Consumer Federation of America

SPRING BREAK IN THE U.S. OIL INDUSTRY:

PRICE SPIKES, EXCESS PROFITS AND EXCUSES

MARK COOPER

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Consumer Federation of America

SPRING BREAK IN THE U.S. OIL INDUSTRY: PRICE SPIKES, EXCESS PROFITS AND EXCUSES

EXECUTIVE SUMMARY

DOMESTIC GASOLINE PRICE SHOCKS

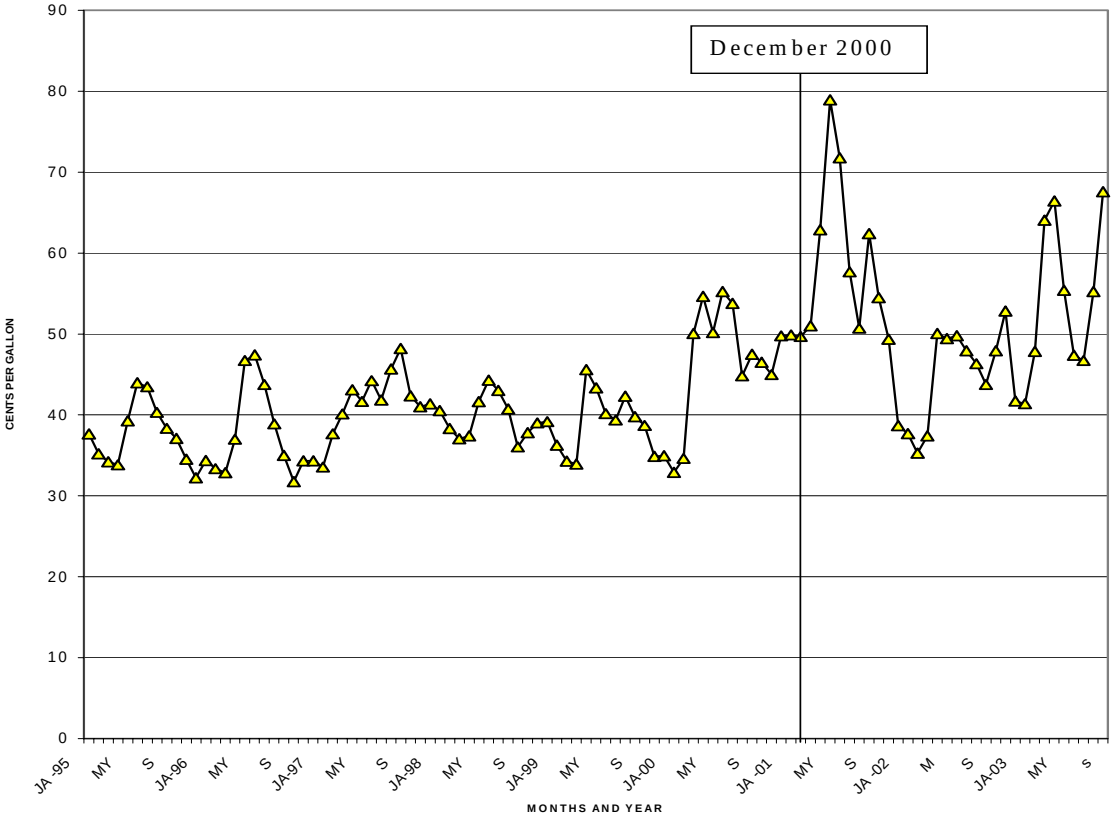
While the politicians in Washington furiously debate whether to drill for oil in pristine and environmentally fragile areas, gasoline consumers across the nation have suffered through a wild price spiral that makes the debate irrelevant. The largest cause of rising gasoline prices in recent years is the domestic refining and marketing sector, not crude oil prices or where it comes from.

Over half of the average increase of 26 cents per gallon in the price paid at the pump since the election of George Bush has been caused by domestic refining and marketing charges. The four price spikes since December 2000 caused by domestic refining and marketing have resulted in an increase of over $30 billion in gasoline prices (see Exhibit ES-1).

This paper shows that business decisions are a major cause of the problem. While the operation of the domestic oil market is complex and many factors contribute to pricing problems, one central characteristic of the industry stands out – it has become so concentrated in several parts of the country that competitive market forces are weak. Long-term strategic decisions by the industry about production capacity interact with short-term (mis)management of stocks to create a tight supply situation that provides ample opportunities to push prices up quickly. Because there are few firms in the market, prices hold above competitive levels for significant periods of time. With an administration in Washington that is very unlikely to criticize or restrain the oil industry (both the President and the Vice President came out of the industry), oil companies have the opportunity to flex their pricing power.

The problem is not a conspiracy, but the rational action of large companies with market power. With weak competitive market forces, individual companies have flexibility for strategic actions that raise prices and profits:

EXHIBIT ES-1: DOMESTIC REFINER/MARKETER SPREAD: 1995-2003

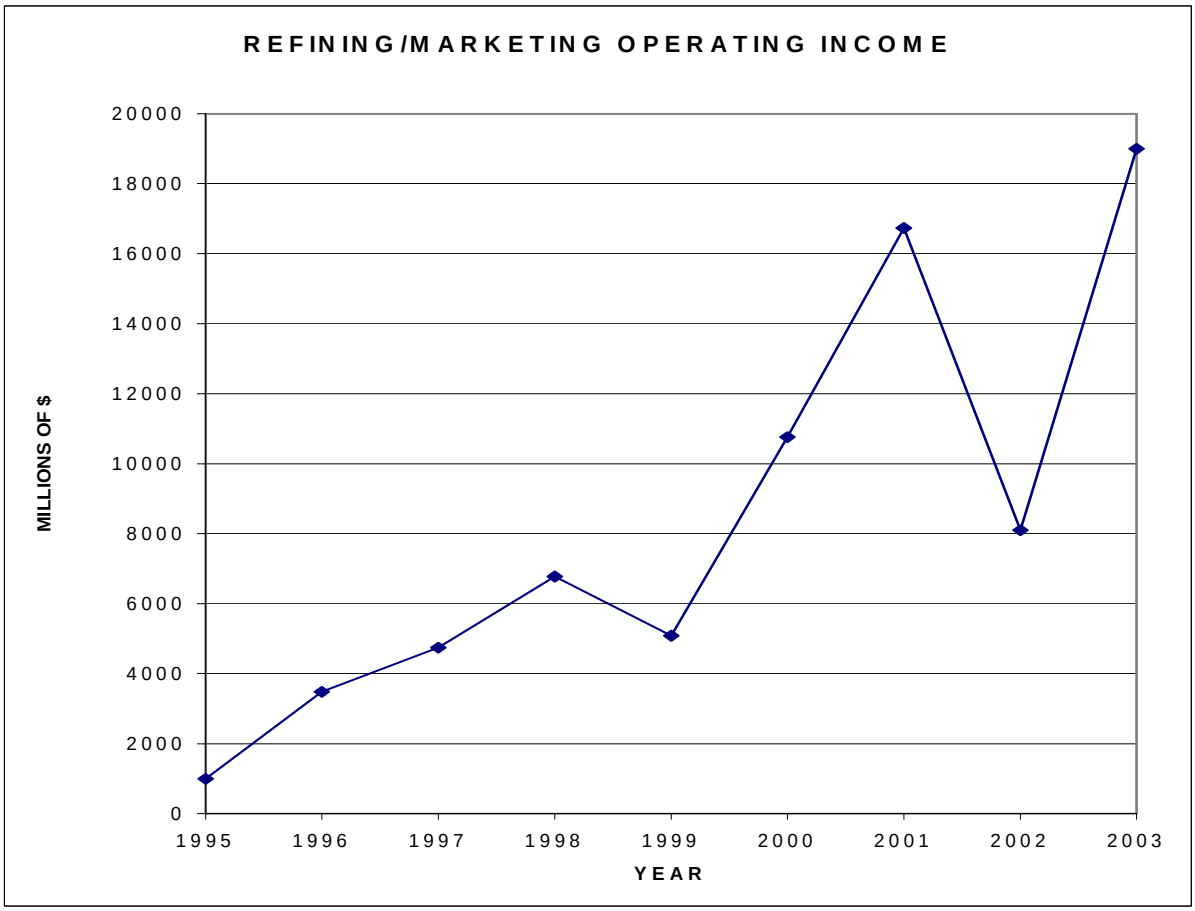


Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *Petroleum Marketing Monthly*, *Weekly Petroleum Status Report*, various issues.

- Individual companies can let supplies become tight in their area and keep stocks low, since there are few competitors who might counter this strategy.
- Companies can simply push prices up when demand increases because they have no fear that competitors will not raise prices to steal customers.
- Individual companies do not feel compelled to quickly increase supplies with imports, because their control of refining and distribution ensures that competitors will not be able to deliver supplies to the market in their area.
- Because there are so few suppliers and capacity is so tight, it is easy to keep track of potential threats to this profit maximizing strategy.

Every accident or blip in the market triggers a price shock and profits mount (see Exhibit ES-2). Moreover, operating the complex system at very high levels of capacity places strains on the physical infrastructure and renders it susceptible to accidents.

EXHIBIT ES-2: REFINING/MARKETING OPERATING INCOME



Source: Energy Information Administration, U.S. Department of Energy, *Performance Profiles of Major Energy Producers: 2001* (January 2003), Table B32; *National Petroleum News*, "Signs of Life," March 2003, Corporate, Downstream Earnings for Major Oil Continue to Rebound," October, 2003; oil industry Second Quarter 2003 financial reports. 2003 estimated based on comparison of 1H01 to 1H03.

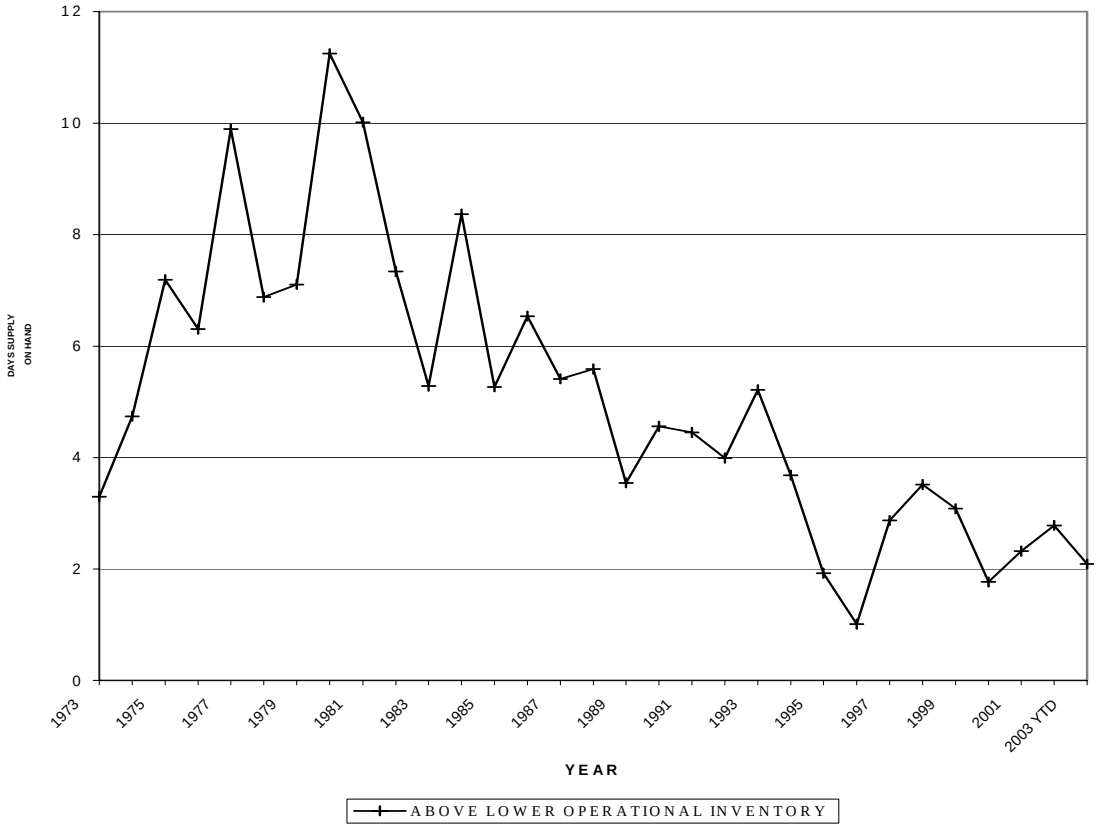
Yet, policymakers have done nothing to address these underlying problems, other than wring their hands and remark about how tight refining capacity is and how low stockpiles were prior to the spike.

SUPPLY

There are two clearly identifiable trends affecting the supply side of the gasoline market – a reduction in capacity relative to demand and an increase in concentration.

In 1985 refinery capacity equaled daily consumption of petroleum products. By 2000, daily consumption exceeded refinery capacity by almost 20 percent. The problem is not

EXHIBIT ES-3: GASOLINE STOCKS ON HAND: DAYS OF SUPPLY ABOVE OPERATIONAL INVENTORY LEVELS



Source: U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Monthly*, various issues, Table, S4, Figure S6; *Weekly Petroleum Status Report.*

simply that no new refineries have been built, but that in the past 15 years about 75 refineries were closed. Reductions in storage capacity and the number of gasoline stations of over ten percent have also taken place in just the past half-decade.

These reductions in capacity have been driven in part by a merger wave that has resulted in a significant increase in the concentration of ownership of refinery capacity and gasoline outlets. Four-fifths of regional refinery markets have reached levels of concentration that trigger competitive concerns, even by the standards adopted by the antitrust division of the Reagan administration's Department of Justice. In these markets, the largest four firms account for at least one-half and as much as three quarters of the refined product output. A similar trend has been in evidence at the level of gasoline stations.

Even more ominous for short-term price volatility is the fact that stockpiles have declined dramatically (see Exhibit ES-3). Storage capacity has been reduced and economic reserves – reserves above what is needed just to keep the system running – have been slashed.

