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JAPANESE ENERGY SECURITY AND CHANGING GLOBAL ENERGY MARKETS:
*AN ANALYSIS OF NORTHEAST ASIAN ENERGY COOPERATION AND JAPAN'S EVOLVING
LEADERSHIP ROLE IN THE REGION*

THE PROBABILITY OF OIL MARKET DISRUPTION:
WITH AN EMPHASIS ON THE MIDDLE EAST

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Introduction

1. Disruptions and Discontinuities

In 1963, Harold Lubell wrote of the possibilities for the disruption of Middle East oil supplies.¹ After two major crises in the area that had impacted on supplies in the 1950s, (Mossadeq's nationalisation of oil in Iran from 1951 to 1954 and the Suez Crisis of 1956), Lubell was concerned about the vulnerability of western economies to potential future events. He sketched some possible scenarios, including an Iraqi invasion of Kuwait, a revolution in Iran, a coup in Iraq that brings a 'young Turk' to the helm, a breakdown in relations between oil companies and governments, civil war in Lebanon, and the nationalisation of the Arabian American Oil Company (Aramco). As scenarios go, his track record then proved to be highly impressive, albeit that no consumer government really paid much attention to the issue for another decade. Lubell turned out to be a genuine Cassandra; genuine in the sense that Cassandra's curse was that nobody would believe her even though she was correct.

Lubell worried about actual disruptions of supply, at a time when the role of Middle East oil in the world market was far less important than it is today. After the first oil shock, the focus on specific probabilities of disruption switched to a more general sense of unease about the Middle East. The main area of concern became simply that the area was supposedly 'unstable', without there being much of a specific target for those worries. To give but one of many examples, in 1987 Robert Belgrave et alia² attempted to list the sources of instability in the Middle East and the associated threats to energy security. Their list of seven issues included: the Soviet threat, the Iran-Iraq war, Shia Islam overwhelming the Gulf States and Iraq, general terrorism, the Palestine question, the impossibility of doing political business with the U.S. in an atmosphere of anti-colonialism, and the problems of low oil revenues. At least the first six of these seven proved to have little stamina as issues and indeed all are rather vague when it comes to the question of if and how an oil supply disruption might ensue. One might assume that in the climate of the times the definition of the threat was not thought important, given the prevailing

¹ Lubell, Harold (1963) **Middle East Oil Crises and Western Europe's Energy Supplies**, John Hopkins Press, Baltimore, MD.

² Belgrave, Robert, Charles K. Ebinger and Hideaki Okino (1987), **Energy Security to 2000**, Gower Publishing Company, Aldershot and Westview Press, Boulder, CO.

conventional wisdom of an underlying feeling of unease about, and perhaps mistrust of, Middle East oil producers.

Table 1 gives a list of all the events in the Middle East and North Africa that have caused a gross loss of oil to the market of more than 50 million barrels (mb), ordered by decreasing volume of gross loss.³ The figures are gross in that in response to most crises, production increases elsewhere have resulted in an often significantly smaller net loss. Of these ten events, only one, namely the Gulf crisis, occurred after 1980. Indeed, as many events occurred between 1970-4 as did in the succeeding quarter of a century.

**Table 1: Significant Middle East and North African Oil
Crises, 1950-2000**

<u>Event</u>	<u>Dates</u>	<u>Gross Loss</u> (mb)
Iranian Nationalisation	1951-4	940
Iranian Revolution	1978-9	640
OPEC Oil Embargo	1973-4	475
Gulf Crisis	1990-1	420
Libyan price dispute, Tapline damage	1970-1	360
Iran-Iraq war outbreak	1980	300
Suez Crisis	1956-7	245
Six Day War	1967	120
Algerian Nationalisation	1971	90
Syrian Transit Dispute	1966-7	65

Source : Adapted from US Energy Information

³ Beyond the events shown in Table 1, a string of other events have caused gross losses of less than 50 mb. These are mainly due to technical problems in specific fields or tanker losses, and the losses produced by the Lebanese Civil War in preventing pipeline transit.

Administration figures

There is then a suggestion that Middle East crises have been happening with decreasing frequency. However, not all events that cause large upward swings in prices are of the type shown in Table 1. In this paper, we are concerned with disruptions that have their roots in Middle East issues, and this leads us to the question of what a disruption actually is. It is not a trivial issue to draw a neat delineating line between events that we would consider to constitute a disruption and those which do not. At the time of the first oil crisis, the situation was somewhat easier, as disruptions would quickly manifest themselves as widening gaps between supply and demand. In that world of long term bilaterally negotiated fixed prices matched together with the dominance of vertically integrated supply chains, the manifestations of supply shortfalls were highly visible. Prices would, of course, be adjusted, but *ex post*, and as a reflection of the presence of shortfalls rather than serving as any rapid method of either indicating the opening up of gaps, or of closing them through the price mechanism.

When the rules of the International Energy Agency (IEA) came to be drawn up after the experience of the first oil shock, it was meaningful to define the conditions for intervention in terms of the physical shortfall that member countries experienced through disruption. There was the possibility of a disruption, and any such disruption would cause overt supply shortfalls. A clear thread joined the disruption with the shortfall; a barrel lost in exports would be neatly matched by a barrel's shortfall at the buyer's end. It was the world of what used to be called oil company supply managers. Barrels were moved around the world like pieces on a chessboard, and there was no other *deus ex machina* to mitigate or alter the impact of any shock.

That world died very rapidly, even though the precepts and vocabulary of policy response have to a large extent remained firmly intact. It was the 1951 oil shock itself that caused the first rumblings of what was to become a seismic shift. The vertically integrated supply chains were torn apart. Major oil companies became crude short, and needed to fill the gap by bilateral trades. At first those trades were subject to the pure *diktat* of producer country administered prices. As time progressed, and as OPEC pricing policy retreated from trying to sit astride the margin, the void was filled by markets.

The importance of the rise of markets is that it changed the manifestations of crises. Previously, volumes led crises. Now the chessboard analogy is no longer appropriate. In today's

world, one can always ultimately get the oil if one wanted it; the problem during a crisis was simply the price one has to pay. The extent of any possible insulation from a crisis was greatly reduced. Prices would rise sharply, and the market would make no distinction between barrels that were part of an uninterrupted flow, and barrels bought in to cover for a shortfall. Even if all one's supplies were bought from countries that were not subject to disruption, once the short term scramble for barrels was over, one would be in no better a position than a country which had had all its imports subject to disruption. Securing the supply lines was no longer the dominant issue it had been in the early 1970s and before.

