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by

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Michael C. Lynch*

This paper is based on a presentation made recently to the International Energy Agency/Organization of the Petroleum Exporting Countries (IEA/OPEC) Seventh Energy Experts' Meeting in Bangkok, Thailand (February 5-6, 2004); the fact that the issue of oil supply security is still on the agenda demonstrates its continuing importance. The events in 2003, in fact, have prompted a number of Asian governments to develop their own strategic oil stockpiles as well as to consider other energy security policies. My intention was to provide some background to help guide those policies.

History

This is not a new issue. The first public discussions began early in the 20th century when Britain and the United States were considering the conversion of their navies from coal to fuel oil. Fuel oil had many advantages, but both nations feared the possibility of becoming vulnerable to political pressure from other countries' controlling the world oil trade. In particular, the British worried about U.S. dominance of world oil output, while the United States feared its own production would decline and it would become dependent on the output of U.K. companies and colonies.

The result was that the United Kingdom created what is now BP (British Petroleum) to ensure its oil supplies, while the United States set aside an oil prospective area known as the Naval Petroleum Reserve to guarantee supply for its fleet. Neither actually played a major role in guaranteeing supply for their respective fleets.

World War I also saw the first "oil crisis." The French, fearing that Royal Dutch/Shell, in which it was heavily invested, would

lose market share in Asia due to a lack of tankers, argued that their war effort would grind to a halt due to a shortage of oil. They encouraged their ally—the British—to put pressure on the United States to have Standard Oil shift its tankers to the European market. Needless to say, the oil crisis did not materialize.[1]

Moreover, the first oil supply disruption occurred at this point when the Russian Revolution cut off oil supplies from the major oil-producing area of Baku. However, given the ongoing chaos in world markets due to the war, this was not a major event.

The first successful oil embargo actually was undertaken by the United Kingdom and the United States against Japan in 1941. The two countries were attempting to slow Japan's aggression against China but instead convinced that nation's rulers to initiate a wider war and seize oil production in Southeast Asia. At the time, British and U.S. oil companies controlled virtually the entire world oil trade, which is why such an embargo was effective.

The next major problem occurred in 1951 when the Iranian government nationalized the holdings of British Petroleum, which responded by using legal means to prevent the export of Iranian oil. Given the surplus of crude-oil-producing capacity, markets were largely unaffected, but the loss of the giant Abadan refinery caused tightness in refined products' markets. It also encouraged consuming nations to push for refineries in their own territory.

Fears

There are a number of concerns usually expressed when dealing with oil supply security: scarcity, a lack of investment to add new capacity, military attacks on oil facilities, political threats including dependence on oil from foreign sources as well as relying on other nations' oil companies for supply, and, finally, volatility of supply.

To begin, two of these issues are not really important. Insufficient investment has been cited as a problem for decades, usually reflecting an exaggerated assumption about capacity cost trends and therefore capital needs. But further, analysts ignore the fact that capital flows in the direction of profits, and insufficient upstream investment would simply raise prices and profits, thereby attracting the needed capital.

And the military threat is certainly a real concern, although the nature has changed over the years. Fears that the Soviet Union would invade Iran to acquire oil proved misguided, and the U.S. Pentagon's worries that the Soviet submarine fleet would attack transatlantic oil trade thankfully were never borne out. But the primary reason not to address this issue is because here energy policy is dealt with from an economic point of view, not a military one.