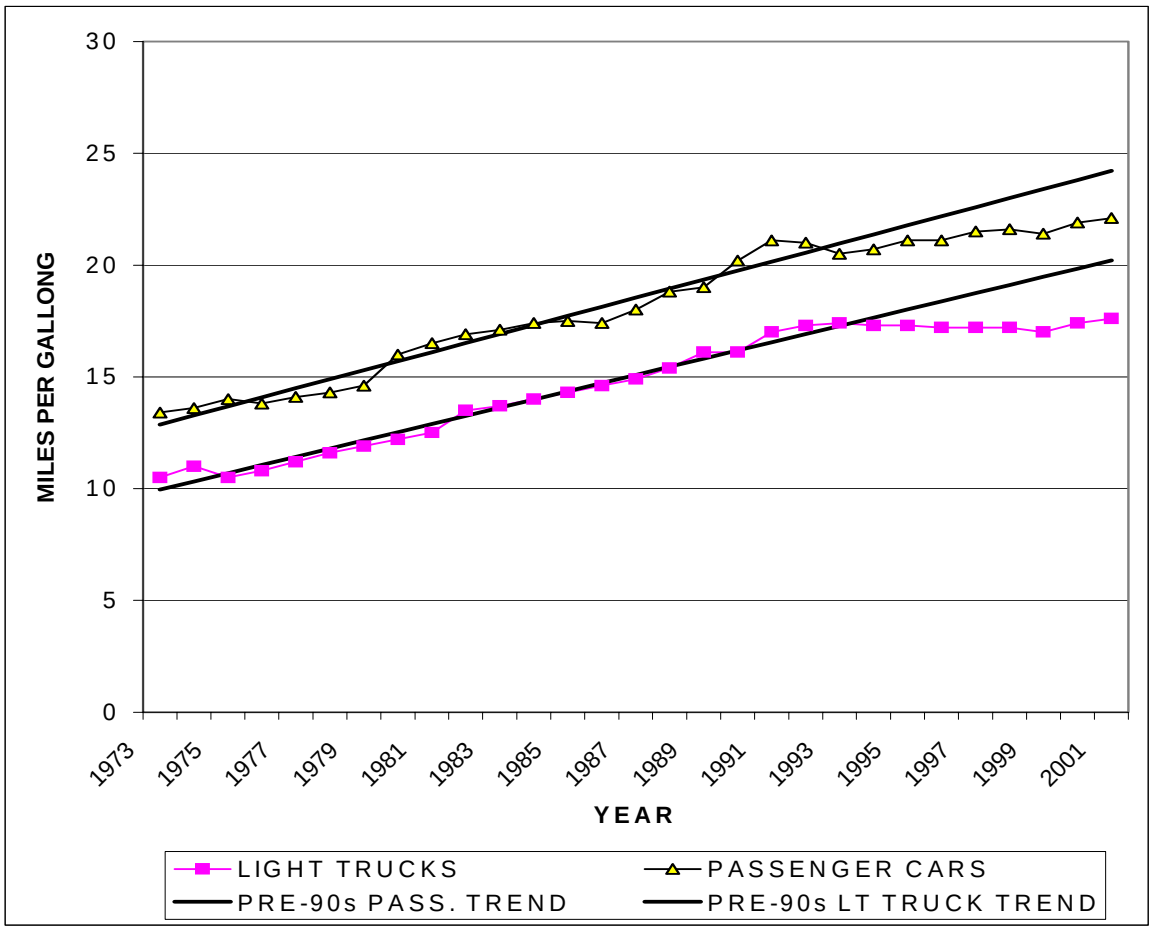
The industry now typically has no more than a day or two of gasoline supplies above its operational minimum, compared to a week or so in the 1980s. Thus, there is little reserve capacity to dampen price increases.

DEMAND

The demand side of the market creates additional pressures and vulnerabilities to price spirals. The demand for gasoline does not respond quickly to price in the short term. When demand is "inelastic" as it is in the gasoline market, suppliers have a better chance of making price increases stick when there is little spare capacity. Increasing demand has reduced spare capacity.

From the second oil price shock in 1979 through 1991, fuel efficiency improved by almost 50 percent (see Exhibit ES-4). In the ensuing decade, there was little if any progress because public policy stopped requiring improvements in fuel efficiency. Had fuel efficiency

EXHIBIT ES-4: LIGHT VEHICLE FUELS EFFICIENCY



Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 1.10.

continued to improve, the U.S. would be consuming well over a million barrels per day less of gasoline.

Consumer-Friendly Policies To Break The Price Spiral

In summary, this analysis demonstrates that gasoline markets are volatile and suffer competitive problems. Market fundamentals (inadequate capacity and inelastic supply and demand), market structures (ownership concentration and vertical integration), corporate conduct (capacity and production decisions), and market performance (price and profits) all point toward the potential for the abuse of market power.

Vigorous and broad based public policies should be pursued to implement permanent institutional changes that reduce the chances that markets will be tight and reduce the exposure of consumers to the opportunistic exploitation of markets when they become tight. To achieve this reduction of risk, public policy should be focused on achieving several interrelated goals.

Restore reserve margins by developing both efficiency and production: Increasing fuel efficiency at the rate achieved in the 1980s in the decade ahead would save about 1.5 to 2 million barrels per day in the decade ahead. Increasing refinery capacity by 10 percent, either through expansion at existing refineries or redevelopment of less than one half of the refineries closed in the past decade, would add another 1.5 to 2 million barrels per day.

Increase market flexibility: Expanding stockpiles – with tax incentives to hold and draw down supplies in the fact of price increases, and/or mandatory stocks requirements as a percentage of sales, and/or government owned/privately operated supplies – could alleviate the chronic problem of inadequate stockpiles.

Promote a more competitive industry: Further concentration of the petroleum industry should be resisted by vigorous enforcement of the Department of Justice Merger Guidelines. Restrictive marketing practices, such as zonal pricing and franchise restrictions on supply acquisition, should be investigated and discouraged.

Deter private actions that make markets tight or exploit market disruptions. Withholding of supply should draw immediate and intense public and governmental scrutiny through a joint federal state task force of attorney's general. Manipulation of product, commodityand derivatives markets should be prevented. The incentives to manipulate markets can be reduced by imposing a windfall profits tax that triggers under specific circumstances of price and profit increases.

I. GASOLINE PRICE SHOCKS ARE A DOMESTIC REFINING AND DISTRIBUTION PROBLEM

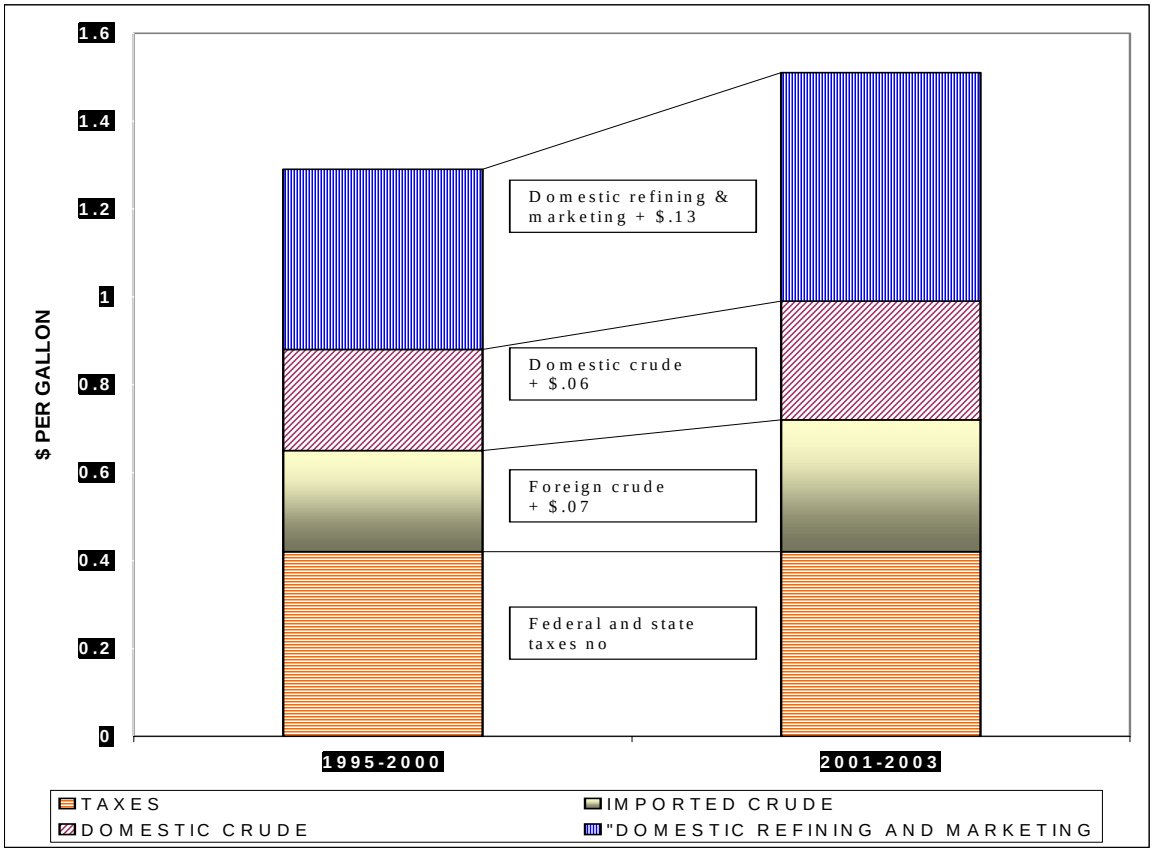
BILLIONS OF DOLLARS OF DOMESTIC OVERCHARGES CAUSE HIGH GASOLINE PRICES

While the politicians in Washington furiously debate whether to drill for oil in pristine and environmentally fragile areas, gasoline consumers across the nation have suffered through a wild price spiral that makes the debate irrelevant. The largest cause of rising gasoline prices in recent years is the domestic refining and marketing sector, not crude oil prices or where it comes from.

Since December 2000, the increase in the domestic average pump price that is taken by domestic refiners and markets has cost the American public over $30 billion.

Of the 26 cent per gallon increase in the average price paid at the pump since the election of George Bush as President in December 2000 (see Exhibit I-1):

EXHIBIT I-1: DOMESTIC PRICE INCREASES ACCOUNT FOR TWO-THIRDS OF THE GASOLINE PRICE INCREASE SINCE THE ELECTION OF GEORGE BUSH

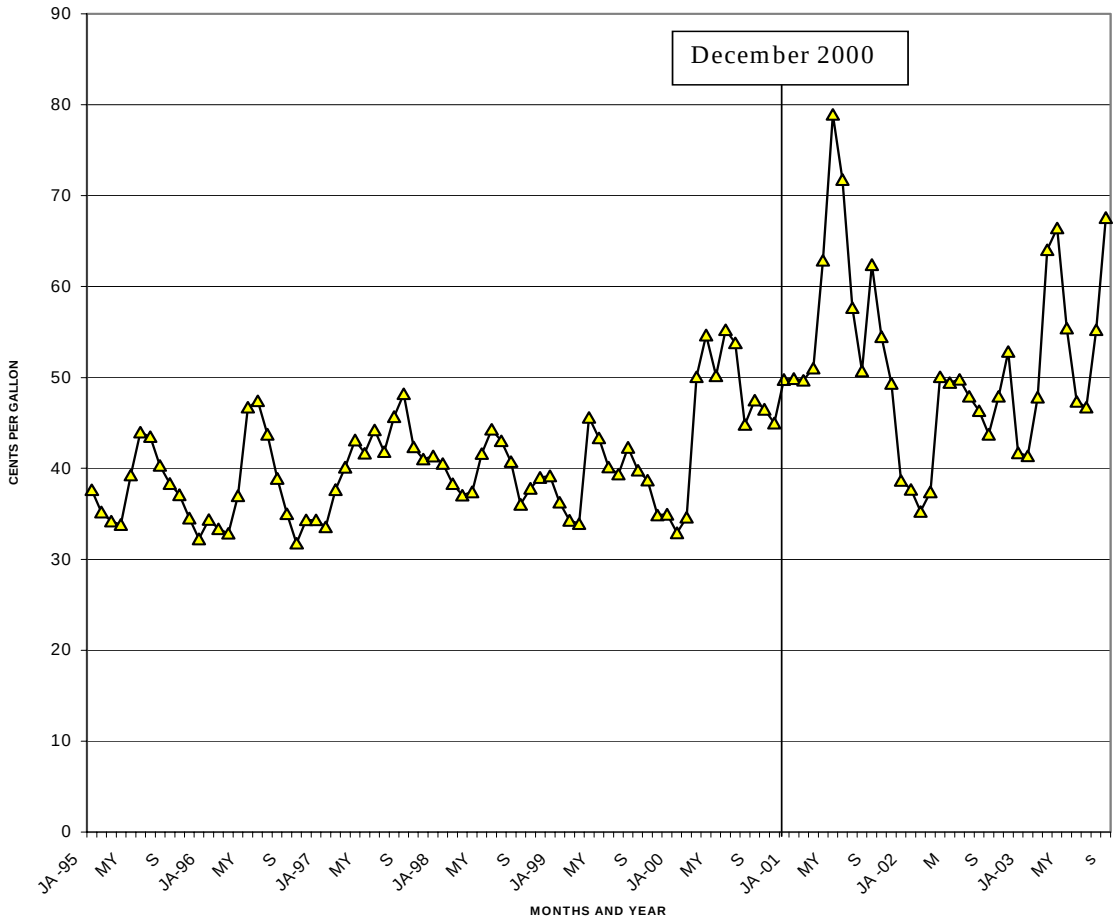


Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *Petroleum Marketing Monthly*, *Petroleum Supply Monthly*, various issues, Tables S1, 36; *Weekly Petroleum Status Report*, various issues.

- 13 cents has been caused by an increase in the domestic refiner/marketer charges.
- 7 cents has been caused by an increase in the price of imported oil,
- 6 cents has been caused by an increase in the price of domestic oil.

For the past three years the domestic refining and marketing segment of the oil industry has taken the American gasoline consumer on a wild roller coaster ride (see Exhibit I-2). A pipeline breaks here, a refinery goes out there, or a blackout shuts down production for a day someplace else. Because stocks are so tight, prices shoot up, and stay up for an extended period of time. For one nebulous reason or another, dire predictions about larger increases are made. Loud claims of price gouging are heard from the public and some policymakers.[1] The

EXHIBIT I-2: DOMESTIC REFINER/MARKETER SPREAD: 1995-2003



Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review, Petroleum Marketing Monthly, Weekly Petroleum Status Report,* various issues.

ride ends, however, before the worst happens and everyone breathes a sigh of relief. A few months later, the episode is repeated.

Little attention is paid to the fact that prices never seem to get back down to where they started and even less attention is given to the underlying dynamics of why this keeps happening or what might be done about it. It is more convenient for politicians to blame accidents or crude oil production and the OPEC cartel and to act as if tight markets and a lack of stocks are acts of nature, than to confront the problem caused by the domestic oil companies.[2]

While the operation of the domestic oil market is complex and many factors contribute to pricing problems, one central characteristic of the industry stands out – it has become so concentrated in several parts of the country that competitive market forces are weak. Long-term strategic decisions by the industry about production capacity interact with short-term (mis)management of stocks to create a tight supply situation that provides ample opportunities to push prices up quickly. Because there are few firms in the market, prices hold above competitive levels for significant periods of time. With an administration in Washington that is very unlikely to criticize or restrain the oil industry (both the President and the Vice President came out of the industry) oil companies have the opportunity to flex their pricing power.

The problem is not a conspiracy, but the rational action of large companies with market power. With weak competitive market forces, individual companies have flexibility for strategic actions that raise prices and profits:

- Individual companies can let supplies become tight in their area and keep stocks low, since there are few competitors who might counter this strategy.

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- Individual companies do not feel compelled to quickly increase supplies with imports, because their control of refining and distribution ensures that competitors will not be able to deliver supplies to the market in their area.

- Because there are so few suppliers and capacity is so tight, it is easy to keep track of potential threats to this profit maximizing strategy.

Every accident or blip in the market triggers a price shock and profits mount. Moreover, operating the complex system at very high levels of capacity places strains on the physical infrastructure and renders it susceptible to accidents.