That change in the structure of the market also made it difficult to tell what a disruption really represents. For instance, OPEC meetings and their setting of production ceilings alter the volumes in the supply chain. That raises the question of whether OPEC meetings represent a disruption, given that they may result in lower levels of production than consumer countries might want?

If we are to consider a disruption in terms of its price impact and its effect on total flows, the distinguishing marks of a disruption become blurred. To illustrate, consider two periods, the Gulf War conditions of August 1990 to March 1991, and the conditions that followed the long downward slide in prices that began at the end of November 1997. Intuitively, most would perhaps believe that the Gulf War was clearly a supply disruption, while there was no disruption in 1998 and 1999. However, definitional problems ensue when we realise that here our case of disruption actually caused less impact than the supposed non-disruption.

In 1998 and 1999, OPEC members and certain key producers sought to correct the market through three tranches of supply reduction. Compared to the Gulf War, in terms of quantities this correction brought a greater net amount of oil off the market for a longer period. In terms of prices, it brought a greater percentage increase, measured from trough to peak, and sustained price increases for far longer. The Gulf War disruption proved to be short lived. The price impact of the Gulf War peaked two months into the crisis, and was in effect completely removed five months into the crisis. By contrast, OPEC's recent market correction measures brought a price peak a full year after the third tranche of output reduction.

In terms of the impact on consuming countries, output restraint in 1999 had far more significant results than the Gulf War. So, if political responses to disruptions are tempered by their price and volume impact, we have a problem. Should governments be more concerned by

Gulf War type events simply because they are clear disruptions, than they are by OPEC market management when the latter can have a far greater impact on the economy? If no, then should government policy responses be centred on the fluctuations caused by market management, given that these events are far more common than disruptions caused by war or politics?

The line becomes even more blurred when we consider what actually represented the source of disruption in the case of the Gulf War. Oil supply was truncated because international sanctions were put on oil exports from Kuwait and Iraq. Consuming countries embargoed the oil. They did not have it withheld from them. In fact, there is no reason to believe that Iraq would have wanted voluntarily to withdraw oil from the world market.

Counterfactual history is not usually a helpful device. However, for the sake of argument in demonstrating how blurred the definition of a disruption can be, let us indulge ourselves in it. Suppose that there had been no effective international response to the invasion of Kuwait. After some settling down as Baghdad's rule was imposed, Kuwait becomes an Iraqi province. Iraq, *de facto*, would then have control over some 6 million barrels per day (mb/d) of capacity, and have the ascendant power within OPEC. Its position was certainly more hawkish than that of Saudi Arabia, and that might have resulted in OPEC decisions that produced higher prices. Alternatively, depending on Saudi Arabia's view of its own security position, it might just as well have led to a price war as the two main protagonists fought for ascendancy. However, even if prices rose, the order of magnitude would most likely be a few dollars per barrel rather than any shock that would send prices into the stratosphere. The above implies that the invasion of Kuwait was not in itself a disruption. What made it a disruption was the reaction of the international community. In that case, the view taken of contingency planning and other protection against disruptions was that these devices were sufficient to allow the international community to *create* the disruption.

As the distinctions are blurred, it is perhaps not surprising that policy responses can become blurred as well. For example, if we could only see policies and not fundamentals, one would conclude that the U.S. had suffered a supply disruption in early 2000. A full-scale diplomatic offensive was put in play against oil producing countries. The use of strategic stocks was threatened, and the administration, Congress and the press all spoke forcibly of national security being jeopardised by the action of foreign producers. When prices became too high as far as the government was concerned, the distinction between supply side disruption and supply

side management became irrelevant in terms of the policy response elicited. In other words, to a large degree, disruption is in the eyes of the beholder.

To narrow down some of these uncertainties, one should perhaps begin by building up a definition and taxonomy of disruption in the oil market. The typical supply chain for internationally traded crude oil begins at the wellhead, with supply passing on through pipelines and storage onto tankers. At point of discharge, the chain passes through further storage and pipelines onto the refinery gate. As a first approximation, we could define a disruption as something that leads to a reduction in the volumes going through this supply chain, with the added proviso that the reduction is considered undesirable by at least one party along the chain.

Such a definition captures most disruptions, for example a refinery outage, a tanker grounding, a terrorist strike on a pipeline, or the onset of war leading to an inability to export. It is, however, not a complete definition. As we have noted above in the context of the late 1990s, the deliberate withdrawal of oil for market control purposes would also fall within this definition. Likewise, long-term structural factors such as the collapse in productive capacity that led output from the former Soviet Union to fall by 5.5 mb/d between 1988 and 1996 would also be captured.

Some precision in language is then called for, and here we introduce the distinction between an oil market dislocation and a disruption. We define a discontinuity as a swing in oil prices that arises from either of two sources. First, it may be a *policy discontinuity*; that is to say it arises from the consequences of changes in producer policy in those countries with spare production capacity. Secondly, it may be a *fundamental discontinuity*, which arises from the dynamics of supply and demand should the supply system be unable to meet the level of national demand.

We define supply disruptions as sudden truncations of supply that can arise in three ways. First, due to an inability of a producing country to export because of either internal conditions, be that civil unrest or war, or external conditions that render normal trade routes impassable. We call this a *force majeure disruption*. Secondly, there is the *export restriction disruption*, which is a deliberate restriction of exports by a producer, or group of producers, for political or strategic ends. Finally, we define the *embargo disruption* as restraints placed by consuming countries on the oil exports of specific countries. To provide examples of this nomenclature, the Gulf Crisis of 1990-1 was an embargo disruption, and the second oil shock was a force majeure disruption. The

first oil shock had elements of an export restriction disruption, although we will argue below that this was not the major factor behind the crude oil price increase. In fact, the first oil shock was closer to what we have called a fundamental discontinuity rather than any form of disruption.

Having defined five distinct types of discontinuity and dislocation, we consider each in turn in the following five sections. A further concluding section provides some conclusions in respect to the implications for energy security policy.

2. Policy Discontinuities

We have defined a policy discontinuity to be a sharp change in the price of oil (either upward or downward) that arises from producer country oil export policy. We have already noted that such a discontinuity can look very much like a disruption from the point of view of consuming countries when it sends prices sharply upwards. However, while raising the question, we have not yet stated whether such events should be treated the same as disruptions in terms of energy security related policies.

An answer comes from considering the meaning of ‘energy security’. A reasonable definition is given by Bohi and Toman (1996), who see energy security as referring to “the loss of welfare that may occur as the result of a change in the price or availability of energy.”⁴ Such a definition makes no distinction as to how that change occurred. It might be due to war, political turmoil or blockaded trade routes. However, it might also be due to a calm non-political evaluation of the state of the oil market and a resultant change in OPEC producer policy. Thinking of energy security in those terms then means that what we have called dislocations are as much an issue as the more obvious and spectacular forms of disruption.

