


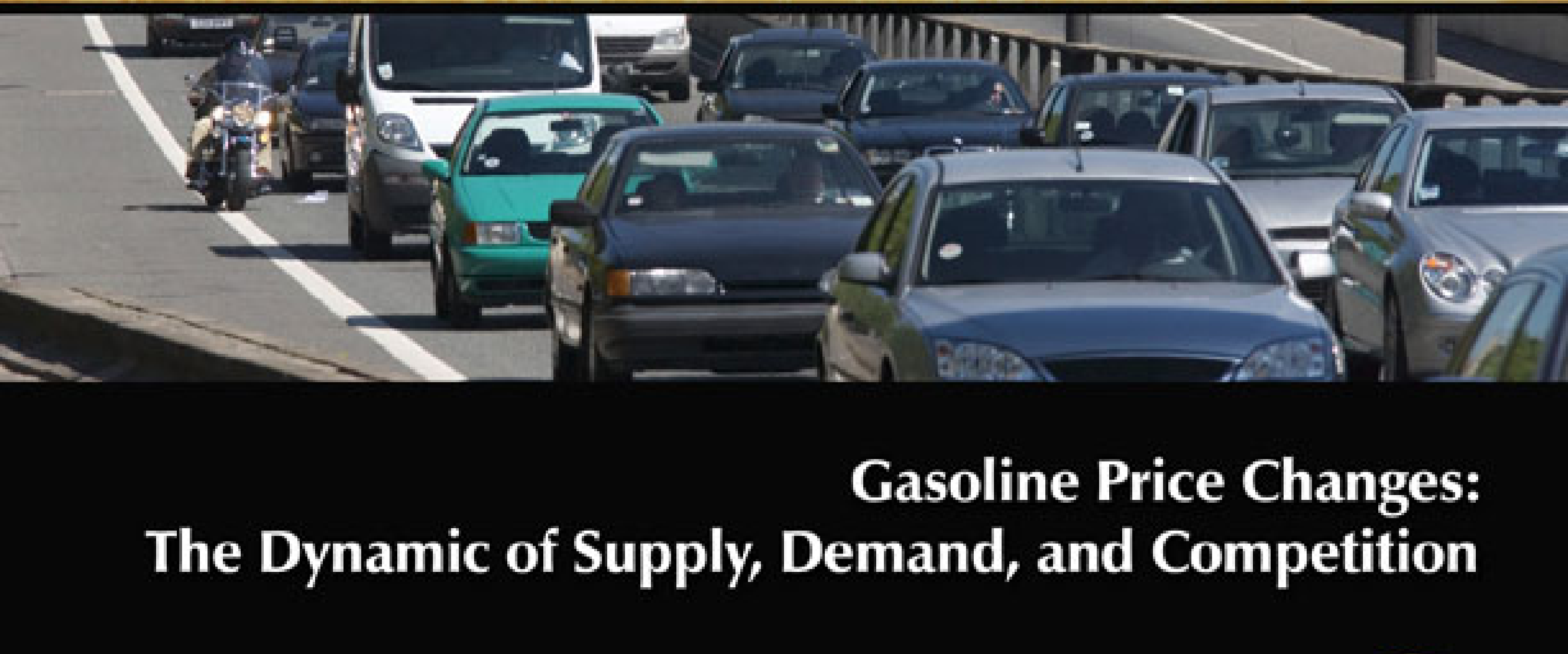

Gasoline Price Changes: The Dynamic of Supply, Demand, and Competition

Federal Trade Commission
2005

Federal Trade Commission

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EXECUTIVE SUMMARY

Many people who purchased gasoline in the U.S. in the past week likely could report the price paid per gallon. Consumers closely follow gasoline prices, and with good reason. U.S. consumers have experienced dramatic increases and wide fluctuations in gasoline prices over the past several years. During 2004 and 2005, U.S. consumers spent millions of dollars more on gasoline than they had anticipated. In the spring of 2005, the national weekly average price of gasoline at the pump, including taxes, rose as high as $2.28 per gallon. Steep, but temporary, gasoline price spikes have occurred in various areas throughout the U.S. Since the mid-1990s, consumers on the West Coast, especially in California, have observed that their gasoline prices are usually higher than elsewhere in the U.S.

Rising average gasoline prices and gasoline price spikes command our attention. What causes high gasoline prices like those of 2004 and 2005? What causes gasoline price spikes? These important questions require a thorough and accurate analysis of the factors – supply, demand, and competition, as well as federal, state, and local regulations – that drive gasoline prices, so that policymakers can evaluate and choose strategies likely to succeed in addressing high gasoline prices.

This Report provides such an analysis, drawing upon what the Federal Trade Commission (FTC) has learned about the factors that can influence average gasoline prices or cause gasoline price spikes. Over the past 30 years, the FTC has investigated nearly all oil-related antitrust matters and has held public hearings, undertaken empirical economic studies, and prepared extensive reports on oil-related issues, such as the Midwest gasoline price spike in June 2000. Since 2002, the staff of the FTC has monitored weekly average retail gasoline and diesel prices in 360 cities nationwide to find and, if necessary, recommend appropriate action on pricing anomalies that might indicate anticompetitive conduct.

Some observers suggest that oil company collusion, anticompetitive mergers, or other anticompetitive conduct – not market forces – may be the primary cause of higher gasoline prices. Anticompetitive conduct is always a possibility, of course. That is the reason for the antitrust laws. The FTC has been and remains vigilant regarding anticompetitive conduct in this industry. The FTC has taken action against proposed mergers in this industry at concentration levels lower than in other industries. Since 1981, the FTC has investigated 16 large petroleum mergers. In 12 of these cases, the FTC obtained significant divestitures and in the four other cases, the parties abandoned the transactions altogether after antitrust challenge. In 2004, the FTC staff published a study reviewing the petroleum industry's mergers and structural changes as well as the antitrust enforcement actions the FTC has taken.[1] In no other industry does the FTC maintain a price monitoring project such as its project to monitor retail gasoline and diesel prices. Most recently, on June 10, 2005, the FTC announced the acceptance of two consent orders that resolved the competitive concerns relating to Chevron's acquisition of Unocal and settled the FTC's 2003 monopolization complaint against Unocal. The Unocal settlement alone has the potential of saving consumers nationwide billions of dollars in future years.[2]

The vast majority of the FTC's investigations have revealed market factors to be the primary drivers of both price increases and price spikes. This Report describes the complex landscape of market forces that affect gasoline prices in the U.S.

The Report does not suggest or evaluate strategies for addressing high gasoline prices. Rather, the Report provides an empirical analysis to help policymakers evaluate different proposals to address high gasoline prices and consumers understand the reasons for gasoline price changes.

I. A CASE EXAMPLE TEACHES THREE BASIC LESSONS.

In August 2003, the FTC staff observed anomalous retail gasoline prices in Phoenix, Arizona. At the beginning of August 2003, the average price of gasoline in Phoenix was $1.52 per gallon. By the third week of August, however, it had peaked at $2.11 per gallon. Over the next few weeks, the price dropped, falling to $1.80 per gallon by the end of September.

The price spike was caused by a pipeline rupture on July 30, and the failure of temporary repairs, which had reduced the volume of gasoline supplies to Phoenix by 30 percent from August 8 through August 23. Arizona has no refineries. It obtains gasoline primarily through two pipelines, one traveling from west Texas and the other from the West Coast. The rupture closed the portion of the Texas line between Tucson and Phoenix.

The shortage of gasoline supplies in Phoenix caused gasoline prices to increase sharply. To obtain additional supply, Phoenix gas stations had to pay higher prices to West Coast refineries than West Coast gas stations were paying. West Coast refineries responded by selling more of their supplies to the Phoenix market.

Phoenix consumers did not respond to significantly increased gasoline prices with substantial reductions in the amount of gasoline they purchased. In theory, to prevent a gasoline price hike, Phoenix consumers could have reduced their gasoline purchases by 30 percent. Without price increases, however, consumers do not have incentives to change the amount of gasoline they buy. Moreover, even with price increases, most consumers do not respond to short-term supply disruptions such as a pipeline break by making the types of major changes – the car they drive, their driving habits, where they live, or where they work – that could substantially reduce the amount of gasoline they consume.

At some point, gasoline prices can become high enough that consumers will make substantial reductions in their gasoline purchases. *How much* prices need to increase depends on how easily consumers can adopt substitutes for gasoline – such as taking public transportation. Empirical studies indicate that consumers do not easily find substitutes for gasoline, and that prices must increase significantly to cause even a relatively small decrease in the quantity of gasoline consumers want. In the short run, a gasoline price increase of 10 percent would reduce consumer demand by just 2 percent, according to these studies. This suggests that gasoline prices in Phoenix would have had to increase by a large amount to reduce the quantity of consumers' purchases by 30 percent, the amount of lost supply. Extrapolating from above, prices would have to increase by 150 percent.[3] Phoenix prices did increase substantially – by 40 percent – but remained far below a 150 percent price increase, because Phoenix gas stations had succeeded in obtaining some additional gasoline supplies from the West Coast. This new supply of gasoline dampened price increases to some extent.

On August 24, the pipeline owner restarted gasoline flow on the Tucson-Phoenix line, although at a reduced capacity. Retail gasoline prices in Phoenix declined by about $0.31 per gallon between the last week in August and the end of September. Phoenix gas stations, however, still had to obtain significant quantities of gasoline from West Coast refineries by pipeline or from other terminals by truck – both at higher cost.

Three basic lessons emerge from this example.

First, in general, the price of a commodity, such as gasoline, reflects producers' costs and consumers' willingness to pay. Gasoline prices rise if it costs more to produce and supply gasoline, or if people wish to buy more gasoline at the current price – that is, when demand is greater than supply. Gasoline prices fall if it costs less to produce and supply gasoline, or if people wish to buy less gasoline at the current price – that is, when supply is greater than demand. Gasoline prices will stop rising or falling when they reach the price at which the quantity consumers demand matches the quantity that producers will supply. In Phoenix, prices rose primarily because there was not enough gasoline to supply the quantity demanded at the prices that prevailed before the pipeline broke.

Second, how consumers respond to price changes will affect how high prices rise and how low they fall. Limited substitutes for gasoline restrict the options available to consumers to respond to price increases. That gasoline consumers typically do not reduce their purchases substantially in response to price increases makes them vulnerable to substantial price increases, such as the 40 percent price increase in Phoenix.

Third, how producers respond to price changes will affect how high prices rise and how low they fall. In general, when there is not enough of a product to meet consumers' demands at current prices, higher prices will signal a potential profit opportunity and may bring additional supply into the market. How high prices have to be to bring in additional supply will depend on how costly it is for producers to expand output. Phoenix gas stations' offers to pay prices to West Coast refiners that were higher than they had been receiving from West Coast gas stations were sufficient to bring additional supplies into Phoenix.

II. WORLDWIDE SUPPLY, DEMAND, AND COMPETITION FOR CRUDE OIL ARE THE MOST IMPORTANT FACTORS IN THE NATIONAL AVERAGE PRICE OF GASOLINE IN THE U.S.

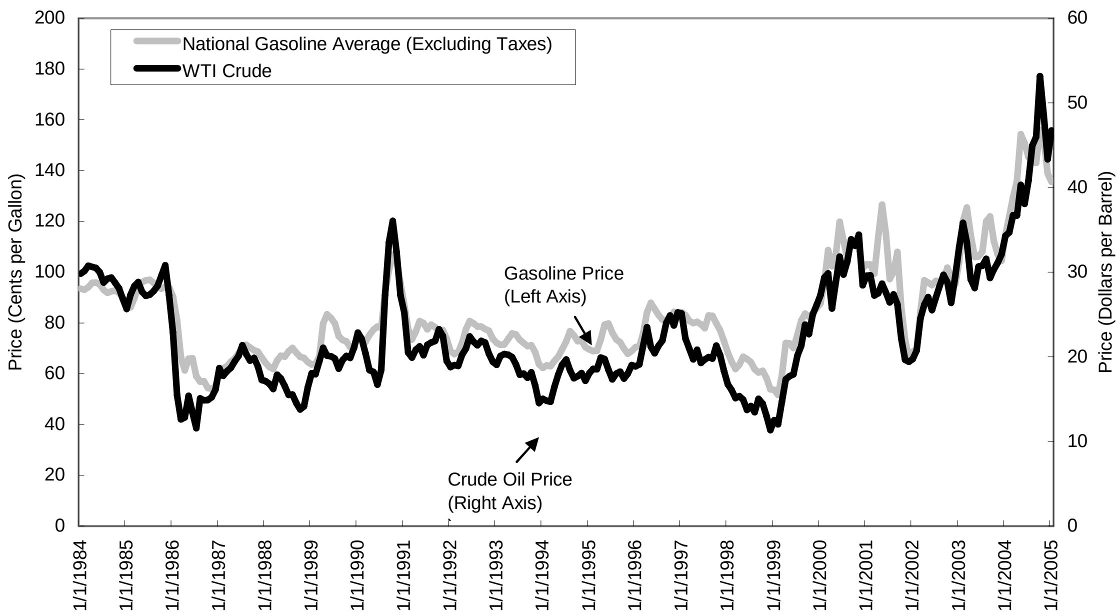
To understand U.S. gasoline prices over the past three decades, including why gasoline prices rose so high and so sharply in 2004 and 2005, we must begin with crude oil.

- *The World Price of Crude Oil Is the Most Important Factor in the Price of Gasoline. Over the Last 20 Years, Changes in Crude Oil Prices Have Explained 85 Percent of the Changes in the Price of Gasoline in the U.S.*

U.S. refiners compete with refiners all around the world to obtain crude oil. Refiners in the U.S. now import more than 60 percent of their crude from foreign sources, up from 43 percent in 1978. The prices of crude oil produced and sold domestically also are linked to world crude prices.

If world crude prices rise, then U.S. refiners must offer and pay higher prices for crude they buy. Facing higher input costs from crude, refiners charge more for the gasoline they sell at wholesale. This requires gas stations to pay more for their gasoline. In turn, gas stations, facing higher input costs, charge consumers more at the pump. To illustrate this relationship, Figure 2-1 compares the U.S. annual average price of gasoline (excluding taxes) with the annual average price of a recognized crude oil benchmark, West Texas Intermediate (WTI), from 1984 to January 2005.[4] When crude oil prices rise, gasoline prices rise because gasoline becomes more costly to produce.

Figure 2-1: Comparison of the National Average Price of Gasoline and the Price of West Texas Intermediate Crude (1984-Jan. 2005)



Source: EIA

- *Since 1973, Production Decisions by OPEC Have Been a Very Significant Factor in the Prices That Refiners Pay for Crude Oil.*

The Organization of Petroleum Exporting Countries (OPEC) is a cartel designed specifically to coordinate output decisions and to affect world crude oil prices.[5] Beginning with OPEC's first successful assertion of market power in 1973-1974, market forces no longer were the sole determinant of the world price of crude oil. At that time, OPEC members agreed to limit how much crude oil they would produce and to embargo the sale of crude oil to the U.S. OPEC members adhered to the production limits and, when OPEC lifted the embargo six months later, crude oil prices had tripled from $4 to $12 per barrel.

The degree of OPEC's success in raising crude oil prices has varied over time. OPEC members can be tempted to "cheat" and sometimes sell more crude oil than specified by OPEC limits. Higher world crude prices due to OPEC's actions increased the incentives to search for oil in other areas, and crude supplies from non-OPEC members such as Canada, the United Kingdom, and Norway have increased significantly. In 2003, almost 30 years after the first oil embargo, OPEC's total crude production was about the same as in 1974, but accounted for only 38 percent of world crude production, as compared to 52 percent of world crude oil production in 1974. Another countervailing force against higher crude prices has been new technologies that aid in finding new oil fields and lowering extraction costs.

Nonetheless, OPEC still produces a large enough share of world crude oil to exert market power and strongly influence the price of crude oil when OPEC members adhere to their assigned production quotas. Especially when demand surges unexpectedly, as in 2004, OPEC decisions on whether to increase supply to meet demand can have a significant impact on world crude oil prices.

- *Over the Past Two Decades, the Demand for Crude Oil Has Grown Significantly.*

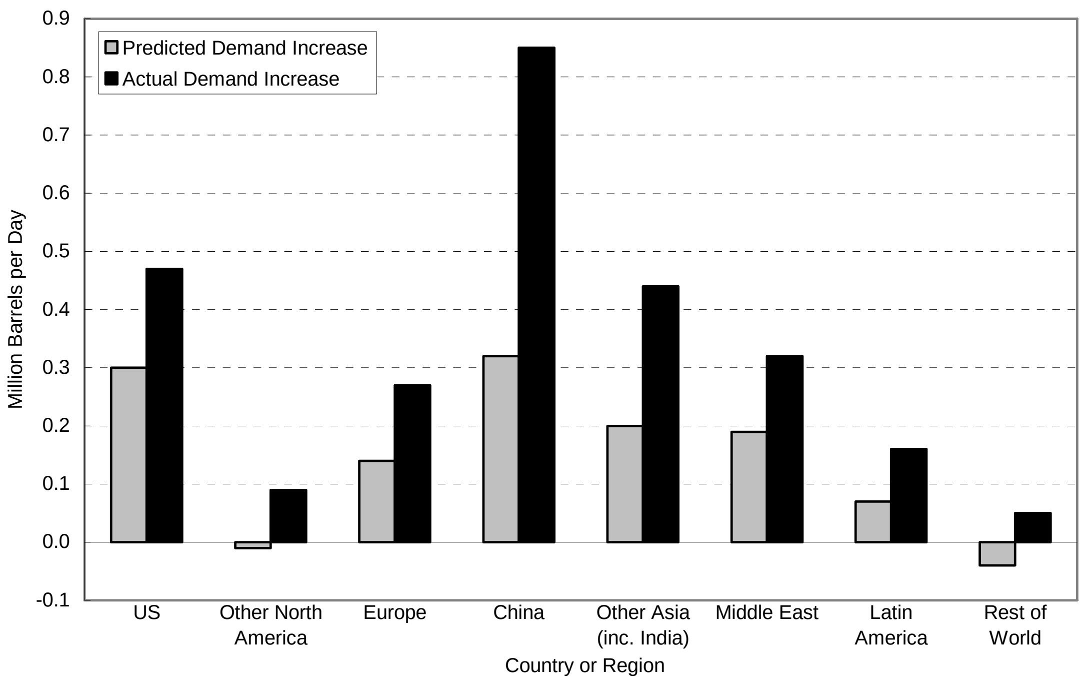
The demand for crude oil depends on the demand for refined products, such as gasoline, diesel fuel, jet fuel, and heating oil. Since 1982, gasoline has accounted for 49 to 53 percent of the daily consumption of all petroleum products. Crude oil consumption has fallen during some periods over the past 30 years, partially in reaction to higher prices and federal laws such as requirements to increase the fuel efficiency of cars. Gasoline consumption in the U.S. fell significantly between 1978 and 1982, and remained lower during the 1980s than it had been at the beginning of 1978. *See* Figure 3-6, *supra*.

Overall, however, the long-run trend is toward significantly increased demand for crude oil. Over the last 20 years, average daily U.S. consumption of all refined petroleum products increased on average by 1.5 percent per year, leading to a total increase of 30 percent. As a result, worldwide demand for crude increased by 27 percent between 1988 and 2004. One would expect increased demand for crude oil at current prices to produce crude oil price increases. Throughout most of the 1990s, however, crude prices remained relatively stable, suggesting that crude producers increased production to meet increased demand. *See* Figure 3-6, *supra*.

- *In 2004, Crude Producers Were Unprepared to Produce Enough Crude Oil to Meet Larger-than-Predicted Increases in World Demand. Crude Oil Prices Increased Because There Was Not Enough Crude Supply to Meet Increasing Demand at Previous Price Levels. Steep Increases in World Prices for Crude Oil Caused Steep Increases in Gasoline Prices.*

Crude oil producers had set 2004 production levels based on much lower projections for demand growth than actually occurred. Projections had placed likely growth in world demand for crude oil at 1.5 percent. In fact, the 2004 rate of growth in crude demand was more than double the projections: 3.3 percent. *See* Figure 2-6. Large demand increases from rapidly industrializing countries, particularly China and India, made supplies much tighter than expected. This phenomenon was not limited to crude oil. Other commodities that form the basis for expanded growth in developing economies, such as steel and lumber, also saw unexpectedly rapid growth in demand, along with higher prices.

Figure 2-6: 2004 Predicted vs. Actual Crude Oil Demand Increase, Million Barrels per Day



Source: IEA

In addition, unexpected production difficulties reduced some producers' crude output, putting upward pressure on prices. Finally, the 2004 political outlook in certain regions, including prospects for terrorist incidents or civil unrest, appeared to threaten the production capacity of some major oil producers. For the most part, production actually did not decrease significantly in any of the areas of concern. However, even incidents that do not directly affect current crude oil production can create concerns and fears about potential crude supply disruptions and thus contribute to increases in crude spot and futures prices.

III. GASOLINE SUPPLY, DEMAND, AND COMPETITION PRODUCED RELATIVELY LOW AND STABLE ANNUAL AVERAGE REAL U.S. GASOLINE PRICES FROM 1984 UNTIL 2004, DESPITE SUBSTANTIAL INCREASES IN U.S. GASOLINE CONSUMPTION.

A review of annual average U.S. gasoline prices in real terms over the past decades reveals surprisingly low prices. Despite ever-growing gasoline consumption in the U.S., increased gasoline supply from U.S. refiners and imports, as well as relatively stable crude oil prices, kept U.S. gasoline prices in check throughout the 1990s. These prices reflect national averages that do not capture regional differences, to be discussed in the succeeding section. Yet they provide an important historical perspective on gasoline prices over the past 20 years.

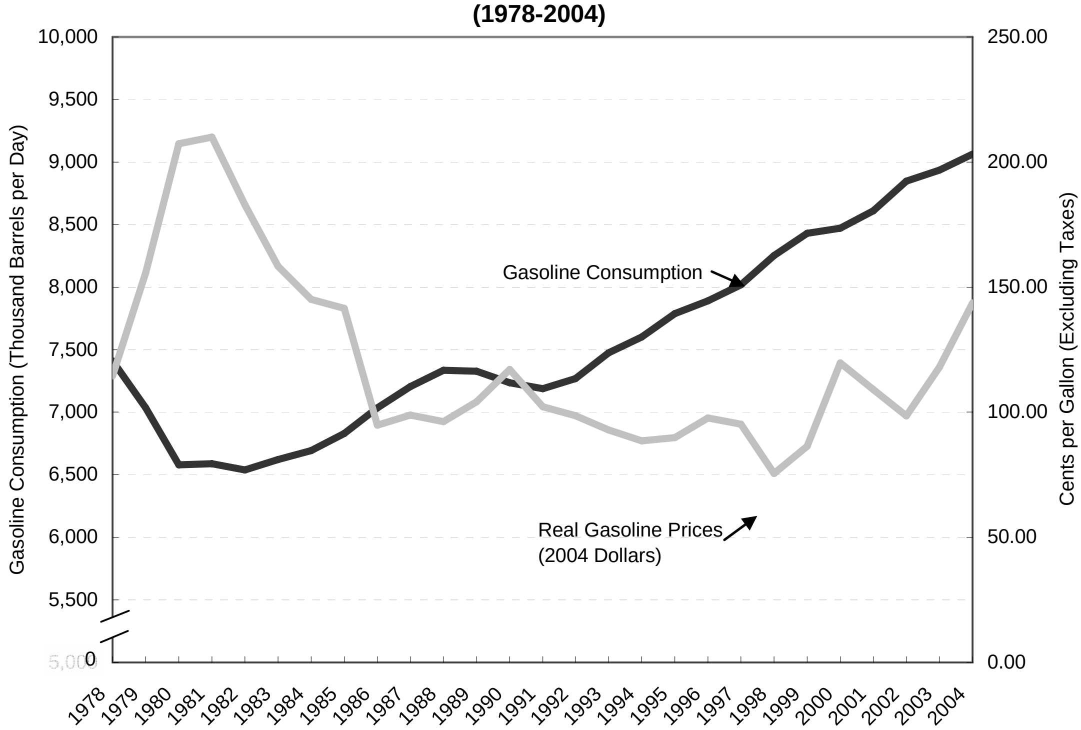
- *U.S. Consumer Demand for Gasoline Has Risen Substantially, Especially Since 1990.*

In 1978, U.S. gasoline consumption was about 7.4 million barrels per day. By 1981, in the face of sharply escalating crude oil and gasoline prices and a recession, U.S. gasoline consumption had fallen by roughly a million barrels per day, averaging about 6.5 million barrels per day. As gasoline prices began to fall in the 1980s, U.S. consumption of gasoline began to rise once again. In 1993, U.S. gasoline consumption rose above 1978 levels; it has continued to increase at a fairly steady rate since then. In 2004, U.S. gasoline consumption averaged about 9 million barrels per day. U.S. gasoline consumption continues to rise, with the U.S. Energy Information Administration (EIA) forecasting 2005 demand at an average of 9.2 million barrels per day.

- *Increased Gasoline Supply from U.S. Refineries and Imports Helped to Meet Increased U.S. Demand for Gasoline and Keep Gasoline Prices Relatively Steady.*

A comparison of “real” average annual retail gasoline prices and average annual retail gasoline consumption in the U.S. from 1978 through 2004 shows that, in general, gasoline prices remained relatively stable despite significantly increased demand. *See* Figure 3-6. “Real” prices are adjusted for inflation and therefore reflect the different values of a dollar at different times; they provide more accurate comparisons of prices in different time periods. “Nominal” prices are the literal prices shown at the time of purchase.

Figure 3-6: U.S. Annual Average Gasoline Consumption and Real National Gasoline Prices (1978-2004)



Source: EIA, BEA

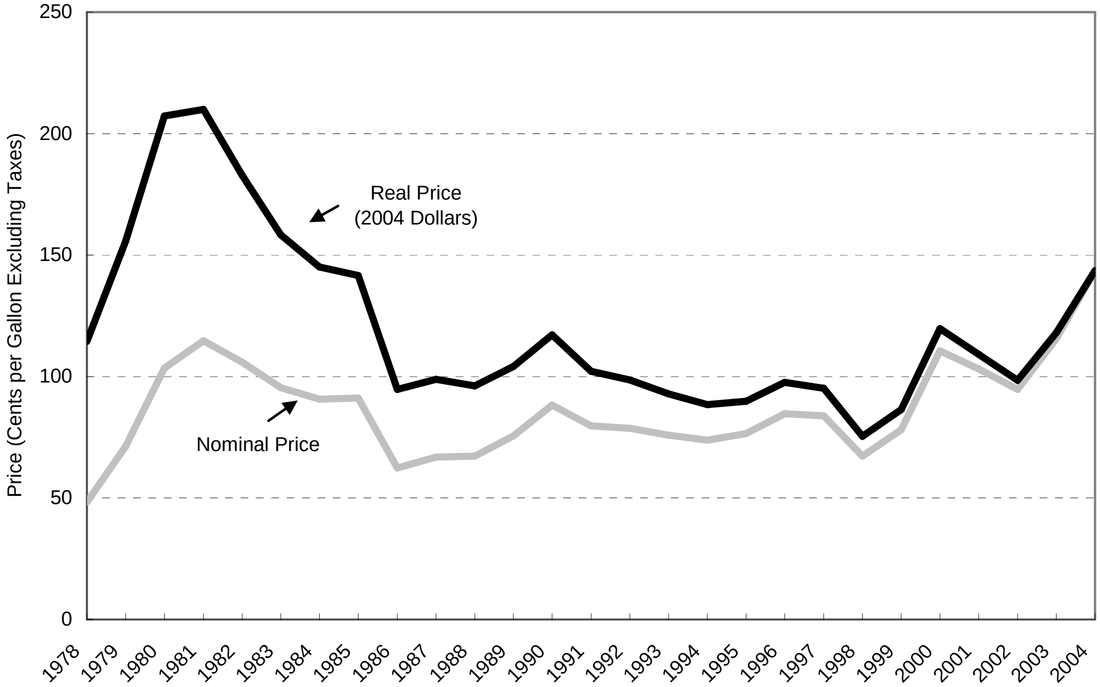
- *For Most of the Past 20 Years, Real Annual Average Retail Gasoline Prices in the U.S., Including Taxes, Have Been Lower than at Any Time Since 1919.*

This analysis examines real annual average retail gasoline prices in the U.S., including taxes, from 1919 to 2004. The data show that, from 1986 through 2003, using 2004 dollars, real national annual average retail prices for gasoline, including taxes, generally have been below $2.00 per gallon. By contrast, between 1919 and 1985, real national annual average retail gasoline prices were above $2.00 per gallon more often than not.

Data from 1978 forward allow us to exclude taxes from the analysis. Prices that exclude taxes give a better sense of market dynamics, because gasoline taxes vary from state to state, are not set by market forces, and represent a large proportion of the annual average U.S. retail price for a gallon of gasoline. For example, from 1991 through 2004, taxes contributed on average 30.3 percent of the U.S. annual average retail price of gasoline.

If taxes are excluded, the data show that real annual average retail gasoline prices in the U.S. did not rise above $1.20 per gallon between 1986 and 2003, and generally ranged between $0.80 and $1.05 per gallon. *See* Figure 3-2. In 2004, however, those prices rose sharply to $1.44. This is the highest real national annual average retail price per gallon since 1984, but it remains well below the 1981 high of $2.10 per gallon.

Figure 3-2: U.S. Annual Average Nominal and Real Gasoline Prices, Excluding Taxes (1978-2004)



Source: EIA, BEA

Average U.S. retail prices, including taxes,[6] have been increasing since 2003, from an average of $1.56 in 2003 to an average of $2.04 in the first five months of 2005, but it is difficult to predict whether these increases represent the beginning of a longer term trend.

- *To Meet Increased U.S. Demand for Gasoline, U.S. Refiners Have Taken Advantage of Economies of Scale and Adopted More Efficient Technologies and Business Strategies.*

U.S. refinery production meets more than 90 percent of U.S. demand for gasoline, on average. Between 1985 and 2004, U.S. refineries increased their total capacity to refine crude oil into various refined petroleum products by 7.8 percent, moving from 15.7 million barrels per day in 1985 to 16.9 million barrels per day as of May 2004. This increase – approximately one million barrels per day – is roughly equivalent to adding 10 average-sized refineries to industry supply. This increase occurred even though U.S. refiners did not build any new refineries during this time and, as refineries were closed, the number of overall refineries declined. Rather, they added this capacity through the expansion of existing refineries, enabling them to take advantage of economies of scale. All else equal, scale economies make larger refineries more efficient than small refineries. U.S. refiners also have adopted processing methods that broaden the range of crude oil that they can process and allow them to produce more refined product for each barrel of crude they process. In addition, they have lowered inventory holdings, thereby lowering inventory costs. Lower inventory holdings may, however, make an area more susceptible to short-term price spikes when there is a disruption in supply.

- *Increased Environmental Requirements Since 1992 Likely Have Raised the Retail Price of a Gallon of Gasoline by a Few Cents in Some Areas.*

Even though many U.S. refineries have become more efficient and have adopted processing methods that allow them to produce more refined product for each barrel of crude they process, some regulations likely have raised retail gasoline prices in some areas. For example, gasoline use is a major factor in air pollution in the United States. Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) requires various gasoline blends for particular geographic areas that have not met certain air quality standards. The air quality in the U.S. has improved due to the Clean Air Act. As with any regulatory program, however, costs come with the benefits. Environmental laws and regulations have required substantial and expensive refinery upgrades, particularly over the past 15 years. It costs more to produce cleaner gasoline than to produce conventional gasoline. Estimates of the increased costs of environmentally mandated gasoline range from $0.03 to $0.11 per gallon and affect some areas of the country more than others.

- *Profits Play Necessary and Important Roles in a Well-Functioning Market Economy. Recent Oil Company Profits Are High but Have Varied Widely over Time, over Industry Segments, and Among Firms.*

Profits compensate owners of capital for the use of the funds they have invested in a firm. Profits also compensate firms for taking risks, such as the risks in the oil industry that war or terrorism may destroy crude production assets or that new environmental requirements may require substantial new refinery capital investments. EIA's Financial Reporting System (FRS) tracks the financial performance of the 28 major energy producers currently operating in the U.S. In 2003, these firms had a return on capital employed of 12.8 percent as compared to the return on capital employed for the overall S&P Industrials, which was 10.0 percent. Between 1973 and 2003, the annual average return on equity for FRS companies was 12.6 percent, while it was 13.1 percent for the S&P Industrials.

The rates of return on equity for FRS companies have varied widely over the years, ranging from 1.1 percent to 21.1 percent between 1974 and 2003. Returns on equity vary across firms as well. Crude oil exploration and production operations typically generate much higher returns than refining and marketing. In essence, companies with exploration and production operations now find themselves in a position analogous to that of a homeowner who bought a house in a popular area just before increased demand for housing caused real estate prices to escalate. Like the homeowner, crude oil producers can charge higher prices due to increased demand. If high prices and high profits are expected to continue, they may draw greater investments over time into the oil industry, in particular to crude exploration and production. Over the long run, such investments may elicit more crude supply, which could reduce high prices.

IV. REGIONAL DIFFERENCES IN ACCESS TO GASOLINE SUPPLIES AND ENVIRONMENTAL REQUIREMENTS FOR GASOLINE AFFECT AVERAGE REGIONAL PRICES AND THE VARIABILITY OF REGIONAL PRICES.

Different regions of the country differ in their access to gasoline supplies. Some regions have large local refining capacity or ready access to multiple sources of more distant refining supply through pipeline, barge, or tanker. Other regions have more limited supply options. These differences can affect gasoline prices.

Differences in requirements for environmentally mandated fuel also can affect gasoline prices. The EPA requires particular gasoline blends for certain geographic areas, but it sometimes allows variations on those blends. Differing fuel specifications in different areas can limit the ability of gasoline wholesalers to find adequate substitutes in the event of a supply shortage.

- *Different Regions Have Different Access to Gasoline Supplies.*

  The **Gulf Coast** has plentiful access to gasoline from its own refineries, which produce far more gasoline than the Gulf Coast consumes. As a result, the Gulf Coast supplies a large proportion of the gasoline sold in the U.S. Most of the gasoline supplies are transported through a large system of refined product pipelines that connects the Gulf Coast with all other regions – except portions of the West Coast.

  The **East Coast** produces some gasoline, but also relies heavily on deliveries from the Gulf Coast and, to a lesser extent, imports from Canada, the Caribbean, Europe, and South America. Large parts of the East Coast are within easy reach of gasoline supplies; however, New England and some areas of the southeast, such as Florida, lack refineries or pipeline connections and therefore depend heavily on water shipments.

  The **Midwest** relies primarily on its own refineries and on gasoline supplies from the Gulf Coast. Pipeline capacity for gasoline deliveries from the Gulf Coast to the Midwest has increased in recent years.

  The **Rocky Mountain** states rely largely on their own refineries, which produce about the same amount of gasoline as consumed there. This region has limited refined product pipeline connections to surrounding areas and therefore remains vulnerable to supply shortages resulting from unanticipated refinery outages.

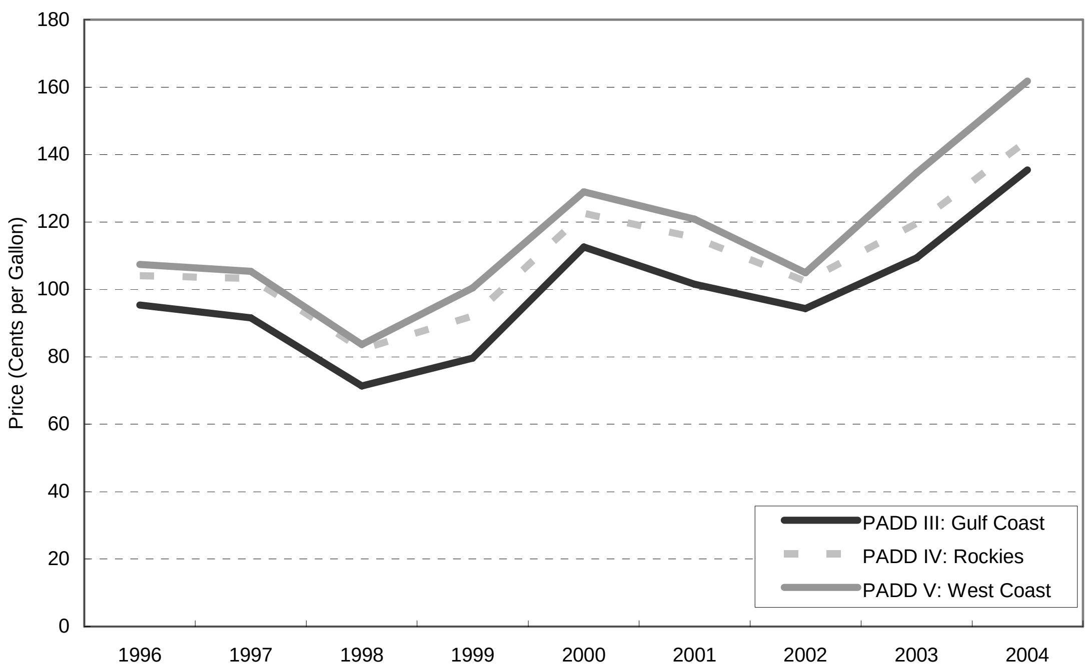
  The **West Coast** relies primarily on its own refineries and water shipments and has very limited pipeline connections to obtain supply from other regions. California is particularly isolated from other regions, in part because it lacks pipeline connections and in part because the state requires the use of unique, environmentally mandated fuel.

- *Since 1992, Annual Average Real Retail Gasoline Prices, Excluding Taxes, Have Risen up to $0.14 Higher in the Rocky Mountain States, and up to $0.25 Higher on the West Coast, than in the Gulf Coast, the East Coast, and the Midwest Regions, Where Prices Tend to Be Within a Few Cents of Each Other*.

The timing of the price changes – *see* Figure 4-11 – suggests they may bear some relationship to the introduction of Phase I (1992) and Phase II (1996) of the stringent and specialized CARB requirements for gasoline sold in California. CARB has required cleaner and more expensive gasoline than in other states, so increased gasoline prices on the West Coast may reflect increased production costs, to some extent. In addition, only a limited number of refineries outside California produce CARB gasoline, which limits substitute gasoline supplies, and thus raises costs in the event of a supply shortage.

The same trend toward higher prices appears in the Rocky Mountain states, however, where environmental requirements are less restrictive, and therefore suggests other possible sources of higher prices. The Rocky Mountain states' limited access to pipeline connections to alternate sources of gasoline contrast with the extensive pipeline connections of the Midwest and East Coast and therefore may contribute to these price differences.

Figure 4-11: Annual Average Real (2004 Dollars) Gasoline Prices, without taxes, PADDs III, IV, and V (1996-2004)



Source: EIA, BEA

Boutique fuels and differential access to gasoline supplies also can contribute to the variability of gasoline prices — that is, the fluctuation of gasoline prices — in particular circumstances.

To address concerns about the variability in gasoline prices, FTC staff analyzed the impact of boutique fuel requirements, access to pipelines, substitutable gasoline supplies and local refinery capacity on gasoline price variability. The FTC staff economic analysis reports the following results:

- **Gulf Coast boutique fuel gasoline prices are not more variable than conventional gasoline prices on the Gulf Coast.** Thus, boutique fuel requirements do not, in and of themselves, cause greater price variability.

- **CARB gasoline prices in California are significantly more variable than conventional gasoline prices on the Gulf Coast.** Boutique fuels may exacerbate price variability in areas, such as California, that are not interconnected with large refining centers in other areas. Among other things, California's inability to substitute gasoline from other refinery regions in the U.S. or to obtain gasoline imports without significant delay makes it vulnerable to the types of unforeseen circumstances, such as pipeline or refinery outages, that can cause price variability.

- **Gasoline prices in the East Coast, the Midwest, and the Rocky Mountain states are significantly more variable than Gulf Coast gasoline prices.** The importance of excess local refining capacity in reducing local gasoline price variability appears in the significantly lower gasoline price variability in the Gulf Coast. The Gulf Coast has a large refining base that produces much more gasoline than is used locally, in contrast to the East Coast, the Midwest, and the Rocky Mountain states.

- **Pipeline access to gasoline supplies can significantly reduce price variability, particularly when adjacent areas along the pipeline are using the same type of fuel.** To have adjacent areas using the same type of fuel may reduce the time it takes to reallocate supplies in case of a supply disruption.

V. STATE AND LOCAL FACTORS, AS WELL AS THE EXTENT OF VERTICAL INTEGRATION AMONG FIRMS, CAN AFFECT RETAIL GASOLINE PRICES.

- *Other Things Being Equal, Retail Gasoline Prices Are Likely to Be Lower When Consumers Can Choose, and Switch Purchases, among a Greater Number of Gas Stations.*

A small number of empirical studies have examined gasoline station density in relation to prices. One study found that stations in southern California that imposed a 1 percent price increase lost different amounts of sales, depending on how many competitors were close to it. Those with a large number of nearby competitors (27 or more within 2 miles) lost 4.4 percent of sales in response to a 1 percent price increase; those with a small number of nearby competitors (fewer than 19 within 2 miles) lost only 1.5 percent of sales. All else equal, stations that face greater lost sales from raising prices will likely have lower retail prices than stations that lose fewer sales from raising prices.

- *The Density of Gas Stations in a Particular Area Will Depend on Cost Conditions.*

The size and density of a market will influence how many stations can operate and cover their fixed costs. Fixed costs will depend on the cost of land and building a station. Zoning regulations may limit the number of stations in an area below what market conditions would indicate the area could profitably sustain. Studies suggest that entry by new gasoline competitors tends to be more difficult in areas with high land prices and strict zoning regulations.

- *Over the Past Three Decades, the Format of Retail Gas Stations Has Changed to Include Convenience Stores and to Increase Sales Volumes per Station. Examples Suggest That the Largest-volume Stations, So-Called "Hypermarkets," Lower Local Retail Gasoline Prices.*

Differences in local retail prices may result from differences in the types of retailers selling gasoline in particular areas. The number of traditional gasoline-pump-and-repair-bay outlets has dwindled for a number of years as brand-name gasoline retailers have moved toward a convenience store format. Independent gasoline/convenience stores – such as RaceTrac, Sheetz, QuikTrip, and Wawa – typically feature large convenience stores with multiple fuel islands and multi-product dispensers. They are sometimes called "pumpers" because of their large-volume fuel sales. By 1999, the latest year for which data are available, brand-name and independent convenience store and pumper stations accounted for almost 67 percent of the volume of U.S. retail gasoline sales.

In addition, hypermarkets are large retailers of general merchandise and grocery items, such as Wal-Mart and Safeway, that have begun to sell gasoline. Hypermarket sites typically sell even larger – sometimes, 4 to 8 times larger – volumes of gasoline than pumper stations. Hypermarkets' substantial economies of scale generally enable them to sell significantly greater volumes of gasoline at lower prices.

- *State and Local Taxes Can Be Significant Factors in the Retail Price of Gasoline.*

Higher gasoline taxes drive up the final price of gasoline. In 2004, the average state sales tax was $0.225 per gallon, with the highest state tax at $0.334 per gallon (New York). In some states, local governments also impose gasoline taxes.

- *Bans on Self-Service Sales Appear to Raise Gasoline Prices.*

New Jersey and Oregon ban self-service sales, thus requiring consumers to buy gasoline bundled with services that may increase costs – that is, having staff available to pump the gasoline. Some experts have estimated that self-service bans alone cost consumers between $0.02 to $0.05 per gallon.

- *Bans on Below-Cost Sales Appear to Raise Gasoline Prices.*

About 11 states have a type of below-cost sales or minimum mark-up laws, which typically either prohibit a gas station from making sales below a certain defined cost or require a gas station to charge a minimum amount above its wholesale gasoline cost. These laws are likely to harm consumers by depriving them of the lower prices that more efficient (*e.g.*, high volume) gas stations can charge.

- *Differences in Vertical Relationships Influence How Gasoline Arrives and Is Sold at Retail Stations. The Relative Importance of Different Distribution Systems Varies from Region to Region Across the Country, with the West Coast Showing a Relatively High Degree of Integration Between Refining and Marketing as Compared to Other Regions.*

The degree to which one company will perform all or only some of the steps involved in refining and marketing gasoline varies among companies. A refiner that is integrated with its own distribution system may set up a *direct* distribution system under which it supplies gasoline to (1) retail sites that it owns and operates, also known as "company-owned-and-operated stations;" (2) retail outlets that are owned by the refiner, but operated by independent lessee-dealers; and (3) retail outlets that are owned and operated by independent "open" dealers that sell company-branded product. An integrated refiner's wholesale price for company-owned-and-operated stations is a non-public, internal transfer price. When an integrated refiner supplies retail outlets owned by the refiner but operated by independent lessee-dealers, or owned and operated by independent "open" dealers, it charges the "dealer tank wagon" (DTW) price to the dealer.

Alternatively, an integrated or independent refiner may use a *jobber* distribution system. A jobber, which may be brand-name, unbranded, or both,[7] buys gasoline at the terminal rack and then delivers the gasoline to (1) stations that it owns and operates; (2) stations that it owns but leases to third parties; and (3) stations that are independently owned and operated.[8] Jobbers pay a "wholesale rack price" for their gasoline purchases, although other contractual terms may also affect the net price. Jobbers may switch brands if alternatives are available.

Compared to the nation as a whole, the Midwest, the Gulf Coast, and the Rocky Mountain states distribute more wholesale gasoline at the rack through jobbers than through DTW sales or internal transfers. The East Coast also distributes the majority of its wholesale gasoline at the rack through jobbers, although DTW sales have more importance in the New

England and mid-Atlantic states. By contrast, on the West Coast, the percentage of DTW distribution is significantly higher than rack sales. The relatively high degree of integration between refining and marketing on the West Coast dates back to at least 1994, predating the wave of petroleum mergers affecting the West Coast that began in 1997.

- *Most Empirical Studies Indicate That Vertical Integration Between Refining and Marketing Can Save Costs and Lower Gasoline Prices. However, Two Studies Suggest That Instances of Vertical Integration Between Refining and Marketing in California Were Associated with Higher Wholesale or Retail Gasoline Prices.*

A 2003 report concluded that the available empirical evidence generally supports the proposition that retail prices at vertically integrated gas stations can be from $0.015 to $0.05 per gallon lower than at leased or independent stations, all else equal. Two studies assessed in the 2003 report found that divorcement statutes – which prohibit refiners from maintaining or acquiring retail gas stations – tend to lead to higher, rather than lower, average retail gasoline prices. Two other studies assessed in the 2003 report examining the West Coast, however, found higher wholesale gasoline prices appear to have resulted from increased vertical integration between refining and marketing.

- *Since 1990, the Degree of Vertical Integration Between Different Levels in the U.S. Gasoline Industry Has Lessened.*

The extent of common ownership of different stages of exploration and production, refining, distribution, and marketing is generally termed the “degree of vertical integration.” Recent moves toward less vertical integration in the oil industry – especially between exploration/production and refining – suggest some decrease in the benefits of vertical integration between upstream and downstream levels. The increased ability of U.S. refiners to switch economically among different types of crude oil, and the maturation of spot and futures markets, are among the factors that may explain why incentives for integration between upstream and downstream levels appear to have diminished over time.

- *Refiner Marketing Practices Such as Zone Pricing and Territorial Restrictions Can Have Pro- and Anti-competitive Effects. The Commission Will Remain Watchful of these Practices.*

Through zone pricing, a brand-name refiner may charge different prices to lessee dealer stations located in different geographic zones. A brand-name refiner also may impose territorial restrictions on jobbers – that is, independent jobbers may supply brand-name gasoline to their own gas stations or open dealers in some areas, but not in others.

Endnotes

1. BUREAU OF ECON., FED. TRADE COMM'N, THE PETROLEUM INDUSTRY: MERGERS, STRUCTURAL CHANGE, AND ANTITRUST ENFORCEMENT 1 n.1 (2004) [hereinafter PETROLEUM MERGER REPORT], *available at* http://www.ftc.gov/os/2004/08/040813mergersinpetrolberpt.pdf. A simple regression of the monthly average national price of gasoline on the monthly average price of West Texas Intermediate (WTI) crude oil explains approximately 85 percent of the variation in the price of gasoline. This percentage may vary across states or regions. Data for the period January 1984 to October 2003 were used for this regression. This is similar to the range of effects given in ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, DOE/EIA-0626, PRICE CHANGES IN THE GASOLINE MARKET: ARE MIDWESTERN GASOLINE PRICES DOWNWARD STICKY? (1999), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/0626.pdf. More complex regression analysis and more disaggregated data may give somewhat different estimates, but they are likely to be of the same general magnitude.

2. On June 22, 2005, CNOOC Ltd., China's third-largest oil company, made an unsolicited $18.5 billion cash bid for Unocal in an effort to break up its pending $16.5 billion acquisition by Chevron.

3. The 10 percent increase in price leading to a 2 percent decrease in quantity demanded are based on historical data looking at small price changes compared to the 150 percent price increase in this example. The actual demand response may be different for such a large change.

4. WTI is a light crude oil that is often used as a benchmark for price and quality.

5. OPEC is an international organization of countries with control over a large proportion of the crude supply. Currently, OPEC members include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. *See* OPEC, *Who are OPEC Member Countries?*, *at* http://www.opec.org/library/FAQs/aboutOPEC/q3.htm (June 28, 2005).

6. Data excluding taxes for 2005 were not available at the time this report was written.

7. Branded jobbers purchase gasoline at the rack from branded wholesale gasoline marketers. In turn, these jobbers sell the gasoline to stations that are licensed to sell under the brand. Unbranded jobbers purchase unbranded gasoline at the terminal rack for delivery to retailers.

8. For a more complete description of direct and jobber distribution systems, *see* PETROLEUM MERGER REPORT, *supra* note 1, at 226-31.

Table of Contents

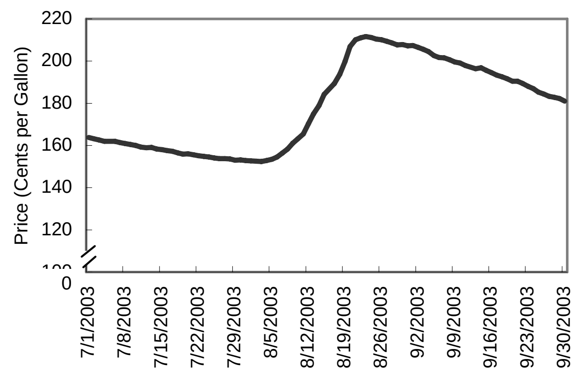
CHAPTER 1. SUPPLY (INFLUENCED BY OPEC),[1] DEMAND, AND COMPETITION DETERMINE GASOLINE PRICES.

Many factors can influence the prices that consumers pay for gasoline at the pump every day. We begin with a case example: a pipeline rupture that significantly reduced gasoline supplies in Phoenix, Arizona in August 2003. The subsequent gasoline shortage led to sharply increased gasoline prices, which then fell gradually over the next six weeks. This event illustrates several of the competitive dynamics at work in gasoline markets.

I. PHOENIX: A STORY OF SUPPLY, DEMAND, AND COMPETITION.

At the beginning of August 2003, the average price of regular gasoline in Phoenix was $1.52 per gallon. By the third week of August, however, it had risen to a peak of $2.11 per gallon.[2] Over the next few weeks, the price then dropped $0.31 per gallon, falling back to $1.80 by the end of September.[3] Through its Gasoline Price Monitoring project, the FTC staff observed this price increase and examined its causes.

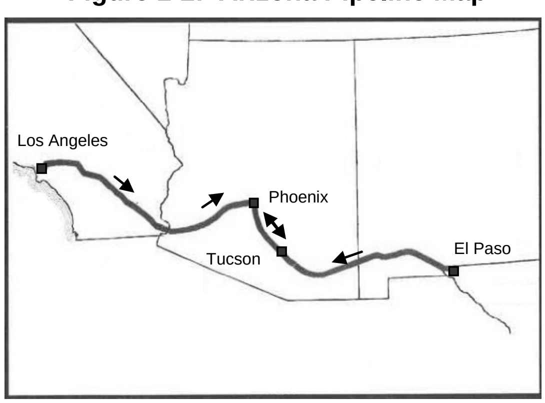
Figure 1-1: Phoenix Retail Gasoline Prices, Regular Unleaded (Daily OPIS; includes taxes)



Source: OPIS

A. Phoenix and Other Parts of Arizona Rely on Pipeline Deliveries for Gasoline.

Figure 1-2: Arizona Pipeline Map



Arizona has no refineries of its own; it obtains gasoline primarily through two pipelines. One pipeline starts in Los Angeles and supplies gasoline from West Coast refineries to the majority of Phoenix's gasoline terminals. The other pipeline starts in El Paso and supplies gasoline from refineries in Texas and New Mexico. Upon entering Arizona, that pipeline travels first to terminals in Tucson, and then to terminals in Phoenix; it delivers the remainder of Phoenix's gasoline.[4]

On July 30, 2003, the Tucson-to-Phoenix section of the pipeline from El Paso ruptured. Temporary repairs initially failed, closing the Tucson-to-Phoenix section of the line from August 8 until August 23, when partial service resumed. The outage reduced the volume of gasoline delivered to Phoenix by 30 percent.[5]

B. In the Short Run, Consumers Typically Do Not Reduce Their Gasoline Purchases Substantially in Response to Increased Gasoline Prices.

