Cost, Conflict & Climate

Navigating the Global Oil Market

By Severin Borenstein

Interest in energy policy has surged – driven, of course, by $4-a-gallon gasoline, but also by an increasing awareness that people, as well as polar bears, are at risk from climate change. If that interest is to lead to something more constructive than grumbles about speculators and promises of gas-tax holidays, we need a better understanding of how the highly integrated worldwide oil market works and how the United States' choices affect it. In particular, we need to understand the triple threat posed by addiction to oil: the economic dislocation caused by

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volatile energy prices, the geopolitical issues posed by world dependence on a few increasingly autocratic oil-producing countries, and the need to reduce fossil-fuel consumption in order to contain global warming. These concerns are interrelated, but they differ in important ways; addressing any one of them in isolation could undermine progress on the others.

WHAT'S HAPPENED TO THE OIL MARKET?

The price of oil early last year was about $60 a barrel. By midyear, it was climbing sharply, exceeding $140 in July 2008. That $140 price is roughly one-third higher in inflation-adjusted terms than the previous historical peak in 1981, in the wake of the Iranian revolution and the beginning of the Iraq-Iran war.

While the media focuses on the rapid run-up in the "spot" price of oil, the change in the market's expectations about future oil prices is yet more striking. From the early 1990s until 2003, long-dated oil futures (that is, contracts for buying and selling oil many years hence) traded at close to $20 a barrel, even as shorter-term futures gyrated in the $10 to $40 range.

But since 2003, long-term futures have been rising sharply in conjunction with short-term prices, indicating that a large share of the price increases reflect perceived long-term scarcity, not transitory phenomena.

The price run-up is frequently linked to the decline in the value of the dollar. After all, when the dollar falls, all goods traded in other currencies in world markets become more expensive. But the quantitative impact depends on how much of the world is buying oil with dollars. For example, if all the world's economies were bound to the dollar except for one tiny country, then a fall of the dollar against that little country's currency would barely change total world oil demand in terms of the dollar-denominated price, so the impact on that price would be negligible. At the other extreme, if the dollar were used in only a tiny fraction of the world's economy, a fall in the greenback against all other currencies would require a nearly one-for-one increase in the dollar-denominated price in order to keep supply and demand in balance.

Reality lies somewhere between. A substantial portion of the world's oil is consumed in economies tied to the dollar. But a larger portion, including oil bought by Europe and Japan, isn't. Between January 2003 and June 2008, the dollar depreciated by 11 percent against the yen, 20 percent against the British pound and 34 percent against the euro. Overall, the dollar has fallen roughly 25 percent against other currencies, and about 75 percent of world oil demand comes from economies using these other currencies, so world demand in terms of dollars has risen by about 19 percent.

All other factors equal, that means that the price of oil would only have to be 19 percent higher in dollar terms in order to clear the market. Over this period, however, the actual increase in the dollar-denominated price of oil has been over 300 percent. Plainly, dollar depreciation has made a difference, but does not directly explain much of the hike in the price of oil.

The Role of Speculators

The blogosphere, as well as many members of Congress, are ready to blame the newest high-profile players in financial markets – hedge

