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THE RESPONSE OF OIL CONTRACTS TO EXTREME PRICE MOVEMENTS

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This study examines the response of oil contracts to extreme price movements. The chosen contract form is a Production-Sharing Agreement (PSA) which is the oil industry's equivalent of sharecropping and one of the most commonly used contractual agreements. We show that only the two significant price increases in the 1970s and only the price falls in the early 1980s and the early 1990s triggered a response in the terms offered by PSAs.

Oil prices, like most commodity prices, fluctuate. More than that, not only do they fluctuate, but every now and then they are particularly low or particularly high. If these extreme price changes are perceived to be more than just a blip, oil companies will adjust their expenditure for exploration and production (E&P) activities accordingly. One can observe that in times of very low oil prices fewer E&P contracts are signed and that during periods of high prices companies rush to sign for exploration acreage. In this paper we will analyse whether the terms of oil contracts, too, respond in any discernible way to extreme price movements.

The Contract Form

Because economists have been strangely silent on the subject of oil we have to start by explaining some fundamentals about fiscal regimes, or contracts, in the oil industry.

The contract type we consider is a Production-Sharing Agreement (PSA) which is one of the most common contractual arrangements in the oil industry. It is essentially the oil industry's equivalent to sharecropping. The first PSAs were signed in 1965/66 in Indonesia from where they spread globally to almost all oil-producing regions. Meanwhile, the only regions that do not offer this contract are North America and western Europe (with the exception of Malta). Under a PSA, the state (often represented by a national oil company) as the owner of the crude oil engages a foreign oil company (FOC) as a contractor to provide technical and financial services for exploration and development operations. The FOC in turn acquires an entitlement to a stipulated share of the oil produced as a reward for the risk taken and services rendered. PSAs are distinguished from other types of oil contracts, such as concessions, in two ways. First, the FOC carries the entire exploration risk. If no oil is found, the company receives no compensation. Second, the government owns both the oil and the installations necessary for the operation.

PSAs come in many shapes and guises but in its most basic form a PSA has four main properties. Regardless of profitability, the foreign partner pays a royalty on gross production to the host country. After the royalty is deducted, the FOC is entitled to a pre-specified share (e.g. 40 percent) of production for cost recovery ("cost oil"). The remainder of the production ("profit oil") is shared between host country and FOC at a pre-agreed share (e.g. 65 percent for the host country and 35 percent for the FOC). The contractor then has to pay income tax on its share of profit oil. In addition, the FOC is often subject to one or more types of bonuses. The most common ones are signature and production bonuses. A signature bonus, if required, has to be paid by the FOC on signing the contract, that is before and regardless of a commercial

oil discovery. A production bonus, on the other hand, is levied once production reaches a certain level.

There are, of course, many more contract variables. One will find clauses on the length of exploration and production periods, ex- and import duties, state participation in the operation, work programmes, pricing, marketing, compensation, and arbitration. The exact terms depend on several factors such as the specific characteristics of the oil field in question, and the balance of power between FOC and host country. It should also be mentioned that not all PSAs require royalty or tax payments on behalf of the FOC.

For the analysis we consider the basic contract variables, namely royalties, cost oil, profit oil, and taxation as well as bonuses. Other variables either vary so strongly between contracts that the construction of trends is rather meaningless (e.g. work programmes) or have been very stable over time (e.g. duties).

The Data

The empirical analysis is based on 300 PSAs signed by 74 countries during the period 1966 to 1999. It is impossible to even estimate what percentage of total PSAs this number represents. However, all the major oil countries have been considered. Indeed every attempt has been made to include all countries that offer PSAs. We are not aware of any other study that is quantitatively as extensive as the current one. The closest is Bindemann (1999) which analysis 268 PSAs and Barrows (1994) which compares the conditions provided by 226 concessions, PSAs and other oil contracts. For the data, we rely on publicly available material from news services and consultants which publish either original contracts or a summary of the terms and conditions. Hence, despite these inevitable limitations, the analysis should equip us with a

close approximation of how, or indeed if, oil contracts have developed with regard to price movements.

Oil Price Developments

For the purpose of this paper we are concerned with major oil price movements that might be perceived as more than just a blip. Hence, it is sufficient to deal with annual averages rather than monthly, weekly, or even daily data. Prices are provided by Wood Mackenzie's North Sea Service and are given in US dollars per barrel (\$/bbl).

