Prepared Statement of
Philip K. Verleger, Jr.[1]
Before

The Permanent Subcommittee on Investigations of the
Senate Governmental Affairs Committee

May 2, 2002

Mr. Chairman, it is a pleasure to appear today to discuss sources of gasoline price volatility. As you are aware, I have testified in the past before the Federal Trade Commission in that agency's investigation of the causes of price volatility. A copy of my prior testimony is attached. In today's testimony, I will make the following points.

- First, the increase in volatility and level of gasoline prices is attributable primarily to a group of countries conspiring to lift crude prices above the market-clearing level. The success of this effort since March 1999 has raised crude oil and gasoline prices by more than 100 percent. The increases in crude oil and wholesale gasoline prices this spring, as well as in prior springs, are substantially the consequence of their scheme.

- Second, the efforts of oil-exporting countries to elevate prices have been aided and abetted by the US auto industry and US consumers. The increased sales of "gas-guzzling" sport utility vehicles and trucks have reversed a twenty-year trend in increased automobile fuel economy. The problem has been exacerbated by the auto industry's success in assigning the cost of eliminating harmful emissions to the petroleum industry. The oil industry's failure to respond with the necessary investments in refining capacity has created a situation where unconstrained demand for gasoline rises at a rate faster than supply. Annual retail price increases of as much as 20 percent during peak driving periods will be required to balance the market in the future unless imports from foreign suppliers meet the higher demand.

- Third, the Congressional oxygenate mandate as specified in the Clean Air Act Amendments of 1990 has seriously complicated the manufacture and distribution of gasoline, contributing to localized shortages and product unavailability.

- Fourth, the merger policy applied by the Federal Trade Commission (FTC) has restricted the growth of the nation's gasoline supply. The policy has focused on the number of refineries and the capacity of refiners. Divestitures of refining capacity have been required. On occasion, these divestitures have denied merging companies

[1] PKVerleger LLC and BP Senior Fellow at the Council on Foreign Relations. Contact: pverleger@compuserve.com. The views expressed in this testimony are solely those of Dr. Verleger.

the opportunity to achieve very large increases in economies of scale by combining two adjacent facilities. A different policy might have boosted gasoline supply considerably.

- Fifth, the world's largest integrated oil companies are opting out of refining in the United States. Integrated companies own approximately 90 percent of refining capacity in Europe but only 56 percent of refining capacity in the United States. Over the last ten years, these firms have sold approximately 10 percent of their refining capacity, in part because they believe the regulatory system in the United States has denied and will continue to deny them the opportunity to earn adequate returns.

- Sixth, independent firms now own 34 percent (or 4.7 million barrels per day) of US refining capacity. This represents an increase of 360 percent in the capacity operated by such companies since 1985. These firms appear to be undercapitalized. As a result, they cannot make all the capital improvements required by environmental laws or growing demand. Furthermore, these firms are less able to compensate for volatility in crude markets. To the contrary, their limited finances may magnify fluctuations in gasoline prices, especially since they enjoy significant market power given the price inelasticity of gasoline demand.

- Lastly, gasoline prices would be far more volatile and higher if major "big box" retailers and a few other specialized retailers had not introduced new competition to gasoline marketing. The entry of firms such as Wal-Mart has offset much if not all the upward pressure on gasoline prices in many regions of the country.

