Consumer Federation of America

ENDING THE GASOLINE PRICE SPIRAL

MARKET FUNDAMENTALS FOR CONSUMER-FRIENDLY POLICIES TO STOP THE WILD RIDE

July 2001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

THE UPWARD SPIRAL OF GASOLINE PRICES

Although gasoline prices have traditionally risen during the summer driving months of June-August, in the past two years the seasonal upswing has turned into a much more violent price spiral – a sharp price spike followed by a modest decline with stabilization at a higher level than previous years (see Exhibit ES-1). The new plateau for pricing today is over 20 cents per gallon higher. The increased cost per household amounts to over $150 per year.

The underlying driver of this ratchet has been an increase in the refiner/marketer share of the pump price, not foreign crude oil price increases. The refiner/marketer share doubled in 2000 and doubled again in the first five months of 2001, representing an increased cost to consumers of over $11 billion just since January 2001.

This paper demonstrates that the price ratchet has resulted from a combination of inadequate capacity and inadequate competition in the industry. The underlying tight market condition is the result of both increasing demand and business decisions that slowed the growth of long-term capacity. The price spiral occurs because suppliers who face weak competition find they can take unilateral actions in tight markets to quickly increase prices and profits and stabilize them at higher levels. Public policy must recognize all three factors, supply, demand and competition, if the price ratchet is to be broken in a consumer-friendly fashion.

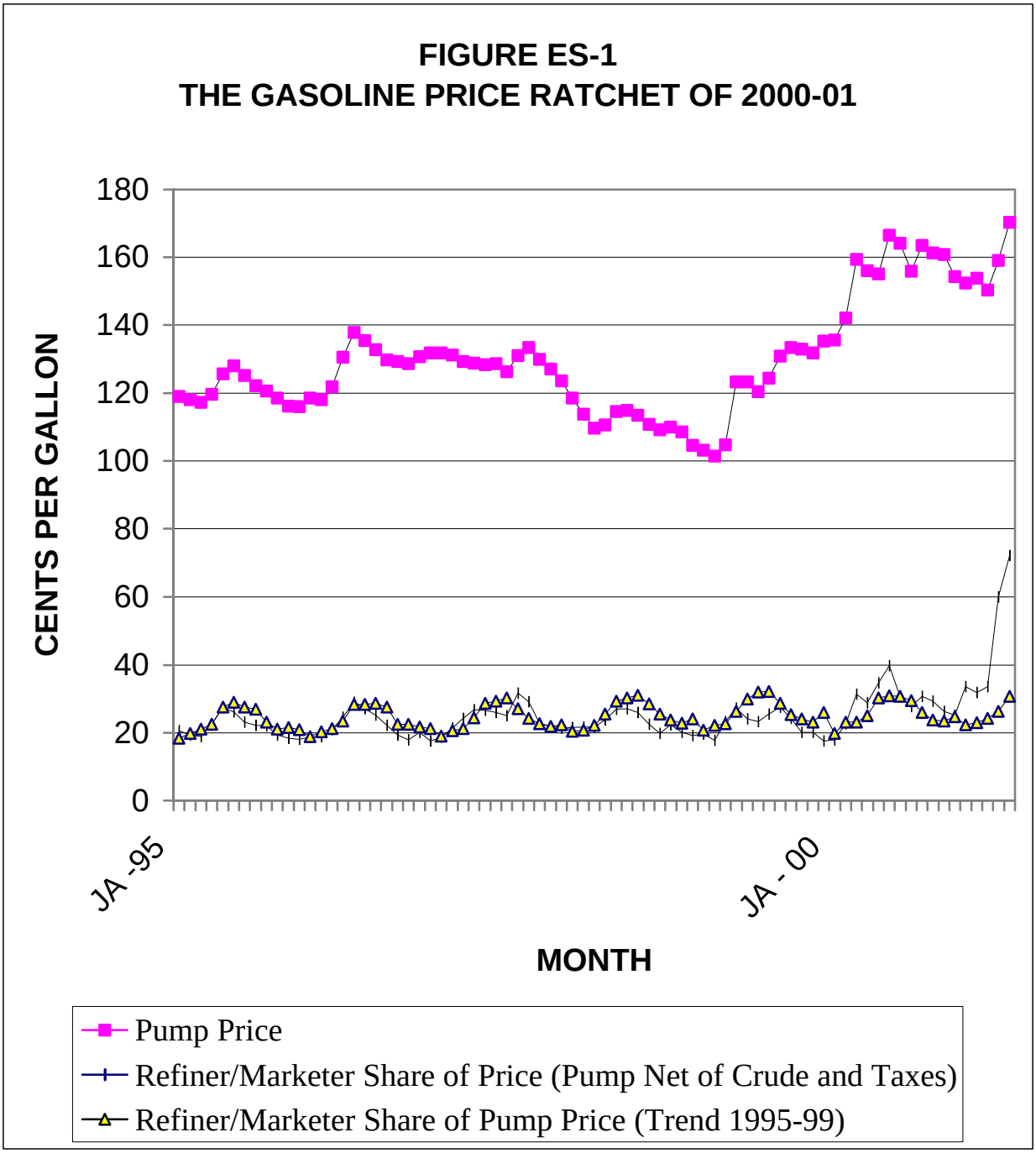
SUPPLY

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 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. 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 it operational minimum, compared to a week or so in the 1980s. Thus, there is little reserve capacity to dampen price increases.



Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 9.4, for pump prices; *Petroleum Marketing Monthly*, Table 1 for crude prices and Table 6 for prices net of taxes; *Petroleum Supply Monthly*, Table S.4 for quantity supplied.

The mergers and reduction of capacity have been driven by business decisions. Larger, more vertically integrated companies may be more efficient, but they can also exploit tight markets. Gasoline markets have been slow to respond to price increases. The price differentials that build up before product imports are used to increase supplies are far larger than the transportation cost of imports. There is clear evidence of cases in which individual decisions not to increase supplies were intended to keep prices up.

The industry and the Administration have argued repeatedly that the problem of moving product into gasoline markets has been caused by fragmentation of markets due to clean air requirements. Because different markets require different additives to meet their summer clean air targets this makes each market small and inhibits the movement of supply from one area to the next. This compounds the market concentration problem, since within those smaller markets individual suppliers have greater market power, but the underlying structural trends of reduced capacity and increased concentration in the industry must receive primary attention.

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.

Over the 1990s, gasoline consumption grew by a total of almost 20 percent, compared to the 1980s when it grew by only 10 percent. The number of drivers and passenger vehicles increased, as the driving age population expanded. Gasoline consumption per passenger vehicles grew by about 7 percent. Of that increase about three quarters was caused by an increase in the number of miles driven and one quarter was caused by the shift to SUVs.

While the shift to SUVs was one striking feature of the 1990s, an equally striking and more important feature of the demand side was the failure of fuel efficiency to improve. If the fuel efficiency of autos had increased as rapidly in the 1990s as it did in the 1980s, autos would have been 20 percent more efficient, getting about 4 miles per gallon more, in 2000. (If there had not been a shift to SUV's, the average fleet efficiency would have been about 1 mile per gallon higher.)

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 five goals.

Restore reserve margins by developing both efficiency and production.

(1) Increasing fuel efficiency at the rate achieved in the 1980s in the decade ahead would save about 1.5 million barrels per day. That rate of progress could be sustained over several decades.

(2) Increasing refinery capacity by 10 percent, either through expansion at existing refineries or redevelopment of less than one half the refineries closed in the past decade, would add another 1.5 million barrels per day.

(3) To the extent investments to meet clean air standards are a barrier to capacity expansion, public policy should find a way to lower the cost of compliance, directly through subsidies or indirectly through research on new technologies, rather than lower the standards.

Increase market flexibility.

(4) Expand 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 add to existing stockpiles.

(5) Larger, more uniform product markets should be developed to expand to increase supply responsiveness, without lowering clear air standards.

Promote a more competitive industry

(6) Further concentration of the petroleum industry should be resisted by vigorous enforcement of the Department of Justice Merger Guidelines.

(7) 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.

(8) Withholding of supply should draw immediate and intense public and governmental scrutiny through a joint federal state task force of attorney's general.

(9) The task force or some other entity should develop ongoing databases and information for evaluating industry structure and conduct.

(10) The incentives to manipulate markets can be reduced by imposing a windfall profits tax that triggers under specific circumstances of price and profit increases.

(11) Ultimately, market manipulation could be made illegal.

Provide adequate energy assistance for low-income households.

(10) Assistance policies directly targeted at transportation expenditures should be considered.

(11) Energy assistance programs should be indexed to energy prices.

I. INTRODUCTION

A. CONTEXT FOR THE ANALYSIS OF GASOLINE MARKETS

Ever since the gasoline lines and oil price shocks of the 1970s, the price and availability of gasoline have been a flashpoint for U.S. energy policy and politics. While consumers have become accustomed to an upswing in prices during the summer driving months of June-August, followed by a downturn in the fall, in the past two years the seasonal upswing has turned into a much more violent price spiral – a sharp price spike followed by a much smaller decline with stabilization at a higher level than previous years (see Figure 1).

The underlying driver of this ratchet has been an increase in the refiner/marketer share of the pump price, not foreign crude oil price increases. The refiner/marketer share doubled in 2000 and doubled again in the first five months of 2001, representing an increase of $11 billion just since January 2001.

These prices increases are felt deeply by consumers because gasoline is a necessity for daily activity. The new plateau for pricing is about 20 cents per gallon higher.[1] The increased cost per household amounts to approximately $150 per year.

Moreover, the impact of gasoline price increases is not evenly distributed (see Exhibit 2). Lower and middle income households (those with income below $30,000 per year) who have automobiles spend between 5 and 10 percent of their income on gasoline.[2] For them, the 20-cent per gallon increase could take an additional one percent of their income. In contrast, upper income households (those with incomes above $75,000 per year) devote less than 2 percent of their income to gasoline consumption. For them the increase would be only .2 percent.

Judging from public opinion polls, the energy price roller coaster imposes substantial discomfort on consumers[3] and raises doubts about the underlying causes.[4] The public certainly seems to have rejected the explanation offered by President Bush in releasing the National Energy Policy Task Force Report that "Overdependence on any one source of energy, especially

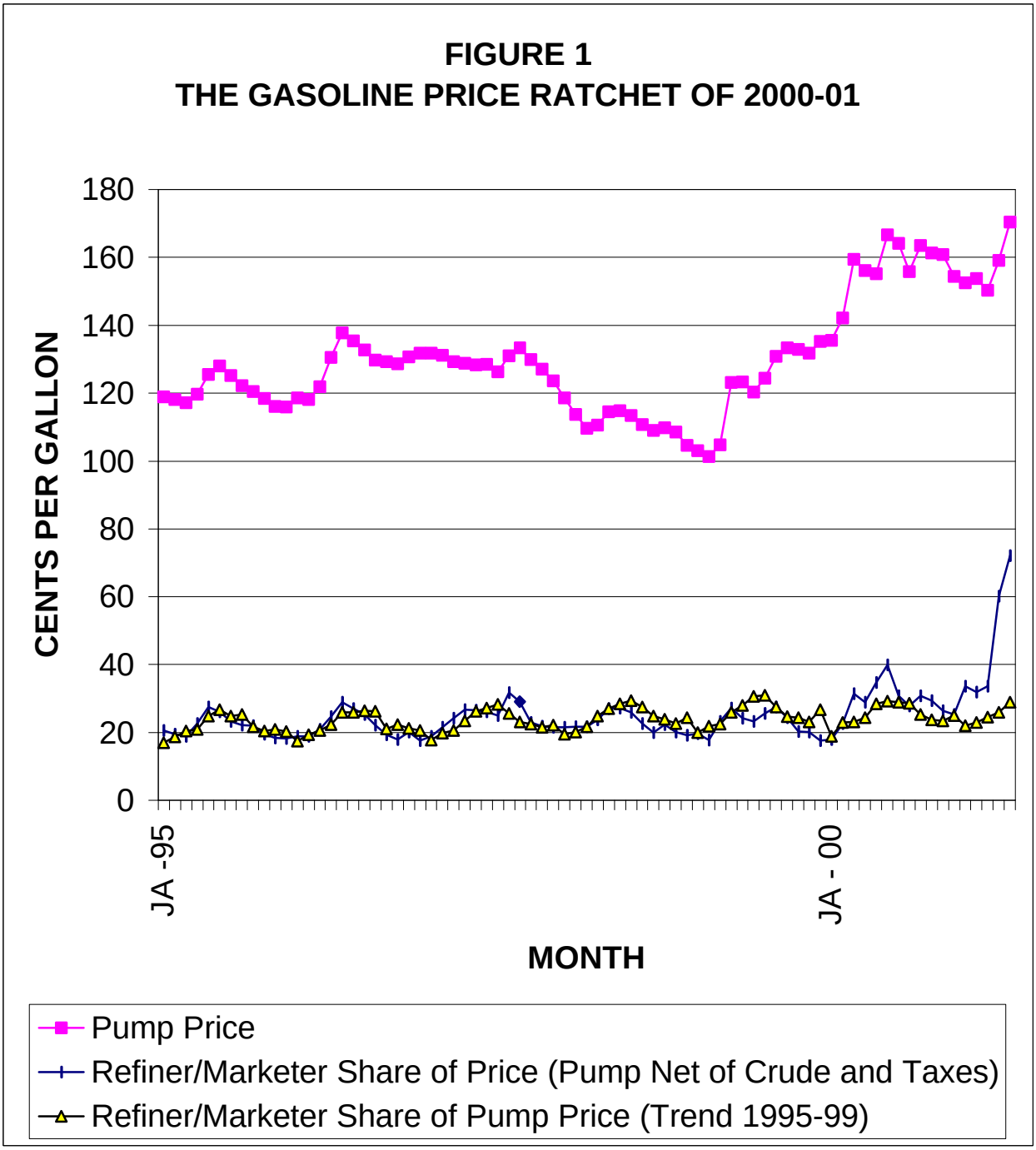
---

[1] The spread in February 2001, even before the most recent gasoline spiral took off was "about 5 cents over what we would typically see this time of year," (see Cook, John, *Petroleum Outlook: More Volatility?*, Energy Information Administration presentation to the MPRA Annual Meeting, March 19, 2001, slide 14).