Given the importance of gasoline in the economy, “consumers of petroleum products in the United States expect that, as with water and electricity, public officials will ensure the reliability and affordability of supplies.”[3] Americans have come to believe that the price spikes

are the result of industry manipulation.[4] This paper shows that there are important ways in which this suspicion is well-founded. Over the past three years policymakers have failed to do provide consumers with a stable market and things are getting worse, not better.[5] While policymakers cannot stop accidents from happening, they can adopt policies that decrease their likelihood and, more importantly, diminish the impact that accidents have on American consumers.

THE DOMESTIC REFINER/MARKETER SPREAD

This analysis focuses on what the U.S. Energy Information Administration calls the spread – the total pump price minus crude oil costs and gasoline taxes. It is referred to as the "domestic refiner/marketer spread" throughout the report because this cost is overwhelmingly paid to domestic refiners and marketers.[6]

The analysis focuses on gasoline. Although gasoline represents only half of the petroleum products supplied to the domestic market, and the prices for these other products have been affected by similar upward price pressures, the majority of these price increases are paid indirectly by the public. Gasoline costs are paid directly.

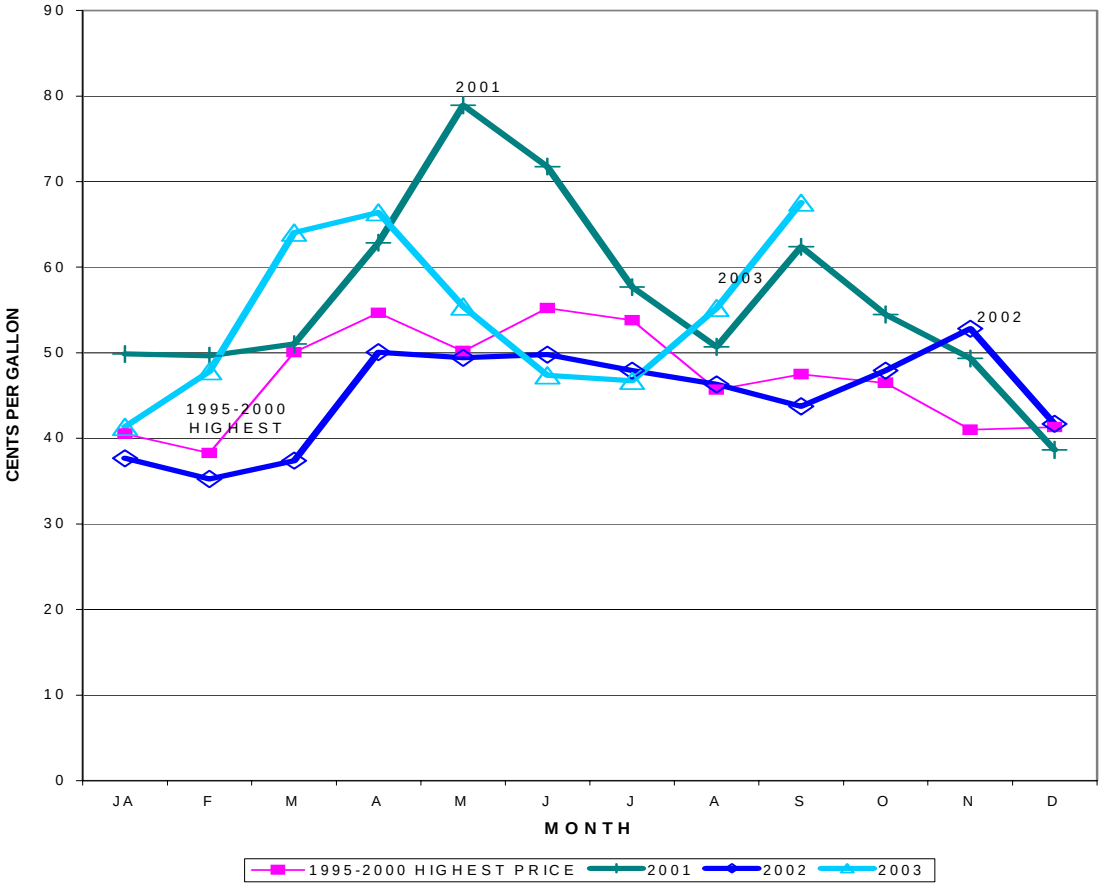
As shown in Exhibit I-2 above, the pattern of increase in the domestic spread on gasoline began in 2000, at the end of the Clinton Administration, but gained much greater intensity during the Bush Administration. When one looks at the pattern of price behavior and the movement of the domestic refiner/marketer spread in recent years, one cannot help but be struck by the dramatic change in behavior that took place after 2000.

From January 1995, when the Clean Air Act Amendments changed the behavior of the domestic refining industry, until January 2000, domestic refiner/marketer spread remained in a narrow range and followed a clear seasonal trend with moderate increases during the summer driving season. In the spring of 2000 margins jumped up, in conjunction with a much larger increase in world crude prices. In January 2001, the spread skyrocketed and remained far above historic levels.

There are two fundamental differences between price increases in 2000 and those since. First, the margin increase in 2001-2003 has been about twice as large as the 2000 increase in the spread. Second, crude oil price increases in 2001-2003 were about half as large. In other words, the domestic spread has played a much larger role in the rising price of gasoline at the pump since December 2000.

A glance at the domestic refiner/marketer spread on a seasonal basis puts this shift in industry behavior in sharp relief (see Exhibit I-3). The highest recorded monthly domestic spread since 1995 for every month of the year has occurred since December 2000 — December 2000; January, February, May, June July, October, 2001; November 2002; March, April, August and September 2003.

EXHIBIT I-3: DOMESTIC REFINER/MARKETER SPREAD: SEASONAL BASIS



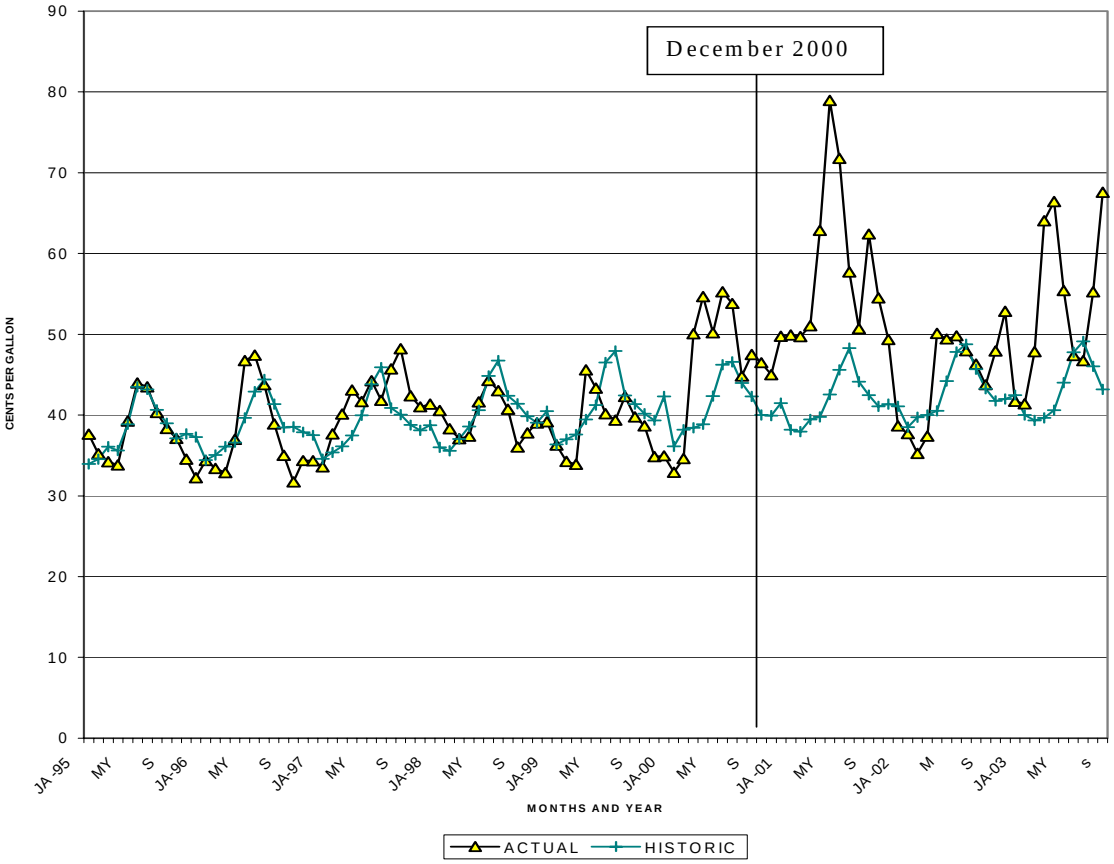
Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *Weekly Petroleum Status Report*, various issues.

Another way to appreciate the dramatic change in domestic pricing patterns is to compare actual prices to expected prices based on historic trends. Exhibit I-4 presents a model that predicts domestic spreads on the basis of aggregate demand and season using data from January 1995 to December 2000. The fit for the model in Exhibit I-4 is quite good, except for the summer of 2000. Since December 2000, prices have been much higher than would have been expected. The total $30 billion increase noted above is derived from this analysis.

Exhibit I-5 presents another view of the change in domestic pricing. It compares the average monthly spread for 1995-2000 to the monthly spread for 2001 – 2003. This view shows the change in sharper terms and produces a higher estimate of the increase in consumer pump prices caused by the domestic refiner/marketer spread.

Industry experts and Department of Energy officials wring their hands about tight supplies, refineries that are running at capacity and difficult transitions to new fuels, but deny

EXHIBIT I-4: ACTUAL VS. HISTORIC DOMESTIC SPREAD: 1995-2003

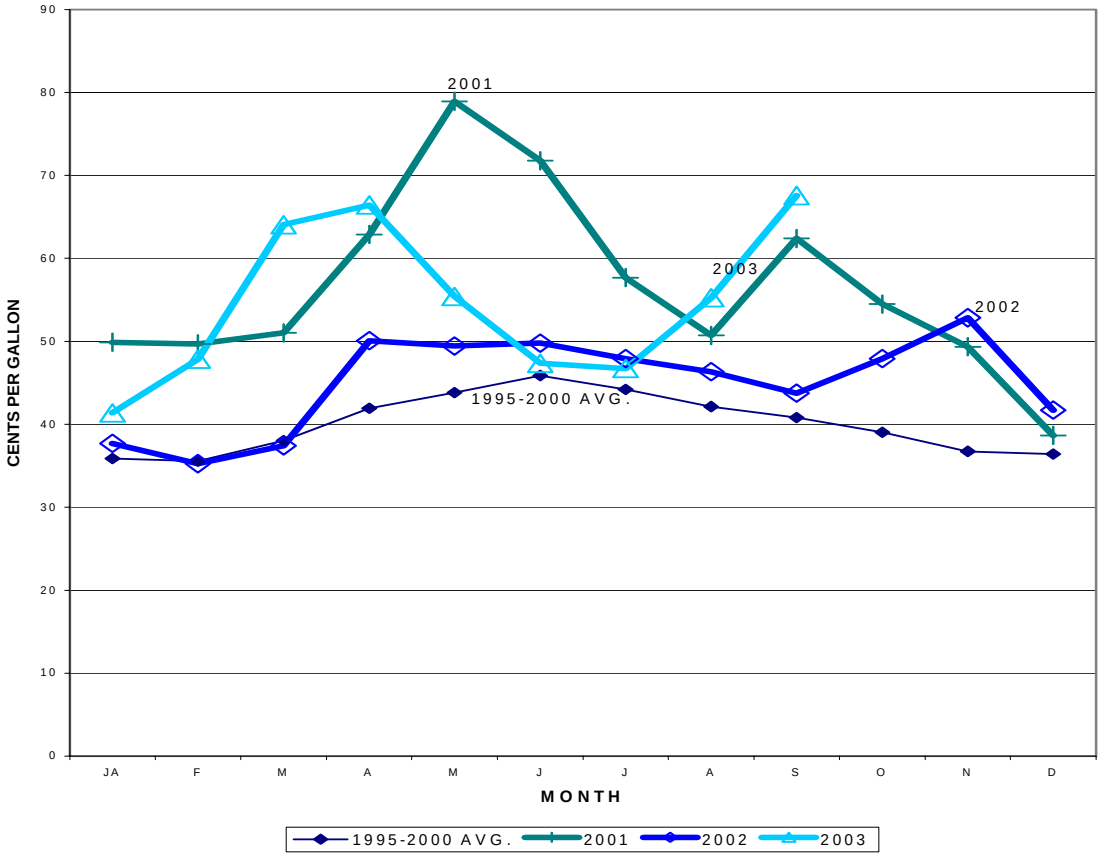


Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *Petroleum Marketing Monthly*, *Petroleum Supply Monthly*, various issues; *Weekly Petroleum Status Report*, various issues.

any wrongdoing.[7] The explanations they offer are more like excuses than analysis. For example, the following excerpt from the Energy Information Administration *Summer 2003 Motor Gasoline Outlook* gives a flavor of the effort to gloss over fundamental problems:

> This summer, motor gasoline markets are expected to be tighter than last summer. Total spreads (retail price, excluding taxes, minus crude oil prices) are expected to average 55 cents per gallon compared to 41 cents per gallon in 2002. This results primarily from higher refinery utilization brought about by the increase in demand combined with low beginning-of-season inventory levels. But the projected spread is less than the 58 cents observed in the summer of 2001, when stocks were at record low levels and the Midwest suffered from ethanol-related blending problems.[8]