The Producer Conspiracy

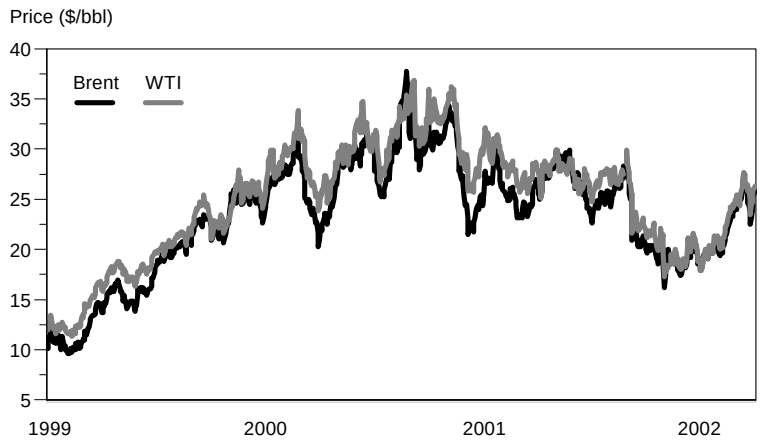
Primary responsibility for the increase in the level and volatility of gasoline prices rests with oil-exporting countries. Beginning in March 1999, these nations have worked aggressively to restrain output in order to boost crude oil prices. They have succeeded most of the time. The market price for crude oil has risen from $10 per barrel to more than $30 per barrel as a direct result of their actions, as can be seen from Figure 1 (page 3).

The price increases were achieved by a conspiracy that would be illegal in the United States or most any other country if undertaken by private companies. The conspiracy may even be illegal under US law. I have filed an affidavit in Federal Court in Alabama in support of an action against OPEC.[2] In that affidavit, I showed that the market price for crude oil in the "but for" world would be less than $19 per barrel for the common indicator of US crude oil prices, West Texas Intermediate (WTI).

[2] See "Expert Report of Dr. Philip K. Verleger, Jr.," Prewitt Enterprises, Inc. et al. v. Organization of the Petroleum Exporting Countries (CV-00-W-0865-S), US District Court for the Northern District of Alabama, Southern Division, January 12, 2001.

The coordinated action of oil-exporting countries is doubly troubling because it has come about through coercion. Twice, first in March 1999 and more recently this last December, the largest members of the Organization of Petroleum Exporting Countries (OPEC) have demanded that non-OPEC countries join in production cuts. These demands were backed by threats of a price war. In the most recent episode, some close US allies — Mexico, Norway, and Russia — were forced to participate in output reductions when OPEC members, particularly Saudi Arabia, threatened to increase production and drive prices to low levels if they did not cooperate.

Figure 1
Brent and WTI Prices



Source: Platts, Petroleum Argus.

The OPEC conspiracy has had two important impacts on gasoline markets. First, higher oil prices are passed through to consumers in the form of higher gasoline prices. Second, OPEC nations have discouraged stock building on the part of consumers. The cartel's policy can be summarized this way: "Make buyers hold minimum stocks." They have pursued this goal because, as commodity economists have known for decades, market agents will hold fewer stocks when prices are above the long-run equilibrium level.[3]

The success of OPEC's action is illustrated in Figure 2 (page 4). This figure shows days of usable[4] supply of crude and product held in industrialized countries. The shaded area is the "normal range" in which stocks have been observed to fluctuate two-thirds of the time. One can note that stocks were well above the normal range in late 1998, early 1999, and again in late 2001. Prices were low during these periods. One can also note that stocks were drawn down to low levels in late 1999 and 2000. Prices rose to high levels during these times.

[3] On this, see John Maynard Keynes, "The Policy of Government Storage of Foodstuffs and Raw Materials," *The Economic Journal* (September 1938) in Donald Moggridge and Susan Howson (eds.), *The Collected Writings of John Maynard Keynes* (London: Cambridge University Press, 1982); Holbert Working, "The Theory of the Price of Storage," *American Economic Review* 48 (1949), pp. 1254-1262; Michael J. Brennan, "The Supply of Storage," *American Economic Review* 47, No. 1 (1958), pp. 50-72; or Jeffrey C. Williams, *The Economic Function of Futures Markets* (Cambridge, England: Cambridge University Press, 1986).

[4] Petroleum stocks are broken into usable and minimum working levels of inventories. Usable stocks are the portion of inventories that can be drawn. Here they are converted into days of supply.