Phoenix consumers did not respond to significantly increased gasoline prices with substantial reductions in how much gasoline they purchased. The reasons are relatively straightforward. In theory, Phoenix consumers could have reduced their gasoline purchases by 30 percent, and that would have prevented a gasoline price hike. Without price increases, however, consumers do not have incentives to change how much gasoline they buy. Moreover, even with price increases, most consumers will not reduce their gasoline consumption by substantial amounts in a short time. Relatively small reductions in gasoline consumption are possible if, for example, consumers consolidate or skip some trips. Most consumers, however, cannot respond to short-term supply disruptions such as a pipeline break by making the types of major changes – the car they drive, where they live, or where they work – that could substantially reduce the amount of gasoline they consume.

Obviously, at some point, gasoline prices can become high enough that consumers will make substantial reductions in their gasoline purchases. *How much* prices need to increase before consumers significantly reduce their demand depends on how easily consumers can adopt substitutes for gasoline – such as taking public transportation or walking. Empirical studies suggest that, in general, consumers do not easily adopt substitutes for gasoline. Such studies generally show that prices must increase significantly to cause even a relatively small decrease in the quantity of gasoline demanded by consumers. Indeed, the studies generally suggest that, in the short run, it requires a gasoline price increase of 10 percent to reduce the quantity demanded by just 2 percent.[6]

Applying this general finding to the situation in Phoenix suggests that prices would have had to increase by a large amount to reduce the quantity of consumers' purchases by 30 percent, the amount of lost supply. Extrapolating from the general finding, prices would have to increase by 150 percent.[7] Phoenix prices did increase substantially – by 40 percent – but not as much as would have been necessary to reduce the quantity demanded by 30 percent. Why did prices not go even higher than a 40 percent increase? As the next section explains, Phoenix gas stations succeeded in purchasing some gasoline from West Coast refiners to replace at least some of the gasoline that the pipeline could not deliver. This new supply of gasoline held prices down to some extent.

C. Phoenix Gas Stations Obtained Gasoline To Make Up for Some of the Lost Supply.

Phoenix gas stations[8] replaced some of the lost supply by purchasing gasoline from West Coast refineries. This was a logical choice. The pipeline from Texas is usually filled to capacity, so gasoline from West Coast refineries – supplied through the Los Angeles-to-Phoenix pipeline – is generally Phoenix's *marginal supply*.[9] *See* Box 1-1.

To obtain the additional supply they needed, Phoenix gas stations had to offer to pay higher prices to West Coast refineries than West Coast gas stations had been paying them. West Coast refineries responded to the higher offers by selling more of their supplies to the Phoenix market than they had previously. Supplies of gasoline through the Los Angeles-Phoenix pipeline increased by more than 20 percent until the Tucson-Phoenix pipeline was repaired.[10]

Box 1-1: Marginal Supply

Marginal supply is the swing supply that enters the market at current prices, but would exit the market if prices fell at all.

How does this work? Suppose that the price of gasoline in City A is $2.00, the price of gasoline in City B is $1.90, and it costs $.10 to ship from City B to City A. At that point, City B is the marginal source of supply for City A. Why? A supplier located in City B does not care whether the gasoline is sold in City B at $1.90, or in City A at $2.00-.10 shipping cost = $1.90. But if the price in City A fell from $2.00 to $1.95, then the supplier would no longer sell in City A ($1.95 - .10 shipping costs = $1.85); it would prefer to sell its supplies in City B at $1.90.

How frequently do marginal suppliers change? In the petroleum industry, these types of supply decisions occur throughout the country every day. As supply and demand conditions change, the marginal supplier to an area may change.

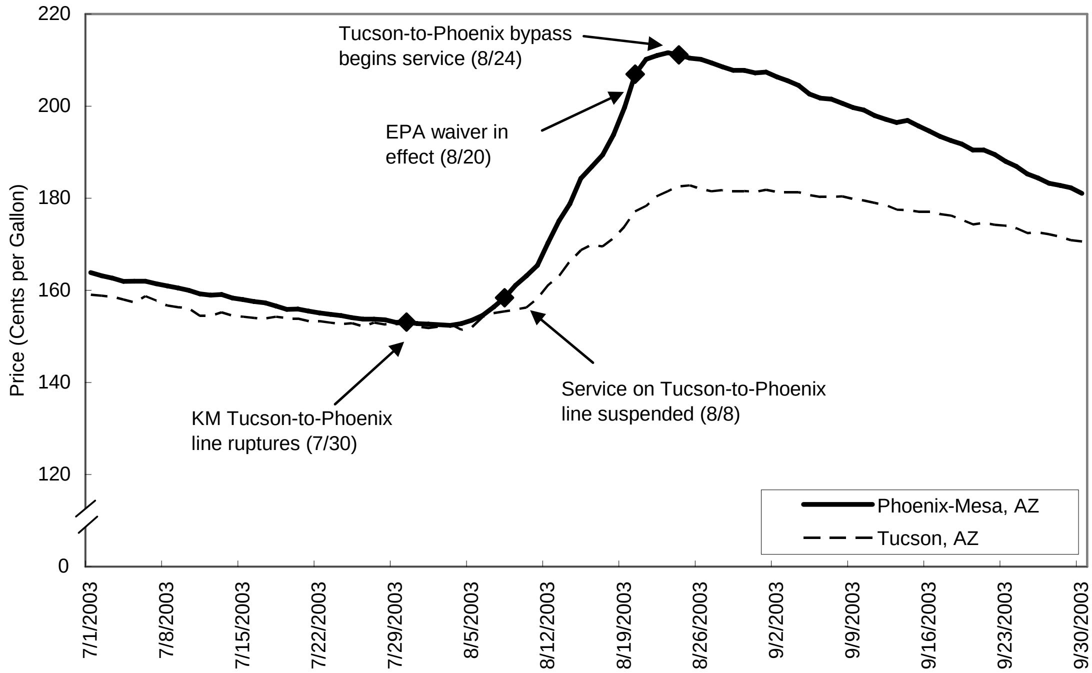
D. Complicating Factors.

Changes in gasoline prices, however, almost always reflect the interaction of multiple factors. Several other factors also contributed to quickly rising prices in Phoenix.

Prior Refinery Interruptions Had Reduced Gasoline Inventories that Otherwise Could Have Provided More Substitute Supplies. West Coast refineries did not have as much supply on hand to sell to Phoenix as they might usually have had. Shortly before the Tucson-Phoenix pipeline ruptured, some unplanned refinery interruptions in California and an unplanned refinery shutdown in Washington state had reduced gasoline supply and forced West Coast refiners to draw down their inventories of gasoline. As West Coast refineries recovered from these supply interruptions, gasoline production increased. Rising consumer demand at the end of the summer driving season, however, prevented refineries from using that increased production to build up inventories again. Thus, the gasoline inventories of West Coast refiners could not provide as much additional supply to Phoenix gas stations as might otherwise have been the case. This made price competition for the remaining supply of gasoline even fiercer.

Environmental Requirements for Phoenix Gasoline Prevented the Substitution of Conventional Gasoline. Pursuant to federal environmental regulation, as mandated by the Clean Air Act and other statutes, Phoenix uses a special blend of gasoline. Consequently, it would be illegal simply to substitute conventional gasoline from terminals in other parts of Arizona. Although gasoline obtained from the West Coast via pipeline met the environmental restrictions, as did some of the gasoline stored at the Tucson terminal and trucked into Phoenix, the special blend requirements mandated by law substantially limited the substitutability of gasoline for Phoenix. On August 19, after gasoline prices spiked, officials from the state of Arizona requested a waiver from the Environmental Protection Agency (EPA) to sell conventional gasoline in Phoenix. The EPA granted the waiver, which became effective on August 20.[11] This waiver allowed Phoenix gas stations to substitute conventional gasoline from any terminal from which it could be trucked economically to Phoenix. This resulted in heightened competition between Tucson and Phoenix retailers for the same scarce resource – conventional gasoline from other Arizona terminals – and led to increased pump prices in Tucson similar to those felt in Phoenix. *See* Figure 1-3.

Figure 1-3: Phoenix & Tucson Retail Gasoline Prices
Regular Unleaded (Daily OPIS; includes taxes)



Source: OPIS

Trucking from, and Truck Congestion in, Tucson Slowed – and Raised the Cost of – Substitute Supplies from Tucson. When the pipeline from Tucson to Phoenix ruptured, gasoline had to be held at terminals in Tucson and then trucked to Phoenix. Truck transportation for gasoline typically costs significantly more than pipeline transportation. Additionally, because of the increased number of trucks pressed into service, shippers reported waiting for seven or more hours to fill tankers at the Tucson terminal. This added both costs and substantial delays in gasoline supply reaching Phoenix,[12] which contributed to higher gasoline prices in Phoenix.

E. Resolution of the Pipeline Problem.

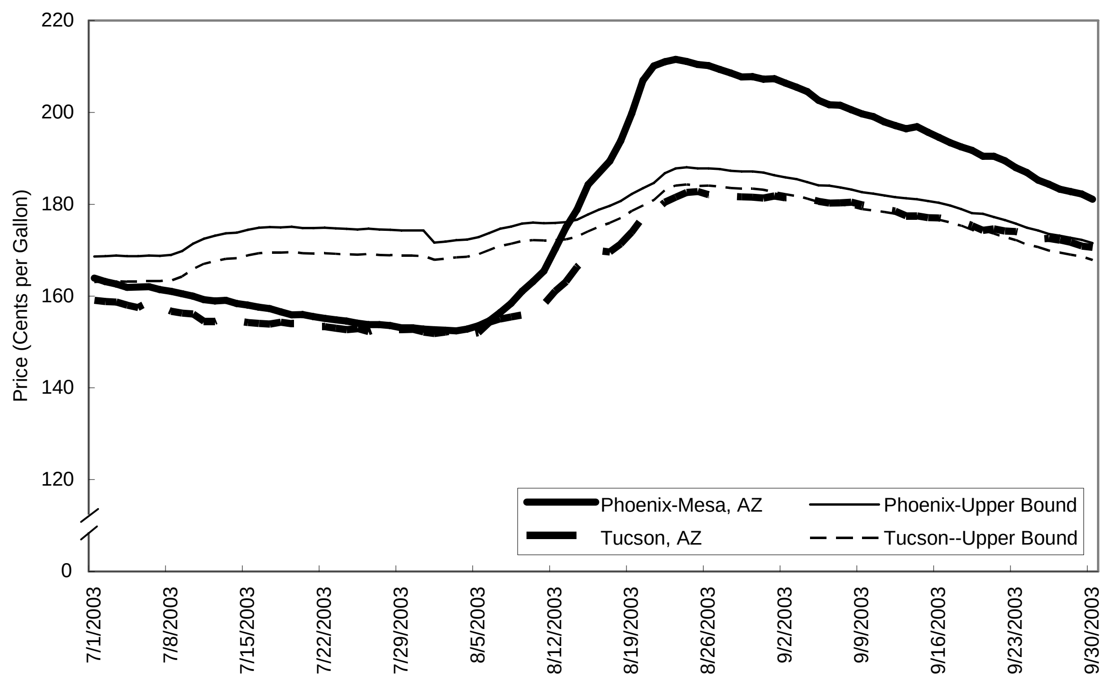
On August 24, the owner of the ruptured pipeline, Kinder Morgan, restarted gasoline flow on the Tucson-to-Phoenix pipeline, but at a reduced capacity. Kinder Morgan built a bypass of the ruptured section and restored 35,000 barrels per day (bpd) of the 54,000 bpd formerly shipped on the Tucson-to-Phoenix pipeline.[13] Even with the bypass fix, 19,000 bpd that refineries in Texas and New Mexico formerly supplied to Phoenix had to be obtained instead from either West Coast refineries through a pipeline or other terminals by truck – both at higher cost.[14]

F. Effects on Gasoline Prices in Phoenix, Tucson, and Other Parts of Arizona, and on the West Coast.

The Commission's Gasoline Price Monitoring project captured the impact of these events on gasoline prices in Phoenix, Tucson, and other parts of Arizona, as well as California, Washington, and Oregon.

Prices in Phoenix. As shown in Figure 1-4, soon after the shutdown of the pipeline, retail gasoline prices in Phoenix were above the predicted range based on historical relationships. The apex of the price spike was relatively short-lived: retail gasoline prices in Phoenix declined by about $0.31 per gallon between the last week of August and the end of September.[15]

Figure 1-4: Phoenix and Tucson Retail Gasoline Actual Price and Upper Bound of Predicted Price Range, Regular Unleaded (Daily OPIS; Includes taxes)



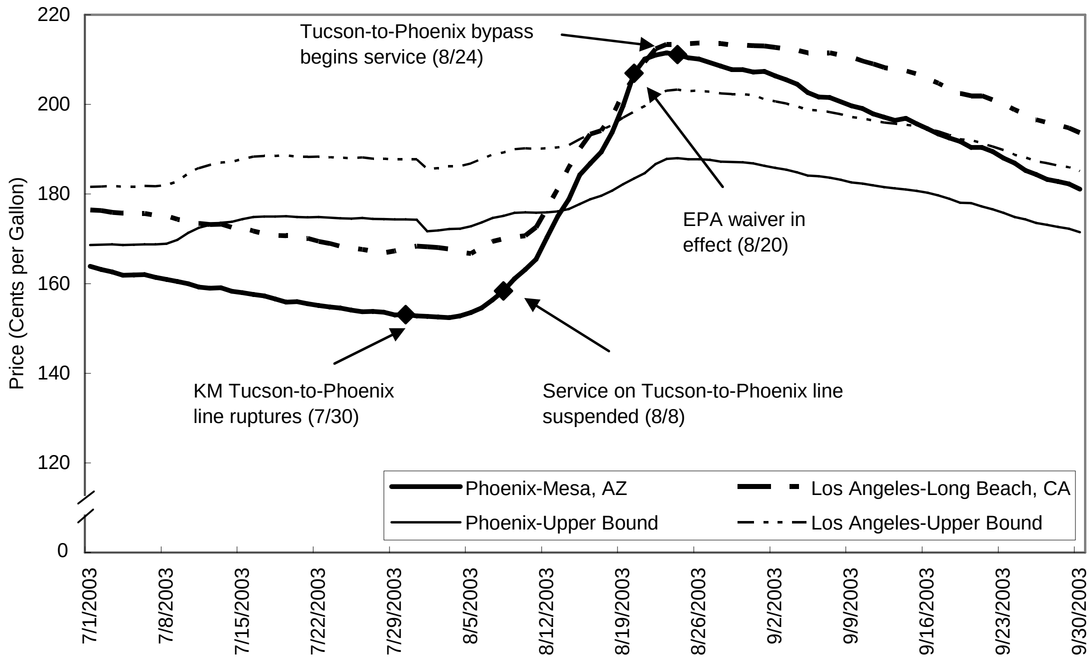
Source: OPIS

Nonetheless, prices remained significantly higher than July's price levels. At least two factors worked to keep prices from falling back to pre-pipeline-rupture levels. First, Phoenix continued to have a greater than normal dependence on more expensive gasoline from the West Coast, because the temporary bypass on the Tucson-to-Phoenix line had less capacity than the regular pipeline. Second, the end-of-summer demand for gasoline in 2003 was higher than predicted, which lowered inventories throughout the United States after the end of August and led to higher gasoline prices nationwide.[16] As a result, the predicted prices for Phoenix after the pipeline break were higher than those predicted before the pipeline break. With lower supply availability than just before the pipeline first broke, and increased national demand, gasoline prices in Phoenix would not be expected to return to their pre-pipeline-break levels.

Ripple Effects: Tucson Gasoline Prices. The pipeline break also disrupted gasoline supplies in Tucson, even though the break was on a pipeline from Tucson to Phoenix. The pipeline rupture caused the Tucson terminal to experience a major shortage of gasoline storage capacity. The special-grade "Phoenix-mix" gasoline that normally would have been shipped to Phoenix had to be stored at the Tucson terminal, thereby reducing available storage capacity. This reduction in storage capacity led to the temporary shutdown of the pipeline into Tucson, also reducing the supply of gasoline for Tucson. Both events helped force prices upward in Tucson,[17] as did the EPA waiver that allowed Phoenix gas stations to use – and to compete with Tucson gas stations for – conventional gasoline.

Ripple Effects: West Coast Gasoline Prices. The interrelationship between gasoline prices in Phoenix and on the West Coast is apparent in Figure 1-5. As reflected in this figure, Phoenix and Los Angeles prices follow the same general trends. For example, Los Angeles gasoline prices rose following the pipeline break, although they rose less than did prices in Phoenix. This effect is not surprising – as Phoenix gas stations offered higher prices to win gasoline from West Coast suppliers, West Coast gas stations also had to offer higher prices to keep supply in California. Thus, gasoline prices in other parts of California rose as Arizona gas stations competed to obtain additional gasoline supplies for Phoenix. Even Oregon and Washington gasoline prices were affected by the Phoenix shortage. Washington refineries traditionally supply gasoline to both Oregon and California markets, as well as to Washington markets. The higher prices in California that were necessary to compete with higher Phoenix prices also caused some Washington refiners to sell more supply than usual in California. This diverted supply from Oregon and Washington markets and resulted in higher prices in those states. The additional demand from Phoenix, combined with the already tight California gasoline market, put pressure on gasoline prices all along the West Coast, forcing those prices higher than they otherwise would have been.

Figure 1-5: Phoenix and Los Angeles Retail Gasoline Actual Price and Upper Bound of Predicted Price Range, Regular Unleaded (Daily OPIS; Includes taxes)



Source: OPIS

II. LESSONS FROM THIS STORY: PRICES SIGNAL PRODUCERS TO ADJUST SUPPLY, AND CONSUMERS TO ADJUST DEMAND, TO FIT CHANGING MARKET CONDITIONS.

This story explains how rising gasoline prices in Phoenix brought in new gasoline supplies that prevented gasoline prices from skyrocketing even higher. This is one role that prices play in markets.

In general, the price of a commodity, such as gasoline, reflects producers' costs and consumers' willingness to pay. The price signals the relative value of that commodity compared to other goods and services. How much a firm is willing and able to produce at a given price is determined by many things, including how much it must pay for the labor it hires, the land and resources it uses, the capital it employs, the material inputs it must purchase, the transportation it must use, and the risks associated with its investment. Consumers' overall willingness to pay for a product also is determined by a large variety of factors, such as the existence and prices of substitutes, income, and individual needs and tastes.

Price changes generally reflect changes in producer costs or consumer demand. Simply put, prices rise if it costs more to produce and supply a good, or if people desire to buy more of that good at the current price. Prices fall if it costs less to produce and supply a good, or if people desire to buy less of that good at the current price. When changes in producer costs or consumer demand occur, the question becomes how much of a price change is necessary to find the new price at which producer supply once again matches consumer demand. *See* Box 1-2. Consumer and producer responses will determine *how much* price has to increase or decrease, and *how long* it takes, to reach the new equilibrium price at which supply equals demand.

Box 1-2: Market Prices

Market prices reflect myriad individual decisions about prices at which to sell or buy. Market prices are a mechanism that equalizes the quantity demanded and the quantity supplied. Rising prices signal consumers to purchase less and producers to supply more. Falling prices signal consumers to purchase more and producers to supply less. Prices will stop rising or falling when they reach the new equilibrium price: the price at which the quantity consumers demand matches the quantity that producers supply.

A. For the Most Part, Consumers Do Not Substantially Reduce Their Demand for Gasoline in Response to Either Short- or Long-Run Price Increases. The Relative Inflexibility of Consumer Demand for Gasoline Makes Consumers More Vulnerable to Substantial Gasoline Price Increases.

Generally speaking, price changes signal to consumers that they should change their decisions about how much to consume. For example, when the summer driving season starts, and consumer demand for gasoline increases, then gasoline prices tend to increase. These price increases signal consumers generally to reduce the amount of gasoline they consume.[18] By contrast, if consumer gasoline demand falls – as it regularly does in the autumn after summer driving vacations are over – then retail gasoline prices are likely to decline. Lower prices may encourage some consumers to drive more than they would have at higher prices. Price changes thus play an important economic function by encouraging consumers and producers to respond to changing market conditions.

When consumers have many close substitutes for a particular good, a relatively small price increase will result in a relatively large reduction in how much they demand. For example, if hydrogen were a very good substitute for gasoline at comparable prices, then even a relatively small increase in the price of gasoline could persuade many consumers to buy hydrogen for their cars instead of gasoline. To induce those consumers to return to the gasoline market, gasoline prices would not need to fall by very much.

This is not what typically happens in retail gasoline markets, however. Consumers often lack adequate short-run substitutes for gasoline to power their cars.[19] Thus, prices may have to rise substantially to reduce consumer demand in order to restore the balance between the quantity supplied and the quantity demanded. As noted earlier, a substantial body of empirical literature has shown that, even if the price of gasoline increases relatively quickly and sharply – as it did in the Phoenix example – the short-run demand for gasoline does not decline much.[20] In other words, short-run demand for gasoline is very inelastic. *See* Box 1-3. This inability to substitute other products for gasoline in the short run at the retail level results in higher price increases than if consumers could easily reduce their demand when prices rise.

Box 1-3: Demand Elasticity

The desire and ability of consumers to change the amount of a product they will purchase when its price increases is known as the price elasticity of that product. The price elasticity of demand is the ratio of the percent change in the quantity demanded to the percent change in price. That is, if a 10 percent price increase results in a 5 percent decrease in the quantity demanded, the price elasticity of demand equals -0.5 (-5%/10%). Demand is defined as "inelastic" if this ratio is between 0 and -1, and "elastic" if the ratio is less than -1.

In the longer run, consumers may have more options for how to adjust to changes in producer costs or consumer demand. Nonetheless, studies indicate that consumer demand for gasoline is still relatively inelastic, even in the long run – that is, more than one year. Estimates of long-run consumer demand elasticity suggest that a 10 percent price increase will result in only a 6 percent decrease in consumption.[21]

B. Producer Supply Responses Work with Consumer Demand Responses to Result in a New Equilibrium Price.

Producer supply responses are equally important to determining a new equilibrium price. The extent of producer supply responses will depend on the cost of increasing output. In the long run, the cost of increasing output decreases, as firms have the ability to change their operations or invest in new capacity.

If expanding production costs little, then a relatively small price increase may be enough to encourage existing or new producers to ramp-up their production levels to provide additional supply to meet increased consumer demand. If additional units of output are significantly more expensive to produce than a slightly increased selling price will cover, however, existing producers will not increase their production, and new producers will not enter the industry. In that case, consumers would have to pay significantly higher prices to obtain additional supply. Additionally, if producers are already producing as much product as they can, increased demand can be met only from new capacity, and producers must be confident that prices will remain high enough for long enough to justify building a new plant.

In any case, a higher price signals a profit opportunity, drawing resources to where they are needed. As we saw in the example of Phoenix, prices rose primarily because there was not enough gasoline to supply the quantity demanded at the prices that prevailed before the pipeline broke. The pipeline break underlying the supply shortage, however, was not sufficient to induce producers to build new pipelines or storage capacity. Producers did not have reason to believe that high prices for their gasoline would continue once the pipeline was fixed.

If consumer demand decreases, prices are likely to fall, all else equal. In that circumstance, falling demand signals producers to reduce the amount of gasoline that they supply. Producers will reduce their production to meet the new, lower level of consumer demand for gasoline, and will not be inclined to consider any new capacity increases.

C. Together, Consumer and Producer Responses to Changes in Market Conditions Will Produce the New Market Equilibrium Price.

Prices need to change if current prices no longer will equate the quantity demanded to the quantity supplied. *See* Box 1-4: *What Happens If Gasoline Prices Are Not Allowed To Change*. For example, a gasoline supply disruption such as the pipeline break in Phoenix will cause prices to increase to give consumers an incentive to decrease consumption and producers an incentive to increase production. In such circumstances, short-run gasoline prices will need to swing sharply higher to provide those incentives. Consumers do not have very many good substitutes, and producers usually cannot instantly increase output or transport distant inventories to increase the quantity supplied to a market. Thus, higher prices are necessary to give consumers and producers sufficient incentives to change their behavior in the short run.

Over much longer time frames, however, both consumers and producers have more options to react to the higher prices, so that the long-run price increase will usually be much smaller than the short-run price increase. For example, following gasoline price hikes in 1979-1980, U.S. consumers decreased their consumption of gasoline by more than 800,000 bpd – from 7,412,000 bpd in 1978 to 6,539,000 bpd in 1982. *See* Figure 3-6 *infra*. Substantially reduced U.S. gasoline consumption, along with other factors, then drove gas prices down to levels significantly below the extremely high levels of 1979-80.

Box 1-4: What Happens If Gasoline Prices Are Not Allowed To Change: Rationing Is a Costly Solution.

Gasoline markets provide a good example of what happens when supply shortfalls are handled through rationing, rather than allowing prices to change to the new equilibrium price. During the oil crises of 1973-74 and 1979, some states rationed gasoline. For example, drivers with odd-numbered license plates could buy gasoline only on Monday, Wednesday, and Friday, and drivers with even-numbered license plates could buy gasoline only on the other days. This type of allocation caused long lines at gas stations all over the country. The time that consumers spent waiting in line was certainly a cost to society, as well as problematic for the individuals stuck in those lines. For a full discussion of the welfare costs of rationing, *see* H.E. Frech III & William C. Lee, *The Welfare Costs of Rationing by Queuing Across Markets: Theory and Estimates from the U.S. Gasoline Crises*, 102 Q.J. ECON. 97 (1987).

Moreover, price controls and rationing do not signal producers to bring more supply to the market to meet increased demand or to offset, at least in part, an interruption in supply. If prices are not allowed to increase in reaction to a supply reduction, producers have no incentive to provide additional supplies to alleviate the supply reduction. Shortages are therefore likely to be prolonged. *See, e.g.*, Robert T. Deacon & Jon Sonstelie, *The Welfare Costs of Rationing by Waiting*, 27 ECON. INQUIRY 179 (1989).

Endnotes

1. The Organization of Petroleum Exporting Countries (OPEC) is a cartel designed specifically to coordinate output decisions and to affect world crude oil prices. OPEC is discussed further in Chapter 2, *infra*.

2. *Market Forces, Anticompetitive Activity, and Gasoline Prices: FTC Initiatives to Protect Competitive Markets: Hearing on Status of U.S. Refining Industry Before the Subcomm. on Energy and Air Quality, House Comm. on Energy and Commerce*, 108th Cong. (July 15, 2004) (Statement of the Fed. Trade Comm'n (FTC) presented by William E. Kovacic, General Counsel), *available at* http://www.ftc.gov/os/2004/07/040715gaspricetestimony.pdf. These prices reflect the average of retail prices collected and published by the Oil Price Information Service (OPIS), a private company. Prices at some individual stations were no doubt higher than this average. For instance, information from the Department of Energy (DOE) Hotline indicates that retail prices ranged from $1.89 to over $4.00, with a handful of stations charging as much as $9.00 per gallon.

3. OPIS, *supra* note 2.

4. Giant Industries, Inc., *Company Profile: History* ("In 1999, Giant constructed a new products terminal in Flagstaff, AZ."), *at* http://www.giant.com/about-profile-history.html (2003). The gasoline terminals in Tucson and Phoenix also send truck deliveries to gas stations and other retail outlets in other cities and regions of Arizona. Other gasoline terminals serve other Arizona markets as well.

5. Manimoli Dinesh, *California Regulators Say No to Texas Pipeline*, OIL DAILY, Aug. 22, 2003.

6. This reflects a short-run inelastic consumer demand for gasoline. Hilke A. Kayser, *Gasoline Demand and Car Choice: Estimating Gasoline Demand Using Household Information*, 22 ENERGY ECON. 331 (2000). This study estimates the short-run price elasticity is -0.23. This means an increase in price of 10 percent results in only a 2.3 percent decrease in the quantity demanded in the short term.

7. The 10 percent increase in price leading to a 2 percent decrease in quantity demanded are based on historical data looking at small price changes compared to the 150 percent price increase in this example. The actual demand response may be different for such a large change.

8. For purposes of brevity, we refer here to all retail sellers of gasoline as "gas stations," although, as discussed in Chapter 5(I), *infra*, important new types of gasoline marketers, such as hypermarkets, are emerging.

9. Press Release, Kinder Morgan, Inc., Kinder Morgan Energy Partners Restarts Pipeline; Increases Gasoline Volumes to Phoenix; Bypass Strategy Successful (Aug. 24, 2003) (on file with author, *at* http://www.kindermorgan.com).

10. Calculated from data contained in Press Release, Kinder Morgan, Inc., Kinder Morgan Energy Partners to Increase Gasoline Deliveries to Phoenix this Weekend (Aug. 21, 2003) (on file with author, *at* http://www.kindermorgan.com/).

11. Glen Creno & Chip Scutari, *Repairs, EPA Ruling Are Positive Signs In Gas Ordeal*, ARIZONA REPUBLIC, Aug. 22, 2003.

12. Barrett Marson & Mary Vandeveire, *Phoenix Gasoline Shortage – Governor Looks At Rationing – National Guard Help Considered As Prices Soar, Lines Lengthen*, ARIZONA DAILY STAR, Aug. 19, 2003. Some of the delay may have been caused by trucking companies that were unprepared for the increased need to truck gasoline into Phoenix. In addition, some truckers had to stand down to meet mandatory rest regulations. "At the Kinder Morgan

terminal in Tucson, tanker drivers sometimes wait up to 10 hours to get a load of fuel . . . ." Anabelle Garay & Jacques Billeaud, *Phoenix Gasoline Problems Persist as Pipeline Remains Shut Down*, ASSOCIATED PRESS ST. & LOC. WIRE, Aug. 18, 2003. "Tucson got hit with higher prices because the Tucson fuel farm is accommodating Phoenix truckers in hopes of getting supplies to Maricopa County." Mary Vandeveire, *Kinder Morgan Energy to Increase Gas Deliveries to Phoenix*, ARIZONA DAILY STAR, Aug. 22, 2003.

13. Kinder Morgan, *supra* note 9.

14. *Id.*

15. OPIS, *supra* note 2.

16. Energy Info. Admin. (EIA), U.S. Dep't of Energy, *What Happened*, THIS WEEK IN PETROLEUM, Aug. 27, 2003, *at* http://tonto.eia.doe.gov/oog/info/twip/twiparch/030827/twipprint.html. Despite record gasoline production for the summer as compared to previous years (both nationally and on the West Coast), higher-than-anticipated demand caused gasoline inventories across the nation to decline to the lowest August levels in the last five years. EIA, *3-TWIP Main Stocks Weekly*, Complete History XLS, *in* THIS WEEK IN PETROLEUM: SUMMARY, *available at* http://tonto.eia.doe.gov/oog/info/twip/twip.asp (last modified June 22, 2005).

17. Anabelle Garay & Beth DeFalco, *Company Set to Begin Testing Pipeline Causing Gasoline Shortages in the Phoenix Area*, ASSOCIATED PRESS ST. & LOC. WIRE, Aug. 19, 2003; *Horizon: The Journalists' Roundtable* (KAET/PBS television broadcast, Aug. 22, 2003).

18. This general theory of gasoline price movement is not brand-specific. Because consumers generally can turn from one brand to another, the prices of different gasoline brands tend to move together in response to changes in market supply or demand.

19. For example, travel by subway or bus would be considered only an imperfect substitute for purchasing gasoline. Hydrogen, electrical, or ethanol-powered automobiles would be considered closer substitutes.

20. *See, e.g.*, Kayser, *supra* note 6.

21. Molly Espey, *Gasoline Demand Revisited: An International Meta-Analysis of Elasticities*, 20 ENERGY ECON. 273 (1998). This study summarizes 42 other studies that estimated the elasticity of gasoline demand. The average price elasticity of demand for long-term studies (at least one year) is approximately -0.6. This means an increase in price of 10 percent results in a 6 percent decrease in the quantity demanded in the long term.

CHAPTER 2. WORLDWIDE SUPPLY, DEMAND, AND COMPETITION FOR CRUDE OIL ARE THE MOST IMPORTANT FACTORS IN THE NATIONAL AVERAGE PRICE OF GASOLINE IN THE U.S.

I. INTRODUCTION.

During 2004 and 2005, U.S. consumers have found themselves paying pump prices (including taxes) of $2.00 and above for regular gasoline. Gasoline price escalation has cost U.S. consumers billions of dollars in increased fuel costs. To understand why prices rose so much in these years, and what causes gasoline price movements generally, we begin with crude oil.

A. Steep Increases in World Prices for Crude Oil Caused Steep Increases in Gasoline Prices.

The price of crude oil is the most important factor in the price of gasoline. Over the last 20 years, changes in crude oil prices have explained 85 percent of the changes in the price of gasoline in the U.S.[1] In 2004, crude oil prices escalated from around $30 to more than $50 per barrel,[2] with gasoline prices also rising sharply. Crude oil and gasoline prices had fallen somewhat by the end of the year, but both prices were on the rise again in early 2005, before beginning to turn down in the second quarter. In the spring of 2005, the national weekly average price of gasoline at the pump, including taxes, rose as high as $2.28.

B. The World Market for Crude Oil Influences Gasoline Prices in the U.S.

U.S. refiners compete with refiners all around the world to obtain crude oil. If world crude prices rise, then U.S. refiners must offer higher prices for crude they buy, including the crude oil produced and sold domestically. Facing higher input costs, refiners charge more for the gasoline they sell at wholesale. This requires gas stations to pay more for their gasoline. In turn, gas stations, facing higher input costs, charge consumers more at the pump.

C. Several Trends Have Shaped the World Market for Crude Oil over the Past 30 Years.

Beginning with OPEC's first successful assertion of market power in 1973, market forces no longer were the sole determinant of the world price of crude oil. Production decisions by OPEC have become a very significant factor in the determination of the prices that refineries pay for crude oil. In addition to cartel activities, increases in demand for crude oil also have worked to push prices higher. Nonetheless, some countervailing forces have kept crude oil prices lower than they might have otherwise been; these countervailing forces include new sources of crude supply and new technologies that aid in finding new oil fields and lowering extraction and yield costs.

D. Over the Past Two Decades, the Demand for Crude Oil Has Grown Significantly.

The demand for crude oil depends on the demand for refined products, such as motor gasoline, diesel fuel, jet fuel, and heating oil. Since 1982, motor gasoline has accounted for 49 to 53 percent of the daily consumption of all petroleum products. Crude oil consumption has fallen for some periods over the past 30 years, partially in reaction to higher prices. For example, following higher crude and gasoline prices due to the Iranian revolution, the Iran/Iraq war, and other factors, gasoline consumption in the U.S. fell significantly between 1978 and 1983 and remained lower during the 1980s than it had been in 1978.

Overall, however, the long-run trend is toward significantly increased demand for crude oil – particularly demand from developing economies such as China and India. Between 1988 and 2004, worldwide demand for crude increased by 27 percent, from 64.9 million barrels per day (bpd) to 82.4 million bpd.

E. Crude Supply from Countries Other than OPEC Members Has Increased.

In 1974, during the oil embargo, OPEC's share of world crude oil production was 52 percent. Higher world prices due to OPEC actions increased the incentives to search for oil in other areas. Although OPEC's total crude oil production in 2003 was comparable to that in 1974 – 30.5 million bpd in 1974 and 30.8 million bpd in 2003 – OPEC's 2003 crude oil production accounted for only 38 percent of world crude oil production compared to 52 percent in 1974. Between 1974 and 2003, crude oil production from countries that are not members of OPEC increased from 28.6 million bpd to 48.9 million bpd.

By contrast, during the same time period, U.S. crude oil production has declined as U.S. crude oil reserves have been depleted. As a result, U.S. refiners now purchase more foreign crude oil than ever before, importing more than 60 percent of their input from foreign sources, up from 43 percent in 1978.

F. OPEC's Actions Have Had a Large Effect on Crude Oil Prices.

OPEC is a cartel designed specifically to coordinate output decisions and to affect world crude oil prices.[3] The degree of OPEC's success in raising crude oil prices has varied over time. In the late 1970s and early 1980s, cartel members adhered to OPEC decisions to cut crude supply, and U.S. gasoline prices increased sharply. OPEC members, however, can be tempted to "cheat" and sell more crude oil than specified by OPEC limits. In addition, new sources of crude oil supply from non-OPEC members such as Canada, the United Kingdom, and Norway, as well as new technology that enables crude production in previously inaccessible locations, have reduced the percentage of world crude oil production attributable to OPEC. Thus, OPEC's success has been mixed over time. Nonetheless, OPEC still produces a large enough share of world crude oil to exert market power and strongly influence the price of crude oil when OPEC members adhere to their assigned production quotas.

G. Crude Oil Prices Skyrocketed in 2004 in Large Part Due to Unexpectedly Large Increases in Demand.

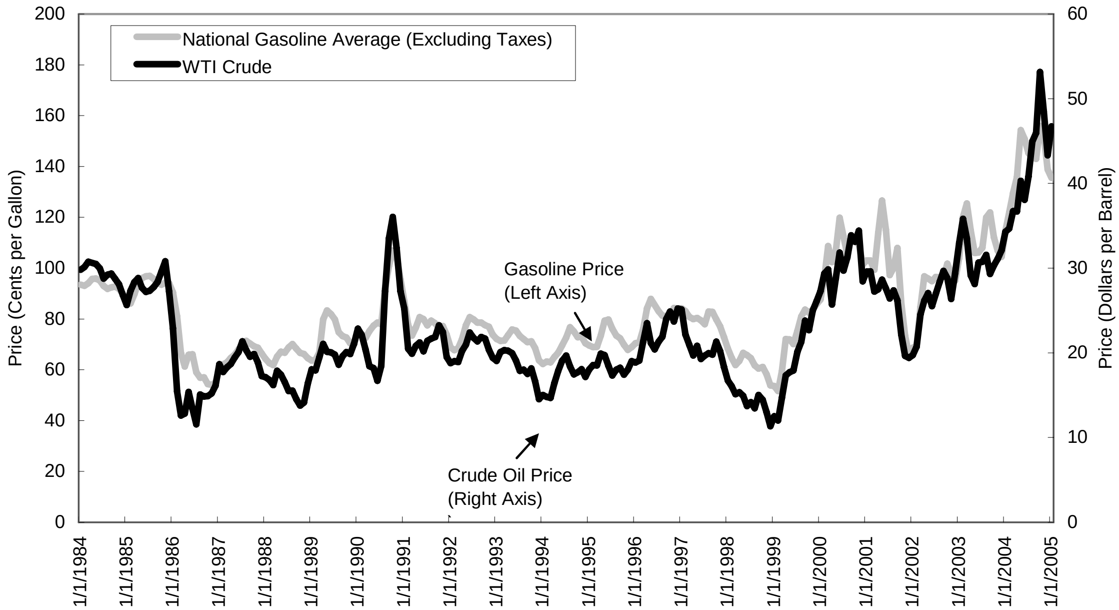
Larger-than-predicted increases in world demand for crude oil caught producers off guard. OPEC, for example, had set 2004 production levels based on much lower projections for demand growth, so they were not producing enough crude oil to meet demand. Large demand increases from quickly industrializing countries, particularly China and India, made supplies much tighter than expected. In addition to increased demand, unexpected production difficulties reduced some producers' crude output.

II. CHANGES IN THE PRICE OF CRUDE OIL ARE THE PRIMARY EXPLANATION FOR CHANGES IN THE NATIONAL AVERAGE ANNUAL PRICE OF GASOLINE IN THE U.S.

Variation in the price of crude oil drives most of the variation in the price of gasoline. John Cook, Director of the Energy Information Administration (EIA), has noted that "historically . . . we see fluctuations in retail prices almost entirely explained by movements in the underlying crude market."[4] There is little doubt that changes in crude oil prices have a greater effect on retail prices than do changes in any other intermediate cost component.[5]

A simple regression[6] of the monthly average national price of gasoline on the monthly average price of West Texas Intermediate (WTI) crude confirms that the variation in the price of crude explains approximately 85 percent of the variation in the price of gasoline.[7] To illustrate this relationship, Figure 2-1 compares the yearly national average price of gasoline (excluding taxes) and the yearly average price of WTI crude oil from 1984 to January 2005.[8]

Figure 2-1: Comparison of the National Average Price of Gasoline and the Price of West Texas Intermediate Crude (1984-Jan. 2005)



Source: EIA

III. DETERMINANTS OF CRUDE OIL PRICES FOR U.S. REFINERS.

A strong link exists between the prices that U.S. refiners pay for crude and the prices paid by refiners in the rest of the world. Any significant disruption in the supply of crude oil from a major oil producing region will force the price of crude oil for U.S. refiners to rise. As noted above in the discussion of the interruption of gasoline supply in Phoenix in 2003, there can be ripple effects in other areas whenever supply of a commodity is curtailed in one area. An interruption in supply of crude oil anywhere in the world causes U.S. refineries to compete with refineries in other areas of the world for the remaining supply of crude oil.

A. The Venezuelan Workers' Strike Interrupted the Supply of One Type of Crude Oil and Thereby Raised Prices for Other Types of Crude Oil.

Venezuela is the fourth largest supplier of crude oil to the U.S.[9] The U.S. imports more than half of the crude oil that Venezuela produces. On December 2, 2002, Venezuelan oil workers went on strike for several months. As a result, Venezuelan crude oil supply fell significantly.[10]

Several U.S. refineries work most efficiently with Venezuelan crude. *See* Box 2-1. Due to much reduced supplies of Venezuelan crude, those U.S. refineries bargained with other suppliers to obtain crude that was similar to Venezuelan crude ("Venezuelan similar crude").[11] Increased demand for Venezuelan similar crude caused prices for that crude to increase. This started a ripple effect throughout crude oil prices. The refiners who typically used the "Venezuelan similar crude" found their prices rising as competition to obtain that crude grew fiercer. Those refiners then tried to find other types of crude oil they could use as a substitute for Venezuelan similar crude. As they increased competition for those types of crude oil, those crude prices rose as well. The ripple effect continued through many different types of crude oil. Thus, a workers' strike in Venezuela that significantly restricted the availability of Venezuelan crude had ripple effects that influenced crude oil prices worldwide.

Box 2-1: *There Are Different Types of Crude Oil, and Refineries Usually Are Designed to Work Most Efficiently with Particular Types of Crude.*

Crude oil is the primary input into the production of motor gasoline and other refined petroleum products. Crude oils from different fields usually have different chemical properties, including differences in density and sulfur content. Heavy crude oil (high density) generally yields smaller amounts of high value products, such as gasoline and jet fuel, than lighter crude oil. Sour crude oil (high sulfur) is more difficult to process. As a result, heavy sour crude oil (*e.g.*, Venezuelan crude oil) typically sells at a discount to sweeter, lighter crudes (*e.g.*, West Texas Intermediate).

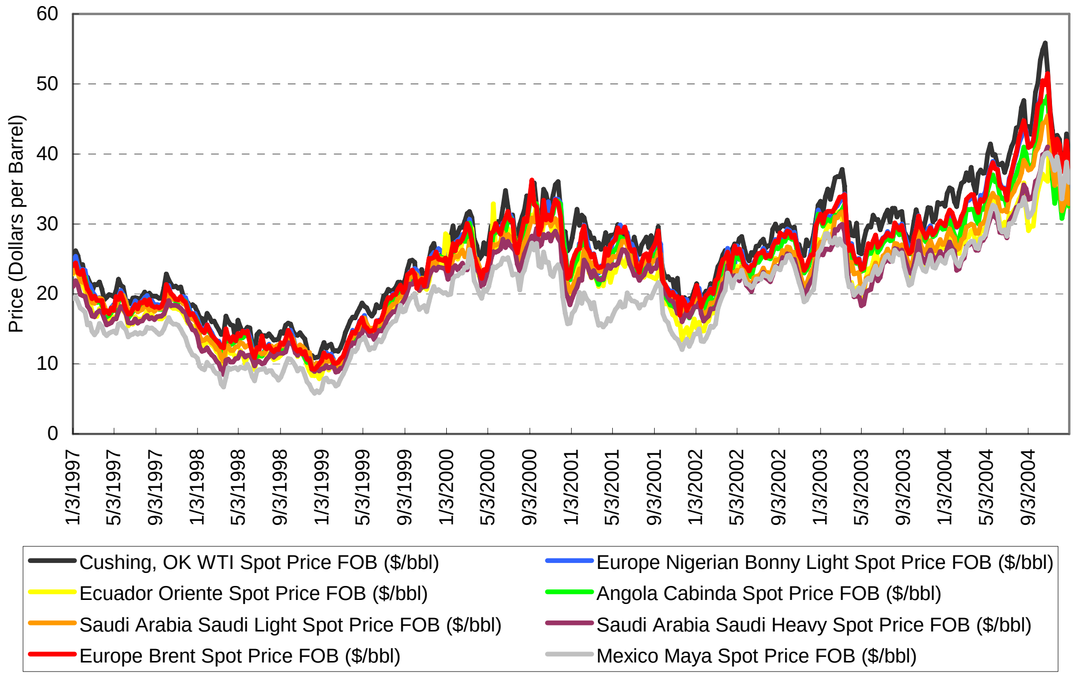
Refineries have made investments to become better able to process different types of crude oil. This has enabled them more easily to substitute among different crude oils. Nonetheless, refineries usually are designed to be most productive using a specific range of crude oil. When they substitute other types of crude, their efficiency and productivity may decline.

B. World and Domestic Crude Prices Are Linked.

U.S. refiners import approximately 60 percent of the crude oil they refine. When the world price of crude oil increases, refiners that purchase imported crude will face higher costs and may try to switch to domestic crude. Increased competition for domestic crude will raise those prices as well. For example, prices for a barrel of WTI crude – a crude that is not similar to Venezuelan crude – shot up by $10 during the Venezuelan crude shortage, as all refiners tried to meet their demand for crude.[12]

Domestic prices will continue to rise until world and domestic prices equalize, taking into account the quality differences among crude types. As a result of this relationship, domestic and world crude oil prices are strongly linked. Figure 2-2 illustrates this relationship by showing a number of different world crude prices, as well as the price of WTI oil, from the beginning of 1997.

Figure 2-2: Weekly Spot Prices for Domestic and Foreign Crude Oil



Source: EIA

C. Supply and Demand in the World Market Determine the Price of Crude Oil, Subject to Periodic Cartel Behavior by OPEC.

1. Crude oil demand.

Crude oil has little use as it comes out of the ground. Thus, the demand for crude oil depends on the demand for refined products, including gasoline, diesel fuel, jet fuel, and heating oil, among other products.[13] Gasoline has been, and is, by far the most important refined petroleum product; since 1982, gasoline has accounted for 49 percent to 53 percent of the daily consumption of all petroleum products.[14]

Over time, population growth and increased uses for refined petroleum products generally have tended to increase demand for crude oil. In addition, as developing countries have become more industrialized, their demand for crude oil has grown. Nonetheless, over the past 30 years, crude oil consumption sometimes has decreased significantly – for example, in response to rising crude prices or economic recessions.

a. Demand for crude oil has fluctuated over the past 30 years.

The 1973 OPEC price hikes, 1979-1980 price hikes, and the impact of the Asian recession in 1998-1999. In 1973, OPEC members controlled 52 percent of the world's production of crude oil. At that time, OPEC members collectively agreed to limit the supply of crude oil, and simultaneously agreed to embargo the sale of crude to the U.S. and other countries that supported Israel. OPEC thus successfully orchestrated higher world prices for crude oil. When OPEC lifted the embargo six months later, crude oil prices had tripled from $4 to $12 per barrel.[15] Following the 1973 prices hikes, U.S. gasoline prices rose sharply, but U.S. gasoline consumption did not decline significantly. Gasoline price hikes occurred again in 1979-1981, due to the Iranian revolution, the Iran/Iraq war, OPEC cartel activity, and other factors. At that time, U.S. consumers decreased their consumption of gasoline by more than 800,000 bpd – from 7,412,000 bpd in 1978 to 6,539,000 bpd in 1982. *See* Figure 3-6 *infra*. U.S. gasoline consumption fell significantly between 1978 and 1982, and remained lower during the 1980s than it had been in 1978, despite lower crude oil and gasoline prices during the late 1980s. Those reduced prices resulted in part from substantially reduced U.S. gasoline consumption and decreased worldwide petroleum consumption due to increased price sensitivity and an economic recession.[16] Indeed, worldwide economic conditions also can affect the demand for crude oil. For example, during the recession in Asian markets in 1998 and 1999, supply outpaced demand for crude oil, and crude oil prices declined significantly.

b. Overall demand for crude oil has grown significantly, especially as developing economies have become more industrialized.

Higher crude demand as developing countries become more industrialized. Conversely, as burgeoning industrial economies in China and India have expanded more recently, worldwide demand for crude oil has increased significantly. China's crude demand increased slowly before 2000, but since then has grown more rapidly.[17] By 2003, China's demand reached 5.56 million bpd, and, for the first time, China surpassed Japan to become the world's second largest consumer of petroleum products after the United States, which used roughly 9 million bpd of crude in 2004. As with China, India's demand for crude oil has significantly increased; between 1987 and 2001, its demand for crude oil doubled.[18]

Trend worldwide and in the U.S.: increased crude demand. Despite some variations, the overall trend has been toward increased demand for crude oil, both worldwide and in the U.S. Between 1985 and 2004, worldwide demand for crude oil increased 38 percent, from 60.1 million bpd to 82.6 million bpd.[19] During this time, average daily U.S. consumption of refined petroleum products increased on average by 1.4 percent per year, leading to an overall increase of 30 percent, from 15.726 million bpd in 1985 to 20.517 million bpd in 2004.[20]

2. Crude oil supply.

a. *Although non-OPEC sources of crude oil have increased, the Middle East still has the largest crude oil reserve and production area in the world, and Saudi Arabia has the largest proven crude oil reserves.*

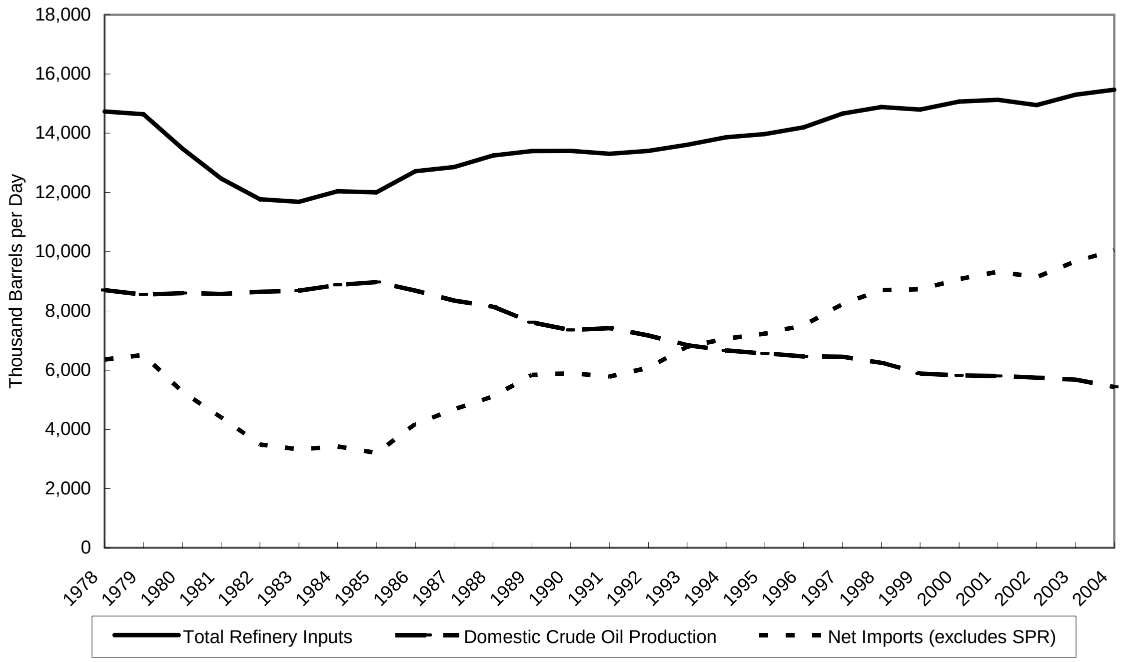
Crude oil is found throughout the world, but it is not evenly concentrated in every region. The Middle East has by far the largest crude oil reserve and production area in the world, followed by North America, the North Sea region, and the area controlled by the former Soviet Union (FSU) countries.[21] Saudi Arabia is the world's largest crude oil producer and has the largest proven crude oil reserves.[22]

OPEC's share of world crude oil production has declined significantly since the oil embargo of 1973.[23] Between 1974 and 2003, non-OPEC production – that is, crude oil production in countries that are not members of OPEC – increased from 28.6 million bpd to 48.9 million bpd. As a result, OPEC's share of world production has fallen from 52 percent in 1974 to 38 percent in 2003.[24] Although OPEC's total crude oil production in 2003 was comparable to that in 1974 – 30.5 million bpd in 2003 and 30.8 million bpd in 1974 – the 2003 production represented a smaller proportion of world crude oil production than it did in 1974.[25] Moreover, OPEC's crude oil production varied over the years between 1974-2003, both in reaction to differences in crude oil demand and as part of OPEC efforts to set the world price of crude.

New technologies have lowered the cost both of finding new sources of crude oil and of extracting crude oil from new and existing oil fields. For example, advances in seismic technology have reduced the cost of finding new oil reservoirs and have lowered extraction costs by reducing the number of dry holes drilled. Also, advances in directional and horizontal drilling reduce costs by using fewer wells to extract oil from a reservoir, while new production platforms have increased access to crude oil in deeper waters.[26]

As other countries' crude oil production has increased, U.S. crude oil production has declined. Over the last 25 years, U.S. crude oil reserves have been depleted. This has reduced the ability of the domestic crude oil industry to satisfy domestic demand. Figure 2-3 shows that domestic crude oil output fell by roughly one-third between 1978 and 2004. As a result, refiners in the U.S. now import more than 60 percent of their crude from foreign sources, up from 43 percent in 1978.[27]

Figure 2-3: U.S. Refinery Inputs and Output (1978-2004)



Source: EIA

b. Worldwide concentration in crude oil production is low.