There is another reason to be concerned about dislocations. Put simply, they are far more common than disruptions, are often longer lasting, and in terms of barrels removed are normally of a greater magnitude. Further, in the case of disruptions, there is normally some country that has the willingness and ability to increase production, so as to fully or partially compensate for the loss. For instance, in Table 1 we showed the total gross loss attributable to the Gulf Crisis to have been 420 million barrels. However, Saudi Arabia alone produced an extra 350 million barrels over the course of the crisis, compared to their baseline production before the invasion of

⁴ Bohi, Douglas R. and Michael A. Toman (1996), **The Economics of Energy Security**, Kluwer Academic Publishers, Dordrecht.

Kuwait. By contrast, in a discontinuity, the countries that change policy are those with excess capacity. While there might be some significant leakage from over quota production, in all there is less compensation than in a disruption. Put another way, the net loss is a greater proportion of the gross loss in a dislocation than it is in a disruption. We have already noted that the withdrawal of barrels by OPEC and Riyadh pact partners over the course of 1999 and early 2000 constituted a greater gross loss than the Gulf Crisis. Indeed, the gross loss was greater than all the disruptions shown in Table 1. It amounted to over one billion barrels, more than even the Iran crisis of 1951-4 withdrew over four years.

A distinction must be drawn between control over the market and the lack of precision over that control. Dislocations are magnified by the lack of fine-tuning ability and the lags of producer response in the market. OPEC in 1999 did not begin with the intention of sending prices above \$25 per barrel, nor did anyone seriously suggest that that would be the result of their actions. One can have the power to kick a ball into motion without having the control over where the ball lands.

Producer country policy changes are frequently over or under reactions, and would very rarely be thought of as being exactly and correctly measured in retrospect. As a result, oil prices are prone to greater levels of volatility and have the capacity for wild swings between the highs and lows. That raises the question as to why there is such a lack of precision. There are two components to this, why a period of over and under shooting cannot be rapidly reined in, and why such periods occur at all.

Lags in producer country policy allow over and under shooting prices to be prolonged and deepened. There are, of course, the simple administrative lags and the exigencies of the timing of meetings. There is the first mover problem, and brinkmanship can play a role. A short period of extremely high prices can be very pleasant and remove urgency. A period of low prices can be wrapped up in a wider set of issues in what is at least a quasi-political process. A final component of the reaction lag is in effect a recognition lag. Producers may see the evidence of prices overheating, but cannot clearly observe why the fundamentals of supply and demand are generating that degree of response, and also have less than certainty in gauging the correct response in quantitative terms. This brings us to the second issue we highlighted, i.e. why prices have a systematic tendency to overshoot.

We would contend the major reasons for price overshooting are informational. The quality of market information is important. Generally, it is true that the lower the quality of fundamental supply and demand information that is available, and the lower the quality of the analysis of that information, the worse will be the decision-making of both market makers and policy makers. Bad information and bad analysis will lead producing countries to misjudge their response, and lead the market to misinterpret the impact of that response. Improving information flows is then a powerful method for preventing discontinuities in prices. This has long been recognised as a valid basis for international action, and indeed it is one of the functions of the International Energy Agency.

It goes beyond the scope of this paper to fully evaluate the quality of the IEA's information output and to say whether the IEA reduces or increases the likelihood of oil price discontinuities. However, it has been contended that the IEA can often add to rather than diffuse oil price volatility, more by their interpretation than by their publication of data.⁵ A major problem is that the quality of the underlying fundamental information is poor. To put this in context, oil prices are driven by events at the margin. A quantity that is small in terms of the overall market, say one per cent of world demand, i.e. 0.7 mb/d, can have a very major impact on price when added to demand or taken from supply and *vice versa*. The problem is that the margin of error on both the estimates of current supply and demand is normally greater than one per cent. Further, those errors build up. Imagine that over the course of a year, the estimate of world demand is underestimated by 1 per cent. In total that would mean some 270 million barrels of demand were missed. In all, minor differences between estimates and the reality can add up to very major differences in perceptions about the current state of the market, and most especially in the assumed position of world inventories.

It is not uncommon for one per cent and greater changes in estimates of world oil demand to be made more than two years in arrears. Such is the quality of information currently possible. In all truth, one must admit that we simply do not know the current state of world oil demand. Market and policy responses are based on the cumulative disequilibria of the past, (i.e. the world inventory position), the current supply position and also expectations of the future. Needless to

⁵ See for instance Horsnell, Paul (1999), 'The Missing Barrels', *Middle East Economic Survey*, July 19th 1999, Vol. XLII no. 29.

say, the quality of future estimates is likely to be poor given that there is such a degree of informational poverty on both the present and the past.

There is also considerable uncertainty on the supply side of the market, particularly concerning OPEC output. There are no official estimates of OPEC production. Indeed, perhaps dramatically demonstrating the point, OPEC itself uses an average of the estimates of journalists and analysts. Needless to say, those estimates are often widely divergent. In addition, output figures are highly political. In some circumstances, and particularly before OPEC meetings, it is common for countries to claim a higher production level than is the reality so that any reductions agreed to have to be made from a fictitiously high number. In other cases, and particularly when prices are being stressed on the downside, they will choose to understate to avoid blame. As the incentives to misreport tend to be common among countries at any one time, the errors compound rather than balance out. The end result is that a large margin of error emerges in our estimate of the current level of world output.

With errors on both the supply and demand sides, the potential for overshooting is magnified. It can take a long time for the market to realise that the fundamentals are radically different from what had been the consensus. The following becomes a common scenario. The market and oil producers both believe that supply is exceeding demand by a wide margin. Prices are driven down by a greater extent than is really warranted, and producers cut output by more than is needed. Over time the market tightens faster than expected, and the market for spot cargoes heats up. Market sentiment changes, not because of a smooth transition in the fundamentals, but because of a discontinuous sharp realisation that the overall supply position is not as comfortable as was thought. Prices overshoot, and are eventually brought back into bounds after lags in producer country policy. Compared to what would have been the path of prices had the fundamentals been less opaque, there would have been an initial undershoot coupled with a later overshoot. The period from 1997 to 2000 was a particularly marked example of this sort of cycle, and such cycles are easily repeatable.