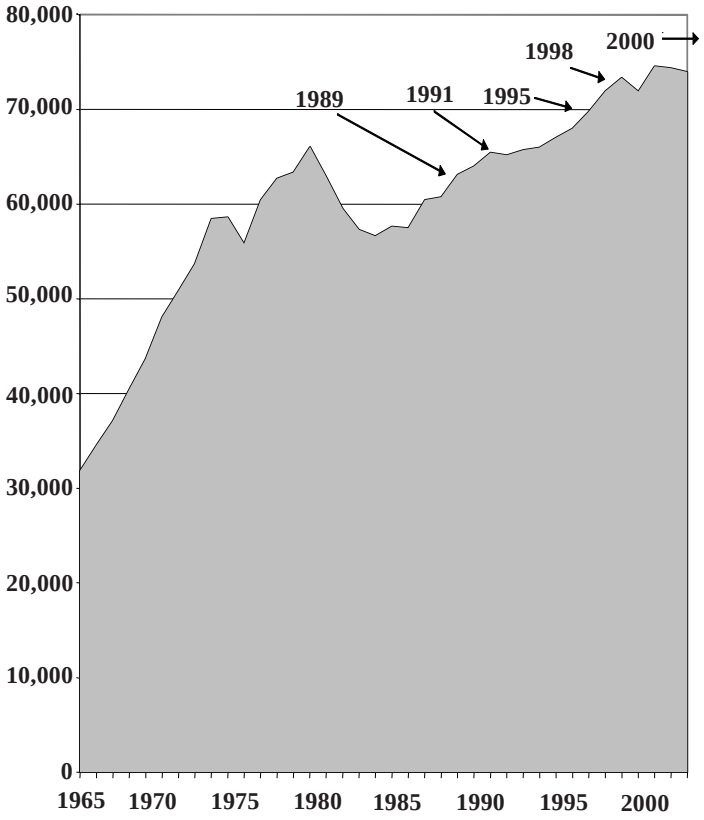
Scarcity also can be ruled out as a threat to supply security; scarcity is a fear, not a reality. Despite the publication of numerous books and articles recently and over the last few decades, there are no credible indicators of geological scarcity of petroleum resources.[2] As just one example, figure 1 shows the many predictions by Colin J. Campbell, a leading Hubbert modeler, of the date when oil production would peak. Beginning in 1989, he repeatedly has argued that the peak was imminent, that prices would be $50 per barrel or higher, and that the world would face economic chaos. The current high prices, which are well below that level, are merely a short-term bubble. Production is still rising and shows no sign of peaking.

Policy Responses

Concerns about oil supply security have led to a variety of policy proposals over the years, many of which have been ineffective or represented nothing more than subsidies for favored industries, rationalized on the grounds of energy security.[3] First and foremost has been an effort to encourage the use of other types of energy, from coal to nuclear to such exotics as solar and ethanol. In fact, the European coal industry received substantial assistance after World War II to protect its market share against cheap Middle Eastern oil on the grounds of energy security. The United States currently spends over $1 billion a year to subsidize ethanol production, which represents approximately 2 percent of U.S. oil imports.

The threat of foreign control of oil supplies has been dealt with by the creation of national oil companies in a number of circumstances, some of which were only partly state owned. This has been common in the member countries of the Organization for

Figure 1
SCARCITY A FEAR, NOT A THREAT: PREDICTIONS OF PEAKING OIL PRODUCTION, 1965-2002[a]
(in thousand barrels per day)



[a]Predictions of Colin J. Campbell. See, for example, Colin J. Campbell, "Oil Price Leap in the Early '90s," *Noroil*, December 1989.

Economic Cooperation and Development (OECD) as well as throughout the developing world. Examples include British Petroleum, French Total and Elf, Agip in Italy, Veba in Germany, Statoil in Norway, and Petrocanada.

Some of these were created as industrial policy, at least in part. The French and Italians especially have a love of "national

champions," which are thought to strengthen their economies and make them more competitive. Most of these companies have been privatized; there is a feeling they do not make a strong contribution to either energy security or economic strength in their state-owned form.

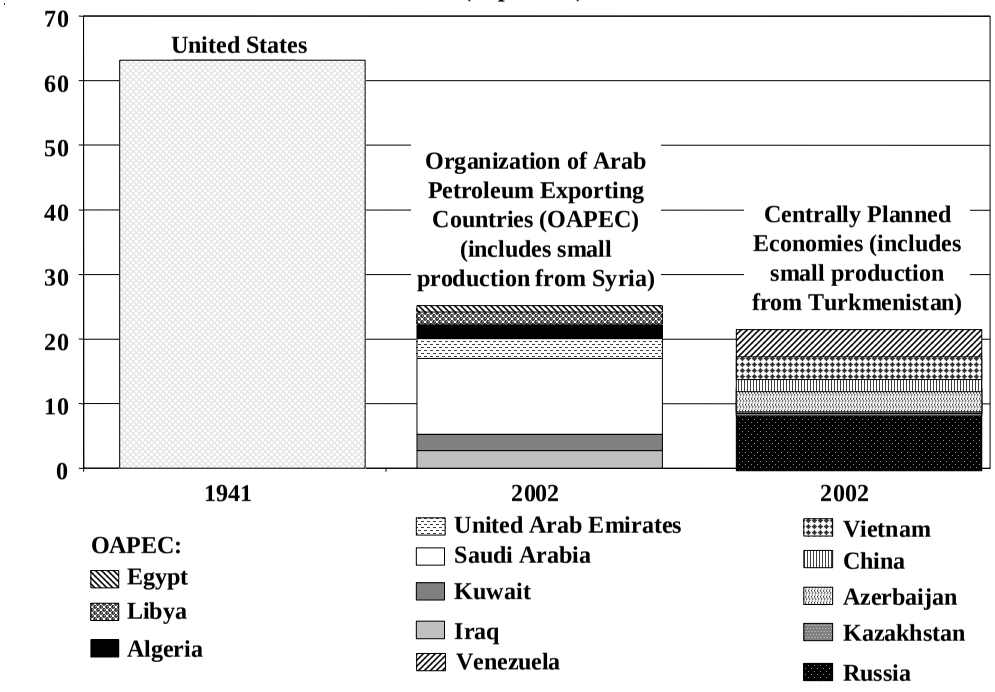
"Access" to oil supplies frequently has been sought by governments, using diplomatic persuasion, military assistance, and foreign aid, along with a variety of other incentives. The mainland Chinese government currently is presumed to be doing such by some scholars who point to military deals in the Middle East, which they believe represents an attempt to gain favor with oil-exporting nations.