Worldwide concentration in crude oil production has fallen since the 1980s, due to the privatization of formerly state-owned entities and the breakup of the Soviet Union. Assuming that all entities, whether state-owned or privately held, were independent firms, the Herfindahl-Hirschman Index (HHI) for world crude oil production was only 276 in 2002, a very low level of concentration.[28] *See* Box 2-2. If market shares are assigned by country outside of the U.S. and Canada, where shares are attributed to individual firms, the world crude oil market remains unconcentrated, with an HHI for world production of 417 in 2002. If all OPEC countries were collectively counted as a single entity, which would be the correct way to assign market shares if the cartel functioned perfectly, the world crude oil production HHI would be moderately concentrated, at a level of 1680 in 2002.

Box 2-2: What Are "Market Concentration" and the Herfindahl-Hirschman Index?

Market concentration affects the likelihood that one firm, or a small group of firms, could successfully exercise market power. The DOJ and FTC Horizontal Merger Guidelines ("Merger Guidelines") explain that "[T]he smaller the percentage of total supply that a firm controls, the more severely it must restrict its own output in order to produce a given price increase, and the less likely it is that an output restriction will be profitable." U.S. DEP'T OF JUSTICE & FEDERAL TRADE COMM'N, HORIZONTAL MERGER GUIDELINES, § 2.0 (1992, revised 1997), (MERGER GUIDELINES) *at* http://www.ftc.gov/bc/docs/horizmer.htm.

The HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. The HHI takes into account the relative size and distribution of the firms in a market. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. An HHI of less than 1000 is considered "unconcentrated," an HHI over 1800 is considered "highly concentrated," and an HHI between 1000 and 1800 is considered "moderately concentrated." *See id.* § 1.51 for presumptions that accompany concentration levels.

Major private oil companies, both individually and collectively, control only a very small share of world crude oil production. The share of world crude oil production accounted for by U.S.-based companies declined from 11.9 percent in 1990 to 8.4 percent in 2002. Recent mergers among major private oil companies have had minimal impact on world crude oil concentration. For example, in 1998, the year before their merger, Exxon and Mobil had only 2.1 and 1.3 percent of world crude oil production respectively; in 2001, the combined firm's share was 3.4 percent.[29] If a firm with such a small share of the market wanted to cut output to increase prices, it would have to reduce its output so substantially – just to raise prices by a tiny amount – that such a strategy would not be profitable.

c. OPEC's influence on crude oil prices is significant, although the success of OPEC as a cartel has varied over time.

OPEC describes itself as an organization whose members aim to control prices in the crude oil market by adjusting their oil output to ensure a balance between supply and demand.[30] Twice a year, or more frequently if OPEC members believe it is required, OPEC members meet to set a "production ceiling" for OPEC members and individual member country output limits. Members then are supposed to limit the amount of crude oil they produce in accordance with the country limits and OPEC production ceilings.[31] In essence, OPEC attempts to raise crude oil prices and increase cartel profits by reducing output below what each member state would produce if making its own independent decision.

The degree of OPEC's success has varied over time. Saudi Arabia appears to be the leader of the OPEC cartel and the most willing to withhold output and force crude oil prices higher.[32] According to some, Saudi Arabia is the only OPEC member consistently willing to produce below its capacity to enforce production levels; other OPEC countries do so only rarely.[33] The reluctance of other countries to produce below capacity has contributed to the historic instability of the OPEC cartel. Although the cartel appears to be able to exercise some market power, it does so only imperfectly. In recent years, OPEC has tried to cut or increase production to enforce a per-barrel price band.[34] These efforts were only sporadically effective, however. Considerable price fluctuations can occur when OPEC members ignore current production agreements. As with any cartel, OPEC's members often can make even greater profits by "cheating" on the cartel – that is, by producing more crude oil to sell at the high prices that result from other countries' restrictions on their crude oil output. Of course, if cheating on the cartel is widespread, the supply of crude oil increases, and crude oil prices will fall.

The effectiveness of OPEC in controlling world oil prices has been the subject of numerous studies. These studies generally find that OPEC members collectively exert market power. No consensus exists, however, on how successful OPEC has been in consistently achieving supracompetitive prices. The studies indicate that, although OPEC has been unable to achieve a perfectly functioning cartel, it generally has been successful in exercising a significant degree of market power and in obtaining prices above competitive levels.[35]

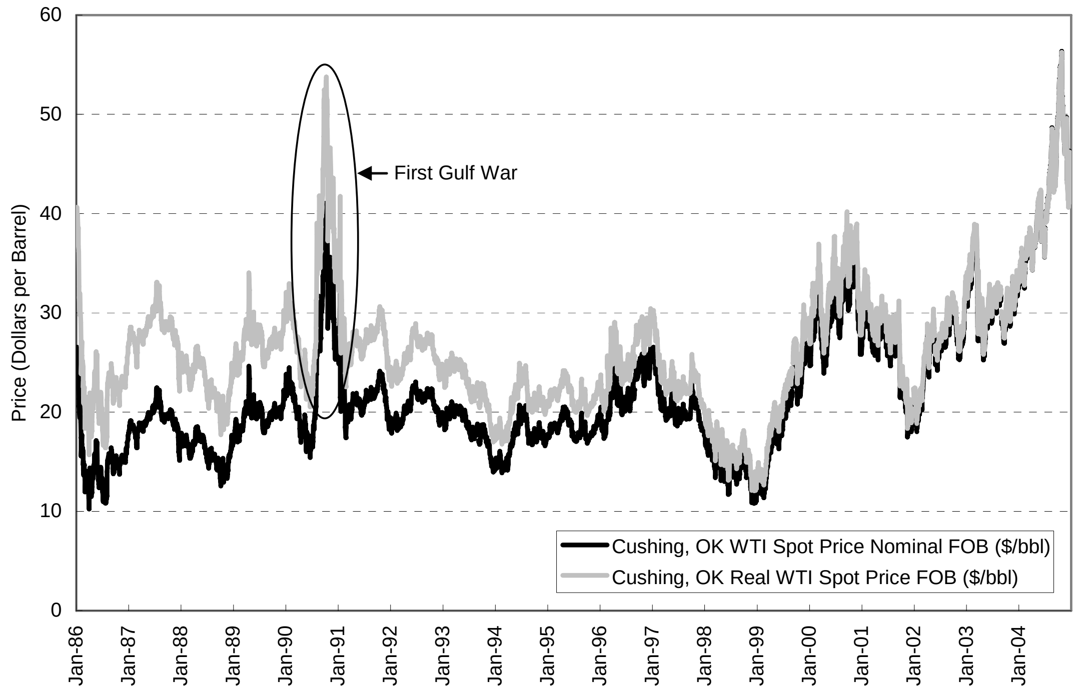
OPEC's influence has been an important determinant of higher prices since 1973, but other factors also contribute. Significantly increased long-run demand from industrializing countries has exacerbated the price-increasing effects of OPEC's production cutbacks. Production and transportation economies, new supplies from non-OPEC areas,[36] and fluctuating demand due to a volatile world economy, however, have kept the cartel from exercising wholly dominant control over crude supplies and prices.

3. Trends in crude oil prices.

OPEC's varied success in controlling crude supply may explain some pricing trends in crude oil prices. As noted earlier, crude oil prices tripled after the OPEC oil embargo of 1973. Crude prices increased sharply again between 1978 and 1981, but then gradually declined during the early 1980s, although remaining at historically high levels.

Beginning in 1985, however, crude prices began to collapse, when certain OPEC members decided to abandon a policy of propping up prices through curtailed production.[37] From 1987 until 1997, crude prices generally centered around $20 per barrel, with the exception of the second half of 1990, when the average price exceeded $29 per barrel as a result of increased demand for crude oil due to the first Gulf War (and other factors arising out of that war). Throughout most of the 1990s, however, crude prices remained relatively stable, suggesting that crude producers increased production to meet increased demand.

Figure 2-4: Daily Crude Oil Spot Prices, 1986 to 2004



Source: EIA

In 1998, crude oil prices dipped below $11 per barrel. Both OPEC and non-OPEC members had miscalculated, increasing crude oil production just as world demand for oil decreased, in part due to the recession in Asia in 1998-99. *See* Figure 2-4. As world demand strengthened again and OPEC instituted production cuts, crude oil prices increased considerably.

By 2000, crude oil prices had risen to more than $26 per barrel. As one would expect, these higher prices reduced the growth in demand, and weaker demand for crude, particularly in the U.S., caused prices to fall somewhat in the beginning of 2001. After September 11, crude prices fell again, largely due to fears of a sharp worldwide economic downturn. Prices stopped falling in 2002, however, as a result of stronger U.S. oil demand, low crude oil inventories, turmoil in the Middle East, and, at the end of the year, labor strikes that resulted in the near cessation of oil exports from Venezuela. Prices climbed in 2002 and continued to climb in 2003 as the U.S. continued its recovery from the mild recession in 2000-01.

IV. THE STORY OF 2004 AND A LOOK AT 2005.

At the beginning of 2004, the monthly average price of crude acquisition for U.S. refineries was $30.92 per barrel. Throughout much of 2004, with some exceptions, average monthly crude acquisition prices continued to climb, peaking at $46.12 per barrel in October.[38] By the end of 2004, the average monthly crude acquisition price had fallen to $40.69 per barrel but had not returned to pre-2004 prices.[39]

Similarly, throughout most of the year, U.S. consumers faced escalating gasoline prices. During the month of January, the national average price for regular gasoline was $1.57 per gallon. The peak for monthly average gasoline prices was October, at $2.00 per gallon. By the end of 2004, as crude oil prices declined, so did monthly average gasoline prices, ending the year at $1.84 per gallon.[40] As noted earlier, Figure 2-1 shows the close relationship between crude oil and gasoline prices.

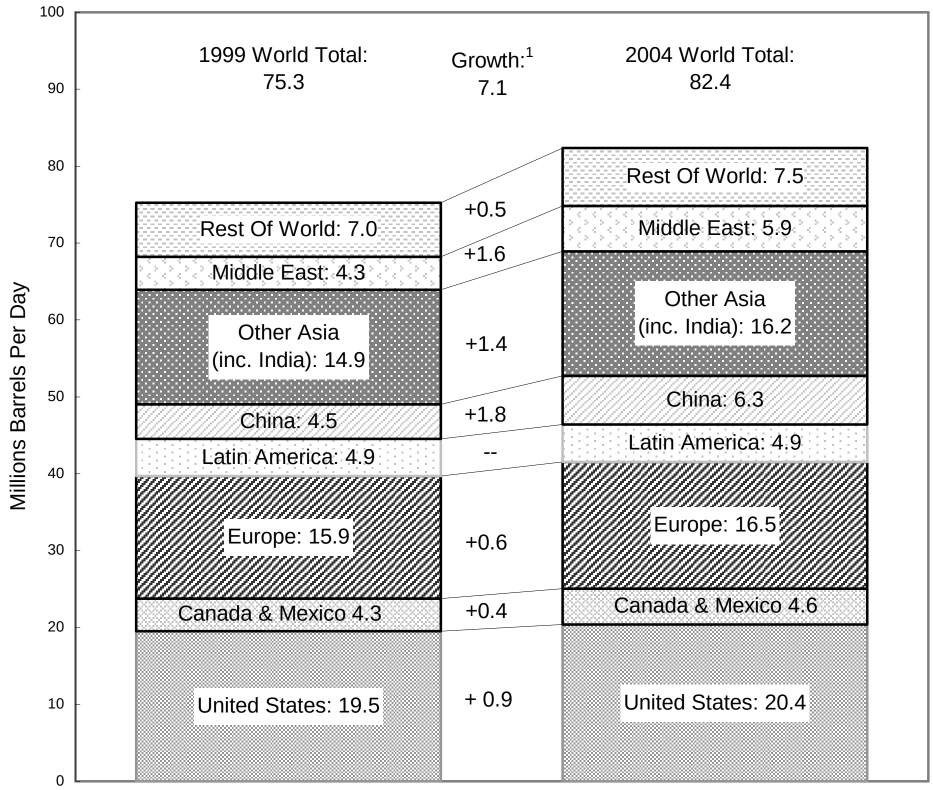
The 2004 prices for crude oil and gasoline differed significantly from what the U.S. experienced during much of the 1990s, when crude prices typically averaged close to $20 a barrel and the national average price for gasoline hovered around $1.20 per gallon.[41] Although prices fell toward the end of 2004, neither crude nor gasoline prices returned to pre-2004 levels, and both were rising again at the beginning of 2005. Most recently, WTI crude prices surpassed $60.00 a barrel during June, 2005.[42]

Why did crude oil prices escalate so sharply in 2004? A number of factors appear to have contributed, including rapidly increasing demand from burgeoning new economies in China and other areas of the world, supply restrictions, and concerns about the stability of oil supply.[43] In addition to the discussion of events below, other factors may have also contributed to 2004's crude prices.

A. Worldwide Demand for Crude Oil – and for Other Commodities Important to Developing Economies – Grew at Rates Higher than Projected, Crude Producers Were Unprepared.

In recent years, world demand for crude oil has been increasing significantly. Figure 2-5 shows that world demand increased from 75.3 million bpd in 1999 to 82.4 million bpd in 2004.

Figure 2-5: World Oil Consumption by Region, 1999 and 2004, Millions Barrels per Day

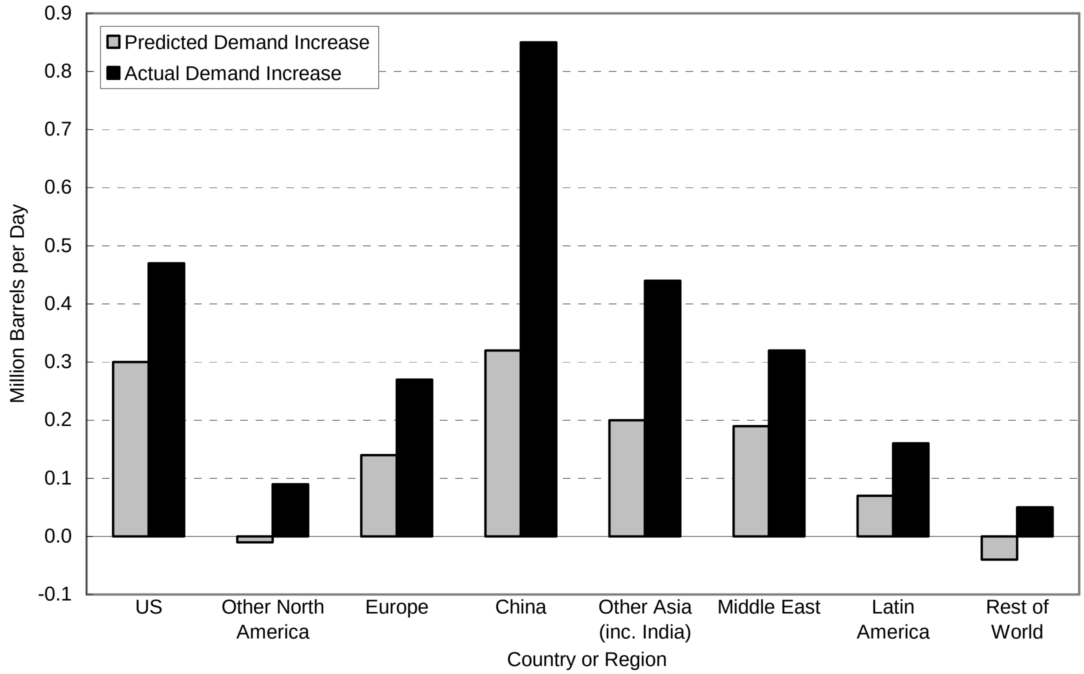


Source: IEA

[1] Numbers may not add up due to rounding.

Thus, that demand for crude oil increased in 2004 was not a surprise. What was a surprise, however, was the rate at which world demand grew. The actual rate at which demand for crude oil grew in 2004 far outstripped the projections of likely growth in world demand from the International Energy Agency (IEA) and OPEC.[44] Projections had placed likely growth in world demand for crude oil at 1.5 percent. In fact, the 2004 rate of growth in crude demand was 3.3 percent – more than double the projections. *See* Figure 2-6.

Figure 2-6: 2004 Predicted vs. Actual Crude Oil Demand Increase, Million Barrels per Day



Source: IEA

This phenomenon was not limited to crude oil. Other basic commodities that form the basis for expanded growth in new economies, such as steel and lumber, also saw unexpectedly rapid growth in demand, along with higher prices. For example, from January to August 2004, the price of hot rolled sheet steel, the industry's benchmark, almost doubled.[45] The growth in overall world demand for these other commodities also surpassed projections.

China provides a significant example of rapid economic growth accompanied by substantially increased demand for crude oil. During 2004, China's annual demand for oil climbed by almost 15 percent.[46] China's economic growth in various sectors, manufacturing boom, and new first car owners appear to have driven much of the world's increased demand for oil. Indeed, over the past five years, Chinese demand has been the source of roughly 25 percent of world oil demand growth.[47]

Other regions also exhibited much stronger than expected demand for oil in 2004. The countries from the FSU, as a group, increased their demand for crude oil by 3.6 percent over the previous year. The Middle East increased demand by 5.7 percent, and North America and Europe increased demand by 2.1 and 1.7 percent, respectively.[48] On a worldwide basis, demand was 2.09 million bpd higher than analysts had forecasted.[49]

Crude producers – particularly the producers that are part of OPEC and account for approximately 40 percent of the world's crude supply in 2004 – had not planned to produce the quantity of crude that the world demanded. Relying on projections that were too low, the members of OPEC set their production ceiling at levels that were lower than the increased crude oil demand. Because producers were not supplying enough crude supply to meet increasing world demand at previous price levels, the global market for crude oil tightened and crude prices rose.[50]

B. Certain Events in 2004 Disrupted the Production and Supply of Crude Oil.

A number of events in 2004 interrupted, or had the potential to interrupt, the supply of crude oil. That supply disruptions occurred was not unique; some crude supply disruptions occur every year. In 2004, however, with insufficient crude supply already causing higher prices, each event had the potential to tighten the market for crude supply – and thus raise prices – even more. Among a variety of events and other factors, three circumstances appear to have been more significant than others: the instability in Iraq, hurricanes in the Gulf Coast, and a workers' strike in Norway.

1. Supply disruptions in Iraq.

Insurgent attacks continued throughout 2004, destabilizing the Iraqi crude oil infrastructure. Saboteurs attacked pipelines, various maintenance facilities, oil terminals, and export terminals.[51] For example, on April 24, suicide bombers attacked Iraq's Basra maritime oil terminal, where roughly 90 percent of Iraq's crude oil exports are loaded onto tankers.[52] The Basra maritime oil terminal was closed for a period in June, when more attacks on two oil pipelines in southern Iraq temporarily halted much of Iraq's oil exports.[53]

Iraq also shut down various facilities and pipelines for maintenance. For example, on March 17, Iraqi officials halted a partial resumption of oil flow through Iraq's Kirkuk-Ceyhan oil export pipeline because of reported corrosion along the line. This pipeline remained idle for the rest of the month.[54] During November, political unrest, insurgency and the continuation of the war led to a sharp decline in Iraq's production abilities. Insurgents sabotaged pipelines to both the southern export terminals and to Ceyhan in Turkey, and the weather created some loading delays.[55] In November, Iraq's production fell by 430,000 bpd because of the incidents. Iraqi production averaged 1.8 million bpd in November, whereas it had averaged 2.2 million bpd in October. In total Iraqi exports fell to 1.35 million bpd from October's 1.75 million bpd.[56] With the start of December, pipelines were down and the 10 million barrel-capacity storage tanks in Ceyhan were largely empty.

2. Gulf Coast hurricanes.

Three major hurricanes – Charlie, Frances, and Ivan – battered the Gulf Coast in 2004. Each disrupted U.S. crude oil output, but Hurricane Ivan inflicted the largest interruption to crude oil production that the U.S. has seen in the last two years. Immediately after Hurricane

Ivan, Gulf Coast crude oil production fell sharply by 1.4 million bpd, which is 83 percent of typical daily Gulf Coast crude oil production.[57] Although the affected companies restored a fair amount of production relatively soon after Hurricane Ivan, many continued operating at reduced capacity as they repaired damage. The damage caused by Hurricane Ivan ultimately led to the shut-in[58] of more than 32 million barrels of crude from September 11 through November 29. This is equivalent to 5.4 percent of the yearly production of oil for the Gulf of Mexico.[59] Hurricane Ivan also disrupted oil tankers from Venezuela, creating a three-day delay on deliveries to the U.S.[60]

3. Workers in Norway.

Norway is a major non-OPEC source of oil for the world.[61] Indeed, in 2003, Norway was the third largest world net oil exporter behind Saudi Arabia and Russia.[62] In 2004, labor strikes affected drilling on Norway's continental shelf for certain periods from June through October.[63] In June 2004, the workers struck for seven days, reducing crude oil production by approximately 375,000 bpd. The strikes forced another shutdown of 200,000 bpd in early September and another 300,000 bpd in early October.[64]

C. In 2004, the Geopolitical Outlook in Certain Areas Created Concern about the Overall Stability of Crude Supply, and Futures Prices may have Reflected these Concerns.

1. An uncertain geopolitical outlook in 2004.

In 2004, the geopolitical outlook in certain areas appeared to threaten the production capacity of some major oil producers. For example, Saudi Arabia, the top supplier of crude oil for the world,[65] faced attacks and suicide bombings from terrorists.[66] In Nigeria,[67] civil unrest, attacks on oil workers, sabotaged pipelines, and striking workers created the possibility of supply disruption.[68] Even incidents that do not directly affect current crude oil production, however, can create concerns and fears about potential crude supply disruptions and thus contribute to increases in crude spot and futures prices. Fear of potential disruptions causes buyers to bid more for current production. For example, analysts focused on the financial difficulties of one of Russia's largest oil producers – Yukos – as the government sought substantial back taxes.[69] Fear that Yukos' future production might be curtailed, causing a future supply shortage that would put upward pressure on prices, led buyers to bid up futures prices.

For the most part, however, production actually did not decrease significantly in any of these countries of concern; indeed, in some, it increased. As discussed in more detail below, Saudi Arabia's production increased during the year.[70] Nigeria consistently managed to export crude oil, at increasing levels.[71] Despite tax worries and conflicts with the Russian government, Yukos' production levels did not decrease significantly.

Nevertheless, concerns and fears about the potential for crude supply to be disrupted may have contributed to increases in both spot and futures prices for crude oil. For instance, if futures prices were high due to a perceived likelihood of crude oil supply interruptions, then refineries would have to pay more for crude oil to outbid those that could profit by purchasing oil and storing it to sell at higher prices later.

2. Linkages between futures and spot markets.

Crude oil is bought and sold for immediate delivery on world spot markets. Spot markets alone, however, may be insufficient for companies that have to make production and purchase decisions for future time periods, based on uncertain information. Crude oil producers, refiners, and consumers of crude and refined products desire to smooth out potentially volatile prices and make business planning more feasible. Futures markets can assist in this task. Futures markets exist to trade oil for delivery some time in the future. Market participants may use either or both markets as their needs arise.

A futures contract specifies the price at which a commodity will be bought and sold at some time in the future. Some commodities, such as oil, wheat, corn, and cattle, can experience highly variable prices due to unanticipated swings in demand or supply. Futures markets enable producers and consumers of those commodities to reduce the risk that they will lose substantial amounts of money due to future price swings.

In most futures markets there are two different types of buyers and sellers – those that buy or sell futures contracts as a "hedge" to reduce risk, and those that buy or sell based on betting that the price will change in their favor. An example of "hedging" would be a crude oil producer contracting to sell crude oil in two months at a set price to hedge against the risk that crude prices will fall. On the other side of the transaction, a refiner may buy a futures contract to purchase crude oil in the future at a set price to hedge against the risk that future crude oil prices will increase. Alternatively, either the buyer or seller could be a financial trader, sometimes referred to as a speculator, that merely attempts to take advantage of volatile prices. Financial traders put their own capital at risk, and in doing so provide needed liquidity to futures markets.

Recent buyers of contracts hedging against higher future fuel prices have been airlines, trucking companies, and other transportation companies that use large amounts of fuel. Press reports in early 2005 indicated that some airlines have current costs of fuel that are substantially less than the current price of fuel would indicate; futures contracts purchased earlier allowed them to lock in much lower prices. On the other side of these transactions, people were betting that fuel prices would fall, so that they could make a profit on selling the fuel at a price higher than future fuel prices turned out to be.

Spot and futures markets are linked. If the futures price is much higher than the spot price, there is an opportunity to buy crude oil in the spot market and sell a futures contract at the same time. The oil would then be kept in storage and delivered when the futures contract expires. Similarly, if the futures price is significantly lower than the spot price, someone with crude oil in inventory could sell crude out of inventory and buy a cheaper futures contract at the same time.

D. In Response to Increased Demand and Higher Prices in 2004, Crude Suppliers Increased Output, Which Lowered Prices Somewhat, at Least Temporarily.

1. OPEC increased production.

For the most part, global oil production trended upward to meet the rising demand for crude. Throughout much of 2004, OPEC members continued to raise their production. In the beginning of 2004, OPEC had set its production ceiling at 23 million bpd. By November, OPEC had raised its production ceiling to an all-time high of 28 million bpd. When demand rises, as it did in 2004, OPEC decisions to raise or lower its production ceiling can significantly impact world crude oil prices. According to analysts, most of the production increases came from Saudi Arabia, because other OPEC countries already were producing at near-maximum capacity.[72] Indeed, although OPEC set the November production ceiling at 28 million bpd, OPEC members were producing approximately 33.5 million bpd of crude by the third quarter of 2004.[73] Unrest in Iraq in November, however, forced OPEC's production levels lower.[74]

2. Crude oil prices continued to escalate in 2005, but recently have become somewhat more variable.

In response to increased production, crude oil prices began trending downward by November and December. On November 1, the spot price for a barrel of WTI crude oil was $50.10. By December 30, the spot price had fallen to $43.36.[75] Nonetheless, a great deal of volatility remained. Between November 1 and December 30, the spot price WTI rose as high as $50.90 and fell as low as $40.71. At the turn of the year, crude oil prices were volatile. Continued high worldwide demand kept pressure on prices through the early part of 2005.[76]

<u>Endnotes</u>

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1. BUREAU OF ECON., FED. TRADE COMM'N (FTC), THE PETROLEUM INDUSTRY: MERGERS, STRUCTURAL CHANGE, AND ANTITRUST ENFORCEMENT 1 n.1 (2004) [hereinafter PETROLEUM MERGER REPORT], *available at* http://www.ftc.gov/os/2004/08/040813mergersinpetrolberpt.pdf. A simple regression of the monthly average national price of gasoline on the monthly average price of West Texas Intermediate (WTI) crude oil explains approximately 85 percent of the variation in the price of gasoline. This percentage may vary across states or regions. Data for the period January 1984 to October 2003 were used for this regression. This is similar to the range of effects given in ENERGY INFO. ADMIN. (EIA), U.S. DEP'T OF ENERGY, DOE/EIA-0626, PRICE CHANGES IN THE GASOLINE MARKET: ARE MIDWESTERN GASOLINE PRICES DOWNWARD STICKY? (1999), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/0626.pdf. More complex regression analysis and more disaggregated data may give somewhat different estimates, but they are likely to be of the same general magnitude.

2. The prices reported in this chapter are nominal – that is, they are not adjusted for inflation. Rather, they are the prices that consumers or producers actually paid at the time of purchase. Of course, since the U.S. has experienced price inflation in every year since the 1940s, unadjusted prices in different years are not strictly comparable.

For example, $2.00 per gallon gasoline in 1974 was actually more expensive, in terms of the number of hours the average consumer would have to work to earn it, than $2.00 per gallon gasoline in 2004.

3. OPEC is an international organization of countries with control over a large proportion of the crude supply. Currently, OPEC members include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. *See* OPEC, *Who Are OPEC Member Countries?*, *at* http://www.opec.org/library/FAQs/aboutOPEC/q3.htm (June 28, 2005).

4. These remarks come from two public conferences held by the Commission (on August 1, 2001, and May 8-9, 2002) on factors that affect refined petroleum product prices. Participants in those conferences detailed the central factors that may affect the level and volatility of refined petroleum product prices. The FTC has incorporated much of the testimony and presentations from these conferences into its work. *See generally* PETROLEUM MERGER REPORT, *supra* note 1; *Market Forces, Anticompetitive Activity, and Gasoline Prices: FTC Initiatives to Protect Competitive Markets: Hearing on Status of U.S. Refining Industry Before the Subcomm. on Energy and Air Quality, House Comm. on Energy and Commerce*, 108th Cong. 15-33 (July 15, 2004) (Statement of the FTC presented by William E. Kovacic, General Counsel) (detailing factors that affect the price of gasoline, and the gasoline price monitoring and investigation project), *available at* http://www.ftc.gov/os/2004/07/040715gaspricetestimony.pdf. *See also* John Cook, Remarks at the Federal Trade Commission Conference on Factors that Affect Prices of Refined Petroleum Products 49 (Aug. 2, 2001) [hereinafter, citations to conference transcripts include the speaker's last name, transcript date, and page cite(s)]. John Felmy of the American Petroleum Institute (API) similarly noted that "gasoline prices are determined fundamentally by crude oil prices as the most important component." Felmy 8/2 at 45. Transcripts of the Conference and presentations are available at http://www.ftc.gov/bc/gasconf/index.htm.

5. *See also* Verleger 8/2 at 7; Montgomery 5/8 at 12; Hogarty 5/9 at 25.

6. Regression analysis refers to statistical techniques to estimate the relationship between different variables, such as gasoline prices and crude oil prices, based on real world data. More complex regression analysis and more disaggregated data may give a somewhat different estimate, but changes in the price of crude oil explain the vast majority of changes in the price of gasoline. *See also supra* note 1.

7. More complex regression analysis and more disaggregated data may give a somewhat different estimate, but changes in the price of crude oil explain the vast majority of changes in the price of gasoline. *See also supra* note 1.

8. WTI crude oil price is a frequent benchmark, but is not necessarily the same as the crude oil acquisition costs noted above, which may be lower than the WTI price.

9. EIA, *Top Suppliers of U.S. Crude Oil Imports, 2003*, *at* http://www.eia.doe.gov/neic/rankings/crudebycountry.htm (last modified Nov. 4, 2004).

10. *See generally* JOANNE SHORE & JOHN HACKWORTH, EIA, IMPACTS OF THE VENEZUELAN CRUDE OIL PRODUCTION LOSS (2003), *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2003/venezuelan/vzimpacts.pdf.

11. EIA, VENEZUELA COUNTRY ANALYSIS BRIEF (June 2004), *at* http://www.eia.doe.gov/emeu/cabs/venez.html.

12. Shore & Hackworth, *supra* note 10.

13. Residual fuel oil includes classes of relatively heavy refined products used in electric power generation and other industrial purposes. Distillate fuel oils include several grades of diesel and fuel oil products used in, among other things, highway diesel engines and heating homes. Jet fuel is used for commercial and military turbojet and turboprop aircraft engines. Liquefied petroleum gases are a variety of gases produced in the refining of crude oil,

such as ethane, ethylene, and propane.

14. PETROLEUM MERGER REPORT, *supra* note 1, at 65. A decline in residual fuel oil consumption, which began in the late 1970s, is attributable largely to its displacement by natural gas and distillates for electricity generation. *Id.*

15. EIA, PETROLEUM CHRONOLOGY OF EVENTS 1970-2000 (May 2002), *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/chronology/petroleumchronology2000.htm.

16. *See* Chapter 3, *infra*, Figure 3-6.

17. INT'L ENERGY AGENCY (IEA), OIL MARKET REPORT, ANNUAL STATISTICAL SUPPLEMENT FOR 2002 AND USERS' GUIDE, Aug. 11, 2003, at 16 tbl.8, *at* http://omrpublic.iea.org/omrarchive/sup2003.pdf. In 1987, China's demand for crude oil was 2.06 million bpd; by 2001, China's demand had grown to 4.67 million bpd. *Id.*

18. *Id*. India used 1.02 million bpd in 1987 and increased its demand to 2.27 million bpd by 2001. *Id.*

19. EIA, MONTHLY ENERGY REVIEW, Apr. 2005, at 155 tbl.11.2, *available at* http://tonto.eia.doe.gov/FTPROOT/multifuel/mer/00350504.pdf.

20. *Id.* at 43 tbl.3.1b.

21. EIA, *Supply*, *in* OIL MARKET BASICS, *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_basics/default.htm (last visited June 28, 2005). IEA, OIL MARKET REPORT, Oct. 12, 2004, at 4, *at* http://omrpublic.iea.org/omrarchive/12oct04full.pdf. The term "former Soviet Union" includes the following countries: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

22. *See* PETROLEUM MERGER REPORT, *supra* note 1, at 151-53 tbl.5-6 to 5-7.

23. *See id.* at 137-38 (OPEC countries accounted for 80 percent of world crude oil capacity in 2000). *See also* American Petroleum Institute, *Responses to U.S. Federal Trade Commission Questions Regarding Factors That Affect Prices of Refined Petroleum Products* 1 (Public Comment, Apr. 19, 2002) (responding that worldwide proven crude oil reserves rose from 700 billion barrels in 1985 to 1,032 billion barrels in 2001, but non-OPEC reserves declined in that period from 227 billion barrels to 219 billion barrels), *at* http://www.ftc.gov/bc/gasconf/comments2/020419apiresponses.pdf.

24. EIA, *Oil Production*, *in* DOE/EIA-0520, INTERNATIONAL PETROLEUM MONTHLY, Annual tbl.4.4, "World Oil Supply 1970-2003," *at* http://www.eia.doe.gov/ipm/supply.html (last modified May 12, 2005).

25. It is important to note that OPEC crude oil production did not stay constant during each year from 1974 to 2003; there were dips and rises in response to changes in world crude demand.

26. *See* EIA, DOE/EIA-0560(98), NATURAL GAS 1998: ISSUES AND TRENDS 175 app.B (1999), *at* http://www.eia.doe.gov/oil_gas/natural_gas/analysis_publications/natural_gas_1998_issues_and_trends/it98.html.

27. EIA, MONTHLY ENERGY REVIEW, Mar. 2005, at 46-47 tbl.3.2a-3.2b, *available at* http://tonto.eia.doe.gov/FTPROOT/multifuel/mer/00350503.pdf.

28. PETROLEUM MERGER REPORT, *supra* note 1.

29. *Id.* at 145-47 tbl.5-3.

30. OPEC, *Functions, at* http://www.opec.org/aboutus/functions/functions.htm (June 28, 2005).

31. *Id.*

32. A.F. Alhajji & David Huettner, *OPEC and World Crude Oil Markets from 1973 to 1994: Cartel, Oligopoly, or Competitive?*, ENERGY J., June 2000, at 31.

33. Montgomery 5/8 at 18. A number of academic studies suggest that Saudi Arabia's actions, or possibly a small core of OPEC nations including Saudi Arabia, are more important than OPEC's overall production decisions in influencing oil markets. *See* note 35, *infra.*

34. For example, in 2003, OPEC attempted to control production to keep the price per barrel between $22 and $28. *OPEC decides to reduce production by 900,000 b/d at 127th Meeting of the Conference in Vienna*, OPEC BULLETIN, Sept./Oct. 2003, at 4, *available at* http://www.opec.org/library/OPEC%20Bulletin/2003/pdf/OB092003.pdf.

35. James L. Smith, *Inscrutable OPEC? Behavioral Tests of the Cartel Hypothesis*, ENERGY J., Jan. 2005, at 51; Bo Yang, OPEC Behavior (unpublished Ph.D. dissertation, Pa. State Univ., 2004) (on file with author); Harri Ramcharran, *Oil Production Responses to Price Changes: An Empirical Application of the Competitive Model to OPEC and Non-OPEC Countries*, 24 ENERGY ECON. 97 (2002); James M. Griffin & Weiwen Xiong, *The Incentives to Cheat: An Empirical Analysis of OPEC*, 40 J.L. & ECON. 289 (1997).

36. As noted above, non-OPEC production has increased substantially, while OPEC production has remained roughly the same.

37. EIA, *supra* note 15, at 3.

38. EIA 2004 data. EIA, Complete History XLS, *in* THIS WEEK IN PETROLEUM: CRUDE OIL, *at* http://tonto.eia.doe .gov/oog/info/twip/twip_crude.html (last modified June 8, 2005).

39. *Id.*

40. *Id.*

41. EIA, MONTHLY ENERGY REVIEW, Nov. 2004, at 128 tbl.9.4, *available at* http://tonto.eia.doe.gov/FTPROOT/ multifuel/mer/00350411.pdf. Crude prices fell precipitously in 1998 to almost $10 a barrel. Similarly, average gasoline prices fell during 1998 to 107.2 cpg. EIA, WEEKLY PETROLEUM STATUS REPORT, Jan. 27, 1999, *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/weekly_petroleum_status_report/historical/1999/1999_01_27/wpsr_1999_01_27.html (last modified Jan. 28, 1999).

42. EIA, *supra* note 38.

43. Other factors may also include devastating weather conditions and striking unions in crude oil exporting countries. *See supra* pages 15-16.

44. *See* IEA, OIL MARKET REPORT, Dec. 10, 2003, at 9-11, *at* http://omrpublic.iea.org/omrarchive/10dec03full.pdf; OPEC, MONTHLY OIL MARKET REPORT, Dec. 2003, at 21-22, *at* http://www.opec.org/home/Monthly%20Oil%20Market%20Reports/2003/pdf/MR122003.pdf. IEA is an energy forum for 26 industrialized countries, including the U.S. IEA member governments share energy information and a commitment to take joint measures to meet oil supply emergencies.

45. *See* Leslie Wines, *Strong Steel Gains Seen Slowing*, INVESTOR'S BUSINESS DAILY, Aug. 10, 2004. *See also* News Release, Nat'l Ass'n of Home Builders, Some Relief in Building Materials Prices Is On the Way, Economists Say (Oct. 29, 2004) ("Led by scrap steel costs, which soared 80 percent since last year, several key building materials have posted double-digit increases over the past 12 months. Steel mill products jumped 43 percent, lumber prices are up 27 percent, gypsum 20 percent and cement 6 percent.") (on file with author, *at* http://www.nahb.org).

46. IEA, OIL MARKET REPORT, Dec. 10, 2004, at 42 tbl.2, *at* http://omrpublic.iea.org/omrarchive/10dec04full.pdf. During the first quarter, China's growth in demand for crude oil was 19.3 percent higher than in the previous year; in the second quarter, it was 24.6 percent higher. *Id.*

47. EIA, CHINA COUNTRY ANALYSIS BRIEF (July 2004), *at* http://www.eia.doe.gov/emeu/cabs/china.html.

48. IEA, OIL MARKET REPORT, Nov. 10, 2004, at 48 tbl.2, *at* http://omrpublic.iea.org/omrarchive/10nov04full.pdf.

49. *Id.* OPEC, *supra* note 44, at 22 tbl.9; OPEC, MONTHLY OIL MARKET REPORT, Oct. 2004, at 17 tbl.6, *at* http://www.opec.org/home/monthly%20oil%20market%20reports/2004/mr102004.htm. *See* EIA, DOE/EIA-0202 , SHORT-TERM ENERGY OUTLOOK, Oct. 2004, *at* http://www.eia.doe.gov/pub/forecasting/steo/oldsteos/oct04.pdf.

50. Joanne Shore & John Hackworth, EIA, *World Petroleum Market Changes and Impact on U.S.*, slide 9 (Oct. 2004), *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/presentations/2004/opis0410/opis0410_files/frame.htm.

51. EIA, *Monthly Energy Chronology - 2004*, at December 2004, *at* http://www.eia.doe.gov/emeu/cabs/chrn2004.html (last modified Dec. 21, 2004).

52. *Id.* This was the first known attack on a maritime facility since the onset of the war in March 2003.

53. Other pipeline attacks also reduced Iraq's ability to supply crude oil. On May 8, 2004, for example, a southern oil pipeline halted pumping to offshore export terminals for approximately 10 days. On June 9, saboteurs exploded a portion of oil pipeline in northern Iraq, and exports to Ceyhan were suspended until June 23. Attacks also occurred on various pipelines, including an attack on September 14 that prevented delivery of 200,000 to 300,000 bpd for several weeks.

54. EIA, *supra* note 51.

55. IEA, *supra* note 46, at 15.

56. *Id.* at 16.

57. *See* Minerals Mgmt. Serv., U.S. Dep't of the Interior, *Release No. 3137, Hurricane Ivan Evacuation and Production Shut-in Statistics as of Thursday, September 16, 2004* (2004), *at* http://www.mms.gov/ooc/press/2004/press0916.htm.

58. "Shut-in" occurs when wells and mines capable of production are closed temporarily. Shut-in may occur during times of repair, cleaning, inaccessibility to a market, or weather-related conditions. EIA, *Energy Glossary*, § S, *at* http://www.eia.doe.gov/glossary/glossary_s.htm (last modified Mar. 4, 2005).

59. Minerals Mgmt. Serv., U.S. Dep't of the Interior, *Release No. 3207, Hurricane Ivan Evacuation and Production Shut-in Statistics as of Monday, November 29, 2004* (2004), *at* http://www.mms.gov/ooc/press/2004/press1129.htm. As of November 29, 196,222 bpd were still shut-in, *i.e.*, approximately 0.99 percent of the 19.7 million barrels consumed in the U.S. each day. Calculations of shut-in oil do not include production lost to the destroyed platforms. *Id.*

60. EIA, *supra* note 51, at September 2004.

61. EIA, NORWAY COUNTRY ANALYSIS BRIEF (Dec. 2003), *at* http://www.eia.doe.gov/emeu/cabs/norway.html; EIA, DOE/EIA-0340(03)/1, 1 PETROLEUM SUPPLY ANNUAL 2003, at 54 tbl.21 (2004) [hereinafter EIA, PETROLEUM SUPPLY], *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/0340301.pdf. Norway was the seventh largest oil producer in 2003. EIA, *Non-OPEC Fact Sheet*, "Top World Oil Producers, 2003," *at* http://www.eia.doe.gov/emeu/cabs/topworldtables1_2.html (last visited June 28, 2005).

62. EIA, *Non-OPEC Fact Sheet*, "Top World Oil Exporters, 2003," *at* http://www.eia.doe.gov/emeu/cabs/topworldtables1_2.html (last visited June 28, 2005). In 2003, Norway exported 3.02 million barrels per day.

63. IEA, OIL MARKET REPORT, Oct. 12, 2004, at 18, *at* http://omrpublic.iea.org/omrarchive/12oct04full.pdf.

64. *Id*.

65. EIA, PETROLEUM SUPPLY, *supra* note 61, at 54 tbl.21; EIA, *Top Suppliers*, *supra* note 9.

66. EIA, *supra* note 51, at September 2004.

67. Nigeria was the world's eleventh largest oil producer in 2003. EIA, NIGERIA COUNTRY ANALYSIS BRIEF (Aug. 2004), *at* http://www.eia.doe.gov/emeu/cabs/nigeria.html; EIA, PETROLEUM SUPPLY, *supra* note 60, at 54 tbl.21; EIA, *Top Suppliers*, *supra* note 8.

68. EIA, *supra* note 51, at September 2004. One of the strikes limited Nigeria's ability to import refined products (Nigeria has a poor refining infrastructure and has to import most of its gasoline) but not its ability to export crude oil. *Id*.

69. *Id.* In the middle of November, the Russian government moved ahead with plans to break up Yukos, announcing that it would auction off a majority stake in Yukos' main production unit. *Oil Prices Climb on U.S. Supplies* (WTOP Radio Network broadcast, Nov. 19, 2004).

70. EIA, *supra* note 51, at September 2004.

71. IEA, *supra* note 63. By September 2004, Nigeria increased its exports to 2.45 million barrels per day. From Nigeria's exports, the U.S. imported an average of over 1 million barrels per day. EIA, MONTHLY ENERGY REVIEW, Oct. 2004, at 51 tbl.3.3d, *at* http://tonto.eia.doe.gov/FTPROOT/multifuel/mer/00350410.pdf.

72. EIA, *A Big Wave or the Beginning of High Tide?*, THIS WEEK IN PETROLEUM, July 28, 2004, *at* http://tonto.eia.doe.gov/oog/info/twip/twiparch/040728/twipprint.html.

73. IEA, *supra* note 46, at 43 tbl.3.

74. *Id.* at 16-17.

75. EIA, *supra* note 38.

76. EIA, *Looking Into the Crystal Ball*, THIS WEEK IN PETROLEUM, Feb. 9, 2005, *at* http://tonto.eia.doe.gov/oog/info/twip/twiparch/050209/twipprint.html.

CHAPTER 3. SUPPLY, DEMAND, AND COMPETITION IN GASOLINE AT THE NATIONAL LEVEL.

I. INTRODUCTION.

We now move the focus from crude oil to gasoline. We first explore yearly average prices and other factors at the national level. A national perspective provides an important historical and current overview, revealing trends in gasoline prices, consumer demand, and gasoline supplies. Nonetheless, a national perspective will not capture important differences among regions and localities. Accordingly, in subsequent chapters, we address issues at both the regional and local levels.

A. The Cost of Acquiring Crude Oil Is Generally the Largest and Most Variable Component of the Retail Price of Gasoline.

A number of cost components – crude oil, refining, transportation, distribution and marketing, taxes, and profits – contribute to the retail price of a gallon of gasoline. This chapter examines how much each type of component contributes and which is most variable. Not surprisingly, over the last 20 years, crude oil generally has been the largest and most variable cost component of the retail price of gasoline. This finding aligns with the finding reported in Chapter 2 that, over the last 20 years, changes in crude oil prices explain 85 percent of the changes in retail gasoline prices in the U.S.[1]

B. For Most of the Past 20 Years, Real Annual Average Retail Gasoline Prices in the U.S., Including Taxes, Have Been Lower than at Any Time Since 1919.

This chapter examines both real and nominal annual average retail gasoline prices, excluding and including taxes, in the U.S. over various time periods. "Real" prices are adjusted for inflation and therefore reflect the different values of a dollar at different times; they provide more accurate comparisons of prices in different time periods. We also report the more familiar, "nominal" prices – that is, literal prices shown at the time of purchase – over the years. Prices that exclude taxes give a better sense of market dynamics, because gasoline taxes vary from state to state and are not set by market forces.

The data show that, for the last 20 years, real national annual average retail prices for gasoline, including taxes, have generally been below $2.00 per gallon. By contrast, between 1919 and 1985, real national annual average retail gasoline prices were above $2.00 per gallon more often than not. If taxes are excluded, the data show that real annual average retail gasoline prices in the U.S. did not rise above $1.20 per gallon between 1986 and 2003, and the 2004 real annual average retail gasoline price in the U.S. – $1.44 per gallon – remains well below the 1981 high of $2.10 per gallon.[2] Average U.S. retail prices, including taxes,[3] have been increasing since 2003, from an average of $1.56 in 2003 to an average of $2.04 in the first five months of 2005, but it is difficult to predict whether these increases represent the beginning of a longer term trend.[4]

C. Between 1984 and 2004, U.S. Demand for Gasoline Increased Substantially, Yet Average Annual U.S. Retail Gasoline Prices Remained Relatively Stable.

During the 1980s, U.S. gasoline consumption remained at or below the level of 1978, when U.S. daily gasoline consumption averaged 7.4 million barrels per day. During the 1990s, however, U.S. gasoline consumption rose steadily, from about 7.2 million barrels per day in 1990 to 9.1 million barrels per day in 2004.

A comparison of average annual retail gasoline prices and average annual retail gasoline consumption in the U.S. from 1984 through 2004 shows that, in general, gasoline prices were surprisingly low despite this significantly increased demand. As Chapter 1 explains, if gasoline demand rises significantly, then gasoline prices also will rise significantly, unless producers supply more gasoline that meets the increased demand. Producers' supply responses were among the factors contributing to relatively stable gasoline prices during this time period, suggesting that U.S. refiners found cost-efficient means to meet consumer demand. This chapter details some of the methods they used to do so, including expanding capacity and making substantial investments in more efficient processes. The data also show increases in imports of gasoline from 1992 through 2004 and relatively stable crude prices as factors contributing to relatively stable gasoline prices.

D. EPA Estimates that Increased Environmental Requirements Have Likely Raised the Retail Price of a Gallon of Gasoline from 4 to 8 Cents per Gallon in Some Areas.

This chapter also reviews environmental requirements that have required significant and expensive refinery upgrades, particularly over the past 15 years.

II. A VARIETY OF COSTS CONTRIBUTE TO THE RETAIL PRICE OF GASOLINE.

A. The Costs of Supplying Gasoline to Consumers.

To supply gasoline to consumers, a producer must acquire crude oil and transport it – usually by ship or pipeline – to a refinery. The refinery processes the crude oil into various petroleum products, typically including motor gasoline. *See* Box 3-1. From a refinery, gasoline travels – usually by pipeline, ship, or barge – to a distribution point known as a terminal that has storage tanks and dispensing equipment, referred to as "racks," for use in transferring gasoline

> *Box 3-1: Refining Gasoline*
>
> Refiners process crude oil into a variety of products, such as gasoline, jet fuel, diesel fuel, lubricants, and other refined petroleum products. Demand for those products dictates how refineries process crude oil. Motor gasoline for transportation continues to represent by far the largest share of the refined petroleum products that U.S. refineries produce – 39 percent of total refined products supplied in 1978, and 44 percent in 2004, as measured on a daily basis. *See* EIA, OIL MARKET BASICS, *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_basics/default.htm (last visited June 28, 2005).

from storage tanks to trucks. At the terminal, gasoline may be sold to independent wholesalers, known as "jobbers." Jobbers then deliver the gasoline to retailers, which in turn sell the gasoline at their gas stations. Alternatively, gasoline may continue through a refiner's retailing system, for distribution and marketing to consumers at its brand-name retail gas stations.

Various state and local taxes can represent a large share of the retail price of gasoline. In 1998, for example, when crude oil prices dipped, state and local taxes represented the largest component of the retail price of gasoline. We discuss taxes below in relationship to other major costs. By contrast, transportation costs for both crude oil and gasoline generally represent a much smaller share of the retail cost of a gallon of gasoline than other costs; they are discussed later.

Figure 3-1 shows the contribution of each of the major cost components to the nationwide average retail price of gasoline by month from 1991 to August 2004. In Figure 3-1, starting from the bottom of the figure:

- "Taxes" include federal and state excise taxes and ad valorem state taxes. As shown in Figure 3-1, taxes remained fairly constant over this period.

- "Distribution and Marketing Costs and Profits" is the difference between average spot prices (*see* Box 3-2) and the average retail price of gasoline (excluding taxes). In other words, it approximates the costs of storage, distribution, marketing, and other costs involved in buying products at the refinery level and selling them at retail stations, plus profits. Distribution and marketing costs and profits also include some of the costs of transporting gasoline from the refinery to the terminal.

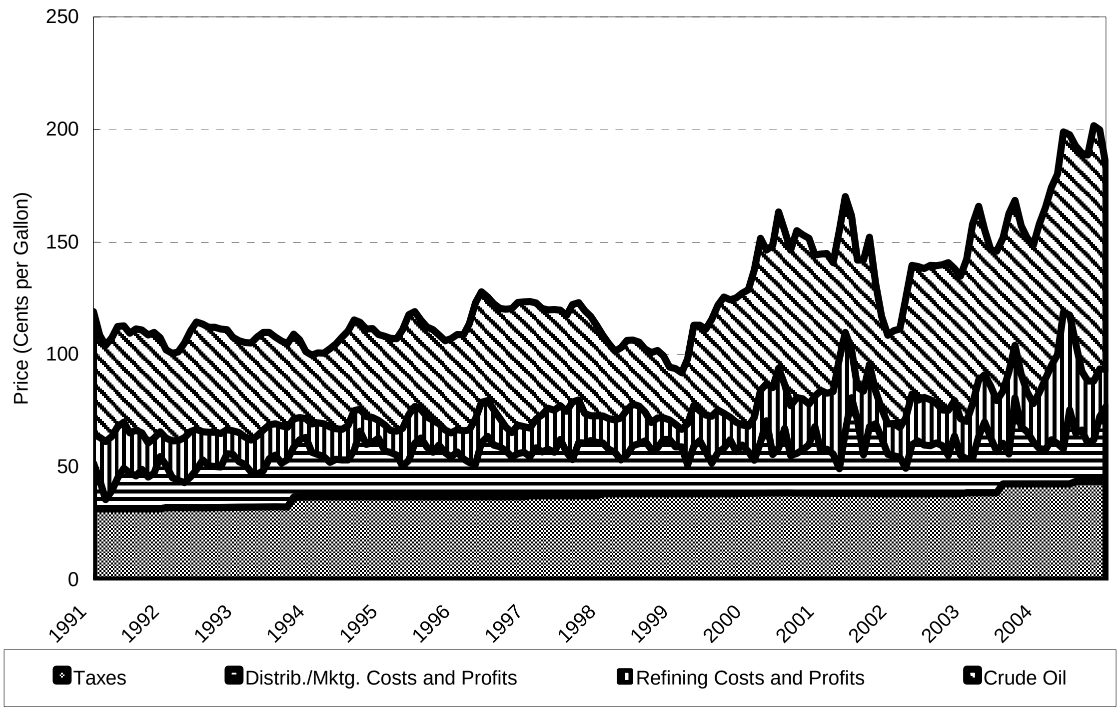
- "Refining Costs and Profits" is the difference between the average per-gallon cost of crude and a weighted average of U.S. spot prices. In other words, it includes all refining and other costs (other than the acquisition cost of crude oil) involved in making refined products from crude oil and selling them on the spot market, plus profits.