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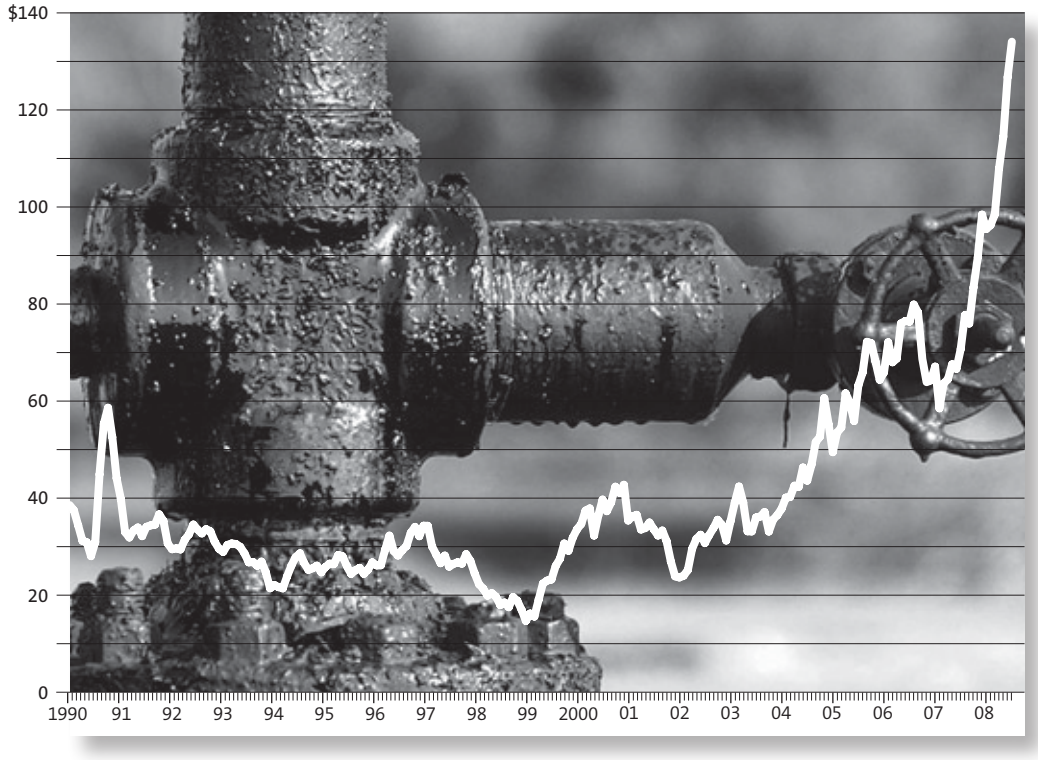
NYMEX CRUDE OIL FUTURES

REAL PRICE OF FRONT-MONTH CONTRACT



SOURCE: Nymex; U.S. Bureau of Labor Statistics

funds, commodity index funds and other institutional investors – for the run-up. An increasing proportion of the participants in oil futures markets are indeed new players who aren't buying oil to hedge against increases in their own production costs, as is done by some refiners and industrial consumers of oil products. As a result, the argument goes, prices are well in excess of those justified by market fundamentals. Some go a step further, arguing that speculators are manipulating the markets, taking big positions in oil futures with the intent of changing expectations and driving up prices.

All this may ring true to consumers and politicians bewildered by the price increase. After all, one can't point to a geopolitical event affecting supply the way one can for the first oil shock in 1974-75 (the Arab oil embargo) or the second in 1980-81 (the Iranian revolution). But the speculation theory just doesn't fit the facts. The demand for physical oil deliveries is matching supply at the current high prices. According to the International Energy Agency, the ratio of oil inventories to oil consumption in developed economies has fluctuated relatively little over the last decade.

Could those speculators be buying actual barrels of oil and secretly storing them, in an effort to boost prices? Not at all likely. To support an oil price just 30 percent over the true market equilibrium, hoarders would have to stash at least 3 percent of world output, or 2.5 million barrels a day. That's enough to fill the

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entire U.S. Strategic Petroleum Reserve – stored in vast underground salt formations – in less than a year. There's no place for speculators to hide that much oil.

This doesn't mean that the price of long-dated oil futures will turn out to be an accurate predictor of oil prices two, five or eight years down the road. Market expectations of future prices, after all, are frequently incorrect, whether in stocks, housing or energy. But regardless of whether long-term oil-futures prices are near the top of a bubble, anyone claiming that the spot price is being distorted by financial traders must still explain how current supply and demand are in sync at that price.

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SO WHY IS OIL SO EXPENSIVE?

The most plausible explanation is the simplest and, unfortunately, also the most dispiriting for consumers: too much demand is chasing too little supply. Worldwide oil consumption, driven increasingly by China, India and other developing countries, went up 1 percent in the fourth quarter of 2007 compared to a year earlier, even though the price was about 50 percent higher. And the end is nowhere in sight. A number of large, rapidly growing economies are on the cusp of even more rapid demand growth as their increasingly affluent consumers discover the joys of mass car ownership.