We noted in the previous section that low oil prices have been seen as a source of instability in the Middle East and hence of disruptions, and so give rise to energy security concerns. We would agree with the conclusion, but argue that the reasoning should be different. It is precisely because prolonged low oil prices reduce the stability of key oil producers that low oil prices are not a sustainable state of the world. They force producers to react eventually, albeit

often with a long lag, and we have argued that such reactions are likely to lead to the overshooting of prices. Hence the problem is not that sustained low prices lead to a disruption, but that they lay the groundwork for a dislocation.

The probability of a policy discontinuity occurring within the space of, say, a decade can be rated as a near certainty. Oil prices will be prone to sharp swings because such is the nature of producer policy and the information regime that the market and producers have to operate under.

3. Fundamental Discontinuities

The first oil shock occurred at a time when the world was on the cusp of a fundamental discontinuity. Years of extremely fast demand growth had eroded spare capacity to the point where the ability of the system to keep up with demand was becoming increasingly open to question. Oil was fundamentally under priced, and a sharp correction upwards was overdue. In the event, the importance of the underlying market tightness was subsumed under the headlines of the war with Israel and the unsheathing of the Arab 'oil weapon'.

The first oil shock is remembered in terms of its volcanic politics, but underneath some very strong economic factors were also driving towards sharp price increases. The extent to which spare capacity had been eaten up meant that it had been inevitable that prices had to adjust upwards. All that was in doubt was precisely what mechanism would serve to prime the process. Politics intervened, but a case can be made that even without the Arab-Israeli war, a sharp discontinuity in price was becoming ever more likely.

In some respects, a fundamental discontinuity in the oil market is a frightening phenomenon in that it can become uncontrollable. When usable excess capacity is eroded away, there is only one mechanism left that can equilibrate the market, and that is a rapid increase in price. A policy discontinuity can eventually be reined in. A fundamental discontinuity cannot be either easily or swiftly brought under control. The lags involved in capacity additions are such that there is a strong cyclical element in the possibility of a fundamental discontinuity. Sustained periods of low prices reduce capacity expansion rates, and make a discontinuity more likely. Sustained high prices bring capacity on stream, and in the longer term reduce the likelihood of any capacity crunch. When one also considers that key producing countries realise that the extent of excess capacity determines their relative position in terms of oil market power, it becomes

clear that generally there is a tendency towards more than ample spare capacity to be held. Fundamental discontinuities are then rather rare animals, and while one was arguably in progress in the early 1970s there have been none since.

At various points over the last thirty years, fears of a fundamental discontinuity have been raised. Generally, these have been on the basis of projections that have been too optimistic in terms of demand, and too pessimistic about the speed and degree of capacity renewal and expansion that was possible. However, it is still a reasonable question to ask whether there is a significant possibility of a fundamental discontinuity over the next decade.

A general answer is that on the basis of current information it would be unwise to rule out the possibility of such a fundamental discontinuity. There are two routes by which it might be generated. One way, which the current author gives little credence to, is to project a falling off of the remaining recoverable reserve base and to further then to equate this directly with a fall in productive capacity. This is a large issue that has been extensively discussed elsewhere.⁶ For our purposes here, in short, we wish to concentrate purely on investment in productive capacity. We believe the link between capacity and reserves to be very weak in the medium term and also that in any case, the pessimists are incorrect in their appraisal of the reserve base and the potential for future proven reserve additions.

The other way to generate a fundamental discontinuity is simply for the investment necessary for maintaining and then extending current capacity to be insufficient compared to that required to maintain an adequate margin of capacity over the level of demand. This makes no presumption about the reserve base. The degree to which reserves are exploited differs dramatically across countries. For example, if Saudi Arabia produced relative to its reserves in the same way that the North Sea does, it would be producing over 100 million b/d. Given this reality, no meaningfully firm links can be drawn in the medium term in either direction between changes in the reserve base and changes in production levels.

Considered from this angle, there are some elements that give grounds for concern. There are some key countries whose ability to expand capacity has been constrained by sanctions or lack of access to capital, especially Iran, Iraq and Libya. Within the Middle East, some of the key fields that have provided the mainstay of production are now showing signs of ageing. That is

⁶ The thesis is most closely associated with the work of Colin Campbell and Jean Laherrere. See for example Campbell, Colin J. (1997), **The Coming Oil Crisis**, Multi-Science Publishing Company, Brentwood.

not to say that in all cases their capacity will fall, but rather that the amount of investment needed just to maintain capacity is increasing. Some key non-OPEC areas are now fully mature, and new provinces are not appearing in substantial numbers. In all, one could draw two differences between the situation at the start of the current decade with that which prevailed in the 1990s. First, the ability of non-OPEC areas to meet the bulk of incremental oil demand as they did in the early 1990s has been diminished. Secondly, the cost to OPEC members of meeting that increment is now higher, and in the case of some countries, even the ability to do so has been compromised. These are not sufficient conditions for a fundamental discontinuity, but they are necessary conditions.

Capacity is rather an elastic concept (particularly as it depends on both the time period before capacity can be brought on, and the period through which it can be sustained). The position is an ever-changing one, and the information available on capacity is often highly questionable. In all it is difficult to be particularly precise. However, we can still give a rough picture of the position at the start of this decade. As of Spring 2000, after OPEC made increases to pull back an overshooting of price levels, estimates of short term spare capacity ranged from 3 mb/d to 6.5 mb/d. The level of precision is not too important; the key point is that even the upper end of estimates is barely adequate and represents under 10 per cent of world demand. The lower end would represent a very tight situation indeed, particularly were capacity expansions to continue to fall below the rate of demand increment. In sum, starting the decade with that rough order of spare capacity means that the maintenance of a sufficient buffer is not in itself guaranteed. Further, as argued above, the ability of the system to expand that buffer is not as strong as it was a decade ago.

A further complication in this picture is the role of price. There appears to be an asymmetry between industry behaviour at low and high prices. A period of low prices will lead to the cancellation of exploration and development projects, but a return to higher prices does not bring all the projects back. Periods of low prices immediately reduce cash flow and lead to cancellations. By contrast, given the long-term nature of most upstream oil investments, periods of high prices have to be sustained for some considerable time before the implicit oil price at which projects are tested is moved up. Such an asymmetry is perfectly rational behaviour for any risk adverse agent, but it does imply that the more volatile are prices around the same average,

the lower will be the rate of capacity expansion. It also implies that the long cycle in prices at the end of the 1990s has caused a longer lasting impact on capacity.

One should not be unnecessarily alarmist. However, looked at over the period of a decade, it is still fair to say that the possibility of a fundamental dislocation can not be ruled out. Its avoidance depends on a series of economic and political factors, none of which can, *a priori*, be absolutely guaranteed to behave in a benign fashion in this regard. This remains the most alarming possibility in terms of supply security. We have already stated that policy discontinuities are both more likely and often more severe than most possible disruptions. A fundamental discontinuity is far less likely, but its uncontrollable nature once it is in play makes it a far more severe potential event.