- "Crude Oil" is the average per-gallon acquisition cost of crude by all U.S. refineries as reported to the Energy Information Administration (EIA).

Box 3-2: Spot Prices

A "spot" price is the market price for the one-time sale of a specific amount of product at a fixed location – for gasoline, spot market sales usually involve quantities of thousands of barrels and occur at convenient transfer points such as refineries, ports, or pipeline junctions. These prices are commonly reported by price reporting services. A "rack" price is the market price for the sale of a truckload (typically about 8,000 gallons) at a truck rack at a terminal, or possibly a refinery. When independent gasoline purchasers called jobbers buy gasoline, they typically pay what are referred to as "rack" prices. Both "spot" and "rack" prices typically vary from day to day.

Figure 3-1: Components of Nominal Retail Gasoline Prices (1991-2004)



Source: EIA

B. Crude Oil Is Generally the Largest Component of the Retail Price of Gasoline.

Each of the previously discussed components contributes varying amounts to the retail price of gasoline, as shown in Figure 3-1 and illustrated in the calculations that follow.[5] The national annual average nominal price of regular gasoline from 1991 through 2004, *including* taxes, was $1.26 per gallon. Over that time period, crude oil on average contributed $0.51 to, or 39.4 percent of, the price of a gallon of gasoline at retail. Thus, crude oil on average was the largest component of the retail price of gasoline during that time period.

From 1991 through 2004, taxes were the second largest contributor to the national annual average price of retail gasoline, on average contributing $0.37 to, or 30.3 percent of, the price of a gallon of gasoline. The contribution that taxes make varies significantly from state to state, however.[6] In addition, some local governments impose gasoline taxes.

The third largest contributor, from 1991 through 2004, was distribution and marketing costs and profits, which averaged $0.20, or 16.3 percent of the nominal price of a gallon of gasoline. The fourth largest contributor to the retail price of gasoline was refining costs and profits, which average $0.18, or 14 percent of the nominal price of a gallon of gasoline.

C. The Cost of Acquiring Crude Oil Varies More Widely than the Other Major Costs.

Measured on a monthly basis, the nominal cost to acquire a gallon of crude oil has ranged between a low of $0.23 in December 1998 and a high of $1.13 in October 2004. The average acquisition cost of crude oil between 1991 and 2004 was $0.51 per gallon. The standard deviation was fairly large – $0.16 per gallon. A relatively large standard deviation indicates significant variations in crude acquisition costs, with more crude acquisition costs lying further from the average of $0.51 than close to the average. *See* Box 3-3.

Refining costs and profits have the second highest variability, with a standard deviation of a little less than $0.08 per gallon. That standard deviation is half the size of the standard deviation in crude oil, indicating that refining costs and profits have been much less variable than crude oil acquisition costs. The standard deviation for the costs of distribution and marketing is even smaller – a little over $0.05 per gallon.

Finally, taxes, which contribute the second largest amount to retail prices, have the lowest standard deviation, at about $0.03 per gallon. This low variability is not surprising; most gasoline taxes are expressed in cents per gallon, not as a percentage of the price of gasoline, and gasoline taxes have changed relatively little in the last decade.

Box 3-3: What Do the "Mean" and "Standard Deviation" Reveal?

In statistics, the mean is the average of a number of observations of real-world data. For example, the mean of $1.48 and $1.52 is $1.50. That same number – $1.50 – is also the average of $1.00 and $2.00, however. To show such differences, statisticians calculate the "standard deviation," which measures how close to the mean individual observations are. If all of the observations are very close to the mean, then the standard deviation will be small. If the observations are spread over a larger range around the mean, the standard deviation will be larger.

The concept of standard deviation can be used to determine whether a particular observation of real-world data is unusual. For example, if prices of gasoline averaged $1.50, and were normally between $1.48 and $1.52, an observation of $1.51 would be expected, but an observation of $1.90 would not. The standard deviation helps to determine mathematically whether, based on the rest of the data, a particular observation is atypical.

D. Increases and Decreases in Crude Oil Prices Pass through to Wholesale and Retail Prices.

This section discusses studies that have examined how quickly and to what extent manufacturers and wholesalers pass on to their customers increases and decreases in the prices of inputs. As discussed above, the price of crude oil is the main factor influencing the retail price of a gallon of gasoline. Some observers perceive a "rockets and feathers" phenomenon, in which retail gasoline prices rise rapidly after a crude oil price increase, but drift downward slowly when the price of crude decreases. This phenomenon has also been labeled "asymmetric pass-through" and "asymmetric price adjustment," meaning that retail prices rise more readily than they decrease in response to changes in input costs.

Studies have examined multiple industries to assess whether and to what extent the "rockets and feathers" phenomenon exists. A study published in 2000 examined prices in over 200 industries (for both producer and consumer goods) and found evidence of asymmetric price adjustments in more than two of every three markets examined.[7] The asymmetric response to cost shocks occurred as frequently in producer-good markets (such as agriculture, lumber, and chemicals) as it did in consumer-good markets (such as alcoholic beverages, fuel, and household durables).

The 2000 study found "[p]rice asymmetry is as characteristic of 'competitive' as 'oligopoly' market structures," and "[i]t is found where the buyers are numerous and unsophisticated consumers as well as where they are large and presumably sophisticated industrial purchasers."[8] The only regularity the study did find was "that more volatile input prices are associated with less price asymmetry."[9]

The results of the studies examining asymmetric pass-through in wholesale and retail gasoline markets vary. Some studies found a small degree of asymmetry, either in the amount of a price change passed through (amount asymmetry) or in the timing of the pass-through (pattern asymmetry), at one or more levels of the distribution chain (refinery, wholesale, or retail).[10] Other studies found no evidence of either pattern or amount asymmetry at any level.[11] For example, a recent research paper by the EIA examined the connection between crude oil and gasoline pricing.[12] According to the EIA research paper, the data did not suggest evidence of asymmetric pass-through in terms of price levels or timing. The results of these studies may differ due to differences in the methodologies used. One study suggests that changing the frequency of the price data – in this case, switching from weekly average prices to daily average prices– leads to different results.[13]

To the extent that asymmetric pass-through may occur, a number of plausible explanations exist. Some theorize that it could arise from an exercise of market power or collusion by refiners, wholesalers, or retailers,[14] although its presence in competitive, as well as oligopolistic markets,[15] suggests the "rockets and feathers" phenomenon by itself does not signal market power or collusion. Other market-based explanations rely on how and when consumers search for lower gasoline prices, how they react to price increases and decreases, and how firms are affected by this consumer behavior.[16] For example, one model predicts that when consumers observe higher prices as compared against the last purchase price, all consumers choose to search, and prices are constrained to marginal cost increases.[17] The model then predicts that, by contrast, when consumers observe prices that are lower relative to last price paid, each consumer perceives "only a small probability that he will find an even lower price by searching," and thus fewer consumers search for cheaper gasoline prices.[18] When fewer consumers search, there is less competition between gas stations. According to this model, even though margins are high, "consumers are not searching, so firms are unable to attract more customers by lowering price."[19]

Another paper asserted that the cost of an intensive search is likely to be higher for most consumers than the corresponding gains from finding a cheaper price for gasoline. Thus, according to this paper, consumers do not search for cheaper gasoline unless the price differential is very high.[20] The authors also argue that if consumers accelerate their gasoline purchases to beat further increases when gasoline prices are rising, they increase demand and quicken the pace at which prices rise.[21] If consumers do not then slow their purchases when prices decline, then the price of gasoline will fall more slowly than it rose.[22]

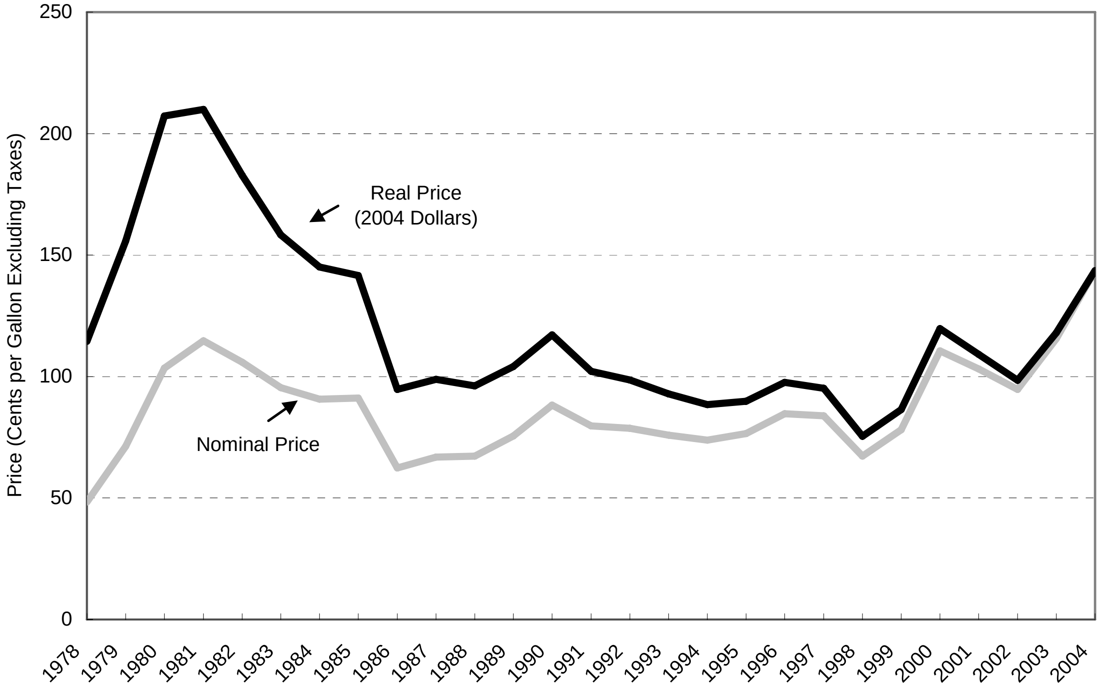
III. THE U.S. IS JUST EMERGING FROM 20 YEARS OF THE LOWEST REAL AVERAGE ANNUAL RETAIL GASOLINE PRICES SINCE 1919.

This section examines annual average retail gasoline prices in the U.S. over a variety of time periods. The data in Figure 3-2 cover 1978-2004. The data exclude taxes, because gasoline taxes vary from state to state and are not determined by market dynamics. The top line of prices adjusts for inflation and therefore reflects "real" prices in 2004 dollars. The lower line reports "nominal" prices – that is, prices actually paid – over the years.

A. Real and Nominal Annual Average Retail Gasoline Prices in the U.S., <u>Excluding Taxes</u>, from 1978 to 2004.

As shown in Figure 3-2, the real national average annual price of a gallon of gasoline at retail – excluding taxes – peaked at $2.10 per gallon in 1981, then dropped steadily to around $0.95 per gallon by 1986. Throughout most of the 1990s, the national average annual retail price of a gallon of gasoline remained within a range between $0.80 and $1.05 per gallon.[23] In 2000, the average annual retail gasoline price increased to $1.20, then moderated somewhat in 2001-2002. In 2003, the national annual average price rose again, this time to $1.18 per gallon.

Figure 3-2: U.S. Annual Average Nominal and Real Gasoline Prices, Excluding Taxes (1978-2004)



Source: EIA, BEA

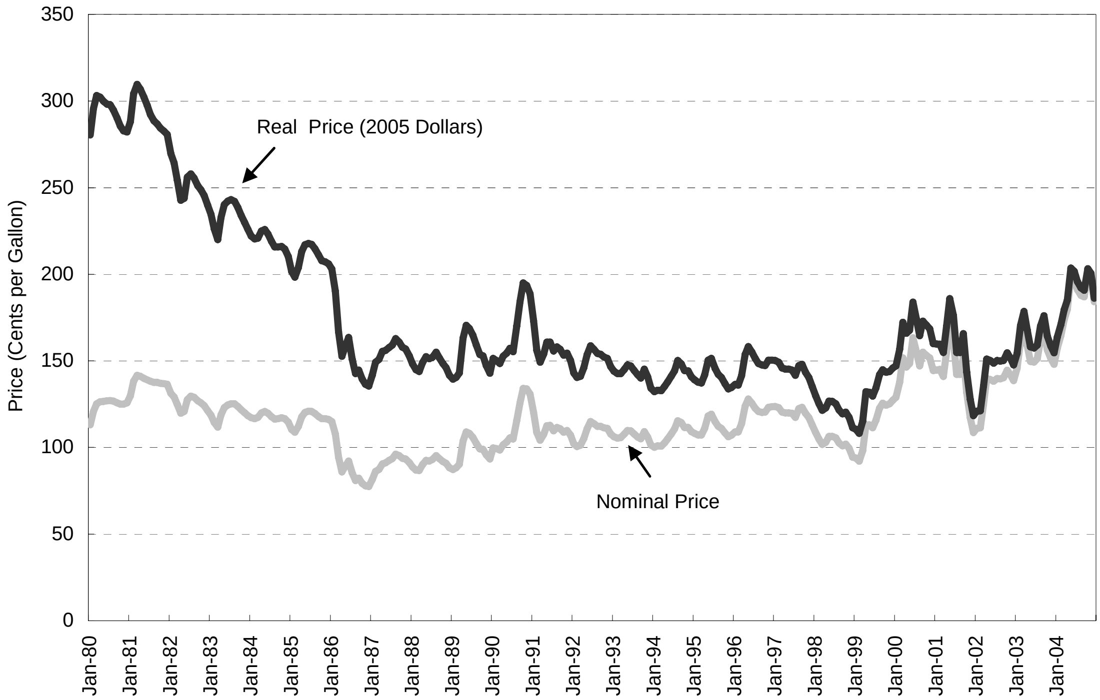
In 2004, the national annual average retail price per gallon of gasoline rose sharply to $1.44. Adjusted for inflation, this is the highest national annual average retail price per gallon since 1984. Nonetheless, the 2004 national annual average retail price per gallon of $1.44 remains well below the 1981 high of $2.10 per gallon, as well as the annual averages of $1.83 and $1.58 per gallon in 1982 and 1983.

In sum, Figure 3-2 shows that the annual average retail price for regular gasoline in the U.S. – adjusted for inflation and excluding taxes – did not rise above $1.20 per gallon between 1986 and 2003. Relative to earlier periods, these average prices, in general, were surprisingly low.

B. Real and Nominal Annual Average Retail Gasoline Prices in the U.S., Including Taxes, from 1978 to 2004.

Adding state and local taxes to the data confirms the observation above that state and local gasoline taxes can add a significant amount. For example, from 1991 to 2004, at the national level, taxes averaged 30 percent of the total retail price. For 2004, the real annual retail price per gallon of gasoline excluding taxes was $1.44, but if taxes are included, the price was $1.85. This is still just about $1.00 below the 1981 national annual average retail price per gallon – including taxes – of $2.94, however. *See* Figure 3-3, showing Monthly Regular Gasoline Prices, Nominal and Real. Figure 3-3 uses monthly data rather than annual data to illustrate the greater variability in real and nominal prices depending upon which averages are used. Both annual and monthly data are useful, and they help illustrate slightly different perspectives on the same data.

Figure 3-3: U.S. Monthly Average Nominal and Real Retail Regular Gasoline Prices (1980-2004)

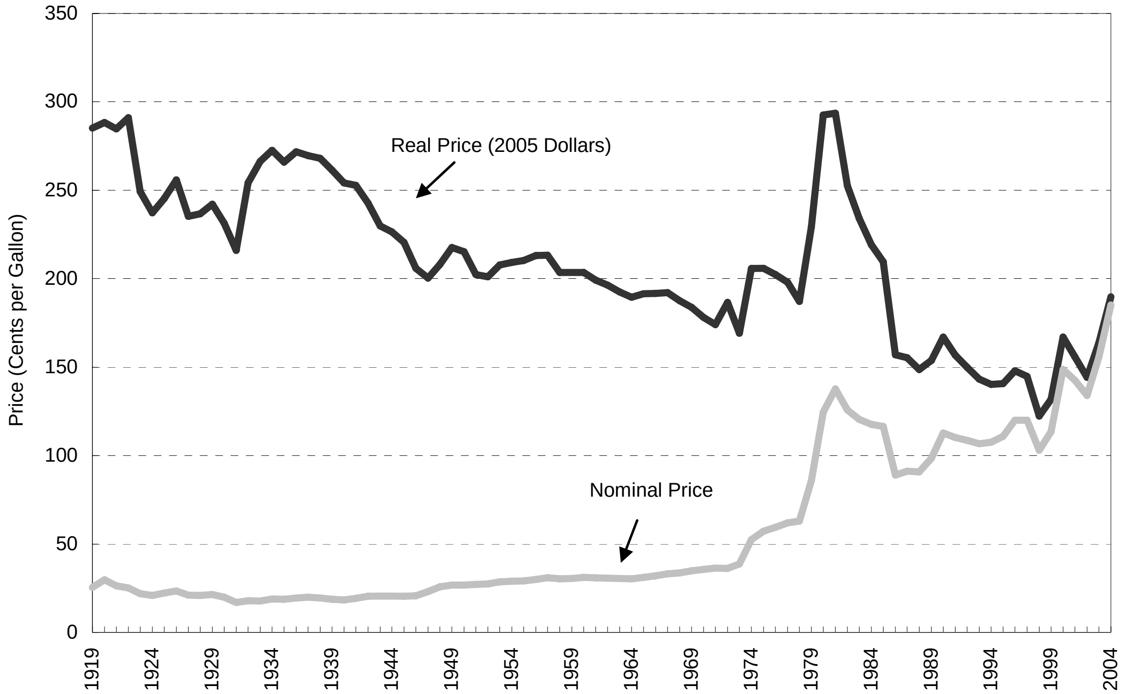


Source: EIA, BEA

C. Real and Nominal Annual Average Gasoline Prices in the U.S., Including Taxes, from 1919 to 2004.

Looking further back in time reveals the U.S. annual average retail gasoline prices in the 1990s as low relative to prices in earlier decades. Figure 3-4 shows real U.S. average annual retail gasoline prices – once again, including taxes – from 1919 through 2004. In real terms – that is, in terms of the price of a gallon of gasoline in relation to the value of a dollar – the data show gasoline prices from 1986 through 2003 were at their lowest levels since 1919. From 1919 until around 1960, real U.S. annual average retail gasoline prices were above $2.00 per gallon. Between 1960 and 1978, real U.S. annual average retail gasoline prices were between $1.65 and $2.10 per gallon. The price spikes of the early 1980s, however, drove annual average prices to almost $3.00 per gallon.

Figure 3-4: U.S. Annual Average Nominal Real Gasoline Retail Prices (1919-2004)

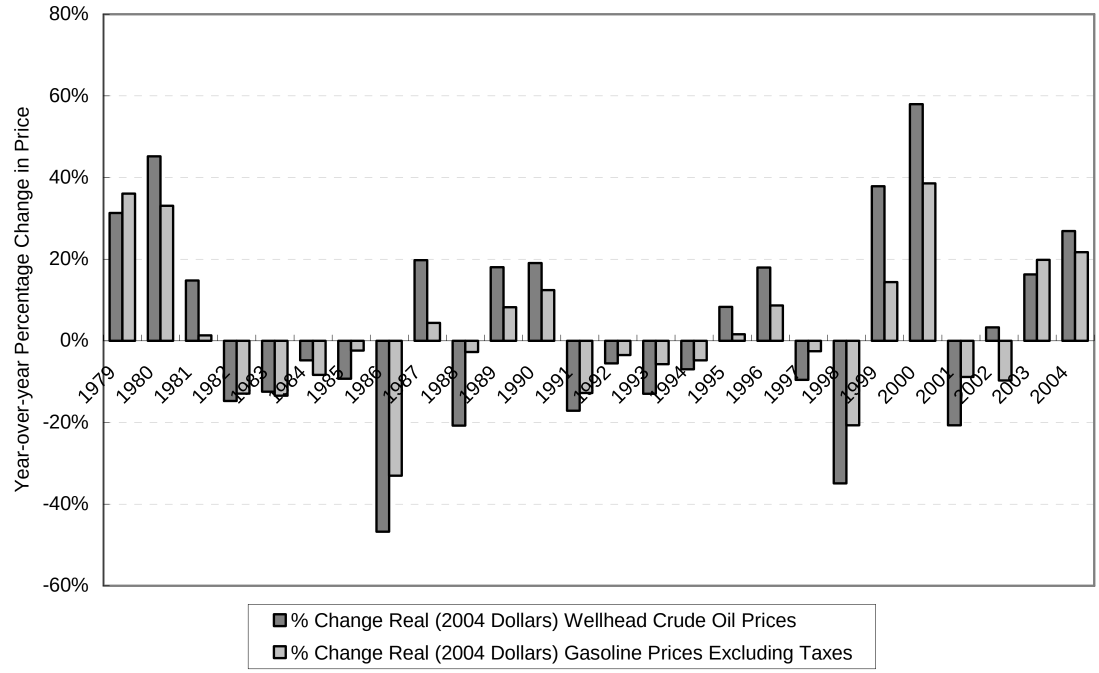


Source: EIA, BLS

D. Year-by-Year Percentage Price Changes from 1979 through 2004.

Finally, Figure 3-5 reports the year-by-year percentage changes for real U.S. annual average retail gasoline prices (excluding taxes) and real wellhead crude oil prices for each year from 1979 through 2004. For that time period, the real U.S. average annual retail gasoline price fell below the prior year's price just as often as it rose, although price drops tended to represent smaller percentages than price increases. In addition, in all years except 2002, gasoline and crude oil prices changed in the same direction, although not by exactly the same percentages.

Figure 3-5: Yearly Real Price Changes for Crude Oil and Gasoline, 1979 to 2004 (2004 Dollars)



Source: EIA, BEA

E. Price Trends for 2005.

With the beginning of 2005, average retail gasoline prices were increasing relative to 2004 levels. The average retail price of gasoline (including taxes) was $2.04 per gallon during the first 5 months.[24] This is higher than the first five months of 2004 when the average retail gasoline price (including taxes) was $1.75.[25] While it is impossible to predict the future, to date, 2005 average retail gasoline prices continue to be significantly higher than over the past 20 years. Additionally, current crude oil futures contracts for delivery through 2010 are over $57 per barrel, [26] indicating that retail gasoline prices may continue to be higher than over the past 20 years.

In sum, the data in Section III show that, for the period from 1985 through 2003, real annual average retail gasoline prices in the U.S. are below those of the previous 40 years and fell below the prior year's prices as often as they rose above them. It is difficult to predict whether U.S. real annual average retail gasoline prices will rise or fall in the future, but the information for 2004 and early 2005 shows higher retail gasoline prices relative to the last 20 years.

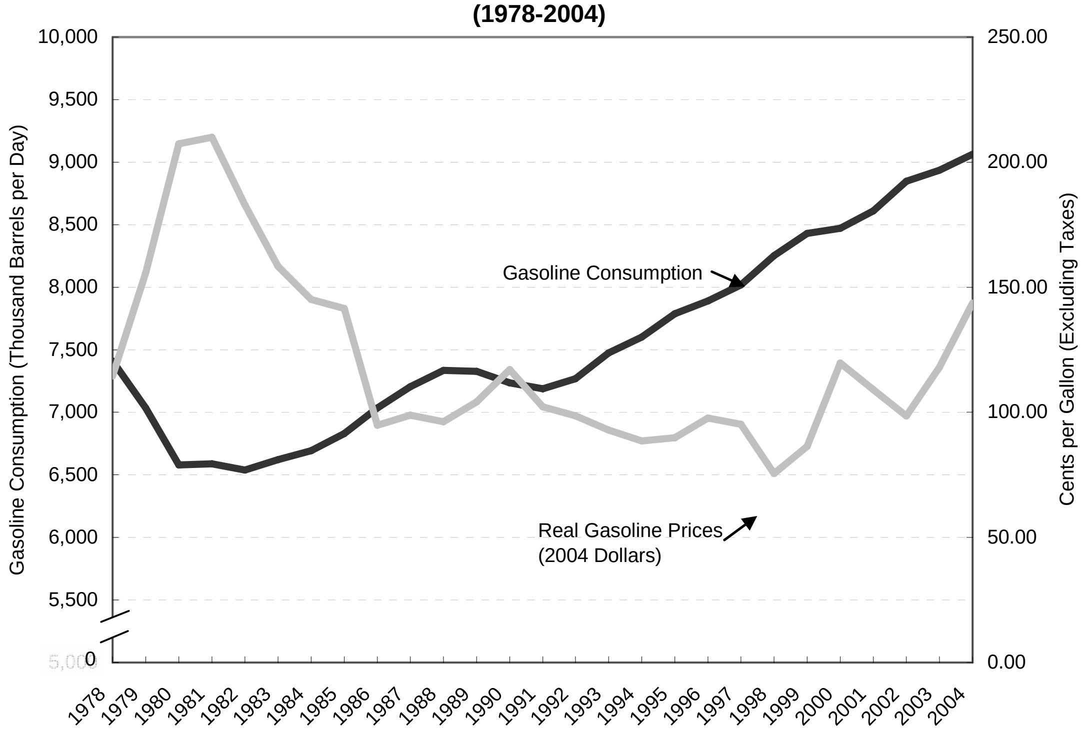
IV. INCREASED GASOLINE SUPPLY FROM U.S. REFINERIES AND IMPORTS HAS HELPED TO MEET INCREASED U.S. DEMAND FOR GASOLINE AND KEEP GASOLINE PRICES RELATIVELY STEADY.

As we discussed in Chapters 1 and 2, increased demand for a product can raise prices. Prices rise until supply is sufficient to meet demand, and an equilibrium price is reached. In this section, we examine U.S. consumers' increased consumption of gasoline over the past 25 years, and how refiners increased supply over that period to meet increased demand. We also review recent increases in gasoline imports to meet increased U.S. demand.

A. U.S. Consumer Demand for Gasoline Has Risen Substantially, Especially Since 1990.

In 1978, U.S. gasoline consumption was about 7.4 million barrels per day. Only a couple of years later, in the face of sharply escalating crude oil and gasoline prices and a recession, U.S. gasoline consumption had fallen by roughly a million barrels per day, averaging about 6.5 million barrels per day in 1981. Over the longer run, high crude oil prices had prompted oil consumers to change their behavior and had reduced worldwide demand for crude oil. Nonetheless, as shown in Figure 3-6, this trend gradually reversed over the course of the 1980s. As gasoline prices began to fall, U.S. consumption of gasoline began to rise once again toward the same levels as in the late 1970s.

Figure 3-6: U.S. Annual Average Gasoline Consumption and Real National Gasoline Prices (1978-2004)



Source: EIA, BEA

By the early 1990s, U.S. gasoline consumption had surpassed earlier levels, increasing at a fairly steady rate since 1993. In 1993, U.S. gasoline consumption rose above 1978 levels. In 2004, U.S. gasoline consumption had risen to an average of about 9 million barrels per day. U.S. gasoline consumption has continued to rise, with the EIA forecasting demand at an average of 9.2 million barrels per day in 2005.[27]

With steadily increasing U.S. demand for gasoline through the 1990s, one might expect to see rising gasoline prices in the U.S. during that time period. Instead, for most of the last 25 years, real U.S. annual average retail gasoline prices have remained relatively stable. *See* Figure 3-6. For example, U.S. annual average gasoline prices in real terms were very similar in 1990 and in 2000 – about $1.20 per gallon, excluding taxes, in 2004 dollars. This price similarity occurred even though U.S. gasoline consumption was very different in each of those years – about 7 million barrels per day in 1990 and about 8.5 million barrels per day in 2000. Furthermore, as discussed below, the quality of gasoline in the U.S. increased over this time due to increased environmental standards that increased refining costs.

Increased demand will not raise prices if supply increases sufficiently to meet demand at current prices. Thus, the relative stability of U.S. annual average gasoline prices suggests that gasoline supplies increased sufficiently to meet increased demand at real prices within the same range as those when demand was less. This relative stability further suggests that U.S. refiners were able to increase supply efficiently. Increased gasoline imports and relatively stable crude prices also appear to have contributed to relatively steady gasoline prices during the 1990s.

B. U.S. Refiners Have Increased Gasoline Supplies and Captured Cost Savings Over the Past 20 Years.

U.S. refinery production has generally kept pace with these increases in demand, meeting 93 percent of annual U.S. demand on average.[28] As a general matter, refineries can increase their capacity to refine crude oil and capture cost savings through a variety of means. One is to build new refineries or add new units to existing refineries to process additional crude oil. Another is to increase the amount of refined product that can be produced from the same amount of crude oil input. A third is to run refineries at higher levels of output. The data discussed in the next section show that U.S. refiners have used all of these methods – except building new refineries – in recent years.

1. Rather than build new refineries, U.S. refiners have increased the average size and capacity of existing refineries.

Between 1985 and 2005, U.S. refineries increased their total capacity to refine crude oil into various refined petroleum products by 10.3 percent, moving from 15.7 million barrels per day in 1985 to 17.3 million barrels per day in 2005. Most of this new capacity came into operation after 1998.[29] This increase – approximately one million barrels per day – is roughly equivalent to adding approximately 10 average-sized refineries to industry supply. U.S. refiners did not build any new refineries during this time, however. Rather, they added this capacity through expansion of existing refineries. *See* Box 3-4.

Box 3-4: No New U.S. Refineries for Gasoline Since 1976, But One Is Now Planned.

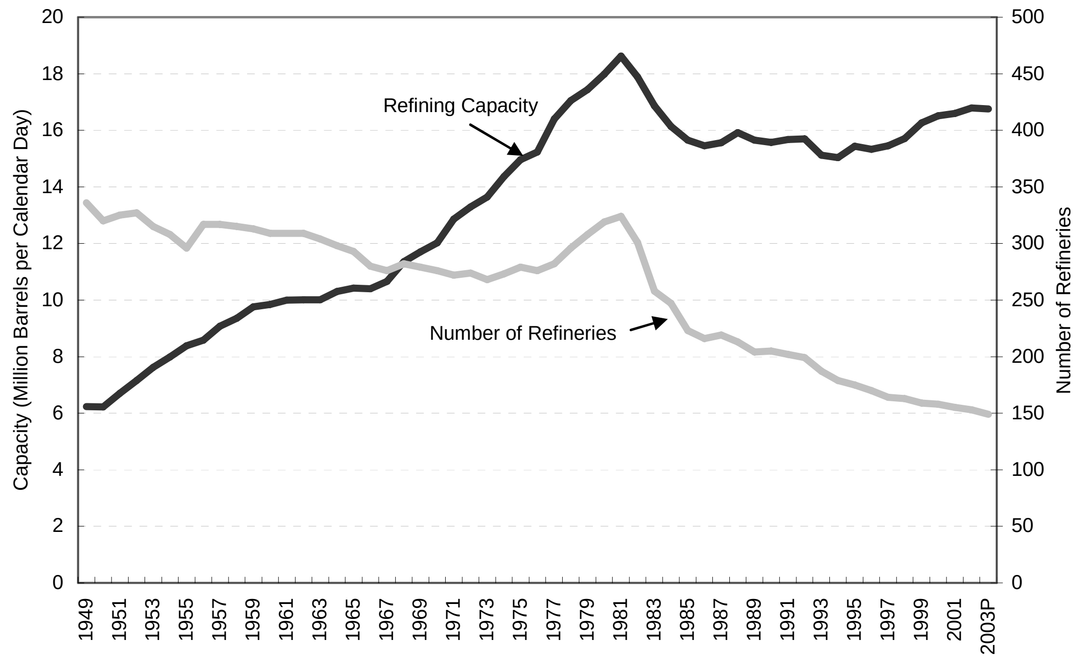
Since 1976, no new refinery has been built in the U.S. with the primary purpose of producing gasoline. Of the variety of factors that likely contributed to this, one may be economies of scale. Because an existing refinery may become more efficient by becoming larger (up to a certain point), it may make more economic sense to expand existing refineries than to build a new one. Another factor may be declining U.S. crude oil production. In earlier years, U.S. refiners often sited refineries near crude production facilities to reduce transportation costs and ensure a steady supply. The opportunities for such economies have declined with the decline in U.S. crude production. Other factors likely include costly and extensive permitting and licensing requirements mandated by various federal, state, and local environmental and other laws, as well as community opposition. In addition, relatively low refinery profitability may not justify the investment required to surmount these hurdles. The EIA reports that, from 1977 to 2003, the return on investment in refining and marketing assets averaged 6 percent per year. This is just over one-half the average return on investment in crude oil production assets (10.3 percent) and pipeline assets (10.9 percent) during the same time period. *See* PETROLEUM MERGER REPORT 72, 193-95 (updated with EIA data through 2003).

Although new entry into refining in the U.S. has been widely regarded as very unlikely, plans for a new refinery in Arizona are now moving forward. The output of such a refinery could ease West Coast gasoline prices. *See* Tony Illia & Tom Armistead, *$2-Billion Petroleum Refinery in Arizona Would Be First in 28 Years*, MCGRAW HILL CONSTRUCTION ENGINEERING NEWS-RECORD, Nov. 1, 2004, *at* http://www.construction.com/NewsCenter/Headlines/ENR/20041101e.asp.

a. Historical background: government regulations in the 1970s encouraged excess crude oil refining capacity and overbuilding of U.S. refineries.

Figure 3-7 shows total U.S. crude refining capacity on a yearly basis for 1949-2004. Between 1949 and 1969, total crude oil refining capacity gradually increased, from 6.2 million barrels per day in 1949 to 11.7 million barrels per day in 1969. The number of U.S. refineries during that period generally declined, from 336 refineries in 1949 to 279 in 1969.

Figure 3-7: U.S. Refining Capacity (Atmospheric Crude Distillation) and Number of Operable Refineries (1949 to 2003)



Source: EIA

The 1970s, by contrast, saw rapid increases in both total crude refining capacity and the number of refineries. In 1973, total U.S. crude refining capacity was 13.6 million barrels per day, produced by 268 refineries. By 1981, total U.S. crude refining capacity had peaked at 18.6 million barrels per day, produced by 324 refineries.

During that time, government controls on crude oil prices and allocation favored small refineries, which provided incentives for companies to open and operate small, inefficient refineries, including many that produced little or no gasoline.[30] After the government controls were eliminated in 1981, a large number of small, inefficient refiners exited over the course of a number of years. By 1991, the total refining capacity of U.S. refineries was reduced to 15.7 million barrels per day, and the number of U.S. refineries had fallen to 202.[31]

b. General trends: the increased size and capacity of an average U.S. refinery reflect economies of scale.

Over the entire 55-year time period from 1949 to 2004, one trend remained relatively constant: the average crude refining capacity of a U.S. refinery has continually increased. This trend goes back at least as far as 1918, when the average refinery capacity was only about 5,000 barrels per day.[32] In 1949, the average U.S. refinery could process only 18,500 barrels of crude per day. By 1969, that had increased to 41,900 barrels of crude per day. During the period of government controls favoring small, inefficient refineries, the average refining capacity of a U.S.

refinery did not rise above 60,000 barrels of crude per day, but average refinery capacity rose quickly once the controls were lifted:

- 1983 – 65,300 barrels per day;
- 1993 – 80,900 barrels per day; and
- 2003 – 112,500 barrels per day.

By 2004, the average total refining capacity of a U.S. refinery had reached 113,400 barrels per day.[33]

The increased average capacity reflects the cost savings known as "scale economies" that are available to larger refineries. All else equal, scale economies make larger refineries more efficient than small refineries. A variety of references place the minimum efficient scale for a refinery – that is, the smallest size at which most cost savings from larger size are achieved – between 150,000 and 200,000 barrels per day.[34] This range is roughly equivalent to the range suggested by a survey of refinery operating costs in 1998,[35] and coincides with the minimum efficient scale identified during the FTC's hearings on these issues.[36] *See* Box 3-5.

Despite the trend toward greater average size, there remains a wide range in capacities among operating refineries. The largest U.S. refinery had a capacity of 557,000 barrels per day as of January 2004,[37] on the other hand,14 refineries still were operating with capacities of 10,000 barrels per day or less during 2004.[38] A small refinery's cost disadvantages from small-scale operation may be offset if it is located near an area of crude oil production or strong gasoline consumption, so that transportation costs are low, or if it is able to serve a niche market.[39] Nonetheless, the general trend toward larger refineries suggests that such offsetting factors are becoming less important.[40]

Box 3-5: Trend Toward Fewer, Larger Refineries

As the average size and sophistication of U.S. refineries have grown, the number of U.S. refineries has declined. The number of operable refineries in the U.S. fell from 223 in 1985 to 149 in 2004, continuing a general trend of at least 60 years. Most refinery closures have involved small, relatively unsophisticated refineries. In addition to being small, many of the closed refineries could not produce higher-valued refined products. The National Petroleum Council found that about half of the refineries closed between 1990 and 1999 did not have facilities normally associated with producing finished gasoline. Some recent closures have related to large investments required to meet new fuel specifications. For example, in 2001, Premcor closed its Blue Island, Illinois refinery, with a crude distillation capacity of about 76,000 barrels per day, because it would have had to invest about $70 million to meet new refined product specifications. *See generally* PETROLEUM MERGER REPORT, *infra* note 23, at 181-82.

2. U.S. refineries have adopted more efficient technologies and business methods.

U.S. refiners have found processing methods that broaden the range of crude oils that they can process and allow them to produce more refined product for each barrel of crude processed. In addition, they have lowered inventory holdings, thereby lowering inventory costs.

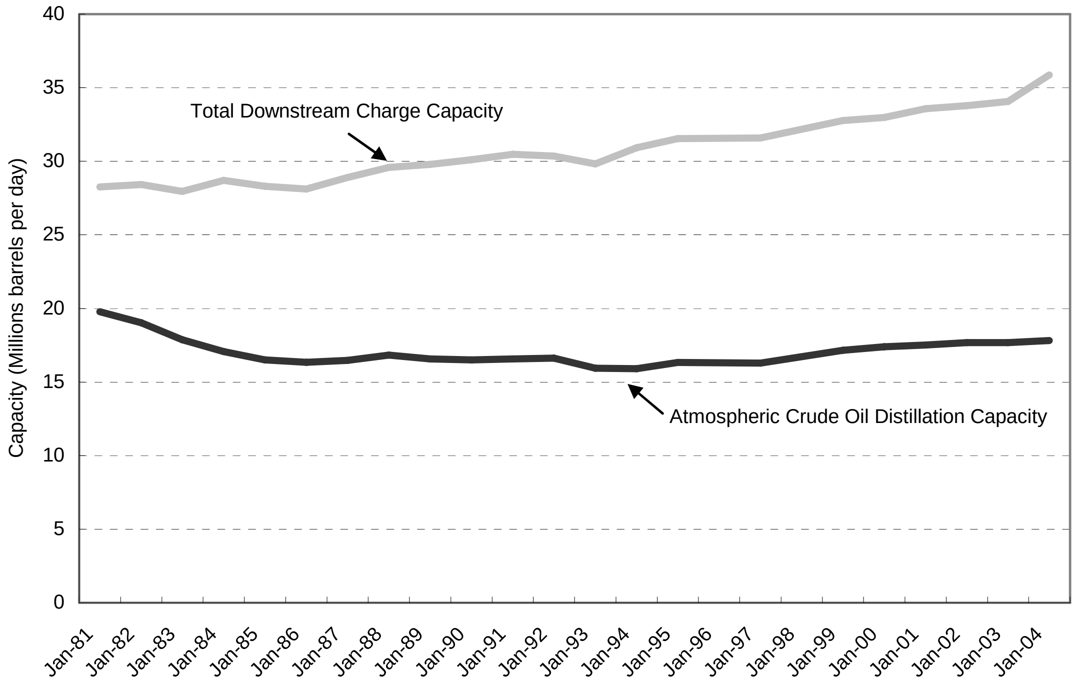
a. Downstream processing units have increased refineries' abilities to process different kinds of crude and produce more high-value refined product for each barrel of crude processed.

One way to assess a refiner's capacity is to measure its capability to process crude oil by *atmospheric distillation*, which involves the separation of crude oil fractions by heating and cooling. This is the most basic and least sophisticated of refinery processes. The capacity of a refinery's *downstream processing units*, which break down, build up, or otherwise treat the hydrocarbon molecules in crude oil, also influences a refinery's production capabilities, however. Nearly all refineries have both atmospheric distillation and downstream processing units.

Downstream processing units enable a refinery to use a wider array of crude oils, including lower-quality, lower-priced crude oil. For example, new technology in downstream processing has given some refineries the ability to make high-value products from sour crude.[41] This enlarges the universe of potential crude oil suppliers.[42] In addition, increased downstream capabilities generally allow refiners to make a greater amount of higher-valued products, such as gasoline, from a given barrel of crude oil. Downstream technology also has allowed refiners to make a broader variety of refined products, including gasoline with more demanding environmental specifications.

The downstream capabilities of U.S. refineries have increased significantly since the 1980s. For example, Figure 3-8 shows that between 1997 and 2004, total industry downstream charge capacity increased from 31.6 million barrels per day to 35.9 million barrels per day, an increase of 6.3 percent.[43] Consumer demand for products such as gasoline and diesel has motivated investment in downstream processes that can increase the yield of these products from a given barrel of crude. Downstream processing units also have been important in allowing refineries to comply with new environmental regulations, as discussed in Section (IV)(B) *infra*. Other technological improvements also have permitted refinery operating costs to decrease.[44]

Figure 3-8: Crude Distillation and Downstream Charge Capacity (1985-2004)



Source: EIA

b. Changes in inventory strategies have reduced refinery costs.

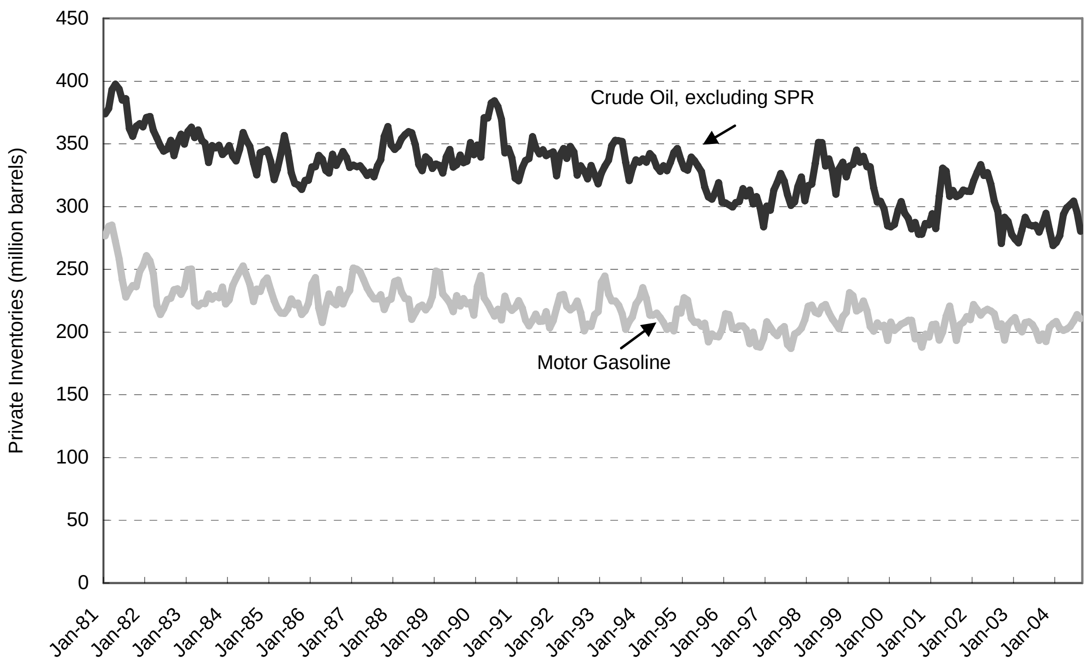
Crude oil and gasoline inventories play several crucial roles in energy markets. *See* Box 3-6. Maintaining inventories, however, is costly, both in terms of the value of assets held in inventory and in terms of the actual costs of storing the product. For example, at the end of November 2004, there were 292 million barrels of crude oil, valued at roughly $40 to $50 billion, in private inventories in the U.S. Private inventories of gasoline totaled 210 million barrels, valued at another $10 billion. By reducing inventories, firms free up capital to invest in other areas and save storage costs. Low inventories may, however, provide little cushion for gasoline supplies when there is an unexpected supply disruption. *See infra* Chapter 4(II).

Box 3-6: The Role of Inventories

Crude oil and gasoline inventories play important roles in energy markets. First, refineries and distribution systems need inventories to run smoothly. For example, if a refinery receives crude oil by tanker, it must store enough crude oil in inventory to run the refinery until the next tanker arrives. Second, refineries and distribution systems must store inventories to meet peak demand. For example, refineries and distribution systems usually build gasoline inventories in the spring to meet increased demand during the summer driving season. If refineries did not build these inventories, they would need much larger refineries to meet peak demand. Conversely, crude inventories often fall in the winter, when refineries reduce operations to perform maintenance. Finally, inventories can help a refiner hedge against future price changes. For example, if a firm believes that crude oil prices will increase in the future, it may build greater inventories of crude oil, rather than pay higher prices for the crude in the future.

Figure 3-9 shows that the amount of crude oil and gasoline held in private inventories has been trending lower since 1981. In part, this is an artifact of how crude oil inventories are measured. Crude produced in the U.S. becomes a part of inventory as soon as it is extracted, while crude produced outside the U.S. does not appear in inventory figures until it is imported. As U.S. crude production has decreased, reported crude inventories similarly have decreased. Nonetheless, the trend toward holding smaller inventories of crude oil and gasoline is real. During the 1980s, refinery closures reduced the amount of inventory required to keep all refineries operating smoothly. During the 1990s, firms used new technologies to improve their inventory management techniques. By lowering inventory costs, improved inventory management may lower the average cost of gasoline.

Figure 3-9: Crude Oil and Gasoline Monthly Inventories (1981-2004)



Source: EIA

3. U.S. refineries have high rates of capacity utilization.

Utilization rates measure the level of output a facility produces relative to that facility's capacity. For example, a 100 percent capacity utilization rate would indicate that a factory is producing at its peak output level. Utilization rates reflect various factors, such as the relative strength of supply and demand, the ability to perform routine maintenance on the industrial system, and the amount of entry and capacity expansion that has occurred over time.

Annual average rates of U.S. refinery utilization, based on atmospheric distillation capacity, have averaged above 90 percent in each year since 1993, when U.S. gasoline consumption first climbed above the levels of the late 1970s. At times, average domestic refinery capacity utilization has reached 95.6 percent.[45]

U.S. refineries have had utilization rates above 90 percent before – for example, during the last half of the 1950s and from 1963 to 1973.[46] A variety of factors may contribute to high utilization rates, such as long run demand increases and lack of new entry. Moreover, several operational changes in recent years have encouraged higher utilization rates. Increased hardware reliability, more efficient maintenance procedures, and better-performing catalysts for downstream processing units have enabled refineries to operate more reliably at sustained rates of high capacity utilization.[47] One recent survey of refining executives indicated that a utilization rate of 96 percent is the maximum sustainable level.[48]

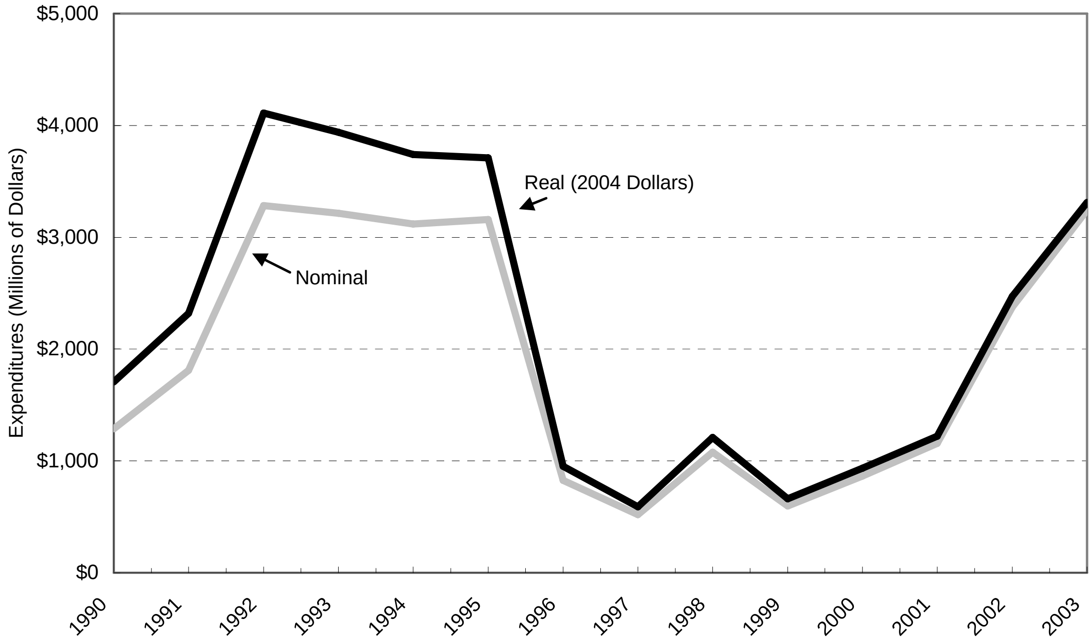
Based on EIA data, annual average capacity utilization rates have dropped somewhat from the peak levels of 1997 (95.1 percent) and 1998 (95.6 percent).[49] From 1999 through 2004, U.S. refining capacity utilization rates ranged from a low of 90.3 percent (2002) to a high of 92.8 percent (2004). These somewhat lower utilization rates may reflect the increased refining capacity, discussed above, which came into operation after 1998.

4. Nonetheless, new environmental regulations have required substantial investments in refineries, and a gallon of environmentally mandated gasoline costs more to produce than a gallon of regular gasoline.

Gasoline use is a major factor in air pollution in the United States.[50] Consequently, Congress has enacted a variety of laws to attempt to ameliorate the effect of gasoline use on air quality. Beginning with the Clean Air Act Amendments of 1970,[51] and continuing with further Amendments in 1990[52] and the Energy Policy Act of 1992,[53] Congress has mandated substantial changes in the quality of gasoline, as well as diesel, that can be sold in the U.S. Many areas within the U.S. now are required to use reformulated gasoline (RFG) during certain times of the year to meet the Environmental Protection Agency's (EPA) clean air requirements.[54] The EPA testified that there "have been tremendous improvements in U.S. air pollution" and that the clean fuel programs will continue to "play a significant role in helping keep our communities' air clean."[55] With the benefits of cleaner air, however, come the cost of higher gasoline prices.

New environmental regulations required substantial investments, particularly at the refining level of the industry to refine a cleaner gasoline. Figure 3-10 shows environmental capital expenditures at the refining level during the 1990s and beyond, when many new environmental requirements were implemented. Refinery environmental investments peaked at $4.1 billion (in 2004 dollars) in 1992. During the 1990s, refinery environmental investments accounted for about 25 percent of total domestic refinery capital investment. Moreover, the American Petroleum Institute (API) estimates that slightly more than half of the oil industry's environmental expenditures between 1992 and 2001 – estimated at $102 billion in 2004 dollars – were related to refining.

Figure 3-10: Refinery Environmental Capital Expenditures (1990-2003)



Sources: API, BEA

Note: API sends surveys to about 800 companies each year, including "all large and mid-size companies, plus a randomly selected group of smaller companies." In 1999, 65 companies completed the survey; see Table 5 of the API report for shares of these participants in various markets. API then extrapolates the data to provide estimates for all domestic firms.

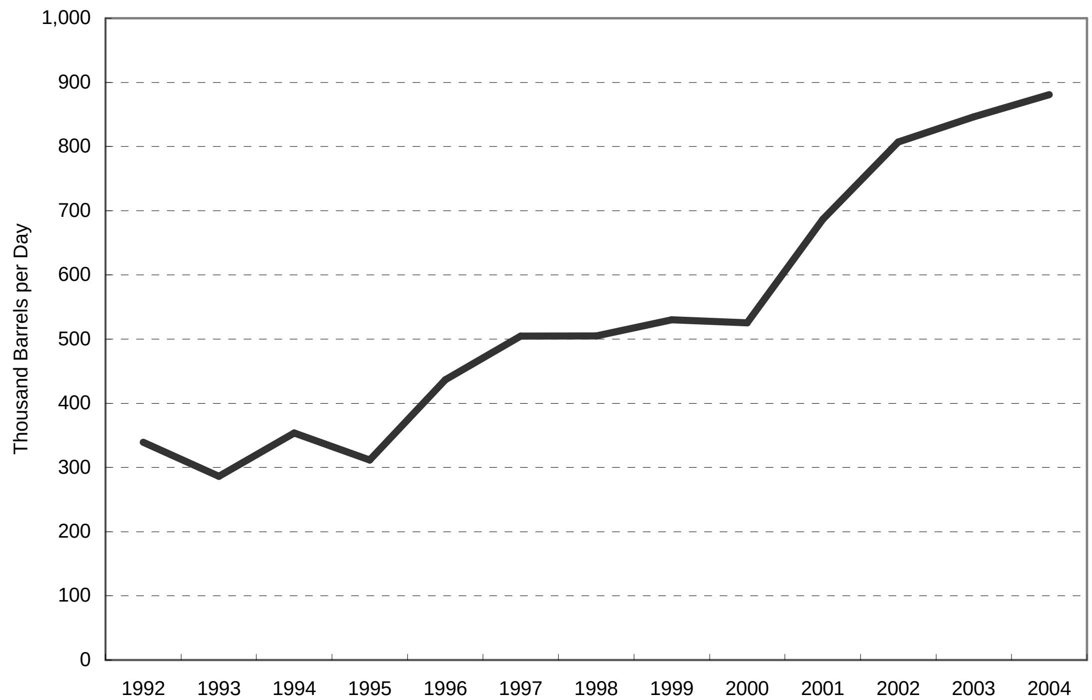
In addition, it costs more to produce cleaner gasoline than conventional gasoline. The EPA estimates that the cost of producing a gallon of RFG is $0.04 to $0.08 more than the cost of producing conventional gasoline.[56] Private estimates show a wider range, from $0.03 to $0.11 for Phase I RFG.[57]

These additional costs made the countervailing cost savings that refineries found through technological and other advances even more important in keeping the price of gasoline relatively low during the 1990s.