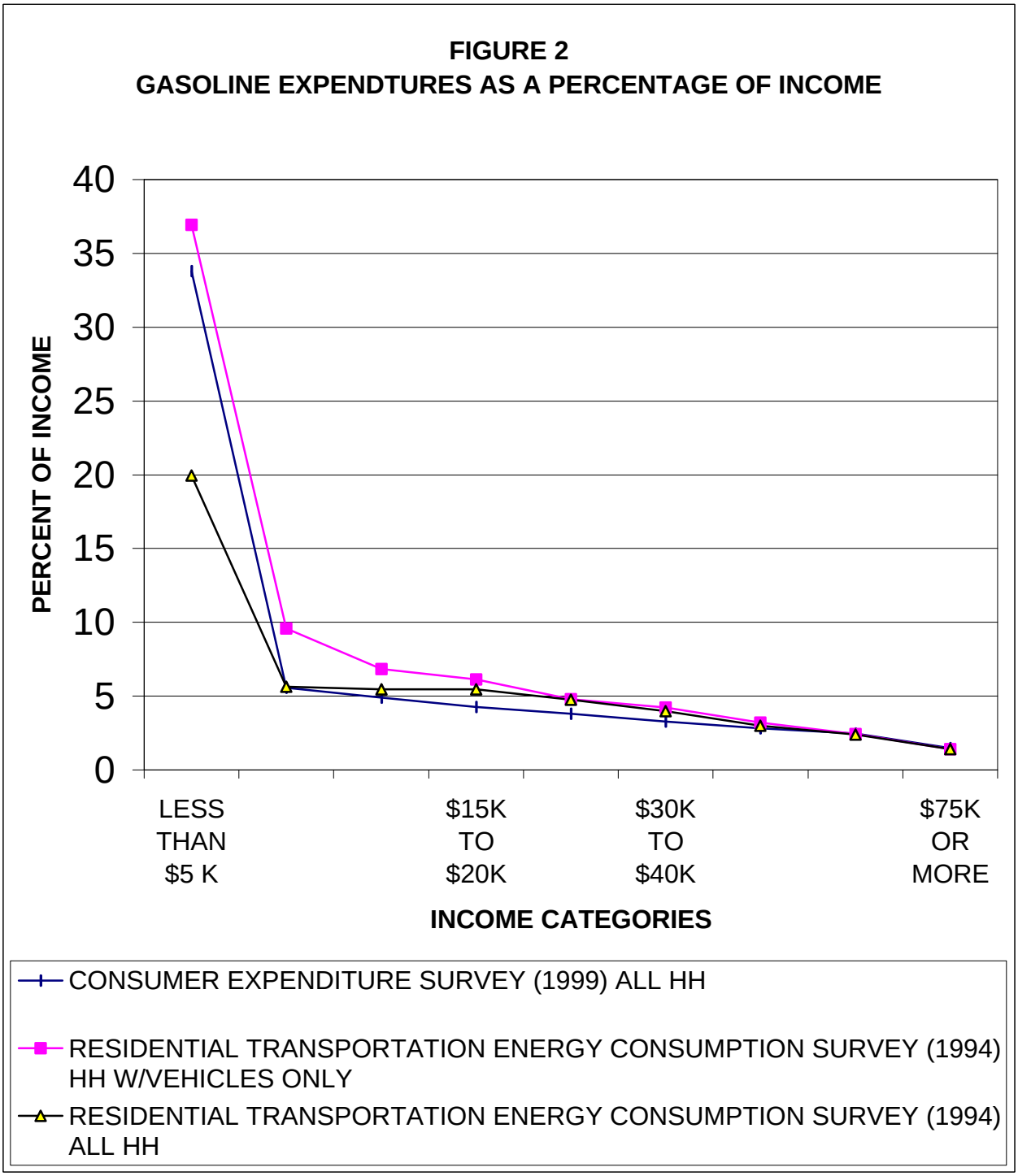
[2] The most recent federal data available is for 1994, thus this statement is based on the U.S. Department of Energy, Energy Information Administration, *Household Vehicle Energy Consumption: 1994*, Table 5.2, compared to *Residential Energy Consumption Survey: 1994*, Table 5.1.

[3] In a Bloomberg poll of June 3, 2001 41% said the price of gasoline was a big problem, while 43% said it was a small problem. Only 15 percent said it was not a problem.

[4] Results from a Field Poll in California (May 24, 2001) and a national public opinion poll (reported on NBC nightly news on May 22, 2001) show that the majority of respondents reject the notion that supply shortages have increased prices. Rather they blame the problem on companies and governments (domestic or foreign). In a Bloomberg poll of June 3, 2001, oil companies were most often cited as the cause of high gasoline prices (43%) followed by oil producing nations (32%) and the Bush administration (9%).



Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 9.4, for pump prices; *Petroleum Marketing Monthly,* Table 1 for crude prices and Table 6 for prices net of taxes; *Petroleum Supply Monthly*, Table S.4 for quantity supplied.



Source: U.S. Department of Energy, *Household Vehicle Energy Consumption: 1994*, Table 5.2; *Residential Energy Consumption Survey: 1994*, Table 5.1.U. S. Bureau of the Census, Department of Labor Statistics, *Consumer Expenditure Survey: 1999*, Table 2.

a foreign source, leaves us vulnerable to price shocks, supply interruptions and in the worst case, blackmail."[5] The public does not support the policy of drilling for more oil to respond to foreign threats[6] as the best solution to a problem that they believe is domestic in nature.[7]

B. OUTLINE OF THE PAPER

Is public opinion misguided?[8] Or, is there an explanation of recent price spikes that is consistent with their perceptions and policy preferences?

This paper presents a multifaceted view of the gasoline price problem that considers both the supply and demand sides of the market, taking into account basic conditions and market structures. It demonstrates that the gasoline market suffers from a lack of capacity, an inability to respond quickly to price increases or supply disruptions and a lack of competition. Furthermore, to a significant extent the lack of capacity and the slow response of supply to price changes are the result of a lack of competition. Looking beyond the crisis of the moment, the paper concludes that fundamental public policy measures should be instituted to prevent the inherent volatility of energy markets from continually buffeting the public.

Chapter II presents the analytic framework. It discusses the market fundamentals that make the analysis of energy markets extremely complex and also renders the gasoline market volatile and vulnerable to market abuse.

Chapter III analyzes the structure, conduct and performance of the gasoline market. It shows that business decisions and government policies interacted to suppress production capacity and constrict market flexibility. Moreover, because the industry is dominated by a small number of large, international, vertically integrated companies, exploitation of tight markets results in rapid, short-term price spikes and increases in profits.

Chapter IV analyzes briefly the equity issues in rising gasoline prices.

Chapter V presents policy observations based upon the analysis of structural problems in the gasoline market. It then discusses specific long and short-term measures that can be taken to alleviate the immediate burden on consumers, prevent excessive market volatility from harming the public, and to diminish the potential for price manipulation.

The analysis and recommendations are at the same level of detail as the Bush Administration's recent *National Energy Policy.* It discusses broad trends and basic structures in

---

[5] "Text of the Speech of President Bush," *Washington Post,* May 18, 2001.

[6] National Energy Policy Development Group, *National Energy Policy*, May 2001, (hereafter, NEPDG).

[7] An *ABC/Washington Post* public opinion poll in early June 2001, found that 81 percent of the respondents strongly supported a policy to "require car manufacturers to improve the fuel efficiency of vehicles sold in this country," compared to 49 percent who strongly supported "increase in oil and gas drilling." A *New York Times* poll, June 22, 2001,shows that conservation is preferred to drilling by more than three-to-one.

[8] After the House of Representatives voted to block drilling in wilderness and national monument areas, Bill Tauzin (R-La.) Chairman of the House Energy and Commerce Committee is reported to have said "The vote yesterday was literally like an ostrich sticking its head in the sand hoping the problem doesn't show up," *Energy Daily,* June 25, 2001.

the industry. It recommends principles for energy policy and the most promising targets for policy development. In this way, it tells policymakers were to devote their attention in developing policy, but it does not provide detailed cost benefit analysis of specific policy measures.

II. MARKET FUNDAMENTALS

A. ANALYTIC FRAMEWORK AND CONTEXT

1. Analyzing Complex Markets

The paper uses the structure, conduct, performance paradigm (SCP) to evaluate the pricing behavior in the gasoline market.[9] The analytic framework enables us to understand the causes of the problems in the industry and arrive at policies to respond effectively. The elements of the approach can be described as follows.

In SCP analysis the central concern is with market performance, since that is the outcome that affects consumers most directly. The concept of performance is multidimensional.[10] The measures of performance to which we traditionally look are pricing, quality and profits. Pricing and profits address both efficiency and fairness. They are the most direct measure of how society's wealth is being allocated and distributed.

The performance of industries is determined by a number of factors, most directly the conduct of market participants. Do they compete? What legal tactics do they employ? How do they advertise and price their products?[11]

Conduct is affected and circumscribed by market structure.[12] Market structure includes an analysis of the number and size of the firms in the industry, their cost characteristics and

---

[9] Scherer, F. M. and David Ross, Industrial *Market Structure and Economic Performance* (Boston, Houghton Mifflin: 1990). Shepherd, William, G., *The Economics of Industrial Organization* (Prentice Hall, Engelwood Cliffs, N.J., 1985).

[10] Scherer and Ross, p. 4.

> We begin with the fundamental proposition that what society wants from producers of goods and services is good performance. Good performance is multidimensional... Decisions as to what, how much and how to produce should be efficient in two respects: Scarce resources should not be wasted, and production decisions should be responsive qualitatively and quantitatively to consumer demands.
>
> The operations of producers should be progressive, taking advantage of opportunities opened up by science and technology to increase output per unit of input and to provide consumers with superior new products, in both ways contributing to the long-run growth of real income per person.

[11] Scherer and Ross, p. 4.

> Performance in particular industries or markets is said to depend upon the conduct of sellers and buyers in such matters as pricing policies and practices, overt and taciturn interfirm cooperation, product line and advertising strategies, research and development commitments, investment in production facilities, legal tactics (e. g. enforcing patent rights), and so on.

[12] Scherer and Ross, p. 5.

barriers to entry. Basic conditions of supply and demand also deeply affect market structure.[13]

The focal point of market structure analysis is to assess the ability of markets to support competition, which "has long been viewed as a force that leads to an ideal solution of the economic performance problem, and monopoly has been condemned."[14] The predominant reason for the preference for competitive markets reflects the economic performance they generate, although there are political reasons to prefer such markets as well.[15] In particular, competition fosters efficient allocation of resources, absence of excess profit, lowest cost production and provides a strong incentive to innovate.[16] Where competition breaks down, firms are said to have market power[17] and the market falls short of these results.[18]

> Conduct depends in turn upon the structure of the relevant market, embracing such features as the number and size distribution of buyers and sellers, the degree of physical or subjective differentiation prevailing among competing seller's products, the presence or absence of barriers to entry of new firms, the ratio of fixed to total costs in the short run for a typical firm, the degree to which firms are vertically integrated from raw material production to retail distribution and the amount of diversity or conglomerateness characterizing individual firms' product lines.

[13] Scherer and Ross, p. 5.

> Market structure and conduct are also influenced by various basic conditions. For example, on the supply side, basic conditions include the location and ownership of essential raw materials; the characteristics of the available technology (e.g. batch versus continuous process productions or high versus low elasticity of input substitution); the degree of work force unionization; the durability of the product; the time pattern of production (e.g. whether goods are produced to order or delivered from inventory); the value/weight characteristics of the product an so on. A list of significant basic conditions on the demand side must include at least the price elasticity of demand at various prices; the availability of (and cross elasticity of demand for) substitute products; the rate of growth and variability over time of demand; the method employed by buyers in purchasing (e.g. acceptance of list prices as given versus solicitation of sealed bids versus haggling); and the marketing characteristics of the product sold (e.g. specialty versus convenience shopping method).

[14] Scherer and Ross, p. 15.

[15] Scherer and Ross, p. 18.

[16] Scherer and Ross, p. 20.

> The cost of producing the last unit of output – the marginal cost – is equal to the price paid by consumers for that unit... It implies efficiency of resource allocation...
>
> With price equal to average total cost for the representative firm, economic (that is, supra normal) profits are absent...
>
> In long-run equilibrium, each firm is producing its output at the minimum point on its average total cost curve...
>
> One further benefit is sometimes attributed to the working of competition, although with less logical compulsion. Because of the pressure of prices on costs, entrepreneurs may have especially strong incentives to seek and adopt cost-saving technological innovation. Indeed, if industry capacity is correctly geared to demand at all times, the *only* way competitive firms can earn positive economic profits is through innovative superiority.

[17] Scherer and Ross, pp. 17...18.

> Pure monopolists, oligopolists, and monopolistic competitors share a common characteristic: each recognizes that its output decisions have a perceptible influence on price... All three types possess some degree of power over price, and so we say that they possess monopoly power or market power...

Pure and perfect competition is rare, but the competitive goal is important.[19] Therefore, a great deal of attention has been focused on the relative competitiveness of markets and the conditions that make markets more competitive or workably competitive.[20] Further, specific measures of the extent of market power based on elasticities of supply and demand and market concentration (measured by the market shares of firms) have been developed.[21]

The power over price possessed by a monopolist or oligopolist depends upon the firm's size *relative to* the market in which it is operating.

[18] Scherer and Ross, Chapter 18.

[19] Scherer and Ross, p. 16…17.

[20] Summarizing the literature, Scherer and Ross, pp. 53-54 develop a long list of characteristic.