4. Force Majeure Disruptions

Most western views of the Middle East are predicated on the view that it is an unstable region, and therefore a source of severe concern in terms of supply security. That view is perhaps justified up to a point, but needs to be seen in perspective. In recent years, major sources of political or military instability and uncertainty within OPEC have been the non-Middle East members Nigeria, Indonesia and Venezuela. Outside OPEC, one could also highlight Angola and Colombia as highly unstable, significant oil producers. Over the 1990s, there were more wars in Europe than there were in the Middle East. One could add that Europe's internal boundaries have also been in a far greater state of flux than those in the Middle East. The difference, of course, is that Europe's areas of instability are, in the broader scheme of affairs, of less strategic value. The grounds for concern about the Middle East cannot then come from any question of a greater relative instability. Rather, they come from the effects of any real or potential instability whatsoever in a region so overwhelmingly important to the world oil market in terms of the absolute volumes supplied.

Regimes in the Middle East and North Africa tend in fact to be very stable, and most rulers achieve some longevity of power, witness *inter alia* Assadin Syria, Qaddafi in Libya, Qaboos in Oman, Mubarak in Egypt and, despite or because of all that has happened, Hussein in Iraq. Most changes of ruler occur from within the regime, even if in some cases the succession is brought about by a semblance of *coup d'etat* rather than by natural causes, (witness past successions in Qatar and Abu Dhabi). In other cases, successions take place smoothly and with

minimum disruption (for example, Jordan, Saudi Arabia and Tunisia). A successful overthrow of the incumbent government by an opposing faction is rare. Indeed in recent years, only Iran and Yemen would fall into this category. This leaves only Lebanon and Algeria, two countries that can be said to have maintained a high level of political instability and uncertainty. One of these is not an oil exporter. The other is minor on the global scale and has maintained its production.

There is one major international oil company that has almost adopted as a motto the saying 'oil flows whatever the regime'. The interpretation of this is that in terms of internal politics, it is only the transitions that can represent a threat to the flow of oil, not the change in regime itself. One can, of course, construct scenarios where dramatic internal changes occur in key Middle East countries. What is harder is to construct a scenario where the new regime wishes, as a matter of policy, to greatly reduce the flow of their oil onto the world market. It is easier to think of conditions in which major consumers may wish to stop the flow from the new regime, but that would be an embargo disruption rather than force majeure. In total, the equation of perceived regime instability with an automatic threat to security of supply is very rarely justified.

In a recycling of the old domino theory, it is common to look around the Gulf to seek future Iranian revolutions. It is natural to try to make analogies, but the Iranian revolution was the result of a very specific set of factors that are not replicated in any significant oil exporter. The revolution came from the combination of a large population based in large urban centres, a disillusioned middle class, and a regime that had little conception of its own fragility and was behaving accordingly. Added to that was a fundamentalist Shia movement that had the capability and numbers to react in opposition to an overt policy of westernization, and then to rise on the back of the Shah's overthrow. In major Gulf oil exporters, these factors are simply not present. Regimes are generally aware of the need for political caution, the technocracy is generally kept on board, and any pressure from fundamentalism works across very different fault lines than it did in Iran. We would then suggest that in the catalogue of worries that importing countries might have over energy security, internal upheaval in the Gulf should be very minor compared to the two types of discontinuity outlined in previous sections. To be concerned, one would have to sketch a realistic scenario for upheaval, and then to ally that scenario with an explanation as to why a new regime's oil policy would be radically different in the longer term.

The major threats of internal disruptions in the Middle East come more from western policy than they do from any current internal dynamic of the region. A wave of anti-Americanism would create dangers, but that wave would have to be initiated by some failure of thought in U.S. foreign policy. Iraq could indeed become an ill-defined power vacuum, but again it would be western policy that would be to blame. It is more likely that the international isolation of Iran might derail the rapprochement between Iran and the Gulf States than anything else, given the move to a more liberal regime in Iran. In short, these possibilities are more likely to emerge from what we have defined as embargo disruptions than by any internally created force majeure.

Beyond dislocations in Middle East producing countries, the other possible source of a force majeure disruption is obstructions in trade routes. To date, the only particularly significant example of this has been the closure of the Suez Canal in 1956, although there was some disruption of tanker shipping in the Gulf in the 1980s during the Iran-Iraq war. World trade in crude oil involves several choke points along supply routes. Most notably, some 18 mb/d move through the Straits of Hormuz at the entrance to the Gulf. One could also add to the list the Malacca Straits (10 mb/d), or Bab el-Mandab at the entrance to the Red Sea (3.5 mb/d). Closure at the latter two locations would cause a very temporary disruption, as cargoes can avoid those points, albeit at the expense of a considerably longer journey. Normal commercial inventories should be sufficient to cope with the hiatus in supply. Ultimately the only major effect would be an increase in freight rates as more of the world's tanker fleet would need to be in transit at any point of time.

The Straits of Hormuz are different in that most of the oil that passes through does not have an alternative export route. Saudi Arabia could divert some exports for loading on the Red Sea, and Iraq theoretically could switch some oil from the Gulf to loading at Ceyhan in Turkey. (In reality, there is rarely very much spare capacity on the Ceyhan route). However, in total there would still be some 16 mb/d of production that would in effect be locked in should Hormuz be closed.

In terms of force majeure disruptions, closure of Hormuz is then the absolute Armageddon scenario. It is, however, rather difficult to construct realistic scenarios where the closure of Hormuz for a significant period is possible. For such a scenario, one could turn to the

school of thought associated with Samuel Huntington⁷ and Kent Calder.⁸ I should admit that not only do I disagree with this school of thought, I find it distasteful based as it is on cultural differences and religious divides. In short, the hypothesis is that cultural zones define the world politic. Huntington sees the natural divide as being between an alliance of Confucianism and Islam against the Christian West (including Russia). Ultimately, the idea is that China and Islam are the natural enemies of the U.S. Calder's work focuses on energy, adding a battle between China and the West for influence in the Middle East. The spectre is raised of a Chinese blue water navy patrolling the Straits of Hormuz, as China seeks to protect its own supply lines, and coming into tension and perhaps conflict with the U.S.

