotas. The cheater reaps the benefits of cooperation (higher unit prices) and the benefits of cheating (no drop in supply). And this is exactly what happened historically: OPEC instituted production quotas in 1982 in order to prop up prices, and these quotas were not respected.

In the international oil industry game, therefore, there is no solution that is optimal for both each individual player and the players as a whole. A strategic agreement based on cooperation will thus be unstable and difficult to sustain, especially when there is no consensus in the oil industry on the most important variable — price. OPEC countries with smaller reserves would like to keep prices high, and those with reserves that have a much longer life cycle would prefer a more moderate price. The logical conclusion is that OPEC's anti-competitive practices are not sustainable.

Hence, collusion among OPEC members was not the main reason for the sharp surge in oil prices between 1973 and 1981. Instead, it was a combination of two factors: first, the fact that the groundwork for this price increase was laid by market pressures fuelled by expectations that supply would fail to keep pace with demand (in other words, a sellers' market in which suppliers are able to raise prices); and, second, the fact that a higher market price was necessary to stimulate exploration and development, which was not feasible under the former lower price.

9/ See Bourgeois and Rodriguez-Padilla (1991), below in this issue of *ESR*, and Hallwood (1990).

1.3 Long-Term Equilibrium and the Production Cost of Crude Oil

Over the long term, changes may occur in production technologies, petroleum consumption patterns, and production zones.

In the long run, the cost of production is a critical variable because the market price cannot deviate from it by very much for very long. When the market price falls below the cost of production, the industry does not earn a profit, as it must in order to invest in new equipment and engage in exploration activities. Producers with the highest costs will drop out of the industry, reducing supply and putting upward pressure on prices. When, on the other hand, the market price is higher than the cost of production for any appreciable length of time, new capital will flow into the industry, increasing supply and exerting downward pressure on prices. In the long run, therefore, the market price gravitates around the cost of production at the highest-cost production sites, the output of which remains necessary to satisfy demand.

It is estimated that, at the present time, a market price of $20/b would suffice to ensure the profitability of all oil production necessary to satisfy world demand (Angelier, 1989). However, today's reality does not follow the pattern envisioned by David Ricardo[10] for agriculture, according to which the higher-cost sites are gradually put into operation as demand increases or, in the case of oil, as the better deposits are exhausted. On the contrary, the sites in the Middle East with the lowest costs of production ($2/b) have the lowest production capacity utilization rates and the largest untapped reserves (these amount to more than a century of production). In the United States and Canada, reserves located in areas where technical costs stand at $8 to $10/b are the most extensively exploited; they account for only 10 years of production. For the world as a whole, meanwhile, reserves equal 43 years of production (1990 figures).

In fact, oil companies base their supply decisions not on the resource cost of production, but on the total price inclusive of taxes and on the freedom they have to dispose of the extracted crude. Cost is lower and freedom greater in the North Sea region and North America than in the Middle East. This explains why the geographic pattern of oil production does not reflect development costs. Moreover, many oil producing countries do not base their production decisions on the prevailing situation in the international oil industry, but rather on their particular economic, social and strategic concerns. From the purely technical and physical standpoint, in-ground stocks were managed in a more rational manner when the Majors' cartel was in effect than today. But this period was no golden age, since Third World countries were denied a fair share of the profits derived from the oil they rightfully owned.

The result of this situation is significant oil price instability. The oil with the highest production cost becomes socially necessary for the world economy when the producing countries with large low-cost reserves start to limit their own production. If the low-cost producers increase production, the production of the high-cost producers becomes superfluous, and market prices tumble. That is exactly what happened in 1986, when Saudi Arabia decided to ignore production quotas (Angelier, 1987). While the market price of oil is affected over the long run by the cost of production, the latter is not merely a technical and economic consideration, but a strategic variable, because of the attitudes of certain players towards the management of their reserves.