The decline in inventories was not an accident. Oil-exporting countries cut production to decrease stocks, knowing that the drop would force crude prices up. Markets worked exactly as predicted in academic theory (see Figure 3). Crude oil prices rose as the conspiracy by oil-exporting countries limited production and caused stocks to decline.

Figure 2
Usable Commercial Stocks in OECD Countries

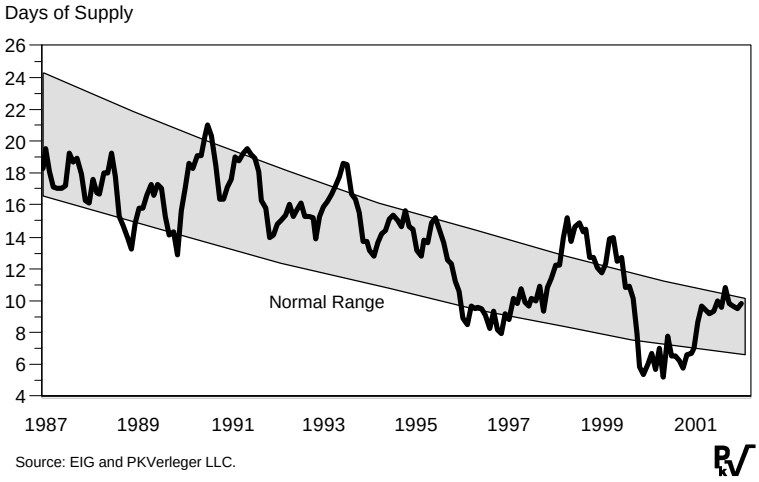
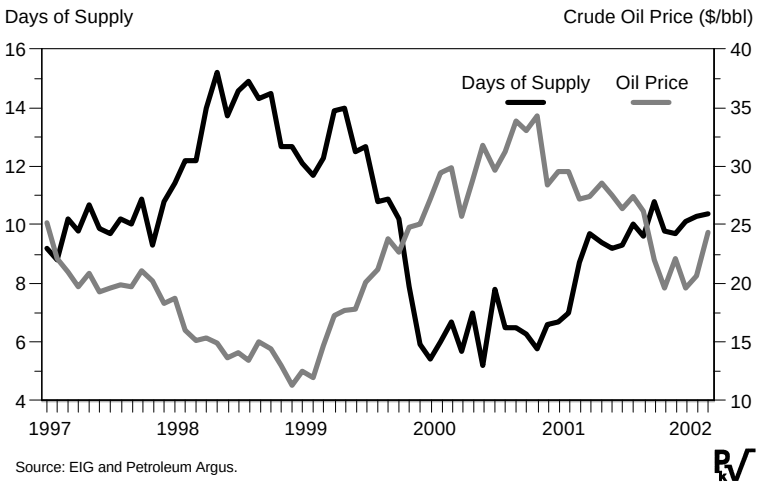


Figure 3
Crude Oil Prices v. Inventories (Days of Supply)



The Role of Demand

Strong consumer demand for gasoline caused by increased vehicle registrations and the decline in fuel economy of new cars and trucks — especially the large sport utility vehicles (SUVs) — has also contributed to gasoline price increases and the rise in gasoline price volatility. Quite simply, automakers have exacerbated the supply-and-demand imbalance. While selling ever-larger numbers of inefficient vehicles, they have ignored the problem of increasing the supply of gasoline and diesel fuel to meet the greater requirements generated by SUVs and small trucks. Instead, the auto industry has engaged in a "Field of Dreams" form of advertising: telling American they can go anywhere in their new oversized trucks but failing to warn them that adequate fuel supplies may not be available.

My very rough and simplistic calculations suggest that retail prices during the peak driving season may have to rise annually at a rate of 10 to 20 percent to balance the

market. Such increases would be required if unconstrained consumer demand for gasoline rises by 3 percent per year on a year-over-year basis, while the gasoline supply grows by only 1 percent.