Oil prices (figure 1) were low and stable between 1965 and 1972 before they began to rise and almost quadrupled by 1974. From 1974 to 1978, despite slight year-to-year increases, they stabilised at this new, higher level. Then, in 1979 the price of oil went sky-rocketing and increased further in 1980 and 1981. From then on a movement in the opposite direction took place with moderate (nominal) decreases until 1985. In 1986, the price dropped dramatically. After that it yo-yoed up and down until 1990 saw a somewhat more marked increase. This was followed by what was essentially a downward trend which was halted in 1995/96 when prices picked up once again. However, this upwards movement only lasted for about two years. In late 1997 prices began to fall to previously unimagined low levels before recovering again in 2000. Therefore, the periods of interest here are 1973/74; 1979-81; 1987; 1989/90; and 1995-97 for increasing prices and 1966-72; 1982-88 (with the exception of 1987); 1991-94; 1998-99 for low, stable prices (1966-72) and downturns respectively.

The Early Years 1965-72

In the early years of the existence of PSAs, hardly any contracts required royalty payments. The very few that did, set the rate at 12.5 percent. The maximum share of gross production available for cost recovery clustered at 40 percent with some contracts not offering any cost oil at all. If the latter case applies, the FOC has to recover costs from its share of profit oil.

With regard to profit oil it was quite common to have fixed scales whereby the government would receive, say, 65 percent of the remaining production and the FOC was entitled to 35 percent. A few contracts offered sliding scales based on the volume of oil produced. A sliding scale could for example take the following form: for production of up to 50,000 bbl/day the share is 60/40 in favour of the government, if production is between 50,001 and 100,000 bbl/day profit oil for the government increases to 70 percent, and at volumes above 100,000 bbl/day the government share rises to 80 percent. These early sliding scales had very few, narrow steps. This manifests itself in the relatively small difference between minimum and maximum profit oil specified in any one contract. The differences were either zero in the case of fixed scales or not more than 10 in the case of sliding scales. From the viewpoint of the FOC the minimum they were entitled to tended to be between 30 and 40 percent, with the maximum being between 35 and 50 percent of total profit oil.

In almost all the early contracts, tax was paid by the national oil company (NOC) on behalf of the FOC. While production bonuses existed from the beginning, signature bonuses were very uncommon during the 1965-72 period.

Contract Response to Rising Prices

Over time, more and more PSAs have introduced royalties. The initial rates were either 10 percent or 12.5 percent of gross production. After the very high oil prices of 1979/81 royalties increased to 20 percent in many contracts. However, the vast majority of PSAs still had zero royalty.

Cost oil changed for the first time during the 1973/74 price hike. Instead of the initial zero or 40 percent cost-recovery limits, contracts now specified cost oil anywhere between those two values. After 1979, this variability increased yet again and ranged from zero to 100 percent. Nonetheless, in the majority of PSAs cost oil was still at 40 percent.

The minimum profit-oil entitlement for the FOC declined to ten percent in some contracts during the mid-1970s and to even lower shares towards the end of the decade. The other notable observation is that in 1979/80 the variability of the minimum FOC share increased in similar fashion to that observed for cost oil. It was now anywhere between five and 75 percent. However, most contracts specified it at either ten, 20 or 35 percent. The maximum share for the FOC displays a similar increase in variability and a downwards trend in the mid-1970s with the FOC entitlement plunging as low as 15 percent in some PSAs. An upwards movement only began in 1979 so that by the early 1980s the maximum FOC share was between 15 and 100 percent, although most contracts set it at 30, 35 or 50 percent. Accordingly the difference between minimum and maximum profit oil for the FOC has increased since the mid-1970s indicating a larger number of sliding-scale contracts with more steps than previously. However, it is equally notable that throughout the 1970s and early 1980s a high number of PSAs still had fixed scales.

Around the time of both the 1973/74 and the 1979/80 price hikes more and more contracts required the FOC to pay tax on its profit-oil share although, as before, the most common scenario was for the NOC to pay the tax on behalf of the FOC. After 1973/74 it became routine for governments to require signature bonuses, and almost all contracts signed during this period of increased oil prices levied production bonuses.

Contract Response to Falling Prices

Royalties began to increase in the mid-1980s. With very few exceptions, those contracts that demanded royalty payments did so in the 10 to 20 percent bracket. What catches the eye, however, is the greater variability of royalty rates after 1986. Whereas before they were either zero, 10, 12.5 or 20 percent, they can now be anywhere in between those numbers. Nonetheless, they still tend to cluster around these initial rates. It is also worth noting that although the large majority of PSAs require no royalty payments this figure is somewhat distorted due to the introduction of First-Tranche Petroleum (FTP) in the Indonesian contracts. While Indonesia has never levied royalty payments as such, the 1988 introduction of FTP has to be regarded as a quasi royalty. It stipulates that the first 20 percent of production are shared between the FOC and the national oil company at the same rate as profit oil. Only then can the FOC begin to recover its costs.