There are two problems with the concept of gaining access to oil supplies from exporting nations. First, the global market has become so broad and diffuse that it is extremely easy to locate supplies on a commercial basis. As figure 2 demonstrates, the market control of the United States in 1941 dwarfs that of even the Organization of Arab Petroleum Exporting Countries (OAPEC) or the former Communist bloc now—the only two remotely cohesive groups of oil producers. Second, having a special relation with an oil-exporting government can actually prove detrimental if an oil supply disruption occurs as a result of that government being overthrown. The friends of the former government will be the enemy of the new one, as the United States discovered in Iran in 1979.

"Cooperation" has been promoted as a means of dealing with oil supply disruptions, including cooperation between the IEA and OPEC as well as cooperation within the IEA. And certainly, cooperation is always to be desired, but it is a rather fragile tool. In the two oil crises of the 1970s, many of the OECD nations talked of cooperation while taking steps to acquire oil supplies to the detriment of their allies.

Finally, the one energy policy upon which nearly everyone can agree is the maintenance of surge capacity to be used in times of supply disruptions. References to the utility of surge capacity, and specifically strategic stocks, go back thousands of years to the Bible and the creation of wheat storage against famine. Strategic petroleum reserves are in that same model.

Figure 2
ECONOMIC EMBARGOES AND MARKET CONTROL, 1941 AND 2002
(in percent)



Realistic Concerns, New and Old

I would like to re-emphasize the greatly diminished threat of economic embargoes, which still concerns some. As seen in figure 2, market concentration has declined enormously over the past few decades. No one country makes up a significant portion of the oil market, certainly not like the United States did for the industry's first century. It is unlikely that any group of nations could make common cause to declare an embargo that would be effective any more. Even the market shares of OAPEC, whose embargoes in 1967 and 1973 did not actually deny supplies to the targeted countries, have fallen.

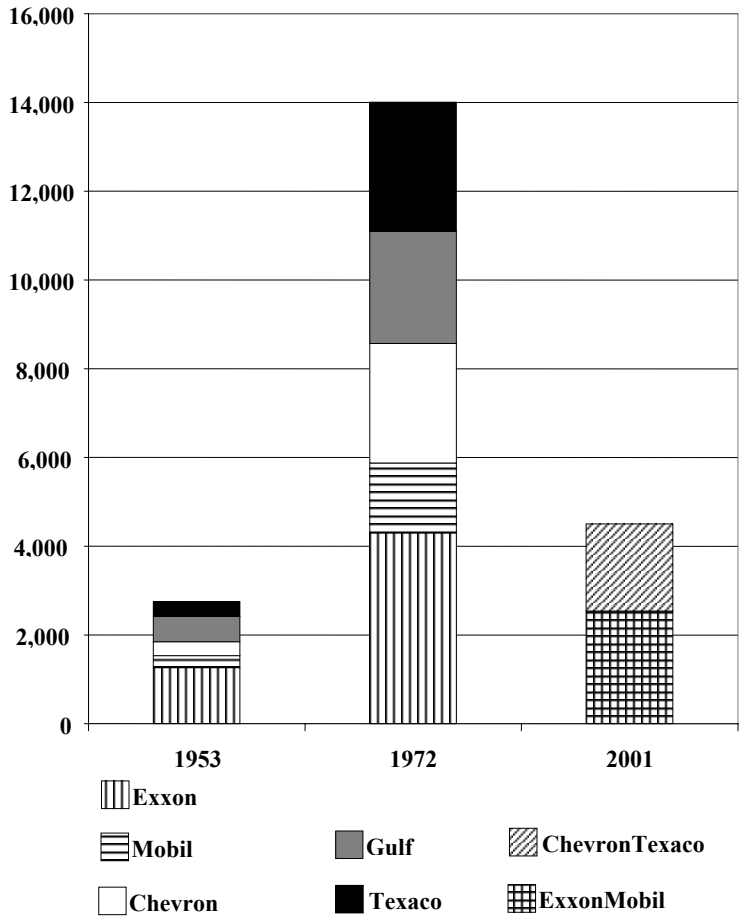
Only in the case of a global consensus, presumably within the United Nations and backed by military force (particularly the U.S. Navy), is an embargo likely to succeed. Given the difficulty in accomplishing such a consensus, it must be presumed that only an extraordinary cause, such as the invasion of another country or use of nuclear weapons, is likely to be sufficient to forge such a consensus.