EXHIBIT I-5: DOMESTIC REFINER/MARKETER SPREAD: SEASONAL BASIS

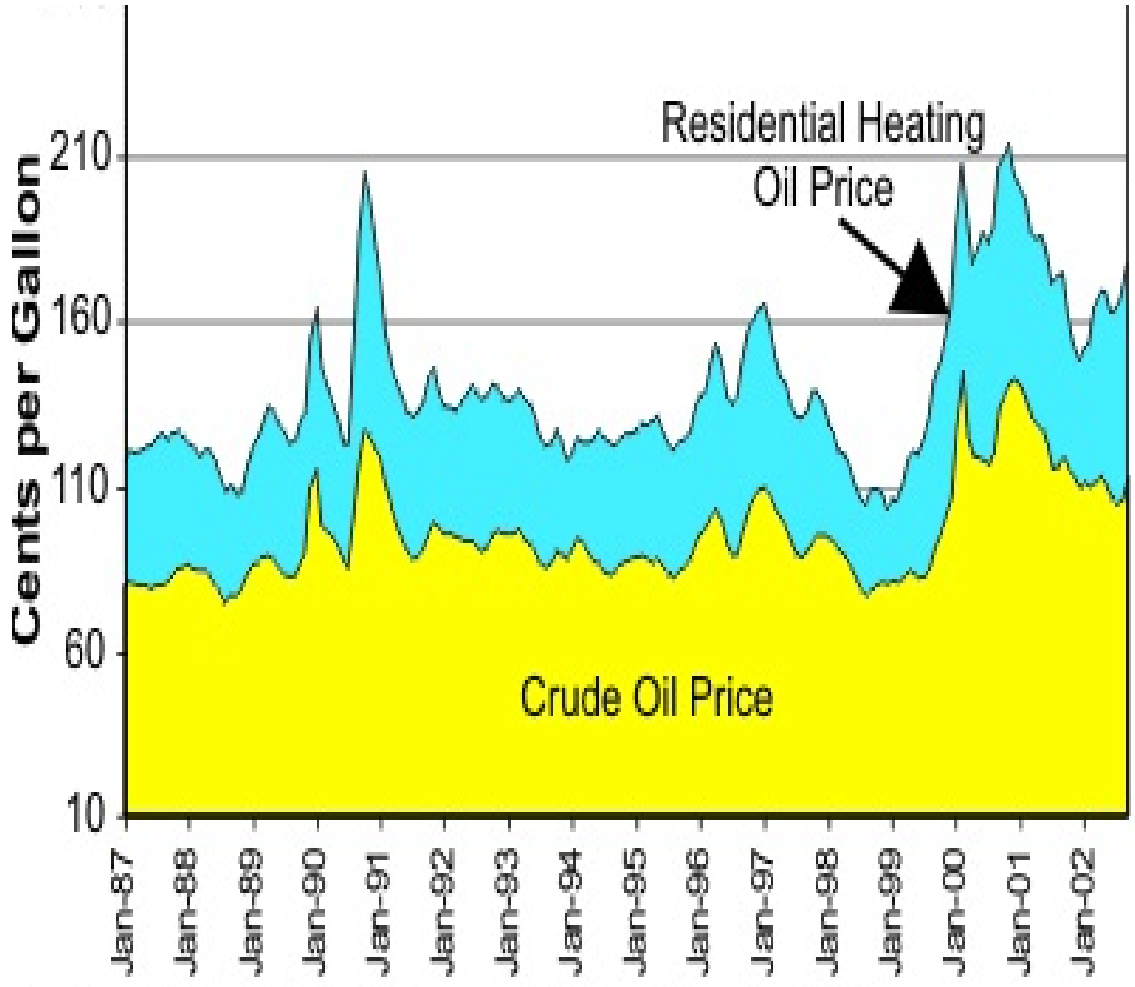


Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, *Weekly Petroleum Status Report*, various issues.

The EIA tries to soften the blow of a very high spread by comparing it to the astronomical level of 2001, rather than the level of 2002, which was itself significantly higher than the 1995-1999 average. The past summer did not go as the EIA expected. The only thing that seems to be predictable is that we will not have enough stocks on hand to deal with the inevitable accidents and incidents that seem to drive up prices.

Exhibit I-6 shows an EIA graph for residential heating oil. This is another product for which the public pays directly. The high price season is the winter, not the summer, but the pattern of increases in the domestic spread since December 2000 is similar.

EXHIBIT I-6: RESIDENTIAL HEATING OIL SPREAD



Source: Energy Information Administration, *Residential Heating Oil: What Consumers Should Know* (Washington, D.C., 2003), Figure 2.

PROFITING FROM PRICE INCREASES IN CONCENTRATED MARKETS

If price increases are not caused by cost increases, crude oil or otherwise, they result in increases in profits. Thus, after price, the second important indicator to which economic analysts look for signs of the exercise of market power and market failure is profits.

The bottom line, literally and figuratively, was a sharp run up in oil company profits in 2000 and 2001 (see Exhibit I-7). Net operating income (income before special items and taxes) tripled from 1997-1999 to 2001. More recent data on the comprehensive basis gathered by the Department of Energy is not available, but general filings from the Securities and Exchange Commission are available.

EXHIBIT I-7: REFINING/MARKETING OPERATING INCOME

Source: Energy Information Administration, U.S. Department of Energy, *Performance Profiles of Major Energy Producers: 2001* (January 2003), Table B32; *National Petroleum News*, "Signs of Life," March 2003, Corporate, Downstream Earnings for Major Oil Continue to Rebound," October, 2003; oil industry Second Quarter 2003 financial reports. 2003 estimated based on comparison of 1H01 to 1H03.

Tracking profits from publicly available sources is difficult because some of the companies do not break out domestic operations, while mergers make long term trends difficult and the allocation of one-time charges to specific lines of business are frequently not identified.[9] While profits were down in 2002, due to very low prices early in the year as a result of the severe economic downturn and travel slow-down following September 11, they were still just above the levels of the late 1990s.

It should be noted that although 1999 was a slightly below average year, 2000 was an extremely good year. *Fortune* reports return on equity of 25 percent in 2000,[10] while *Business*

Week reports 22 percent.[11] This is almost twice the historic average for the industry and about 50 percent more than other large corporations achieved.[12] These extremely high profits for 2001 were at such astronomical rates of profit that they were not sustainable. The weak economy lowered prices and profits early in 2002, but by the end of 2002, profits had increased dramatically. The sharp price increases in 2003 are producing another very high level of profits. By the first half of 2003 the industry was seeing record profits once again.

A recent Rand study drew the connection between the business strategies to increase profitability and the pricing volatility.

> For operating companies, the elimination of excess capacity represents a significant business accomplishment: low profits in the 1980s and 1990s were blamed in part on overcapacity in the sector. Since the mid-1990s, economic performance industry-wide has recovered and reached record levels in 2001. On the other hand, for consumers, the elimination of spare capacity generates upward pressure on prices at the pump and produces short-term market vulnerabilities. Disruptions in refinery operations resulting from scheduled maintenance and overhauls or unscheduled breakdowns are more likely to lead to acute (i.e., measured in weeks) supply shortfalls and price spikes.[13]

II. ECONOMIC FUNDAMENTALS OF GASOLINE MARKETS

Inadequate Competition in the Oil Industry is a Major Cause of Price Spikes

World events simply cannot explain a domestic refiner/marketer spread that is well above its historic levels or repeated price spikes, even when international markets are quiet. We must look to domestic factors to understand the cause of the domestic price increases.

This paper shows that the fundamental problem lies in the supply-side of the domestic market, not the demand-side. The conduct of the oil industry clearly contributes to the problem. Oil companies do not have an interest in preventing the price spikes because they profit handsomely from them. Consequently, they have done a very poor job of preparing themselves for these shocks.

- Over the 1990s, the industry dramatically reduced capacity to tighten markets.
- It is not about to expand refinery and storage capacity to alleviate a structurally tight supply demand balance.
- The industry does not manage stocks to prevent price spikes.
- The industry does not respond quickly to higher prices by increasing product supplies.

It has become evident to all observers of the domestic oil market that stocks of crude and especially product are the key variables that determine price shocks. In other words, stocks are not only the key variable, they are also a strategic variable. The oil industry does a miserable job of managing stocks and supplying product from the consumer point of view. Policymakers have done nothing to force them to do a better job.

If the industry were vigorously competitive, each firm would have to worry a great deal more about being caught with short supplies or inadequate capacity and they would hesitate to raise prices, for fear of losing sales to competitors. Oil companies do not behave this way because they have power over price and can control supply. Mergers and acquisitions have created a concentrated industry in several sections of the country and segments of the industry. The amount of refinery capacity, stocks and product on hand are no longer dictated by market forces, they can be manipulated by the oil industry oligopoly to maximize profits.

Demand is Inelastic and Generally Predictable

To be sure, the oil industry only controls the supply-side of the market. Markets might not become so tight if consumers stopped buying so much gasoline. Unfortunately, the ability of consumers to cut back on gasoline is severely limited and the industry knows it.

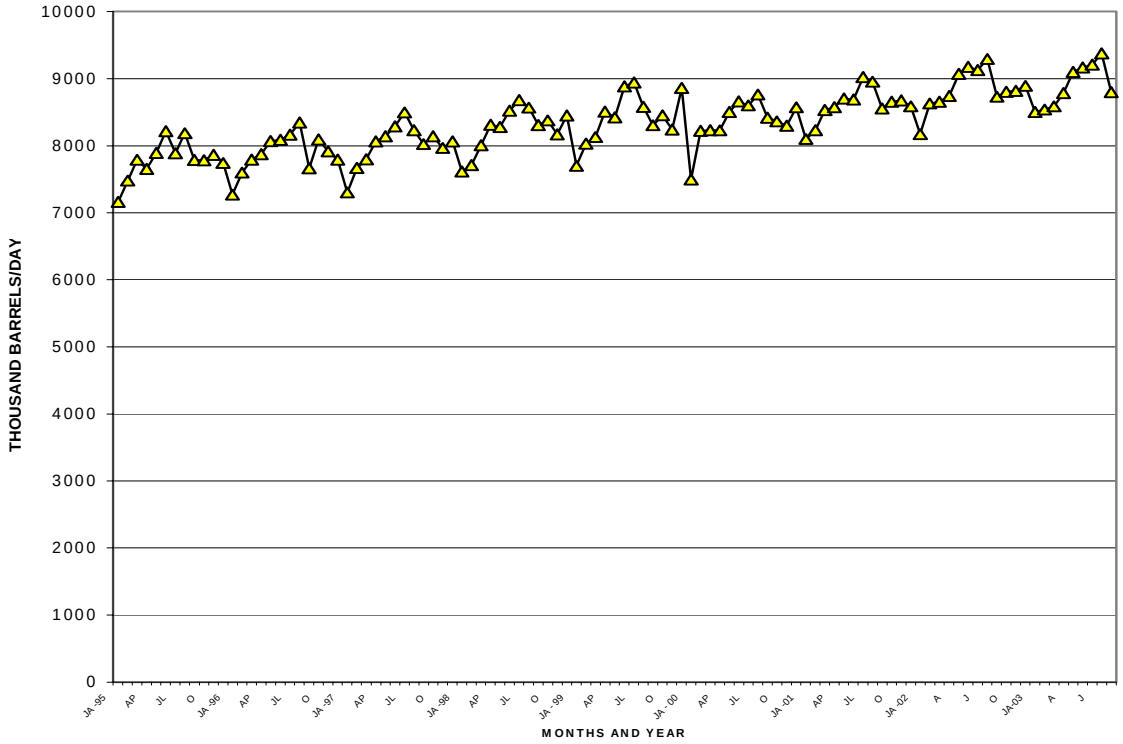
Demand is generally predictable in a seasonal pattern (see Exhibit II-1). With demand quite predictable and inelastic, price is determined by the supply side. The flow of product and stockpiles are critical. Supplies must be adequate to deal with shifts in demand. Demand may help to set the stage, but it is supply that provides the action.

The demand side of the market creates pressures and vulnerabilities to price spirals. The demand for gasoline does not respond quickly to price in the short term – it is quite inelastic. By this term, economists mean that as prices increase (or decrease) demand does not decrease (or increase) very much. Elasticity is measured in terms of percentage changes. For example, if a ten percent increase in price results in a 20 percent decrease in demand, the price elasticity of demand is said to equal -2 (20%/10%). When the elasticity is greater than 1 in absolute value, demand is said to be elastic. Alternatively, if a 10 percent increase in price results in a 2 percent decrease in demand, the elasticity is said to be -.2, and this is considered inelastic.

The demand elasticity for gasoline has been studied hundreds of times in the U.S. and abroad. The best estimate of short-term elasticity (usually measured by demand response in a period of about a year) is -.2.[14] The best estimate of the long-term elasticity is about -.4.[15] Both of these are quite low.

The low elasticity of demand is grounded in the daily life of Americans. Many discussions of the gasoline market start from the premise that people drive a lot, perhaps too much. But we must have an appreciation for why people drive as much as they do. Examining price and income elasticities leads to the conclusion that gasoline is a necessity of

EXHIBIT II-1: GASOLINE PRODUCT SUPPLIED



Source: U. S. Department of Energy, Energy Information Administration, *Petroleum Supply Monthly*, Table S.4, *Weekly Petroleum Status Report*, various issues.

daily life. Recognizing this fact leads to policy choices that can have the greatest impact, while imposing the least cost and inconvenience on consumers.

Gasoline consumption is determined by the physical and economic structure of daily life. People need to drive on a daily basis because of the way our communities are built and our transportation systems are designed. Stores are far from homes. Homes are far from work. Social and after-school activities are dispersed. In most communities, mass transit is scarce and inconvenient. It is necessary to drive to get from here to there. We own more cars and drive more miles on a household basis over time. These trends and patterns have become stronger and more deeply entrenched as our society has become wealthier and the number of two-earner households has grown. For the past three decades there has been an almost perfect, one-to-one correspondence between economic growth and total miles driven.[16]

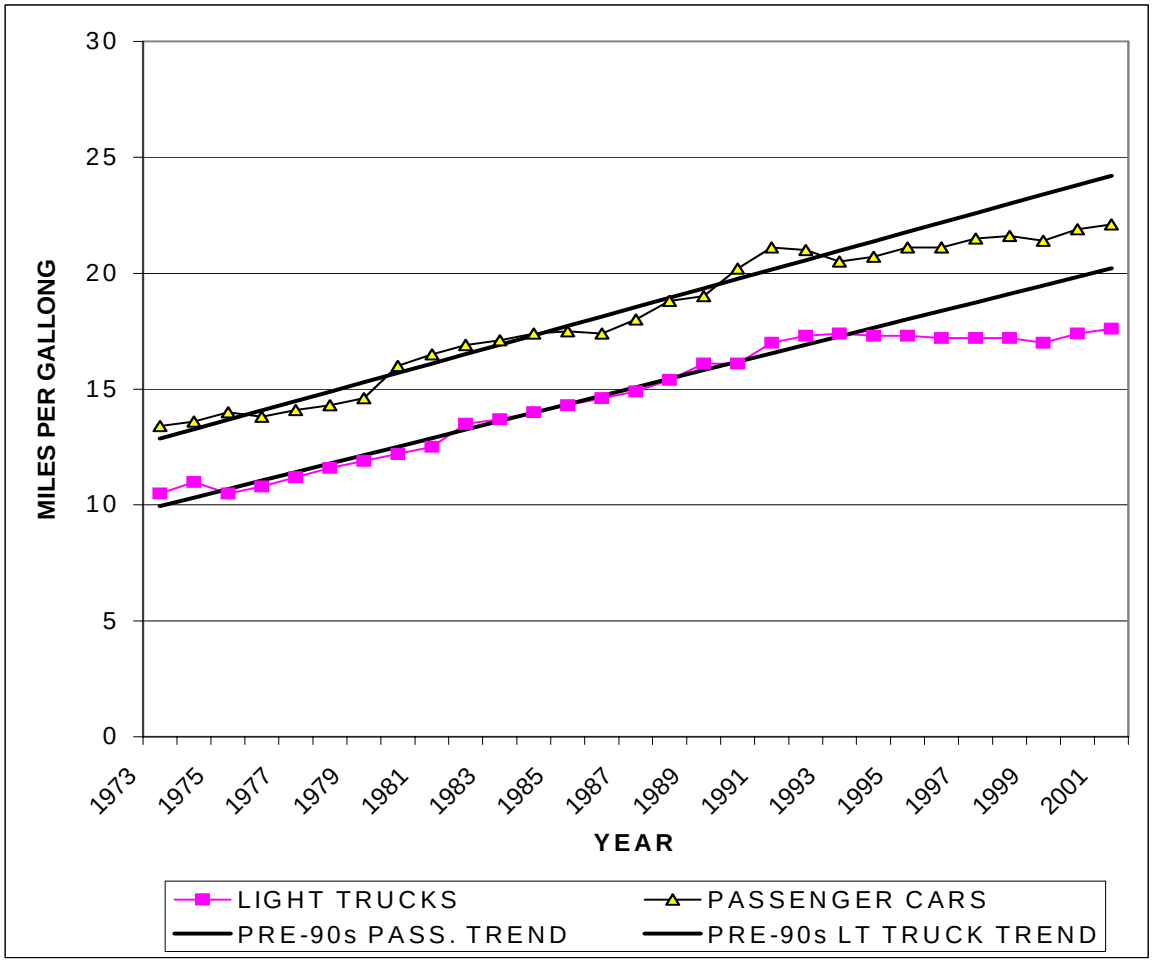
Because automobiles and driving are necessities, not luxury goods, people buy a certain amount to meet their daily needs, but they do not consume much more beyond meeting those needs.[17] Households that have vehicles in rural and suburban areas use considerably

more gasoline than those in central cities. They have to. They live farther from work, friends and local businesses. Because gasoline consumption is so deeply embedded into the routine of daily life, we would not expect it to fluctuate wildly.