[21] As already noted, Scherer and Ross point out that market power allows a firm to set price above cost and achieve above normal profits. Landes, W. M. and R. A. Posner, "Market Power in Anti-trust Cases," *Harvard Law Review*, 19: 1981, two prominent conservative economic analysts offer a similar concept. The most frequent starting point for a discussion of the empirical measurement of the price impact of monopoly power is the *Lerner Index.* As Scherer and Ross (PP. 70…71) note, the *Lerner Index*, is defined as

[L]= (Price – Marginal Cost)/ Price.

Its merit is that it directly reflects the allocatively inefficient departure of price from marginal cost associated with monopoly. Under pure competition, [Ll]=0. The more a firm's pricing departs from the competitive norm, the higher is the associated Lerner Index value. A related performance-oriented approach focuses on some measure of the net profits realized by firms or industries.

Landes and Posner (pp. 938-945) state the price cost margin as the firm's elasticity of demand. They then transform the index into an expression that uses market shares of firms and the market elasticity of demand and supply.

We point out that the Lerner index provides a precise economic definition of market power, and we demonstrate the functional relationship between market power on the one hand and market share, market elasticity of demand, and supply elasticity of fringe competitors on the other.

$$L = \frac{(P - C)}{P} = \frac{1}{E_d} \qquad \frac{S}{e_m^d + e_j^s (1 - s_i)}$$

where:

S_d = the market share of the dominant firm

e_m = elasticity of demand in the market

e_j^s = elasticity of supply of the competitive fringe

s_i = market share of the fringe.

In words this formula says that the markup of price over cost will be directly related to the market share of the dominant firm and inversely related to the ability of consumers to reduce consumption (the elasticity of demand) and the ability of other firms (the competitive fringe) to increase output (the elasticity of this supply). These are market characteristics and fundamentals that are accessible to economic analysts. They form the focal point of the analysis in this paper.

2. Recognizing the Complexity of Gasoline Markets

The multidimensional view of markets offered by the SCP framework fits the fundamental economic traits of energy production and consumption well. Energy markets are highly complex. Their volatility poses particular challenges for policy and economic analysis.[22]

Contrasting energy commodities to financial instruments like stocks and bonds, a recent book entitled *Energy Risk*, identified the uniqueness of energy markets. The key elements are the supply-side difficulties of production, transportation and storage, and the demand side challenges of providing for a continuous flow of energy to meet inflexible demand, which is subject to seasonal consumption patterns.

> [T]he deliverables in money markets consist of a "piece of paper" or its electronic equivalent, which are easily stored and transferred and are insensitive to weather conditions. Energy markets paint a more complicated picture. Energies respond to the dynamic interplay between producing and using; transferring and storing; buying and selling – and ultimately "burning" actual physical products. Issues of storage, transport, weather and technological advances play a major role here.
>
> In energy markets, the supply side concerns not only the storage and transfer of the actual commodity, but also how to get the actual commodity out of the ground. The end user truly consumes the asset. Residential users need energy for heating in the winter and cooling in the summer, and industrial users' own products continually depend on energy to keep the plants running and to avoid

---

[22] To appreciate the volatility of these markets and the challenge they pose for analysis, we can consider the problems that the Department of Energy has had in projecting gasoline prices. We can start with a mid-1997, report from the Department of Energy (U.S. Department of Energy, Energy Information Administration, *Motor Gasoline Assessment: Spring 199,* July 1997, p. 45) that attempted to anticipate gasoline prices just a few months ahead by stating the following.

> A mid-June update of the April Short-Term-Energy Outlook bodes well for drivers. Summer gasoline prices should stay below last year's summer prices as a result of low crude oil prices and normal seasonal declines from June.

Within a month, prices were rising dramatically. Less than a year later, the Department of Energy's *Assessment of Summer 1997 Motor Gasoline Price Increase* (U.S. Department of Energy, Energy Information Administration, May 1998, p. 1) described what had happened as follows.

> As the summer of 1997 was coming to a close, consumers experienced yet another surge in gasoline prices. Unlike the previous increase in spring 1996, crude oil was not a factor. The late summer 1997 price increase was brought about by the supply/demand fundamentals in the gasoline markets, rather than the crude oil markets.
>
> The nature of the summer 1997 gasoline price increase raised questions regarding production and imports. Given very strong demand in July and August, the seemingly limited supply response required examination. In addition, the price increase that occurred on the West Coast during late summer exhibited behavior different than the increase east of the Rocky Mountains.

A similar ambivalence afflicted the summer of 2001 predictions, with early warning of very high prices followed by downward revisions. Volatility is certainly the order of the day (see Cook, John, *Petroleum Outlook: More Volatility?*, Energy Information Administration presentation to the MPRA Annual Meeting, March 19, 2001).

> the high cost of stopping and restarting them. Each of these energy participants – be they producers or end users – deals with a different set of fundamental drivers, which in turn affect the behavior of energy markets...
>
> What makes energies so different is the excessive number of fundamental price drivers, which cause extremely complex price behavior.[23]

A recent analysis of the Midwest price spikes of 2000 conducted by the Federal Trade Commission demonstrates the complex interaction of these factors the gasoline market. Very tight gasoline supplies in the Midwest were the result of long-term trends in supply and demand, business decisions and regulatory requirements, as well as unforeseen events. The price increase was exacerbated by the failure of the industry to react quickly to increase supply and decisions to keep supply off the market.

> 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.[24]

These two observations, one generally about energy, the other specific to gasoline, set the stage for the complex picture that must be drawn to understand gasoline pricing behavior. They both point to the important role of supply and demand fundamentals.

B. FUNDAMENTALS OF GASOLINE SUPPLY

On the supply side of the gasoline market, 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.

---

[23] Pillipovic, Dragana, *Energy Risk: Valuing and Managing Energy Derivates* (McGraw-Hill, New York: 1998), p. 3.

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

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 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.

Accidents have a special role in networks such as these. Because of the demanding physical nature of the network, they 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.

One critically important effect of these physical and economic characteristics is to render the supply-side of the market inelastic.[25] By this term, economists mean that as prices increase (or decrease) supply does not increase (or decrease) very much. The elasticity is measured in terms of percentage changes. For example, if a ten percent increase in price results in a 20 percent increase in demand, the price elasticity of supply is said to equal 2 (20%/10%). When the elasticity is greater than 1, demand is said to be elastic. Alternatively, if a 10 percent increase in price results in a 2 percent increase in supply, the elasticity of is said to be .2, and this is considered inelastic.

Given the basic infrastructure of supply in the industry, the availability of stocks to meet changes in demand is the critical factor in determining the flexibility of supply. Under all circumstances, since output is slow to respond to price changes because of its inelasticity, stockpiles, storage and importation of product become a critical element of the gasoline market.[26] Stocks are the key factor in policy responses to market power where supply is inelastic. [27]

---

[25] 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.

[26] 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.

[27] 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.

Every investigation of every product price spike in the past several years points to 'unusually low stock' as a primary driver of price shocks. The issue is so fundamental and the theme so often repeated, it is worth reviewing the track record of the past half-decade to drive the message home.

The U.S. Department of Energy identified "lower than normal gasoline stocks" in a chapter entitled "Spring '96 Gasoline Price Runup,"[28] and gave stocks an even more prominent role in a chapter entitled "Petroleum Stocks: Causes and Effects of Lower Inventories" noting that

> stocks are needed to keep petroleum supplies moving smoothly from wellhead to end-users. As an immediate source of supply, stocks provide a cushion against normal and unexpected demand and supply fluctuations. Crude oil, distillate, and total gasoline stocks dropped in 1995 and reached new lows in 1996, drawing attention to the long-term downward trend.[29]

Again, the U.S. Department of Energy remarks 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.[30]

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,

---

> 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 the 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.

[28] Energy Information Administration, *Petroleum 1996: Issues and Trends*, September 1997, p. 27.

[29] Id., p. 85.

[30] Energy Information Administration, *Assessment of Summer 1997*, p. 5.

including pipeline and refinery supply problems, and an unexpectedly difficult transition to summer-grade Phase II reformulated gasoline.[31]

Finally, in explaining the early spring price runup in 2001, inventories were the starting point (p. 1): " Low petroleum inventories set the stage for our current situation, as they did last year both for heating oil and for gasoline."[32]

C. FUNDAMENTALS OF GASOLINE DEMAND

The continuous flow of large quantities of product to meet highly seasonal demand is the central characteristic of the demand side of the market. Many discussions of the gasoline market start from the premise that people drive a lot, perhaps too much. But in order to design proper policies to deal with gasoline demand and how it affects the market, we must have an appreciation for why people drive as much as they do. Examining price and income elasticities leads to the conclusion that energy is a necessity of 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 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 tendency for two-earner households has grown. For the past three decades there has been an almost a perfect, one-to-one correspondence between economic growth and the growth of total miles driven.[33]

The result of the underlying socioeconomic determinants of automobile travel is to render demand "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

---

[31] Joanne Shore, Petroleum Division. The FTC reached a similar conclusion in its Midwest Gasoline Price Investigation, at note 23.

[32] "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.

[33] *National Energy Policy*, p. 3-13.

demand response in a period of about a year) is .2.[34] The best estimate of the long-term elasticity is about .4.[35] Both of these are quite low.

The low elasticity of demand is the critical factor in rendering the gasoline market volatile and vulnerable to abuse.[36] 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 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.[37] As a result, everyone buys a basic amount of energy, but the amount grows more

---

[34] Espey, Molly, "Gasoline Demand Revisited: An International Meta-Analysis of Elasticities," *Energy Economics* 20 (1998), 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), estimated 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) 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).

[35] 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 for U.S. only studies at -.42.

[36] Landes and Posner point out that when demand elasticities are low, market power becomes a substantial problem. In their words, Lerner Index "comes apart."

> [T]he formula "comes apart" when the elasticity of demand is 1 or less. The intuitive reason is that a profit-maximizing firm would not sell in the inelastic region of its demand curve, because it could increase its revenues by raising price and reducing quantity. Suppose, for example, that the elasticity of demand were .5. This would mean that if the firm raised its price by one percent, the quantity demanded of its product would fall by only one-half of one percent. Thus its total revenues would be higher, but its total costs would be lower because it would be making fewer units of its product.
>
> Raising price in these circumstances necessarily increases the firm's profits, and this is true as long as the firm is in the inelastic region of its demand curve, where the elasticity of demand is less than 1.
>
> If the formula comes apart when the elasticity of demand facing the firm is l or less, it yields surprising results when the elasticity of demand is just a little greater than 1. For example, if the elasticity of demand is 1.01, equation (la) implies that the firm's price will be 101 times its marginal cost. There is a simple explanation: a firm will produce where its demand elasticity is close to one only if its marginal cost is close to zero, and hence a relatively low price will generate a large proportional deviation of price from marginal cost

[37] 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.

slowly than income. The implications of this pattern of consumption are that expenditures on gasoline tend to take a larger share of the income of lower income households.

Economists talk about this as the income elasticity of demand. They measure the income elasticity as the percentage change in consumption compared to the percentage change in income. If a ten percent increase in income leads to 5 percent change in demand for gasoline, it is said to have an income elasticity of demand of .5 and to be inelastic. The studies of gasoline find that its income elasticity is in the range of .5 to .8.[38]

The price and income elasticities described above are typical of necessities. Because the price elasticity is low, consumers have difficulty substituting for this commodity when its price increases. Yet, because the income elasticity is high relative to the price elasticity, the price increase will take a relatively large share of income. This indicates a large decrease in consumer welfare with the price increases.[39]

When the price of a necessity goes up, lower income people suffer a large loss in their well-being. Because gasoline is a necessity, it becomes more and more difficult to reduce consumption as income declines. That is, poorer households will try to spend less for this

---

[38] Espey, "Gasoline," finds .39 for the short term and .8 for the long term for the wide range of studies. For U.S. specific studies Espy, "Explaining," find .62. Hilke finds .5 for the U.S. for the short term, as do Dahl, C.A. and T. Sterner, "Analyzing Gasoline Demand Elasticities: A Survey," *Energy Economics* 13 (1991) 203-310.

[39] Lester Taylor, Telecommunications Demand: A Survey and Critique (Cambridge Massachusetts: MIT press, 1980), p. 82), describes another necessity, telephone service, as follows:

> When substitution effects are large relative to income effects, consumers can substitute away from goods whose prices have risen with little loss in utility. However, when income effects are large relative to substitution effects, an increase in price means a relatively large decrease in utility...since the income effect is indicated to be large relative to the substitution effect in the price elasticity of demand..the welfare of these households may be significantly decreased by increase in the price.

A similar discussion for energy that revolves around the difficulty of cutting back on energy consumption in the short term is provided by Hunt, Lester and Neil Manning, "Energy Price and Income Elasticities of Demand: Some Estimates for the UK Using the Cointegration Procedure," *Scottish Journal of Political Economy*, May 1989, pp. 189-190.

> Our results suggest the long-run income-elasticity of energy demand is around .4 and .5, whereas the short-run (impact) income elasticity is around .6 to .8. The affect of a change in income on energy demand is, therefore, greater in the short-run than in the long run. This may follow from the inflexibility of firms' and households' energy-using capital and appliance stocks in the short-run; an increase in income will, therefore bring about an immediate decrease in the derived demand for energy in the short-term, but this derived demand is reduced in the longer term as more energy efficient machines are installed.
>
> The long-run price elasticity of energy demand estimate is approximately -.3 and the short-run (impact) elasticity approximately -.1. Therefore, the effect of a change in the real price of energy is less in the short-run than in the long-run which is in contrast to the above case for income changes. This may also reflect the fixed nature of the machine and appliance stocks in that a rise in the real price of energy produces a modest fall in energy consumption in the short-term. Energy consumption falls further in the longer-term, however, as the price increase induces the installation of more energy efficient domestic appliances and capital goods.