Apart from the geological, economic and strategic factors, there is another consideration affecting the long-run production cost of oil: the level of technology. In the early 1970s, industry observers believed that the production cost of oil would rise (Chevalier, 1973), and that this would translate into price increases. Over the past 15 years, however, substantial progress has been made in exploration (more advanced seismic and computer technology), drilling (greater speed and depth, stronger drilling bits, possibility of drilling on an angle and horizontally), and

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10/ Ricardo is the 19th century English economist who developed the theory of natural resource rent.

production (in-ground oil recovery rates have increased from around 20% to 25%). The extent of these developments is well illustrated by an example. In 1983, when Elf decided to develop the Alwyn North Sea oil field, they estimated that a market price of $25/b would be required for the project to remain profitable. Today the market price is $18/b, and the company enjoys a margin of $3/b on oil from this field. The reason is that costs are $10/b lower than anticipated. Advances in petroleum technology have headed off most of the price increases that were thought necessary to ensure the profitability of the new sites needed to balance world demand. Along with strategic factors, this helps explain why the price increases of the 1970s have been gradually erased, so that in constant dollars the price of oil today is only slightly higher than it was in 1974.

Reiterating the overall argument, over the long run the market price of oil tends to approximate the cost of production, which in turn depends on the demand to be satisfied, the production strategies possibly followed by major producers, the geological characteristics of new deposits, and the physical characteristics of the crude they contain, as well as advances in petroleum technology. In the medium term, a strategic variable related to industrial structure may allow a group of actors who have insulated themselves from competitive forces to raise the market price above the long-run equilibrium price. On to these two mechanisms are superimposed short-term fluctuations stemming from the inelasticity of oil supply and demand attributable to the current arrangements for marketing crude.

On the basis of these three processes, we turn now to a forecast of probable oil price developments, based on assumptions about future developments within these three time frames. The horizon for the forecast will be the year 2000.

2. Oil Price Forecast

The first question to be addressed is the short-run equilibrium between supply and demand. In 1990 world demand for petroleum stood at 3.1 billion tonnes or 62 million barrels per day

(Mb/d).[11] It is forecast here to grow by an average of 2% per year over the next 10 years to reach a volume of 76 Mb/d. Demand is expected to be concentrated more on uses that are specific to oil (motor vehicle fuel, petrochemicals), with other forms of energy increasingly substituting for heating applications. Overall, then, only 14 Mb/d of extra production capacity is needed to satisfy this additional demand.

Between now and the year 2000, North American production is forecast to fall by about 1 Mb/d, while Western European production will remain unchanged, and the production of non-OPEC countries in the Third World (in particular, Argentina, Brazil, Colombia, Egypt, and the two Yemens) will increase by about 3 Mb/d. At present OPEC is producing at less than 100% capacity. However, only Saudi Arabia is in a position to increase its production by 10 Mb/d at short notice with a minimum incremental cost. Three other OPEC members (Kuwait, Iran and Iraq) have excess capacity totalling 8 Mb/d that could be quickly developed, while the remaining OPEC countries have additional capacity of 4 Mb/d.[12] Overall, then, there is currently 24 Mb/d of capacity that could be brought on stream over the next 10 years, while the anticipated volume needed to satisfy demand is only 14 Mb/d. From a purely physical point of view, therefore, there is no shortage of oil, and supply appears adequate to meet demand without giving rise to severe tensions. Since supply and demand are balanced, the price of oil in constant dollars should remain at its current equilibrium level of $18 to $20/b.

The balance described above could, however, be disturbed by geopolitical events. For instance, the major western countries might deem unacceptable the degree of energy dependence connected with a heavy concentration of supply in the Middle East. To reduce such dependence, they might try to encourage higher prices for

11/ Production data are presented below in barrels per day, using a conversion factor of 7.3 barrels per tonne.

12/ Complete data may be found in Angelier (1990) and Bourgeois and Martin (1989). See also Masters *et al* (1990).