The inability of consumers to reduce demand is the critical factor in rendering the gasoline market volatile and vulnerable to abuse.[18] When demand is inelastic, consumers are vulnerable to price increases, since they cannot cut back on or find substitutes for their use of the commodity. When the most important market force in disciplining market power, demand elasticity, is as low as observed for gasoline, there are many opportunities to exercise market power.

Because demand is deeply embedded in the patterns of daily life in our society, a central public policy in the 1980s focused on increasing the fuel efficiency of the vehicle fleet (see Exhibit II-2). From the second oil price shock in 1979 through 1991, fuel efficiency

EXHIBIT II-2: LIGHT VEHICLE FUELS EFFICIENCY



Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 1.10.

improved by almost 50 percent. In the ensuing decade, there was little if any progress. Public policy allowed the demand side to put pressure on the market.

Supply is Inelastic

Short-term supply in the oil industry is also extremely inelastic. That is, it cannot be quickly increased. The key elements are the supply-side difficulties of production, transportation and storage for providing for a continuous flow of energy.[19]

Because of the nature of the underlying molecules, the production, transportation and distribution networks are extremely demanding, real time systems. Energy is handled at high pressure, high temperature and under other physical conditions that are, literally, explosive. These systems require perfect integrity and real time balancing much more than other commodities.

Transportation and distribution infrastructure is extremely capital intensive and inflexible. Many sources of energy are located far from consumers, requiring transportation over long distances. The commodities are expensive to transport and store. They are delivered over a network that is sunk in place with limited ability to expand in the short and medium term.

Refineries and pipelines, two key parts of the gasoline distribution chain, are not only capital intensive, but they take long lead times to build. They have significant environmental impacts. In the short term, their capacity is relatively fixed. Refineries must be reconfigured to change the yield of products. Although oil pipelines have largely depreciated their historic, sunk costs, expansion would be capital intensive. Thus, pipeline capacity is generally fixed capacity as well.

Accidents have a special role in networks such as these. Because of the demanding physical nature of the network, accidents are prone to happen. Because of the volatile nature of the commodity, accidents tend to be severe. Because of the integrated nature of the network and demanding real time performance, accidents are highly disruptive and difficult to fix.

These physical and economic characteristics render the supply-side of the market inelastic.[20] Given the basic infrastructure of supply in the industry, the availability of excess capacity and stocks to meet changes in demand is the critical factor in determining the flexibility of supply. Since output is slow to respond to price, stockpiles, storage and importation of product become a critical element of the gasoline market.[21]

Stocks are the key factor in policy responses to market power where supply is inelastic.[22] Every investigation of every product price spike in the past several years points to ‘unusually low stock’ as a primary driver.[23] But stock levels are no accident; they are the result of business decisions.

III. BUSINESS STRATEGIES CREATE AND EXPLOIT MARKET POWER

Supply is Tight as a Result of Business Decisions to Not Add Capacity

There are two clearly identifiable trends affecting the supply side of the gasoline market – a reduction in capacity relative to demand and an increase in concentration. These trends result from the business decisions of oil companies.

The National Energy Task Force of 2001 recognized that reduction in capacity was a business decision. Government did not choose to carry much lower stocks, private businesses did.[24]

> Ongoing industry consolidation, in an effort to improve profitability, inevitably leads to the sale or closure of redundant facilities by the new combined ownership. This has been particularly true of terminal facilities, which can lead to reductions in inventory and system flexibility. While excess capacity may have deterred some new capacity investments in the past, more recently other factors, such as regulations, have deterred investment.[25]

The prominent role of business decisions in reducing capacity raises the concern that these decisions are intended to reduce competitive market forces and secure market power for major industry players. While mergers and acquisitions or facility closings are nominally justified by claims of efficiency gains, [26] they have a real economic effect of reducing competition.

As a recent Rand study put it, the 1990s witnessed a change in attitude in the industry, wherein "[i]ncreasing capacity and output to gain market share or to offset the cost of regulatory upgrades is now frowned upon."[27] In its place we find a "more discriminating approach to investment and supplying the market that emphasized maximizing margins and returns on investment rather than product output or market share."[28]

Documents from the mid-1990s indicate that industry officials and corporate officers were concerned about how to reduce capacity, with observations such as "if the U.S. petroleum industry doesn't reduce its refining capacity, it will never see any substantial increase in refinery profits," from a Chevron Corporation document written in November 1995. A Texaco official, in a March 1996 memorandum, said refinery overcapacity was "the most critical factor" facing the industry and was responsible for "very poor refining financial results."[29]

Soon after these observations were made by senior oil industry management a string of mergers hit the industry (see Exhibit III-1). In the past half-decade there has been a merger wave of vertically integrated firms including Exxon-Mobile, BP-Amoco-Arco, Chevron-Texaco, and Phillips-Tosco-Conoco.[30] The dominant firms have spent an immense amount of their capital on mergers and acquisitions.[31]

EXHIBIT III-1: OIL INDUSTRY MERGERS AFFECTING REFINING CAPACITY SINCE 1995

1996	Tosco/Circle K
	Ultramar/Diamond Shamrock (UDS)
1997	Tosco/Unocal
1998	BP/Amoco
	Shell/Texaco
	Citgo/Chalmett/Hess
1999	BP/ARCO
	Exxon/Mobil
	Marathon/Ashland
	UDS/total
2001	Phillips/Tosco
	Valero/UDS
	Valero/Huntaway
2002	Phillips/Connoco
	Shell/Motiva/Equilon/Dear Park
	Chevron/Texaco

Source: Energy Information Administration, U.S. Department of Energy, *Performance Profiles of Major Energy Producers: 2001* (January 2003), Figure 33; Energy Information Administration, U.S. Department of Energy, *Restructuring: The Changing Face of Motor Gasoline Marketing*, xxx, Table 1.

With oil companies merging and eliminating "redundant" capacity, it should not be surprising to find that capacity has not kept up. Refinery capacity has not expanded to keep up with the growth in demand. Exhibit II-2 shows the relationship between refinery output and demand. In 1985 refinery capacity equaled daily consumption of petroleum products. By 2002, daily consumption exceeded refinery capacity by almost 20 percent.

In the early1980s, a public policy providing support for small refineries was terminated. This accounted for the loss of about 100 refineries between 1980 and 1985 (See Exhibit III-3). Since then, scores of other refineries have been shut down. Government did not close refineries, private businesses did. In the 1990s alone, approximately 50 refineries were closed. Since 1995, over 20 refineries have been shut down. The number of operating refineries has been reduced by 13 percent since 1995. The refineries get larger, but smaller in number and are owned by fewer and fewer entities. Over the last two decades of the twentieth century the number of firms engaged in refining in the United States declined by two-thirds.[32]

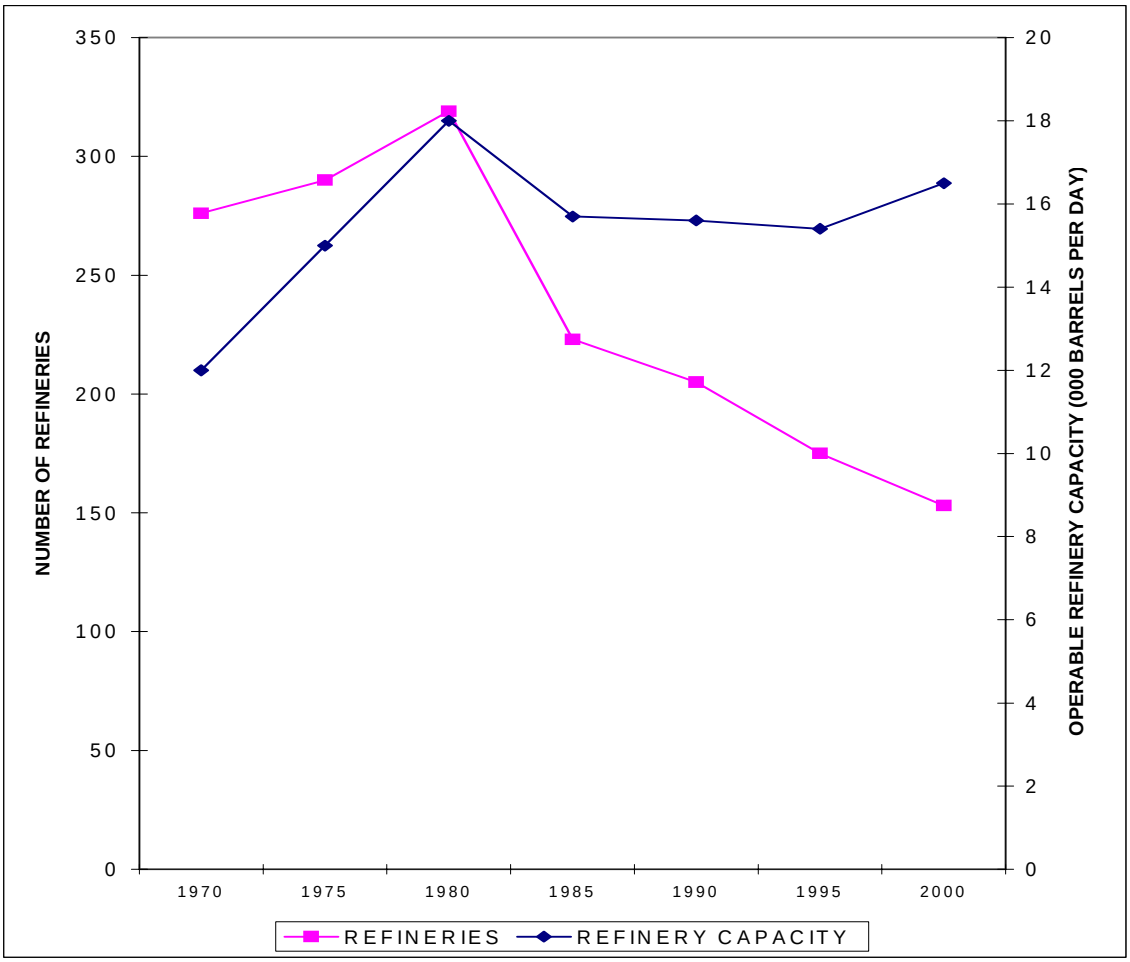
EXHIBIT III-2: REFINERY CAPACITY AND PRODUCT SUPPLIED

Source: U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, various issues, Tables S1, 36; *Weekly Petroleum Status Report*, various issues.

Once these trends become clear, the complaint by policymakers that no new refineries have been built in recent years loses it compelling public policy impact.[33] Similarly, blaming the decline of capacity relative to demand on the Clean Air Act does not stand close scrutiny. Consolidation of the refinery industry was a conscious business decision that began long before amendments to the Clean Air Act in 1990 and continued after changes in gasoline formulation.

In fact, at the time of the 1995 changes in Clean Air Act requirements the Department of Energy conducted a study of the impact of environmental requirements on the refining industry. It concluded that "pollution abatement operating costs have been and continue to be a small part of overall operating costs."[34] Similarly, general reviews of the industry at the time concluded that "a close examination reveals that the change in refining costs attributable to RFG had no major impact on margin behavior between 1993 and 1995."[35] In fact, overall operating costs have been declining.[36]

EXHIBIT III-3: REFINERIES AND REFINERY CAPACITY

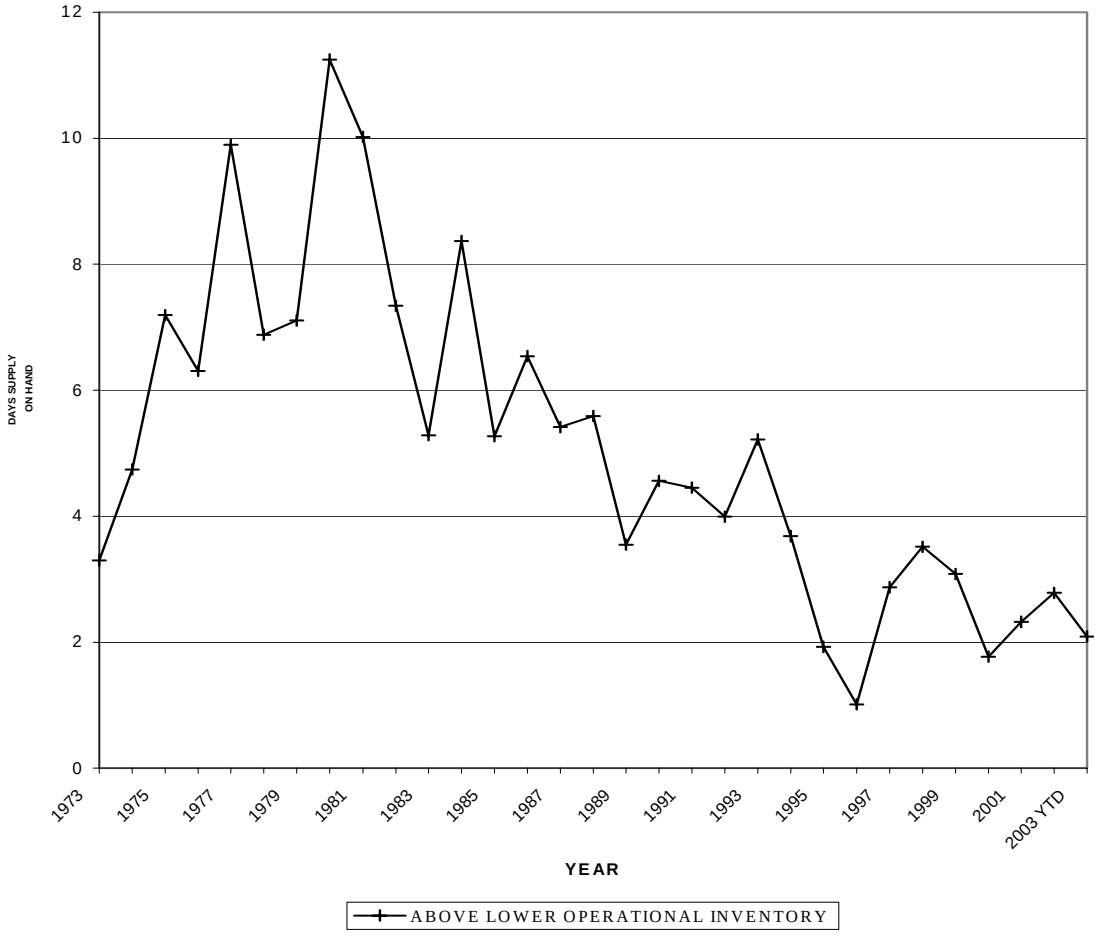


Source: U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, various issues, Tables S1, 36.