Note that in this discussion, as in the case of U.S. data, the long run elasticity of demand with respect to income is about twice the long run elasticity of demand with respect to price, satisfying the fundamental condition for a necessity as described by Taylor, but both are inelastic.

commodity at lower levels of income, but they find it more and more difficult to do so because it is a necessity. As a result, as described in Figure 2 in the introduction, at each lower level of income, expenditures for this commodity rise as a percentage of income, although they fall in absolute value. Households are forced to spend a larger share of their income on telephone service to maintain their well-being.

People drive a substantial amount because they have to and a substantial amount more if they can afford to. Income and place of residence are prominent variables influencing gasoline consumption.[40] To gain a perspective on the magnitude of the impact of placed of residence and income on gasoline consumption we note that approximately 79 percent of households that live in center cities have vehicles, compared to 92 percent of households that live in suburbs and rural areas. Approximately 67 percent of all households eligible for federal assistance have a vehicle. In contrast over 98 percent of all households with incomes above $50,000 have a vehicle.

Even among households that have a vehicle, we observe substantial differences in consumption across place of residence and income. Households that have vehicles in rural and suburban areas use considerably more gasoline than those in central cities. Figure 3 contrasts data on gasoline consumption by households that reside in center cities to those that reside in the suburbs and rural areas. It presents data for households that own vehicles across income levels.

Those who reside in rural and suburban areas drive more than those who live in center cities. The difference is larger for upper income households than for lower income households. Households eligible for federal assistance who reside in suburban or rural areas consume over 20 percent more gasoline than households eligible for federal assistance who reside in center cities. Households with income above $50,000 per year who reside in the suburbs or rural areas consume over 40 percent more gasoline than their counterparts who reside in center cities. Upper income households who live in rural areas consume over twice as much gasoline as lower income households who live in center cities. When vehicle ownership is factored in, the difference in consumption between rural upper income and urban lower income households would be a factor of three.

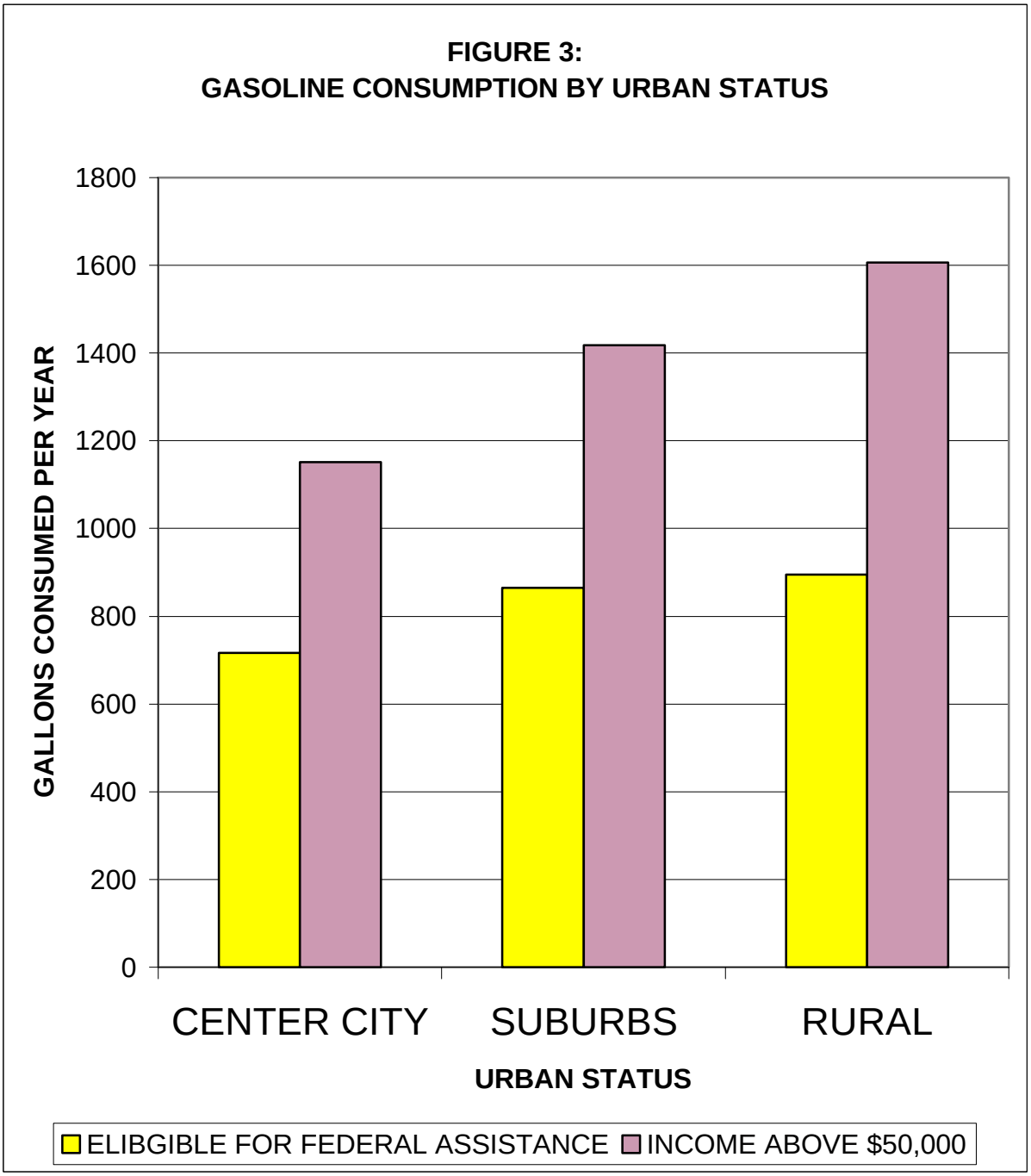
D. A TIGHTENING MARKET

1. Increases in Gasoline Demand

Understanding the nature of demand for gasoline is critical for developing policy to influence consumption. For policy purposes, not all of the factors that affect demand are accessible or relevant. The growth in the adult population, which propels the growth in the number of vehicles, is not something we would or could change, even though the number of drivers and cars increased by about 10 percent over the past decade.[41] Slowing income

[40] Greening, Lorna, et al., "Use of Region, Life Cycle and Role Variables in the Short-Run Estimation of the Demand for Gasoline and Miles Traveled," *Applied Economics*, 27, 1995, review a number of variables that affect driving and gasoline consumption. The income and region variables are important in all cases, as are two earner families.

[41] *Statistical Abstract of the United States: 2001*, Table 1026;



Source: U.S. Department of Energy, *Household Vehicle Energy Consumption: 1994*, Table 5.9

growth just to reduce gasoline consumption is not a likely candidate, even though that influenced the number of miles and the types of cars driven.[42]

It is the behavior of the population, given it size and wealth on which policy focuses. While the pattern of daily life determines the number of miles driven, the quality of the vehicle fleet determines the number of gallons consumed to cover those miles (see Table 1). The types of cars chosen and efficiency of the vehicles combine to determine gas mileage. Once the community is laid out and the car is chosen, the ability to change the amount of gasoline consumed is limited, without suffering deprivation.[43]

Table 1 presents the key drivers of gasoline consumption over the past two decades, the number of vehicles, the mileage per vehicle and the fuel efficiency of the vehicles. Total gasoline consumption grew by about 1.5 percent per year in the 1990s. This increase reflected the combination of increasing miles driven, a shift from cars to light trucks, which includes SUVs and changes in the fuel efficiency of the vehicle fleet.

TABLE 1: GROWTH IN POLICY RELEVANT FACTORS AFFECTING GASOLINE CONSUMPTION

	COMPOUND ANNUAL CHANGE	
	1990s	1980s
TOTAL GASOLINE CONSUMPTION	1.5%	1.0%
VEHICLES REGISTERED		
CARS	0	.9
LIGHT TRUCKS	8.9	5.1
VEHICLE USAGE (MILES PER VEHICLE)		
CARS	1.3	1.7
LIGHT TRUCKS	0	1.3
FUEL EFFICIENCY (MILES PER GALLON, MPG)		
CARS	.6	2.4
LIGHT TRUCKS	.7	2.8

Sources and notes: Average annual changes are presented because the length of the period for which data is available differs between the two decades. For the 1980s, the data is 1980 to 1990. For the 1990s, the data is 1990 to 1999. U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 1.10; 3.4; U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States,* various issues, Motor Vehicle Registrations; U.S. Federal Highway Administration, *Highway Statistics: Light Trucks.*

[42] *Monthly Energy Review: December 2000*, Table 10.1; *Statistical Abstract*, Table 1049; *National Energy Policy*, p. 3-13.

[43] Telling people not to do things means they are being deprived. Giving them alternative ways to do them (including changing modes of transportation or using more fuel efficient cars, which usually entails using more capital and less fuel) is a substitution. *Webster's Third New International Dictionary, Unabridged* (Springfield, MA, 1986) defines a substitute as "something that is put in the place of something else or is available for use instead of something else." This is in contrast to the definition of deprivation, "to take away, to take something away from."

The increase in gasoline consumption per vehicle can be decomposed into the increase in mileage and the change in vehicle type. Mileage accounts for about three quarters of the increase. One quarter of the increase was caused by the shift to SUVs.

While the shift to SUVs was one striking feature of the 1990s, an equally striking and more important feature of the demand side was the failure of fuel efficiency to improve. Fuel economy improvements did not keep up. Between 1973 and 1979 (the first two energy price shocks caused by the 1973 Arab-Israel war and the subsequent Arab oil embargo and the Iranian Revolution) average fuel efficiency increased by just under 1 percent per year. Between 1979 and 1990-911 (The Iraqi invasion of Kuwait) average fuel efficiency increased by 2.5 percent per year (see Figure 4). Since 1991 there has been virtually no improvement in fuel efficiency.

If the fuel efficiency of autos had increased as rapidly in the 1990s as it did in the 1980s, autos would have been 20 percent more efficient, getting about 4 miles per gallon more, in 2000. If there had not been a shift to SUVs, the average fleet efficiency would have been about 1 mile per gallon higher.[44]

2. The Failure of Supply-side Capacity to Expand

Supply-side production capacity has not increased as fast as demand. Consequently, over the past decade and a half, all elements of the supply-side have become constrained relative to demand.

Refinery capacity has not expanded to keep up with the growth in demand. Figure 5 shows the relationship between refinery output and demand. In 1985 refinery capacity equaled daily consumption of petroleum products but by 2000, daily consumption exceeded refinery capacity by almost 20 percent. As discussed in the next Chapter, the decline in refinery capacity is partly the result of consolidation in the industry.

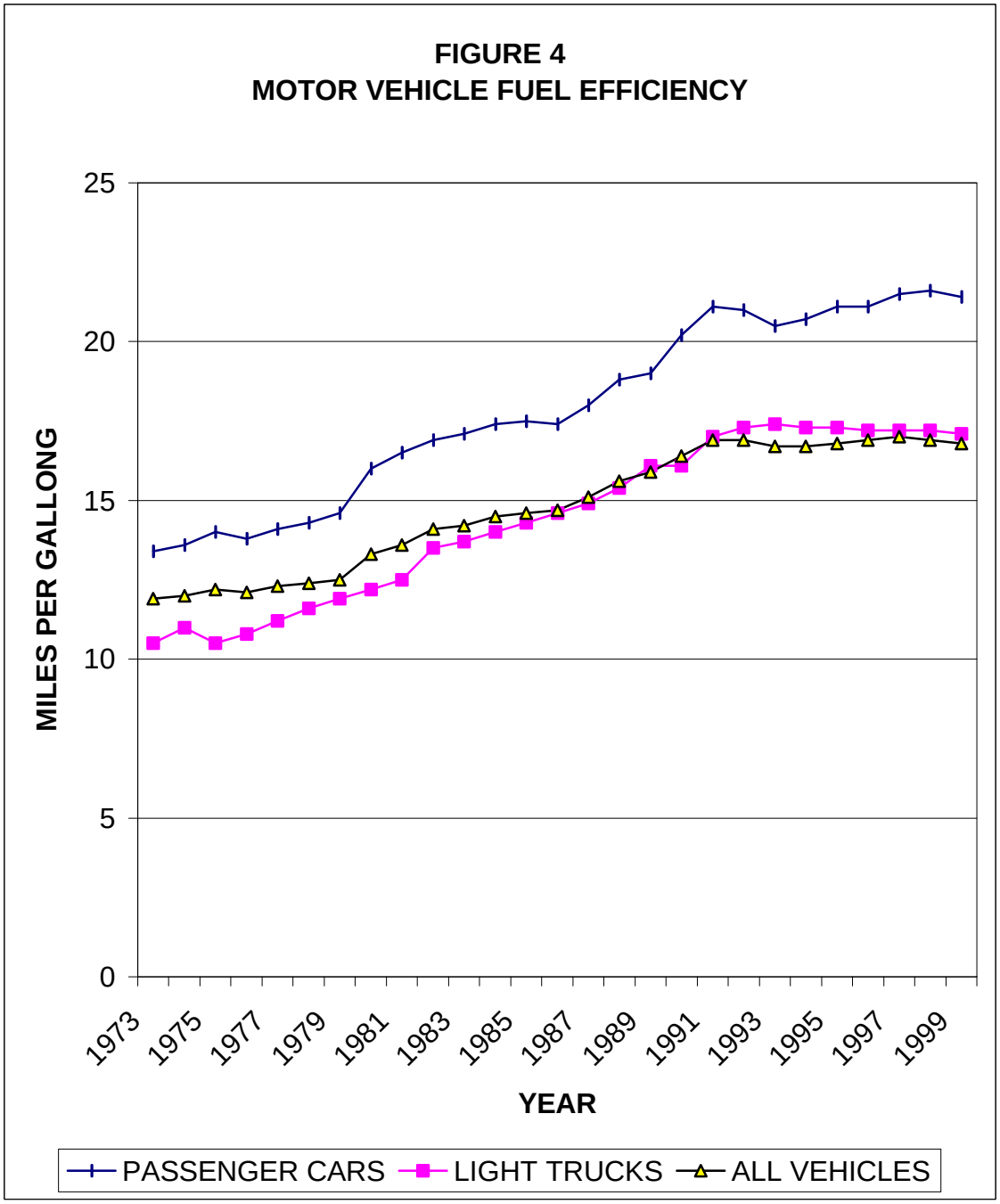
Figure 6 shows the relationship between stocks and demand for gasoline. Stocks are measured as the number of days of demand for gasoline in storage. It shows both total stocks and the amount of stock above what is considered the lower operational inventory. Because of the nature of operations of gasoline delivery systems, a certain level of stock is needed to keep the system running in real time.[45] Operations are subject to disruption should stocks fall