And no country possesses control of the industry through ownership of oil companies any longer. As figure 3 shows, the U.S. majors no longer represent a significant portion of the global oil industry, even after the mergers of recent years. Saudi Aramco, the world's largest oil company in terms of production and reserves, has a market share less than the largest U.S. and British majors did prior to the 1970s. As seen in figure 4, the rest of the world's market has grown and left the majors' role much diminished. They have been replaced by a myriad of smaller companies representing a wide variety of countries and governments.

It is worth noting that the only two successful embargoes that have been carried out were both initiated by the United States: in 1941 against Japan and in 1990 against Iraq. Since the most recent oil supply disruption was the U.S.-led invasion of Iraq, some could argue that the United States is the greatest threat to oil supply security.

Although many of the traditional concerns are no longer valid, there are two remaining areas that governments need to address: supply and demand volatility. The former is the more important as the latter occurs primarily as a result of the former.

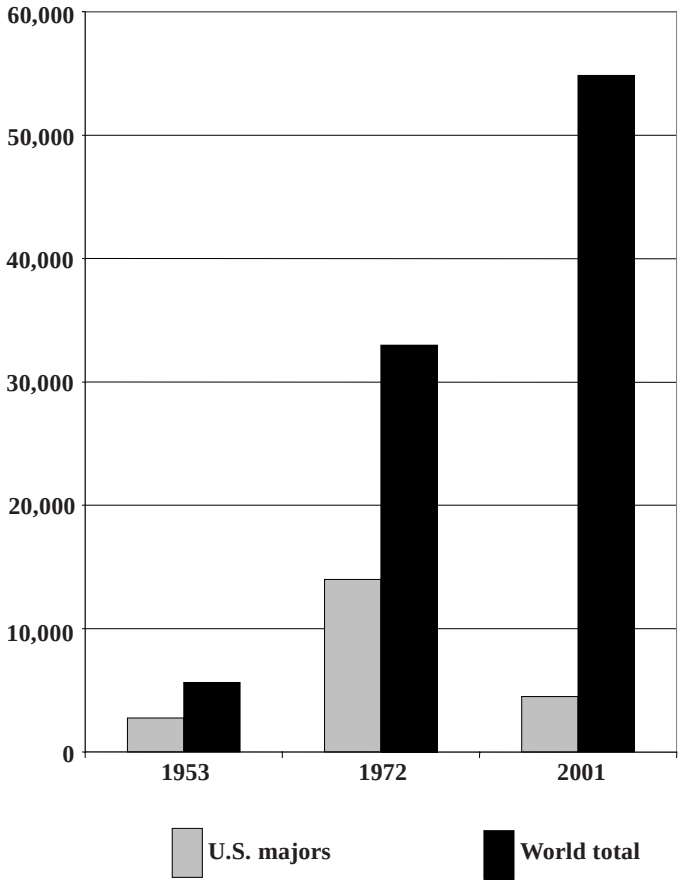
Figure 3
THE U.S. MAJOR OIL COMPANIES' PRODUCTION, 1953, 1972, AND 2001
(in thousand barrels per day)



Supply Volatility

Supply volatility here refers specifically to changes in supply that are (a) unplanned, (b) due to events that are unrelated to the oil market, such as wars and civil strife, and (c) large enough to be important. This deliberately excludes events such as pipeline

Figure 4
U.S. MAJORS' PRODUCTION IN A GLOBAL PERSPECTIVE, 1953, 1972, AND 2001
(in thousand barrels per day)



breaks, regular maintenance shutdowns, or attempts to manipulate the oil market.

That these supply changes are caused by events external to the oil market, as opposed to a nationalization or embargo, is significant for policy reasons: energy policies will not affect the triggering mechanism. Consuming nations cannot enact an oil security policy that will prevent wars in the Middle East or political instability in areas like Nigeria, Venezuela, or California.