Now I recognize that 10 or 20-percent increases in gasoline prices in the summer are not politically attractive. However, the only alternatives would be to increase gasoline imports from refineries in South America, Europe, and Asia or convince consumers to voluntarily reduce their driving.

On this issue, the Senate may wish to compare and contrast the situation in Europe with the one in the United States. In Europe, gasoline demand has not grown since 1990 and there have been relatively few sudden increases in gasoline prices. By contrast, US gasoline demand increased by 16 percent from 1990 to 2000. During this period, there were numerous price spikes. The increase in demand has played an important part in the greater volatility of gasoline prices. Greater use has resulted from economic growth, population growth, and our tragic refusal to address fuel conservation. Unfortunately, greater gasoline price volatility is a direct consequence of the automakers' current penchant to sell larger and larger, less-fuel-efficient vehicles and the consumers' willingness to buy them.

The Oxygenate Mandate

The nation's gasoline supply has also been adversely affected by the oxygenate mandate imposed by Congress in 1990. When this rule was passed, some scientists believed that including oxygenates in reformulated gasoline (RFG) might improve air quality. Their claim has since been disproved. Yet Congress and the EPA have continued to insist that RFG contain oxygenates. These requirements have complicated gasoline distribution and contributed to higher gasoline prices, as the Federal Trade Commission noted in its review of the Midwest gasoline price increases last year.[5]

The FTC's Merger Policy

The Federal Trade Commission has mandated the divestiture of refining assets in three of the petroleum mergers it has reviewed in the last ten years. These divestitures were required by the merger guidelines adopted by the FTC and the Department of Justice, guidelines not prepared specifically for the petroleum industry.

Unfortunately, this "cookbook" application of merger guidelines to the petroleum industry has adversely affected the expansion of gasoline supply by preventing firms from taking advantage of unique opportunities and by forcing the transfer of refining assets from well-capitalized integrated companies to undercapitalized independent refiners.

The loss of unique opportunities is certainly the least understood consequence of the FTC merger policy. While it is widely recognized that petroleum refineries provide the classic

[5] See "Midwest Gasoline Price Investigation," Final Report of the Federal Trade Commission, March 29, 2001. [http://www.ftc.gov/os/2001/03/mwgasrpt.htm]

example of an increasing returns to scale business, most observers do not know that refinery expansion is constrained by space. Larger refineries require more land. Today, land is not available at most sites. This means that refinery expansions can occur only if two existing plants can be combined. The evidence suggests that very large gains in capacity can be achieved when such combinations can be made.

The merger of the Shell and Texaco refining and marketing businesses provided an excellent opportunity to apply this reasoning because the two firms had adjacent facilities in the State of Washington. However, the opportunity was lost when Shell was required to sell its refinery. This divestiture may have reduced long-run gasoline supply by as much as 1 percent.

The FTC has also required other merging firms to divest refineries. Exxon had to sell off its Benicia refinery. The buyer was Valero Corporation, a modestly sized firm that operates refineries. More recently, the FTC required Valero to sell a San Francisco refinery to an even smaller firm when Valero merged with Ultramar Diamond Shamrock. Each sale moved refining capacity to firms with less capitalization. Over time, these events will reduce gasoline supply.

The loss in supply could be particularly acute in 2005 when refiners must reduce the sulfur content in gasoline. The new EPA regulations will require increased capital spending by refiners. Because small firms have less access to capital markets, their investments may have to be limited and they may be forced to cut supply. Indeed, one undercapitalized independent, Premcor, has already announced the closure of a Midwest refinery because it could not raise the capital required to upgrade it. Other independent refiners may have to take similar steps.