---

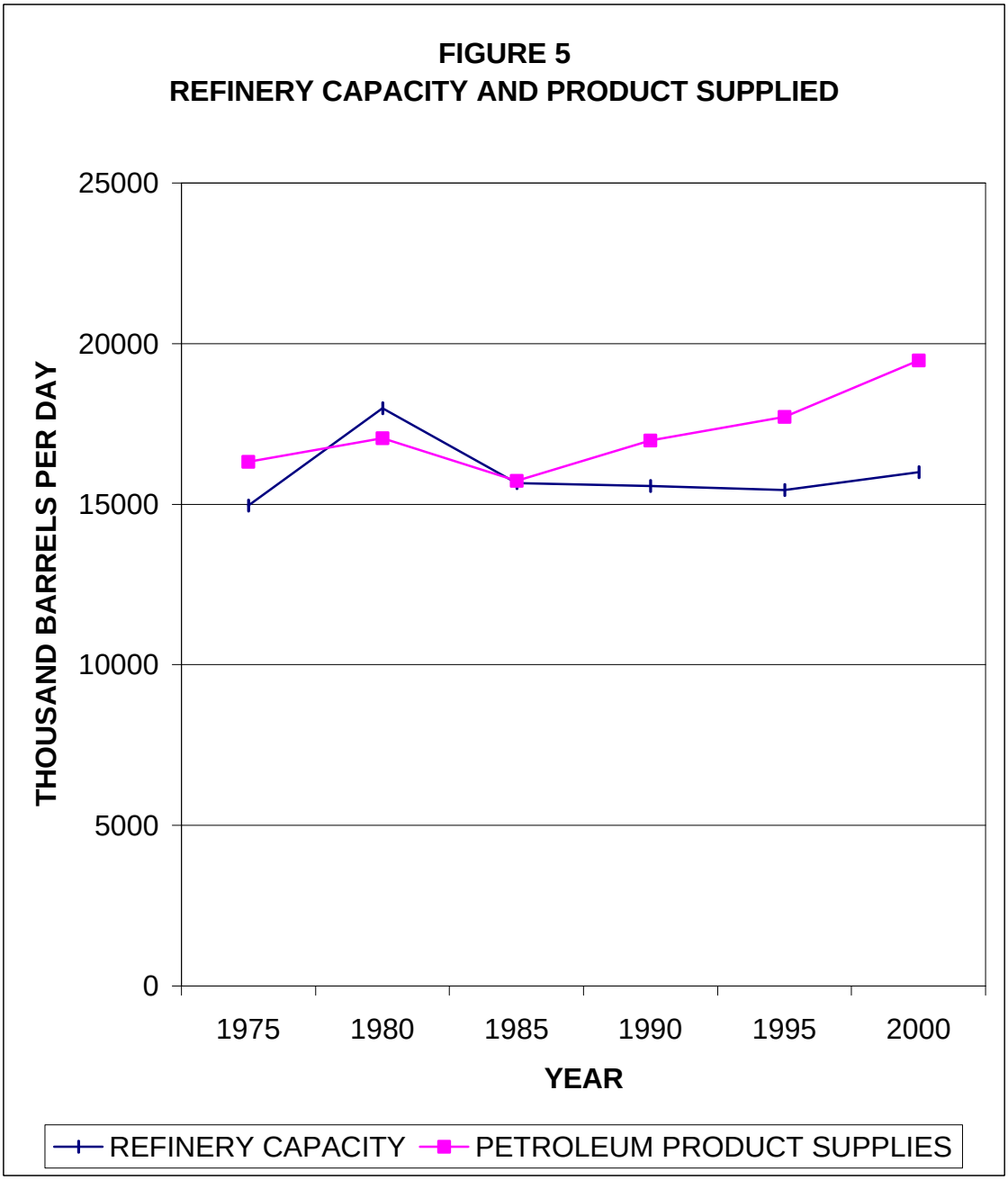
[44] Greene, David, L. "Why CAFÉ Worked," *Energy Policy,* 26 (1998), p. 602, concludes this was the impact in the period 1975-1996.

[45] 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.

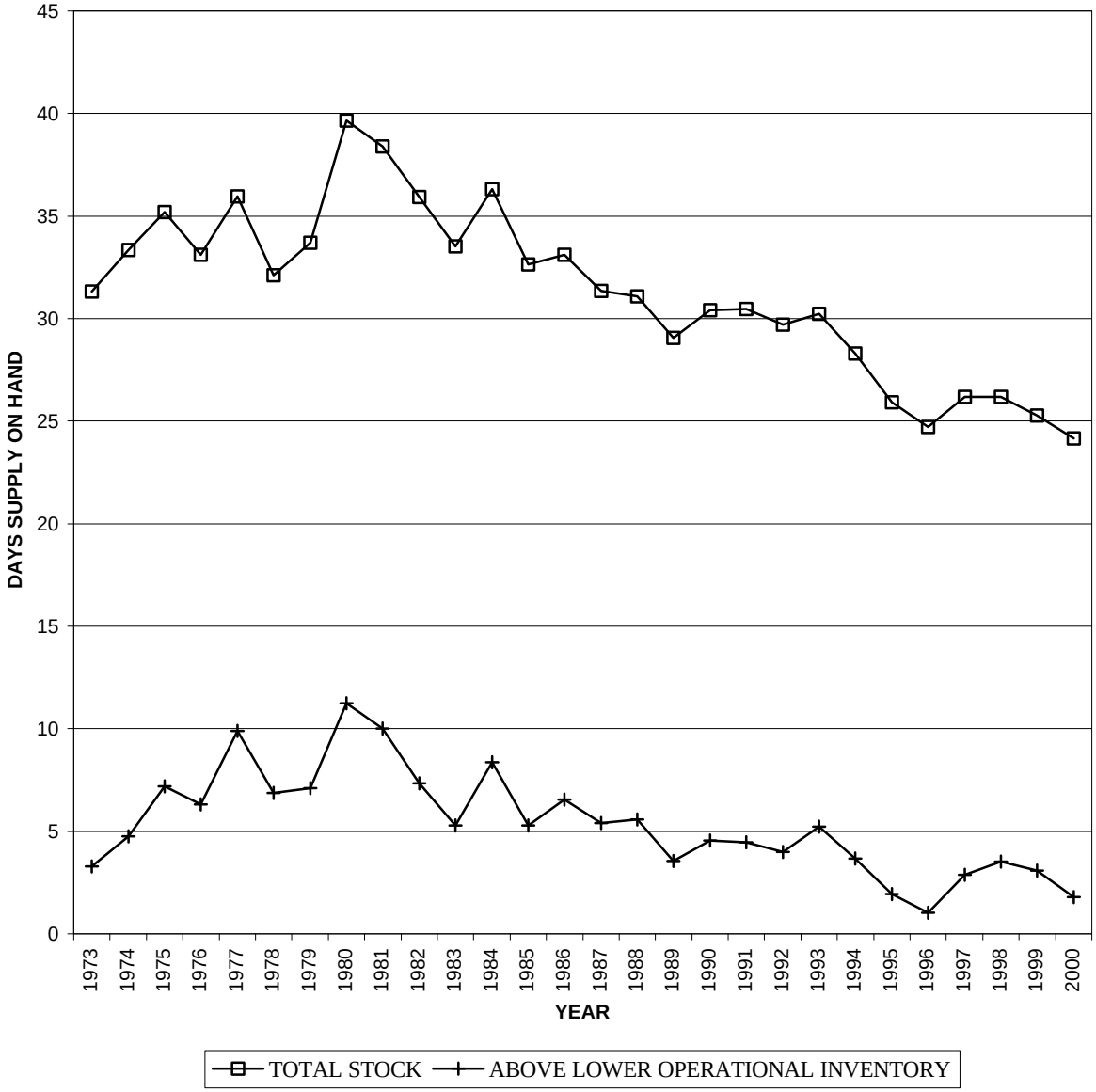


Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 1.10.



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

FIGURE 6: GASOLINE STOCKS



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

below this level.[46] Thus, it is stocks above this level that are available to respond to shifts in demand or price.

In recent years, stockpiles have declined dramatically when measured as a percentage of demand. In the early 1980s, stocks on hand would run at 40 days supply during off-peak periods and 35 days supply during the peak period.[47] By the mid-1990s, stocks were running in the range of 30 to 35 days supply. Recently stocks have plunged to a range of 20 to 25 days. More importantly, the reserves above the lower operational inventory levels have declined to very low levels. They generally are in the range of a couple of days, compared to a week or more in the 1980s. As discussed in the next Chapter, this decline in stocks is at least partially the result of consolidation in the industry.[48]

D. CONCLUSION

Physical and economic fundamentals set the context for markets, they do not determine market structure, conduct or performance. The current situation has developed over a substantial period of time for a variety of reasons. The recent report of the National Energy Policy Development Group blames environmental and other regulation for the failure to expand refinery and pipeline capacity.[49] The failure to keep stocks up is explained as a derivative of the capacity constraints, since there is never an opportunity to produce product for storage. The inability to move product from one market to the next is attributed to fragmentation of markets because of "boutique" fuels that require specific blends to meet the clean air requirements of individual markets. A close look at the behavior of the gasoline market suggests that that there is a lot more to the problem than that.

III. MARKET ANALYSIS

A. STRUCTURE: BUSINESS DECISIONS THAT MAKE MARKETS TIGHT

1. Reducing Capacity

While refinery capacity has been steady over the past two decades, a large number of small refineries have been shut down (see Figure 7). In the early 1980s, a public policy to

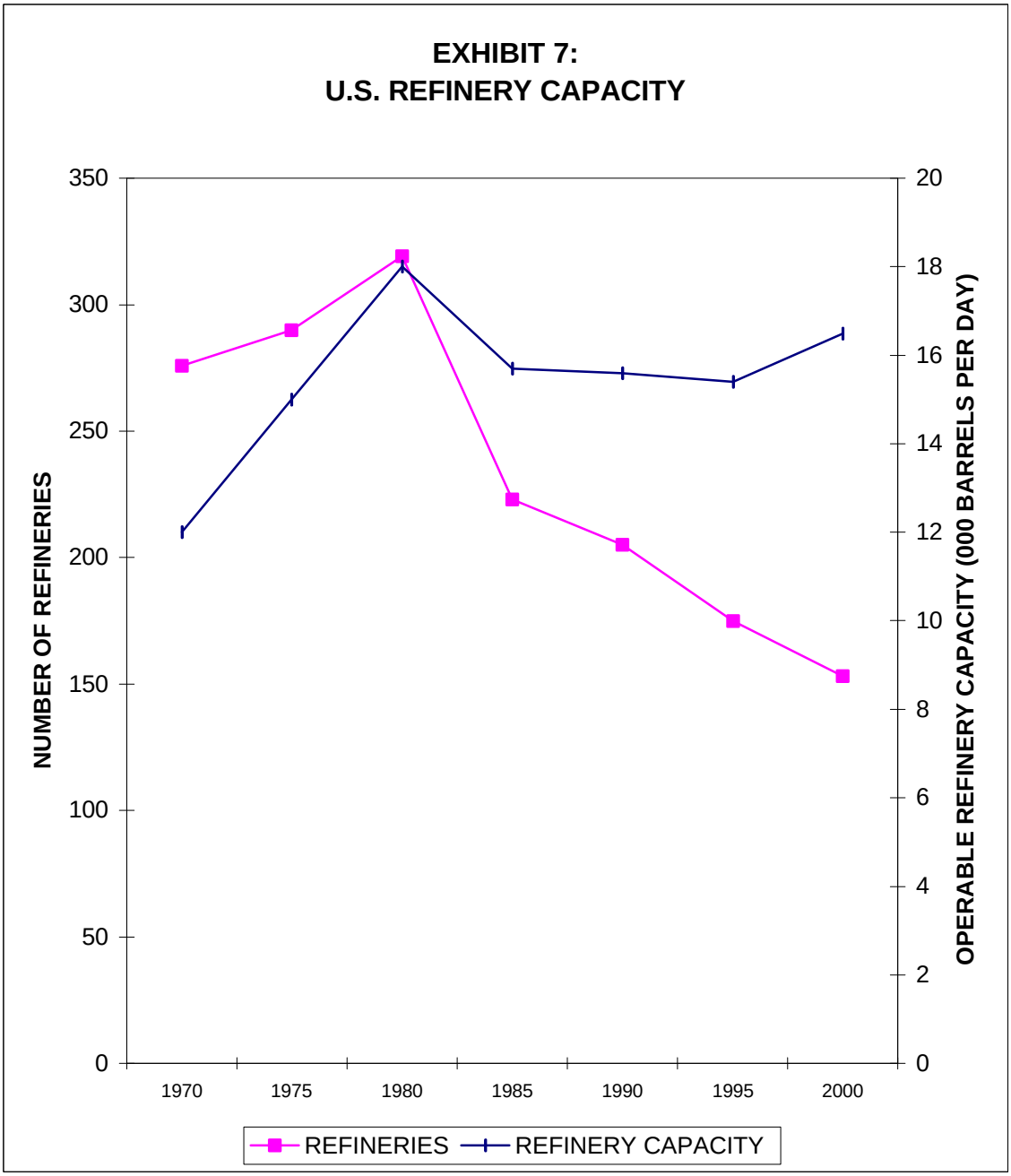
---

[46] The general literature of 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 figure 6, 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.

[47] *Petroleum 1996: Issues and Trends*, September 1997, p. 90.

[48] NEPDG, p. 7-13, recognizes the existence of the problem, but brushes it aside.