Reductions of over 10 percent in storage capacity and more than 10 percent in the number of gasoline stations have also taken place in just the past half-decade. Just as with refineries, the decline in storage is attributable in part to a reduction in capacity.[37] The reduction in capacity equals over ten days' supply, and ten days of working storage capacity. The decline in gasoline stocks is a critically important factor in keeping markets tight.[38]

Exhibit III-4 shows the relationship between stocks and demand for gasoline. Stocks are measured as the number of days of demand of gasoline held in storage. The Exhibit shows that the amount of stock above what is considered the lower operational inventory has declined. Because of the nature of operations of gasoline delivery systems, a certain level of

EXHIBIT III-4: GASOLINE STOCKS ON HAND: DAYS OF SUPPLY ABOVE OPERATIONAL INVENTORY LEVELS



Source: U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Monthly,* various issues, Table, S4, Figure S6; *Weekly Petroleum Status Report.*

stock is needed to keep the system running in real time (the lower operational level).[39] Operations are subject to disruption should stocks fall below this level.[40] It is the stocks above this level that are available to respond to shifts in demand or price. The reserves above the lower operational inventory level have declined to very low levels. They generally are in the range of a couple of days, compared to four or five days in the early 1990s and over a week in the 1980s.

The tight supply demand balance that results from industry decisions to close refineries may also contribute directly to occurrence of accidents. The extremely high capacity utilization that creates high levels of profit also puts additional stress on equipment.[41]

Over the course of the last decade, the number of gasoline stations has declined as well, while the number of vehicles that need to be supported has grown. The number of gasoline stations has declined by 16 percent, from 210 thousand to 176 thousand. The number of motor vehicles has increased by 16 percent, from 189 million to 210 million. As a consequence, the number of motor vehicles per station has increased by 39 percent, from 900 to 1250. Each station pumps more gas, but there are fewer competitors.

THE DOMESTIC OIL INDUSTRY HAS BECOME DANGEROUSLY CONCENTRATED

The wave of mergers in the industry noted above has resulted in a level of concentration that creates the basis for business behaviors and strategies that can exploit market power. Several major mergers between vertically integrated companies in the top tier of the oil industry have pushed petroleum product markets to levels of concentration that are a serious concern.

Because the supply and demand elasticities for gasoline are so low[42] and the expenditures on energy are so large,[43] we believe these industries should be held to close scrutiny because the exercise of market power results in higher prices.[44] Antitrust authorities have failed to exercise proper caution to protect the public interest and consumers are suffering as a result.

Antitrust authorities use two measures of market concentration. The four firm concentration ratio is equal to the market share of the four largest firms. If the four largest firms control 60 percent or more of the market, the market is a tight oligopoly.[45] William Shepherd describes these thresholds in terms of four firm concentration ratios as follows:[46]

> Tight Oligopoly: The leading four firms combined have 60-100 percent of the market; collusion among them is relatively easy.
>
> Loose Oligopoly: The leading four firms combined have 40 percent or less of the market; collusion among them to fix prices is virtually impossible.

The HHI (Hirshman Herfindahl Index), a measure used by the Department of Justice, is the sum of the square of the market shares of all firms in a market. Under its Merger Guidelines, the DOJ considers a market with an HHI of 1000 or less to be unconcentrated. Such a market would have the equivalent of ten equal-sized competitors. In such a market, the four firm concentration ratio would be 40 percent. Any market with a concentration above this level is deemed to be a source of concern. The DOJ considers an HHI of 1800 as the point at which a market is highly concentrated. This level falls between five and six equal-sized competitors.

Shepherd refers to collusion in his discussion, but it is important to note that it is not the only concern of market power analysis or the Merger Guidelines. The DOJ Guidelines are oriented toward conditions under which a broad range of anticompetitive behaviors are

sufficiently likely to occur as to require regulatory action. The Merger Guidelines recognize that market power can be exercised with coordinated, or parallel, activities and even unilateral actions in situations where there are small numbers of market players.[47] The area of noncollusive, oligopoly behavior has received a great deal of attention. A variety of models have been developed in which it is demonstrated that small numbers of market participants interacting in the market, especially on a repeated basis, can learn to signal, anticipate, and parallel one another to achieve outcomes that capture a substantial share of the potential monopoly profits.[48]

Exhibit III-5 shows two measures of market concentration. Oil companies, like all capitalist enterprises, will seek to gain market power. Antitrust authorities are charged with ensuring they do not succeed. Unfortunately, over the past decade when, a host of mergers were approved, antitrust authorities did not take the fundamentals sufficiently into account. They have prevented a few local markets from becoming highly concentrated, but that was far too lenient a standard. Because supply and demand are so inelastic and vertical leverage is so

EXHIBIT III-5: CONCENTRATION OF REFINERIES IN REGIONAL MARKETS

		1994		2000	
PETROLEUM ADMINISTRTIVE		HHI	4-FIRM	HHI	4-FIRM
DEFENSE DISTRICT (PADD)		CR			CR
I.	East Coast	1297	62	2007	77
II.	Upper Midwest	731	40	980	52
III.	Gulf Coast	453	29	753	42
IV.	Mountain West	1000	49	1061	51
V.	West Coast	1037	54	1376	67

Source: U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual 1999,* Volume 1 (June 2000); Table 38 for market shares, p. 122 for PADDs. The states in each PADD are as follows I = ME, NH, VT, MA, RI, CT, NY, NJ, PA, WV, DE, MD, VA, NC, SC, GA, FL; II= OH, MI, IN, KY, TN, IL, WI, MN, IA, MO, OK, KS, MB, SD, ND, III= AL, MI, AK, LA, TX, NM; IV= MT, WY, CO, UT, ID; V= WA, OR, NV, AZ, CA, HI AK.

important, antitrust authorities should have insisted that markets remain unconcentrated (i.e. below the moderately concentrated threshold).

The recent mergers have pushed three of the country's five regional refining markets (Petroleum Administrative Defense Districts or PADD) into a danger zone of concentration.

This concentration reflects a business decision in which "operating refineries have sought to concentrate their activities in markets where they hold a leading market share."[49]

There has clearly been a sharp increase in the level of concentration in all markets except the Mountain West. The East Coast, Mountain West and West Coast all fall well above the unconcentrated zone. The upper Midwest is close to the upper limit of the unconcentrated zone based on HHI with the four firm concentration ratio moving well above the unconcentrated level.

Product markets are much smaller than refinery markets. That is, while refineries may serve a broad area, most consumers buy virtually all of their gasoline in the metropolitan area in which they live. Most studies of gasoline prices use the metropolitan area as the unit of analysis. While we lack data on a city-by-city basis, some data is readily available on a state-by-state basis. It confirms that the trend of increasing concentration has brought the industry to a level that is a source of concern.

EXHIBIT III-6: CONCENTRATION OF GASOLINE DISTRIBUTION IN STATE MARKETS

CALIFORNIA

CFA-Outlets	1994 HHI	4-Firm CR	5-Firm CR		1999 HHI	4-Firm CR	5-Firm CR
	1143	60	69	→	1432	73	90

DOE Reformulated Volume	1997 HHI	5-Firm CR
	1290	74

CONNECTICUT

CFA-Outlets	1994 HHI	4-Firm CR		1999 HHI	4-Firm CR
	1022	53	→	1415	65

Lundberg Total Volume	1998 HHI	4-Firm CR		1999 HHI	4-Firm CR
	1110	55	→	1264	62

ILLINOIS

CFA-Outlets	1994 HHI	4-Firm CR		HHI	1999 4-Firm CR
	1053	55	→	1311	63

WISCONSIN

CFA-Outlets	1994 HHI	4-Firm CR		1999 HHI	4-Firm CR
	1175	65	→	1400	66

Sources: CFA, calculated from *National Petroleum News*, Annual Survey of Outlets; *Lundberg, Connecticut of Market Report: February, 1999*; DOE, U.S. Department of Energy, Energy Information Administration, *Assessment of Summer 1997 Motor Gasoline Price Increase*, May 1998, p. 64

Exhibit III-6 presents several analyses of the concentration of gasoline distribution at the state level. We have prepared analyses of California, Illinois, Wisconsin and Connecticut based on the number of branded gasoline stations in each state. We have selected a time frame similar to that of the prior refinery analysis. California was selected because the West is frequently mentioned in discussions of high gasoline prices. There was also a U.S. Department of Energy study available for comparison. Illinois and Wisconsin were selected because they have been focal points of concern in recent price spikes. Connecticut is included because it represents another PADD and there was a separate analysis available for comparison.

We observe sharp increases in concentration in each of these states. Each is now well into a range of concentration that is a source of concern for competitiveness. The level of concentration we estimate on the basis of outlets is consistent with the other analyses that are based on volumes of sales. The trend of increasing concentration is observable in all cases.

These analyses do not take mergers in the past two years into account. As described in Exhibit III-1, they certainly made matters worse. Moreover, the previous discussion focuses on horizontal concentration. Vertical integration between segments of the industry may have an impact as well. Vertical integration by dominant firms may create a barrier to entry requiring entry at two stages of production,[50] or foreclosing critical inputs for competitors in downstream markets.[51] Vertical arrangements may restrict the ability of downstream operators to respond to local market conditions.[52]

Vertical integration not only removes important potential competitors across stages of production,[53] but also may trigger a wave of integrative mergers,[54] rendering small independents at any stage extremely vulnerable to a variety of attacks.[55]

Gasoline markets are vulnerable to the negative effects of vertical integration. Product must move downstream from the refinery or the tanker to the pump. Vertically integrated operations are closed to independent sources of supply. They may impose zonal pricing formulas or restrictions on sources of supply on their distribution outlets.[56] With vertical integration, the market may be less responsive than it could be both in the short term, since competing product has difficulty getting into individual markets at the end of a vertically [57] integrated chain, and in the long term because new competitors in any market may have to enter at several stages of the business.

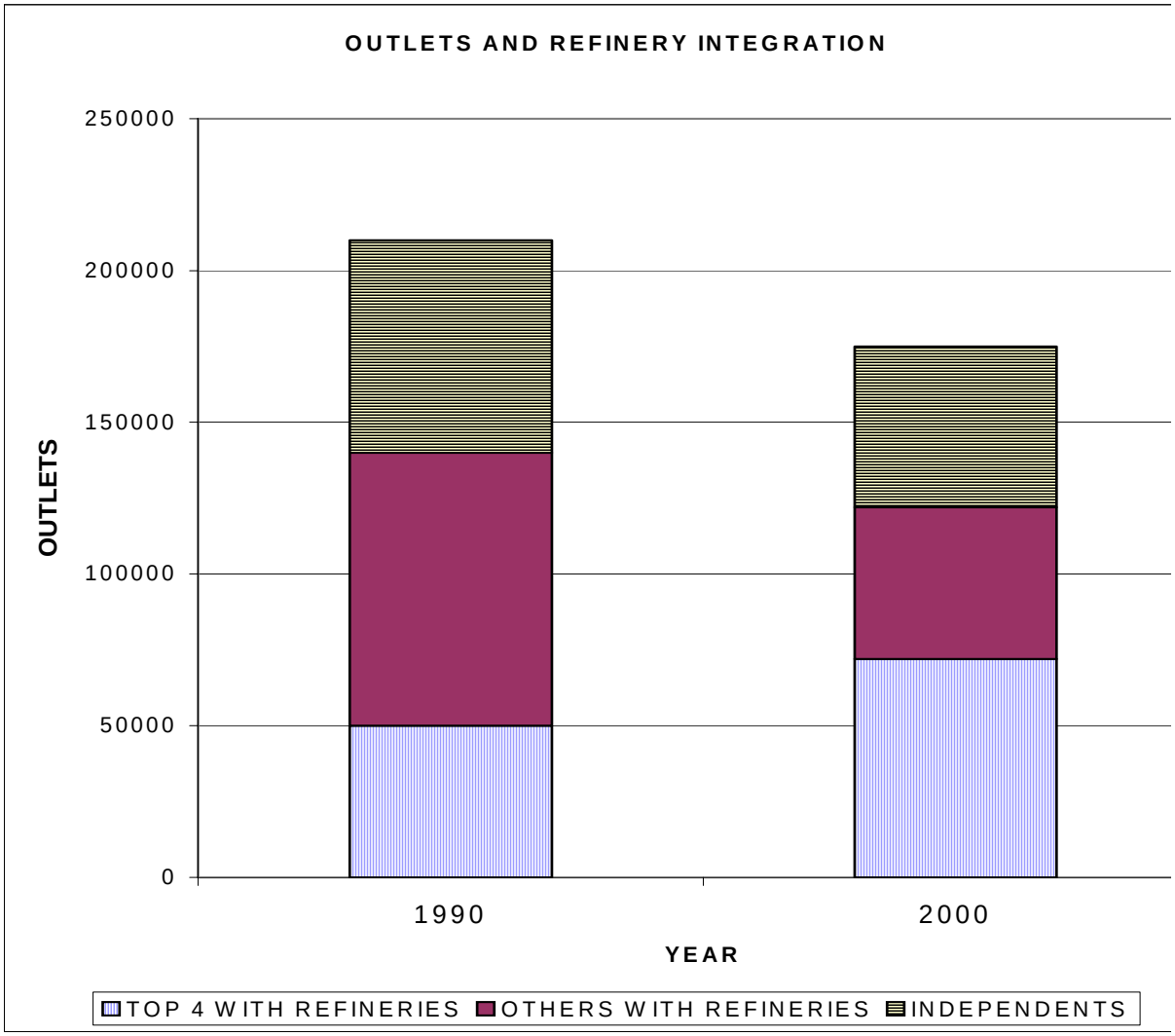
An interesting study of cities across the country as well as the first merger in the wave of late 1990s mergers (the Tosco/Unocal merger of 1997) finds support for this concern. The study finds that both horizontal concentration and vertical integration are associated with high prices:

> Upstream concentration is positively correlated with price, the market share of independents is negatively correlated with price and the average market share of the vertically integrated suppliers covaries positively with wholesale price…

> Moreover, the incentive to raise price is also positively correlated with the geographic proximity of integrated stations to rival independents, indicating that the greater the degree of competition, or cross-price elasticity, between integrated retailers and rival independent retailers, the greater the integrated firm's incentive to raise rivals' wholesale costs.[58]

In light of these findings, the integration of refining and distribution is important. The percentage of stations owned by companies that also own refineries did not change much over the decade, but the size of the largest integrated owners increased dramatically (see Exhibit III-

EXHIBIT III-7: OUTLETS AND REFINERY INTEGRATION



Source: Energy Information Administration, U.S. Department of Energy, *Restructuring: The Changing Face of Motor Gasoline Marketing*, Table 2; McEwan, Ron, "Position and Status of Retail 'Brand' Within the Industry," *National Petroleum News*, August 2001.