The nation's largest independent refiner, Valero, has called on the Bush administration to ameliorate this problem. The firm's CEO has suggested that the government should impose fees on gasoline imports. Such an action would raise the price of gasoline manufactured in the United States relative to the price of imported product. For example, if a fee of 10 cents per gallon were levied on imported gasoline, US-manufactured gasoline would command a premium of 10 cents per gallon above the price of gasoline manufactured in Venezuela, Canada, or the Netherlands. Valero's CEO clearly recognizes that instituting such a fee would provide his firm and other US refiners with the extra profits needed to upgrade their refining capacity. Indeed, they could count on increased cash flow of more than $10 billion per year from a 10-cent tariff program.

The fee would have the same effect as a gasoline tax except that domestic refiners would realize higher prices on production while the government received revenues only from imported product. Valero justifies its gasoline tax (the Valero Gasoline Tax) on the basis that it requires higher margins on gasoline to enable investments in new equipment to produce the low-sulfur gasoline and diesel fuel required by the EPA. As noted above, though, retail prices would be much higher today had it not been for the increase in imports.

In summary, the application of merger guidelines to refining has shifted a portion of US refining capacity from well-capitalized integrated companies to smaller independent refiners that may lack the financial resources to expand capacity. The merger policy may also have prevented firms from expanding capacity at certain critical facilities.

The Role of Integrated Companies

The integrated oil companies have been a popular political target for over thirty years. They are investigated, attacked, and vilified every time gasoline or heating oil prices increase. However, the attackers miss a point: the integrated oil companies have been slowly abandoning the refining business in the United States. This point is emphasized in Table 1, which shows statistics on the distribution of ownership of refining capacity in 1985 and 2001.[6]

Table 1. Distribution of Crude Distillation Capacity by Type of Firm — 1985 and 2001
(Thousand Barrels per Day)

Type of Firm	1985	Market Share	2001	Market Share
Integrated Majors	7,421	48.8%	8,165	49.9%
Smaller Integrated Firms	3,184	21.0%	0	0.0%
Large Independent Refiners	842	5.5%	4,724	28.9%
Other Refiners	3,745	24.7%	3,478	21.3%
Total	15,192		16,367	

Source: Compiled by PKVerleger LLC from DOE publications.

In Table 1, I show statistics on the number of refineries, the total capacity of refineries, and the distribution of ownership between major integrated companies, smaller integrated companies, and independent refiners.[7] Several statistics stand out.

- First, the number of refineries has declined from 211 to 156 (not shown in table).
- Second, the capacity of US refineries has increased from 15.2 million barrels per day to 16.4 million barrels per day, reflecting in part the ability to combine adjacent facilities noted above.
- Third, the share of capacity owned by medium-sized integrated companies such as Arco has declined from 21 percent to 0 percent. Today, there are no medium-sized integrated companies.
- Fourth, the share of capacity owned by larger independent refiners such as Sun and Valero has increased from 5 percent to 29 percent.

[6] The year 1985 was selected because the Federal Trade Commission is conducting a parallel investigation of the industry. In its formal request, the Agency asked for a quantification of changes in the industry between 1985 and 2001.

[7] The integrated companies are BP, Chevron Texaco, Citgo, Conoco, Exxon Mobil, Phillips, and Shell. Independent refiners are Ashland Marathon, Frontier, Giant, Koch, Premcor, Sinclair, Sun, Tesoro, Valero, and Williams.

The increase in refining capacity owned by independent companies is partially the result of divestitures ordered by the FTC. However, the primary force for change has been the decision of integrated companies to voluntarily sell refineries. Over the last decade BP, Chevron, Exxon, and Equilon (now Shell) have sold nineteen refineries with capacity of 2.7 million barrels per day (16 percent of the nation's 1985 refining capacity). All but two of these sales were voluntary.

There seem to be two reasons for the actions of the integrated companies. First, environmental regulations make it very difficult for them to earn what they perceive as an adequate return from refining. Second, these companies are changing their supply strategies. In the past, they produced more gasoline than required by their dealer systems. Today, they seem to want to rely on third parties to provide some product.