Still, world demand has been growing for decades. Why the price run-up now?

Until this decade, the capacity to supply oil had been growing just as fast as demand, leaving plenty of room to expand production at the first sign of rising prices. In the last few years, however, supplies have not been keeping pace, thanks to problems ranging from mismanagement (Mexico, Venezuela and Iran), to violence (Iraq and Nigeria), to depletion of older fields (the United States, Norway and Indonesia). Today, only Saudi Arabia has the capacity to significantly increase output in the short run.

With the market supply balanced so tightly, even a small acceleration in demand may not be accommodated with additional quantity, so it has to be offset with higher prices that cause some consumers to cut back. Because the world demand for oil is not very sensitive to price in the short term, it takes a big price increase to achieve the required reductions in consumption. That largely accounts for the price jumps we've seen over the last year.

The tight balance also gives a major oil producer the market power to raise prices further by ratcheting down output. In the past, OPEC has tried to do this collusively, with modest success before 1986 and mostly failure since then. But today's near-shortage means that one swing producer – Saudi Arabia – is in a position to move the price on its own by curtailing just 1 or 2 percent of world supply.

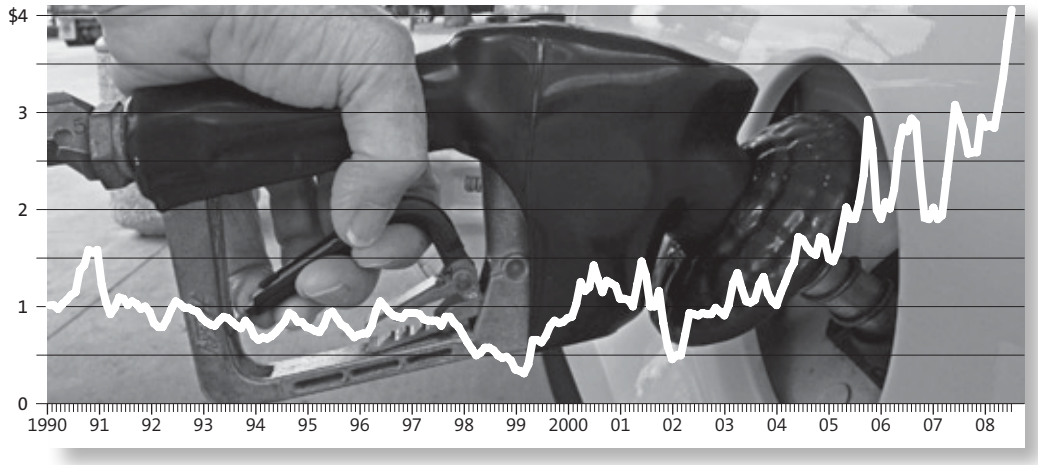
All told, then, sluggish growth in supply and rapid growth in demand, exacerbated by the weak dollar, explains the recent price run-up pretty convincingly.

The Price at the Pump

Consumers don't track oil markets. Most drivers don't even know how much oil is in a

U.S. GASOLINE PRICES

AVERAGE PRICE OF A GALLON OF GAS



SOURCE: U.S. Energy Information Administration; U.S. Bureau of Labor Statistics

"barrel." (It's 42 U.S. gallons.) What consumers care about is the price of refined products, like gasoline, diesel fuel and heating oil. The price of gasoline has been rising since 1999, which was when the inflation-adjusted retail price hit its lowest level in history. Gasoline prices track oil quite reliably, with every $1 increase in the price of a barrel of crude translating to about a 2.5 cent increase per gallon at the pump.