7). The integrated companies also appear to be more regionalized.[59] Each company covers a smaller area more densely, resulting in less competition.

CONDUCT: EXPLOITING TIGHT MARKETS

Concentrated markets like these facilitate the exercise of market power. If a small number of companies dominate a market, collusion may become easier, but several decades of economic analysis has shown that non-collusive behaviors that reduce competition and increase price are an equal concern.[60] With small numbers of companies it becomes easier to monitor the behavior of other market participants, signal intentions, dominate product or geographic markets, or to take unilateral actions that influence price.

> The Federal Trade Commission analysis of the Midwest price spikes of 2000 provides an important base of understanding. It describes the first price spike after the merger wave of the late 1990s. It demonstrates the complex interaction of factors in the gasoline market, but also introduces the element of decisions that caused supplies to be tight and kept them that way:
>
> Prices rose both because of factors beyond the industry's immediate control and because of conscious (but independent) choices by industry participants...
>
> In sum, the evidence does not indicate that the price spike in Midwest gasoline in the spring and early summer 2000 was caused by a violation of the antitrust laws. The spike appears to have been caused by a mixture of structural and operating decisions made previously (high capacity utilization, low inventory levels, the choice of ethanol as an oxygenate), unexpected occurrences (pipeline breaks, production difficulties), errors by refiners in forecasting industry supply (misestimating supply, slow reactions), and decisions by firms to maximize their profits (curtailing production, keeping available supply off the market). The damage was ultimately limited by the ability of the industry to respond to the price spike within three or four weeks with increased supply of products. However, if the problem was short-term, so too was the resolution, and similar price spikes are capable of replication. Unless gasoline demand abates or refining capacity grows, price spikes are likely to occur in the future in the Midwest and other areas of the country.[61]

Approximately $26 billion of the $30 billion increase in the domestic spread occurred in the price spikes in the ensuing 30 months. It is not only short-term decisions about refinery runs and stocks that affect the market greatly as it becomes concentrated. With few players, longer-term decisions also have a major impact. The FTC found these decisions to have had a substantial impact on the market in its study of the midwestern gasoline market.

> A significant part of the reduction in the supply of RFG was caused by the investment decisions of three firms. When determining how they would

> comply with the stricter EPA regulations for summer-grade RFG that took effect in the spring 2000, three Midwest refiners each independently concluded it was most profitable to limit capital expenditures to upgrade their refineries only to the extent necessary to supply their branded gas stations and contractual obligations. As a result of these decisions, these three firms produced, in the aggregate, 23 percent less summer – grade RFG during the second quarter of 2000 than in 1999. Consequently, these three firms were able to satisfy only the needs of their branded gas stations and their contractual obligations, and could not produce summer – grade RFG to sell on the spot market as they had done in prior years. [62]

A Rand study found this to be a widespread phenomenon.

> Relying on… existing plant and equipment to the greatest possible extent, even if that ultimately meant curtailing output of certain refined product… openly questioned the once-universal imperative of a refinery not "going short" – that is not having enough product to meet market demand. Rather than investing in and operating refineries to ensure that markets are fully supplied all the time, refiners suggested that they were focusing first on ensuring that their branded retailers are adequately supply by curtailing sales to wholesale market if needed.[63]

Moreover, the industry has become so concentrated that the ability to implement strategic policies to affect the supply demand balance has been shifted to the producers. As one study noted:

> Of note, a few refiners are contemplating the potential for a significant easing of demand, perhaps as soon as 2010, prompted by the introduction of highly efficient motor vehicles. Such thinking may create pressure to minimize increases in capacity and other investments in plant and equipment in the mid-term, thus contributing to higher and more volatile prices and better profit margins.[64]

As suggested by the Federal Trade Commission report, individual companies now may have pricing power, not through collusion but through individual action.[65] That is, with supply and demand tight and a small number of suppliers in each market, individual suppliers recognize that they can influence the price, at least for short periods of time, by withholding supplies. They are no longer the price takers we find in competitive markets; they become price makers:

> In addition, at least one firm increased its summer-grade RFG production substantially and, as a result, had excess supplies of RFG available and had additional capacity to produce even more RFG at the time of the price spike. It thus found itself with considerable market power in the short term. This firm did sell off some inventoried RFG, but acknowledged that it limited the

> magnitude of its response because it recognized that increasing supply to the market would push down prices and thereby reduce the profitability of its overall RFG sales.[66]

In recent years, imports have begun to fill the gap as prices increase. However, the price gap that develops before imports increase far exceeds the cost of transportation. As the Department of Energy put it:

> The gasoline price difference between the United States East coast (New York Harbor) and Rotterdam was in the 0-4 cents per-gallon range from 1991 to 1994, but it has been in the 3-8 cents per gallon range since. Since transportation costs are in the 3-5 cents-per-gallon range, Europe to United States movements are economically attractive. Gasoline from the Middle East (particularly Saudi Arabia) has been finding its way to U.S. markets because Asian refining growth has impacted the need and economics for gasoline imports. Finally, any strength in U.S. gasoline markets attracts some increases in imports from traditional Western hemisphere sources, such as Venezuela, Virgin Islands, and Canada.[67]

In fact, the "strength" in the U.S. market represents a sustained run up of over 20 cents at the pump and over 10 cents in the refiner/marketer share. This is a much larger "price difference" than historically has been the case and raises the question of why didn't gasoline from foreign sources "find their way" to the U.S. sooner to restrain price increases. The domestic industry is hostile to imports, with "many refining industry representatives in the RAND discussion spoke about "unfair foreign competition" and the need for duties and other measures to restrain imports."[68]

Prices run up quickly because of even slight disruptions in the supply demand balance and producers are slow to react because they do not fear that others can bring product to market and steal their business. Consequently, prices are said to be sticky downward.[69] There is a debate about whether gasoline prices change asymmetrically with respect to crude oil prices. The majority of published studies find support for the "rockets and feathers" view.[70] Prices rise like rockets and float down like feathers.[71] The debate centers around whether the price changes in crude oil (up and down) are fully and finally reflected in the pump price. In separate analyses Severin Borenstein and the U.S. General Accounting Office find the difference to be a penny or two per gallon.[72]

One fundamental difference between the price spikes of recent years and the "rockets and feathers" debate should be underscored. In the recent circumstances, we are not dealing with crude oil price changes alone, so the question is not whether refiner/marketer margins "catch up," or whether some of the change in crude oil price ends up in the refiner/marketer pockets (bottom line). The recent price spikes have been significantly driven by refiner/marketer margins. Even if margins return to historic levels after the spike, there is no doubt that a net increase in marketer margins has occurred.

IV. POLICIES TO COMBAT SHORT TERM VOLATILITY AND CREATE LONG TERM STABILITY

Two years ago, in response to the first evidence of a price ratchet, we recommended a broad and comprehensive set of responses to this complex problem.[73] Those policies made sense then; they make even more sense today. The Federal government has done little to move policy in that direction.

It is time for public policy makers to seek to institute permanent institutional changes that both reduce the chances that markets will be tight and reduce the exposure of consumers to the opportunistic exploitation of markets when they become tight. To achieve this reduction of risk public policy should be focused on achieving five primary goals:

- Restore reserve margins by increasing both vehicle fuel efficiency (demand-side) and production capacity (supply-side).
- Increase market flexibility through stock and storage policy.
- Discourage private actions that make markets tight and/or exploit market disruptions by countering the tendency to profiteer by withholding of supply.
- Promote a more competitive industry.

Expand Reserve Margins By Striking A Balance Between Demand Reduction and Supply Increases

Improving vehicle efficiency (reduction in fleet average miles per gallon) equal to economy wide productivity over the past decade (when the fleet failed to progress) would have a major impact on demand. It would require the fleet average to improve at the same rate it did in the 1980s. It would raise average fuel efficiency by five miles per gallon, or 20 percent over a decade. This is a mid-term target. This rate of improvement should be sustainable for several decades. This would reduce demand by 1.5 to 2 million barrels per day and return consumption to the level of the mid-1980s.[74]

Expanding refinery capacity by 10 percent equals approximately 1.5 million barrels per day. This would require 15 new refineries, if the average size equals the refineries currently in use. This is less than one-third the number shut down in the past ten years and less than one-quarter of the number shut down in the past fifteen years. Alternatively, a ten percent increase in the size of existing refineries, which is the rate at which they increased over the 1990s, would do the trick, as long as no additional refineries were shut down.

Placed in the context of redevelopment of recently abandoned facilities or expansion of existing facilities, the task of adding refinery capacity does not appear daunting. Such an expansion of capacity has not been in the interest of the businesses making the capacity decisions. Therefore, public policies to identify sites, study why so many facilities have been shut down, and establish programs to expand capacity should be pursued.

This combination of demand-side and supply-side policies to improve the long run market balance would restore the supply/demand balance to levels that typified the mid-1980s.

Expanding Storage And Stocks

It has become more and more evident that private decisions on the holding of stocks will maximize short-term private profits to the detriment of the public. Increasing concentration and inadequate competition allows stocks to be drawn down to levels that send markets into price spirals. While the Strategic Petroleum Reserve has been developed as a strategic stockpile and companies generally take care of operating stocks, the marketplace is clearly not attending to economic stockpiles. Moreover, the SPR should be filled in a manner that does not harm consumers.

Companies will not willingly hold excess capacity for the express purpose of preventing price increases. They will only do so if they fear that a lack of supply or an increase in brand price would cause them to lose business to competitors who have available stocks. Regional gasoline markets appear to lack sufficient competition to discipline anti-consumer private stock policies.

Public policy must expand stocks. Gasoline distributors (wholesale and/retail) can be required to hold stocks as a percentage of retail sales. Public policy could also either directly support or give incentives for private parties to keep storage. It could lower cost of storage through tax incentives when drawing down stocks during seasonal peaks. Finally, public policy could directly underwrite stockpiles. We now have a small Northeast heating oil reserve. It should be continued and sized to discipline price shocks, not just prevent shortages. Similarly, a Midwest gasoline stockpile should be considered.

Taking The Fun and Profit Out of Market Manipulation

In the short term, government must turn the spotlight on business decisions that make markets tight or exploit them. Withholding of supply should draw immediate and intense public scrutiny, backed up with investigations. Since the federal government is likely to be subject to political pressures not to take action, state government should be authorized and supported in market monitoring efforts. A joint task force of federal and state attorney's general could be established on a continuing basis. The task force should develop databases and information to analyze the structure, conduct and performance of gasoline markets.

As long as huge windfall profits can be made, private sector market participants will have a strong incentive to keep markets tight. The pattern of repeated price spikes and volatility has now become an enduring problem. Because the elasticity of demand is so low – because gasoline is so important to economic and social life – this type of profiteering should be discouraged. A windfall profits tax that kicks in under specific circumstances will take the fun and profit out of market manipulation.

Ultimately, market manipulation should be made illegal. This is particularly important for commodity and derivative markets.

PROMOTING A WORKABLY COMPETITIVE MARKET

Further concentration of these industries is quite problematic. The Department of Justice Merger Guidelines should be rigorously enforced. Moreover, the efficiency defense of consolidation should be viewed skeptically, since inadequate capacity is a market problem.

Restrictive marketing practices, such as zonal pricing and franchise restrictions on supply acquisition should be examined and discouraged. These practices restrict flows of product into markets at key moments.

Markets should be expanded by creating more uniform product requirements. These should not result in a relaxation of clean air requirements.

ENDNOTES

[1] "Consumer Groups Seek Energy Price Probe," *Energy Daily*, March 11, 2003, p. 4.

[2] Peterson and Mahnovski, p. 5, note the following:

> Oil industry research, analyses and policy dialogs conducted in both the private and public sectors tend to emphasize the natural resource side of the business – upstream crude oil exploration and production. Much less analysis and discussion is devoted to oil companies as the downstream manufacturers of intermediate and finished petroleum products.

[3] Peterson and Mahnovski, p. 5.

[4] Harwood, J. "Americans Distrust Institutions in Poll," *Wall Street Journal*, June 13, 2002, cited in Peterson, D. J. and Sergej Mahnovski, *New Forces At Work in Refining: Industry Views of Critical Business and Operations Trends* (Santa Monica: Rand, 2003), p. 19.

[5] For other products imports play a larger role, close to 10 percent for distillate and 50 percent for residual fuel oil.

[6] New imports of gasoline constitute a very small portion of total gasoline product supplied – about 4 percent. Transportation and marketing costs after the product is landed are domestic, but refining costs for this product are not. Ignoring product imports in the analysis of gasoline results in a slight overestimate of the domestic share.

[7] *Do Current High Petroleum Product Prices, ?* (Energy Information Administration, March 12. 2003), pp. 1-2.

[8] Energy Information Administration, *Summer 2003 Motor Gasoline Outlook*, April 2003.

[9] Public Citizen, Record Oil Company Profits Underscore Market Consolidation, May 31, 2001; Fortune 500, July 18, 2001; Business Week First Quarter Results, May 21, 2001

[10] *Fortune 500*, July 18, 2001.

[11] *Business Week*, Spring 2001, p. 92.

[12] U.S. Department of Energy, Energy Information Administration, *Performance Profile*, 2001, pp. 7-8.

[13] Peterson and Mahnovski, p. xvi.

[14] Espey, Molly, "Gasoline Demand Revisited: An International Meta-Analysis of Elasticities," *Energy Economics* 20 (1998), pp. 273-295, identifies 363 estimates of short-term elasticity. The median is -.23 for the short term and -.43 for the long term. Kayser, Hilke, A., "Gasoline Demand and Car Choice: Estimating Gasoline Demand Using Household Information," *Energy Economics* 22 (2000), estimates the short-term elasticity in the U.S. at -.23. Puller, Steven L. and Lorna A. Greening, "Household Adjustment to Gasoline Price Change: An Analysis Using 9 years of US Survey Data," *Energy* Economics 21 (1999), pp. 37-52, find a one-year price elasticity of -.34, but model a more complex structure of responses within shorter periods. They find a larger elasticity of miles traveled in the first quarter after a price shock (-.69 to -.76), but that demand "snaps back." The larger reduction in miles driven is still "inelastic." Moreover, the reduction in miles driven is larger than the reduction in fuel consumed since it appears that households cut back on the most efficient driving miles (i.e. higher speed vacation miles).

[15] Espy, Molly, "Explaining the Variation in Elasticity Estimates of Gasoline Demand in the United States: A Meta-analysis," *The Energy Journal*, 17, 1996, Table 2, shows the average elasticity of demand from U.S. only studies at -.42.

[16] National Energy Policy Development Group, *National Energy Policy* (Washington, D.C.: May 2001) (hereafter NEPDG), p. 3-13.