C. Imports of Gasoline into the U.S. Have Risen over the Past Decade.

Imports of finished gasoline and gasoline blendstocks[58] also have assisted in meeting increased U.S. demand. Imports of refined petroleum products have increased somewhat in recent years and are expected to become much more important in the future.[59] *See* Figure 3-11. For example, the annual average of weekly gasoline imports increased from 340,000 barrels per day in 1992 to 880,000 barrels per day in 2004 – an increase in imports from 4.7 percent of supply in 1992 to 9.7 percent of supply in 2004.[60]

Figure 3-11: U.S. Annual Average of Weekly Gasoline Imports (1992 to 2004)



Source: EIA

V. PROFITS PLAY NECESSARY AND IMPORTANT ROLES IN A MARKET ECONOMY. IN THE OIL INDUSTRY, PROFITS HAVE VARIED WIDELY OVER TIME.

Profits for some companies in the oil industry recently have been very high. ExxonMobil, for example, has become the world's most profitable company, with net income of $23.5 billion. Some have criticized oil companies severely for making this level of profits. The same high prices for crude oil and gasoline that have led to high profits in the oil industry also have led to increased consumer expenditures on gasoline. In 2003, the average household spent $1,333 on gasoline and motor oil.[61] With prices increasing almost 19 percent in 2004, the average household needed to spend an extra $250 to purchase the same amount of gasoline in

2004 as in 2003. Some consumers face difficult choices when budgeting for these higher gasoline expenditures.

Profits, however, play necessary and important roles in a well-functioning market economy. Moreover, profit levels in the oil industry – as in other industries – have been variable over time and among firms. This section reviews the roles that profits play in a healthy market economy and gives a historical perspective on profitability in the oil industry.

A. Profits Play Necessary and Important Roles in a Market Economy.

Profits play two necessary and important roles in a market economy. First, profits compensate owners of capital for the use of the funds they have invested in a firm. The level of profits for a firm, as well as the rate of return on those investments in that firm, will be influenced by supply and demand, in addition to regulatory conditions. Second, profits are a reward for an investor's willingness to bear the risk that an enterprise will not be successful and the investment will be lost. If the enterprise instead is successful, an investor may receive a high rate of return. High rates of return signal possible profit opportunities and thus encourage investors to reallocate resources across the economy, investing new capital in areas of high rates of return.

Profits play the same roles in the oil industry. The oil industry, which produces more than 80 million barrels per day of petroleum products, is one of the largest in the world. A great deal of investment must support the enormous infrastructure required to find and produce crude oil, transport it to refineries, produce finished petroleum products, and distribute these products throughout the world. Investors expect compensation for the use of their funds in supporting this business.

Profits also compensate firms for taking risks. The oil industry faces many types of risks. Potential changes in the macroeconomic climate, at either the national or the global level, and general uncertainty about future prices pose investment risk for all industries, including oil. Other risks are more specific to the oil industry. For example, production levels may be lower than expected at an oil field, or war or terrorism, in some areas, may destroy crude production assets or reduce their values. At downstream levels, refinery margins may fall if the price of gasoline falls relative to the price of crude oil. New environmental requirements may increase operating costs or require substantial new capital investments. Over the longer run, energy-saving innovations at the consumer level may reduce the demand for refined petroleum products. That these risks did not come to pass in any particular year may make investments look very profitable in hindsight. That does not necessarily mean, however, that firms should have invested more based on the information about risks that firms had at the time.

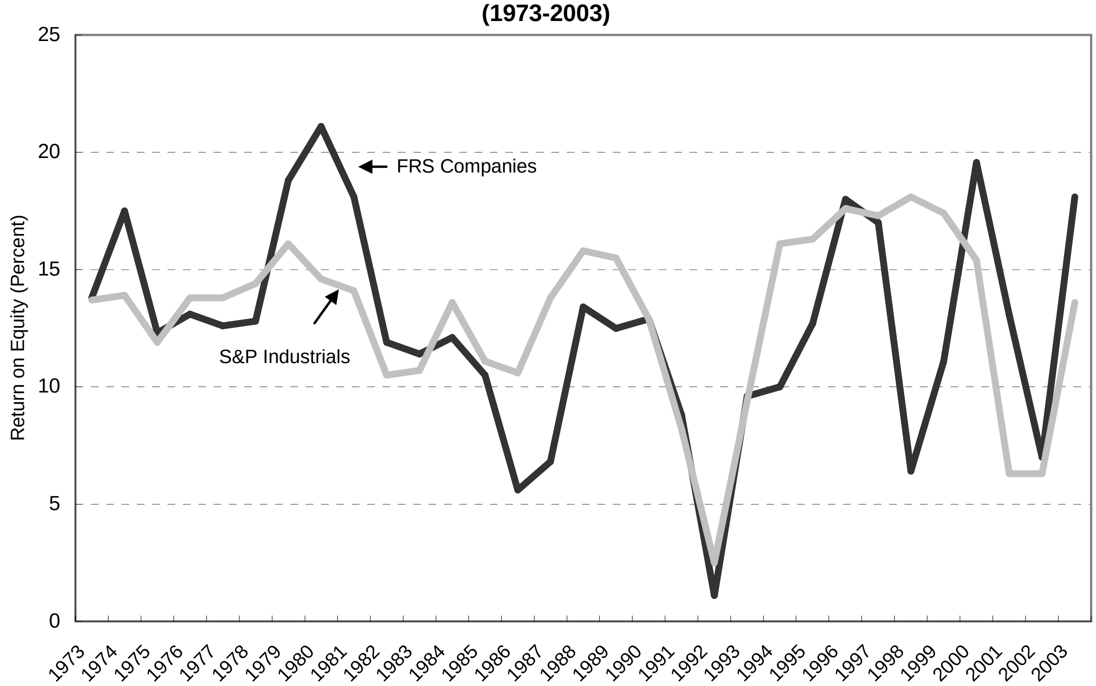
B. Profits in the Oil Industry Have Varied Over Time, Over Industry Segments, and Among Firms.

EIA's Financial Reporting System (FRS) tracks the financial performance of the major energy producers operating in the United States; currently, there are 28 such firms. In 2003, these FRS firms had an operating income of $82 billion, but total capital employed by these firms was much larger – $638 billion.[62] This translates to a return on capital employed of 12.8 percent, as compared to the return on capital employed for the overall S&P Industrials, which was 10.0 percent. In other recent years, FRS companies' rate of return on employed capital has been below that of the overall S&P Industrials.

Over the long run in the oil industry, the return on equity averaged less than for a broader group of industrial firms, before moving ahead of other firms in recent years.[63] The average annual return on equity between 1973 and 2003 was 12.6 percent for FRS companies, but 13.1 percent for the S&P Industrials. Figure 3-12 shows annual return on equity for FRS firms and the S&P Industrials. These rates of return on equity vary widely over time, with FRS return on equity ranging from 1.1 to 21.1 percent between 1973 and 2003.

Return on equity varies across firms as well. In 2003, return on equity for Tesoro was 8 percent, while it was 23 percent for ExxonMobil. EIA data are not yet available for 2004, but return on equity for FRS firms will likely increase due to continued strong demand for petroleum products. More recent financial data available from annual reports and SEC filings for individual FRS firms confirm this. According to these data, net income for six selected large petroleum firms increased from $34 billion in 2003 to $50 billion in 2004, with their weighted average return on equity increasing from 20 to 25 percent.[64]

Figure 3-12: Return on Equity for FRS Companies and S&P Industrials (1973-2003)



Source: EIA

Profitability in the oil industry varies depending on industry segment as well. Crude oil production accounts for a large portion of the overall profits for FRS firms. In 2003, FRS firms' net income from crude production was $44 billion out of total petroleum net income of $59 billion. The FRS companies have benefited from higher oil prices caused by the increase in world demand. As oil prices have increased, their exploration and production operations have become much more profitable.

In essence, companies with exploration and production operations are in a position analogous to that of a homeowner who bought a house in a popular area just before increased demand for housing caused real estate prices to escalate. The homeowner would not expect to sell the house based on the price paid for it, but rather based on what the house was worth in today's market. Similarly, the fact that an oil company could profitably produce its crude oil at $30 per barrel does not mean that the firm should expect to sell its crude below what increased demand for crude oil has made it worth in the world market today.[65] Indeed, even if a firm were inclined to sell at a price based solely on production costs (and not on supply and demand), that would not reduce crude oil prices. Rather, savvy oil traders would flock to buy the cheaply offered crude oil and then resell it at the higher market price.

Domestic refining and marketing represents a much smaller source of net profits for the FRS companies. In 2003, this segment accounted for $7.4 billion in net income, or $0.032 per gallon of refinery throughput. This was a substantial change from 2002, when refining and marketing were responsible for $1.4 billion in losses for the FRS companies as a whole. From the data available so far, the year 2004 appears to have been more profitable than 2003 for refining and marketing.[66] Based on recent company financial data for the six selected oil companies, their net income from domestic refining and marketing increased from about $3.8 billion to $8.3 billion between 2003 and 2004, or from $0.032 per gallon of crude oil processed to $0.064 per gallon of crude oil processed.[67] For these six companies, the increase in net income from their refining and marketing operations per gallon of refinery throughput was roughly 10 percent of the $0.28 per gallon increase in retail gasoline prices between 2003 and 2004.[68]

In sum, as noted in Chapter 1, high prices may signal profit opportunities that draw additional resources to where they are needed. Similarly, high profits throughout the oil industry may signal opportunities for increased investment in exploration and production, as well as in refining and marketing. In the long run, increased investments may lead to more crude oil production and refining capacity, which could help ameliorate high prices. Nonetheless, because opening new crude oil fields or adding new refinery capacity takes years to complete, firms will base these investment decisions on profit prospects over the life of those investments.

Endnotes

1. *See supra* Chapter 2(I) (using a simple regression of the monthly average national price of gasoline on the monthly average price of WTI crude to determine the percentage the variation in the price of crude contributes to the variation in the price of gasoline).

2. Calculations are from downloaded data at: ENERGY INFO. ADMIN. (EIA), U.S. DEP'T OF ENERGY, DOE/EIA-0384(2003), ANNUAL ENERGY REVIEW 2003 (2004), *available at* http://tonto.eia.doe.gov/FTPROOT/multifuel/038403.pdf. Real prices are calculated using the GDP deflator from the Bureau of Economic Analysis, Department of Commerce, *at* http://www.bea.doc.gov (last visited June 28, 2005).

3. Data excluding taxes for 2005 were not available at the time this report was written.

4. These data are from EIA, DOE/EIA-0202, SHORT-TERM ENERGY OUTLOOK, June 2005, app. at 4 tbl.A4, *at* http://tonto.eia.doe.gov/FTPROOT/forecasting/steomonthly/jun05.pdf.

5. For the calculations we use data from the gasoline components monthly history from January 1991 through December 2004, as reported by EIA, *Gasoline Components History*, *available at* http://tonto.eia.doe.gov/oog/info/gdu/gaspump.html (last modified Apr. 12, 2005).

6. *See infra* Chapter 5(I).

7. Sam Peltzman, *Prices Rise Faster than They Fall*, 108 J. POL. ECON. 466 (2000).

8. *Id.* at 493.

9. *Id*. at 494.

10. *See* Severin Borenstein et al., *Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?*, 112 Q.J. ECON. 305 (1997); U.S. GEN. ACCOUNTING OFFICE (GAO), ANALYSIS OF THE PRICING OF CRUDE OIL AND PETROLEUM PRODUCTS (Mar. 1993); Jeffrey D. Karrenbrock, *The Behavior of Retail Gasoline Prices: Symmetric or Not?*, FED. RES. BANK ST. LOUIS REV., July 1991, at 19.

11. *See* Lance J. Bachmeier & James M. Griffin, *New Evidence on Asymmetric Gasoline Price Responses*, 85 REV. ECON. & STAT. 772 (2003). The working paper version of the Bachmeier and Griffin paper was presented at the FTC Conference on Factors that Affect Prices of Refined Petroleum Products (May 8, 2002). Transcripts of the Conference and presentations are available at http://www.ftc.gov/bc/gasconf/index.htm. *See also* EIA, DOE/EIA-0626, PRICE CHANGES IN THE GASOLINE MARKET: ARE MIDWESTERN GASOLINE PRICES DOWNWARD STICKY? (1999), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/0626.pdf; David Shin, *Do Product Prices Respond Symmetrically to Changes in Crude Prices?*, OPEC REV., Summer 1994, at 137.

12. MICHAEL BURDETTE & JOHN ZYREN, EIA, GASOLINE PRICE PASS-THROUGH (2003), *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2003/gasolinepass/gasolinepass.htm.

13. Bachmeier & Griffin, *supra* note 11.

14. *See, e.g.*, Borenstein et al., *supra* note 10.

15. Peltzman, *supra* note 7.

16. *See* Stephen P.A. Brown & Mine K. Yücel, *Gasoline and Crude Oil Prices: Why the Asymmetry?*, FED. RES. BANK DALLAS ECON. & FIN. REV., Third Quarter 2000, at 23, *at* http://www.dallasfed.org/research/efr/2000/efr0003b.pdf; MATTHEW LEWIS, OHIO STATE UNIV., ASYMMETRIC PRICE ADJUSTMENT AND CONSUMER SEARCH: AN EXAMINATION OF THE RETAIL GASOLINE MARKET (American Econ. Ass'n, Annual Meeting Paper 2005, Sept. 2004), *at* http://www.aeaweb.org/annual_mtg_papers/2005/0108_1430_0803.pdf.

17. Lewis, *supra* note 16.

18. *Id.* at 2.

19. *Id.*

20. Brown & Yücel, *supra* note 16, at 26.

21. *Id.*

22. *Id.*

23. In 1990, with the anticipation of the first Gulf War, the annual average retail price excluding taxes was $1.17 per gallon. In 1998, during the Asian recession, it was $0.76. *See supra* note 2.

24. Data excluding taxes for 2005 were not available at the time this report was written.

25. These data are from EIA, *supra* note 4, app. at 4 tbl.A4.

26. This is based on data from the New York Mercantile Exchange (NYMEX), *Light, Sweet Crude Oil Session Expanded Table*, *at* http://www.nymex.com/jsp/markets/lsco_fut_csf.jsp (viewed June 23, 2005).

27. EIA, DOE/EIA-0202, SHORT-TERM ENERGY OUTLOOK, Apr. 2005, app. at 5 tbl.A5, *at* http://www.eia.doe.gov/pub/forecasting/steo/oldsteos/apr05.pdf.

28. BUREAU OF ECON., FED. TRADE COMM'N (FTC), THE PETROLEUM INDUSTRY: MERGERS, STRUCTURAL CHANGE, AND ANTITRUST ENFORCEMENT 61 (2004) [hereinafter PETROLEUM MERGER REPORT], *available at* http://www.ftc.gov/os/2004/08/040813mergersinpetrolberpt.pdf.

29. *Id.* at 180-82.

30. Phillip Verleger, Remarks at the FTC Conference on Factors that Affect Prices of Refined Petroleum Products 109 (Aug. 2, 2001) (there was a huge financial incentive under the old entitlements program between 1972 and 1980 for independents to build refineries) [hereinafter, citations to conference transcripts include the speaker's last name, transcript date, and page cite(s)]. See BUREAU OF ECON. & COMPETITION, FTC, MERGERS IN THE PETROLEUM INDUSTRY 74-78 (1982) for a fuller discussion of government controls on crude oil prices and allocation, and pp. 194-200 for a fuller discussion of the entry of relatively inefficient refineries.

31. *See also* Slaughter 5/8 at 92 (noting that as of August 2002, the industry was down to 148 refineries).

32. PETROLEUM MERGER REPORT, *supra* note 28, at 183 n.15.

33. *Id.* at 180-83.

34. *Id.* at 183 n.16 (citing engineering studies relied upon by BUREAU OF ECON. & COMPETITION, *supra* note 30).

35. *Id.* at 183 n.17 (citing NAT'L PETROLEUM COUNCIL, U.S. PETROLEUM REFINING: ASSURING THE ADEQUACY AND AFFORDABILITY OF CLEANER FUELS 28-29 fig.I-5 (2000)).

36. *See* Murphy, 8/2 at 108; Verleger 8/2 at 109 ("[N]obody builds a refinery today around the world of less than 150,000 to 200,000 barrels a day because of the economies of scale.").

37. Exxon's Baytown, Texas refinery is currently the largest U.S. refinery. PETROLEUM MERGER REPORT, *supra* note 28, at 179.

38. *Id.* at 183.

39. *Id.* at 184.

40. *Id.*

41. Rothschild 8/2 at 121.

42. EIA, DOE/EIA-0545(99), PETROLEUM: AN ENERGY PROFILE 1999, at 29 (1999) (stating that new technology that increased refiners' flexibility "reduced dependence on the more expensive high gravity, low-sulfur oils imported from the Middle East."), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/054599.pdf.

43. EIA, *Table 4. U.S. Refineries and Refining Capacities, 1987-2004, at* http://www.eia.doe.gov/emeu/finance/usi&to/downstream/update/table4.html (last modified Feb. 24, 2005). Total downstream charge capacity includes capacities for vacuum distillation, thermal cracking, catalytic cracking, catalytic reforming, catalytic hydrocracking, and catalytic hydrotreating.

44. EIA, DOE/EIA-0340(03)/1, 1 PETROLEUM SUPPLY ANNUAL 2003, at 120 tbl.41 (2004), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/0340301.pdf

45. EIA, *Refining*, *in* OIL MARKET BASICS, *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/oil_market_basics/default.htm (last visited June 28, 2005); *see also* National Petrochemical & Refiners Association (NPRA), *Comments on the Federal Trade Commission's Second Public Conference on Refined Petroleum Products* 8, 31 (Public Comment, Apr. 18, 2002), *at* http://www.ftc.gov/bc/gasconf/comments2/npra.pdf.

46. EIA, DOE/EIA-0384(2002), ANNUAL ENERGY REVIEW 2002, at 143 tbl.5.9 (2003), *at* http://tonto.eia.doe.gov/FTPROOT/multifuel/038402.pdf.

47. D.J. PETERSON & SERGI MAHNOVSKI, NEW FORCES AT WORK IN REFINING 42 (Rand, Science and Technology Doc. No. MR-1707-NETL, 2003).

48. *Id.* at 43.

49. EIA, *supra* note 46, at 143 tbl.5.9. According to these data, a preliminary estimate put refinery capacity utilization for 2002 at 90.3 percent; utilization rates for 1997 and 1998 were 95.2 and 95.6 percent, respectively.

50. The mobile source sector, *i.e.*, transportation, is a significant contributor to air pollution, accounting for over 50 percent of the oxides of nitrogen (NOx) inventory, 42 percent of the volatile organic carbon inventory, and 80 percent of carbon monoxide. Gasoline and diesel are the primary fuel sources for this sector. Larson 5/8 at 72-73.

51. Pub. L. No. 91-604, 84 Stat. 1698.

52. Pub. L. No. 101-549, 104 Stat. 2468.

53. Pub. L. No. 102-486, 106 Stat. 2776.

54. See discussion *infra* Chapter 4(II).

55. Larson 5/8 at 79-80. *See also id.* at 73 ("The emissions impact of RFG . . . is estimated to be equivalent to removing about 16 million passenger vehicles from our roads.").

56. Larson 5/8 at 74.

57. *See* EIA, *1995 Reformulated Gasoline Market Affected Refiners Differently*, *in* DOE/EIA-0380(1996/01), PETROLEUM MARKETING MONTHLY (1996), and studies cited therein.

58. Gasoline blendstocks (such as alkylates, reformate, or RBOB) are unfinished gasoline components that will be blended with other components to produce finished gasoline that can be used by consumers.

59. PETROLEUM MERGER REPORT, *supra* note 28, at 61.

60. Data are from EIA, Complete History XLS, *in* THIS WEEK IN PETROLEUM: CRUDE OIL, *at* http://tonto.eia.doe.gov/oog/info/twip/twip_crude.html (last modified June 8, 2005).

61. Data are from Bureau of Labor Statistics, Consumer Expenditure Survey, *at* http://www.bls.gov/data/home.htm (last visited June 12, 2005).

62. EIA, DOE/EIA-0206(03), PERFORMANCE PROFILES OF MAJOR ENERGY PRODUCERS 2003, at 68-69 (2005), *at* http://www.eia.doe.gov/emeu/perfpro/perfpro2003.pdf. Capital employed is total assets minus current liabilities, while return on capital employed is operating income divided by capital employed.

63. *Id.*

64. The six firms are Chevron, ConocoPhillips, ExxonMobil, Sunoco, Tesoro, and Valero.

65. As noted in Chapter 2(III), *supra*, private oil companies have relatively small shares of world crude oil production, which limits their individual influence on crude oil prices.

66. Some of the increase in net income for refining and marketing is due to stronger demand. Nonetheless, other factors may also be important. For example, some of the increase in refining and marketing net income is due to investments to increase the ability to process lower-quality crude oil. The price difference between sweet and sour, as well as between light and heavy, crude oil widened in 2004. For example, according to Valero's 2004 10-K filing:

> Since approximately 50% of Valero's total throughput represents sour crude oil feedstocks, Valero's profitability is also significantly affected by the spread between sweet crude oil and sour crude oil prices, referred to as the "sour crude oil discount." For the year 2004, both refined product margins and sour crude oil discounts were the best ever experienced by Valero. The strength of those positive industry fundamentals significantly enhanced Valero's results of operations for the year ended December 31, 2004 . . . . Valero's operating results during 2004

> benefitted significantly from recent investments that increased Valero's capacity to process lower-cost feedstocks.

SEC File No. 1-13175, 10-K filed Mar. 14, 2005, *available at* http://yahoo.brand.edgar-online.com/doctrans/finSys_main.asp?formfilename=0000950134-05-004779&nad. Firms that took the risk to add equipment to their refineries were rewarded with lower feedstock prices relative to their competitors. However, the discount for lower-quality crude oil fluctuates over time; if it falls, these refiners will still have to cover their increased fixed-cost investment in these refinery improvements.

67. For ConocoPhillips, Chevron, and ExxonMobil, company financials broke down net income from domestic refining and marketing as well as the amount of petroleum processed at their domestic refineries. Sunoco, Tesoro, and Valero net income is for the entire firm, but the majority of these firms' operations are in domestic refining and marketing. (Valero has a refinery and marketing assets in Aruba and Canada, and Sunoco also manufactures chemicals.)

68. 3.2 cents per gallon divided by 192.3 - 163.8 cents per gallon (prices from EIA, MONTHLY ENERGY REVIEW, May 2005, at 126 tbl.9.4, *at* http://tonto.eia.doe.gov/FTPROOT/multifuel/mer/00350505.pdf).

CHAPTER 4. SUPPLY, DEMAND, AND COMPETITION IN GASOLINE AT THE REGIONAL LEVEL.

I. REGIONAL DIFFERENCES IN ACCESS TO GASOLINE SUPPLIES AND ENVIRONMENTAL REQUIREMENTS FOR GASOLINE AFFECT REGIONAL GASOLINE PRICES.

National averages can mask differences among regions in supply and demand. This chapter explores differences among regions in terms of access to gasoline supplies, both on a regular basis and in the event of a supply shortage. Refineries are at the heart of the system for bulk supply of refined petroleum products – that is, the delivery of refined products to wholesale distribution terminals which, in turn, supply retail gasoline stations. A consuming area's bulk supply of gasoline comes either from local refineries or from more distant refineries that supply the market by pipeline, barge, or tanker. Some areas have large local refining capacity or ready access to multiple sources of more distant refined product supply through pipelines, barge, or tanker. Other areas have more limited supply options. Regional differences in refining capacity and gasoline transportation infrastructure can result in differences in average regional prices, as well as regional price variability, as discussed in greater detail in this chapter.

In addition, the federal government, some states, and some localities have laws that require the use of environmentally cleaner fuel in particular geographic areas during certain times of the year. Under the Clean Air Act (CAA), the Environmental Protection Agency (EPA) requires various gasoline blends for particular geographic areas that have not met certain air quality standards.[1] There is no question that, as a result of the CAA, air quality in a number of metropolitan areas across the U.S. has improved significantly. With these benefits, however, there are costs. Several states, sometimes working with local refiners, have persuaded the EPA to allow more variance in fuel specifications. These additional fuel specifications meet other, sometimes more stringent, targets for lowering air pollution. As a result of the proliferation of unique fuel requirements, differing fuel specifications apply in different parts of the country at various times of the year. In most circumstances, gas stations are legally prohibited from selling conventional gasoline when regulations require the sale of environmentally safer gasoline. These varied requirements can limit the ability of gasoline wholesalers to find adequate substitutes in the event of a supply shortage.

In areas with environmental requirements for non-conventional gasoline, consumers may pay higher average gasoline prices and confront more price variability than consumers in areas without such laws and regulations. The impact that environmentally mandated fuels have on the variability of gasoline prices depends on that area's refining capacity or access to other sources of gasoline supply through pipelines or other means of transportation.

II. SEVERAL EXAMPLES ILLUSTRATE THE SOURCES OF REGIONAL DIFFERENCES IN GASOLINE PRICES.

We begin with a series of examples that illustrate price effects associated with proximity to refineries and other sources of gasoline supply, as well as with certain environmental fuel requirements. The following discussion presents local examples that illustrate how access to sources of gasoline supply can affect both the averages and the variability of gasoline prices in particular communities.

A. Access to Refineries Can Affect Gasoline Prices.

The following examples reveal how access to nearby refineries can affect gasoline prices. The examples illustrate price effects that differ depending on whether a region has limited or ample nearby refining capacity.

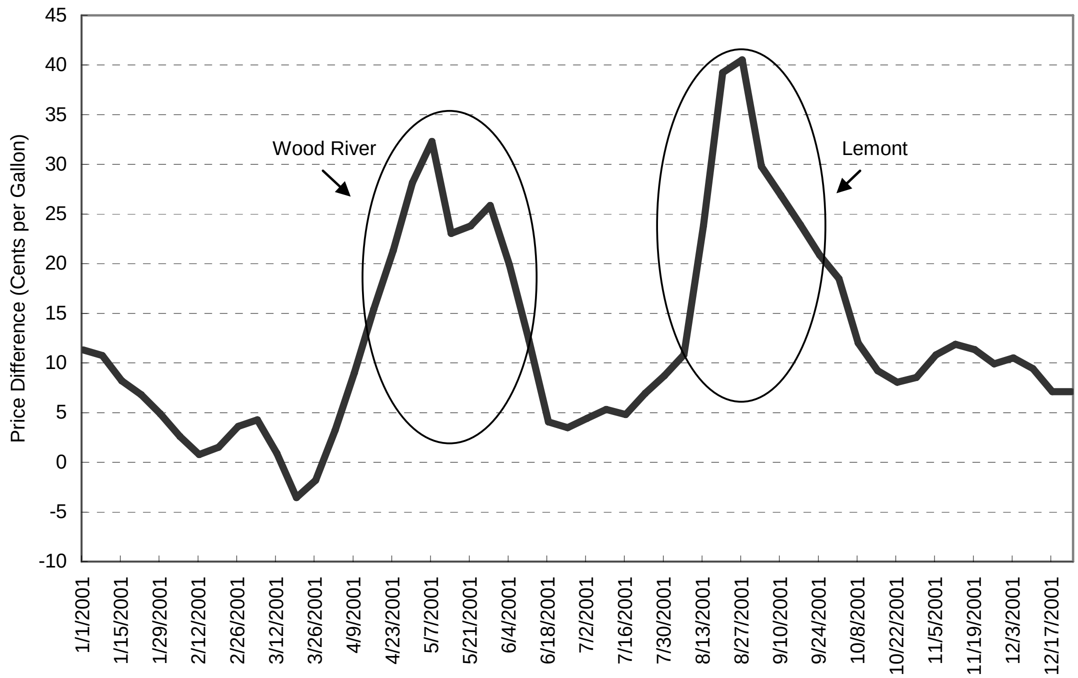
1. In the Upper Midwest, where refining capacity is not sufficient to meet consumer demand, two refinery fires in the spring and summer of 2001 caused wholesale and retail gasoline price spikes.

Refining capacity in the Upper Midwest is not sufficient to supply consumer demand in that region. Thus, the Upper Midwest (*e.g.*, Chicago and Milwaukee) must obtain and transport some gasoline from outside the region. In the event of a supply shortage, Upper Midwest gas stations must seek additional gasoline supplies from more expensive – typically, more distant – sources. To respond to a supply shortage in the Upper Midwest, distant refiners may need to change their product mix to make more gasoline (instead of other refined petroleum products) or pull product out of other markets to supply the Upper Midwest. Such gasoline then needs to be transported to the Upper Midwest. This process overall tends to increase costs and can take weeks.

In the spring and summer of 2001, two separate refinery fires shut down significant refinery capacity in the Upper Midwest. On April 30, 2001, a fire at the Tosco refinery in Wood River, Illinois, reduced output from the refinery for a few weeks.[2] This refinery outage caused the wholesale and retail price of gasoline in the Upper Midwest to increase at rates faster than other regions in the spring of 2001. During this supply restriction, for example, wholesale gasoline prices in Chicago increased up to $0.30 per gallon relative to those in the Gulf Coast.[3] Prices returned to normal in mid-June, after the refinery had been repaired.[4]

In August 2001, a fire at the Citgo Lemont refinery near Chicago damaged a crude distillation unit, reducing output from the refinery for more than six months.[5] This time, wholesale prices in Chicago increased as much as $0.40 per gallon relative to the Gulf Coast, but returned to normal by mid-October, as gasoline consumption declined at the end of the summer driving season, and pipeline supplies increased. *See* Figure 4-1.

Figure 4-1: Weekly Difference Between Chicago and Houston (Gulf) Wholesale Rack Prices (2001)



Source: OPIS

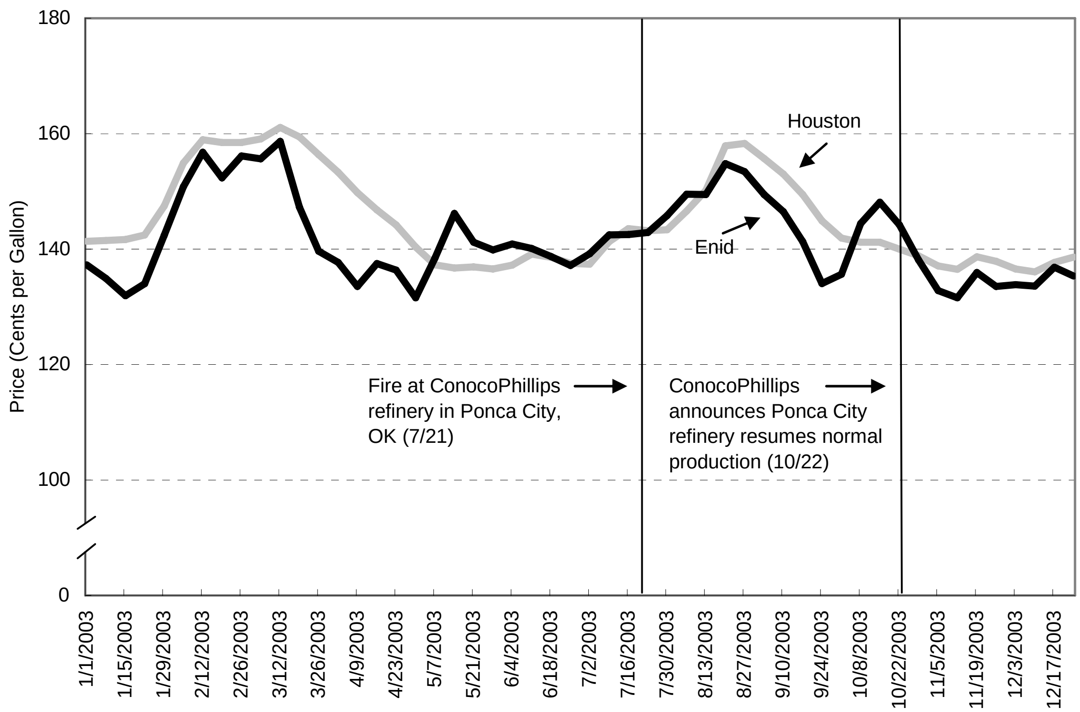
In both of these cases, Upper Midwest gas stations (like the Phoenix gas stations in Chapter 1) had to pay higher prices to bring increased gasoline supplies into the Upper Midwest during these supply restrictions.

2. By contrast, a refinery outage in an area with ample, nearby sources of gasoline supply had no appreciable impact on wholesale or retail gasoline prices.

In areas with access to ample sources of gasoline supply, one refinery outage may not have any appreciable impact. For example, on July 21, 2003, an explosion at ConocoPhillips's Ponca City, Oklahoma refinery caused massive damage but had little effect on gasoline prices. During two and one-half months of repair, the refinery operated at about 60 percent of its capacity, processing 120,000 barrels per day instead of its usual 194,000 barrels per day. Prices for gasoline, however, did not spike in Oklahoma.

The Ponca City refinery, along with the other Oklahoma refineries, produces far more gasoline than the area demands. To meet demand within the state after the explosion, the refineries simply reduced the amount of gasoline that they exported to other areas. Thus, supply in Oklahoma remained stable, although supply leaving Oklahoma declined somewhat. This reduction in supply to other areas did not significantly affect gasoline prices in those areas, however, because the Ponca City refinery is near the large refining center on the Gulf Coast, which offers multiple sources of gasoline supply. For example, as shown in Figure 4-2, throughout 2003, retail gasoline prices (including taxes) in Enid, Oklahoma, did not look much different from retail gasoline prices (including taxes) in Houston. Figure 4-2 shows retail gasoline prices on both the date of the explosion and the date that ConocoPhillips announced that the refinery returned to normal operations – October 22, 2003.[6]

Figure 4-2: Weekly Enid, OK & Houston Retail Gasoline Prices, with taxes (2003)



Source: OPIS

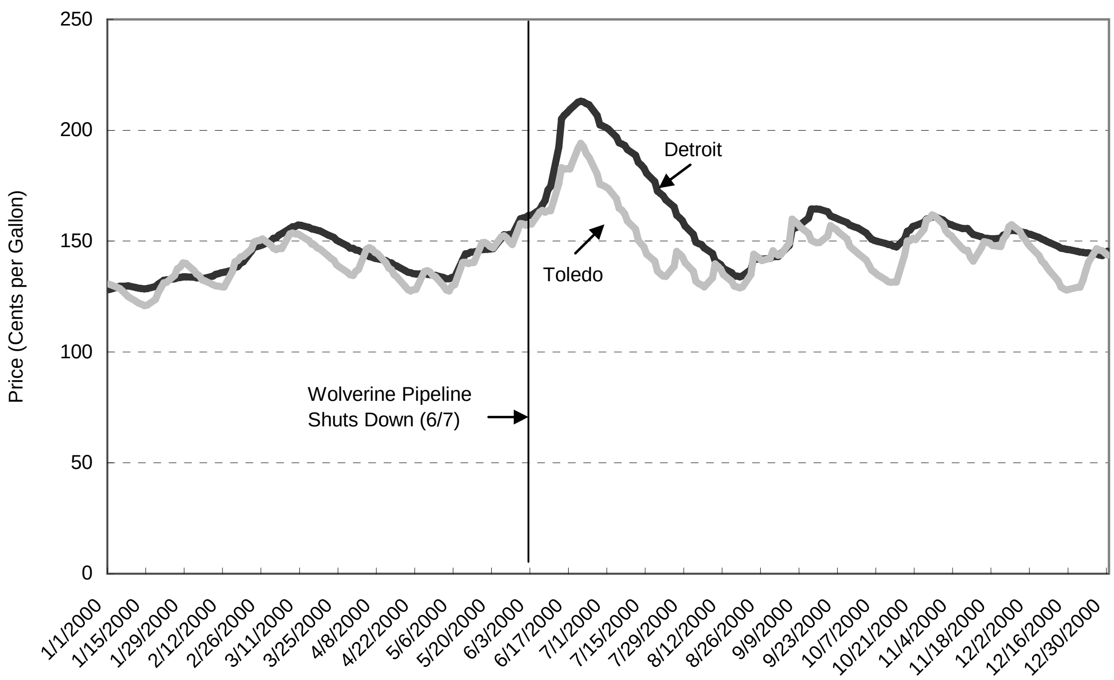
B. Access to Refined Product Pipelines Can Affect Gasoline Prices.

The next examples show how a region's reliance on refined product pipelines may affect gasoline prices. The first example details price effects resulting from a pipeline break; the second discusses price effects resulting from limits on pipeline capacity.

1. A pipeline outage on the Wolverine pipeline in June 2000 caused a price spike in Detroit, Michigan, which relies heavily on gasoline supplies brought in by that pipeline.

The Wolverine pipeline carries one-third of Michigan's gasoline supplies into that state. From June 7 to June 16, 2000, that pipeline had an unexpected outage and completely shut down, significantly limiting gasoline supplies to Detroit.[7] Prior to the pipeline shutdown, retail gasoline prices in Detroit were about $0.30 per gallon cheaper than those in Chicago, which was experiencing the price spikes discussed in the Commission's *Midwest Gasoline Price Investigation*.[8] Within a few days of the pipeline break, this price difference shrank so that retail gasoline prices in Detroit were only $0.05 per gallon cheaper than in Chicago. Analogously, retail gasoline prices in Detroit were roughly similar to those in Toledo, Ohio, before the break, but were soon $0.25 to $0.35 per gallon more than in Toledo after the break. *See* Figure 4-3.

Figure 4-3: Daily Retail Gasoline Prices, with taxes, in Detroit and Toledo (2000)



Source: OPIS

Refiners brought gasoline by truck from western Michigan to increase gasoline supplies in Detroit. Truck transportation, however, is the most expensive way to move gasoline. Retail prices of conventional gasoline in Detroit peaked at $2.03 per gallon in June, before dropping to $1.74 by the middle of July once the pipeline was fixed.[9] During this time, Michigan had one of the highest average gasoline prices in the nation.[10]

2. During the summers of 2001-2004, higher wholesale gasoline prices in Denver, Colorado, reflected Denver's significant reliance on pipeline supplies.

In areas primarily dependent upon gasoline supplied through pipelines for their marginal supply,[11] prices may rise when the capacity of a pipeline is constrained or reaches its limits. Summertime gasoline demand and prices in Denver, Colorado, from 2001 through 2004, illustrates this phenomenon. During the summer, gasoline demand generally is higher than at other times, as consumers take more driving vacations. The pipeline supplying gasoline to Denver, Colorado, from the east generally was full and thus did not have the capacity to meet increased summer demand in 2001-2004. To obtain additional gasoline supplies sufficient to meet increased summer demand, Denver gas stations had to look to other, higher-cost suppliers.

This effect can be seen in Denver's wholesale price of gasoline at different times of the year. During the non-summer months in 2001-2004, Denver obtained its marginal gasoline supplies by pipeline from the east, from an area linked to the Gulf Coast. Thus, during the non-summer months in 2001-2004, the wholesale price of gasoline in Denver reflected the wholesale spot price for gasoline on the Gulf Coast plus pipeline transportation costs. In the summers, however, the pipeline generally was full and unable to meet demand. Thus, Denver retailers had to pay wholesale gasoline prices set by a higher-cost marginal supplier.[12] Differences during the summer months averaged $0.114 per gallon between 2001 and 2004, but only $0.045 over the other months during those years.[13]

C. Boutique Fuel Requirements Can Affect Gasoline Prices.

The final examples in this section show how boutique fuel requirements may affect gasoline prices. The first example illustrates price effects from limits on the ability to substitute conventional for boutique fuel when a supply shortage hits. The second illustrates that, with adequate planning and proper incentives, a transition between different types of fuel can be made without price spikes.

1. In Detroit, the need to use environmentally mandated gasoline exacerbated gasoline price spikes due to a pipeline break in June 2000 and refinery shutdowns during the blackout of August 2003.

In Michigan, only the greater Detroit area (basically, southeast Michigan) uses non-conventional gasoline. In the late spring and summer, to reduce air pollution, consumers there must use gasoline with less volatility. Using less volatile gasoline reduces the gasoline evaporation rate and thus reduces the level of ozone-forming hydrocarbons released into the atmosphere.[14] The environmental requirements for summertime gasoline in the greater Detroit area mean that, when a pipeline break or refinery shutdown disrupts Detroit's usual supplies of less volatile summertime gasoline, Detroit wholesalers cannot substitute the conventional gasoline that the rest of Michigan and many of the surrounding states use. Indeed, according to then-Attorney General, now Michigan Governor Jennifer Granholm, when the Wolverine pipeline broke in June 2000 (discussed above), the requirement for less volatile gasoline in the greater Detroit area limited wholesalers' ability to substitute gasoline supplies from Ohio, Indiana, and Illinois, and therefore slowed the eventual decline in Detroit gasoline prices.[15]

In August 2003, Detroit was part of a blackout during which 50 million North Americans lost electric power. A Marathon Ashland refinery, which had been processing gasoline to meet air quality requirements in the greater Detroit area, shut down for eight days. Other refineries that supply the greater Detroit area also shut down due to the power outage. With refinery production disrupted, consumers quickly depleted gasoline supplies, especially when gasoline demand surged, as people in the greater Detroit area drove greater distances to fill up their vehicles. Anticipating difficulties in finding environmentally compliant substitute gasoline for the Detroit area, like those experienced in June 2000, Governor Granholm sought the EPA's approval to waive the environmental specifications for gasoline used in southeast Michigan the day after the blackout.[16]

The August 2003 depletion of gasoline supply and surge in gasoline demand in the greater Detroit area still had an impact on price, although prices did not rise as much as if the waiver not gone into effect. One week prior to the blackout, the average price for a gallon of gasoline in the greater Detroit area was $1.59. Ten days after the outage, gasoline prices in the greater Detroit area had increased to an average of $1.77, and just before Labor Day, weekend prices peaked at nearly $1.88 per gallon. As refineries came back on line and production started to regain normal levels, gasoline prices began to fall.[17]

2. In the Northeast, a major shift in the type of environmentally mandated fuel occurred without significantly increased gasoline prices or price variability.

One type of environmentally safer gasoline used in many parts of the U.S. is reformulated gasoline (RFG). RFG requires the addition of an oxygenate to the fuel. The two oxygenates used in the U.S. are ethanol and methyl tertiary butyl ether (MTBE). MTBE has been the primary oxygenate used in RFG in many areas of the country, including the Northeast. The use of MTBE has raised concerns about groundwater contamination and other environmental issues, however, and various governmental entities have banned, or considered banning, MTBE.

Beginning on January 1, 2004, New York and Connecticut prohibited the use of MTBE as an oxygenate. This decision meant that not only would gasoline distributors use ethanol to replace MTBE, but it also required a different blendstock (referred to as "reformulated blendstock for oxygenate blending" (RBOB)[18]) in which to mix the ethanol. New York and Connecticut distributors needed RBOB from refineries, but could not rely on nearby refineries to meet the new demand for RBOB. The Northeast lacks refinery capacity sufficient to meet gasoline demand; gasoline distributors rely on imported refined gasoline to meet consumer demand. Refineries on the Gulf Coast send gasoline via pipelines, and Europe and South America also send refined petroleum products to New York and Connecticut.

Whether refineries in Europe and South America would make the investments necessary to produce RBOB in quantities sufficient to meet the new demand in New York and Connecticut was unclear;[19] producing low-vapor-pressure RBOB is a more costly and difficult process than producing RFG with MTBE.[20] In late 2003, anticipating the MTBE ban in New York and Connecticut, a number of petroleum traders and the Energy Information Administration (EIA) predicted that the Northeast could expect gasoline price volatility and price spikes in the spring of 2004, when refiners would first have to supply RBOB for blending with ethanol.[21] Nonetheless, by March 2004, a number of European refineries were making RBOB,[22] and by

June 2004, they were supplying RBOB to the East Coast.[23] By mid-June, Venezuelan refineries were sending regular shipments of RBOB to the East Coast as well.[24] The switch to RBOB blended with ethanol went smoothly in New York and Connecticut.

Price data confirm that the transition went well. The data show that, despite some substantial differences between the price of gasoline in the Northeast and on the Gulf Coast, gasoline prices in the Northeast in 2004 were not noticeably more volatile than in previous years.

D. Other Factors Can Reduce Average Gasoline Prices but Exacerbate Gasoline Price Spikes.

1. Low inventory levels.

As noted in Chapter 3, refineries have begun to keep lower inventories of crude oil and gasoline, which reduces the cost of supplying gasoline to consumers. The advent of computerized and other "just-in-time" inventory techniques now allows the delivery of crude oil much closer to the time when a refinery needs it and delivery of gasoline to terminals much closer to the time when distributors need it. Although "just-in-time" inventory techniques can make refineries and distribution systems more efficient and thus lead to lower average gasoline prices, low inventories at refineries and terminals may exacerbate price spikes.[25] For example, in May and June of 2000, a variety of factors – several refinery breakdowns, longer-than-anticipated refinery maintenance, unexpected difficulties in producing the new summer-grade RFG required by EPA regulations for use in Chicago and Milwaukee, and unexpected supply disruptions in the two major refined product pipelines that serve the Midwest – combined to cause gasoline price increases in the Midwest.[26] Low gasoline inventory levels at that time in the Midwest exacerbated the price spikes by limiting the gasoline supplies available to mitigate price increases.[27]

2. High rates of capacity utilization.

Also as noted in Chapter 3, technical advances now allow refineries to operate for longer periods of time at relatively high utilization rates. One recent survey of refinery industry executives indicated that a very high utilization rate – 96 percent – is the maximum sustainable level.[28] High utilization rates can improve a refinery's efficiency and potentially lead to lower average gasoline prices, but high utilization rates also can contribute to price volatility and periodic supply problems. When unexpected gasoline supply disruptions occur or gasoline demand increases unexpectedly, then high refining utilization rates can mean that no or little extra refining capacity is available to remedy a supply shortage or satisfy an increase in demand.[29] Indeed, in its *Midwest Gasoline Report*, the Commission concluded that "[t]he current high capacity utilization rates in the oil refining industry leave little room for error . . . . Assuming that demand continues to grow, occasional price spikes in various parts of the country are likely unless refining capacity is increased substantially."[30]

Initially, such shortages may be met by reallocating supplies from nearby areas, or refineries may change their product mix to increase gasoline production. Depending on the timing of the shortage, refineries also may choose to delay maintenance or otherwise increase capacity utilization. A long-run shortage could encourage investment in additional capacity by either local refiners or pipeline owners that would like the ability to bring additional supplies in from other areas.

Tight capacity does not necessarily lead to higher short-run prices, but a lack of "surge capacity" may extend the duration of a price spike.[31] Although excess capacity could alleviate price spikes, building and maintaining extra capacity that may be used only occasionally would involve costs that could increase average gasoline prices to consumers.[32] Required excess capacity could involve costs not only for refining, but also for other stages of gasoline production and distribution as well, such as pipelines and terminals.

III. REGIONAL DIFFERENCES IN ACCESS TO GASOLINE SUPPLIES MAY LEAD TO REGIONAL DIFFERENCES IN RETAIL GASOLINE PRICES.

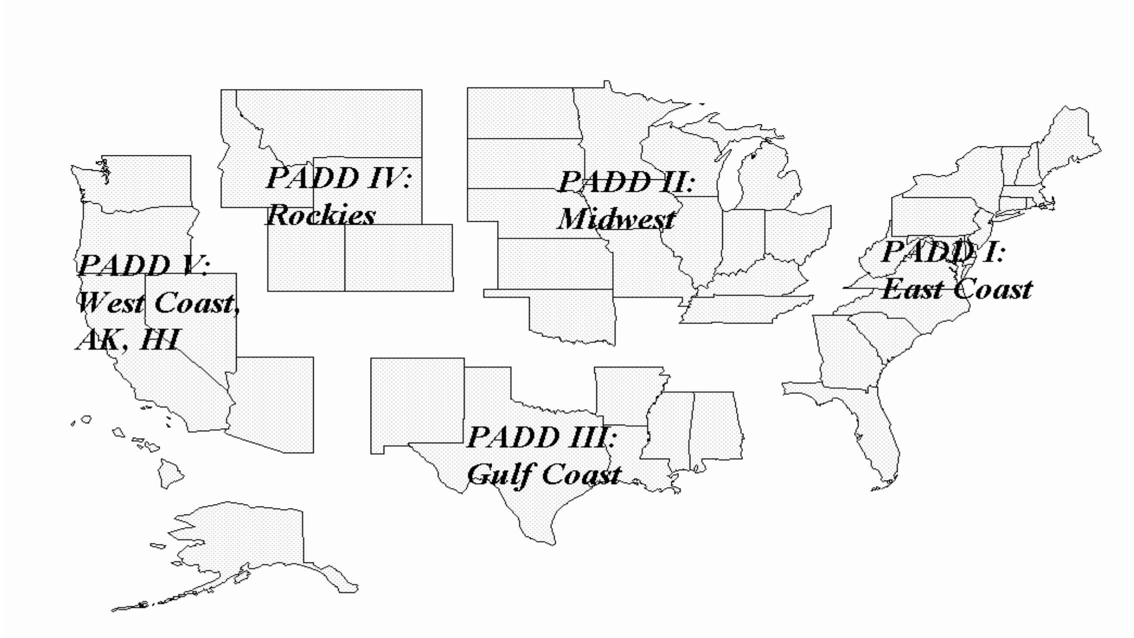
The examples above highlight ways in which differential access to gasoline supplies, including environmentally mandated fuel, can affect wholesale and retail gasoline prices in particular areas. We next examine each region's annual gasoline consumption, the refining and gasoline transportation infrastructure through which each region obtains gasoline supplies, and one region in which year-round environmental fuel specifications significantly limit the availability of substitute gasoline supplies. Finally, we compare retail gasoline prices in different regions of the U.S. to assess whether they reflect some of the differences we have described.

A. Regions in the U.S. Differ in the Amount of Gasoline Consumed.

In the following examples, we describe regions in terms of the Petroleum Administration for Defense Districts (PADDs) delineated during World War II and still used by the EIA as a basis for data collection. *See* Figure 4-4. The PADDs are defined as follows:

- **PADD I is the East Coast,** defined as Connecticut, Delaware, District of Columbia, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia, and West Virginia.
- **PADD II is the Midwest,** defined as Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, and Wisconsin.
- **PADD III is the Gulf Coast,** defined as Alabama, Arkansas, Louisiana, Mississippi, New Mexico, and Texas.
- **PADD IV is the Rocky Mountains,** defined as Colorado, Idaho, Montana, Utah, and Wyoming.
- **PADD V is the West Coast,** defined as Alaska, Arizona, California, Hawaii, Nevada, Oregon, and Washington.

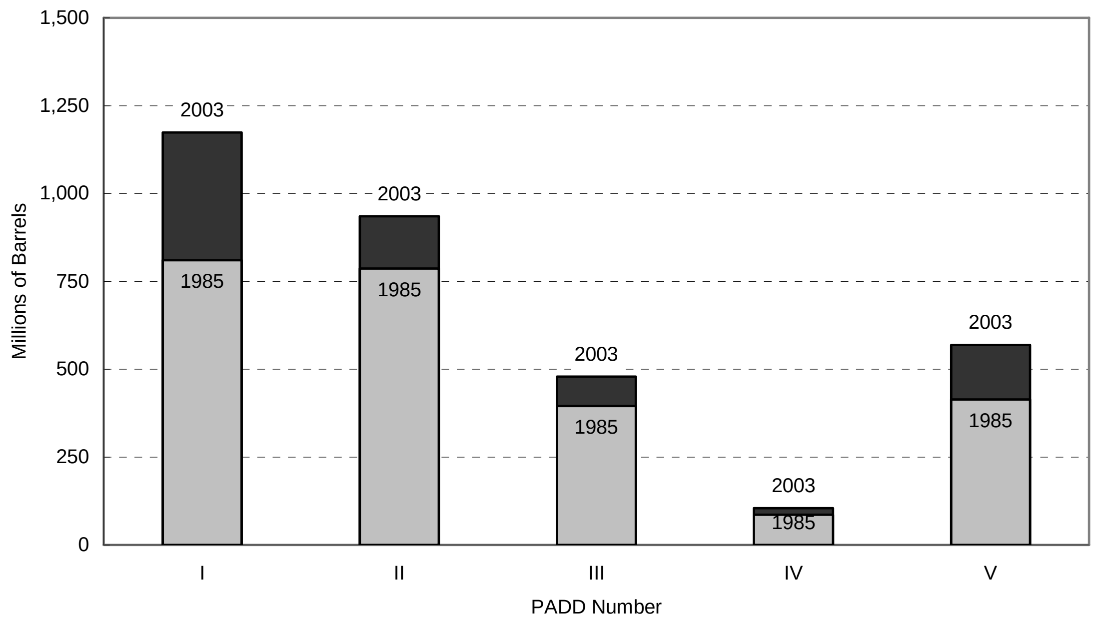
Figure 4-4: Map of U.S. PADDs



Of course, these regions are geographically quite large. Different locations within a PADD, as discussed above, may have different degrees of access to sources of gasoline supply. Also, while these regions are useful for data collection, they may not represent a relevant geographic market for antitrust purposes.

