United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Antitrust, Monopolies and Business Rights, Committee on Judiciary, U.S. Senate

GASOLINE MARKETING

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-236481.3

February 26, 1991

The Honorable Howard M. Metzenbaum
Chairman, Subcommittee on Antitrust,
Monopolies and Business Rights
Committee on the Judiciary
United States Senate

Dear Mr. Chairman:

Consumers have the option of purchasing several different grades of unleaded gasoline—regular, mid-grade, and premium—which are classified according to an octane rating.[1] Because of your concern that consumers may be needlessly buying higher priced premium unleaded gasoline for their automobiles when regular unleaded gasoline would meet their needs, you asked us to determine: (1) whether consumers were buying premium gasoline that they may not need, (2) whether the higher retail price of premium gasoline includes a price mark-up added between the refinery and the retail pump which is greater than that included in the retail price for regular gasoline, and (3) possible reasons for the price differences between premium and regular gasoline.

Results in Brief

Although not conclusive, indications are that consumers may be overbuying premium gasoline. For example, both government and industry studies show that premium gasoline sales, as a percentage of gasoline sales, exceed the percentage of vehicles on the road that require premium gasoline. Further, consumers' choice of premium gasoline may in some instances depend on price rather than need. This is illustrated by industry information showing that the increased price of premium gasoline since the August 2, 1990, Iraqi invasion of Kuwait resulted in a significant drop in premium gasoline sales. If consumers choose to buy premium gasoline that is not needed for their automobiles, it could be costing them millions of dollars each year.

In analyzing nationwide averages of gasoline sales along with retail and refiners' prices, we found that the price difference between premium and regular gasoline established at the refinery was about the same as the price difference between the two grades of gasoline set at the retail pump. Two factors that contribute to the higher price of premium over regular gasoline are the costs of additional processing to increase the

[1] Premium gasoline has an octane rating above 90.

octane level and the cost of more or better additives that may be included in premium gasoline.

Possible Consumer Overbuying of Premium Gasoline

Although not conclusive, the government and industry studies we reviewed indicate that consumers may be buying more premium gasoline than need be. The studies show that sales of premium gasoline, as a percentage of total gasoline sales, exceed the percentage of vehicles on the road needing premium. For example, a March 1990 Department of Energy (DOE) Energy Information Administration (EIA) report shows that the percentage of new cars needing premium gasoline decreased from 26.6 percent in 1971 to about 6 percent in 1988. Furthermore, the study shows that the total automotive fleet on the road needing premium—which includes all cars, old and new—decreased from 18 percent in 1983 to 15 percent in 1988. At the same time, the sales of premium gasoline as a percentage of total gasoline sales generally increased. According to EIA information, premium gasoline sales increased from 14 percent of total nationwide gasoline sales in 1984 to 23 percent in 1989.

Although the government and industry studies show the percentage of difference between premium gasoline sales and vehicles on the road requiring premium gasoline, it varies between the studies. One of the studies, which was done by the oil industry, showed a 3-percentage-point difference. The second study, done by an automotive manufacturer, showed the difference to be 26 percent. EIA's study showed a 9-percentage-point difference. Methodological differences and data limitations between the studies contribute to the wide range of estimates. Also, the studies do not discuss the different usage patterns or fuel efficiencies that may exist between automobiles using premium and regular gasolines. Unless one makes a number of assumptions about automobile gasoline consumption—for example, cars that use premium gasoline are no different with respect to fuel efficiency or miles driven per year from cars using regular gasoline—the results of these studies should not be viewed as conclusive evidence that premium gasoline overbuying is occurring, nor the extent of any possible overbuying.

Another indication that overbuying may be occurring is that when gasoline prices rise substantially, fewer consumers are willing to substitute premium gasoline for a lower octane fuel. EIA and oil refinery officials told us that consumer willingness to buy premium gasoline is sensitive to the overall gasoline price level. The recent increase in gasoline prices brought on by the Iraqi invasion of Kuwait bears this out. For example,

a Washington, D.C., area industry official told us that the average premium wholesale price for eight major brands of gasoline in the greater Washington, D.C., market rose from $1.17 to $1.46 per gallon, during a 2-1/2-month period after the invasion. (The average price of regular gasoline also increased about the same amount.) During this same time period, premium gasoline sales, as a percentage of total gasoline sales, dropped from 40 percent to 20 percent, a 50-percent loss in the market share—which could mean that consumer overbuying has been occurring. Officials of three major U.S. refineries indicated to us that the general increase in gasoline prices has significantly lowered premium's market share nationwide.