Besides oil and taxes, the other major component of gas prices is the refinery margin – the difference between the cost of crude and the wholesale price of refined fuels. The two earlier oil shocks drastically reduced the growth in gasoline demand relative to expectations, leaving refiners with considerable excess capacity and leading to 20 years of low refinery margins. Not surprisingly, however, refinery expansion lagged demand growth over that period, so by the beginning of this decade the capacity overhang had mostly disappeared. In addition, mergers among refiners in the late 1990s and new regional gasoline standards (to meet air-quality standards and other regulations) that balkanize markets gave some companies the market power to boost margins further in some regions. The result: for most of this decade, refiners have been making great money.

But 2008 looks like the 1970s all over again if you are producing gasoline. High oil prices have undercut gasoline consumption and sunk refiner margins. The only bright spot for this segment of the industry – thus, an even darker spot for consumers – is the diesel market. The global capacity to refine middle distillates (including diesel fuel, heating oil and jet fuel) has tightened because of rapid growth in demand for these products from Europe, Japan and developing countries.

In the last 10 years, the share of new cars running on diesel in Europe has nearly doubled, to more than 50 percent. And in many parts of the developing world, diesel still plays a major role in electricity generation, where demand continues to rise. The result of this changing demand pattern has been lower margins on gasoline and higher margins on middle distillates.

In the short run, refineries have limited flexibility to shift the production mix between

gasoline and other products. But eventually the difference in profitability should induce more refineries to invest in equipment that can alter the mix toward middle distillates, which will bring down their margins while probably pushing up gasoline margins. In fact, the wholesale price difference between diesel and gasoline was 40 to 50 cents in summer 2008, but the futures markets are predicting it will be down to 17 cents by the summer of 2011.

for instance, would probably deliver about 1 million barrels a day to a global market likely to reach 100 million barrels a day by the time the new wells came on line. The fact that it would expand oil production in the United States by more than 15 percent is irrelevant for evaluating its impact on prices to American consumers.

In fact, additional domestic production offers no more benefit to American consumers than added production in any other part of the world that is sufficiently stable to de-

Expanded domestic production would have a very modest impact on the price of petroleum products because the price of oil is set by global supply and demand.

HIGH OIL PRICES AND THE U.S. ECONOMY

With less than half of the oil used in the United States consumed as gasoline, the effect of an oil price shock extends well beyond the pump. In all, the United States slurps up about 21 million barrels of oil per day. At $130 a barrel, this costs American consumers about $760 billion a year more than oil at $30 a barrel, roughly an extra $2,500 per person annually.

In 2007, three-quarters of the oil consumed in the United States was imported. The gap between domestic production and consumption is frequently presented as the primary energy challenge the country faces – particularly by advocates of expanded exploration and drilling in the United States. Expanded domestic production, however, would have a very modest impact on the price of petroleum products because the price of oil is set by global supply and demand. Drilling in the Arctic National Wildlife Refuge in Alaska,

liver a reliable supply. Still, oil production in the United States does generate income, increasing the profits of mostly American-owned companies and generating royalties and tax revenues for the U.S. Treasury. In the debate over domestic drilling, those are the benefits against which the environmental costs need to be weighed.

Beyond these direct effects, there are also macroeconomic concerns about the process of adjusting to rapidly changing prices and personal spending power. Oil price shocks preceded nearly all of the economic downturns that have occurred in the United States since 1970. The most recent run-up, however, may not have a similarly doleful impact. Earlier oil shocks occurred in an era in which oil represented a larger portion of total income. Probably more important, in previous oil market disruptions, Washington responded by imposing price and allocation regulations that significantly added to the economic dislocation. (Gasoline price regulation in the

United States, not the Arab oil embargo, caused the 1970s gas lines.) Finally, prior to the last few years, the experience with oil price shocks has been primarily from sudden supply-side disruptions, while the current increase is largely driven by strong demand worldwide. The dislocations linked to demand seem likely to have a less serious macroeconomic impact.