A frustration with increasingly complex environmental regulations is undoubtedly a primary motive for selling refining assets. Over the last decade, the industry has been required to spend substantial sums to produce cleaner gasoline and low-sulfur diesel fuel. Additional expenditures will be necessary in the next five years to remove more sulfur from diesel fuel and to lower sulfur levels in gasoline. The coming standards reflect a victory by the auto industry over the oil industry. Refiners had asked the EPA to impose the cost on the auto industry but lost the bureaucratic battle.

The response of the major oil companies seems natural. Integrated oil companies have abandoned as much of the refining business as they can. Their management has recognized that they have spent billions to meet existing standards for little or no financial returns. Managers also do not expect to see good returns from the additional investment requirements being imposed by the EPA. Indeed, the integrated companies clearly fear that the EPA will follow past practices and grant exemptions to smaller refiners if prices rise sharply when the new rules go into effect. Such exemptions are perceived to deny the integrated companies a chance to earn a return on their investment while rewarding the undercapitalized independents. These executives have ample evidence to support their beliefs. Under the circumstances, the integrated companies have hoisted the white flag and sold out.

Integrated companies have also sold capacity because they apparently no longer want to supply buyers that will not sign long-term contracts with them. In other words, the integrated companies have no interest in serving unbranded dealers. This reflects a change in strategy. Historically, integrated refiners produced more gasoline than their branded dealers could sell. Although data are sketchy, it appears that these firms are aiming to produce volumes that at most meet their internal needs. The change in strategy may have occurred because returns in refining have been so low. It may also have occurred because integrated companies are facing increased competition in retail marketing from large department store companies such as Wal-Mart.

The Role of Independent Refiners

The emergence of independent refiners as significant gasoline suppliers may inadvertently increase gasoline price volatility. The rise in volatility would occur for the following reasons:

- First, these firms often lack adequate working capital to chase rapidly rising crude prices.

- Second, these companies must be mindful that bidding up prices for a specific cargo of crude will increase the cost of their entire crude supply.

- Third, the low price elasticity of demand gives these firms market power. In many cases, they would do better by delaying crude purchases at times of tightening markets, which reduces gasoline production or sales, and benefiting from the rapid rises in spot gasoline prices that would result.

The undercapitalization of independent refiners may constrain the activity of such firms at times of rising crude prices, especially when oil-exporting countries exercise market power. The constraint comes from the cost of a cargo of crude. The increase in crude prices from the high teens to the high twenties can raise the price of a crude oil cargo by $10 to $20 million, while an incremental cargo may cost more than $50 million. The magnitude of these sums relative to the working capital available to these companies may cause them to reduce oil purchases when crude oil prices are volatile or oil-exporting countries attempt to reduce production and raise prices.

In bidding for crude, refiners also must be aware that any price increase associated with their purchases will raise the cost of all the oil they purchase because crude oil prices are indexed to the spot market. Thus, if Firm A has purchased a cargo of crude linked to the price of WTI and the price of WTI increases due to Firm B's purchases, Firm A would pay more for its supplies. Some firms will protect themselves from such swings in the market but others will not. In general, there will be an incentive to reduce purchases and potentially cut production at times of rising prices.

Finally, some independent refiners may have a strong incentive to respond to OPEC's efforts to tighten crude markets by cutting gasoline sales or production because this action is more likely to boost profits than paying more for crude. The April 8 decision by Iraq to reduce crude output to show solidarity with the Palestinians emphasized the situation faced by independent refiners. This act threatened to reduce crude supply to one company by perhaps 10 percent. The company could have replaced the lost crude through open market purchases, perhaps raising its crude costs by $2 per barrel or 5 cents per gallon. At best, such an action would have left its profits unchanged if spot gasoline prices rose by an equivalent amount.

However, if the company accepted the cut and balanced the reduction in purchases with lower gasoline production, it would reduce US gasoline output by perhaps 0.5 percent.