It is perhaps too easy to dismiss Huntington type analyses as merely being a consequence of the fall of the Soviet Union as Washington strategic analysts cast around for a new enemy.⁹ However, Calder does make a valid point. The movement of China to net crude oil importer status is a significant change, and it does introduce a potentially powerful new player into the Middle East equation. The naval war games scenarios may be fanciful. On the other hand, we have contended that the chances of a significant and long-lasting force majeure disruption originating from within the Middle East are not large. In relative terms, concern over force majeure disruptions arising from trade route problems, and in particular Hormuz, do not then seem completely inappropriate. We would, however, reiterate that our forms of discontinuities still seem to represent a more valid area for concern than the disruptions discussed in this section.

5. Export Restriction Disruptions

The use of oil as a political defensive weapon had been attempted twice before 1973. During the Suez crisis in 1956, Syria attacked Anglo-French pipeline interests, most notably removing the Kirkuk-Tripoli pipeline from operation and stemming the flow of oil from Iraq into

⁷ Samuel Huntington (1997), **The Clash of Civilizations and the Remaking of World Order**, Simon & Schuster, New York, NY.

⁸ Kent E. Calder (1996), **Asia's Deadly Triangle: How Arms, Energy and Growth Threaten to Destabilize Asia Pacific**, Nicholas Brealey Publishing, London.

⁹ Many others have diametrically opposed views to the idea of building up the idea of a Chinese threat, for example the late Gerald Segal of the International Institute for Strategic Studies. See Segal, Gerald (2000), '*Does China Matter?*' Foreign Affairs, September/October 1999.

the Mediterranean. In 1967, an Arab oil boycott was arranged in attempt to cut the flow of oil to the West. In both cases, the success of the oil weapon was strictly limited. The oil company supply men moved oil around the world in an effective manner, and other countries, even within OPEC, increased their production. In 1967, Iran and Venezuela ramped up their production and the net impact of the boycott proved to be extremely minor. Six years later, matters were to be very different.¹⁰

The literature on the economics and politics of the first oil shock is vast.¹¹ However, the general point can be made that much of this literature does not distinguish between the effects of the oil weapon and those of the fundamental oil market discontinuity that was in play. It is all too easy to assign all the effects to the political use of oil. In the event, the fundamental discontinuity enhanced the effectiveness of the oil weapon, but it also had its own effects on the path that prices took independent of the politics. For our purposes in this paper, we wish to focus on just two aspects. First, why did the oil weapon have an effect in 1973 and not in 1967? Secondly, why have producers not unsheathed the oil weapon since 1973?

The relative success of the defensive use of the oil embargo by Arab states in 1973 compared to the failure in 1967 can be put down to two factors that we have already noted. First, the world oil market was on the cusp of a fundamental discontinuity. Demand was still increasing at more than 7 per cent per annum, and the buffer of spare capacity within the system was all but completely eroded. In 1967, production increases elsewhere covered most of the loss from the embargo. By contrast, in 1973, of the 5 mb/d reduction in supplies from the Arab countries of OPEC (OAPEC) between September and November, production increases elsewhere (most notably from Iran and Iraq), were sufficient to replace little more than 15 per cent. Secondly, the days of power of the supply men within the oil companies were passing. The vertical disintegration of the oil companies was already in progress, and the companies had little access to even the wafer thin level of spare capacity that was available. Moving tankers around the board was a game that helped solve the problem in 1967, six years later it could mitigate but

¹⁰ For an analysis of the period leading up to the 1973 embargo in terms of the political use of oil, see Al-Sowayegh, Abdulaziz (1984), **Arab Petropolitics**, Croom-Helm, London.

¹¹ To note but two approaches, for the economics of the crisis see Rybczynski, T. M. (ed.) (1976), **The Economics of the Oil Crisis**, Holmes & Meier, New York, and for the policy responses see Horwich, George and Weimer, David Leo (eds) (1988), **Responding to International Oil Crises**, American Enterprise Institute for Public Policy Research, Washington.

not completely alleviate the problem.¹² A couple of years further on from 1973, even the now limited effectiveness of the supply men had all but disappeared.

The oil weapon has been central to the perceptions of the threat posed by Middle East oil to western security since 1973. Yet it is a weapon that has only been used once, and all producer intervention in the oil market that followed it has not had overt political objectives. Its lack of use is the result of several factors. First, it is essentially a defensive weapon, and one, which is intrinsically bound with the Arab-Israeli conflict and most especially the Palestine issue.¹³ A breakdown of political stability in the region is a necessary condition for the use of that weapon. One should note the direction of causality at work here. The oil weapon is not a threat in itself. The threat is a general Middle East insecurity, which would create the conditions under which use of the oil weapon could be considered. In other words, an export restriction disruption does not occur in a vacuum.

The second reason for the lack of use of the oil weapon is more pragmatic. It is rare that the state of the world oil market is such that it could have major effects. As noted above 1973 represented far more helpful circumstances for its use than 1967. However, the third reason is perhaps the most important. The oil weapon has two cutting edges --political influence and the economic development of oil producing states. The second edge is normally uppermost in policy formation. The use of the political edge carries the need for some sacrifice, given the economic and political reactions that can have longer-term adverse effects on oil revenue streams. While countries would be prepared to make those sacrifices according to the general regional political and military situation, the primary motivation for policy in the oil market is in normal circumstances an economic one. The use of oil is intended to foster the economic development of oil exporting countries. That development could be compromised by overt politicisation and use of the oil weapon, and hence that step is only likely to be considered should the political interests of the exporters be put under heavy duress by external actions.

¹² Governments, however, still thought that the supply men could achieve a miracle. Most famously, the then Prime Minister of Britain attempted to get companies (including BP which the government held a majority shareholding in) to shift oil to the UK. He was rebuffed. (See Ritchie, Berry (1995), **Portrait in Oil: An Illustrated History of BP**, James & James, London).

¹³ For more on this interpretation see al-Sowayegh op. cit. Al-Sowayegh is particularly resentful of attempts to separate the Palestine question from the oil weapon.

The irony of the energy security dimensions of the oil weapon is that normally the weapon is considered as an abstract threat that arises in isolation. However, its use is only likely in the case of a severe foreign policy failing by western powers. All too often the oil weapon is portrayed as representing a blackmail of the West. In reality, it serves more as a factor to remind them that they should take some account of Arab sensibilities in formulating their policy towards the Middle East. Arguably, that is more of a prescription for sensible policy formation rather than being a constraint imposed on those in thrall of the use of oil in international politics. Overall, we would place the probability of an export restriction disruption over the next decade as being extremely low. Further, we see such a disruption as arising from a grievous policy failure elsewhere, not a separate event that emerges automatically from its own internal dynamics. In terms of its impact on perceptions and energy security policy, the export restriction disruption has perhaps been the most important of the five types of discontinuity and disruptions we have consider in this paper. In terms of its implications for the oil market, we would suggest that it is the least important.