[49] Virtually all of the recommendations dealing with this infrastructure addresses environmental and regulatory matter, see Chapter 7.



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

support small refineries was terminated. This accounted for the loss of about 100 refineries between 1980 and 1985. 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. In just the past five years over 20 refineries have been shut down.

The complaint that no new refineries have been built in recent years loses it compelling public policy impact.[50] Blaming this on the Clean Air Act misses the point. Consolidation of the refinery industry is a business decision that began long before changes in the Clean Air Act amendments of 1990 and continued after the adjustment to 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."[51] 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."[52]

Just as with refineries, the decline in storage is attributable in part to a reduction in capacity. Storage capacity declined by over 10 percent in the past half decade.[53] The reduction in capacity equals over ten days' supply, and ten days of working storage capacity. The secular decline in gasoline stocks is a critically important factor in keeping markets tight.[54] The recent National Energy Task force recognized the trend. Government did not choose to carry much lower stocks, private businesses did.[55]

> 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

---

[50] NEPG, p. 7-13.

[51] 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).

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

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

[54] Pirrong, p. 70.

> This is true because the demand for a storable commodity is a derived demand equal to the sum of the demand curve for immediate consumption and the demand curves for future consumption (net of production and storage costs). The ability of consumers and producers to respond to sudden increases in supplies through storage and the adjustment of future consumption or production decisions (such as, increasing future consumption or reducing future shipments of the commodity to the delivery market) tends to dampen the price response to an increase in supply of a storable commodity.

[55] *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."

deterred some new capacity investments in the past, more recently other factors, such as regulations, have deterred investment.[56]

The prominent role of business decisions in reducing capacity immediately 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 justified by claims of efficiency gains, [57] they have a real economic effect of reducing competition. Recently revealed documents from the mid-1990s indicate that industry officials and corporate officers were concerned about how to reduce capacity, with observations like

> "if the U.S. petroleum industry doesn't reduce its refining capacity, it will never see any substantial increase in refinery profits," said a Chevron Corporation document 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."[58]

2. Concentration of Ownership

A wave of mergers in the industry 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 (Exxon-Mobile, BP-Amoco-Arco, Chevron-Texaco, Phillips-Tosco) have pushed petroleum product markets to levels of concentration that are a serious concern.

The U.S. Department of Justice (DOJ) defines market levels of concentration to determine the extent of review of mergers.[59] DOJ is unlikely to challenge mergers between companies in markets that are in unconcentrated. To make this assessment, it calculates the index of concentration known as the HHI (Hirshman-Herfindahl index). [60] Another way to

---

[56] NPEG, p. 7-13.

[57] The 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).

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

[59] U.S. Department of Justice, *Merger Guidelines,* revised 1997.

[60] Shepherd, p. 389, gives the following formulas for the Herfindahl-Hirschman Index (HHI) and the Concentration Ratio (CR):

$$H = \sum_{i=1}^{n} S_i^2$$

$$CR_m = \sum_{i=1}^{m} S_i$$

where
n = the number of firms
m= the market share of the largest firms (4 for the 4 firm concentration ratio)
S_i = the share of the ith firm.

quantify market concentration is to calculate the market share of the largest 4 firms (4 firm concentration ratio or CR4).

Under Merger Guidelines issued early in Ronald Reagan's first term, 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 4-firm concentration ratio would be 40 percent (see Table 2). Any market with a concentration above this level was deemed to be a source of concern and increases in concentration through mergers would receive scrutiny.

TABLE 2: DESCRIBING MARKET CONCENTRATION FOR PURPOSES OF PUBLIC POLICY

DEPARTMENT OF JUSTICE MERGER GUIDELINES	EQUIVALENTS IN TERMS OF EQUAL SIZED FIRMS	HHI	4-FIRM SHARE
↑	5 EQUAL SIZED FIRMS	HHI= 2000	CR4=80
HIGHLY CONCENTRATED		HHI= 1800 OR MORE	
	6 EQUAL SIZED FIRMS	HHI= 1667	CR4=67
UNCONCENTRATED	10 EQUAL SIZED FIRMS	HHI= 1000	CR4=40
↓			

Sources: U.S. Department of Justice, *Horizontal Merger* Guidelines, revised April 8, 1997, for a discussion of the HHI thresholds; Shepherd, William, G., *The Economics of Industrial Organization* (Prentice Hall, Engelwood Cliffs, N.J., 1985), for a discussion of 4 firm concentration ratios.

The DOJ considers a market with an HHI of 1800 as the point where a market is considered highly concentrated. In terms of equal sized competitors, this level falls between five and six. A market with six equal sized competitors would have an HHI of 1667. In such a market, the four firm concentration ratio would be 67. A market with five equal sized competitors would have an HHI of 2000. The four firm concentration ratio would be 80 percent.

Shepherd describes these thresholds in terms of four-firm concentration ratios as follows:[61]

---

[61] Shepherd, p. 4.

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.

Shepherd refers to collusion, but that is not the only concern of is not the only concern of market power analysis, or the Merger Guidelines. The Merger Guidelines of the Department of Justice recognize that market power can be exercised with coordinated, or parallel activities and even unilateral actions.

> Market power to a seller is the ability profitably to maintain prices above competitive levels for a significant period of time.*/ In some circumstances, a sole seller (a "monopolist") of a product with no good substitutes can maintain a selling price that is above the level that would prevail if the market were competitive. Similarly, in some circumstances, where only a few firms account for most of the sales of a product, those firms can exercise market power, perhaps even approximating the performance of a monopolist, by either explicitly or implicitly coordinating their actions. Circumstances also may permit a single firm, not a monopolist, to exercise market power through unilateral or non-coordinated conduct --conduct the success of which does not rely on the concurrence of other firms in the market or on coordinated responses by those firms. In any case, the result of the exercise of market power is a transfer of wealth from buyers to sellers or a misallocation of resources.
>
> */ Sellers with market power also may lessen competition on dimensions other than price, such as product quality, service or innovation.[62]

---

[62] Horizontal Merger Guidelines, at section 0.1. Lawrence Sullivan and Warren S. Grimes, *The Law of Antitrust: An Integrated Handbook,* Hornbook Series (West Group, St. Paul, 2000), pp. 596-597, describe the DOJ approach as follows:

> The coordination that can produce adverse effects can be either tacit or express. And such coordination need not be unlawful in and of itself. According to the 1992 Guidelines, to coordinate successfully, firms must
>
> (1) reach terms of interaction that are profitable to the firms involved and
>
> (2) be able to detect and punish deviations. The conditions likely to facilitate these two elements are discussed separately, although they frequently overlap.
>
> In discussing how firms might reach terms for profitable coordination, the Guidelines avoid using the term "agreement," probably because no agreement or conspiracy within the meaning of Section 1 of the Sherman Act is necessary for the profitable interaction to occur. As examples of such profitable coordination, the Guidelines list "common price, fixed price differentials, stable market shares, or customer or territorial restrictions." Sometimes the facilitating device may be as simple as a tradition or convention in an industry.
>
> The go on to not the mechanisms that might be used and the usefulness of the HHI index in this regard.
>
> Oligopoly conditions may or may not require collusion that would independently violate Section 1 of the Sherman Act. A supracompetitive price level may be maintained through price leadership (usually the leader is the largest firm), through observance of a well-established trade rule (e.g., a

Because the supply and demand elasticities for gasoline are so low[63] and the expenditures on energy are so large,[64] we believe these industries should be held to close scrutiny. The critical level for scrutiny is the unconcentrated threshold (10 or more equal sized firms)[65] because short-term inelasticity allows sharp increases in price and the size of expenditures on this commodity creates large price impacts and transfers of wealth in short periods of time.

As Table 3 shows, recent mergers have pushed three of the five regional refining markets (Petroleum Administrative Defense Districts of PADD) in the country into a danger zone of concentration. 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 into the concentrated 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-

---

> convention of a 50 percent markup in price among competing retailers), or through strategic discipline of nonconforming members of the industry...
>
> To the extent that one or very few members of a concentrated industry have much higher market shares than other members, the opportunities for strategic disciplining may expand... The expanded ability of the larger firm to coerce price discipline is reflected in the Herfindahl-Hirschman Index (HHI), which will assign a high concentration index to an industry with a very large participant. An industry with the same number of participants, each of them roughly equal in size, will have a lower index.

[63] 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.

[64] 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."

[65] Given the low elastiticities it can be argued that even ten equal sized firms may not ensure a workably competitive market. As J. W. Friedman, Oligopoly Theory (Cambridge: Cambridge University Press, 1983), pp. 8-9, points out the economic literature would support a much less concentrated market as fully competitive.

> Where is the line to be drawn between oligopoly and competition? At what number do we draw the line between few and many? In principle, competition applies when the number of competing firms is infinite; at the same time, the textbooks usually say that a market is competitive if the cross effects between firms are negligible. Up to six firms one has oligopoly, and with fifty firms or more of roughly equal size one has competition; however, for sizes in between it may be difficult to say. The answer is not a matter of principle but rather an empirical matter.

state basis. It confirms that the trend of increasing concentration has brought the industry to a level that is a source of concern.

TABLE 3:
CONCENTRATION OF REFINERIES IN REGIONAL PETROLEUM MARKETS

PETROLEUM ADMINISTRTIVE DEFENSE DISTRICT (PADD)		1994 HHI	1994 4-FIRMHHI CR	2000 HHI	2000 4-FIRM 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.

Notes: HHI = Hirschman Hefindahl Index (market shares of all firms squared and summed);
4-Firm CR = Four Firm Concentration Ratio (market share of the four largest firms)

Table 4 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 since 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 since 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.

TABLE 4:
CONCENTRATION OF GASOLINE DISTRIBUTION IN STATE MARKETS

CALIFORNIA								
CFA-Outlets	1994					1999		
	HHI	4-Firm CR	5-Firm CR			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					1999		
	HHI	4-Firm CR				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						1999	
	HHI	4-Firm CR				HHI	4-Firm	CR
	1053	55	→				1311	63
WISCONSIN	1994						1999	
CFA-Outlets	HHI	4-Firm CR					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

3. Vertical Integration

The previous discussion focuses on horizontal concentration. Vertical integration between the 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,[66] or foreclosing critical inputs for competitors in downstream markets.[67] Vertical arrangements may restrict the ability of downstream operators to respond to local market conditions,[68]

Vertical integration not only removes important potential competitors across stages of production,[69] but also may trigger a wave of integrative mergers,[70] rendering small independents at any stage extremely vulnerable to a variety of attacks.[71]

---

[66] 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.

[67] 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.

[68] 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.

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

> Potential competition may be important for some markets. If one such potential entrant merges with a firm already inside the market, the ranks of actual plus potential competitors are reduced by one. Unless the entrant is in a vertical relation, the conglomerate reduces the total degree of competitive constraint, even if only slightly.
>
> In addition, [Bain] pointed out that vertical merger also eliminated one of the most natural potential entrants into each stage. Indeed, these two theories are complements. It is difficult to argue that firms in neighboring stages are the most likely entrants without also believing that entry at both stages is more difficult than entry at one stage.

[70] Perry, p. 247.

> The first firms to integrate into neighboring stages reduce the number of alternative sources for other firms at either stage. This "thinning" of the market can increase the costs of market or contractual exchange. Subsequent integration by other firms then becomes more likely.

[71] Scherer and Ross, pp. 526-527.

> It is possible that business firms undertake vertical integration mergers not to enhance the level of monopoly power at some stage, but to redistribute it. Oligopolies often settle down into behavioral patterns in which price competition atrophies, even though some or all sellers suffer from excess capacity. Non-price rivalry then becomes crucial to the distribution of sales. One form of nonprice competition is the acquisition of downstream enterprises which, all else (such as prices) being equal, will purchase from their upstream affiliates. If acquisition of this sort deflects significant amounts of sales, disadvantaged rivals are apt to acquire other potential customers in self-defense,

Gasoline markets are vulnerable to these 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 of sources of supply on their distribution outlets. [72]

With vertical integration the market may be less responsive that it could be both in the short term, since competing product has difficulty getting into individual markets at the end of a vertically [73] integrated chain and in the long term because new competitors in any market may have to enter at several stages of the business. The FTC found this 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. [74]

> and reciprocal fear of foreclosure precipitates a bandwagon effect in which the remaining independent downstream enterprises are feverishly sought.

Shepherd, p. 290.

> Triggering: If there are 10 nonintegrated firms and only one of them integrates, then little affect on competition might occur. But if this action induces the other 9 to do the same, the ultimate impact of the first "triggering" move may be large. Any increase in market power is magnified.

[72] Borenstein, Severin, A. Colin Cameron and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes, *Quarterly Journal of Economics,* 1997.

[73] Scherer and Ross, pp. 526-527.

> It is possible that business firms undertake vertical integration mergers not to enhance the level of monopoly power at some stage, but to redistribute it. Oligopolies often settle down into behavioral patterns in which price competition atrophies, even though some or all sellers suffer from excess capacity. Non-price rivalry then becomes crucial to the distribution of sales. One form of nonprice competition is the acquisition of downstream enterprises which, all else (such as prices) being equal, will purchase from their upstream affiliates. If acquisition of this sort deflects significant amounts of sales, disadvantaged rivals are apt to acquire other potential customers in self-defense, and reciprocal fear of foreclosure precipitates a bandwagon effect in which the remaining independent downstream enterprises are feverishly sought.

Shepherd, p. 290.

> Triggering: If there are 10 nonintegrated firms and only one of them integrates, then little affect on competition might occur. But if this action induces the other 9 to do the same, the ultimate impact of the first "triggering" move may be large. Any increase in market power is magnified.

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

The past half-decade has certainly experienced a merger wave of vertically integrated firms including Exxon-Mobile, BP-Amoco-Arco, Chevron-Texaco, and Phillips-Tosco.[75] The dominant firms spend an immense amount of their capital on mergers and acquisitions.[76]

B. CONDUCT: EXPLOITING TIGHT MARKETS

The tightening of supply reflects private business decisions in other ways. As suggested by the Federal Trade Commission report, individual companies now may have pricing power, not through collusion but through individual action.[77] 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 oligopolistic markets.