The two most notable developments with regard to cost recovery during periods of falling prices are that from the mid-1980s onwards more and more, although still just a small number of contracts allowed for 100 percent cost oil, and that in the early 1990s the variability of this parameter increased significantly with the majority of PSAs setting cost oil at either 40, 50 or 100 percent.

During the early 1980s the previous trend of downwards variability for minimum profit oil was somewhat reversed with a large number of PSAs now specifying the variable between 30 and 50 percent. In addition to the fixed and volume-based sliding scales, an r-factor scale was introduced. For this, the profit oil split between government and FOC depends on the rate-of-return achieved by the FOC. The price fall in the early 1990s increased variability at both ends with contracts being scattered almost equally below and above the 30-percent level. The development of the maximum FOC share corresponds to that of the minimum entitlement: Upwards variability in the early 1980s, increased variability upwards and downwards during the early 1990s. Again, the persistence of fixed-scale contracts well into the 1990s is notable.

With regard to tax and bonuses we can find no significant changes during periods of falling prices.

Some Concluding Remarks

In a nutshell, the starting position with regard to PSAs was one with no royalties, cost oil of 40 percent, fixed profit oil scales, no tax for the FOC, no signature bonus, and some production bonuses. As a response to the price rises in 1973/74 and 1989/90 more contracts introduced royalties, cost oil became more variable, the variability of profit oil increased at the lower end of the scale, signature bonuses and tax payments became more common place. The decline in oil prices in the early 1980s and 1990s led to increased but more variable royalties, increased cost oil which also became more variable, greater variability of profit oil at both ends, greater frequency of sliding scales plus the introduction of r-factor scales but hardly any change with regard to tax and bonuses. In fact, taxation is one of the more stable contract parameters over

time. This is not surprising considering that in most instances tax is not a contract-specific element but is based on the generally applicable tax laws of a country. Tax legislation, in turn, tends to change very rarely. If it is altered, this happens mostly on a small scale. By the same token, the increase in royalty during periods of lower prices is not surprising either. Low prices translate into decreased oil revenue for governments even if production levels remain stable. Often, production is cut due to oil companies adjusting their E&P budgets to a changed price environment. In this scenario, higher royalties guarantee a minimum cashflow for the producer countries despite falling prices.

Overall, we can see that oil contracts have developed significantly since 1965, and in most cases offer more flexibility today than they did in the early days of PSAs. Indeed, more and more contract variables can be negotiated these days whereas the initial PSAs tended to be much more specific. Some of these developments coincide with periods of extreme price movements. It appears that the price hike in 1973/74, which represents the first significant price movement in the period under consideration, had a strong impact on contract terms, and that the 1979/80 price increase also had some effect. The, generally smaller, increases in 1987, 1989/90 and 1995-97 have had no discernible consequences for PSAs. Similarly, only the price falls in the early 1980s and the early 1990s seem to have triggered a contract response.

How can we explain this? Let us start with the price surges. The two price hikes in the 1970s were far more significant than any other price increase between 1965 and 1999. In addition, the high price level achieved through the 1973/74 increase persisted for many years. Both movements were orchestrated by OPEC (although there is a school of thought that maintains that in 1973/74 OPEC was merely a tool of the USA (Terzian 1985)). As pointed out earlier, PSAs address the sharing of risks and rewards as well as the balance of power

between the contracting parties. The run-up to the 1973/74 price hike in particular marks a period of increased confidence by the oil-producing countries who realised that by changing their contracts they could obtain substantially higher oil revenues than before. This new-found confidence was also borne out by the nationalisation of foreign oil assets in several producer countries. The price increase in the late 1970s falls in the same category, although for different reasons - not least events in Iran, where in late 1978 the oil workers went on strike, and then in early 1979 the US-supported government of the Shah was toppled by Khomeini and his supporters. Hence, it appears that both price hikes were triggered by events within OPEC that indicated increased confidence by its members which then spread to other producer countries.

But what about the three other price increases? The foundation for the 1987 surge was laid the previous year with reports of a likely OPEC agreement on production cuts which materialised later that year, and the escalation of the Iran-Iraq war in mid-1987. The somewhat more significant price increase in 1989/90 can be largely explained by the Exxon Valdez accident, and the Iraqi invasion of Kuwait. The relatively slight upwards movement that began in 1995 was triggered by the severe disruption of Nigerian oil production in 1994 when that country's oil workers went on strike in response to the imprisonment of the apparent winner of the presidential elections, and OPEC's 1995 decision not to increase production. Therefore, the main difference between the 1973/74 and 1979/80 price hikes on the one hand and the three smaller increases on the other hand, is not only the magnitude of the price movements but also the special characteristics that drove prices up. In the first two instances these were strategic decisions by OPEC, in the latter three cases, albeit containing an element of this strategic decision-making, non-controllable events and domestic policy issues were the driving forces.