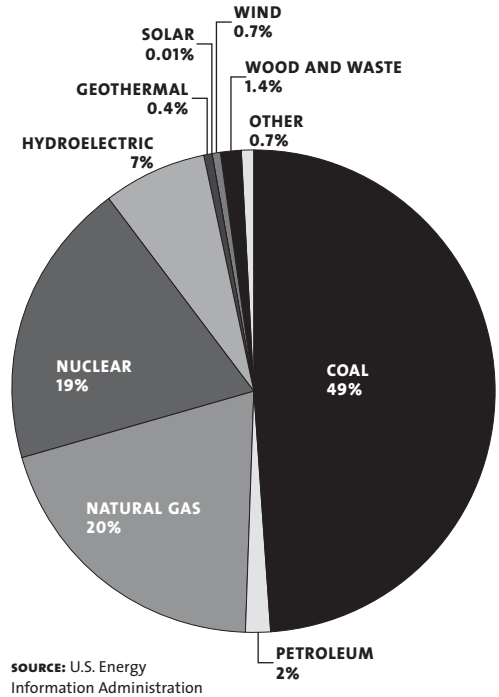
Still, the macroeconomic challenge of avoiding recession or inflation (or both) is formidable. With oil at $130 a barrel (in contrast to the $30 price that the 2003 futures market forecast for 2008), the United States was spending about $500 billion more per year for oil imports than was anticipated five years ago – a substantial drag, even in a $14 trillion economy.

THE GEOPOLITICS OF OIL

Oil price increases strengthen the economic hand of oil exporters, including those that make no secret of their animosity toward the United States. At $130 a barrel, Iran is earning at least $65 billion more per year from oil exports than it would be earning if the price were $30 a barrel. That means more cash is potentially available to finance Hamas and Hezbollah or to invest in the technology to build nuclear weapons. Venezuela is enjoying a similar-size windfall, and using some of it to sustain anti-American interests in Nicaragua, Cuba, Ecuador, Bolivia and Argentina.

One might expect that such a significant transfer from American consumers and toward unfriendly and repressive governments would give American policymakers the backbone to get serious about reducing oil consumption. But there has been little movement in that direction. The view of many American consumers seems to be more aptly captured by the bumper sticker that asks, "What's our oil doing underneath their country?"

SOURCES OF ELECTRICITY GENERATION IN THE U.S., 2006



SOURCE: U.S. Energy Information Administration

High oil prices and large outlays for imports also contribute to the trade deficit, which increases liabilities to foreigners that must ultimately be paid back or exchanged for U.S. assets. This has led to the hypocritical political position that countries selling us oil (as well as other goods and services) should be content to take payment in dollars – and should not use the revenues from those sales to purchase American banks, port facilities, oil companies, or other assets with strategic or symbolic value. With a weakening dollar, however, holders of those dollar liabilities will be ever more inclined to convert them to tangible assets.

One strategy gaining traction in Congress is to prosecute OPEC in U.S. courts on charges of collusion under the Sherman Antitrust Act. However, the legal basis for prosecuting companies that are wholly owned by sovereign

nations is problematic. In addition, the collusion shoe doesn't look any better on the other foot; many of the same politicians ready to declare legal war on OPEC are also arguing that the United States should create a purchasing cartel with other oil-consuming countries to counter OPEC's alleged market power with some of our own.

If such intergovernmental coordination were actually subject to the Sherman Act, agreements to reduce consumption in order to lower prices would be as illegal as agreements to reduce production in order to raise prices.

OIL AND CLIMATE CHANGE

Few American leaders have come to grips with the tensions among the goals of lowering energy costs, containing the power of hostile oil producers and slowing global climate change. Coal producers, for example, are still promoting their product as a plentiful, reliable substitute for imported oil. Coal could, indeed, be converted to liquid fuel for transportation – and at a cost that is quite competitive with $130-a-barrel oil. But creating synthetic fuel derived from coal would emit two to three times more greenhouse gases than production from conventional oil.

Clean-coal technologies may someday reduce emissions substantially, but that day isn't likely to arrive soon. And even if these technologies were ready for prime time, the liquid fuel would still be burned in internal combustion engines, emitting carbon dioxide in quantities equivalent to gasoline.