> 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.[78]

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

---

[75] 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.

[76] 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 recent 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.

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

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

> imports from traditional Western hemisphere sources, such as Venezuela, Virgin Islands, and Canada.[79]

In fact, the "strength" in the U.S. market represents a sustained run up of over 20 cents at the pump and over 30 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.

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.[80] 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.[81] Prices rise like rockets and float down like feathers. The debate centers around whether the price changes in crude oil (up and down) are fully and finally reflected in the pump price. Borenstein and the General Accounting Office find the difference to be a penny or two per gallon.[82]

> Finally, in the transmission of price increases from wholesale to retail, we find evidence of asymmetry: retail prices change more quickly in response to wholesale price increases than to wholesale price decreases…
>
> The asymmetry implies that variability in crud oil prices, even if there is no systematic increase or decrease in price, is costly to consumers.[83]

Borenstein offers two explanations that raise the possibility of "short run market power among retailers."[84]

> Hypothesis 1. Prices are sticky downward because when input prices fall the old output price offers a natural focal point for oligopolistic sellers…
>
> An oligopolistic coordination equilibrium of the kind described here is consistent with a rapid response of prices to positive cost shocks and a slow response to

---

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

[80] 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 the fall back all the way). This is not the majority view, however.

[81] Bacon, Robert W., "Rockets and Feathers: The Asymmetric Speed of Adjustment of UK Retail Gasoline Prices to Cost Changes," *Energy Economics* 1991; Reilly, Barry and Robert Witt, "Petrol Price Asymmetry Revisited," *Energy Economics*, 1998.

[82] 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).

[83] Id., pp. 306… 322.

[84] Id., p. 305.

> negative shocks. The response to costs shocks would be asymmetric because retailers would refrain from cutting prices in response to a negative price shock and would instead rely on prevailing prices as a focal point for oligopolistic coordination. Retailers would not exercise similar restraint after a positive cost shock...
>
> If stations in an area are operating at competitive margins and then the wholesale price of gasoline declines, it seems plausible that each station might maintain its retail price until it sees convincing evidence (in the form of lower sales) that competing stations have lowered price. The sellers are certainly not price takers and the buyers are not completely informed about the price of each seller...
>
> Hypothesis 3: Volatile crude oil prices create a signal-extraction problem for consumers that lowers the expected payoff from search and makes retail outlets less competitive...
>
> This result is consistent with the theoretical work... which demonstrates that consumers may search less when the common input prices of all retailers become variable, causing short-run decreases in the elasticity of demand that each retailer faces. It is also consistent with a model of sticky downward price adjustment in an oligopoly with imperfect monitoring[85]

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, so the question is not whether refiner/marketer margins "catch up," or whether some of the change in price ends up in the refiner/marketer pockets (bottom line). The recent price spikes have been entirely 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. The question is why? The following example serves to underscore the problem.

The *Wall Street Journal* recently identified the company that "withheld" supplies during the summer 2000 price spike in the Midwest as Marathon oil.[86] Within that market, Marathon "only" has a market share of 16 percent in a market that is just below the cutoff point of the unconcentrated level. It is the number two refiner in that market. Does it have market power?

In the short term, it may well have such power, as the following example shows. Assume a demand elasticity of .2 and a supply elasticity of .5. Assume no collusion between firms. Nevertheless, the unilateral action of such a firm could raise prices by 25 percent in the

[85] Id., p. 324... 328... 335.

[86] "FTC Alleges Marathon Ashland Withheld Gasoline to Increase Profits," June 11, 2001.

short term.[87] Even if this were only applied to refiner/marketer margins, the impact on price would be about $.05 per gallon. These are exactly the orders of magnitude of price effects at issue in the "rockets and feathers" gasoline price literature. More importantly, if the three dominant firms acted in parallel, as suggested by the above FTC observation on refinery investment decisions, margins could double,[88] which is what has been observed over the past two years. It may not sustain that price increase in the long term, but even $.05 per gallon even in one-market costs consumers hundreds of millions of dollars.

C. PERFORMANCE: PROFITING FROM PRICE INCREASES

The first indicator of performance to which economic analysts look for signs of market power is price. We have shown that the run-up in prices cannot be attributed to rising costs of compliance with clean air rules. Nor, as we have pointed out, are they the result of crude oil price changes. Figure 8 presents the same data as Figure 1, except that we overlay each year since 1995 one on top of the other. We start in January 1995, since that was the start of the new reformulated gasoline standard. It shows the remarkable increase in refiner/marketer margins over the past eighteen months.

The second indicator to which economic analysts look for signs of the exercise of market power is profits. The bottom line, literally and figuratively, has been a sharp run up in oil company profits over the same 18-month period (see Table 5).[89]

The profits of the integrated oil companies that dominate the refining sector have hit record highs, measured in terms of return on equity, in the past eighteen months. The price spiral of recent years has resulted in a sharp increase in industry profits. Net income from refining and marketing doubled in 2000, compared to 1999. In the first quarter of 2001, profits increased by almost 75 percent. Overall profits for these companies followed a similar pattern

---

[87] The formula for estimating the Lerner index is:

$$L = \frac{(P - C)}{P} = \frac{1}{E_d} \qquad \frac{S}{e_m^d + e_j^s (1 - s_i)}$$

Under the assumptions specified we arrive at the following estimate

L=.16/(.2 +(.84*.5))
L=.5/.62
L=.258

[88] The three firm market share is approximately 50 percent. Therefore,

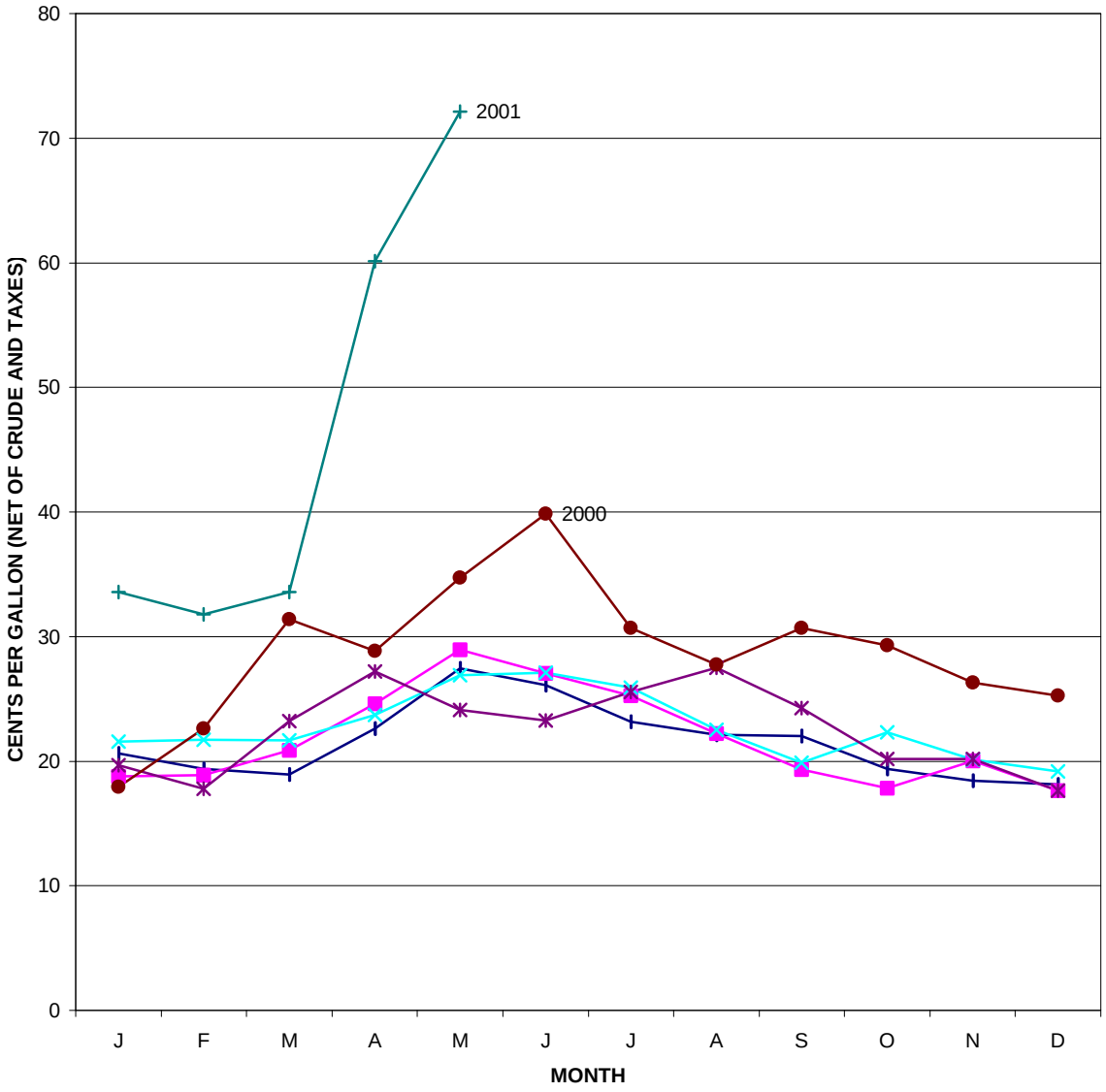
L=.5/(.2 +(.5*.5))

L=.5/.45

L=1.11

[89] 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

FIGURE 8
INCREASING REFINER/MARKETER SHARE OF GASOLINE PUMP PRICE: 1995-2001



Source: Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 9.4, for pump prices; *Petroleum Marketing Monthly,* Table 1 for crude prices and Table 6 for prices net of taxes.

TABLE 5:
INCREASING PROFITS FOR OIL OPERATIONS

	PERCENT INCREASE IN PROFITS	
	ANNUAL 1999 – 2000	1ST Q 2000 - 2001
MAJORS (9 FIRMS)		
REFINING AND MARKETING	93	71
INTEGRATED OIL (Exploration, production, refining and marketing)	145	76
PETROLEUM REFINING (FORTUNE, 16 FIRMS)	148	
COAL OIL AND GAS (BUSINESS WEEK, 27 FIRMS)		89

Sources: 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

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,[90] while *Business Week* reports 22 percent.[91] This is almost twice the historic average for the industry and about 50 percent more than other large corporations.[92] Thus, even as prices "settle down" to 2000 levels, they are coming to rest at a plateau that is incorporating excessive rates of profit.

D. CONCLUSION

In the past half decade the industry has undergone a major merger wave and subsequent consolidation and restriction of capacity (see Figure 9). While demand for petroleum products grew about 10 percent, refinery capacity continued to fall short. More importantly, the number of refineries, the amount of storage capacity and the number of branded gasoline stations each declined by more than ten percent. This contraction and consolidation reflected business decisions and in the past two years, they have had their inevitable effect. Price spirals of recent years have resulted in a sharp increase in industry profits.

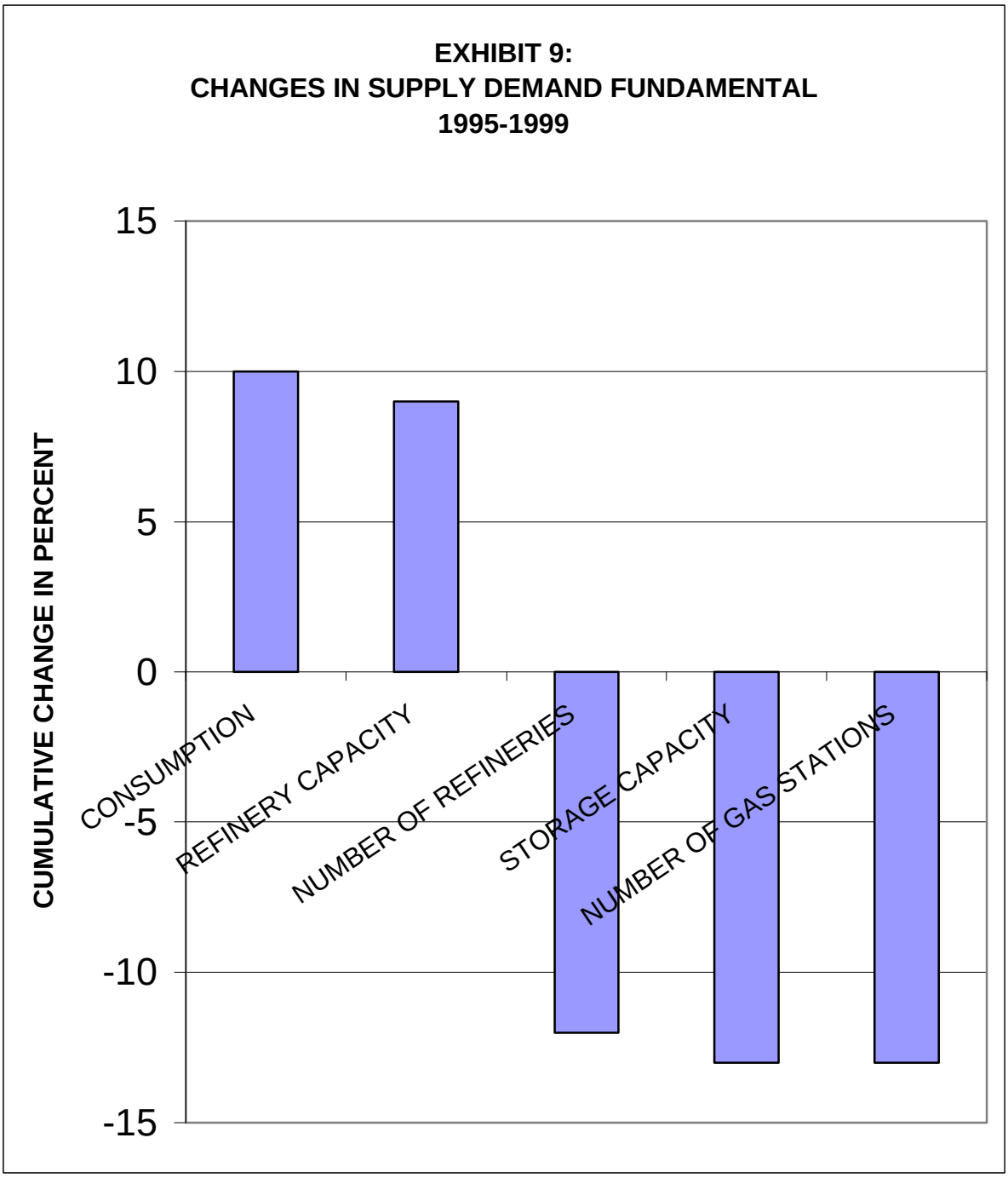
In summary, this analysis demonstrates that gasoline markets are volatile and suffer competitive problems. Market fundamentals including basic conditions (inadequate capacity and inelastic supply and demand), market structures (ownership concentration and vertical integration), corporate conduct (capacity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

---

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

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

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



Sources: Source: U. S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, Tables 3.1a, for consumption; *Petroleum Supply Annual*, Table 36 for refinery capacity and number, Table 44 for storage capacity, *National Petroleum New*, Mid-July Special for number of branded gasoline stations.