Several factors contribute to the purchase of premium gasoline for vehicles designed to use lower octane fuel. Although manufacturers recommend regular gasoline for most automobiles, weather conditions, altitude, and automobile driving conditions may at times increase a vehicle's octane requirements. This adds to the difficulty in determining if overbuying is occurring.

Premium gasoline overbuying can be costly to consumers when viewed on a nationwide basis. In 1989, gasoline sales amounted to about 117 billion gallons, and the average price difference between premium and regular gasoline was 14 cents per gallon. If one assumes that the 3- to 26-percent-differences between premium gasoline sales and fleet requirements shown in the studies we reviewed do in fact represent overbuying, it would mean that consumers could have spent from $491 million to about $4.3 billion in 1989 for premium gasoline that the studies show was not required. Again, as pointed out above, these studies do not conclusively prove that overbuying is occurring. The results are used here for illustrative purposes to show the possible consumer cost associated with overbuying.

Premium and Regular Gasoline Price Differences

Because of the manner in which gasoline sales and pricing information is reported by refiners to EIA, we could not develop precise information on price markups for premium and regular gasolines as they move through the complex distribution system. For example, we could not adjust EIA's nationwide refiners' price information for transportation costs associated with the final delivery of gasoline to the retail dealer that may vary between grades and over time. However, using nationwide averages of gasoline sales and retail and refiners' prices, we found that the price difference between premium and regular gasoline sold at the retail

pump, excluding taxes, appears to be about the same as the price difference established between the two grades of gasoline by the refinery. Our analyses of EIA data are based on the assumption that these transportation costs are the same for the two grades of gasoline. Furthermore, it should be noted that because the gasoline sales and pricing information are based on nationwide averages, they do not necessarily represent the marketing practices of specific refineries or specific geographical gasoline distribution networks.

To illustrate the differences in premium and regular gasoline prices, in 1984, the average refiner's price for premium was 8 cents per gallon more than the price for regular gasoline. In that same year, the average retail, or pump, price for premium was 9 cents more than the retail price of regular—an increase of 1 cent over the refiner's price difference. In 1989, the gap between the average refiner's price for premium and regular had increased to 14 cents while, at the pump, the average price difference was also 14 cents—no increase over the refiner's price difference. Thus, the price difference between regular and premium gasoline at the retail pump was roughly the same as the price difference established by the refinery.

Reasons for Price Differences

According to EIA and industry officials, two factors that contribute to the higher price of premium gasoline are the costs of additional processing to increase the octane level and the cost of additional additives, which may be added to premium gasoline. The cost to increase the octane level includes octane-enhancing blending components such as oxygenates or reformate, which includes additional crude oil feedstocks. Refiners incur costs ranging from 4 to 13 cents a gallon to increase the octane level of premium gasoline. Also, more expensive engine-cleaning detergents may be added to premium gasoline, which can increase its cost.

The detailed results of our work are contained in appendixes I through III. In order to determine whether premium gasoline overbuying is occurring, we interviewed officials from the three major domestic automobile manufacturers, oil refiners, EIA, and gasoline and automotive trade associations. In addition, we obtained and analyzed three studies—an EIA and two industry studies—which compared the percentage of premium gasoline sales with the percentage of cars on the road requiring premium gasoline. We did not verify the accuracy of

these data; however, we corroborated the data used in these studies with EIA and industry officials whenever possible.

With respect to our second objective—the gasoline pricing issue—we obtained EIA pricing data for regular and premium grades of gasoline at two points of distribution. The first pricing point occurs when the refiner sells the gasoline to a reseller; the second pricing point occurs when the consumer buys it at the retail pump. Using EIA information, we were able to make general observations showing the relationship of average refiners' and retail prices and the price differences between regular and premium grades of gasoline over time. However, as indicated in a previous section of this letter, EIA does not collect pricing information in enough detail to make precise pricing comparisons between different grades of gasoline as they move through the distribution system. Our analyses of the refiner's prices for the two grades of gasoline are based on the assumption that refiners' total costs associated with the final delivery of gasoline to the retailer do not vary between grades and over time. We did not trace the EIA pricing data back to the original data collection instrument.