Ultimately, containing climate change will require much greater use of non-fossil fuels for transportation. Two broad technologies are most relevant for the next few decades: biofuels and electric vehicles. For the moment, the only biofuel produced in quantity in the United States is corn-based ethanol; it replaces roughly 5 percent of the energy supplied by oil in the United States. But the energy from coal and natural gas required to produce ethanol from corn, along with conversion of forest and grassland to new cropland, offset most or all of the greenhouse gas reduction from burning less oil. Ethanol can be produced from other plant feedstocks, some of which don't require arable land, as corn and

other food-based feedstocks do, but fuel synthesis from less valued feedstocks is still very expensive.

Electric vehicles of one form or another are likely to play an increasing role over the next two decades. However, the impact on greenhouse gas emissions will depend very much on the fuel used to generate the extra electricity needed to drive the vehicles. If it comes from the cheapest source, coal, the reductions in greenhouse gases will be small. Natural-gas-fired power plants would yield much larger reductions because gas yields more energy per molecule of carbon dioxide emitted; but gas supplies are already strained.

With electricity from wind, solar and geothermal sources, emissions from electric vehicles could be largely eliminated, but these alternative-energy sources remain more expensive than fossil fuels. Some argue that electricity from nuclear power could alter this equation. But nuclear power is hardly cheap, and continues to face significant safety, security and waste-disposal issues.

Regardless of the generation source, the electricity grid cannot be a primary source of power for cars until a cost-efficient, space-efficient electric storage technology for mobile usage is available. Researchers are working on the battery problem, but progress has been dishearteningly slow. Despite these challenges, hybrid electric vehicles, like the Toyota Prius, are already on the market and "plug-in" hybrids – which run mostly on electric power, but also carry a small engine that burns gasoline – are likely to be available in 2010.

Finally, productive policy debate on transportation energy is frequently undermined by those heralding hydrogen as the answer to our woes. Hydrogen is an energy-storage technology, not a new source of energy; it has to be produced through some other energy-consuming process. And right now the most cost-effective process involves burning fossil fuels – hardly a solution to the climate challenge. Scientists generally view hydrogen transportation fuel as more than 20 years away from viability, and even then the source of energy for producing hydrogen will remain a question.

THINKING GLOBALLY

Americans can and should respond to the challenges presented by the escalating cost of oil, its uncertainty of supply and the prospect of emissions-induced climate change. But it is important to understand the limits imposed by the reality that America is just one of many suppliers and consumers in the worldwide oil market. The price impact of policies designed to reduce domestic demand for oil or to increase domestic supplies – more-efficient cars, development of alternative greenhouse-gas-sparing fuels, increased domestic exploration – will be limited by the fact that oil prices are set in global markets.

The impact of electric vehicles on greenhouse gas emissions will depend very much on the fuel used to generate the extra electricity needed to drive the vehicles.

For example, increasing auto fuel economy by 40 percent, as would happen by around 2030 under the energy legislation passed last year, would lower American oil consumption by about 17 percent. But the likely impact on price in the far larger global oil market would be modest, reducing consumption by just

about 3.5 percent after more than two decades – an amount equal to the worldwide demand growth that occurred between 2003 and 2005. The same calculus applies to domestic exploration. Even the most optimistic forecasts of expanded drilling in the arctic and offshore suggest that production could be increased by a few million barrels per day – not a trivial increase, but only a few percent of global consumption decades from now.

This is not to say that doing what we can to curb demand for oil or to increase its supply would have no effect on price. But any conceivable American effort to reduce demand or increase supply would have far less effect, for example, than a mild global recession or even a pause in the rate of economic growth of developing countries.

Some economists have asserted that policies to raise oil supply or lower oil demand many years down the road could have a substantial effect on current prices by altering expectations. The argument is that the prospect of greater supply and lower price in the future would induce the owners of existing oil reserves to put more of it on the market today in order to take advantage of the higher current price.