6. Embargo Disruptions

In recent years, the flow of oil to the West and the patterns of world trade have been more distorted by the policies of consuming governments than by those of the producers. Embargoes, both unilateral and multilateral, have affected a series of countries. Their short run effects differ. In the case of unilateral sanctions, (such as US sanctions against Libya and Iran), the immediate effect of sanctions is simply to change the pattern of trade. The imposition of unilateral sanctions does not stop oil from being exported, but it causes a short-term period of jockeying while the embargoed oil finds new customers. Multilateral sanctions, particularly when under the umbrella of the UN, are, of course, more drastic, and the flow of oil is normally severely curtailed. In the longer term, the effects of unilateral sanctions (particularly by the U.S.) and those of multilateral sanctions begin to converge. Sanctions reduce the ability of countries to build up production capacity by reducing access to both financial capital and physical capital equipment. Unilateral sanctions may then have no significant impact on short run production, but they can impinge significantly on long term production capacity.

We do not attempt here to discuss whether sanctions are an effective political instrument. There is, however, considerable debate on whether they are either effective or the most effective

means of meeting objectives.¹⁴ There is a ratchet at work, where it becomes much easier to impose sanctions than it is to lift them, and so an embargo once imposed can become a long-term phenomenon. Indeed, at time of writing, the three most affected oil producers (Iran, Iraq and Libya) have faced a decade or more of some form of restraint. Here, our intention is simply to point out that long-term sanctions can enhance the probability of other discontinuities and disruptions. The mechanisms by which they do so comprise of a set of both economic and political factors.

In terms of economic factors, we have already noted that even unilateral sanctions can reduce long term capacity expansion rates. Normally the world oil market is prone to the consistent presence of excess capacity beyond the level needed for a sufficient safety buffer. Under those circumstances, one should perhaps not be too concerned about the impact of sanctions on capacity. However, under the rarer set of circumstances where a fundamental discontinuity becomes a possibility, the constraining impact on capacity then becomes a potential problem. While in no way implying that there is any inevitability, we have above not completely discounted the possibility of a fundamental discontinuity occurring. In such a case, an additional factor would be introduced into the case for lessening or removing the constraints faced by Iran, Iraq and Libya. The other problem with any tightening of the market is that increases the potential cost of further embargoes. For instance, at time of writing, it would seem that any reimposition of export restraints against Iraq would be an extremely difficult step to take. The irony of the situation is that the same logic would imply that Iraq's current market power and capability to cause a major disruption is increasing.

In terms of political factors, the major current problems are more centred on devising exit strategies from existing embargoes than by the possibility of fresh sanctions. We noted above that the four factors that could lead to potential force majeure disruptions were anti-Americanism, a vacuum in Iraq, a derailing of the rapprochement between Iran and Gulf States, and, related to the latter, the end of the move to a more liberal framework in Iran. All of these are affected by the exit strategy from either U.N. sanctions against Iraq or U.S. sanctions against

¹⁴ In addition, there are often underlying issues that can prove fairly intractable. See for example, Graham-Brown, Sarah (1999), **Sanctioning Saddam : The Politics of Intervention in Iraq**, I.B. Taurus, London and Cordesmann, Anthony H. (1999), **Iraq and the War of Sanctions: Conventional Threats and Weapons of Mass Destruction**, Praeger Publishers, Westport, CT.

Iran. Arab public opinion is sensitive to the scale of humanitarian crisis in Iraq. Creation of a vacuum in Iraq not only creates a major source of instability; it also potentially leads to greater anti-Americanism should circumstances require an even greater western security presence. Likewise, developments in Iran are not unaffected by the stance of the U.S. It is questionable whether reform could persevere without economic growth, and that growth relies on a full reintegration of Iran into the world economy.

These exit strategies represent the greatest threat in what we have defined as an embargo disruption. An incorrect strategy could leave all the pieces in place for a prolonged period of uncertainty. In the worst possible case, one would have an unviable Iraq with an even worse humanitarian crisis, a greater Western military commitment, and a return to radicalism in Iran. Our own view is that the Middle East is not inherently and fundamentally unstable, but there remain various ways through which Western policy failures could destabilise it. Overall, we must then rank the probability of an embargo disruption as significantly higher than the other two forms of disruption. Indeed, one could go as far as to say that the most realistic triggers for other disruptions would be failures in the exit strategy from current embargoes.

7. Conclusions

We have in this paper used a definition of energy security as the loss of economic welfare that arises from movements in energy prices. We have considered taxonomy of two forms of discontinuity and three forms of disruption. All of these have implications for energy security as all can cause rapid movements in oil prices. A summary of our conclusions on the current probability of occurrence by event type is given in Table 2.

**Table 2 : Summary of Probabilities
by Event Type**

Event	Probability
<i>Discontinuities</i>	
Policy	High
Fundamental	Medium
<i>Disruptions</i>	
Force majeure	Low
Export restriction	Very low
Embargo	Medium

We have argued that discontinuities are more common occurrences than disruptions, and indeed that policy discontinuities are almost a permanent state. In addition, we have argued that the severity of discontinuities can be greater than that of disruptions, as there is generally less ability in a discontinuity to produce compensating flows of oil elsewhere in the system. As was noted above, the magnitude of the policy discontinuity of 1999 proved to be greater than any oil crisis that has ever originated in the Middle East. The focus for energy security concerns has tended to be placed on disruptions. We would argue that this focus has both overemphasised the importance of possible disruptions and neglected the far greater exposure that consuming countries have to discontinuities.

This would imply that the policy response debate on the issue of energy security has had the wrong focus. If energy security is threatened more by high probability of policy discontinuities, then more attention should be devoted to them, rather than to fundamental discontinuities. Policies for confronting the possible damage of discontinuities tend to be relatively simple and also relatively low cost. Further, as it is generally in the interests of both producers and consumers to avoid discontinuities, these policies can sometimes be implemented so as to cause a minimum of political and diplomatic friction.¹⁵

In the case of policy discontinuities, we argued that the major reason for over and under shooting of oil prices is poor market information. A better quality of information with more depth, and produced in a more timely fashion, will always represent an improvement. One can never completely remove a degree of informational poverty about the fundamentals of the market. However, we would argue that currently the degree of that poverty is so large that it can create major dislocations in oil prices. We noted above that informational poverty and incorrect analysis not only drove prices too far down in 1999, they were also responsible for the massive overshoot in prices in early 2000. The provision of better information and better analysis into the public domain is not an expensive option, at least when compared to the high probability and high costs of policy discontinuities. However, we suspect that many governments, particularly but not exclusively in Europe, see the provision of information as an expenditure with few tangible benefits that can be easily cut, rather than as a vital energy security instrument.