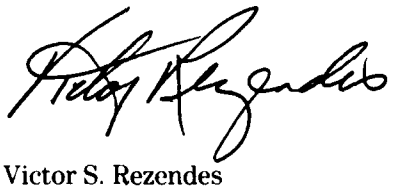
Our third objective was to determine the possible reasons for the price differences between premium and regular gasoline. In order to meet this objective, we interviewed officials from EIA, oil companies, and gasoline trade associations to obtain their views on the reasons for price differences. A listing of those from whom we obtained information to meet our three objectives is shown in appendix IV.

We conducted our work from January through September 1990 in accordance with generally accepted government auditing standards. We did not include the impacts of the Iraqi invasion of Kuwait in our price analyses because your request focused on consumer buying habits and the differences between the price of premium and regular grades of gasoline—not the impact of the invasion on overall gasoline prices.

As agreed with your office, we did not obtain official agency comments on a draft of this report. However, we discussed the information presented in this report with DOE officials, who agreed with our facts, and incorporated their comments where appropriate. Unless you publicly announce its contents, we plan no further distribution of this letter for 7 days from the date of this letter. At that time, we will make copies available to others upon request.

Should you need further information, please contact me at (202) 275-1441. Other major contributors are listed in appendix V.

Sincerely yours,



Victor S. Rezendes
Director, Energy Issues

Contents

Tables

Figures

Abbreviations

API	American Petroleum Institute
CRC	Coordinating Research Council
DOE	Department of Energy
EIA	Energy Information Administration
EPA	Environmental Protection Agency
FTC	Federal Trade Commission
GM	General Motors
MTBE	methyl tertiary butyl ether
PADD	Petroleum Administration for Defense Districts

Need for Premium Gasoline in Today's Automobiles

Premium gasoline[1] sales, as a percentage of total gasoline sales, increased during the 1980s. At the same time, however, the number of new cars needing premium gasoline, based on auto manufacturers' recommendations, has declined—which has also led to a decline in the overall percentage of the automotive fleet on the road needing premium. Government and industry studies estimate that the differences between the percentage of premium gasoline sales and the percentage of the automotive fleet needing premium gasoline vary from 3 to 26 percent. However, because of methodology problems, conclusions as to whether the public is overbuying premium gasoline cannot be drawn from these studies.

According to government and industry officials, there are a number of possible reasons why consumers buy premium octane gasoline—such as their perceptions that premium gasoline improves vehicle performance. They indicated, however, that consumers' substitution of premium for regular is sensitive to price. As the price goes up, consumers are less willing to buy the more expensive premium gasoline.

Overbuying can represent significant costs to consumers on a nationwide basis. For example, using 1989 sales and pricing data on premium gasoline, and assuming that the estimates in the studies we reviewed do in fact represent consumer overbuying, consumers could be spending from $491 million to about $4.3 billion annually for premium gasoline that the studies show is not required.

Premium Gasoline Sales Have Increased

Refiners distribute and sell several different grades of gasoline, which are classified according to an octane rating. A gasoline's octane rating indicates its resistance to engine knock. Engine knock is a metallic pinging or knocking noise caused by improper combustion. Instead of burning smoothly, a portion of the fuel-air mixture explodes prematurely in the engine cylinder. The higher the octane rating, the higher the resistance to engine knock. According to industry sources, buying gasoline with too little octane can cause engine knock, which can lower engine efficiency, reduce mileage, increase emissions, and damage an engine. An industry source informed us that most cars generally operate well with gasoline having the octane rating recommended by automobile manufacturers.

[1]When we use the term "premium" in this report, it primarily refers to premium unleaded gasoline. EIA included negligible amounts of premium leaded gasoline in its 1984 to 1989 sales and pricing figures.

Presently, there are four grades of gasoline as shown in table I.1:

Table I.1: EIA Gasoline Grade Octane Ranges

Gasoline grade	Octane ranges
Premium unleaded	90.1–94.0
Midgrade unleaded	88.0–90.0
Regular unleaded	85.0–87.9
Regular leaded	87.0–90.0

U.S. premium gasoline sales, according to EIA information, have grown since 1984. Despite a slight shift away from premium gasoline sales in 1989,[2] the premium U.S. market share grew from 14 percent in 1984 to 23 percent in 1989. As shown in table I.2, this increase took place in all parts of the country.