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crude to ensure that petroleum reserves in North America, Europe and Asia could be profitably developed.[13]

It seems unlikely that price fluctuations can be eliminated. The inelasticity of oil supply and demand appears to be an inherent characteristic of the industry. Moreover, the current marketing arrangements seem likely to remain in place. Like the similar arrangements associated with other major commodities, they tend to thwart any attempt to stabilize prices. Thanks to these market mechanisms, however, there is little likelihood of a new oil price shock. In the past, these shocks constituted sudden adjustments to supply/demand imbalances. They were sudden not only because of the price inelasticity of oil supply and demand, but also because the marketing arrangements prevailing prior to the shock did not permit adjustment in prices. Since the latter condition has now changed, it is reasonable to assume that any discrepancy between supply and demand will be instantly reflected in prices, so that imbalances will not build up and inevitably precipitate a shock as in the past.

Turning to the structure of the international oil industry, a new framework is emerging, one that strikes a balance between the two main groups of actors: the OPEC countries and the major multinational oil companies. In 1990, OPEC members produced 24 Mb/d of crude, had refining capacity of 8 Mb/d, and delivered 5 Mb/d of refined product to their domestic and foreign markets. In 1990, the six largest western oil companies produced 8 Mb/d, 14 Mb/d in refining capacity, and sold 20 Mb/d of refined product. The oil industry is effectively dichotomized — the upstream sector mainly dominated by OPEC and the downstream sector by the multinationals. OPEC is unlikely to regain the position it enjoyed in 1973 and 1979, when it was able to impose unilateral price increases. As we have seen, OPEC's internal cohesion is not easy to maintain, and extended cooperation between its members does not appear feasible. Efforts to expand the Organization also seem to have come to naught. Meetings were organized in 1988 and 1989 between OPEC and seven other exporters (Egypt, Mexico, Angola, China, Colombia, Malaysia and Oman), but without success. Thus there is little chance that OPEC will once again be in a position to set the benchmark price and to dominate the international oil scene.

Meanwhile, the major oil companies are gradually increasing their involvement in the upstream sector and are once again proposing concession contracts. While their power vis-a-vis the producing countries is definitely increasing, there is little prospect of them reestablishing the all-powerful cartel that existed in the past.

At the same time, some OPEC members are altering their strategies somewhat by starting to seek financial cooperation with the major western oil companies and expanded political cooperation among the exporting countries. In the 1970s, a number of producing countries acquired refining capacity in a bid to ensure a better return for their crude and to become more independent of the major western companies. This strategy was not successful, primarily because of the surpluses that prevailed on petroleum product markets through the 1980s. These countries have nevertheless pursued their policies aimed at achieving greater independence by purchasing refining and distribution facilities in the importing countries in order to guarantee markets for their products, and thereby entering into financial cooperation with the selling companies. Kuwait, Venezuela, Saudi Arabia and Mexico have developed an impressive network of secure outlets in this manner. Alongside this emerging trend, concession contracts have made a comeback. The signatories to these contracts are on a more equal footing than in the past. As a result, even though OPEC will inevitably account for a growing share of production in the years to come, it is highly unlikely to adopt the confrontational attitude it did in the past.

Finally, the production cost of oil should not increase dramatically. Currently known petroleum reserves (which amount to 950 billion barrels) are exploitable within a market price range of between $12 and $20/b. In-ground recovery rates should increase by 25 to 30%, which will

13/ Criqui (1991) has extensively discussed this phenomenon; see above in this issue of *ESR*.

effectively increase reserves by 490 billion barrels, bringing the market price down to $20/b or lower. If the price of oil rises to between $20 and $30/b, however, some 840 billion barrels in additional reserves will be added to known reserves. This will alter the current balance of power in the industry; oil substitutes and the potential entry of new competitors will become significant factors; their effect will be to pull prices back to their current equilibrium level. It should also be noted that progress will continue in prospecting, drilling and production technology, and the cost of crude production can be expected to drop by another 10% over the next 10 years. Thus oil prices in constant dollars should remain stable in the long run.

On the whole, then, the current determinants of oil prices will continue to operate in the years to come, and oil prices will remain relatively stable in the long run, although there will be wide, sharp price swings in the short term. Of course, this assumes that the status quo in the oil industry is not radically disrupted by the emergence of some new political or military factor.

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