Such a change in supply would increase retail prices by perhaps 5 percent.[8] In April, a 5-percent increase in retail prices would have translated into a 10-percent rise in spot prices. A 10-percent increase in spot prices would almost exactly offset the loss in revenues incurred from the reduced volume of crude processed. Indeed, the firm's gross profits might actually increase if several independent refiners shared the cut in crude supplies.

This exercise reveals that independent refiners may have an incentive to respond to tightening crude supply by limiting gasoline production and sales. They are most likely to have this advantage if they market most of their output on the spot market.

Integrated firms, in contrast, do not generally have this incentive because they market most or all their production under dealer contracts that are not directly linked to spot prices. Instead, prices charged to branded dealers seem to increase in a more modulated manner. Thus, the transfer of refining assets to independent refiners seems to have increased gasoline price volatility, particularly when oil-exporting countries attempt to squeeze supplies.

The Role of Hypermarkets

The emergence of large merchandise and grocery distributors as gasoline marketers has offset much of the upward pressure on gasoline prices and could conceivably help stabilize them over the intermediate and long term. Over the last ten years, these firms have significantly affected retail prices in Britain and France. Competition authorities at the EU believe that consumer prices are significantly lower whenever this activity is permitted by local regulation and entry is not blocked by existing integrated companies. Preliminary evidence suggests that the entry of Wal-Mart and other large discounters into gasoline distribution has had a similar impact in the United States.

These firms are able to offer lower prices to consumers because they enjoy economies of scale and scope. Their large size and incredible volumes allow them to obtain supplies at lower costs. At the same time, the diversified nature of their business enables them to sell gasoline for less. These firms can offer consumers substantial benefits as long as they are permitted to compete.

Unfortunately, there is a concerted effort to block the entry of hypermarkets in Europe and the United States. In Spain, the dominant integrated oil company has apparently made it impossible to obtain supplies. In the United States, retail distributors have been attempting to block hypermarket entry by convincing state legislators to pass below-cost selling laws. The FTC recently noted in a letter to the Virginia legislature that passing such laws harms consumers.

In general, however, the entry of this new distribution channel should help moderate increases in gasoline prices.

[8] This assumes a short-term price elasticity of -0.1, a figure consistent with much of the literature, including my own work with Professor Houtaker.

Conclusion

This Senate inquiry has been convened to determine the causes of gasoline price increases and volatility. As I have indicated above, a number of factors explain the rise in prices.

The most important cause of the increase in gasoline prices since 1999 has been the success of OPEC's conspiracy. The limitation of crude production by oil-exporting countries has forced prices to rise from levels around $18 per barrel, which I would assert are "equilibrium levels," to the high twenties.

A second key factor is the strong growth in the economy combined with the sale of large, fuel-inefficient vehicles by automakers. The auto industry's flaunting of the spirit of fuel economy standards has contributed to strong growth in gasoline demand, growth that US refiners cannot meet.

The third factor has been the FTC's merger policy. In the interest of promoting competition, the FTC has required divestitures of refineries, and this has inadvertently boosted price volatility.

The fourth factor has been the decision by major oil companies to get out of refining. The sale of refining assets by major companies to smaller independent firms has left the market more vulnerable to crude price fluctuations. Furthermore, these firms have less incentive to boost gasoline production aggressively at times of crude oil price volatility than the integrated companies that previously dominated the market had.

The final factor is US environmental regulations. These rules make it impossible to build new refineries or expand existing ones. Consequently, prices must increase to offset the rise in unconstrained demand created by fuel-guzzling vehicles. These regulations also make it more difficult to manufacture gasoline by requiring unneeded oxygenates in fuel. The oxygenate requirements reduce supply and raise prices. Government regulations also threaten to impose increased costs for removing sulfur from gasoline and diesel fuel. The prospect of higher, potentially unrecoverable costs has prompted the exit of those companies most able to meet consumer demands. These firms — the integrated majors — will continue to depart refining, leaving the United States short of the transportation fuels it requires.