The story is less clear-cut when considering falling prices. The early 1980s saw a worldwide oil glut, a decline in demand due to recession, conservation and use of alternative fuels, and an apparent loss of OPEC's control over world oil prices. The other price decline being followed by a change in contract terms took place in the early 1990s at a time of OPEC overproduction, surging North Sea output, the partial utilisation of the US Strategic Petroleum Reserve, and continued weak demand. However, the lower oil prices towards the end of the 1990s came about in similar fashion. They occurred in the wake of the Asian economic crisis and at a time of general overproduction. The most likely explanation of why the first two price falls discussed here had an effect on contracts whereas the latter had not, is that they followed very steep price rises and continued over a prolonged period of time (ignoring the 1987 upwards jump). One could also speculate that because, on a daily basis, prices fell to such dramatic lows in 1999, reaching at one point US\$8/bbl, they were not expected to stay that low for long. Hence, no contract adjustments occurred.

With research such as this, one would usually also look at time lags. However, oil contracts are signed all the time (there is no season) taking into account the prevailing price level and expectations about future price developments among other factors. If each PSA was based on a model contract, which is at the same time that country's petroleum legislation, then the legislation would have to be changed before the contract terms could be altered. Since changes in legislation usually require an act of parliament, some time would elapse between price increase (or decrease) and contract response. As pointed out earlier, PSAs have become more flexible over time, an increasing number of contract terms can be negotiated, and model contracts have either ceased to exist or offer the same flexibility as individual contracts. Hence, time lags play no part in the developments outlined before. In addition, the ascendancy

of sliding scales, especially those based on rates of return, works as a build-in adjustment mechanism to extreme price movements.

One final aspect that merits further examination is the potential impact of increased competition on the formulation of oil contracts. The period starting in the early 1990s is a particularly suitable point of reference for this undertaking. Since then, several countries have begun to open or reopen their oil sectors to foreign firms. The most spectacular newcomers to the international scene were the Caspian countries. At the end of 1997 their proven oil reserves stood for 15 percent of total world reserves. The earliest Caspian PSA in our dataset is one signed by Azerbaijan in 1993. Azerbaijan is also one of the most active countries with regard to tendering PSAs. New and numerous investment opportunities such as these will inevitably lead to increased competition for risk capital. A simple view of the world would thus suggest that in order to continue to attract foreign investment the 'old players' will have to adjust their PSA terms. Adjustment here means offering more favourable exploration and production conditions to FOCs. If this argument were to hold the data should indicate a change in the main PSA elements during the 1990s. This is where things get just a little complicated. While we cannot discern any clear global trends in response to new players entering the arena, we do notice some marked regional developments that fall in this period. Contract parameters in Asia and Central America changed in the early 1990s before the first Caspian PSAs were signed. The same is true for North Africa with the exception of changes in the minimum profit-oil share (increased), maximum and minimum exploration periods (decreased and increased respectively), and bonuses (decreased) which occurred in the second half of the 1990s. There were hardly any alterations in the South American contract terms since the mid-1990s. Royalties and cost oil went slightly up, with profit oil showing a rather insignificant downturn.

The Middle East and Southern/central Africa display various modifications to their PSAs since 1993/4. However, they tend to move in opposite directions. Cost-recovery limits, for instance, increased in the Middle East but decreased in Southern/central Africa. The changes, especially in the latter region, are not necessarily to the advantage of the FOC. Hence, while we can show that PSAs have undergone changes in the 1990s it is not possible to pinpoint these alterations in the contract parameters as a response to increased competition.

All in all, oil contracts appear to respond to significant price moves either way but especially to upwards movements. The response to the initial large price rise or fall is more marked than that to later, similar developments.

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Table 1: THE DEVELOPMENT OF CONTRACT VARIABLES 1965-99
(range in percentage)

Year	Royalty	Cost Oil	Min Profit Oil	Max Profit Oil
1965-72	0-12.5	0-40	30-50	35-50
Rising Prices				
1973-74	0-12.5	0-40	10-30	20-50
1979-81	0-20	0-100	5-75	20-78
1987	0-20	30-100	10-75	16.6-100
1989-90	0-20	25-100	7.5-75	20-100
1995-97	0-20	25-100	10-85	10-95
Falling Prices				
1982-88	0-20	25-100	10-75	20-75
1991-94	0-20	0-100	10-65	20-100
1998-99	0-20	25-100	10-85	10-90