In 2003, the U.S. consumed about 3.3 trillion barrels of gasoline, up from roughly 2.5 trillion barrels in 1985. Regions of the U.S. differ significantly in how much of this gasoline they consume. The EIA estimates total annual consumption of gasoline in each PADD by adding the region's refinery production of gasoline, "other" production, such as ethanol, MTBE, and alkylates (typically a small amount),[33] imports of gasoline from outside the U.S., and deliveries of gasoline from other PADDs. The EIA then subtracts the region's exports of gasoline to locations outside the U.S. and deliveries to other PADDs. This results in a number that represents "product supplied" to each region and therefore approximates gasoline consumption in that region.[34]

Figure 4-5: Gasoline Consumption by PADD (1985 and 2003)



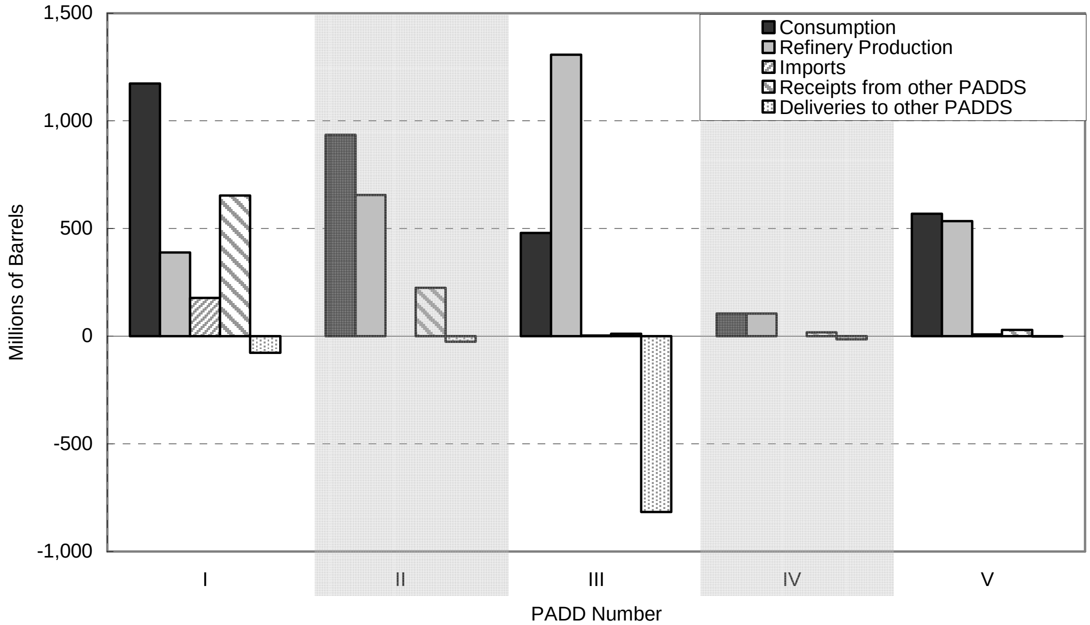
Source: EIA
Note: Gasoline consumption is what EIA reports as "product supplied," which is the sum of refinery production, imports, receipts from other PADDs, other production, and decrease in gasoline stocks, less shipments to other PADDs and exports.

As Figure 4-5 shows, in both 1985 and 2003, the East Coast (PADD I) and the Midwest (PADD II) were the largest consuming areas. Similarly, in both 1985 and 2003, the West Coast (PADD V) and the Gulf Coast (PADD III) were third and fourth in annual gasoline consumption. The Rockies (PADD IV) has remained the area with the smallest annual gasoline consumption.

B. Refining Capacity and Gasoline Transportation Options Vary Among Different Regions of the U.S.

Gasoline consumption in a region typically does not match the amount of gasoline it refines. Indeed, refinery capacity varies widely among different regions in the U.S. Although some regions have enough refining capacity to be largely self-sufficient, others depend heavily on gasoline supplies delivered through pipelines and marine transport from other PADDs. *See* Figure 4-6.

Figure 4-6: Gasoline Consumption, Production, Imports, and Inter-PADD Shipments (2003)



Source: EIA

Note: Gasoline consumption is what EIA reports as "product supplied," which is the sum of refinery production, imports, receipts from other PADDs, other production, and decrease in gasoline stocks, less shipments to other PADDs and exports.

Access to refined product pipelines also varies widely among different regions in the U.S. The refined product pipeline system in the U.S. generally runs between refineries and areas of gasoline consumption that have less or no refinery capacity. Pipelines accounted for 81 percent of the shipments of refined petroleum products between PADDs in 2003, but pipeline importance varies substantially across geographic areas.[35] *See* Box 4-2.

Box 4-2: Pipeline Transportation of Gasoline

Refined product pipelines typically are regulated by the Federal Energy Regulatory Commission or state regulatory agencies. The price of transportation on regulated pipelines represents a small percentage of the total cost of gasoline. For example, the average cost of moving a gallon of gasoline by pipeline 1,000 miles from the Gulf Coast to the Chicago region is approximately $0.02. At typical pipeline speed of between 3 and 8 miles per hour, such a trip would take approximately 12 days. *See* Cooper 8/2 at 1; Jacobs 5/8 at 109; Coleman 8/2 at 129. *See* PETROLEUM MERGER REPORT 164-65 for discussion of pipeline regulation.

Pipeline owners and others report that pipeline expansion is difficult for many reasons, including the difficulty of obtaining construction permits. Cooper 8/2 at 4; *see also* Jacobs 5/8 at 117, 171; Morgan 5/8 at 125. Nonetheless, several pipeline expansion projects to allow Gulf Coast gasoline to reach the Midwest and the Southwest are underway or have been completed; such projects can significantly improve access to gasoline supplies in those areas.

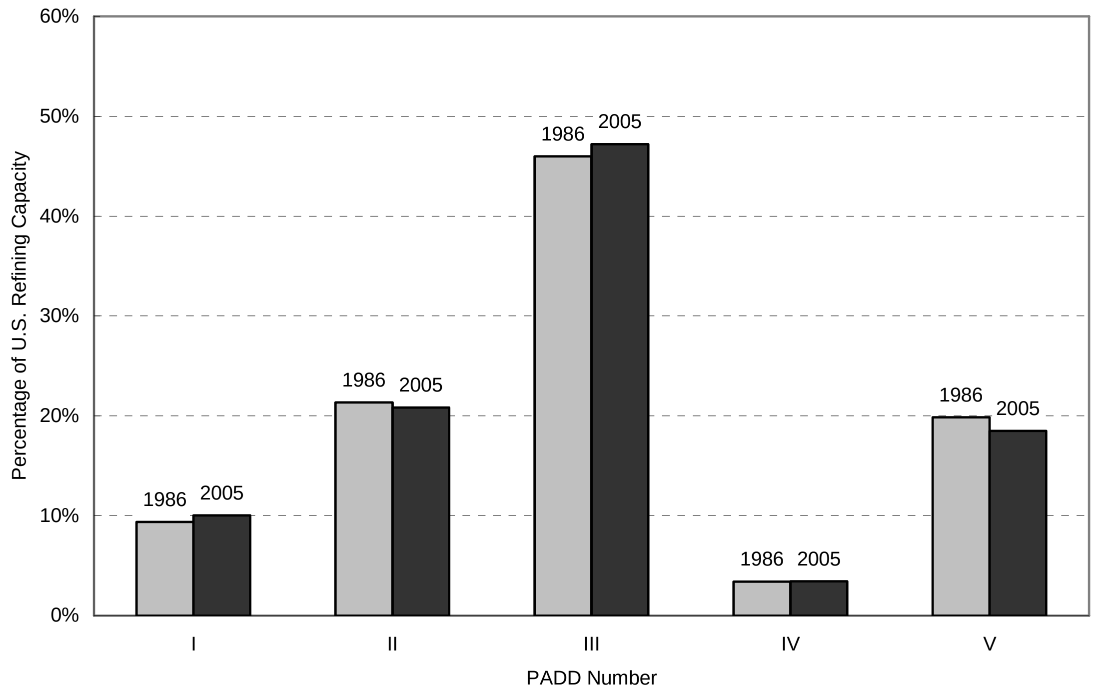
If an area must obtain refined petroleum from marine transport, a federal statute known as the Jones Act[36] increases the transportation costs. The Jones Act requires that any product transported by vessel between U.S. ports be carried in domestically-built ships staffed by U.S. crews, which is more expensive than carriage by foreign-built, foreign-staffed ships. A recent government estimate of the total welfare cost of the Jones Act for all tanker shipping is $656 million dollars a year, based on the assumption that a foreign ship has operating costs of only 59 percent of a Jones Act ship.[37] The observed cost of transportation of refined petroleum products from the Gulf to the West Coast, $0.10 to $0.25 per gallon,[38] implies that the Jones Act imposes an additional cost of about at least 4 cents per gallon when it is necessary to transport gasoline using Jones Act ships.[39]

1. The Gulf Coast (PADD III) has plentiful access to gasoline supplies.

The Gulf Coast has long had the greatest number of refineries, as well as the largest amount of refining capacity, of any region in the United States.[40] Gulf Coast refineries together have the capacity to produce a much greater quantity of gasoline than the region demands. As Figure 4-6 shows, PADD III's gasoline production in 2003 (roughly 1.3 trillion barrels of gasoline) far exceeded its gasoline consumption in 2003 (roughly 479 million barrels).

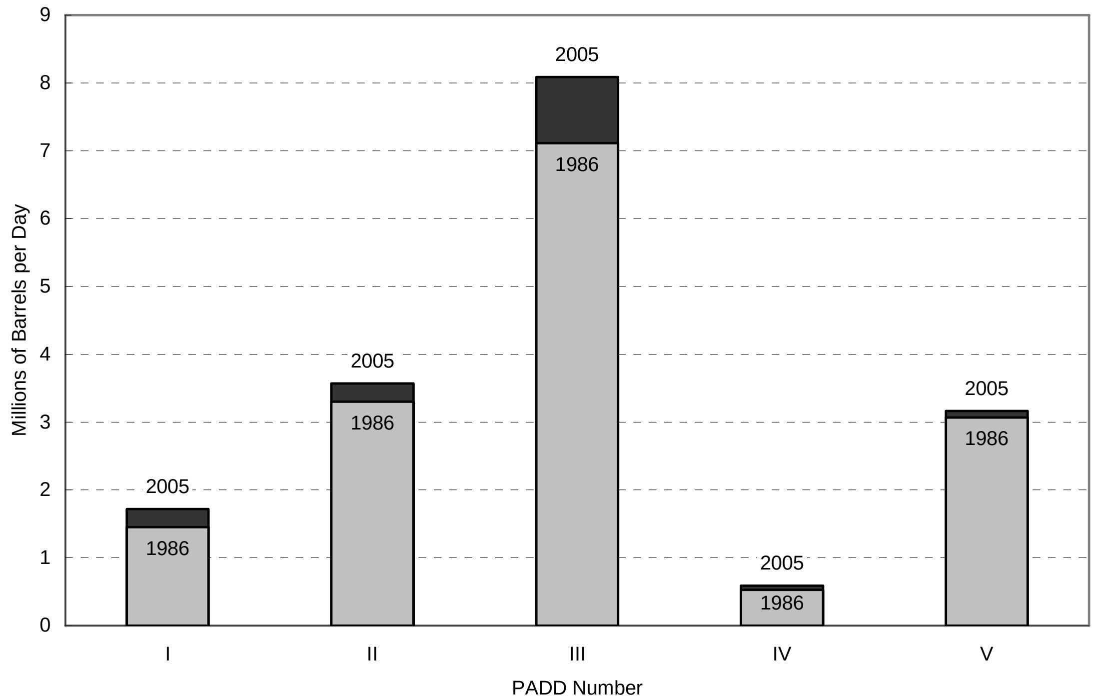
As a result, the Gulf Coast supplies a large proportion of the gasoline sold in the U.S. As shown in Figure 4-7, in both 1986 and 2005, Gulf Coast refining capacity represented approximately 46 to 47 percent of the refining capacity in the U.S. Although the relationship among PADDs in terms of percentage of U.S. refining capacity has changed relatively little since the 1980s, PADD III's increase in refining capacity from 1986 to 2005 – from around 7 million barrels per day to just over 8 million barrels per day – was the greatest of any PADD. *See* Figure 4-8.

Figure 4-7: Percentage of U.S. Refining Capacity by PADD (1986 and 2005)



Source: EIA

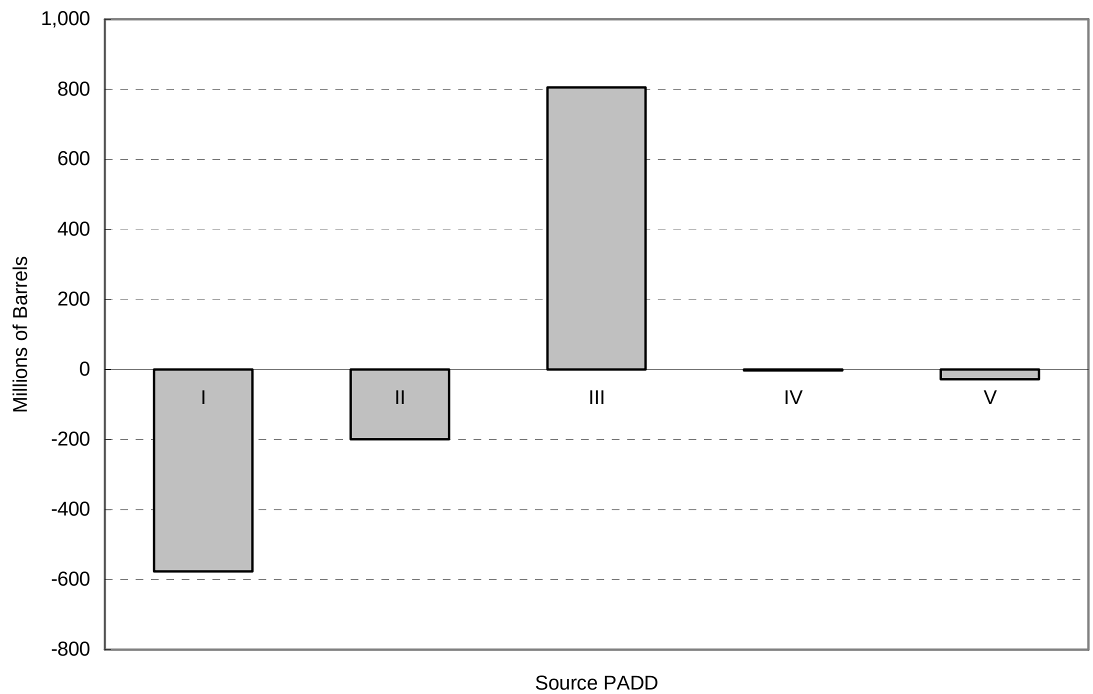
Figure 4-8: Refining Capacity by PADD (1986 and 2005)



Source: EIA

In 2003, the Gulf Coast (PADD III) was the only net supplier of gasoline to other PADDs, with net shipments of 806 million barrels of gasoline. *See* Figure 4-9. This is more gasoline than was produced in any other PADD that year.

Figure 4-9: Net Shipments of Gasoline to other PADDS



Source: EIA

A large system of refined product pipelines connects the Gulf Coast with all other PADDs – except portions of PADD V on the West Coast. Tankers sometimes deliver gasoline supplies from the Gulf Coast to the West Coast.[41]

2. The East Coast (PADD I) produces some gasoline but also relies heavily on deliveries from the Gulf Coast and, to a lesser extent, imports from Canada, the Caribbean, Europe, and South America.

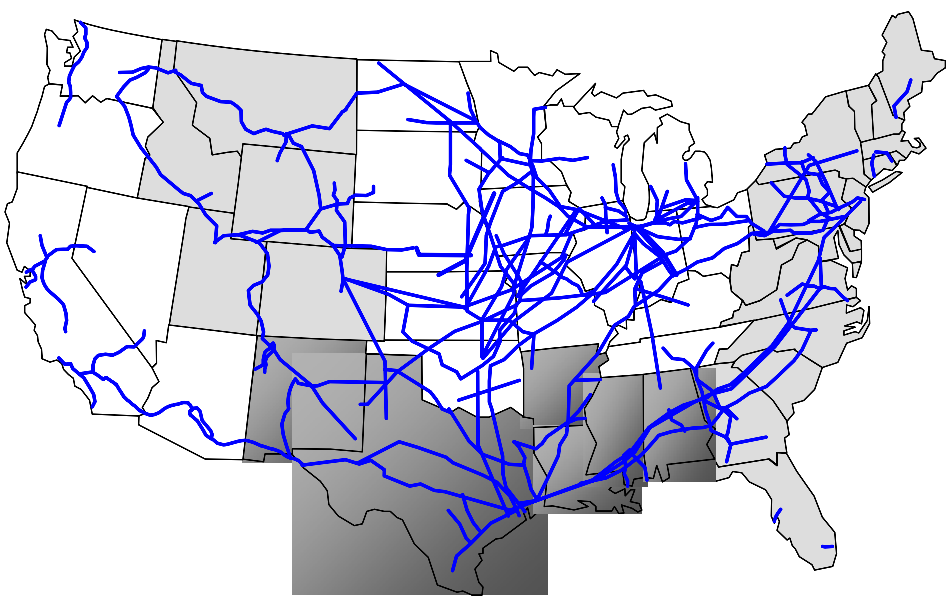
Refinery production of gasoline in the East Coast increased from about 225 million barrels in 1985 to about 389 million barrels in 2003.[42] Despite the increase in refining capacity that this change reflects, the East Coast still consumes far more gasoline than its refineries produce. *See* Figure 4-6, *supra*.

Indeed, the East Coast typically receives a far greater proportion of its gasoline from the Gulf Coast (almost 55 percent in 2003) than East Coast refineries produce (about 33 percent in 2003).[43] Foreign imports also represent a substantial source of supply for the East Coast, accounting for about 15 percent (315 million barrels) of the gasoline consumed in PADD I in 2003.[44] *See* Figure 4-6, *supra*.

Gasoline supply conditions vary within PADD I. About 95 percent of the refining capacity in the East Coast is located in Pennsylvania, New Jersey, and Delaware.[45] Thus, large parts of the East Coast are within easy reach of gasoline that is refined in PADD I and then transported by major pipelines and marine shipments to heavily populated and other nearby areas.[46] In addition, two large pipelines, the Colonial and the Plantation, deliver gasoline from the Gulf Coast to the East Coast, and one of those pipelines delivers gasoline as far north as the New York area.[47] The two pipelines follow similar inland routes through the Southeast, and, in a few areas, spurs of these pipelines expand farther west or go toward the Atlantic coast.[48]

By contrast, New England has no refineries and no connections to the major pipelines that deliver gasoline from the Gulf Coast to other parts of PADD I. Thus, New England depends heavily on barge shipments from the New York City area,[49] as well as imports from Canada, the Caribbean, Europe, and South America. Some areas of the Southeast, such as Florida, similarly are unconnected to major refined petroleum products pipelines and are also heavily dependent on water shipments for gasoline supplies from both the Gulf Coast and imports. *See* Figure 4-10.

Figure 4-10: Major Refined Product Pipelines



Source: Allegro Energy Group

3. The Midwest (PADD II) relies primarily on its own refineries and gasoline supplies from the Gulf Coast.

Between 1985 and 2003, the amount of gasoline refined in the Midwest increased from about 593 million to about 655 million barrels per year. *See* Figure 4-8, *supra*. Despite this increase, the proportion of U.S. refining capacity in PADD II dropped slightly in 2005. *See* Figure 4-7 *supra.*

As shown in Figure 4-6 *supra*, gasoline consumption in the Midwest exceeds its refinery production by about 43 percent. In 2003, gasoline refined in the Midwest provided about 655 million barrels of the supplies consumed there, leaving about 280 million barrels to be supplied from areas outside the Midwest.[50] The Midwest imported about 140 million barrels of the 280 million barrels in 2003 from the Gulf Coast (PADD III).[51]

Pipeline capacity for gasoline deliveries from the Gulf Coast to the Midwest has increased in recent years. The Centennial pipeline was converted from natural gas to transport refined petroleum products.[52] The Centennial carries gasoline from the Gulf to central Illinois and supplies other pipelines that serve Chicago; it moves up to 210,000 barrels per day.[53] The Explorer pipeline, which also travels from the Gulf Coast to the Midwest, was expanded to increase capacity by 130,000 barrels per day.[54] The addition of the Centennial pipeline and the expansion of the Explorer pipeline have significantly increased pipeline capacity from the Gulf Coast to the Midwest and appear to have eased the tightness of gasoline supplies in the summer in the Midwest.[55]

4. The Rocky Mountain States (PADD IV) rely on PADD IV refineries and have limited pipeline connections.

Gasoline consumption in the Rocky Mountain States is the lowest of any of the five PADDs (about 104.3 million barrels in 2003). *See* Figure 4-5, *supra*. Refineries in the Rockies produce about the same amount of gasoline (about 104.1 million barrels in 2003) as is consumed there. *See* Figures 4-5 & 4-6, *supra*. Not all of the gasoline produced by PADD IV refineries is consumed in the Rocky Mountain states, however. In 2003, the Rocky Mountain states exported and imported relatively small amounts of gasoline.[56] Although, the Rocky Mountain states are, for the most part, self-sufficient in terms of gasoline supplies, limited connections to other PADDs leave them vulnerable to supply shortages in the event of unanticipated PADD IV refinery outages. That circumstance may change, however, if proposed projects for new pipelines and increases in the capacity are built or undertaken. This would enable the existing pipelines in the Rocky Mountain states to become better connected to gasoline supplies in the Gulf Coast and in the Midwest.[57]

5. The West Coast (PADD V) relies primarily on its own refineries and marine supplies, and has very limited pipeline connections.

Gasoline consumption in the West Coast rose from about 414 million barrels in 1985 to about 569 million barrels in 2003. *See* Figure 4-5, *supra*. The percentage of West Coast gasoline consumption supplied from West Coast refineries rose from 90 percent to 93 percent during that time.[58]

Access to gasoline supplies varies within PADD V itself. For example, two states in PADD V – Alaska and Hawaii – are not contiguous with the U.S. and therefore must rely on in-state refineries and marine transport for gasoline supplies. Washington state has refineries; Oregon has none, but receives gasoline from refineries in Washington state and California. Washington state and Arizona receive some small pipeline shipments from the Gulf Coast and the Rocky Mountain states, and Arizona has pipeline connections through which it can receive gasoline from California refineries. Some deliveries of Gulf Coast gasoline arrive in California by tanker, but California relies heavily on its own refineries.[59]

In recent years, new projects have been planned, and one completed, to increase access to gasoline supplies in the Southwest. Arizona may benefit from gasoline deliveries by the newly completed Longhorn pipeline, which moves gasoline from Houston to west Texas, and thus permits Gulf Coast gasoline to be shipped west of El Paso on other pipelines to destinations such as Phoenix and Tucson.[60] Plans have been announced to build a refinery in Arizona, which currently has none.[61]

California, however, remains relatively isolated from other regions, in part because it lacks pipeline connections with other major refining regions in the U.S.[62] and in part because of its environmentally mandated fuel. The Clean Air Act Amendments of 1990 mandated three specialized fuels in order to improve air quality – RFG, wintertime oxygenated gasoline, and conventional gasoline.[63] As noted in Chapter 3, the air quality within the U.S. has greatly improved due to the clean fuel programs.[64] In addition, California instituted its own, more stringent fuel requirements. In 1992, Phase I of the California Air Resources Board (CARB) gasoline regulations went into effect and required new specifications for less volatile summertime gasoline and detergents and began the phase-out of leaded gasoline. Additionally, as of 1992, California's winter maximum oxygen content by weight was lowered to 2.0 percent, lower than the 2.7 percent allowed in other states. Since 1992, CARB has continued to require cleaner, and thus more expensive, gasoline in California than is required in other states. In 1996, California started Phase II of its CARB program. The CARB Phase II program incorporates a stricter quality and emission standards than mandated in other states by the federal RFG Phase II program, which began in 2000. As of January 1, 2004, California also banned the use of MTBE as an additive in gasoline and requires the use of ethanol as an oxygenate instead.[65]

C. Regional Differences in Annual Average Real Retail Gasoline Prices by PADD over the Past 20 Years Suggest that Less Ready Access to Gasoline Supplies, Especially When Combined with Boutique Fuel Requirements, Contributes to Higher Annual Average Real Retail Gasoline Prices.

Demand and supply conditions differ across the nation, as discussed above. In particular, regional differences in ease of access to gasoline supplies from refineries or pipelines, as well as some boutique fuel requirements, appear to influence gasoline prices. Table 4-1 below shows annual average real gasoline prices, excluding taxes, for each PADD from 1984 to 2004.

Table 4-1: Annual Average Real (2004 Dollars) Retail Gasoline Prices By PADD, Cents per Gallon Without Taxes (1984-2004)

Year	PADD I: East Coast	PADD II: Midwest	PADD III: Gulf Coast	PADD IV: Rockies	PADD V: West Coast
1984	146.5	147.3	147.5	146.4	148.0
1985	145.0	143.6	142.1	144.7	141.8
1986	99.2	96.0	95.9	96.6	101.8
1987	103.4	100.3	99.2	101.9	101.0
1988	101.2	95.8	96.7	96.5	99.4
1989	109.4	104.6	104.6	106.2	107.7
1990	121.8	117.7	119.7	117.7	119.9
1991	107.4	103.1	105.5	102.8	98.6
1992	99.7	95.6	98.1	104.2	107.0
1993	92.6	89.5	92.1	98.5	101.6
1994	87.8	85.9	86.8	95.5	95.7
1995	90.7	87.0	89.7	94.7	96.2
1996	96.3	95.7	95.4	104.0	107.4
1997	93.6	92.2	91.5	103.2	105.4
1998	72.7	72.9	71.4	82.2	83.7
1999	81.6	82.0	79.6	92.0	100.4
2000	116.4	118.3	112.6	122.5	128.9
2001	104.3	109.3	101.5	115.3	120.8
2002	96.7	98.7	94.3	102.4	104.9
2003	114.2	114.3	109.4	119.6	134.6
2004	141.4	139.5	135.4	144.2	161.8

Source: EIA, BEA

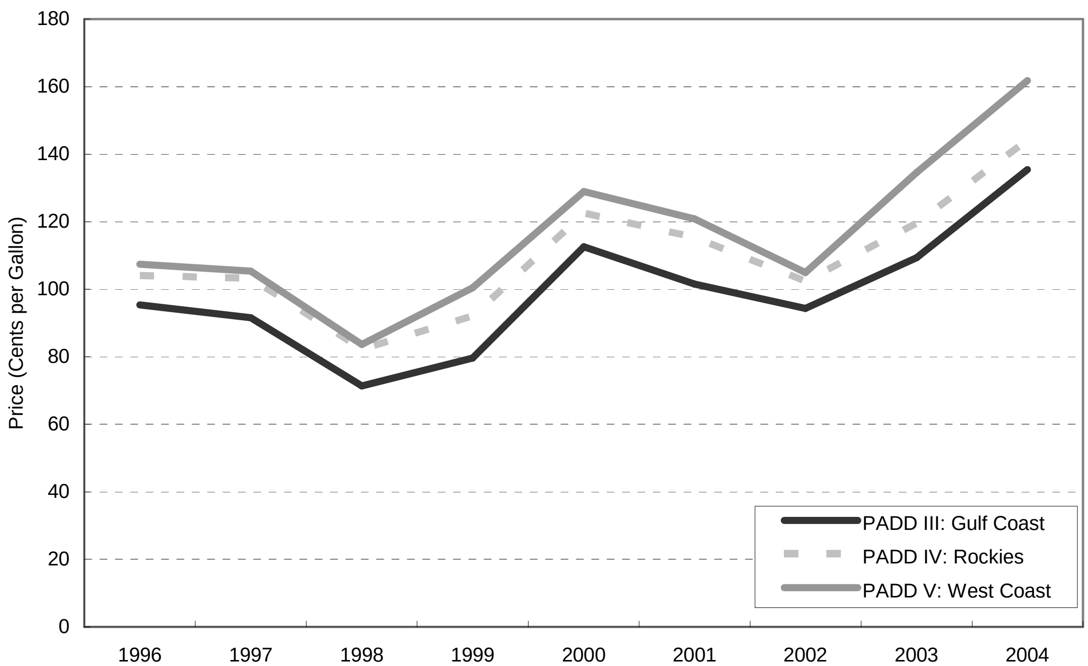
1. Over the past 20 years, regional differences have emerged in annual average real retail gasoline prices, excluding taxes.

From 1984 through 1990, differences in annual average real retail gasoline prices among PADDs, as shown in Table 4-1, were generally small, usually 5 cents per gallon at most. No PADD consistently had the lowest average annual real retail gasoline prices in each of those years. A larger difference among PADDs did appear in 1991, when the West Coast (PADD V) enjoyed annual average real retail gasoline prices that were 9 cents lower than those on the East Coast (PADD I).

Beginning in 1992, however, greater price differences began to appear on a regular basis. Average annual real retail gasoline prices in Rocky Mountain states (PADD IV) and the West Coast (PADD V) began to increase in relation to prices in other regions of the country. For example, from 1992 to 1995, the Midwest (PADD II) regularly had the lowest annual average real retail gasoline prices, excluding taxes, in the U.S. During that time, annual average real retail gasoline prices, excluding taxes, in the Rocky Mountain states ranged from 7 to 10 cents higher than those in the Midwest. Annual average real retail gasoline prices in the West Coast (PADD V) ranged from 9 to 12 cents higher than those in the Midwest.

Regional differences have only become more exaggerated since 1995. Figure 4-11 shows Gulf Coast annual average real retail gasoline prices, excluding taxes, from 1996 to 2004; during that time, the Gulf Coast consistently had the lowest such prices. Figure 4-11 also shows annual average real retail gasoline prices, excluding taxes, for the Rocky Mountain states (PADD IV) and the West Coast (PADD V) during that time.

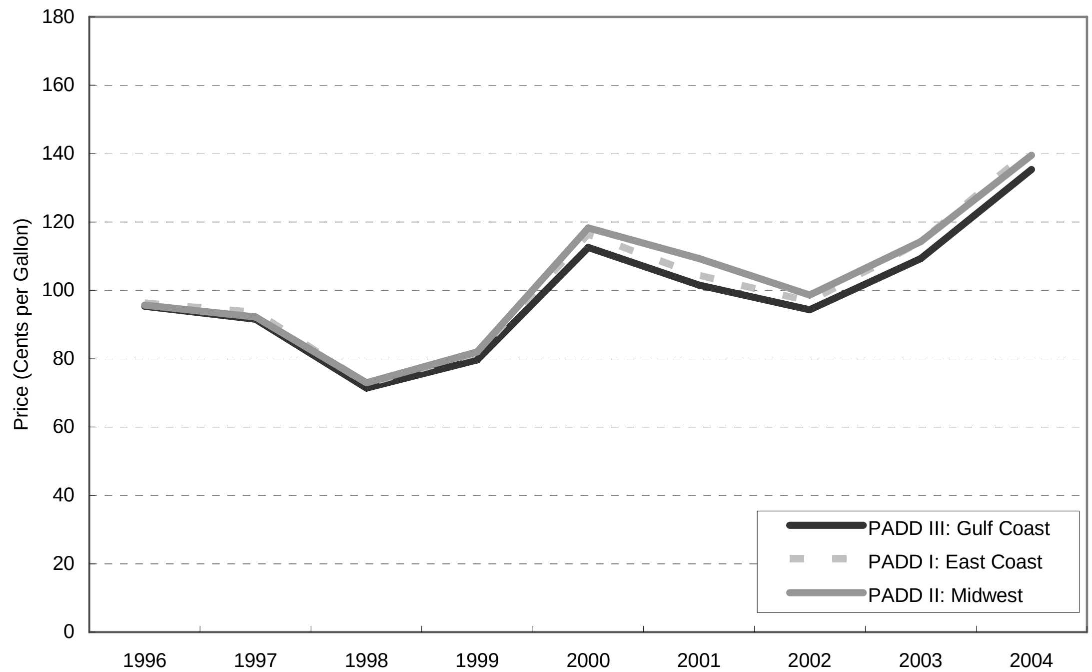
Figure 4-11: Annual Average Real (2004 Dollars) Gasoline Prices, without taxes, PADDs III, IV, and V (1996-2004)



Source: EIA, BEA

By contrast, as shown in Figure 4-12, annual average real retail gasoline prices, excluding taxes, on the East Coast (PADD I) and in the Midwest (PADD II) have generally remained within a few cents of prices in the Gulf Coast (PADD III) since 1996, although differences between prices in those PADDs and PADD III do appear to have grown somewhat over time.

Figure 4-12: Annual Average Real (2004 Dollars) Gasoline Prices, without taxes, PADDs I, II, and III (1996-2004)



Source: EIA, BEA

2. Producing cleaner burning fuels and limited access to infrastructure are possible sources of higher average retail gasoline prices on the West Coast and, to a lesser extent, in the Rocky Mountain states.

a. Producing cleaner burning fuel increases the average cost of gasoline and raises the costs of obtaining substitute gasoline supplies in the event of a supply shortage.

The timing of the price changes shown above suggests that they may bear some relationship to the introduction of Phases I (1992) and II (1996) of the stringent and specialized CARB requirements for gasoline sold in California. As noted earlier, since 1992, CARB has required cleaner, and thus more expensive, gasoline in California than is required in other states. Only a limited number of refineries outside of California produce CARB gasoline.[66]
To some extent, the West Coast's higher annual average real retail gasoline prices reflect production costs associated with California's more stringent environmental standards for gasoline.

In addition to raising production costs for gasoline, the requirement to use CARB gasoline in California reduces the amount of gasoline available elsewhere to replenish supplies in the event of a shortage. It is illegal to use conventional gasoline in California, so California gas stations cannot substitute nearby supplies of conventional gasoline for CARB gasoline. Both the limited number of refineries outside of California that make CARB gasoline and California's isolation from major pipelines connected with other major refinery centers reduce sources of substitute gasoline. Indeed, if California had better pipeline connections to the Gulf or other areas with large refining capacity, more refiners outside of California might have greater incentives to make CARB gasoline or blending components suitable for CARB gasoline.

b. Relatively limited access to pipelines may contribute to higher annual average real retail gasoline prices in the Rocky Mountain states and the West Coast.

Although environmental requirements are important on the West Coast, the same trend toward higher average prices appears in the Rocky Mountain states, where environmental requirements are less restrictive. This suggests there are other possible sources of higher average prices.

The Rocky Mountain states also have relatively limited access to pipeline connections to supply substitute gasoline in the event of a shortage. By contrast, the East Coast and the Midwest are much better connected to pipelines that can supply substitutable gasoline in the event of a shortage. These differences may contribute to the price differences shown in Table 4-1. For the Rocky Mountain states, price differences may diminish if pipeline projects come to fruition and pipeline connections are increased. Other factors, however, may have also contributed to higher average prices in both the Rocky Mountain states and the West Coast.

D. Boutique Fuels and Differential Access to Gasoline Supplies Can Contribute to Gasoline Price Variability in Particular Circumstances.

One issue of concern to consumers is the extent to which gasoline prices seem to have become more variable. See Box 4-3 discussing how to measure price variability. Consumers in some regions – especially the West Coast – perceive more price variability than in the past.

There are at least two possible explanations for price variability. First, the large number of different boutique fuel requirements throughout the country may have caused greater price variability because they cannot use conventional gasoline as a substitute for supply. Boutique fuels include various types of RFG, less volatile summer gasoline, [67] ultra-low-sulfur gasoline (such as the low-sulfur gasoline currently used in Atlanta, GA), winter-oxygenated gasoline, and gasoline mandated by CARB.

Second, regions with less easy access to gasoline supplies may experience more variability in gasoline prices, because they are less able to find substitute gasoline in the event of a refinery or pipeline outage or other supply disruption. Of course, it also may be that both factors combine to increase gasoline price variability.

To address some of consumers' questions about the variability of gasoline prices, the FTC staff collected and analyzed data, focusing on the questions below. This section reports staff's findings.

Box 4-3: How to Measure Price Variability: Standard Deviations and the Mean

As noted in Chapter 3, *see* Box 3-3, the mean is the average of a number of observations of real-world data. For example, the mean of $1.48 and $1.52 is $1.50. That same number – $1.50 – is also the average of $1.00 and $2.00, however. To show such differences, statisticians calculate the "standard deviation," which measures how close to the mean individual observations are. If the observations generally are very close to the mean, then the standard deviation will be small. If the observations are spread over a larger range around the mean, the standard deviation will be larger.

The standard deviation can measure how gasoline prices are dispersed around the mean of gasoline prices in a particular area and, thus, can measure the variability of gasoline prices. A small standard deviation means lower variability; a larger standard deviation means greater variability. In addition, an "F" statistic can test whether the standard deviations in different areas are significantly different in statistical terms or within the range of differences that might normally be expected. Thus, the "F" statistic can show whether different areas have statistically significant differences in the degree of gasoline price variability that they experience.

1. Gulf Coast boutique fuel gasoline prices are not more variable than conventional gasoline prices on the Gulf Coast.

To analyze whether boutique fuel gasoline prices are more variable than conventional gasoline prices on the Gulf Coast, the staff used "gross product margins," which eliminate some of the possible sources of gasoline price volatility *other than* boutique fuels. "Gross product margins" are the differences between spot prices for gasoline prices and crude oil prices. Examining this difference, rather than gasoline prices themselves, removes the variability that changes in crude oil prices can cause. To remove that variability is important, because, as discussed in Chapter 2, changes in crude oil prices explain most of the changes in gasoline prices. In particular, the staff analyzed the difference between weekly average spot prices for gasoline and West Texas Intermediate (WTI) crude oil. The analysis compares gross product margins on the Gulf Coast for three types of boutique fuel, as well as for RBOB, with gross product margins for conventional gasoline. A focus on the Gulf Coast, the center of much refining capacity, largely removes pipeline disruption as a source of variability and brings the focus more clearly onto price variability in relation to refineries.

Table 4-2 compares the variability in gross product margins for various types of boutique gasoline for the Gulf Coast over various times ranging from January 2002 through December 2004, with the variability in gross product margins for conventional gasoline. Prices are not available for each of the boutique blends over the same dates, because, for example, gasoline with low volatility is required only from June through mid-September, and spot prices for low sulfur gasoline (RBOB)[68] are available only from November, 2003. Accordingly, the gross product margins for conventional gasoline were calculated for the appropriate, corresponding time periods.

Table 4-2 presents the standard deviations for gross product margins for boutique fuels in the Gulf in the far left-hand column. The standard deviations for gross product margins for conventional gasoline in the Gulf appear in the next column. Moving to the right, past the column showing the differences between these, the "F" statistic appears; it indicates the extent to which the level of variability in gross product margins is similar for conventional and boutique gasoline.

Table 4-2: Gulf Coast Gross Product Margin Variability for Boutique Fuels

Refining Margin	Dates	Standard Deviation				Weeks of Obs	Mean		
		Sample	Gulf Conv - WTI	Diff	F-stat		Sample	Gulf Conv - WTI	Diff
Gulf RFG - WTI	1/02 to 12/04	$ 0.0763	$ 0.0746	$ 0.0017	1.05	156	$ 0.1591	$ 0.1295	$ 0.0295
Gulf RBOB - WTI	11/03 to 12/04	$ 0.1035	$ 0.0958	$ 0.0077	1.17	60	$ 0.2055	$ 0.1954	$ 0.0100
Gulf 7.8 RVP - WTI	3/02 to 9/04 mid-Mar to mid-Sep	$ 0.0860	$ 0.0832	$ 0.0028	1.07	75	$ 0.1680	$ 0.1591	$ 0.0088
Gulf Low Sulfur - WTI	4/03 to 12/04	$ 0.0940	$ 0.0854	$ 0.0086	1.21	88	$ 0.2108	$ 0.1719	$ 0.0389

Table 4-2 shows that the variations in gross product margins for different specifications of gasoline in the Gulf Coast are very similar. The difference in the standard deviation between any of the listed boutique fuels and conventional gasoline in the Gulf is less than $0.01 per gallon.[69] *See* Column "Standard Deviation," subcolumn "Diff." In addition, the "F" test reveals that the differences in Table 4-2 are not statistically significant. Thus, at least within the Gulf Coast, the price variability of boutique fuels is very similar to the price variability of conventional gasoline.

Columns on the right of Table 4-2 show mean gross product margins for conventional and boutique fuels on the Gulf Coast over the listed time periods. Although the variability in gross product margins is similar, the means are not. The average gross product margins for boutique fuels are higher than for conventional gasoline, reflecting their higher production costs.

2. Boutique gasoline prices in California are significantly more variable than conventional gasoline prices on the Gulf Coast.

Once again, the analysis uses gross product margins, this time focusing on the variations in gross product margins between California boutique fuels[70] and WTI[71] and gross product margins between conventional Gulf Coast gasoline and WTI. Table 4-3 reveals significantly more variability in the gross product margins for California boutique fuel than for conventional gasoline in the Gulf. *See* Column "Standard Deviation," subcolumn "Diff." In addition, the "F" test reveals a statistically significant difference at the 1 percent level between the variations in gross product margins for California boutique fuel and for Gulf Coast conventional gasoline. That is, there is no more than one chance in one hundred that the variability in California boutique fuel prices is the same as the variability in conventional gasoline prices on the Gulf Coast.[72] Moreover, as was the case with boutique fuel prices on the Gulf Coast, the average of boutique fuel prices in California is higher than that for conventional gasoline prices on the Gulf Coast.

Table 4-3: California Gross Product Margin Variability for Boutique Fuels

Refining Margin	Dates	Standard Deviation				Weeks of Obs	Mean		
		Sample	Gulf Conv - WTI	Diff	F-stat		Sample	Gulf Conv - WTI	Diff
California RFG - WTI	1/02 to 11/03	$ 0.1169	$ 0.0477	$ 0.0692	6.00	98	$ 0.2574	$ 0.1038	$ 0.1536
California RBOB - WTI	3/03 to 12/04	$ 0.1614	$ 0.0823	$ 0.0790	3.84	95	$ 0.3852	$ 0.1696	$ 0.2156

Several factors contribute to the significantly higher degree of price variability in California than in the Gulf. First, when there is an unexpected refinery outage in California, it affects a much larger share of the region's gasoline supply than if that outage were to occur in the Gulf. Further, because the Gulf is connected with the East Coast and the Midwest, the effects of any disruption on the Gulf Coast are spread over many more consumers than can be spread over California and its neighboring states. Finally, the Gulf Coast and the areas it is interconnected with – especially the East Coast – can receive gasoline imports much faster than California. California's inability to substitute gasoline from other refinery regions in the U.S. or to obtain increased gasoline imports without significant delay makes it more vulnerable to the types of unforeseen circumstances, such as refinery and pipeline outages, that cause price variability.

3. Gasoline prices in the East Coast (PADD I), the Midwest (PADD II), and the Rocky Mountain states (PADD IV) are significantly more variable than Gulf Coast gasoline prices.

For this analysis, the staff looked at gross product margins for various retail areas, calculating these margins as the difference between weekly average retail prices for regular grade gasoline (less taxes) and WTI crude oil for 1997 through 2004. The staff compared the variability in gross product margins for gasoline in 60 retail areas in the Gulf Coast (PADD III) with the variability of the same margins in 253 retail areas in the East Coast (PADD I), the Midwest (PADD II), and the Rocky Mountain states (PADD IV).

This comparison indicates that retail gasoline gross product margins in the East Coast, the Midwest, and the Rocky Mountain states are more variable than those in the Gulf Coast. The standard deviation for the variability in retail-to-WTI crude margins in the East Coast, Midwest, and Rocky Mountain states combined is 8.55. The standard deviation for the variability in retail-to-WTI crude margins in the Gulf Coast is 7.76. The difference between these two standard deviations is statistically significant. In other words, there are less than five chances in one hundred that the variability in retail-to-WTI crude margins in the East Coast, the Midwest, and the Rocky Mountain states combined is the same as the variability in those margins on the Gulf Coast.[73]

4. Differences in access to pipelines and substitutable gasoline supplies appear most significant in explaining these differences in the variability of gasoline prices in different locations in the U.S.

Table 4-4 illustrates the importance of pipeline access to reducing gasoline price variability. Table 4-4 presents standard deviations to show the variability in retail-to-WTI crude margins in areas that use conventional gasoline year-round and that are located along the Colonial and Plantation pipelines. These major pipelines run from the Gulf Coast along the East Coast to the mid-Atlantic.

Table 4-4: Conventional Gasoline Gross Product Margin Variability Along the Colonial and Plantation Pipelines (2002-2004)

PADD	State	Fuel Type	Standard Deviation (Retail to WTI)
III	Louisiana	Conventional	$0.0926
III	Mississippi	Conventional	$0.0905
III	Alabama	Conventional	$0.0917
I.C	Georgia	Conventional	$0.0920
II	Tennessee	Conventional	$0.0923
I.C	South Carolina	Conventional	$0.0884
I.C	North Carolina	Conventional	$0.0939
I.C	Virginia	Conventional	$0.0958

The data in table 4-4 are arranged roughly from south to north, the direction of the two parallel pipelines and their spurs. *See* Figure 4-10, *supra*. The data points run through Louisiana, Mississippi, Alabama, Georgia, Tennessee, South Carolina, North Carolina, and Virginia.[74] Along this geographic progression, the standard deviations range between $0.0926 in Louisiana to $0.0958 in Virginia, which means the prices tend to move together. The differences in these standard deviations are very small. Thus, it appears that the Colonial and Plantation pipelines effectively tie these retail areas to their primary supply centers in the Gulf.

A closer look at the variability of gasoline prices within South Carolina also suggests the importance of pipeline access in reducing the variability of gasoline prices. Table 4-5 shows the standard deviations for retail-to-WTI margins in several areas in South Carolina. The areas are listed in terms of proximity to pipeline terminals, with areas at the top of the list closer to pipeline terminals and those at the bottom of the list farther away from pipeline terminals. Greenville-Spartanburg-Anderson has the lowest variability – a standard deviation of $0.0884; Colonial and Plantation pipeline terminals in Spartanburg serve that area. Columbia, which is located about 90 miles from the Spartanburg pipeline terminals and 110 miles from marine terminals in Charleston-North Charleston, has a slightly higher standard deviation – $0.0971. Although the differences in standard deviations among these locations are relatively small, the data suggest a pattern of increasing price variability in retail locations to the south and east of the state, locations that are less likely to receive gasoline supplies from the Gulf by pipeline, but are more likely to receive gasoline supplies by water.

Table 4-5: Conventional Gasoline Gross Product Margins in South Carolina (2002-2004)

Metropolitan Statistical Area	Fuel Type	Standard Deviation (Retail to WTI)
Greenville-Spartanburg-Anderson	Conventional	$0.0884
Charlotte-Gastonia-Rock Hill	Conventional	$0.0971
Augusta-Aiken	Conventional	$0.0949
Columbia	Conventional	$0.0983
Charleston-North Charleston	Conventional	$0.0971
Sumter	Conventional	$0.0984
Florence	Conventional	$0.1002
Myrtle Beach	Conventional	$0.1038

Whether pipelines can make substitutable gasoline supplies readily available in response to unforeseen supply shortages also will affect gasoline price variability. A comparison of the price variability of conventional and boutique fuels at pipeline origins and terminations confirms this point.

As discussed above, the variability in gross product margins for conventional gasoline is very similar along the length of the Colonial and Plantation pipeline systems. For example, for conventional gasoline, the standard deviation for retail-to-WTI margins for areas in Louisiana served by the Colonial and Plantation pipelines is $0.0926; the standard deviation for areas of Virginia served by those pipelines is $0.0958. *See* Table 4-4, *supra*.

The story is different for boutique fuels, however. The substitutability of gasoline supplies may be difficult if locations near the site of the supply shortage do not use the same type of gasoline used in the area of the shortage. For RFG, the variability of gasoline prices is significantly larger near the end of the Plantation pipeline in Maryland than it is near the origins of both the Colonial and Plantation pipelines in the Gulf. The standard deviation for retail-to-WTI margins in RFG regions in Texas served by both pipelines is $0.0891. By contrast, the standard deviation for retail-to-WTI margins in RFG areas of Maryland served by both pipelines is $0.1053. The difference between the standard deviations in these two areas is statistically significant.

At first glance, the difference in the variability of retail prices for conventional and boutique gasoline between areas in Texas and Maryland served by both pipelines seems unexpected. After all, as shown in Table 4-4, the two pipelines effectively connect – and thus reduce gasoline price variability – all along the pipelines from Louisiana to Virginia. In addition, as shown in Table 4-2, conventional gasoline and boutique fuels do not differ significantly in price variability in the Gulf Coast. In this case, neither pipeline limitations nor differences between conventional and boutique fuels alone appear to account for these results.

Rather, the reason for the difference appears to lie in the fact that no regions along the Colonial and Plantation pipelines south of Virginia require the use of RFG. Any RFG in those pipelines is being shipped to Virginia or Maryland. If Virginia or Maryland experiences a supply shortage of RFG, the pipelines have no ability to divert supplies from other locations along the route into Virginia and Maryland. Instead, a shortage of RFG in Virginia or Maryland requires new shipments of RFG from the Gulf, which slows supply responses and thus increases price variability. For conventional gasoline, by contrast, the diversion of additional supplies to states along the pipelines experiencing supply shortages would be much faster and less costly and, accordingly, any effect from a supply shortage would be spread across a much broader area. The interaction between boutique fuel requirements and pipeline distribution limitations appears most significant in explaining these particular differences in standard deviations in Texas and Maryland for RFG retail-to-WTI margins.

5. Conclusion.

In sum, the analyses discussed above indicate that boutique fuel requirements do not, in and of themselves, cause greater gross product margin variability. For example, boutique fuel gross product margins in the Gulf are not significantly more variable than those for conventional gasoline. Nonetheless, boutique fuels may exacerbate the variability in areas, such as California, that are not interconnected with large refining centers.

Interconnections via pipelines can reduce variability in gross product margins, but local refining capacity also appears to be important. The Gulf Coast, with its very large refining base, has less variable gross product margins than the East Coast, the Midwest, and the Rocky Mountain states. Pipeline interconnections will help reduce variability in an area. The effectiveness of pipelines in reducing gasoline price variability seems to be stronger when adjacent areas along the pipeline are using the same type of fuel, which may reduce the time it takes to reallocate supplies in case of a local supply disruption. For example, the variability of gross product margins for conventional gasoline, which is sold all along the Colonial and Plantation pipelines, is similar in the Gulf and in Maryland, but the variability of gross product margins for RFG, which is not sold between Texas and Maryland, appears to be higher in Maryland than in the Gulf.

Endnotes

1. The Clean Air Act, as amended in 1990, 42 U.S.C. §§ 7401-7626, mandated the establishment of reformulated gasoline requirements for "non-attainment areas" that had not met federal goals for air quality. *See* FED. TRADE COMM'N (FTC), MIDWEST GASOLINE PRICE INVESTIGATION 4 (final report, 2001) [hereinafter MIDWEST

INVESTIGATION], *available at* www.ftc.gov/os/2001/03/mwgasrpt.htm.

2. *Gasoline Climbs Anew on Wood River Fire,* PLATTS OILGRAM NEWS, May 1, 2001.

3. These prices reflect the average of retail prices collected and published by the Oil Price Information Service (OPIS), a private company.

4. OPIS, *supra* note 3.

5. Cathy Landry et al., *Citgo Asks for US Help on Midwest "Gas"; Market jumps as Lemont may be down 6 months*, PLATTS OILGRAM NEWS, Aug. 24, 2001.

6. *Conoco Oklahoma Refinery Back*, OIL DAILY, Oct. 23, 2003.

7. *See also* Mary Coleman, Remarks at the FTC Conference on Factors that Affect Prices of Refined Petroleum Products 127 (Aug. 2, 2001) [hereinafter, citations to conference transcripts include the speaker's last name, transcript date, and page cite(s)]. Transcripts of the Conference and presentations are available at http://www.ftc.gov/bc/gasconf/index.htm.

8. MIDWEST INVESTIGATION, *supra* note 1, § II.A, "The Spring and Early Summer 2000 Spike in Midwest Gasoline Prices."

9. The drop in price corresponds with the repaired pipeline and increased supplies entering the area.

10. MIDWEST INVESTIGATION, *supra* note 1, § III.B.1.b, "Pipeline Disruptions."

11. *See supra* Chapter 1, Text Box 1-1.

12. Coleman 8/2 at 3. Marginal supply refers to the supply that is drawn into a market just at the current price; if the current price fell, that marginal supply would no longer be sold in that market. A current price is the price necessary to bring in supplies sufficient to meet current demand. *See supra* Chapter 1, Text Box 1-1 for a fuller explanation.

13. OPIS, *supra* note 3.

14. Environmental regulations typically allow the use of more volatile gasoline during the winter months, because air quality generally is better during the winter and higher volatility assists gasoline combustion in cold weather. *See* MIDWEST INVESTIGATION, *supra* note 1, § II.B, "EPA Regulations Requiring the Use of Reformulated Gasoline in Certain Urban Areas."

15. *Gas Prices: How Are They Really Set?: Hearings Before the Permanent Subcomm. on Investigations, Senate Gov't Affairs Comm.*, 107th Cong. (May 2, 2002) (statement of Jennifer M. Granholm, Attorney General, State of Michigan), *available at* http://hsgac.senate.gov/050202granholm.htm. *See also supra* Chapter 1 discussion of Kinder Morgan pipeline disruption in Arizona and the impact of environmental regulations on the prices in Phoenix as compared with the prices in Tucson.