Additionally, reducing the probability of a fundamental discontinuity depends on fostering a climate in which capacity expansion in producing countries maintains a healthy spare capacity buffer over the level of oil demand. As such, it has two main components. The first relates to capital markets and ensuring that producers both have access to capital, and that the terms of that access are fair. As we have noted above, long-term sanctions, both unilateral and multilateral, are not helpful in this regard. The second component is that consuming countries should recognise that there is a parallel concept to security of supply that relates to security of demand. Producing countries need to feel that there is adequate security of demand before making substantial long-term investments in production capacity. This is largely a matter of consuming country rhetoric. Sets of policy targets and projections that aim to dampen the

¹⁵ They can, however, also be implemented so as to cause a maximum of friction, as was the case for US diplomatic lobbying in response to the policy discontinuity of early 2000.

demand for oil are rarely fulfilled. Consuming governments can often send a message that their aim is that oil demand will be reduced. If that aim is not fulfilled, then they should not be too surprised that producers have not expanded capacity to cater for them. The obvious current example of this is Kyoto targets. One must be clear that from the point of view of producers, the Kyoto process undermines security of demand. As a result, it will lead them, *ceteris paribus*, to reduce their long-term investment in capacity. If it turns out that Kyoto is more about current rhetoric than it is about future actions, then the chances of a fundamental discontinuity are enhanced. Whatever the realities of Kyoto implication, one should not doubt that the major oil exporters see it as being an inherently hostile process.

Reducing the threat of discontinuities is then about attempting to reduce uncertainties in information, and uncertainties in the investment climate. Policy debate has, however, been centred on what we have argued are the less serious area of disruptions. In determining policy responses to the issue of supply security, one should distinguish between those policies, primarily economic, that seek to reduce the *ex post* impact of a given crisis, and those policies, primarily political, that seek to reduce the *ex ante* probability of a crisis. The greatest attention has been given to the former set of policies, encompassing such instruments as the maintenance of strategic reserves, import taxes and methods of changing the energy mix by promoting substitution away from oil. All such instruments carry some form of dead-weight economic loss, be that a transaction cost or a market distortion. The maintenance of strategic reserves involves a cost, added to which there is the interest foregone on the capital bound up in the reserve. Import taxes create distortions. Dictating the composition of the energy mix implies that the total cost of energy is higher than it would be without intervention. These losses are sustained in a constant stream, regardless of whether any oil crisis emerges, and need to be compared against the perceived value of the externality.

Quantifying the energy security premium is an exercise that is fraught with obvious difficulties. However, there is little evidence that such a premium is large. For example a study by the US Department of Energy in 1990 placed the premium at between 44 cents and \$1.27 per barrel of imports.¹⁶ At those levels, it becomes extremely questionable whether permanent

¹⁶ US Department of Energy (1990), **Report of the NES Oil Externality Subgroup**, US DOE, Washington, quoted in Bohi and Toman op. cit.

intervention would be rational. To put the figures in context, it would be considered a very quiet day on the futures markets if oil prices did not range over 44 cents over the course of one day. A range of \$1.27 would represent a more active, but in no way extraordinary day. While we would not put too much stress on the exactness of any estimates of the externality, the point is that there is a strong suspicion that the theoretical value of the perceived externality used by policy makers is higher than any empirical estimates.

A problem with the formulation of oil policy is that petroleum issues still tend to sit astride both politics and economics. Worse, one person's economics can be another person's politics. To give a specific example of this phenomenon, consider the non-renewal of Arabian Oil's concession to produce in the Neutral Zone when the original concession ran out in 2000. The motivations for this on the Saudi Arabian side were economic. Because of Saudi Arabia's OPEC commitments, producing oil from the Neutral Zone meant that higher value Saudi Arabian production was to be shut in elsewhere. Continuation of the concession would have meant incurring a continuing economic opportunity cost, and attempts to recover this in other forms proved to be a stumbling block in negotiation. There was very little of a political context on the Saudi side.

The political aspect was, however, much more to the fore in Japanese reactions to the ending of Arabian Oil's concession. The obvious concerns raised were focussed on the energy security implications. There is a question as to whether Japanese supply security has been damaged by the loss of the Arabian Oil concession with Saudi Arabia in the Neutral Zone, and whether it would be further damaged by any future loss of the Kuwaiti Neutral Zone interest concession. In the pre-1973 world, one would have to include that significant damage had been done, as there were now fewer pieces on the board for Japanese supply men to move about. In the post-1973, world the change makes little difference. It constitutes a shift from oil imports that are essentially moved within a vertically integrated channel to imports that are sourced through term contract. There is no evidence that Japan's position in term contract negotiations has been weakened, and as such the change would appear to have no real implications for energy security, particularly since Neutral Zone production was disrupted during the Gulf War anyway. We would argue that in the case of oil, the internal organisation of domestic energy industries is a minor component of energy security. In the quantity-led circumstances that prevailed prior to 1973, the nature of control over the oil industries and competition within it played a role in the

effectiveness of response to crises. With the emergence of a world market and the leading role now played by prices, the need for a continuing heavy control regime has passed. Governments, of course, still have the possibility of imposing emergency controls at times of crisis if desired. However, given that the value of the energy security premium tends to be low, a permanent intervention in the oil market on energy security grounds alone will be rarely justified given the dead weight costs associated with that intervention.

The above does not hold for all energy sources. For example, the market for LNG is a highly exaggerated version of the pre-1973 oil market. The commodity is governed by extremely long-term contracts. No real world market exists, and there is very little fungibility between sources of supply. The deregulation of energy markets does carry some strong implications, as generally any deregulation that allows potential entry will tend to undermine the viability of very long-term contracts. To remain competitive, LNG suppliers would then need to radically alter the basis of financing for the industry. Achieving capitalisation for a 25 year project becomes almost impossible, because consumers could only make a guarantee about security of demand by paying a large risk premium. The question for the LNG industry is how short and how flexible a contract is possible in capitalising a project under these circumstances.

In conclusion, we can state that the likelihood within the next decade of a large swing in oil prices that impacts on energy security can be rated as a near certainty. What is in doubt is the source of that swing. We have suggested that the most likely event is a policy discontinuity and the most severe is a fundamental discontinuity. By contrast, we have suggested that our three forms of disruption are less likely phenomena, and moreover that any such disruption is more likely to occur through failures in foreign policy than by any inherent characteristic of, or dynamic within, the Middle East.