The year 2003 was a good example of how there still exists a threat of supply disruptions. It also shows how relatively minor events can combine to worsen the situation. The loss of some Nigerian supply would have gone unnoticed if it had not occurred in combination with the strike in Venezuela and the loss of Iraqi production (figure 5). Even the larger cutoff of Venezuelan oil, due to its brevity, would have been almost unnoticed if it had not occurred just before the war in Iraq commenced.

Pipelines: A Growing Element

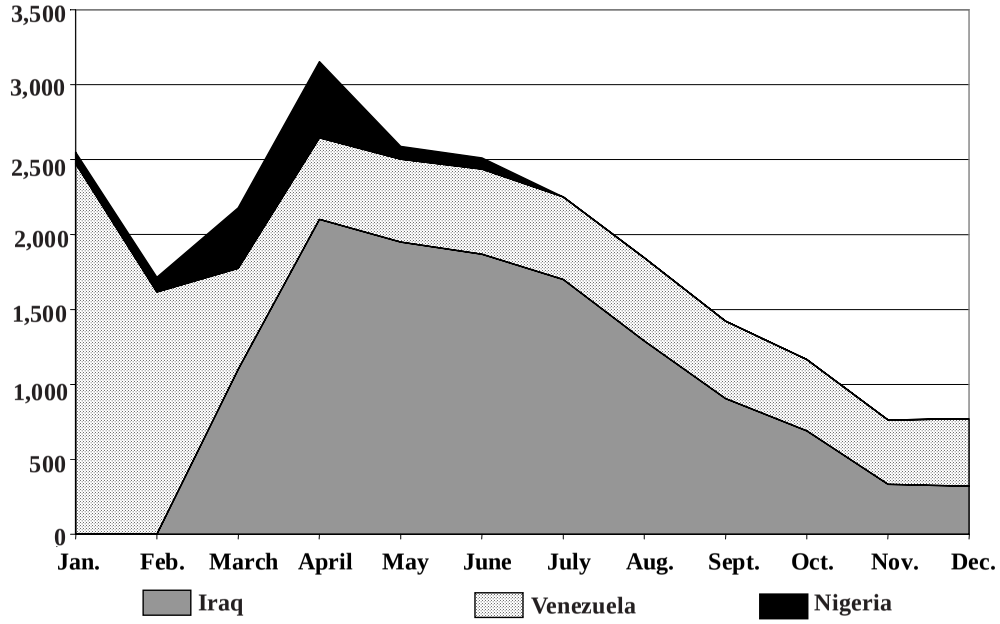
A little noticed factor in the world oil market is the increasing reliance on long distance, transnational oil pipelines. In the past, only a few pipelines crossed national borders, mostly in the Middle East, which suffered difficulties primarily due to political conflicts and most of them ultimately were shut down by these problems. At the same time, however, the exporting nations had alternative routes that they could use so that the impacts were relatively minor.

The Trans-Arabian Pipeline that went through Transjordan is one such example. After the creation of Israel, the pipeline was rerouted to go through Syria and Lebanon. But after Israel seized Syria's Golan Heights, disagreements about the repair of the pipeline led to it being closed permanently. An Iraqi export line through Syria was closed after Iraq attacked Iran, an ally of Syria; it only reopened in the past few years. The biggest line was the one from Iraq to Saudi Arabia, which was closed after the Iraqi invasion of Kuwait in 1990.

Now, however, there are a number of large pipelines from the Caspian that cross several borders and some Russian export routes through former Eastern bloc allies or daughter republics. There also are proposals to build a Russian pipeline either to China or its Pacific coast, as well as from Kazakhstan to China, along with the reopening of the Iraqi-Saudi pipeline. The results could be as much as 5 million barrels a day of oil traversing through a handful pipelines, much of it originating in the former Soviet Union and/or traversing Russian territory.

This is not a major policy concern, especially compared to the vulnerability of the oil fields in the Middle East. However, the concentrated transportation capacity represents a serious

Figure 5
OIL SUPPLY LOST IN 2003
(in thousand barrels per day)



vulnerability, given the large amount of capacity involved in some of the pipelines. Although accidents usually should not cause lengthy closures, the danger of terrorist or guerrilla attacks repeatedly closing a pipeline is very real as is the possibility of other political and/or fiscal disputes leading to the shutdown of a line. Such an event is unlikely to trigger an oil crisis, but the unexpected loss of 1 million barrels a day of supply to the world market could worsen an existing oil supply disruption.