16. MICH. PUB. SERV. COMM'N, REPORT ON AUGUST 14TH BLACKOUT 81-84 (Nov. 2003), *at* http://www.michigan.gov/documents/mpsc_blackout_77423_7.pdf.

17. *Id.*

18. RBOB is blended with ethanol to make RFG.

19. *See* TANCRED LIDDERDALE, ENERGY INFO. ADMIN. (EIA), U.S. DEP'T OF ENERGY, MOTOR GASOLINE OUTLOOK AND STATE MTBE BANS, *at* http://www.eia.doe.gov/emeu/steo/pub/special/mtbeban.html (last modified Apr. 6, 2003).

20. MIDWEST INVESTIGATION, *supra* note 1, § II.B.

21. *See U.S. Gasoline Gets Messy*, INT'L OIL DAILY, Oct. 23, 2003. Ethanol requirements aggravate the supply and storage problem. Verleger 8/2 at 43; Morgan 5/8 at 124. *See also* McKeeman 8/2 at 172 (major storage problem in California is ethanol). Ethanol is not moved by pipeline because it is a solvent and thus adversely affects product integrity in batch operations. Accordingly, ethanol is delivered by truck to terminal locations. Cooper 8/2 at 3. Once at the terminal, ethanol must be stored in separate tanks before it is mixed with gasoline. McKeeman 8/2 at 172.

22. Carol Cole, *Europe's Refiners May Be Ready but Not Willing to Ship Ethanol RBOB*, 8 GLOBAL REF. & FUELS REP., Mar. 17, 2004.

23. Kim Benestante et al., *US Spot, Futures Unleaded Prices Hit New Highs; Tight Blending Components, Refinery Snags Keep Bulls in Control*, PLATTS OILGRAM PRICE REP., May 4, 2004.

24. Gary Raynaldo, *First Venezuelan RBOB Imports Arrive on Spec*, PLATTS OILGRAM PRICE REP., June 17, 2004.

25. On June 15, 2005, the Office of the Attorney General of Florida released a report on gasoline pricing in Florida. *See* OFFICE OF THE ATTORNEY GENERAL OF FLORIDA, REPORT ON GASOLINE PRICING IN FLORIDA (2005). The Florida report found no evidence of state or federal antitrust violations, but included low inventory levels as a factor that contributed to high prices. This Report agrees with the Florida report that lower inventory holdings may make an area more susceptible to short-term price spikes when there is a disruption in supply. This Report, however, also notes a long-term benefit from lowering inventory costs – that is, lower average prices for a gallon of gasoline.

26. MIDWEST INVESTIGATION, *supra* note 1, § II.A.

27. MIDWEST INVESTIGATION, *supra* note 1, *Executive Summary*.

28. D.J. PETERSON & SERGI MAHNOVSKI, NEW FORCES AT WORK IN REFINING 43 (Rand, Science and Technology Doc. No. MR-1707-NETL, 2003).

29. The *Report on Gasoline Pricing in Florida*, *supra* note 25, also included recent oil company mergers as a factor purportedly contributing to high prices in Florida. The Florida report stated these mergers created an "interdependent marketplace" which may have allowed refiners to charge higher prices for gasoline. The Florida report did not, however, identify an empirical basis for finding coordination or collusion among the oil companies. The Florida report posited that the "relatively small number of refineries are expected to recognize that their behavior is interdependent, and that actions taken by one firm will significantly impact others and likely market prices." *Id.* at 69. As we note in the FTC's *Petroleum Merger Report*, the FTC has required significant divestitures in many petroleum industry mergers to prevent increased concentration in properly defined relevant antitrust markets. The Herfindahl-Hirschman Index (HHI) (*see supra* Box 2-2) for wholesale gasoline suppliers (which includes imports as well as domestically produced product) in Florida in early 2004 was only 1,019. The HHI has been at roughly the same level for the last five years, ranging from 994 to 1,125. BUREAU OF ECON., FED. TRADE COMM'N (FTC), THE PETROLEUM INDUSTRY: MERGERS, STRUCTURAL CHANGE, AND ANTITRUST ENFORCEMENT, 243-44 tbl.9-6 (2004) [hereinafter PETROLEUM MERGER REPORT], *available at* http://www.ftc.gov/os/2004/08/040813mergersinpetrolberpt.pdf. While the state of Florida likely does not represent a relevant geographic market for antitrust purposes, this HHI level indicates that the Florida "wholesale market" is

on the threshold of a moderately concentrated industry which typically does not support a claim that the industry is "interdependent."

30. MIDWEST INVESTIGATION, *supra* note 1, *Executive Summary*.

31. Cook 8/2 at 67. *See* Montgomery 5/8 at 25 (supply shocks can lead to refinery scarcity rents). Nonetheless, the peak annual capacity utilization in recent years was in 1998, a year that was not associated with unusually high annual average refining margins.

32. Excess capacity is useful only if excess crude is available at the refinery to allow increased production. As discussed above, refineries operate with crude inventories lower than in the past, so even if excess capacity were available, it might take some time to obtain the crude needed to put that excess capacity online. Similarly, excess capacity is useful only if an adequate downstream infrastructure exists to deliver the gasoline to retailers.

33. "Other production" is the production of hydrocarbons/oxygenates and motor gasoline blending components, and fuel ethanol blended into finished motor gasoline. In 2003, PADD II had the highest volume of "other production" – roughly 82 million barrels; all other PADDs showed less than 30 million barrels in "other production."

34. Changes in each region's inventories of gasoline supply are added or subtracted, depending on whether gasoline inventories have increased or decreased; these changes also typically represent small numbers.

35. Coleman 8/2 at 128-29.

36. Sec. 27 of the Merchant Marine Act of 1920, 46 U.S.C. 883, 19 CFR 4.80 and 4.80(b).

37. U.S. INT'L TRADE COMM'N, PUB. NO. 3519, THE ECONOMIC EFFECTS OF SIGNIFICANT U.S. IMPORT RESTRAINTS, INVESTIGATION NO. 332-325 (3rd ed. 2002), *available at* http://hotdocs.usitc.gov/docs/pubs/332/pub3519.pdf.

38. CAL. ENERGY COMM'N, P600-03-014, GULF COAST TO CALIFORNIA PIPELINE FEASIBILITY STUDY (2003), *available at* http://www.energy.ca.gov/reports/2003-09-09_600-03-014F.PDF.

39. U.S. INTERNATIONAL TRADE COMMISSION, PUBLICATION 3201, THE ECONOMIC EFFECTS OF SIGNIFICANT U.S. IMPORT RESTRAINTS, SECOND UPDATE 1999, INVESTIGATION NUMBER 332-325 (May 1999).

40. PETROLEUM MERGER REPORT, *supra* note 29, 203-04 tbls.7-5 to 7-6.

41. *Id.* at 210.

42. *Id.* at 203-04 tbls.7-5 to 7-6.

43. *Id.* at 204 tbl.7-6. The Gulf Coast delivers most of the gasoline that the East Coast receives from other PADDs. *See id.*

44. *Id*.

45. *Id.* at 192 n.41.

46. *Id.*

47. *Id.* at 211.

48. *Id.* at 214 n.24. For example, Colonial has completed construction of an expansion into Knoxville, Tennessee, and has announced plans to expand capacity into eastern North Carolina and Virginia. *Id.* at 215 n.30.

49. *Id.* at 210.

50. *Id.* at 204 tbl.7-6.

51. *Id.*

52. *Id.* at 213 & n.19.

53. *Centennial No Panacea for Gasoline Crunch*, OIL DAILY, Mar. 29, 2002.

54. Press Release, Explorer Pipeline, Expansion complete; pipeline already at capacity (Jan. 6, 2004) (on file with author, *at* http://www.expl.com/news/16200435496.htm).

55. PETROLEUM MERGER REPORT, *supra* note 29, at 213. The MidAmerica and TEPPCO pipeline systems also transport gasoline from PADD III to PADD II. *Id.* at 211.

56. *Id.* at 204 tbl.7-6.

57. *Id.* at 184-85.

58. *Id.* at 203-04 tbls.7-5 to 7-6.

59. *Id*. at 210.

60. *Id*. at 213.

61. Tony Illia & Tom Armistead, *$2-Billion Petroleum Refinery in Arizona Would Be First in 28 Years*, MCGRAW HILL CONSTRUCTION ENGINEERING NEWS-RECORD, Nov. 1, 2004, *at* http://www.construction.com/NewsCenter/Headlines/ENR/20041101e.asp.

62. PETROLEUM MERGER REPORT, *supra* note 29, at 196.

63. *See* EIA, PETROLEUM CHRONOLOGY OF EVENTS 1970-2000 (May 2002), *at* http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/chronology/petroleumchronology2000.htm.

64. Larson 5/8 at 73, 79-80.

65. CAL. ENERGY COMM'N, NO. 100-03-013F, TRANSPORTATION FUELS, TECHNOLOGIES AND INFRASTRUCTURE ASSESSMENT REPORT (Subsidiary Volume of Integrated Energy Policy Report, 2003), *at* www.energy.ca.gov/reports/100-03-013F.PDF.

66. PETROLEUM MERGER REPORT, *supra* note 29, at 196.

67. Gasoline with low volatility is required in some areas to reduce emissions of volatile organic compounds to help reduce ground-level ozone.

68. The spot prices for RBOB do not include the net cost of ethanol that must be blended with the gasoline before it

is sold to consumers.

69. In statistical terms, using an F-test, one cannot reject the hypothesis that each of the listed Gulf boutique fuels has the same variance as conventional gasoline in the Gulf at the 10 percent significance level.

70. Again, spot prices for CARB to be blended with ethanol (CARBOB) are available only for the last year or so. As with RBOB, the spot prices of CARBOB do not include the net cost of ethanol that needs to be blended with the gasoline before it is sold to consumers.

71. WTI is the crude used for all gross product margin calculations in this section. Although Alaskan North Slope (ANS) crude would be more appropriate for calculating California refinery margins, ANS and WTI are nearly perfectly correlated, so the use of WTI has minimal impact on the variability of California's product margins across time. The data consist of weekly average prices from January 2002 through December 2004.

72. Statistically speaking, using an F-test, one can reject the hypothesis that California boutique fuel prices have the same variability as conventional gasoline prices on the Gulf Coast at the 1 percent significance level.

73. In statistical terms, using an F-test, one can reject the hypothesis that the variability in retail-to-WTI crude margins in PADDS I, II, and IV combined is the same as the variability in those margins in PADD III at the 5 percent significance level.

74. Texas does not appear in Table 4-4, *supra*, because the areas along the pipelines within Texas for which the FTC has retail price data use boutique, not conventional, gasoline during the summer.

CHAPTER 5. STATE AND LOCAL POLICIES, AS WELL AS THE EXTENT OF VERTICAL INTEGRATION AMONG FIRMS, CAN AFFECT RETAIL GASOLINE PRICES.

I. LOCAL FACTORS CAN AFFECT RETAIL GASOLINE PRICES.

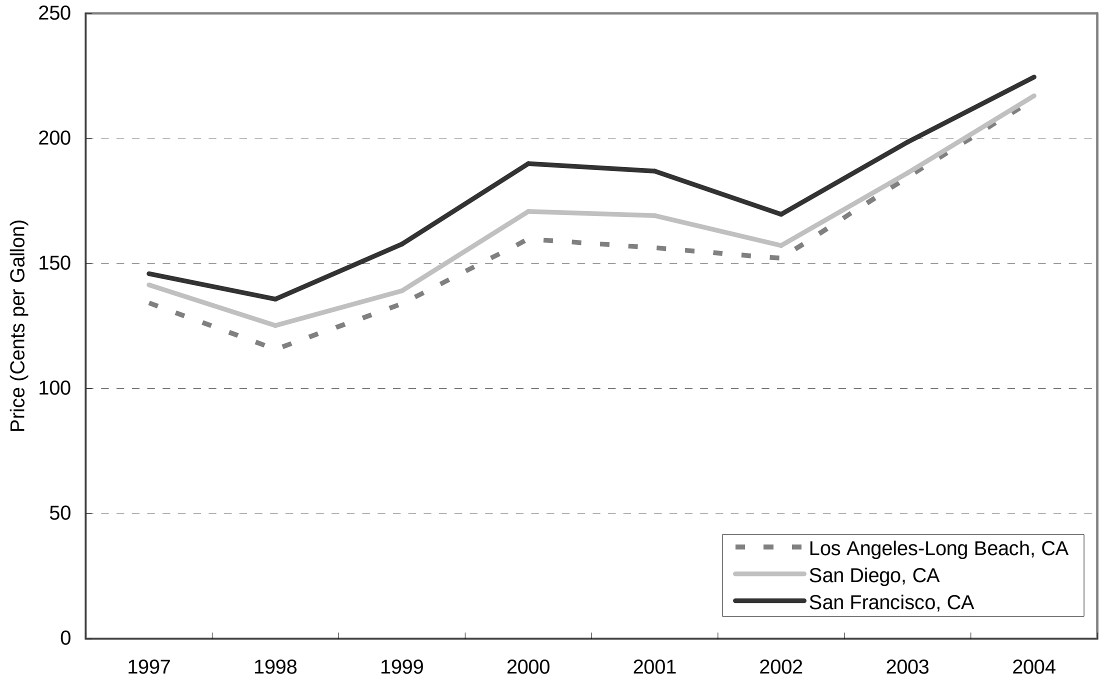
This chapter discusses factors at the local level that can affect the price at the pump. Prices in gasoline retail markets, as in other retail markets, depend on local supply and demand factors, such as the number and location of retail competitors, how easy it is to enter into retailing in a given area, local regulatory conditions, and state and local taxes. Unique regulatory factors in the petroleum industry include state statutes that ban self-service gasoline. In addition, the degree of vertical integration between refiners and retailers, and certain vertical practices, such as redlining and zone pricing, may affect gasoline prices. The interaction of all of these factors influences local gasoline prices at the pump.

A. Other Things Being Equal, Retail Gasoline Prices Are Likely To Be Lower When Consumers Can Choose, and Switch Purchases, Among a Greater Number of Gas Stations.

Certain communities sometimes seem to have consistently higher or lower gasoline prices than nearby areas. Such persistent price differences may stem in part from differences in the number and density of gasoline sellers in different communities. The number and density of gasoline sellers in various communities reflect differences in local supply and demand conditions, but local regulatory conditions also affect the number and density of local gasoline sellers. Studies suggest that, when consumers have more nearby gasoline sellers to choose from, prices tend to be lower as the sellers compete for consumers' business.

For example, price surveys revealed that retail stations in Los Angeles sold gasoline at generally lower prices than stations in San Diego or the San Francisco Bay Area. To understand this phenomenon, one study examined whether a higher density of gas stations in Los Angeles might explain these persistent geographic price differences.[1] *See* Figure 5-1.

Figure 5-1: Los Angeles, San Diego and San Francisco Retail Gasoline Prices (Annual OPIS; including taxes)

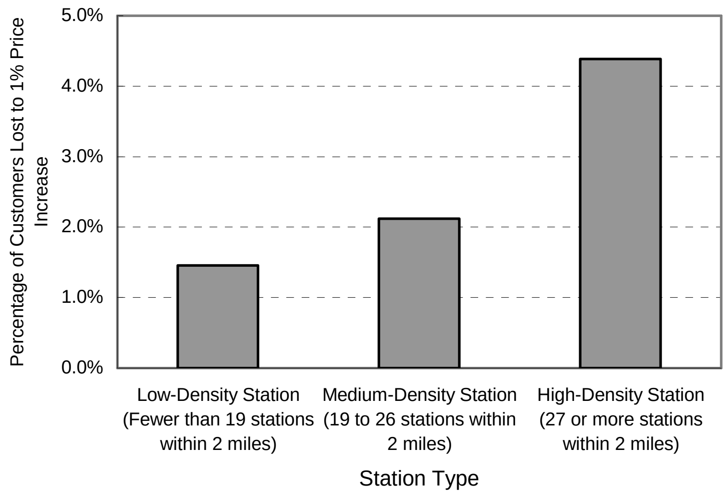


Source: OPIS

The study used a field experiment in which a large gasoline retailer allowed the authors randomly to change the prices charged at some of its company-operated stations in the three California cities. The study showed:

- when a gas station with a large number of nearby competitors (27 or more other stations within a two-mile radius) increased its price for a regular grade of gasoline by 1 percent, its sales declined by 4.4 percent;
- when a station with a medium number of nearby competitors (at least 19 and less than 27 other stations) increased its price by 1 percent, its sales declined by 2.1 percent; and
- when a station with a small number of nearby competitors (fewer than 19 other stations) increased its price by 1 percent, its sales declined by 1.5 percent.[2]

Figure 5.2: Barron, Umbeck and Waddell Estimates of the Effect of Local Competition



Source: Barron, Umbeck and Waddell

All else equal, stations that face greater lost sales from increasing prices will likely have lower retail prices than other stations that lose fewer sales from increasing prices. This result suggests that, all else equal, (1) retail gasoline prices tend, in part, to be dependent on the extent of retail competition; and (2) when the number of sellers in a local gasoline market rises, the average price for gasoline is likely to decline.[3] In a similar vein, another study suggests that gasoline may cost more for consumers in rural areas – which perhaps offer a more limited selection of gas stations – than for urban consumers. Rural stations often sell low volumes of gasoline and therefore may have higher average fixed costs, requiring them to earn higher margins on each gallon of gasoline sold to be profitable.[4]

Station density will depend on cost conditions in an area. For example, the size and density of a market will influence how many stations can operate and cover their fixed costs. These fixed costs will depend on the cost of land and of building a station. In some markets, factors such as these may make it harder for more competitors to enter and compete for retail gasoline sales. The fact that there are fewer stations in these areas, however, does not necessarily imply that such firms earn "supra-competitive" prices. Rather, they may need higher prices to cover higher costs.

Zoning regulations may limit the number of stations in an area below what market conditions would indicate the area could profitably sustain. For example, studies suggest that in some areas, zoning laws, the high cost of land and labor, and other restrictions may influence whether new retail gasoline sellers enter a market.[5] One study, looking at the San Francisco area, noted that "gasoline station development costs – real estate and construction costs – are about 50 percent higher in San Francisco than in Los Angeles;"[6] these high costs may tend to limit the number of gas stations built in San Francisco. Indeed, there has been limited entry by high-volume gasoline sellers in San Francisco. The study also noted that "zoning and other regulations make it harder for station owners in San Francisco to operate convenience stores on the same property as gasoline stations and therefore [these regulations] eliminate profitable secondary sales."[7] In regions such as San Francisco, with high land prices and strict zoning regulations, entry by new competitors tends to be more difficult than in areas that lack those factors.

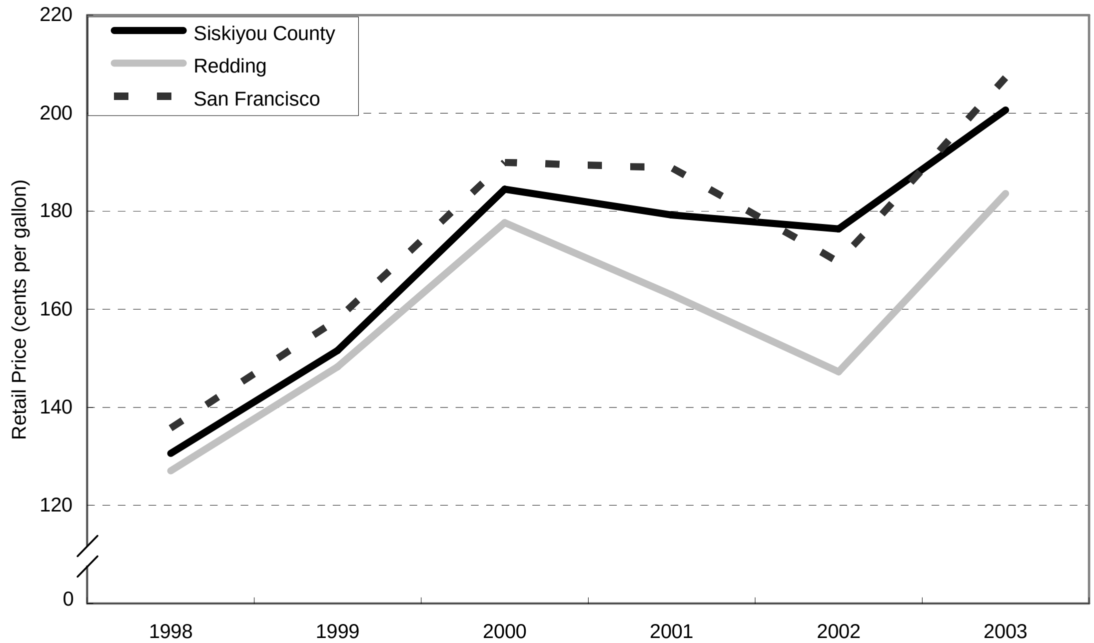
B. The Growing Role of Convenience Stores and Hypermarkets in Gasoline Sales May Lower Prices.

Differences in local retail prices may occur not only because of different numbers and density of gas stations within a vicinity, but also because of differences in the types of retailers selling gasoline in particular areas. Gasoline retailing in Northern California offers an illustration of how retail prices diverged between neighboring regions when one area evolved toward a high-volume, low-cost retail format, while the other maintained a more traditional format. The entry of high-volume discount stations and hypermarkets in one California county appears to have lowered retail gasoline prices there. Hypermarkets are large retailers of general merchandise and grocery items, such as Wal-Mart and Safeway, that have begun to sell gasoline.[8]

1. Examples suggest that hypermarket competition tends to lower local retail gasoline prices.

During late 2002 and early 2003, a number of local news articles drew attention to increasing gasoline price differences between Siskiyou County, California, and its neighboring counties of Shasta and Butte.[9] Figure 5-3 compares annual average retail prices for regular grade gasoline in Siskiyou County with prices in the city of Redding in Shasta County from 1998 to 2003.

Figure 5-3: Average Retail Gasoline Prices, with Taxes, for Siskiyou County, Redding, and San Francisco (1998-2003)



Source: OPIS

During the late 1990s, the average gap between Siskiyou and Redding was approximately $0.03 per gallon – a difference that apparently arose in large part from the additional cost of transporting petroleum products to Siskiyou from the local terminal rack in Chico, Butte County.[10] Retail markets in Redding are approximately 75 miles from the rack in Chico, whereas retail markets in Siskiyou County are approximately 150 miles from that rack.

During 2001, the price gap between Siskiyou and Redding began to widen and ultimately grew to an annual average of more than $0.15 per gallon. Understandably, consumers in Northern California asked what might have caused these changes. Two possible answers were (1) competitive conditions changed in Siskiyou, leading to higher relative prices, or (2) competitive conditions changed in Redding, leading to lower relative prices.

Figure 5-3 helps demonstrate which answer is correct. It shows that prices in Redding became lower relative to San Francisco, while Siskiyou prices remained stable relative to San Francisco.[11] Thus, it appears that the widened gap in prices between Siskiyou and Redding stemmed from an increase in the efficiency of gasoline retailing in Redding and not from decreased competitiveness in Siskiyou. This increased efficiency was associated with the entry of new retail formats in Redding.

Starting some time in 2000 and continuing into 2001, retail gasoline competition in Redding began to change relative to competition in Siskiyou. The Redding area had experienced an influx of high-volume discount stations like ARCO and Beacon in the late 1990s,[12] and hypermarkets appear to have begun entering the region in 2001.[13] One of the hypermarkets that entered Redding was Safeway. When supermarkets, such as Safeway, sell gasoline, they typically sell between 150,000 and 300,000 gallons per site, per month. This high volume of sales contrasts with that of the average traditional service station, which historically has sold approximately 60,000 gallons of gasoline a month.[14] For example, of the approximately 25 gas stations in the vicinity of Siskiyou County, the average station sells only about 50,000 gallons per month, and the county's highest-volume stations sell only 150,000 gallons per month.[15]

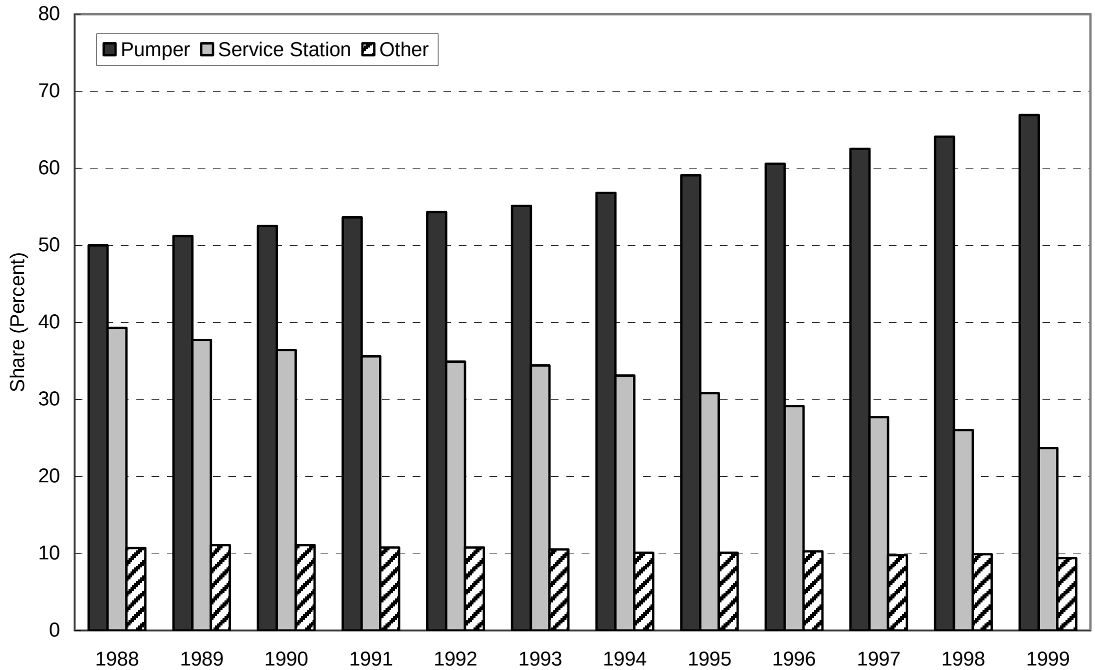
Another illustration of the effect of hypermarket entry involves the reaction of nearby gas stations when a Sam's Club in Louisville, Kentucky, began selling gasoline. After the hypermarket opened, stations in closest proximity to Sam's lowered gasoline prices below the levels maintained by other, more distant stations. For example, following Sam's entry, a BP station closest to the hypermarket – less than a tenth of a mile away – reduced its prices by $0.02 to $0.03 per gallon, relative to the prices charged by more distant BP stations.[16]

2. Retail gasoline sales reflect four important national trends.

In the past three decades, four important national trends have emerged in sales of retail gasoline. First, traditional gasoline-pump-and-repair-bay outlets have been a dwindling part of the industry. Specialty retailers now handle the lion's share of repair services, such as transmission and brake maintenance, oil changes, and tire sales, that traditional gas stations formerly provided. Second, as early as the 1980s, branded gasoline retailers began to shift toward a convenience store format, with the sale of food, beverages, and other conveniences supplanting the provision of repair and specialty automotive products and services.

Third, independent (that is, not owned by a refiner) gasoline/convenience stores – such as RaceTrac, Sheetz, QuikTrip, and Wawa – began entering the market. These independent stores typically feature large convenience stores with multiple fuel islands and multiple-product dispensers. Some refer to these retailers as "pumpers" because of their high-volume fuel sales. With the ability to sell significantly higher gasoline volumes and additional in-store revenue streams, many of the large independent retailers became high-volume, low-price gasoline retailers and successfully captured significant retail market share from traditional outlets.[17] Branded gasoline retailers responded by expanding their own convenience store offerings, such as Mobil's On-The-Run, and replacing any outdated fuel pumps with higher-volume, multiple-product dispensers, thus, in some instances becoming pumper stations. By 1999, the latest date for which data are available, branded and independent convenience store and pumper stations accounted for almost 67 percent of the volume of U.S. retail gasoline sales.[18] On average, the largest convenience store companies – those with over 200 outlets – sell approximately 120,000 gallons of fuel per site, per month, as compared with the 60,000 gallons a traditional gas station typically sells.[19]

Figure 5-4: Share of Gasoline Sold by Retail Format, 1988-1999



Source: National Petroleum News

The fourth and most recent market trend is the entry of hypermarkets, discussed above. The largest hypermarket sellers include Albertson's, Costco, HEB, Kroger, Meijer, Safeway, Sam's Club, and Wal-Mart.[20] By the last quarter of 2002, roughly five years after hypermarkets began selling gasoline in the U.S., they had captured 5.9 percent of retail gasoline sales nationwide. It has been projected that hypermarkets will account for 13.1 percent of the nation's retail gasoline sales by 2007.[21]

Hypermarkets' substantial economies of scale enable them to sell significantly higher volumes of gasoline at lower prices than their competitors.[22] Some larger hypermarket sites typically sell between 500,000 and 1,000,000 gallons of fuel in a month – between 4 and 8 times the volume of a typical convenience store and pumper outlet.[23] Hypermarkets also can reduce costs by operating unattended pumping stations – consisting of little more than a canopy, a kiosk, and several multiple-product dispensers – and may offer lower gasoline prices to attract customers to the adjacent store. In addition, the costs of adding a pumping station to a hypermarket site typically are substantially lower than the costs of constructing a convenience store. A pumping station at an existing hypermarket can be constructed in only a few months for as little as $500,000 to $650,000. A hypermarket's characteristically small "pad" (fuel site) occupies only about 300 to 600 square feet of the hypermarket's parking lot. By contrast, a typical convenience store/gasoline outlet can be built in under one year, at a cost of $1 to $1.5 million.[24]

C. Government Regulations Can Affect Retail Gasoline Prices.

In addition to zoning regulations, a number of other government regulations can affect retail gasoline prices. *See* Box 5-1 for an example of how various regulations can effect retail gasoline prices. Local and state taxes and regulations regarding how stations may sell gasoline are two examples.

Box 5-1: Hawaii

Hawaii provides an example where a number of local factors and regulations contribute to higher gasoline prices. For example, the price for regular unleaded gasoline in Hawaii for May, 2005, averaged $2.45 per gallon, including federal, state and local taxes, compared with $2.13 per gallon nationwide. (These prices reflect the average of retail prices collected and published by the Oil Price Information Service (OPIS), a private company). There are several reasons for this.

First, costs are higher in Hawaii than on the mainland. Crude oil and gasoline must be shipped via tanker several thousand miles to reach Hawaii. The shipping costs may reach as high as $0.14 per gallon. *See* ICF *Consulting, Implementation Recommendation for Hawaii Revised Statutes Chapter 486H, Gasoline Price Cap Legislation*, at 21, exhibit 2.5 (2005), *at* http://www.hawaii.gov/budget/puc/dockets/05-0002_ICF_2005-04-15.pdf. Part of the shipping costs includes the cost of complying with the Jones Act, which adds additional costs to any product transported by vessel between U.S. ports. *See* Chapter 4(III) *supra*. In addition, Hawaii's two refineries are small by mainland standards. Also, land in Hawaii is expensive, which contributes to higher retail costs. These higher retail costs in Hawaii are reflected in higher retail margins on gasoline. The retail margin for 2004 averaged $0.213 per gallon in Hawaii compared with $0.076 per gallon nationwide. EIA, *DOE/EIA-0487(04), Petroleum Marketing Annual 2004, at 57 tbl.31*. (We define retail margin here as the price of regular gasoline sold through retail outlets excluding taxes less the DTW price.).

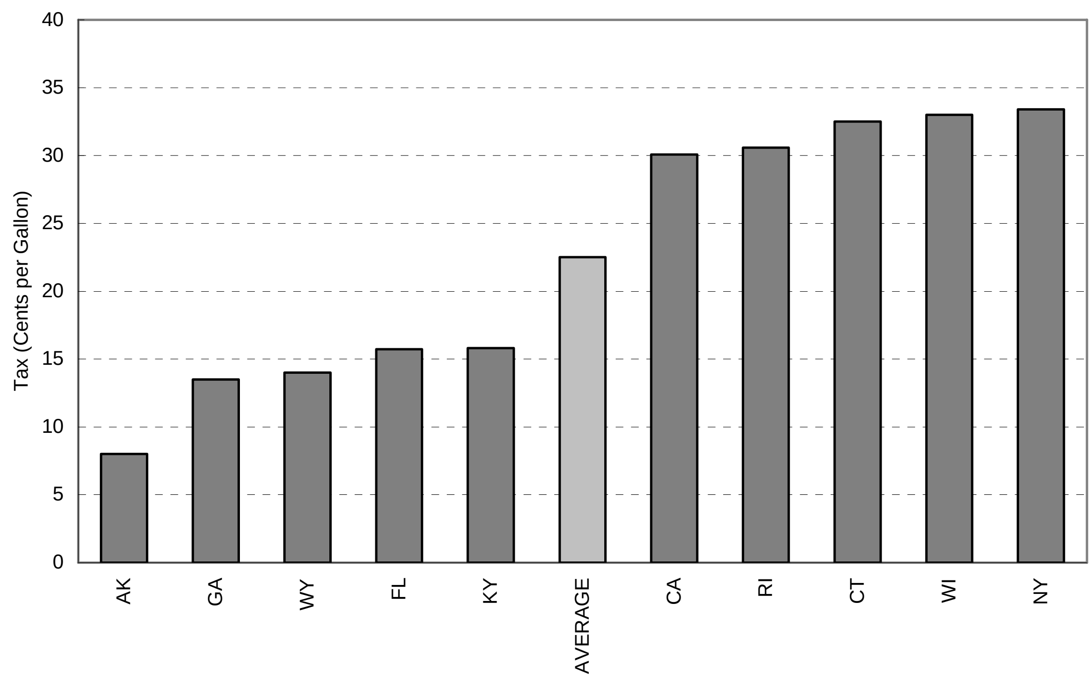
Second, gasoline taxes are significantly above average in Hawaii. In December 2004, state and local taxes averaged $0.256 per gallon nationwide, but were $0.388 per gallon in Hawaii. This accounts for roughly $0.13 per gallon of the pump price difference. *See* API, *Nationwide and State-by-State Motor Fuel Taxes* (Nov. 2004), *at* http://api-ec.api.org/filelibrary/GastaxNovember2004Final.pdf. The amount of local taxes varies within Hawaii and is higher on Maui and in the city of Honolulu than elsewhere. *See* HawaiiGasPrices.Com, GasBuddy Organization Inc., *US Fuel Tax Rates by State*, at http://www.hawaiigasprices/com/tax_info.aspx, (June 22, 2005).

Third, a variety of state laws likely contribute to higher gasoline prices in Hawaii. Hawaii enacted "anti-encroachment" legislation in 1997 that limits oil companies and jobbers from opening stations near dealer-operated stations. This has an effect similar to that of divorcement legislation. *See* Section III, *supra*. Also, Hawaii set rent caps for lessee-dealer stations. The caps may prevent wholesalers from obtaining a competitive rate of return on lessee-dealer stations and may result in fewer such stations and higher wholesale prices. Within Hawaii it is difficult to obtain fee-simple ownership to land, and this may reduce the incentive to invest in gas stations. Finally, in September 2005, a wholesale gasoline price cap is scheduled to go into effect. Although the contours of the price cap are not yet set, this legislation has the potential to induce exit or discourage future entry from the wholesale market, creating shortages, while allowing retailers to continue to charge market rates. *Competition and the Effects of Price Controls in Hawaii's Gasoline Market Before the State of Hawaii*, (Jan. 28, 2003) (Statement of Jerry Ellig, FTC, Office of Policy Planning), *at* http://www.ftc.gov/be/v030005.htm.

1. State and local taxes can be significant factors in the retail price of gasoline.

The retail price of gasoline depends in part upon how much tax a state levies on it. Higher gasoline taxes drive up the final price of gasoline. The average state sales tax for 2004 was $0.225 per gallon. The states with the highest average taxes on gasoline in 2004 were New York ($0.334 per gallon), Wisconsin ($0.330 per gallon), Connecticut ($0.325 per gallon), Rhode Island ($0.306 per gallon), and California ($0.301 per gallon). Many areas also have local taxes. For example, all areas in Florida also have a local tax of between $0.099 per gallon and $0.178 per gallon. Similarly, Honolulu has a local tax of $0.165 per gallon.

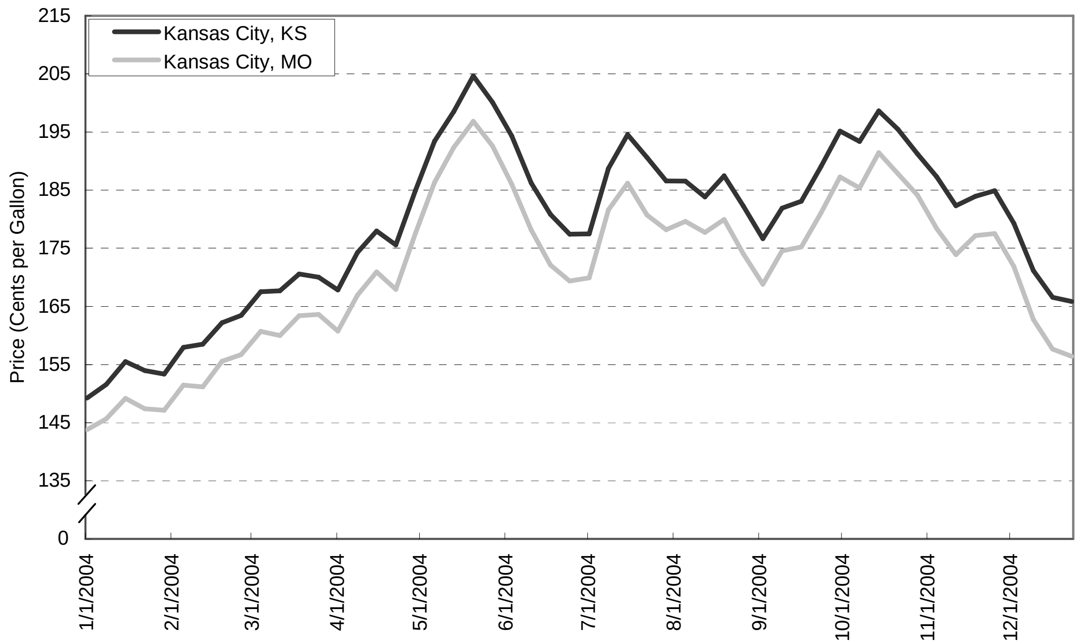
Figure 5-5: 2004 State Gasoline Tax Comparison



Source: American Petroleum Institute

A comparison of annual average gasoline prices in Kansas City, Kansas, with those in Kansas City, Missouri, illustrates how different tax levels can affect the retail price of gasoline. These adjacent cities face similar supply conditions for obtaining gasoline, but average prices have differed markedly. For example, during 2004, gasoline taxes in Kansas City, Kansas, averaged $0.0745 per gallon more than in Kansas City, Missouri. This corresponds to retail gasoline prices averaging $0.075 per gallon more in Kansas City, Kansas, than Kansas City, Missouri. *See* Figure 5-6.

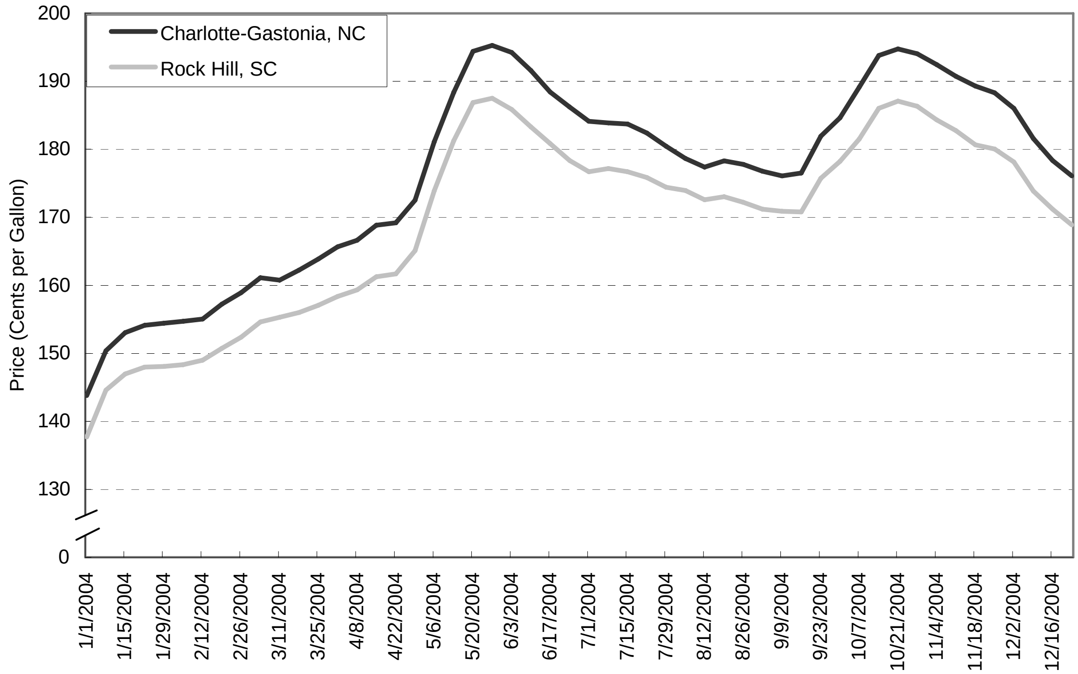
Figure 5-6: 2004 Kansas City, KS and Kansas City, MO Weekly Retail Unleaded Regular Gasoline Prices (includes tax)



Source: OPIS

Another comparison – between Charlotte-Gastonia, North Carolina, and Rock Hill, South Carolina which are within the same metropolitan statistical area – further illustrates the point. During 2004, gasoline taxes averaged $0.079 per gallon more in Charlotte-Gastonia than in Rock Hill; correspondingly, retail prices averaged about $0.069 per gallon higher in Charlotte-Gastonia than Rock Hill. *See* Figure 5-7.

Figure 5-7: 2004 Charlotte-Gastonia, NC and Rock Hill, SC Weekly Retail Unleaded Regular Gasoline Prices (includes tax)



Source: OPIS

2. Regulations regarding the methods stations may use to sell gasoline can influence the retail price of gasoline.

Statutory bans on self-service sales[25] and restrictions on below-cost sales[26] appear to increase gasoline prices. Both types of laws appear to force retail gasoline prices higher by protecting existing retailers from more efficient competitors.[27]

Banning self-service stations. Although safety was the rationale for some states' earlier prohibitions on self-service gasoline sales, this ban – now on the books only in New Jersey and Oregon – also appears to rest on a desire to protect smaller retailers from structural changes in the marketplace.[28] By banning self-service, this state law essentially requires consumers to buy gasoline bundled with services that are likely to increase costs – that is, having staff available to pump the gasoline. One study concluded that self-service bans have imposed costs on large and diffuse groups of consumers, while providing only minor benefits to narrow interest groups, such as small service station owners.[29] Some academic experts have estimated that self-service bans cost consumers between $0.02 and $0.05 per gallon.[30]

Banning below-cost sales. About 11 states have a type of below-cost sales or minimum mark-up laws, which typically either prohibit a gas station from making sales below a certain defined cost or require a gas station to charge a minimum amount above its wholesale gasoline cost. Pursuant to such a law in Minnesota, for example, the Minnesota Department of

Commerce ordered Kwik Trip, Inc. and Murphy Oil USA Inc. to cease and desist from selling gasoline at too low a price.[31] In both cases, the state alleged that the respondent had "engaged in the offer and sale of gasoline below the minimum allowable price."[32] Although these restrictions ostensibly are designed to prevent the predatory pricing of gasoline, there is economic evidence that they lead to higher retail prices.[33] These laws are likely to harm consumers by depriving them of the lower prices that more efficient gas stations can charge while still covering their costs, including their fixed costs.[34] Even if a gas station has lower wholesale costs, and presumably may charge a lower price than other stations with higher wholesale costs, it still does not have the ability to compete by charging the lowest price it may be willing to charge when a below-cost sales law is on the books. *See also* Box 5-2 for a discussion of federal law on gasoline distribution.

Box 5-2: The Petroleum Marketing Practices Act

The Petroleum Marketing Practices Act is designed to prevent major oil companies from exerting control over retail prices through the termination of branded dealers. 15 U.S.C. §§ 2801-2806 (1994). The purposes of the law are "to balance the perceived unequal bargaining power between dealers and their suppliers" (William R. O'Brien, *Federal Laws Affecting the Right of a Franchisor to Terminate or Not Renew a Franchise: Petroleum Marketing Practices Act*, 49 ANTITRUST L.J. 1371, 1371 (1980)) and "to establish a uniform, nationwide set of rules governing [motor fuel] franchise relationships" (American Bar Ass'n, Section of Antitrust Law, *Monograph No. 9, Refusals to Deal and Exclusive Distributorships*, app.C at 60 (1983)). The Act sets forth the circumstances that govern termination or non-renewal of retailer franchises.

The Act essentially has frozen into place whatever branded distribution networks existed in 1978. According to some, the Act likely has had the effect of institutionalizing inefficiency by encouraging systems with too many lessee or contract dealers relative to company-operated stations. Williams 8/2 at 151-52. The economics of any market are constantly changing, driven by entry, exit, new technology, and changes in supply and demand. Different kinds of distribution systems may be cost-effective during different time periods. To add a statutory impediment to changing the distribution system runs the risk that refiners will not be able to react in a timely manner to changing market conditions.

II. DIFFERENCES IN VERTICAL RELATIONSHIPS INFLUENCE HOW GASOLINE ARRIVES AND IS SOLD AT RETAIL STATIONS.

We next examine two downstream stages in the distribution of gasoline: the delivery of gasoline from the refinery to a storage terminal and wholesale distribution from the terminal to the gas station. Firms differ in the extent to which they perform these operations themselves or contract to have others provide these operations. This section reviews gasoline storage at terminals and sales of gasoline at wholesale.

A. Terminaling – Storage of Bulk Supplies of Refined Petroleum Products.

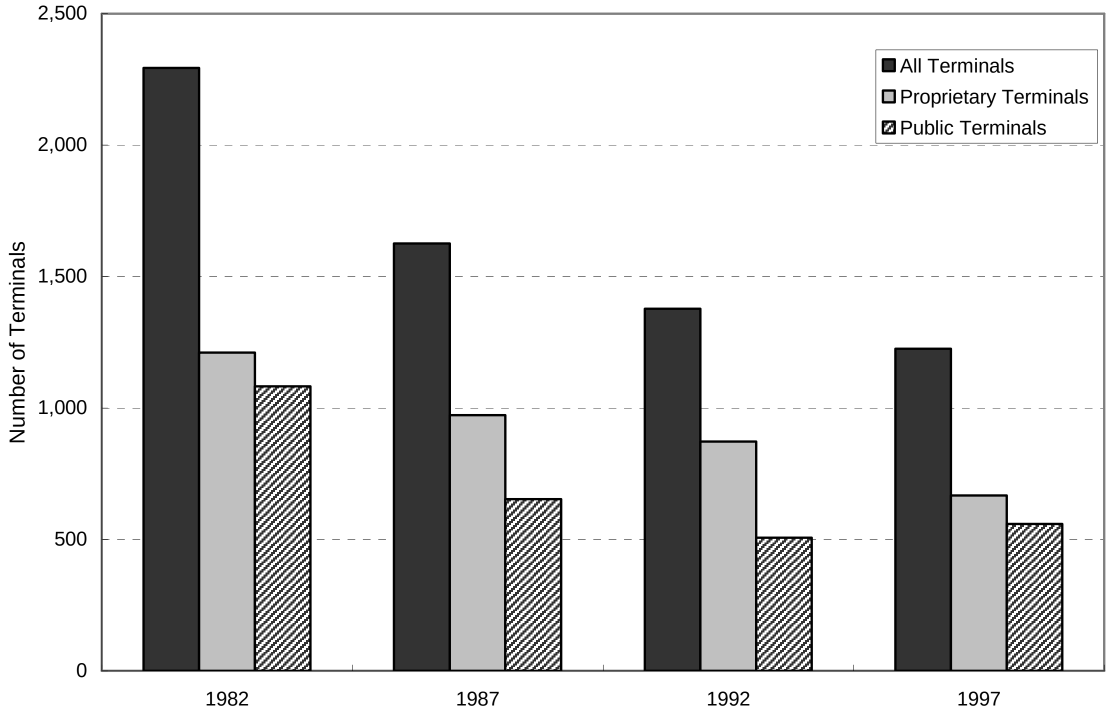
Once gasoline leaves the refinery, it typically travels – primarily through pipelines and marine vessels – to a storage terminal.[35] Generally, the gasoline next is dispensed from units at the terminal called "racks" into tank trucks for delivery to gas stations. Terminal charges for gasoline are typically less than $0.025 per gallon[36] and are not a major component of the final retail price.

Some refined product terminals – sometimes referred to as "public" terminals – are owned and operated by pipeline companies or other firms with no upstream interests in refining and no downstream interests in marketing. Public terminals typically sell services to all types of wholesalers.

Other terminals – generally called "proprietary" terminals – are integrated upstream with a refiner, downstream with branded retail gas stations, or both. Proprietary terminals distribute gasoline primarily to retailers and jobbers associated with the firm's brand, although they may supply other branded or independent retailers through various contractual arrangements.

As Figure 5-8 shows, the overall number of terminals in the United States declined between 1982 and 1997.[37] These terminal closures appear to reflect a reduced need for storage capacity due to, among other things, terminals' reductions in their inventory holdings through supply management technologies, such as "just-in-time inventory."[38] Another technological development that has reduced the need for greater storage capacity is "in-line blending." In-line blending allows gasoline, such as mid-grade gasoline, to be blended at the terminal from stocks of regular and premium-grade gasolines. Previously, such gasoline was blended at the refinery and stored separately at the terminal. Changes such as these have resulted in the closing of less cost-effective terminals.

Figure 5-8: Petroleum Product Termnials



Source: U.S. Census Bureau

Between 1982 and 1992, the number of proprietary and public terminals generally declined at a similar pace nationwide – 45 and 48 percent, respectively – although there were regional differences in the rates of decline.[39] Between 1992 and 1997, the number of proprietary terminals continued to decline by 24 percent nationally. During the same time, the number of public terminals increased by 10 percent nationally.[40]

Although Bureau of Census data track the number of terminals only through 1997, an informal survey of more recent transactions, from 1998 through 2004, also suggests declining numbers of proprietary terminals and an increasing percentage of all terminals that are public. For example, Colonial Pipeline acquired six terminal facilities from Conoco and Murphy Oil in 1998,[41] Buckeye Partners acquired BP Amoco's Taylor, Michigan, terminal in 2000,[42] Kinder Morgan purchased five product terminals in the western U.S. from Shell in 2003,[43] and Magellan Midstream Partners purchased six terminals from Shell in 2004.[44] Some branded gasoline firms have taken advantage of certain economies by contracting with public terminal operators rather than running their own terminals.[45]

B. Wholesaling.

Gasoline wholesaling covers all distribution functions from purchase of gasoline and pickup at the terminal rack to delivery at a retail gas station. An integrated refiner may set up a *direct* distribution system under which it supplies gasoline to: (1) retail sites that it owns and operates, also known as "company-owned-and-operated stations;" (2) retail outlets that are owned by the refiner but operated by independent lessee dealers; or (3) retail outlets that are owned and operated by independent "open" dealers that sell company-branded product. An integrated refiner's wholesale price for company-owned-and-operated stations is a non-public, internal transfer price. When an integrated refiner supplies retail outlets owned by the refiner but operated by independent "lessee" dealers, or owned and operated by independent "open" dealers, it charges the "dealer tank wagon" (DTW) price to the dealer.

Alternatively, an integrated or independent refiner may use a *jobber* distribution system. A jobber, which may be brand-name, unbranded, or both,[46] buys gasoline at the terminal rack and then delivers the gasoline to: (1) gas stations that it owns and operates; (2) stations that it owns but leases to third parties; and (3) stations that are independently owned and operated.[47] Jobbers pay a "wholesale rack price" for their gasoline purchases, although other contractual terms may also affect the net price.

Essentially, the gasoline distribution system past the terminal boils down to three basic modes of wholesale distribution to retailers: (1) sales to company-owned-and-operated stations at an internal transfer price; (2) sales to exclusively supplied retailers on a DTW basis; and (3) sales at the terminal rack to jobbers at a wholesale rack price, with jobbers then transferring the gasoline to its own stations or selling it to independent retail stations. In 2003, rack sales were about 63 percent of distribution nationwide; DTW and company-owned distribution roughly split the remainder, with 19 percent and 18 percent respectively.[48]

The relative importance of each of these three distribution systems, however, differs from region to region across the country.[49] Compared to the nation as a whole, the Midwest (PADD II), the Gulf Coast (PADD III), and the Rocky Mountain states (PADD IV) distribute more wholesale gasoline at the rack through jobbers than through DTW sales or internal transfers. The East Coast (PADD I), like PADDs II through IV, distributes the majority of its wholesale gasoline at the rack through jobbers. Within the East Coast itself, however, DTW sales have greater importance in New England and the Mid-Atlantic states, whereas, rack sales are by far the most important method of distribution in the Southeast states.