[17] Hsing, Yu, "On the Variable Elasticity of the Demand for Gasoline: The Case of the U.S.A.," *Energy Economics*, April 1990, p. 134, notes that the income elasticity declines over time and draws an analogy with expenditures on food,

> The declining income elasticity in the long-run indicates that the proportion of income spent on gasoline continues to decline as income rises. This is because the demand for gasoline like many food commodities has its limit beyond which saturation is reached.

[18] Landes, W. M. and R. A. Posner, "Market Power in Anti-trust Cases," *Harvard Law Review*, 19: 1981, point out that when demand elasticities are low, market power becomes a substantial problem.

[19] Federal Trade Commission, *Midwest Gasoline Price Investigation*, March 29, 2001, pp. i…4.

[20] Consodine, Timothy J. and Eunnyeong Heo, "Price and Inventory Dynamics in Petroleum Product Markets," *Energy Economics*, 22 (2000), p. 527, conclude "supply curves for the industry are inelastic and upward sloping." See also "Separatiblity, Functional Form and Regulatory Policy In Models of Interfuel Substitution," *Energy Economics*, 1989.

[21] Consodine, Timothy J., "Inventories Under Joint Production: An Empirical Analysis of Petroleum Refining," *Review of Economics and Statistics*, 1997, p. 527, "high inventory levels depress prices… In some cases, imports of product are more variable than production or inventories.

[22] Pirrong, Stephen Craig, *The Economics, Law and Public Policy of Market Power Manipulation* (Kluwer, Boston, MA, 1996), pp. 10… 24… 59.

> Economic frictions (including transportation, storage, and search costs) which impede the transfer of the underlying commodity among different parties separated in space or time can create the conditions that the large trade can exploit in order to cause a supracompetitive price…
>
> Although the formal analysis examines transportation costs as the source of friction, the consumption distortion results suggest that any friction that makes it costly to return a commodity to it original owners (such as storage costs or search costs) may facilitate manipulation.
>
> The extent of market power depends on supply and demand conditions, seasonal factors, and transport costs. These transport cost related frictions are likely to be important in many markets, including grains, non-precious meals, and petroleum products.
>
> Transportation costs are an example of an economic friction that isolates geographically dispersed consumers. The results therefore suggest that any form of transactions costs that impedes the transfer of a commodity among consumers can make manipulation possible…

All else equal, the lower the storage costs for a commodity, the more elastic its demand.

See also, William Jeffrey and Brian Wright, *Storage and Commodity Markets* (1991); Deaton, Angus and Guy Laroque, "On the Behavior of Commodity Prices," *Review of Economics and Statistics* (1992).

[23] Energy Information Administration, *Petroleum 1996: Issues and Trends*, September 1997, p. 27. The U.S. Department of Energy identified "lower than normal gasoline stocks" in a chapter entitled "Spring '96 Gasoline Price Runup." Energy Information Administration, *Assessment of Summer 1997*, p. 5, remarked on the role of stocks in the 1997 price runup as follows:

Gasoline stocks plummeted, dropping 15 million barrels, compared to an average monthly decline (for the 1992-1996 period) of 4 million barrels. Stocks ended the month at near-record low levels. Gasoline suppliers were left facing August, which is usually the highest demand month of the year, with virtually no inventory.

Joanne Shore, EIA Petroleum Division. In analyzing the Midwest price spike of 2000, the Department of Energy again found stocks to be the culprit, starting an analysis entitled *Supply of Chicago/Milwaukee Gasoline Spring 2000* as follows:

> This summer's run-up in Midwest gasoline prices, like other recent price spikes, stemmed from a number of factors. The stage was set for gasoline volatility as a result of tight crude oil supplies, which led to low product stocks and relatively high crude oil prices. With little stock cushion to absorb unexpected events, Midwest gasoline prices surged when a number of supply problems developed, including pipeline and refinery supply problems, and an unexpectedly difficult transition to summer-grade Phase II reformulated gasoline.

The FTC reached a similar conclusion in its Midwest Gasoline Price Investigation, at note 23.

Finally, in explaining the early spring price runup in 2001, inventories were the starting point –

: " Low petroleum inventories set the stage for our current situation, as they did last year both for heating oil and for gasoline." "Statement of John Cook, Director, Petroleum Division, U.S. Department of Energy," *Subcommittee on Energy and Air Quality, Committee on Energy and Commerce, U.S. House of Representative*, May 15, 2001, p.1.

[24] *Midwest Gasoline Price Investigation*, note 23 citing OECD and DOE documents states "Higher crude prices led producers to draw down inventories in anticipation of replacing them later at lower prices."

[25] NEPDG, p. 7-13.

[26] They certainly have value on the stock market (see Edwards, Kenneth John D. Jackson and Henry L. Thompson, "A Note on Vertical Integration and Stock Ratings of Oil Companies in the U.S.," *The Energy Journal*, 2000).

[27] Peterson and Mahnovski, p. 16.

[28] Peterson and Mahnovksi, p. 42.

[29] "Oil Data Show Industry Role in Shortages a Possibility," *New York Times*, June 15, 2001.

[30] U.S. Department of Energy, Energy Information Administration, *Performance Profiles of Major Energy Producers: 1999*, p. 19 , notes the first two mega-mergers – Exxon-Mobile and BP-Amoco. This was followed by the Chevron-Texaco merger.

[31] Id., p. 15, shows that even excluding mega-mergers like Exxon-Mobil, mergers and acquisitions equal 15 to 25 percent of total additions to investment. Similarly, Id. P. 55, remarks on the growth of nonintegrated refiners (p. 55), but of the 13 companies noted, at least four (including three of the largest) are either a joint venture of vertically integrated companies or have recently been reintegrated through merger. Joint operating agreements also abound in the industry.

[32] Peterson and Mahnovksi, p. xv.

[33] NEPDG, p. 7-13.

[34] U.S. Department of Energy, Energy Information Administration, *The Impact of Environmental Compliance Costs on U.S. Refining Profitability* (October 1997), p. 3, shows operating costs per gallon associated with pollution abatement at about $.01 per gallon and large capital costs for a short period of time to meet new requirements, but these had already begun to decline by 1995. The impact of capital expenditures must also be small, in the range of a penny per gallon. Other studies lead to similar estimates of costs associated with pollution abatement of a few cents per gallon; see Nadim, Farahad, et al., "United States Experience with Gasoline Additives," *Energy Policy*, 29 (2001).

[35] U.S. Department of Energy, Energy Information Administration, *Petroleum 1996: Issues and Trends* (September 1997), p. 137.

[36] Peterson and Mahnovski (p. xv), note that following "a wave of mergers, acquisitions joint ventures and selective divestitures… [whose] aim was cutting costs gaining economies of scale, increasing returns on investment, and boosting profitability… Consolidation and restructuring appear to have had the salutary effect executives intended, "EIA data indicates that mid and large-size refiners reduced their per barrel operating costs."

[37] U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Annual*, Table 44.

[38] Pirrong, p. 70.

[39] U.S. Department of Energy, Energy Information Administration, *Petroleum Supply Monthly*, April 2000, p. 145, defines the lower operational inventory as follows:

> Lower operational Inventory (LOI): The lower operational inventory is the lower end of the demonstrated operational inventory range updated for known and definable changes in the petroleum delivery system. While not implying shortages, operational problems or price increases, the LOI is indicative of a situation where inventory-related supply flexibility could be constrained or non-existent. The significance of these constraints depends on local refinery capability to meet demand and the availability and deliverability of products from other regions or foreign sources.

[40] The general literature on stock and storage behavior shows that stocks are typically kept to ensure operational flow (see Pyndick, Robert S., "Inventories and the Short-Run Dynamics of Commodity Prices," *Rand Journal of Economics*, Spring 1994, "The Present Value Model of Rational Commodity Pricing," *The Economic Journal*, May 1993;Consodine, Inventories. In Exhibit III-3 , the LOI is placed at 185 million barrels

throughout the period, although it may have varied over time. As supplies have become tight, operators may have squeezed the LOI down. With refinery capacity stable over the past ten years, using a constant level for the period on which this paper focuses provides a sound basis for analysis.

[41] Peterson and Mahnovksi, p. 43.

[42] Landes and Posner (p. 947) stress the importance of adjusting scrutiny based on the market characteristics:

> Market Share Alone Is Misleading. -Although the formulation of the Lerner index… provides an economic rationale for inferring market power from market share, it also suggests pitfalls in mechanically using market share data to measure market power. Since market share is only one of three factors... that determine market power, inferences of power from share alone can be misleading. In fact, if market share alone is used to infer power, the market share measure… which is determined without regard to market demand or supply elasticity (separate factors in the equation), will be the wrong measure. The proper measure will attempt to capture the influence of market demand and supply elasticity on market power.

[43] Landes and Posner (p. 954) also argued that the size of the market at issue should be considered, "if very high market shares are required to justify a finding of monopoly power in a small market, then a lower market share should suffice in a large market."

[44] Recent studies that document the importance of concentration and market power in various markets at a micro level include Sen Anindya, "Higher Prices at Canadian Gas Pumps: International Crude Oil Prices of Local Market Concentration," *Energy Economics,* 2003; Borenstein, Severin and Andrea Shepard, "Sticky Prices, Inventories and Market Power in Wholesale Gasoline markets," *RAND Journal of Economics*, 2002; Delpachitra, Sarath B., " Price Rigidity in the Downstream Petroleum Industry in New Zealand: Where Does it Happen," *Energy Economics*, 2002; Adrangi, Bahram, Arjun Chatrath, Kambiz Raffiee, and Ronald D. Ripple, "Alaska North Slope Crude Oil Price and the Behavior of Diesel Prices in California," *Energy Economics*, 2001; Gilbert, Richard and Justine Hastings, "Vertical Integration in Gasoline Supply: An Empirical Test of Raising Rivals Costs," *Competition Policy Center,* University of California, Berkeley, 2001, Borenstein, Severin, A. Colin Cameron and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes, *Quarterly Journal of Economics,* 1997.

[45] Shepherd, p. 389.

[46] Shepherd, p. 4.

[47] U.S. Department of Justice and Federal Trade Commission *Horizontal Merger Guidelines*, 1997, at section 0.1.

> The rule of thumb reflected in all iterations of the Merger Guidelines is that the more concentrated an industry, the more likely is oligopolistic behavior by that industry.... Still, the inference that higher concentration increases the risks of oligopolistic conduct seems well grounded. As the number of industry participants becomes smaller, the task of coordinating industry behavior becomes easier. For example, a ten-firm industry is more likely to require some sort of coordination to maintain prices at an oligopoly level, whereas the three-firm industry might more easily maintain prices through parallel behavior without express coordination.

[48] John B. Taylor, Economics (Boston: Houghton Mifflin, 1998); W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (Cambridge: MIT Press., 2000), Chapter 5; Jean Fudenberg and Jean Tirole, "Noncooperative Game Theory for Industrial Organization: An Introduction and Overview," in Richard Schmalensee and Robert D. Willig, (eds.) *Handbook of Industrial Organization* (New York: North-Holland, 1989).

[49] Peterson and Mahnovksi, p. 24.

[50] Scherer and Ross, p. 526, formulate the issue as follows "To avoid these hazards, firms entering either of the markets in question might feel compelled to enter both, increasing the amount of capital investment required for entry."

[51] Shepherd, pp. 289-290, describes this issue as follows:

> When all production at a level of an industry is "in-house," no market at all exists from which independent firms can buy inputs. If they face impediments or delays in setting up a new supplier, competition at their level will be reduced. The clearest form of this is the rise in capital a new entrant needs to set up at both levels.

> Ores, special locations, or other indispensable inputs may be held by the integrated firm and withheld from others. The integration prevents the inputs from being offered in a market, and so outsiders are excluded. A rational integrated firm might choose to sell them at a sufficiently high price.

[52] Shepherd, p. 294, argues that integration by large firms creates this problem. Restrictions may be set on areas, prices or other dimension … Only when they are done by small-share firms may competition be increased. When done by leading firms with market shares above 20 percent, the restrictions do *reduce* competition.

[53] Perry, martin K., "Vertical Integration: Determinants and Effects," Richard Schmalensee and Robert D. Willig, *Handbook of Industrial Organization* (Amsterdam, North Holland: 1989), p. 197.

[54] Perry, p. 247.

[55] Scherer and Ross, pp. 526-527; Shepherd, p. 290.

[56] Borenstein, Cameron and Gilbert.

[57] Scherer and Ross, pp. 526-527; Shepherd, p. 290.

[58]Gilbert and Hastings, p. 27; see also Hastings, Justine, "Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California," *Competition Policy Center*, 2000.

[59] In 1990, 22 integrated companies covered an average of 28 states. In 1999, 17 companies covered an average of 26 states.

[60] Even introductory economics texts now contain long discussions of strategic behavior and game theory [see, for example, Taylor, *Economics*, Chapter 11] and it has become a routine part of applied policy analysis [Hasting, Justine, "Factors that Affect Prices of Refined Petroleum Products" (Washington, D.C. Federal Trade Commission Public Conference, August 2, 2001)].

[61] Federal Trade Commission, *Midwest Gasoline Price Investigation*, March 29, 2001, pp. i... 4.

[62] FTC, *Midwest Gasoline Price Investigation*, p. 4.

[63] Peterson and Mahnovksi, p. 17.

[64] Peterson and Mahnovski, p. xviii.

[65] FTC. *Midwest Gasoline Price Investigation*. The West Coast gasoline market has also been the object of repeated complaints about pricing behavior.

[66] FTC, *Midwest Gasoline Price Investigation*, p. 4.

[67] U.S. Department of Energy, Energy Information Administration, *Assessment of Summer 1997 Motor Gasoline Price Increase*, May 1998, p. 17.

[68] Peterson and Mahnovski, p. 31.

[69] Energy Information Administration, *Price Changes in the Gasoline Market*, March 1999, reviews several decades of studies with mixed results in the analysis of gasoline price asymmetry – the tendency of prices to increase rapidly, but fall slowly. The report concludes that there is strong evidence of pattern asymmetry (i.e. prices do rise faster than they fall) but not amount asymmetry (eventually they fall back all the way). This is not the majority view, however.

[70] Reilly, Barry and Robert Witt, "Petrol Price Asymmetry Revisited," *Energy Economics*, 1998.

[71] Bacon, Robert W., "Rockets and Feathers: The Asymmetric Speed of Adjustment of UK Retail Gasoline Prices to Cost Changes," *Energy Economics* 1991; Galeotti, Marzio, Alessandro Lanza and Matteo Manera, "Rockets and Feathers Revisited: An International Comparison on European Gasoline Markets," *Energy Economics*, 2003.

[72] Borenstein, Gasoline Prices, p. 322; U.S. General Accounting Office, "Energy Security and Policy: Analysis of the pricing of Crude Oil and Petroleum Products (Washington, DC, March 1993).

[73] Consumer Federation of America, *Ending the Gasoline Price Spiral (July 2001).*

[74] National Research Council, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards* (Washington, D.C.: 2002); Union of Concerned Scientists, *Drilling in Detroit* (Wasington, D.C.: 2001).