Table I.2: Regional Premium Gasoline Market Share

	Percent of total gasoline sales	
Market share	**1984**	**1989**
National average	14	23
Regional average[a]		
East Coast states	20	32
Midwest states	10	16
Gulf Coast states	12	20
Rocky Mountain states	5	13
West Coast states	14	23

[a]EIA uses the Petroleum Administration for Defense Districts' geographical grouping of states for reporting regional gasoline sales and pricing information

A Decreasing Percentage of Passenger Cars Needs Premium Gasoline

According to an EIA study, the need for higher octane gasoline in new cars has been decreasing in recent years.[3] EIA's study showed that in 1971, 26.6 percent of the new cars sold required premium gasoline, but that in 1988, the number of new cars sold needing the higher octane gasoline had decreased to 6 percent. As discussed in a later section of this appendix, EIA's study was limited to passenger cars; it did not include vans and light-duty trucks.

[2]Premium unleaded lost about 3 percent of the market share between 1988 and 1989.

[3]EIA, Economics of Gasoline Pool Octane Growth, Mar. 1990.

According to an EIA study, the decrease in octane requirements for new cars is attributable to automobile manufacturers' decision to put catalytic converters in cars beginning with model year 1975 in response to Clean Air Act legislation. Since leaded gasoline damaged catalytic converters, EPA established regulations calling for unleaded gasoline, which is generally lower in octane than leaded gasoline. Further, automobile manufacturers lowered engine compression ratios to accommodate the lower octane of unleaded gasoline. In today's auto fleet, according to the EIA study, cars needing premium gasolines are mostly luxury or high-performance vehicles.

According to the EIA study, as the octane need of new car models decreases, the octane needs for the total fleet of cars on the road likewise decreases. As shown in table I.3, the percentage of the overall fleet of cars on the road needing premium gasoline decreased from 18.1 percent in 1983 to 15 percent in 1988. An EIA official said that older cars in the fleet dampen the effect of the new car models' lower octane need. Again, these percentages reflect only passenger cars and do not include vans and light-duty trucks.

Table I.3: Total U.S. Auto Fleet Octane Requirements

	Gasoline grade in percent[a]		
Year	Regular	Midgrade	Premium
1983	64.4	17.5	18.1
1984	64.4	17.7	17.8
1985	64.9	17.8	17.3
1986	66.2	17.3	16.4
1987	67.2	17.0	15.9
1988	68.7	16.3	15.0

[a]Numbers may not add to 100 percent because of rounding.

Although Not Conclusive, Indications Are That Premium Gasoline Overbuying May Be Occurring

We obtained three studies—one done by EIA, one by General Motors Corporation (GM), and another by the American Petroleum Institute (API)—which show estimates of the percentage of the automotive fleet needing premium gasoline and the percentage of premium gasoline sales as a portion of gasoline sales. The studies' estimates are shown in table I.4 below.

Table I.4: Estimates of U.S. Fleet Requiring Premium Gasoline and Sales of Premium Gasoline As a Percentage of Gasoline Sales

Study	Percent of premium sales	Percent of fleet needing premium gasoline	Difference (Percent)
EIA	24[a]	15[b]	9
API	24[a]	21[b]	3
GM[c]	29[d]	3	26

[a]The EIA and API sales data reflect 1988 premium sales as a percentage of total gasoline sales.

[b]The analysis includes passenger cars only for the 1960-88 model years.

[c]The analysis includes passenger cars, vans, and light-duty trucks for the 1975-86 model years.

[d]GM sales data reflect 1986 premium unleaded sales as a percentage of unleaded gasoline sales only. On the other hand, EIA and API data reflect premium sales as a percentage of leaded as well as unleaded gasoline sold.

EIA's analysis indicates a 9-percentage point difference between the percentage of premium gasoline sales and the percentage of the automotive fleet needing premium gasoline. In performing its study, EIA used information developed by the Coordinating Research Council (CRC)[4] and the Motor Vehicle Manufacturers Association[5] to estimate the number of passenger cars needing high-octane gasoline. From Motor Vehicle Manufacturers Association data, EIA estimated the total number of passenger cars on the road. EIA then used CRC data to estimate the number of passenger cars needing higher octane gasoline.

CRC develops its data using a sample of the number of properly tuned vehicles produced each year.[6] Rather than using auto manufacturers' suggested octane needs for vehicles they produce, CRC develops information on the octane needs of the sampled vehicles using individuals' perceptions of engine knock. Two sets of perception data are developed. One reflects a trained rater's awareness of engine knock, while the second reflects a customer's awareness of engine knock—we term the customer "an untrained rater." The awareness of an untrained rater is representative of the awareness that the general public would have of engine knock. The vehicle's octane requirement tends to be higher when trained rater data are used because the trained rater would be more sensitive to engine knock. EIA used CRC's trained rater data in determining

[4]The CRC is a nonprofit research corporation supported by the petroleum and automotive equipment industries.