IV. EQUITY CONSIDERATIONS: THE IMPACT OF EXPENDITURES AND PRICE CHANGES FOR GASOLINE ON HOUSEHOLDS

Economics focuses on efficiency. It has difficulty dealing with distributional or equity issues.[93] In simple terms, economists treat every dollar equally. As a practical matter, an additional dollar gained or lost may mean much more to a low-income person than a wealthy one.[94] This chapter briefly reviews the equity impacts of expenditures on gasoline. These impacts have certainly played a part in the policy debate.

A. EXPENDITURE PATTERNS

In Figure 2 we presented the percentage of income spent by those households with vehicles at each income level from the 1994 Residential Transportation Energy Consumption Survey, as well as the expenditures for all households in that survey and the Consumer Expenditure Survey of 1999. It shows the pattern of a necessity, with lower income households spending a larger percentage of their income on gasoline.

Table 6 provides more detail on this issue. Approximately 87 percent of all households had a vehicle. They consumed over 1000 per gallons per year. On average households with vehicles spend over $1,000 per year.

Virtually all upper middle and upper income households (incomes above $50,00 per year) have a vehicle. They consume about 1300 to 1400 gallons per year and spend about $1,500 per year.

Far fewer lower income households have a vehicle and those with vehicles consume considerably less energy. Households with incomes below $10,000 or those eligible for federal assistance) consume 700 to 800 gallons per year and spend $800 to $900 per year.

Expenditures for recent years exhibit similar patterns. Averaged across all households (as opposed to those with vehicles) upper income households spend about three times as much

---

[93] Scherer and Ross, p. 4, note as one of their performance indicators the following:

> The distribution of income should be equitable. Equity is notoriously difficult to define, but it implies at least that producers do not secure rewards in excess of what is needed to call forth the amount of services supplied.

[94] Id., p. 28, offers the following observation on the equity issue in terms of evaluating the impact of monopoly versus competition.

> If all families of a given size have similar income utility functions, the marginal utility of income must be higher for the multitudes who supply only their labor services than for the wealthy few with substantial monopoly shareholdings. A redistribution of income away from monopolists and toward labor suppliers will therefore add to the sum of utility for all citizens. Yet however appealing this may appear on intuitive grounds, there is no scientific way of making the interperonsal utility comparison required to support it. Therefore, we tread warily when we say that competition is beneficial not only because it allocated resources efficiently, but also in terms of income distribution equity.

TABLE 6: HOUSEHOLD GASOLINE CONSUMPTION BY INCOME GROUPS (1994)

INCOME GROUP	1994 HOUSEHOLD TRANSPORTATION PERCENT WITH VEHICLE	CONSUMPTION, HOUSEHOLDS WITH VEHICLES GALLONS PER YEAR	$/YEAR	AVERAGE ALL HOUSEHOLDS $/YEAR	1999 CES AVERAGE ALL HOUSEHOLDS $/YEAR
LOW INCOME					
LESS THAN $10,000	58	670	772	448	512
ELIGIBLE FOR FEDERAL ASSISTANCE	67	828	957	641	
AVERAGE INCOME	87	1067	1234	1076	1071
UPPER INCOME					
$50,000 TO 74,999	98	1325	1528	1497	
				}	1576
$75,000 OR MORE	99	1443	1692	1675	

Source: U.S. Department of Energy, *Household Vehicle Energy Consumption: 1994*, Table 5.2, 5.18; *Residential Energy Consumption Survey: 1994*, Table 5.1.U. S. Bureau of the Census, Department of Labor Statistics, *Consumer Expenditure Survey: 1999*, Table 2.

on gasoline as lower income households. While consumption rises with income, it does not rise as fast as income. Therefore, the expenditure on gasoline takes a smaller and a larger share of the income of lower income households.

Among very low-income households (incomes below $5,000), gasoline expenditures take a third of income for those who have a vehicle. For the lower income group as a whole, the percentage is about 15 percent. For lower and lower middle income households, gasoline expenditures take 5 to 10 percent of income for households with vehicles. For all households in these groups, the average percentage of income devoted to gasoline is between 3 and 7 percent. Conversely, for upper income households gasoline expenditures take less than two percent of income.

B. ENERGY EXPENDITURES AND TAX CUTS

This pattern of spending helps to explain the skeptical reaction that met President Bush's claim that one reason to rush the income tax cut was to offset energy price increases.[95] Because of the distribution of energy expenditures, there is a mismatch between energy price increases and tax cuts. Those upper income households who get most dollar savings from the tax cut do not incur most gasoline expenditures. They receive about 1.5 times as much.

Table 7 shows the distribution of gasoline expenditures and tax cuts by income quintiles. The bottom two quintiles (low and lower middle income) pay about a quarter of the gasoline

[95] NBC, *Evening News,* May 14, 2001.

bill, but they receive about one-twelfth of the tax cuts. The wealthiest 20 percent of the population pays about 31 percent of the gasoline bill but receives about 59 percent of the fully phased in tax cut.

TABLE 7: DISTRIBUTION OF ENERGY EXPENDITURES AND TAX CUTS BY INCOME QUINTILES
(Percent accruing to each income group)

QUINTILES	GASOLINE[a/] EXPENDITURE	TAX CUT PHASE IN[b/] 2006
Lower	9%	1%
Lower Middle	14	7
Middle	20	14
Upper Middle	25	19
Upper	31	59

SOURCES
Gasoline, Bureau of the Census, Department of Labor Statistics, *Consumer Expenditure Survey: 1999*, Table 2. Quintiles =Table 1, "Quintiles of Income Before Taxes: Average Annual Expenditures and Characteristics, Consumer Expenditure Survey, 1999," Available at the BLS Home page. Tax Cut, Quintiles = *Bush Tax Plan Benefits are Similar to Campaign Proposal: Skewed Toward Wealthy*, Citizens for Tax

Table 8 shows a similar analysis broken down by income levels. Those with incomes below $30,000 pay about 30 percent of the gasoline bill, but they receive about 20 percent of the tax cut in 2001 and only 11 percent in 2006. Over the seven-year phase in period, they receive only 14 percent of the tax cut, less than half their share of the energy bill. Those with incomes above $50,000 pay about 47 percent of the energy bill, but they receive about 58 percent of the 2001 tax cut and about 76 percent of the fully phased in tax cut. Over the seven-year phase in of the tax cut, they receive about 70 percent of the tax cut, more than twice their share of the gasoline bill.

TABLE 8: DISTRI BUTION OF ENERGY EXPENDITURES AND TAX CUTS BY INCOME LEVELS

INCOME GROUP	GASOLINE[a/] EXPENDITURE	TAX CUT PHASE IN[b/] 2001	2006	TOTAL 2001-2006
Less Than $10k	6%	2%	0%	0%
$10K to $20K	12	7	4	5
$20K to $30K	12	12	7	9
$30K to $40K	12	12	7	8
$40K to $50K	11	11	7	8
$50K or more	47	58	76	70

SOURCES:
Gasoline, Bureau of the Census, Department of Labor Statistics, *Consumer Expenditure Survey: 1999*, "Income Before Taxes Average Annual Expenditures and Characteristics, Consumer Expenditure Survey, 1999," Available at the BLS Home page. Tax Cut = *Distributional Effects of A Chairman's Mark of the "Restoring Earnings to Lift Individuals and Empower Families ('Relief') Act of 200,* Joint Committee on Taxation, May 11, 2001

V. POLICY RESPONSES

A. ECONOMIC FUNDAMENTALS AND POLICY PRINCIPLES

Public policy responses must reflect physical and economic reality. Since the laws of physics cannot be repealed, public policy must be cognizant of the increased likelihood and severe impact of accidents in energy industries, like refineries and pipelines. Physical and institutional structures must be prepared to deal with accidents in this industry.

The low short run elasticity plays a critical role in price volatility and the exercise of market power. The extremely low elasticity of demand is one of the key characteristics of the gasoline market. Suppliers are well aware of the rigidities in the market and can take advantage of them under the right circumstances. Because the gasoline market is so large, even small and short term pricing abuse imposes substantial costs on the public.

Under these circumstances, firms with relatively small market shares can increase profits by withholding supplies, unless the elasticity of supply is high. Unfortunately, petroleum product markets do not exhibit very elastic supply. Reserve margins and stocks are crucial.

1. Supply

Avenues for increasing supply are available, but they may not be pursued, if left to industry business decisions. Since short-term elasticities are quite low, a variety of resources that can be called upon to meet demand quickly are necessary to prevent price volatility. Having reserve margins of production and transport capacity would dampen price volatility. Stockpiles and storage are the best option when demand shifts or supply is interrupted. Import of product is an important option when refinery capacity is not available or, depending on geographic location, when pipeline capacity is not available.

The recent closure of refineries also suggests an avenue for expanding capacity. The most readily available path to expanding capacity may be to identify existing facilities that have been shuttered, or sites that have been recently abandoned to expand capacity while minimizing environmental impact should be explored. Each of these options should be considered, particularly in markets where capacity is tight and ownership is concentrated.

The behavior of small refiners in response to the elimination of programs that supported their existence makes it clear that public policy can affect the number and geographic distribution of refinery capacity. If we want geographically dispersed refinery capacity to promote local responses to supply problems, we just have to pay for it.

2. Demand

In the long run, reducing the size of the market, without imposing deprivation on consumers, is the major policy challenge.

The consumption patterns deeply embedded in spatial relationships lead us to conclude that increased fuel economy is the more readily achievable approach to reducing gasoline

consumption than changing living patterns. Reducing fuel use per vehicle allows existing mobility patterns to be preserved, while consumption is reduced.

Shifting preferences for vehicles (toward higher efficiency vehicle types) requires greater change in social behaviors. It is also vulnerable to changes in taste. Moreover, it requires a change in the stock over a substantial period of time, perhaps a decade. While policies to affect these behaviors should be pursued, their complexities and difficulties should be recognized.

Attempting to overlay mass transit on existing living patterns may be pursued as a long-term strategy. However, given consumer preferences and the spatial distribution of activity, this is a substantial task. The increasing suburbanization of living patterns frequently results in relatively low densities and high costs for mass transit. Changing the geographic distribution of work, home and play, requires the greatest amount of social change.

3. Distributional Effects

Equity impacts of rising energy prices, particularly as they affect low and lower middle income households, must be dealt with directly. Neither general tax cuts nor existing energy assistance programs, such as the Low Income Home Energy Assistance Program (LIHEAP), address the problem of rising or volatile transportation energy costs. Even if it could be argued that LIHEAP addresses the general energy needs of groups, ad hoc efforts to increase programs like LIHEAP tend to fall short and come long after the impacts of rising energy prices have been felt.

B. POLICY TARGETS

It is time for public policy to seek 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 developing both efficiency (demand-side) and production (supply-side).
- Increase market flexibility through stock and storage policy.
- Discourage private actions that make markets tight/or exploit market disruptions by countering the tendency to profiteer by withholding of supply.
- Promote a more competitive industry.
- Address the disproportionate burden that rising energy price place on lower income households.

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

We have earlier identified the hierarchy of policies to reduce demand. Increasing the fuel efficiency of the fleet through increased standards for mileage and use of hybrid vehicles

should be given top priority. Shifting preferences for vehicle types and modes of transportation through taxes and incentives are a second category to be considered.

A goal of achieving an improvement of 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. This is a mid-term target. This rate of improvement should be sustainable for several decades. This would reduce demand by 1.5 million barrels per day. This would return consumption to the level of the mid-1980s.

Expanding refinery capacity by 10 percent equals approximately 1.5 million barrels per day. This would require 15 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 to be 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.

Once the magnitude of the task on the supply-side is placed in perspective, and given the objective analysis of the environmental costs involved, the call to overturn environmental laws loses its force. It seems that expansion of supply-side capacity can be accomplished within the current confines of environmental laws. To the extent that the costs of compliance can be demonstrated to be a significant problem, then underwriting compliance (directly through financial subsidies or indirectly through research) rather than relaxing standards 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.

2. 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. 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. Participants in the distribution of gasoline 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 by draw 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.

3. 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. It needs to be 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 could be made illegal.

4. 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 looked on 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.

5. Low-income assistance

Rather than fight repeated battles over supplemental appropriations, it would be more effective to index assistance payments to energy prices. It may be time to consider new programs that deal directly with transportation fuel costs. Transportation energy is a necessity in the 21st century.

D. CONCLUSION

Reviewing this list of policy targets, it can be seen that several policies that the National Energy Policy Task force recommended have been included. The problem with the task force recommendations is that it took far too narrow a view and placed priority on one factor, expanding capacity. The nature and extent of competition and demand are market fundamentals that require equal consideration and emphasis.