The Decline of OPEC's Surge Capacity

Probably the biggest factor that has increased the world's vulnerability to oil supply disruptions is the long-term, secular decline in OPEC's surplus capacity. As figure 6 illustrates, surplus capacity was enormous during the 1980s when demand for OPEC oil collapsed. However, this was not a normal situation and cannot be expected to occur in the future, certainly not on that magnitude. No country wants to maintain unused capacity on a regular basis—the exception being Saudi Arabia, which maintains a "strategic" surplus. Simple depreciation and decline over time means that any surplus can be expected to disappear, depending on OPEC's market expectations and investment.[4] There is likely to be some new surplus capacity in the years to come, especially with Iraq expanding its oil production. But it will be nothing like what was experienced before and is likely to remain insufficient to offset more than minor losses of oil supply.

Downstream Vulnerability

For many years, the downstream sector of the industry has not been considered vulnerable to disruption, and experience certainly supported that. However, the 1951 loss of the giant Abadan refinery in Iran should be kept in mind as evidence that downstream does matter. As the enormous surplus capacity in the global refinery sector has declined, and as the reliance on product exports from OPEC members has risen, the vulnerability to downstream disruptions has increased (figure 7). Still, the threat is much less than on the upstream side, where export levels are much higher. More frequent but relatively minor problems can be expected from downstream incidents compared to the occasional upstream disruption.

Figure 6
SURPLUS CAPACITY OF THE ORGANIZATION OF THE PETROLEUM EXPORTING COUNTRIES, JANUARY 1970-JANUARY 2002
(in thousand barrels per day)

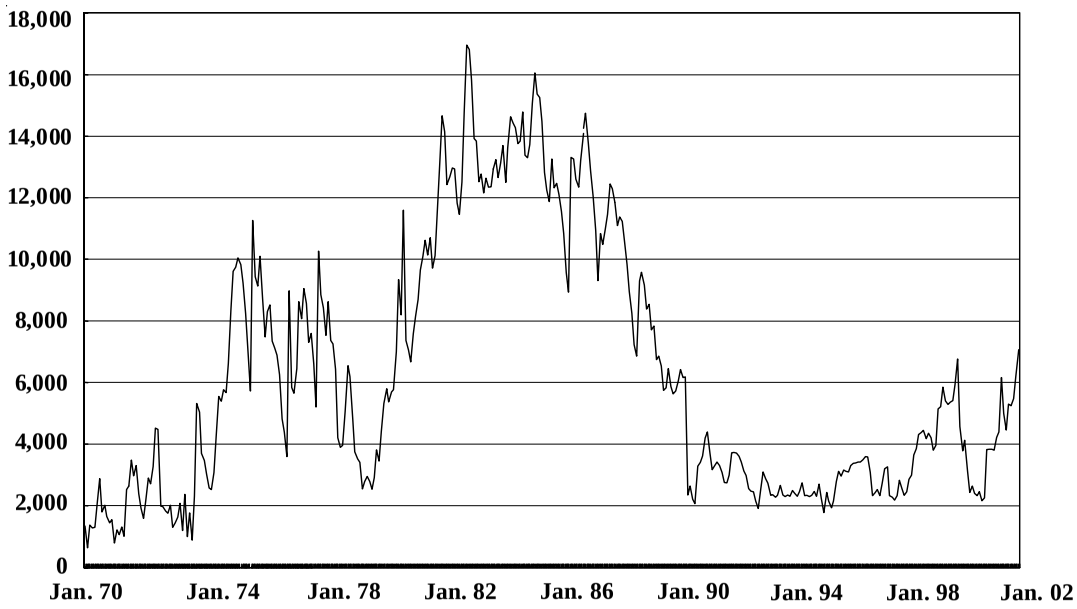
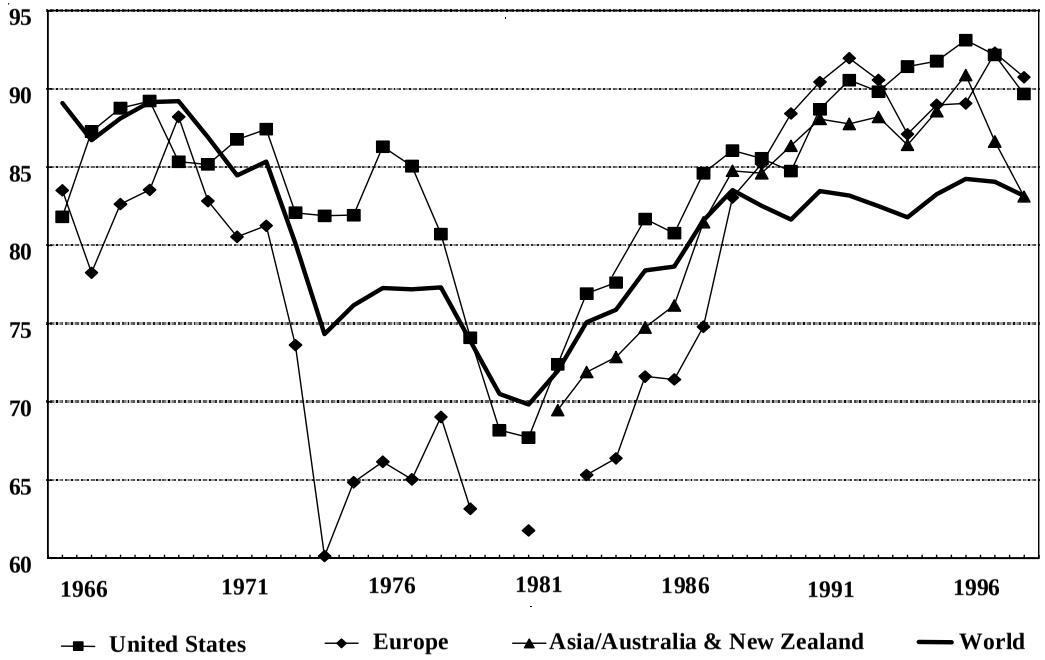