On the West Coast (PADD V), the percentage of DTW distribution is significantly higher than rack sales. Between 1994 and 2003, DTW sales ranged from 47 percent to 54 percent, while jobbers' sales ranged from 26 percent to 30 percent.[50] The relatively high degree of integration between wholesale and retail on the West Coast dates back to at least 1994, predating the series of petroleum mergers affecting the West Coast that began in 1997.[51]

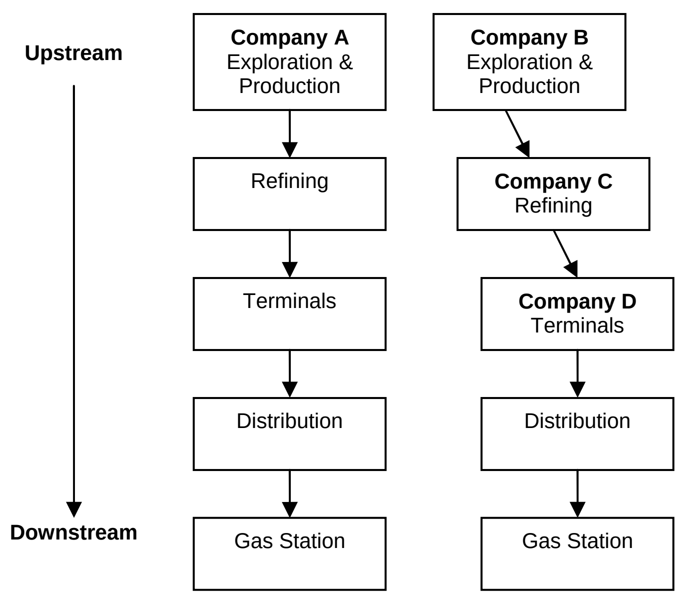
III. VERTICAL INTEGRATION IN GASOLINE MARKETS: THEORY, EVIDENCE, AND TRENDS.

The extent of common ownership of different stages of production, distribution, and marketing is generally termed "the degree of vertical integration." U.S. commercial law, with certain state law exceptions,[52] allows one firm to own all stages. In the petroleum industry, the important stages or steps include: the exploration and production of crude oil, the transportation of crude oil to refineries, crude oil refining, the transportation and storage of bulk quantities of refined products, and, finally, local wholesale and retail distribution and marketing. The degree of vertical integration – that is, the degree to which one company will perform all or only some of these steps – varies among companies in oil-related businesses.[53] *See* Box 5-2; *see also* Figure 5-9, which shows Company A as hypothetical wholly integrated petroleum company and Companies B, C, and D as companies with varying degrees of vertical integration.

Box 5-2: Examples of Different Degrees of Vertical Integration

Some companies, such as ExxonMobil, ConocoPhillips, Shell, and Chevron, may perform all of the steps between exploration and marketing. Others, such as Sunoco, Tesoro, and Valero, focus on refining, distribution, and marketing assets. Finally, some companies concentrate on one step. For example, Anadarko, Occidental, and Devon Energy focus on crude oil exploration and production assets; Koch focuses on refining; and RaceTrac and Sheetz focus on marketing.

Figure 5-9: Examples of Vertical Integration



This section discusses the potential procompetitive and anticompetitive effects of vertical integration, studies examining the possible price effects of vertical integration, and trends relating to vertical integration in the gasoline industry since 1990.

A. Vertical Integration May Be Cost-Effective for a Firm.

As a general matter, firms may integrate vertically – that is, own assets to perform more than one step in the production, distribution, and marketing of a good – because integration can lower costs. In certain circumstances, vertical integration can (1) reduce transaction costs; (2) prevent contractual partners from taking advantage of a firm; (3) eliminate double markups and thereby increase overall demand for a product; and (4) eliminate distortions of input choices when a supplier has market power.[54]

1. Reduce transactions costs.

When two separate firms enter into a supply relationship, they must negotiate the terms of that supply relationship. For example, the two firms must agree on and enforce prices, quantities, and other terms of trade. Such contract negotiations cost money in terms of personnel time, legal advice, and other matters. Vertical integration can reduce such transactions costs, if it is easier to establish these terms through direct managerial control of two business units than through either (1) long-term contracts, or (2) repeated, arm's-length transactions with firms selling in spot markets.[55] If the mutually beneficial terms of the trade between two vertically related business units are complex, and it is difficult to specify all future contingencies within a contract, using direct managerial control is likely to reduce transactions costs below those associated with contractual relationships.

2. Prevent opportunism by contractual partners.

To prevent contractual opportunism means to eliminate the risk that one party to a contract will take advantage of the other. This can happen if a contract is "incomplete" – that is, the contract fails to specify the rights and obligations of the parties in all possible circumstances. When a contract is incomplete, unforeseen circumstances may allow one of the firms to benefit unduly from the terms of the contract. This type of risk tends to be more significant when potential contract partners need to invest in specialized assets to create the value resulting from the proposed contract. For example, a very heavy grade of crude oil might require special, long-lived investments in refinery-processing equipment to produce high-value refined products. These special investments, however, may have relatively little value in processing other types of crude oil. Therefore, to make such investments worthwhile, a refiner would need a reliable source of heavy crude oil. To rely on a long-term supply contract with a producer of heavy crude oil, a refiner typically would require the contract to be sufficiently complete. To negotiate a sufficiently complete contract may be very costly, however. If a sufficiently complete contract could not be negotiated, vertical integration between the very heavy crude oil producer and the refiner might be required to achieve the transaction.

3. Eliminate double markups.

Double markups (also known as double marginalization) occur when two independent, vertically related firms each have some ability to charge above marginal cost. In that situation, each independent firm, as it sells its product or service to the next company or ultimately to the consumer, sets a profit-maximizing price in excess of its marginal costs, without considering that the other firms will also lose sales as it increases prices. Consumers are worse off, because there are two markups instead of one; firms may be worse off because higher prices due to two markups may reduce demand below where it could have been with only one markup.

To illustrate, suppose there are two independently owned, unregulated product pipelines,[56] which are connected and jointly represent the only way that gasoline can be efficiently moved from a refinery center to some distant consuming area. Each pipeline would charge the profit-maximizing price along its segment of the route without regard to how its markup could reduce demand for use of the other pipeline. Two markups by two pipelines could reduce demand for use of the two pipelines together. Vertical integration of the two pipelines would eliminate that situation, replacing the two markups with one. As a result, the price of transporting gasoline along the entire route would fall, and the combined profits of the now-merged pipelines would increase as buyers of transportation services increased their shipments in response to the lower prices.

4. Eliminate distortions of input choices.

If a firm can vary the amount of an input it buys from a supplier with market power, the firm may choose not to use the optimal amount of that supplier's product, but instead to use more of a less effective substitute. Vertical integration can offer firms a more cost-effective way to avoid this distortion. For example, suppose a clothing company can make shirts out of cotton, polyester, or a blend of both. Suppose further that if faced with competitive cotton and polyester prices, the company would choose to make shirts out of cotton. If the supplier of cotton has market power and charges above the competitive price, however, the shirt company may choose to blend in polyester. If the shirt company vertically integrates into cotton production and faces its true cost, it will produce cotton shirts. Therefore, vertical integration can remove the distortion in how a firm chooses to make its products.

5. Most empirical studies indicate that vertical integration between refining and marketing can save costs and lower gasoline prices.

A report released in 2003 summarized and assessed the reliability of nine papers that examined the relation of vertical integration between refiners and retailers to gasoline prices.[57] This 2003 report concluded that the available empirical evidence generally indicates that retail prices tend to be lower if one company owns both refining and retailing operations than if they are owned separately. "Taken together, these studies support the proposition that retail gasoline prices at vertically integrated stations [that is, gas stations owned and operated by a refiner] can be from $0.015 to $0.05 lower than at leased or independent stations, other things equal, and that prices at competing stations are also lower."[58]

Divorcement legislation prohibits refiners from maintaining or acquiring retail gas stations.[59] States with such legislation apparently were concerned that an integrated refiner/retailer might set wholesale prices to independent jobbers and gasoline stations at a rate higher than its own internal transfer price, thus enabling the refiner/retailer to sell gasoline to consumers at prices lower than those charged by its competitors. Some argue that this might persuade consumers to abandon independent gas stations and, in the long run, reduce overall retail competition, as independent gas stations go out of business.

Two of the studies assessed in the 2003 report found that divorcement statutes tend to lead to higher, rather than lower, average retail gasoline prices.[60] One study found that the price of regular unleaded gasoline averages $0.026 per gallon higher in states that have some form of divorcement legislation than in states that do not.[61] This amounts to an estimated reduction in consumer welfare by approximately $112 million annually in the six states that have divorcement legislation.[62] The other study examined the effects of divorcement legislation within the state enacting the legislation. This study found that before the legislation, company-owned-and-operated stations priced gasoline lower than franchise or independent stations; after the enactment of divorcement legislation, retail gasoline prices at both the formerly company-owned-and-operated stations (which had to be divested) and competing gas stations increased by about $0.010 to $0.035 per gallon.[63]

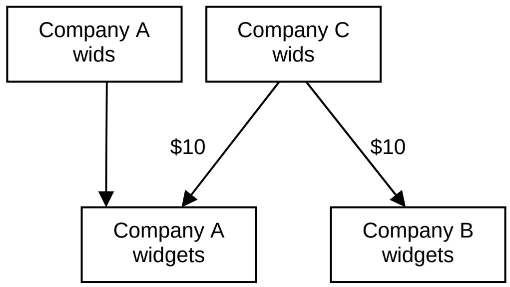
B. Potential Anticompetitive Effects of Vertical Integration.

Although the evidence indicates that vertical integration may often have procompetitive effects, in some circumstances it may reduce competition and harm consumers. Economists generally recognize four ways in which vertical integration may harm consumers by allowing firms to: (1) raise their rivals' costs; (2) evade price regulation; (3) facilitate anticompetitive coordination; and (4) make entry more difficult.

1. Raise rivals' costs.

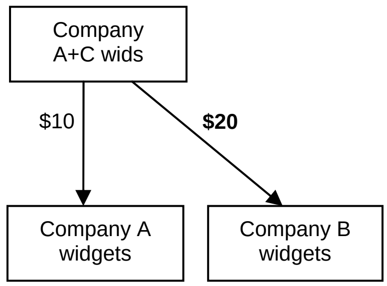
A vertically integrated firm may plan a strategy that could raise the costs of a rival, making the rival a less effective competitor.[64] Consider two companies – Company A and B – that compete in selling widgets. Wids are a key input into the production of widgets, and there is only one independent producer of wids, Company C. Company B is totally dependent on Company C for wids, and Company A also meets most of its wid needs by buying from Company C. However, Company A sources a small fraction of its wids from Company A's upstream subsidiary, whose wid-making production capacity could be easily expanded if necessary. *See* Figure 5-10.

Figure 5-10



Under some circumstances if Company A were to acquire Company C, Company A might have an incentive to increase the price of wids to its widget competitor, Company B. This would increase Company B's costs and might cause Company B to reduce its output of widgets. As a result, some widget demand would shift to Company A. Company A in turn may find it profitable to increase its prices, everything else equal. Note, however, if Company A's costs also fall as a result of acquiring Company C, Company A may also have an incentive to expand widget output, an effect which would tend to reduce widget prices, everything else equal. *See* Figure 5-11.

Figure 5-11:
Raising Rivals' Costs



2. Evade price regulation.

A regulated firm with market power might be able to evade price regulation if it were vertically integrated with an unregulated, downstream firm and then exercised its market power by selling exclusively through that unregulated firm.[65] For example, suppose Company D sells wids, over which it has a natural monopoly. A natural monopoly may occur when it is more efficient for one firm to serve an entire market than for two or more firms to do so.[66] Wids are a required input for widgets. Company E is one of several firms that makes and sells widgets to the public. If the price of wids is regulated, but the price of widgets (Company E's product) is not regulated, then Company D has an incentive to purchase Company E and restrict its competitors' access to wids. The price of wids becomes an internalized transaction and evades price regulation, thus allowing Company D to gain monopoly profits by selling the widgets in the unregulated sector.

3. Facilitate anticompetitive coordination.

Under some circumstances, vertical integration may facilitate anticompetitive coordination.[67] In this example, suppose again that wids are a required input for making widgets. Wids are homogeneous, and the number of manufacturers selling wids is relatively limited. However, because the prices of wids are generally not known, the wid manufacturers are unable to coordinate their prices. A large number of companies sell widgets, and those retail prices are easily available. Therefore, if the wid makers want to agree to coordinate prices, they might integrate downstream into widgets, so they would have a greater ability to identify firms that deviated from an agreed-upon supracompetitive price. This integration would make monitoring an anticompetitive agreement easier, because widget prices are easier to identify than wid prices.

4. Make entry more difficult.

Finally, vertical integration may make entry by new competitors more costly and difficult, if a would-be entrant has to enter both the upstream and downstream markets simultaneously to be successful.[68] For example, suppose a firm wished to enter the widget market on a large scale, and wids are a required input. In this example, however, most of the firms in the widget industry are vertically integrated between manufacturing and marketing – that is, they make and sell both wids and widgets. Additionally, there is a limited independent supply of wids, other than from the vertically integrated firms that make both wids and widgets. In this situation, a potential widget entrant might have to enter the wids industry to ensure that it has all the wids it needs to make its widgets. If such "two-level" entry is more risky, more difficult, or more time-consuming than entry into the entrant's primary market – in this example, widgets – a merger that would further increase vertical integration could create barriers to entry.

5. Two studies suggest that vertical integration between refining and marketing were associated with higher wholesale or retail gasoline prices.

The 2003 report[69] also evaluated two case studies of vertical integration between refining and marketing on the West Coast. The first study asked whether refiner Tosco's acquisition of Unocal's West Coast refining and marketing assets raised wholesale gasoline prices.[70] According to the authors' theory, now that Tosco participated in marketing as well as refining, it would raise rivals' input costs by increasing wholesale prices to its independent jobber competitors. Due to a relatively high degree of integration between wholesale and retail on the West Coast, jobbers or independent retailers may have fewer options to switch brands in response to wholesale price increases. Indeed, the study showed that Tosco's wholesale prices increased by $0.07 to $0.17 per gallon in certain areas. The study did not examine what happened to other firms' wholesale prices or to retail prices to consumers, however.[71]

The second study examined ARCO's long-term lease of 260 retail gas stations from Thrifty, an unintegrated retailer in Southern California.[72] Prior to the lease agreement, Thrifty purchased its gasoline from many different wholesalers, including wholesalers that also sold branded gasoline to other branded stations. After the agreement, Thrifty bought solely from ARCO and changed the Thrifty signs on its stations to ARCO. The study found that before the lease, stations nearby (1 mile or less) that competed with Thrifty had posted prices that were 2 to 3 cents lower than at stations that were not nearby. After Thrifty and ARCO integrated, gasoline prices at those same nearby stations rose by 4 to 6 cents per gallon so that they were about 2 to 3 cents above stations that were not nearby.[73] The author interpreted the results to support the hypothesis that retail gasoline prices will rise when independents are replaced by branded integrated stations where consumers are brand loyal.[74] Possible effects from the rebranding of the acquired firms' retail outlets, as distinct from possible effects from increased vertical integration itself, however, complicate the interpretation of this study's results.

C. Since 1990, the Degree of Vertical Integration Between Various Levels in the U.S. Gasoline Industry Has Decreased.

Except when prohibited by state laws, each firm in the petroleum industry decides what degree of vertical integration among the different steps of exploration and production, refining, distributing, and marketing gasoline best maximizes its profits. Different economic and geographic circumstances might lead a firm to integrate more fully or not, and different firms may assess differently the benefits and costs of vertical integration in particular circumstances. For example, the extent to which refiners are integrated forward into the retail sector varies significantly among various PADDs and local markets.[75]

In recent years, the degree of vertical integration between various levels of the industry appears to have decreased.[76] Several notable transactions in the 1990s reflect this trend.[77] For example, Unocal exited the downstream market entirely in 1997 by selling its refining and marketing business to Tosco; Unocal now focuses on exploration and production. By contrast, Sunoco exited the exploration and production business but retained its refining, distribution, and marketing assets. BP, Exxon, Mobil, Chevron, and the Shell/Texaco joint venture all chose to divest some refining and marketing assets.[78] Nonintegrated retailers like RaceTrac, Sam's Club, and Kroger have entered the market with only retailing assets. In certain locations, some refiners and major brand marketers have exited the terminal business, selling their terminals to independent public operators like Colonial Pipeline.

EIA data similarly reveal a decline in integration between exploration and production, on the one hand, and refining, on the other hand. In 1990, large, integrated U.S. oil companies held 72 percent of U.S. crude distillation capacity, while independent refiners (that is, refiners with no exploration and production assets) held 8 percent. By 1998, the share of large, vertically integrated U.S. oil companies had fallen to 54 percent, and independents' share had increased to 23 percent. The independents' share fell somewhat after Phillips acquired Tosco, but at the end of 2003, four large nonintegrated refiners still accounted for 19.6 percent of U.S. refining capacity.[79]

The EIA's list of major energy companies also reflects a trend away from vertical integration. In 1990, large, vertically integrated U.S. oil companies obligated to report pursuant to the EIA's Financial Reporting System (FRS) accounted for 90 percent of the assets of FRS companies. By 2000, their share had fallen to 59 percent.[80]

All of these transactions suggest some decrease in the benefits of vertical integration between upstream and downstream levels. A variety of factors may explain why the incentives for vertical integration between crude oil exploration and production and refineries appear to have diminished over time. Previously, refiners may have relied consistently on their own crude oil production, perhaps from a field located near the refinery. By contrast, many of today's refiners have made investments to increase their ability to switch economically among different types of crude oil. This ability makes them less dependent on a single source for crude oil supply.

In addition, the expansion of spot and futures markets makes it easier for many independent refiners to purchase adequate supplies of crude oil and, thus, to guard against future price increases. Prior to the development of these markets, an independent refiner could be vulnerable to supply shortages if it did not produce its own crude oil and could become less competitive if it had to continue to pay high prices under long-term, fixed-price contracts even as crude oil prices fell. The maturation of the spot and futures markets has helped to broaden the alternative sources of crude oil for many refiners and made it easier to write long-term contracts with prices based on spot and futures prices. This gives refiners more certainty and diminishes the need to rely on intra-company transfers of crude oil.[81]

The degree of vertical integration between refining and marketing may also have changed. A 6 percent increase in the share of national sales accounted for by rack sales between 1994 and 2002 suggests that nationally, on balance, vertical integration between refining and marketing has not increased, and arguably has decreased.[82] The possible reasons for a decline in vertical integration between refining and marketing are not readily apparent.

In sum, the available evidence indicates that the effects of vertical integration vary depending on the circumstances. Most empirical studies have found that vertical integration between refining and retailing tends to result in lower gasoline prices to consumers, suggesting that vertical integration between those levels can be cost-effective in some circumstances. Recent moves toward less vertical integration in the oil industry, however, suggest that vertical integration may have become less necessary to achieve cost efficiencies in other situations. Two studies discussed in the 2003 report, *see supra*, suggest the possibility of anticompetitive effects due to vertical integration between refining and retailing, but do not have empirical support for their theory of the likely effects on retail prices to consumers. The FTC will remain watchful to both the potential anticompetitive effects and the potential costs savings of vertical integration.

IV. MARKETING PRACTICES.

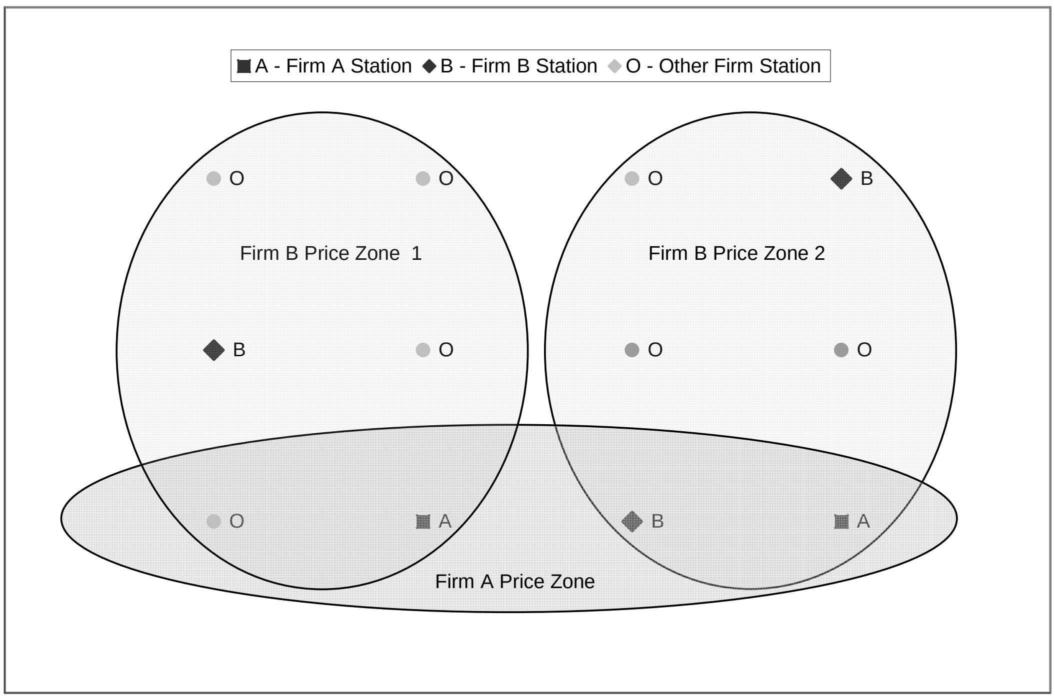
Branded refiners sometimes engage in "zone pricing" or territorial restrictions, sometimes referred to as "redlining." Both practices affect how wholesale gasoline is sold.

Through zone pricing, a branded refiner may charge different DTW prices to lessee dealer stations located in different zones. Through territorial restrictions, a branded refiner may impose territorial restraints on independent jobbers – that is, independent jobbers may supply branded gasoline to their own gas stations or open dealers in some locations, but not to others.

A. Zone Pricing.

A price zone typically "is a contiguous set of gasoline stations of the same brand that face a common set of competitive factors, including competing brands."[83] A branded refiner uses its knowledge of geographic features and local demand patterns to define an area of effective local competition among retailers. This area of effective local competition is the basis for DTW price zones. A branded refiner's DTW prices to lessee dealers may differ between different zones. Zones may change over time, depending on evolving competitive factors. *See* Figure 5-12.

Figure 5-12: Hypothetical Example of Price Zones



Some assert that zone pricing is anticompetitive and leads to higher retail prices for gasoline.[84] Two principal antitrust concerns are raised: (1) zone pricing may allow branded refiners to coordinate wholesale gasoline prices more effectively; and (2) zone pricing may give branded refiners the ability to deter entry through localized price cuts – that is, brand-name refiners might lower DTW prices to lessee dealers only in price zones that new competitors are trying to enter, thus making entry less profitable (or perhaps even unprofitable) for the new entrant.[85]

The FTC's investigations have revealed no evidence of coordination of wholesale prices. In practice, price zones delineated by one branded refiner seldom coincide with the price zones that another branded refiner uses. Different branded refiners assess local competition in different ways. For example, the FTC's Western States Gasoline Pricing Investigation (*Western States Investigation*) "revealed no evidence of coordination by refiners in their use of price zones or in the zones' geographic locations or dimensions."[86] Variations in wholesale gasoline prices further suggest that branded refiners are not using zone pricing to collude on wholesale gasoline prices.

Zone pricing may provide branded refiners the flexibility to meet localized competition, thus resulting in lower prices than might otherwise occur.[87] For example, if lessees in a highly competitive area receive lower DTW prices, they may be able to lower gasoline prices to compete more effectively. A recent experimental economic study analyzed the effects of zone pricing on two types of geographic retail areas – a centrally located area served by a cluster of stations, and isolated areas served by a single station.[88] The experimental study found that consumers in the cluster area paid higher prices when zone pricing was banned than when it was permitted, and that consumers in isolated areas paid the same prices irrespective of whether zone pricing was allowed.[89] Finally, distributors engaging in arbitrage may mitigate any anticompetitive effects from zone pricing.[90]

Nonetheless, the FTC remains vigilant to the possibility that zone pricing might have anticompetitive effects. Staff of the Commission will continue to review any evidence that suggests that zone pricing may raise retail gasoline prices and thus harm consumers.

B. Territorial Restrictions.

With territorial restrictions, a branded refiner permits independent jobbers to distribute the brand-name refiner's gasoline *only* in certain geographic areas. Two types of territorial restrictions generally are in use. The first is territorial, in which contractual provisions specify that the branded refiner may refuse to approve the jobber's request to supply branded gasoline to independent stations or to supply its own stations in specific price zones. The second is site-specific, in which the brand-name refiner provides financial disincentives for the jobber to sell in locations directly supplied by the branded refiner and also prevents the jobber from shipping low-priced gasoline to stations located in high-priced zones.[91]

Some assert that the limits that territorial restrictions can place on competition among gas stations of the same brand may lead to higher retail prices for gasoline. According to the Petroleum Marketers Association of America, territorial restrictions can afford branded refiners with "a monopoly on the brand …. [A]s a consequence, brand-loyal customers are reduced to a single purchase option …. In dual distribution areas …, where intrabrand competition is allowed to flourish, consumers generally enjoy the benefit of lower prices."[92]

Some further suggest that the existence of territorial restrictions indicates coordination among owners of major brands to raise gasoline prices. During the FTC *Western States Investigation*, however, the evidence revealed that brand-name refiners used different territorial restriction methods and redlined the same geographic areas differently.[93] The use of different methods and geographic areas does not support a theory that branded refiners coordinate on territorial restrictions to raise retail gasoline prices. The Commission's *Western States Investigation* uncovered no evidence that territorial restrictions gave any refiner the ability profitably to raise price or reduce output and no direct evidence of competitive harm.[94]

Moreover, the Supreme Court has recognized the likelihood that reductions in intrabrand competition (*e.g.*, competition among gas stations selling the same brand) will stimulate horizontal, or interbrand, competition (*e.g.*, competition among gas stations selling different brands).[95] Territorial restrictions may also allow a branded refiner to implement a more efficient distribution system. For example, absent territorial restrictions, "jobbers could cherry-pick good sites within the marketer's distribution system and deliver to those stations, increasing distribution costs for the marketer. Dual distribution also could lead to inefficient duplication of assets by the marketer and jobber."[96]

Absent evidence of a conspiracy among refiners, the Commission would likely be required to analyze territorial restrictions under the antitrust rule of reason.[97] A rule of reason analysis requires a balancing of potential pro- and anti-competitive effects.

Nonetheless, the Commission will remain vigilant against any potential anticompetitive effects of territorial restrictions. The Commission will continue to assess any evidence of possibly anticompetitive territorial restrictions to evaluate the likelihood of harm to gasoline consumers.

Endnotes

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1. JOHN M. BARRON ET AL., CONSUMER AND COMPETITOR REACTIONS: EVIDENCE FROM A RETAIL-GASOLINE FIELD EXPERIMENT (Mar. 2004), *at* http://ssrn.com/abstract=616761.

2. *Id.* at 13, 15.

3. *Id*. at 30-31.

4. *See generally A Report on Retail and Wholesale Gasoline Prices in the Miami/Globe and Phoenix Markets: Hearing before the Subcomm. on Antitrust, Monopolies and Business Rights, Senate Comm. on the Judiciary*, 102nd Cong., 483-84 (May 6, 1992) (statement of John Umbeck) (an analysis of wholesale and retail gasoline price differences in the Globe/Miami and Phoenix areas of Arizona).

5. *See* BARRON, *supra* note 1, at 30-31; GOV'T ACCOUNTABILITY OFFICE (GAO), GAO/RCED-00-121, MOTOR FUELS: CALIFORNIA GASOLINE PRICE BEHAVIOR 20 (2000), *available at* http://www.gao.gov/new.items/rc00121.pdf.

6. GAO, *supra* note 5, at 20.

7. *Id.*

8. Philip K. Verleger, Remarks at the Federal Trade Commission Conference on Factors that Affect Prices of Refined Petroleum Products 36 (Aug. 2, 2001) [hereinafter, citations to conference transcripts include the speaker's last name, transcript date, and page cite(s)]. Transcripts of the Conference and presentations are available at http://www.ftc.gov/bc/gasconf/index.htm.

9. Earl Bolender, *What's (Way) Up With Gas Prices?*, MT. SHASTA NEWS, Sept. 05, 2001; John Diehm, *Summer Could Bring Soaring Gas Prices*, MT. SHASTA NEWS, Apr. 11, 2001.

10. A "rack" is the facility for dispensing refined petroleum products from storage in a terminal to trucks for subsequent delivery to retail outlets.

11. To ensure that the price differences did not result from other phenomena, the study uses San Francisco as the control region. San Francisco serves as the control region and base measure because a majority of the gasoline that is supplied to the rack in Chico comes from refineries in the San Francisco area. In addition, gasoline retailing in San Francisco appears to have experienced less change than other areas of the state.

12. *Yreka Gas Prices Remain High*, SISKIYOU DAILY NEWS (Online Edition), July 24, 2002.

13. Devanie Angel, *Gas Pains*, CHICO NEWS & REV., Jan. 30, 2003.

14. BUREAU OF ECON., FED. TRADE COMM'N (FTC), THE PETROLEUM INDUSTRY: MERGERS, STRUCTURAL CHANGE, AND ANTITRUST ENFORCEMENT 232 (2004) [hereinafter PETROLEUM MERGER REPORT], *available at* http://www.ftc.gov/os/2004/08/040813mergersinpetrolberpt.pdf.

15. Diehm, *supra* note 9; Bolender, *supra* note 9.

16. These prices reflect the average of retail prices collected and published by the Oil Price Information Service (OPIS), a private company.

17. PETROLEUM MERGER REPORT, *supra* note 14, at 232. *See also* Bob Frei & Jim Peters, *New Millennium Gasoline Retailing: Challenge to the Incumbents*, NAT'L PETROLEUM NEWS, May 2000, at 54; William J. McAfee, *From "Circle Service" to Do-It-Yourself: 1950s to Today*, NAT'L PETROLEUM NEWS, May 2002, at 66.

18. PETROLEUM MERGER REPORT, *supra* note 14, at 246 tbl.9-5.

19. *Id.* at 233.

20. *Id.* at 240.

21. *Industry*, CONVENIENCE STORE NEWS, June 6, 2003.

22. Hogarty 5/9 at 22.

23. PETROLEUM MERGER REPORT, *supra* note 14, at 239.

24. *Id.* at 238-39.

25. *See* Michael G. Vita, *Regulatory Restrictions on Vertical Integration and Control: The Competitive Impact of Gasoline Divorcement Policies*, 18 J.REG. ECON. 217 (2000) (noting that in 1993 – the last year for which data were available as of the time of the article – the price of regular unleaded gasoline in states that banned self-service was $0.03 per gallon higher than in states that allowed self-service); *see also* Ronald N. Johnson & Charles J. Romeo, *The Impact of Self-Service Bans in the Retail Gasoline Market*, 82 REV. ECON. & STAT. 625 (2000) (finding the cost of self-service bans to be $0.03 to $0.05 per gallon).

26. *See* Rod W. Anderson & Ronald N. Johnson, *Antitrust and Sales-Below-Cost Laws: The Case of Retail Gasoline*, 14 REV. OF INDUS. ORG. 189 (1999); J. Isaac Brannon, *The Effects of Resale Price Maintenance Laws on Petrol Prices and Station Attrition: Empirical Evidence from Wisconsin*, 35 APPLIED ECON. 343 (2003).

27. *See, e.g.*, Star Fuels Mart, LLC v. Sam's E., Inc., 362 F.3d 639, 648 n.3 (10th Cir., 2004) (despite no evidence of harm to competition under a Sherman Act standard, the court upheld a preliminary injunction under the Oklahoma Unfair Sales Act, which forbids retailers from selling fuel below cost; the court explained that "[t]he purpose of the OUSA . . . is simply to prevent loss leader selling and to protect small businesses.").

28. *See*, *e.g.*, OREGON REV. STAT., ch. 480, § 480.315 (including, among others, the following reasons for the prohibition: "dispensing of [gasoline] by dispensers properly trained in appropriate safety procedures reduces fire hazards"; "crime and slick surfaces . . . are enhanced [at self-service stations] because Oregon's weather is uniquely adverse, causing wet pavement and reduced visibility"; "the increased use of self-service at retail in other states has contributed to diminishing the availability of automotive repair facilities at gasoline stations"; and "self-service dispensing at retail contributes to unemployment, particularly among young people"). Although these reasons might seem equally applicable to motorcycles, Oregon allows a motorcycle operator to dispense gasoline. *Id*. §480.349.

29. Johnson & Romeo, *supra* note 25, at 632.

30. Johnson & Romeo, *supra* note 25; *see also* Donald Vandegrift & Joseph A. Bisti, *The Economic Effect of New Jersey's Self-Service Operations Ban on Retail Gasoline Markets*, 24 J.CONSUMER POL'Y 63 (2001).

31. Kwik Trip, Inc., No. MI 2402972 ML (Cease & Desist/Consent, May 24, 2004); Murphy Oil USA, Inc., No. MI 2402973 ML (Cease & Desist/Consent, May 24, 2004); Minn. Dep't of Commerce, *Enforcement Actions: Miscellaneous* (May 31, 2004), *at* http://www.state.mn.us/mn/externalDocs/Commerce/ Enforcement_Actions_May_2004_050704120541_EnfAct053104.htm.

32. Minn. Dep't of Commerce, *supra* note 31; *see also* Mark Brunswick, *Selling Gas For Too Little Can Be Costly; State Regulations Are Penalizing Some Retailers Who Don't Charge Enough For Fuel*, MINNEAPOLIS STAR-TRIBUNE, June 2, 2004, at 1B.

33. *See*, *e.g.*, Anderson & Johnson, *supra* note 26, at 203; Robert Fenili & William Lane, *Thou Shalt Not Cut Prices! Sales-Below-Cost Laws for Gas Stations*, 9 REGULATION, Sept./Oct. 1985, at 31-32. *But see* JAMES ALM ET AL., DO MOTOR FUEL SALES-BELOW-COST LAWS LOWER PRICES? (Andrew Young School of Pol'y Stud., Working Paper, 2004) (finding that gasoline prices in states that have adopted such laws are about 1 cent lower 5 years after the law is imposed), *at* http://aysps.gsu.edu/publications/2004/alm/sales_below_cost.pdf.

34. Williams 8/2 at 153-54. The Commission staff, in letters to state officials, has provided economic advice opposing the passage of state gasoline pricing laws that would place stricter bounds on retailers' pricing conduct than are imposed by the existing federal prohibition against predatory pricing. These letters pointed out that anticompetitive below-cost pricing already is illegal under the federal antitrust laws – and, according to scholarly commentary and court decisions, rarely occurs in any event – and that the proposed state legislation would penalize some forms of price-cutting that benefit consumers. *See* Letter from the FTC's Bureau of Competition, Bureau of Economics, and Office of Policy Planning to The Honorable Demetrius C. Newton, Speaker Pro Tempore, Alabama

State House of Representatives (Jan. 29, 2004) (regarding the "Alabama Motor Fuels Marketing Act"), *at* http://www.ftc.gov/be/v040005.htm; Letter from the Bureau of Competition and the Office of Policy Planning to Governor George E. Pataki, State of New York (Aug. 8, 2002) (concerning N.Y. Bill No. S04522, the "New York Motor Fuel Marketing Practices Act"), *at* http://www.ftc.gov/be/v020019.pdf; Letter from the Bureau of Competition and the Office of Policy Planning to The Honorable Robert F. McDonnell, House of Delegates, Commonwealth of Virginia (Feb. 15, 2002) (concerning Va. Senate Bill No. 458, "Below-Cost Sales of Motor Fuels"), *at* http://www.ftc.gov/be/v020011.htm.

35. *See supra*, Chapter 4(III).

36. PETROLEUM MERGER REPORT, *supra* note 14, at 222. This price includes both storage (which is calculated on a per-month basis) and dispensing components.

37. The last year for which data are available is 1997. U.S. CENSUS BUREAU, *Economic Census of Wholesale Trade: Subject Series*, tables entitled: "Petroleum Bulk Stations by Type of Stations for States" and "Bulk Storage Capacity by Type of Product for States" (1982, 1987, 1992, 1997). The only publicly available data on trends in terminal concentration are not reliable. The Bureau of the Census tracks the number of product terminals nationally and by state. The collected data refer to the number of terminals owned by "refiner-marketers" and by "others"; this distinction corresponds roughly to that between proprietary and public terminals.

38. *See* NAT'L PETROLEUM COUNCIL, U.S. PETROLEUM PRODUCT SUPPLY INVENTORY DYNAMICS 37-38 (1998).

39. PETROLEUM MERGER REPORT, *supra* note 14, at 223.

40. *Id.* at 223-24.

41. Colonial Pipeline Co., *Terminalling Services, at* http://www.colpipe.com/sv_ts.asp (last visited June 28, 2005).

42. Press Release, Buckeye Partners, L.P., Buckeye Partners Acquires BP Amoco Terminal (Mar. 21, 2000) (on file with author, *at* http://www.buckeye.com).

43. *Kinder Morgan to Purchase Five Terminals*, MODERN BULK TRANSPORTER, Oct. 1, 2003.

44. Press Release, Magellan Midstream Partners, L.P., Magellan Midstream Partners Completes Acquisition of Strategic Pipeline Systems (Oct. 1, 2004) (on file with author, *at* http://www.magellanlp.com).

45. PETROLEUM MERGER REPORT, *supra* note 14, at 228. Note that some refiners may also be purchasing terminal assets.

46. Branded jobbers purchase gasoline at the rack from branded wholesale gasoline marketers. In turn, these jobbers sell the gasoline to stations that are licensed to sell under the brand. Unbranded jobbers purchase unbranded gasoline at the terminal rack for delivery to retailers.

47. For a more complete description of direct and jobber distribution systems, *see* PETROLEUM MERGER REPORT, *supra* note 14, at 226-31.

48. ENERGY INFO. ADMIN. (EIA), U.S. DEP'T OF ENERGY, DOE/EIA-0487(03), PETROLEUM MARKETING ANNUAL 2003, at 221 (2004), *at* http://tonto.eia.doe.gov/FTPROOT/petroleum/048703.pdf. *See also* PETROLEUM MERGER REPORT, *supra* note 14, at 226.

49. PETROLEUM MERGER REPORT, *supra* note 14, at 230-31, 242-44 tbls.9-2 to 9-3.

50. EIA, *supra* note 48, at 247; PETROLEUM MERGER REPORT, *supra* note 14, at 242 tbl.9-2.

51. *See* PETROLEUM MERGER REPORT, *supra* note 14, at 11-12.

52. A few states forbid refiners from owning retail outlets. *See* note 59, *infra*, and related text.

53. However, the degree of integration of such firms may vary geographically.

54. *See* Vita, *supra* note 25, and sources cited therein. *See also* DENNIS CARLTON & JEFFREY PERLOFF, MODERN INDUSTRIAL ORGANIZATION 377-95 (3d ed. 2000); W. KIP VISCUSI ET AL., ECONOMICS OF REGULATION AND ANTITRUST 218-33 (3d ed. 2000). For a discussion of the case law on vertical integration, *see* ANDREW I. GAVIL, WILLIAM E. KOVACIC & JONATHAN B. BAKER, ANTITRUST LAW IN PERSPECTIVE: CASES, CONCEPTS AND PROBLEMS IN COMPETITION POLICY 339-417, 689-756 (2002); *Antitrust Law Developments*, 2002 ABA SEC. ANTITRUST L. 130-228, 253-56.

55. Whether the direct managerial control lowers transactions costs will depend on the specific situation. For example, some branded marketers choose to use direct distribution in some areas and jobber distribution in others.

56. The prices that pipeline operators charge for the use of their lines are often, but not always, fixed due to government regulations. The oil pipeline pricing index was established in Revisions to Oil Pipeline Regulations Pursuant to the Energy Policy Act of 1992, Order No. 561, FERC Stats. & Regs. (CCH) ¶ 30,985 (1993).

57. *See* John Geweke, *Empirical Evidence on the Competitive Effects of Mergers in the Gasoline Industry* (Public Comment, FTC Conference on Factors That Affect Prices of Refined Petroleum Products II, July 16, 2003), *at* http://www.ftc.gov/bc/gasconf/comments2/gewecke1.pdf.

58. *Id.* at 18-19.

59. Jurisdictions that have passed divorcement laws include Connecticut, Delaware, Hawaii, Maryland, Nevada, Virginia, and the District of Columbia. For an analysis of various states' divorcement statutes, *see* LEGISLATIVE REFERENCE BUREAU, ST. OF HAW., REGULATING HAWAII'S PETROLEUM INDUSTRY 196-213 (Ch.15 "Retail Divorcement") (1995), *at* http://www.hawaii.gov/lrb/rpts95/petro/pet15.html; *see also* John M. Barron et al., *Predatory Pricing: The Case of the Retail Gasoline Market,* 3 CONTEMP. ECON. POL'Y 131 (1985).

60. Vita, *supra* note 25; John M. Barron & John R. Umbeck, *The Effects of Different Contractual Arrangements: The Case of Retail Gasoline Markets*, 27 J. L. ECON. 313 (1984).

61. Vita, *supra* note 25. The study tested two conflicting hypotheses: (1) that divorcement legislation increases consumer welfare because vertical integration is anticompetitive; and (2) that such legislation harms consumers by eliminating efficiency gains from vertical integration. *See also* Barron & Umbeck, *supra* note 60; Williams 8/2 at 152.

62. Vita, *supra* note 25. Other studies have reached the same general conclusion. *See* A.A. Blass & Dennis W. Carlton, *The Choice of Organizational Form in Gasoline Retailing and the Cost of Laws that Limit that Choice*, 44 J.L. ECON. 511 (2001) (finding that refiners open new company or lessee-operated retail outlets to gain efficiencies – rather than for predatory purposes – and concluding that state divorcement policies may impose annual costs of as much as $1 billion on society); Barron & Umbeck, *supra* note 60, at 327 (finding that the Maryland statute mandating divorcement led to higher average self-serve and full-serve gasoline prices at the formerly integrated stations as compared to the competing stations).

63. Barron & Umbeck, *supra* note 60. A third study, published in 1993, examined a data set limited solely to a cross-section of gas stations in one state. The primary focus of the study was the relationship between station characteristics and ownership form; a secondary focus was the relationship between ownership form and price. The study found that retail prices were lower at company-owned-and-operated stations than at all other stations, but the estimates were imprecise. Andrea Shepard, *Contractual Form, Retail Price, and Asset Characteristics in Gasoline Retailing*, 24 RAND J. ECON. 58 (1993).

64. *See* JEFFREY CHURCH & ROGER WARE, INDUSTRIAL ORGANIZATION: A STRATEGIC APPROACH 625-42 (2000); James C. Cooper, et al.,, *Vertical antitrust policy as a problem of inference*, INT'L J. INDUS. ORG. (forthcoming 2005); *but cf.* WILLIAM S. COMANOR ET AL., VERTICAL ANTITRUST POLICY AS A PROBLEM OF INFERENCE: THE RESPONSE OF THE AMERICAN ANTITRUST INSTITUTE (Am. Antitrust Inst., Working Paper No. 05-04, 2005).

65. CARLTON & PERLOFF, *supra* note 54, at 386-87.

66. A common example of a natural monopoly is water distribution, in which the main cost is laying a network of pipes to deliver water. One firm can do the job at a lower average cost per customer than two firms with competing networks of pipes.

67. CARLTON & PERLOFF, *supra* note 54, at 409. *See also In re* Shell Oil Co., No. C-3803, Analysis of Proposed Consent Order to Aid Public Comment 30, 36-37 (Dec. 19, 1997), *at* http://www.ftc.gov/os/1997/12/shelltex.pdf.

68. CARLTON & PERLOFF, *supra* note 54, at 409.

69. *See* Geweke, *supra* note 57.

70. RICHARD GILBERT & JUSTINE HASTINGS, MARKET POWER, VERTICAL INTEGRATION, AND THE WHOLESALE PRICE OF GASOLINE (Univ. of Cal. Energy Inst., Working Paper No. PWP-084, 2001, rev. 2002), *at* http://aida.econ.yale.edu/~jh529/RRC_Revision0604.pdf; Hastings 8/2 at 146-47.

71. *See* CHRISTOPHER T. TAYLOR & DANIEL S. HOSKEN, THE ECONOMIC EFFECTS OF THE MARATHON-ASHLAND JOINT VENTURE: THE IMPORTANCE OF INDUSTRY SUPPLY SHOCKS AND VERTICAL MARKET STRUCTURE (Bureau of Econ., FTC, Working Paper No. 270, 2004) (describing the importance of examining both retail and wholesale prices when measuring the competitive effects of mergers, the authors state that, if they had analyzed wholesale prices without examining retail prices, the study would have concluded a merger had led to higher prices when in fact the wholesale price increase was not passed through by retailers), *available at* http://www.ftc.gov/be/workpapers/wp270.pdf.

72. Justine Hastings, *Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Guidance From Contract Changes in Southern California*, 94 AM. ECON. REV. 317 (2004). When the Geweke 2003 report examined the Hastings study, the report reviewed an unpublished and undated version of the study.

73. *Id.* at 323.

74. *Id.* at 328.

75. Davis 5/9 at 7-8. *See also* PETROLEUM MERGER REPORT, *supra* note 14, at 230.

76. Davis 5/9 at 7-8.

77. For more information, *see* PETROLEUM MERGER REPORT, *supra* note 14, at 93-128 (Ch. 4, "Mergers and the

Petroleum Industry Since 1985: The Empirical Data").

78. Some of these companies were also required to divest assets pursuant to FTC action. *See, e.g.*, *In re* Exxon Corp., No. C-3907 (Jan. 26, 2001) (decision and order), *available at* http://www.ftc.gov/os/2001/01/exxondo.pdf; *In re* BP Amoco p.l.c., No. C-3938 (Aug. 29, 2000) (decision and order), *available at* http://www.ftc.gov.os/2000/08/bparco.do.pdf.

79. EIA, *The U.S. Petroleum Refining and Gasoline Marketing Industry*, *at* http://eia.doe.gov/emeu/finance/usi&to/downstream/index.html (last modified June 1999). *See also* PETROLEUM MERGER REPORT, *supra* note 14, at 194-95.

80. EIA, DOE/EIA-0206(00), PERFORMANCE PROFILES OF MAJOR ENERGY PRODUCERS 2000, at 73-78 (2002), *available at* http://tonto.eia.doe.gov/FTPROOT/financial/020600.pdf. To be a FRS reporting company, a firm must be a U.S.-based corporation that has at least 1 percent of U.S. crude oil or natural gas reserves or production or at least 1 percent of U.S. refining capacity or refined product sales volume. Six firms – Amoco, ARCO, Ashland, Coastal, Mobil, and Total (N. America) – left the FRS list as the result of consolidations, while three others – Kerr-McGee, Sunoco, and Unocal – remain on the FRS list as nonintegrated firms after divesting either upstream operations (Sunoco) or refining operations (Kerr-McGee and Unocal). Other firms not on the 1990 list were counted among the FRS companies in 2000, including non-integrated refiners such as Premcor, Tesoro, and Valero.

81. *See* PETROLEUM MERGER REPORT, *supra* note 14, at 140-41, 198-99.

82. *Id.* at 230.

83. DAVID W. MEYER & JEFFREY H. FISCHER, THE ECONOMICS OF PRICE ZONES AND TERRITORIAL RESTRICTIONS IN GASOLINE MARKETING 6 (Bureau of Econ., FTC, Working Paper No. 271, 2004), *available at* http://www.ftc.gov/be/workpapers/wp271.pdf.

84. *Solutions to Competitive Problems in the Oil Industry: Hearings Before the House Comm. on the Judiciary*, 106th Cong. 194 (Apr. 7, 2000) (statement of Richard Blumenthal, Attorney General, State of Connecticut), *available at* http://commdocs.house.gov/committees/judiciary/hju64736.000/hju64736_0f.htm.

85. MEYER & FISCHER, *supra* note 83, at 16. *In re* Exxon Corp., No. C-3907, Analysis of Proposed Consent Order to Aid Public Comment 7 (Jan. 26, 2001) (finding evidence that incumbents had used zone pricing to deter entrants from expanding their gas stations), *at* http://www.ftc.gov/os/1999/11/exxonmobilana.pdf.

86. In 1998, in response to concerns that differences in gasoline prices between Los Angeles, San Diego, and San Francisco might reflect anticompetitive conduct, the Commission opened an investigation into gasoline marketing and distribution practices used by the major oil refiners in Arizona, California, Nevada, Oregon, and Washington. *See* Statement of Commissioners Sheila F. Anthony, Orson Swindle, and Thomas B. Leary, No. 981-0187 (concerning Western States Gasoline Pricing Investigation), *at* http://www.ftc.gov/os/2001/05/wsgpiswindle.htm; *see also* Concurring Statement of Commissioner Mozelle W. Thompson, No. 981-0187 (concerning Western States Gasoline Pricing Investigation), *at* http://www.ftc.gov/os/2001/05/wsgpithompson.htm.

87. MEYER & FISCHER, *supra* note 83, at 25.

88. CARY A. DECK & BART J. WILSON, EXPERIMENTAL GASOLINE MARKETS (Bureau of Econ., FTC, Working Paper No. 263, 2003), *available at* http://www.ftc.gov/be/workpapers/wp263.pdf.

89. Essentially, when zone pricing is banned refiners offer a price that is above the cluster area zone price and below the isolated area zone wholesale price. The refiners try to achieve a balance that allows them to extract economic rents from the isolated stations and remain viable in the cluster areas. Thus, a refiner's gains in the cluster area, due

to higher wholesale prices, are offset by reduced earnings in the isolated markets. *Id.* at 23.

90. *In re* Exxon Corp., No. C-3907, Analysis of Proposed Consent Order to Aid Public Comment 7 (Jan. 26, 2001), *at* http://www.ftc.gov/os/1999/11/exxonmobilana.pdf. In considering the price zones as part of its merger analysis, the Commission expressly stated that it had not "concluded that these practices of themselves violate the antitrust laws or constitute unfair methods of competition within the meaning of Section 5 of the FTC Act." *Id*. at 7 n.8. The Commission also noted that the merger might limit arbitrage opportunities because it reduced "interbrand competition through the elimination of one independent supplier." *Id.* An arbitrage opportunity refers to an opportunity to buy a product in one market and almost immediately sell it in another market at a higher price, including any transportation or transaction costs.

91. PETROLEUM MERGER REPORT, *supra* note 14, at 227 n.17.

92. MEYER & FISCHER, *supra* note 83, at 28 (quoting Petroleum Marketers Ass'n of America, PMAA White Paper on Refiner Redlining in Historic Independent Marketer Territories (2003)).

93. *See* Statement of Commissioners Anthony et al., *supra* note 86.

94. *See id*.

95. Continental T.V., Inc. v. GTE Sylvania, Inc., 433 U.S. 36 (1977). *See also* Business Electronics Corp. v. Sharp Electronics Co., 485 U.S. 717 (1988).

96. MEYER & FISCHER, *supra* note 83, at 32 (internal citation omitted).

97. *Continental T.V.*, 433 U.S. 36.

APPENDIX A:
GLOSSARY OF TERMS AND ACRONYMS

Primary Sources: Energy Glossary of the U.S. Energy Information Administration (EIA), *at* http://www.eia.doe.gov/glossary/glossary_main_page.htm, OPIS Energy Glossary, *at* http://www.opisnet.com/market/glossary.asp

Term	Definition
American Petroleum Institute (API)	A trade association for the oil and natural gas industry.
Barrel	A unit of measure of petroleum equivalent to 42 US gallons.
Barrels per Day (BPD)	A unit of measure for extraction of crude oil or processing capacity of a refinery.
California Air Resources Board (CARB)	A government agency established by California law to target reductions in air pollution through research, air quality monitoring, and vehicle emissions standard setting.
DOJ	United States Department of Justice
Dealer Tank Wagon Sales (DTW)	Wholesale gasoline priced to include delivery to a retail outlet; branded refiners charge DTW prices to gasoline retailers.
EIA	United States Energy Information Administration
Elasticity of Demand	The desire and ability of consumers to change the amount of a product they will purchase when its price increases is known as the price elasticity of that product. The price elasticity of demand is the ratio of the percent change in the quantity demanded to the percent change in price. That is, if a 10 percent price increase results in a 5 percent decrease in the quantity demanded, the price elasticity of demand equals -0.5 (-5%/10%). Demand is defined as "inelastic" if this ratio is between 0 and -1, and "elastic" if the ratio is less than -1.
EPA	United States Environmental Protection Agency
FERC	U.S. Federal Energy Regulatory Commission
FRS	Financial Reporting System
Former Soviet Union (FSU)	The Former Soviet Union includes the following countries: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.
FTC, Commission	United States Federal Trade Commission
GAO	United States Government Accountability Office

Herfindahl-Hirschman Index (HHI)	The Herfindahl-Hirschman Index is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. The HHI takes into account the relative size and distribution of the firms in a market. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases.
IEA	International Energy Agency
Jobber	Independent gasoline wholesalers known as "jobbers" may purchase gasoline from refiners, store it in public terminals, and sell it to gas stations for resale to consumers.
MTBE	Methyl Tertiary Butyl Ether
NYMEX	New York Mercantile Exchange. The largest U.S. trading market for energy futures and options.
Organization of Petroleum Exporting Countries (OPEC)	At the time of writing, OPEC's 11 member countries include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.
OPIS	Oil Price Information Service
Petroleum Administration for Defense Districts (PADD)	5 geographic regions, in total including all 50 United States and the District of Columbia, defined by the Petroleum Administration.
Rack	A facility for dispensing refined petroleum products from the terminal at which they are stored to trucks for subsequent delivery to retail outlets.
RBOB	Reformulated Gasoline Blendstock for Oxygenate Blending
Reformulated Gasoline (RFG)	Cleaner burning gasoline produced for use in motor vehicles that meets compositional properties established by the Federal Clean Air Act and the EPA.
Strategic Petroleum Reserve (SPR)	Surplus petroleum stocks stored by the U.S. government.
WTI	West Texas Intermediate crude oil

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