The problem is that there is very little evidence that oil producers could increase current output even if they believed that oil would sell for much less in the future. Almost no excess production capacity is believed to exist outside of Saudi Arabia, which itself probably has less than two million barrels per day of unused capacity. And Saudi Arabia is driven by a host of competing forces in deciding how much oil to produce as it attempts to sustain its dominant position in the oil market and its autocratic regime at home. More generally, the very fact that futures prices are about the same or even somewhat lower than the spot oil price already gives producers strong incentives to accelerate production. Why hold onto oil that the market already believes will be less valuable in the future?

By the same token, the very idea that curbing demand or increasing domestic supply could help America to achieve "energy independence" is almost meaningless. For starters, there is no conceivable set of policies that would make it possible for the United States to stop importing oil while it remains the country's primary transportation fuel. But even if dramatic demand reductions or abundant new domestic oil supplies greatly reduced imports, the U.S. oil market would never be "independent" of the rest of the world. Short of drastic government intervention that no policymaker is likely to (or should) support, oil in the United States will sell at the world price, and the prices of gasoline and other refined products will reflect that oil cost.

WHAT IS TO BE DONE?

The three problems created by our oil addiction – cost, geopolitical security and greenhouse gas emissions – are likely to remain at the forefront of politics and the policy debate. Understanding the interactions of these challenges, and the need to analyze them in the context of the integrated world oil market, will be critical in moving toward a rational energy policy.

In that world market, there is little that the United States could do on its own to drive down the price of oil. But there is much we could do to minimize the risks created by heavy dependence on petroleum. A good place to start is to drop the rhetoric of energy independence and focus on the more achievable goal of energy security. This comes down to developing energy sources that are more diverse, both geographically and technologi-

cally, and therefore less subject to crippling price shocks. Improving vehicle fuel economy and reducing reliance on petroleum-based transportation fuels will be critical to this effort. It is important to understand, however, that the primary short-run impact will be to lower oil consumption – and therefore our total oil cost and vulnerability to disruption – not to drive down prices.

Addressing the geopolitical dangers of high oil prices will remain a more elusive goal, but international coordination among oil-consuming countries will be a necessary condition for progress. Unilateral action by the United States will not be sufficient to stanch the flow of wealth to leaders of some oil-producing nations who reject democracy and seek wider military and political influence.

High prices, focused interest-group lobbying and the yearning for secure supplies of transportation fuels will increase pressure for development of liquid fuel supplies synthesized from plentiful tar sands, oil shale and coal. This tack, however, would undermine nascent efforts to contain greenhouse gas emissions because all of these alternatives produce more emissions than conventional oil.

Reducing reliance on conventional oil without increasing greenhouse gas emissions necessitates technological advances that can eventually be adopted in both the developed and developing worlds. The basic scientific knowledge for those advances is a public good that should be subsidized by governments that have the wealth and expertise to back the research – with the United States at the forefront. Commercial development and consumer adoption of these technologies will then require strong economic incentives on an international scale. Such incentives could be created by a tax on greenhouse gas emissions, but cap-and-trade programs that avoid the T word are more viable in political terms.

The economic dislocation from such policies would fall disproportionately on the poor, both domestically and internationally. Within the United States, the financial impact of increased energy taxes – either through direct taxation or a tradable permit system that would have the same effect of raising energy prices – should be offset by using some of the tax revenue (or income from auctioning permits) to reduce Social Security payroll taxes and other taxes that hit the poor.

Any conceivable American effort to reduce demand or increase supply would have far less effect than a mild global recession or even a pause in the rate of economic growth of developing countries.

The impact on living standards in poor countries is even more problematic. This reality would certainly justify giving financial incentives to emerging economies to curb greenhouse gas emissions and to build industrial and transportation bases that are energy-efficient. Technologies that increase energy efficiency and lower the cost of non-fossil fuels should be licensed at little or no cost to poor countries.

The problems generated by dependence on fossil fuels in general and oil in particular have been a long time coming and can't possibly be solved quickly. A solid understanding of how the energy economy works, however, will be critical to minimizing the costs of addressing these challenges.