Figure 7
REFINERY CAPACITY UTILIZATION, 1966-2002
(in percent)



Demand security receives very little attention normally. Of course, OPEC often complains about the volatility of demand.[5] But aside from the normal commercial uncertainty, this is usually not a major problem. Sharp, unexpected changes in demand caused by external events are relatively infrequent and normally of limited size. Two recent cases include the impact of the September 11, 2001, terrorist attacks on the global economy—and especially jet fuel demand—as well as the outbreak of SARS and the 2003 war in Iraq—again on jet fuel demand.

Both represented dislocations in global oil demand, but not severe ones. And while demand in China and other areas has tended to be stronger than expected in 2003 and early 2004, the biggest problem is the lack of transparency. The fact that the Chinese market is still dominated by a few players and strongly influenced by government policy means that imports can shift suddenly and unexpectedly. Still, the magnitude of the change (and uncertainty) is relatively small compared to the oil crises that have occurred in the past.

Demand Security: The Downside of the Strategic Petroleum Reserve

Some have fretted that demand for oil to fill strategic petroleum reserves (SPRs) will put pressure on the market and cause problems as governments shift their buying habits unexpectedly. At least one U.S. energy economist has suggested using the U.S. SPR to deliberately manipulate the world oil market—a suggestion that is unlikely to be implemented and certainly ineffective if tried. These concerns would seem to be overblown.

Demand Security: Hoarding

Finally, I would point to one remaining issue regarding insecurity of demand. In recent years, hoarding has not seemed to be a major problem; it did not occur in either the Gulf War of 1991 or the 2003 war in Iraq. The Iranian oil crisis in 1979 is the primary example of the potential effect, given that hoarding reached as much as 3 million barrels a day and lasted for well over a year, thereby prolonging the crisis and definitely proving a major cause of the lengthy period of elevated prices that ultimately occurred.

Hoarding is important because it directly correlates with market tightness. People hoard because of uncertainty about supply. This is natural behavior and is economically rational, not aberrant. Past analyses broke down over the interpretation as panic (or prudent) behavior and as representing speculation.[6]

But since hoarding did not occur in the past two crises (1991 and 2003), some believe it will not occur again. This is not certain, however, because special circumstances may have reduced the incentive to hoard in those instances. As mentioned, hoarding is economically rational under the right circumstances. Figure 8 shows that commercial inventories have declined over the years as the industry attempts to reduce its inventory costs. But in doing so, it is increasing the market's vulnerability to supply disruptions and hoarding.

Conclusions

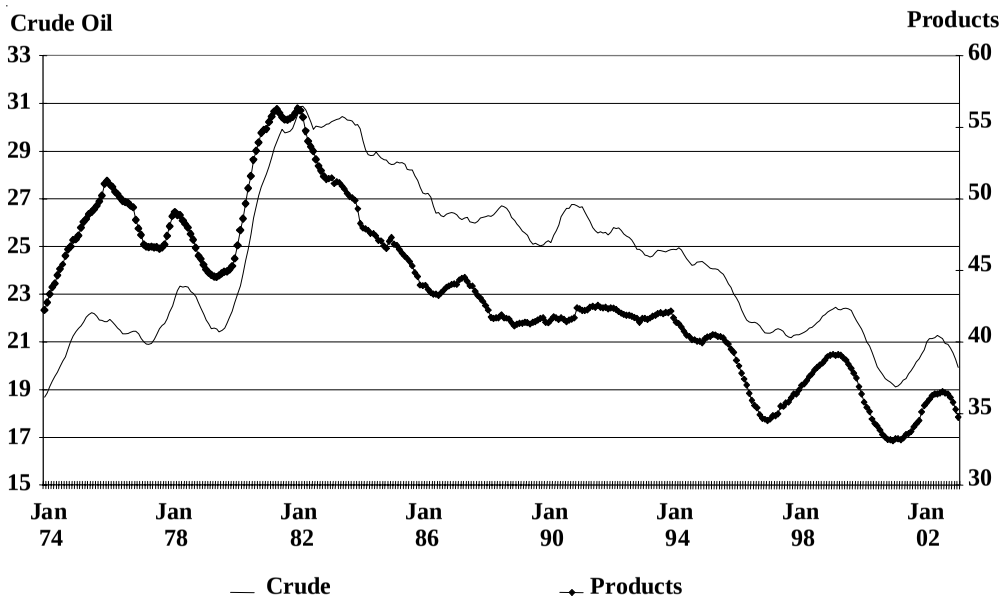
In conclusion, I have to say, and only partly in jest, that the United States is clearly part of the oil security problem. U.S. politicians love to interfere in free markets in an effort to accomplish various political goals. Also, the United States is the dominant military power at present and few others are capable of the type of actions as were seen in the 2003 Iraq War.

But more important, embargoes are not the threat that many governments seem to think. The world oil market has become so diffuse, there are so many oil-exporting nations and so many oil companies, that only under unusual circumstances could an embargo be effectively mounted. It would require that a nation commit a severe offense against the international community and/or be vulnerable to a naval blockade, that is, an island nation.

Further, supply disruptions are quite certain. They are a constant of the world's political economy and, if anything, are now more likely as a result of growing political instability in the Middle East as well as the economic problems that most oil-exporting nations are experiencing. The growing exports from Russia, which remains politically volatile, are an added potential source of future instability.

In terms of policies, the primary—almost the only—effective approach is the presence of surge capacity. Having excess capacity

Figure 8
COMMERCIAL CRUDE OIL AND PRODUCT INVENTORIES, JANUARY 1974-JANUARY 2003
(in days of consumption)



in OPEC is useful but not guaranteed, nor is its use in any given disruption. Unfortunately, consumer strategic stocks also have a long record of going unutilized despite their clear need (as in late 1990 or early 2003). Hopefully, the future will see better-informed decisions by policy makers as there is no doubt they will be called upon to confront energy security perceptions and issues again and again.

NOTES

*Michael C. Lynch is President of Strategic Energy and Economic Research (SEER) and a research affiliate at the Center for International Studies of the Massachusetts Institute of Technology (M.I.T.). He has combined S.B.-S.M. degrees in political science from M.I.T. and has performed a variety of studies related to international energy matters, including forecasting of the world oil market, energy and security and corporate strategy in the energy industries, as well as analysis of oil and gas supply. The author currently is working on a book, *The Fog of Commerce: Oil Crises and Economic Security*. Mr. Lynch is a former Chief Energy Economist at DRI-WEFA, Inc., a leading economic consulting firm, a past-President of the United States Association for Energy Economics and Program Chair of its 1996 North American Conference. Aside from English, his publications have appeared in Spanish, Arabic, Italian, Russian, and Japanese. He serves on the editorial board of the journal *Energy Policy*.

[1]This instance was described in detail in Gregory P. Nowell, *Mercantile States and the World Oil Cartel* (Ithaca, New York: Cornell University Press, 1994).

[2]A review of these many forecasts can be found in Michael C. Lynch, "The New Pessimism about Petroleum Resources: Debunking the Hubbert Model (and Hubbert Modelers)," *Minerals & Energy*, vol. 18, no. 1 (2003).

[3]Robert Bradley, *Oil, Gas & Government: The U.S. Experience* (Lanham, Maryland: Rowman & Littlefield Publishers, 1996), discusses the manner in which many U.S. regulations served protectionist ends.

[4]I first warned of this in Michael C. Lynch, "The Next Oil Crisis," *Technology Review*, November/December 1987.

[5]See Michael C. Lynch, "Causes of Oil Price Volatility," *The Journal of Energy and Development*, autumn 2002.

[6]An excellent discussion can be found in Daniel Bedger and Robert Belgrave, "Oil Supply and Price: What Went Right in 1980," Energy paper no. 2, Royal Institute of International Affairs, London, 1982.