[5]The Motor Vehicle Manufacturers Association is an association of automotive industry companies. Part of its duties include compiling automotive statistics.

[6]The studies we reviewed did not investigate any relationship between the maintenance of vehicles and the need for premium gasoline.

the percentage of the fleet with various octane requirements and then compared the percentage of the fleet requiring premium gasoline with the total sales of premium gasoline that are reported to EIA by the petroleum industry.

However, as indicated earlier in this appendix, EIA's determination of the percentage of the fleet requiring premium gasoline includes only passenger cars. The fleet requirement does not include the octane needs of vans and light-duty trucks. On the other hand, the gasoline sales information used in comparison with the fleet requirement includes sales to all vehicles—including vans, light-duty trucks, boats, and motorcycles. Vans and light-duty trucks account for about 29 percent of the total vehicle fleet in the United States. Adding the octane needs for these vehicles to the fleet requirement, or reducing the total gasoline sales figure to compensate for sales to these vehicles and other gasoline users, could possibly change the difference between the two estimates in EIA's study. In our analysis, we did not attempt to determine the amount and direction of the change.

In July 1990, API published a study indicating a 3-percentage-point difference between the percentage of premium gasoline sales and the percentage of cars needing premium gasoline.[7] The API study used the same CRC and Motor Vehicle Manufacturers Association information as the EIA analysis. However, the API study differs in its premium gasoline fleet requirement figure. This difference is due to the fact that API included automobiles needing 89.1 octane and above in its determination of premium requirements. EIA, on the other hand, categorizes automobiles with octane requirements above 90 as those needing premium gasoline. Therefore, the API requirement reflects a higher percentage of the fleet needing premium gasoline than EIA's data. The API study used the same EIA data on total gasoline sales that were used in EIA's study and, as in EIA's study, used only passenger cars in determining the gasoline requirement of the fleet.

The GM study indicates a 26-percentage point difference between premium gasoline sales and vehicle fleet needs.[8] The GM study differed from the EIA and API studies in several ways. First, the GM study included vans and light-duty trucks along with passenger cars in determining the fleet

[7] Analysis of Factors Influencing the Consumption of Premium Motor Gasoline, API Research Study 052 (July 1990).

[8] Automotive Fuels for the 1990s—Challenges and Opportunities, GM Research Publication (Mar. 1989).

octane requirement. Second, rather than using CRC trained rater information in estimating the number of vehicles needing higher octane gasoline, GM used CRC's untrained rater information. As indicated above, untrained rater information reflects the general driving public's awareness of engine knock. The percentage of the vehicle fleet that needs premium gasoline tends to be lower when untrained rater data are used because, as indicated in the GM study, the general public may not be as sensitive to engine knock as the trained rater. As a result, the difference between the percentage of premium gasoline sales and the number of vehicles in the fleet needing premium gasoline is higher. A third major difference in the GM study is the way in which the premium gasoline sales information was developed. GM used sales information developed by a private source rather than EIA's information on sales. This sales information did not include leaded gasoline sales when calculating the percentage of unleaded premium gasoline sold—the EIA and API studies both use the total amount of gasoline sold, which includes leaded as well as unleaded gasoline, in making their calculations. Thus, because GM used a smaller total sales figure, its study shows a higher percentage of premium unleaded gasoline sales than the other two studies.

Conclusions as to whether overbuying of premium gasoline is occurring cannot be drawn from the three studies without making a number of assumptions of the gasoline consumption patterns of the automotive fleet. For example, one would have to assume that cars using premium gasoline are no different with respect to fuel efficiency or miles driven per year from cars that use regular gasoline.

Although the above studies cannot be used to conclusively demonstrate premium gasoline overbuying, other evidence suggests that some overbuying may be occurring. According to the EIA report and an automobile industry official, the relatively low price of premium gasoline, in recent years, has spurred its increased use. When premium gasoline prices from 1984 to 1989 are adjusted for inflation, the retail price of premium was actually lower in 1989 than the price of regular in 1984. According to EIA officials, the choice for premium gasoline is price sensitive. In 1986, the average price of premium gasoline fell 27 cents to 75 cents per gallon,[9] and the premium sales growth rate increased almost 4 percentage points. In 1989, when premium gasoline prices increased, the sales of premium gasoline decreased.

[9]Prices do not include taxes.

The August 2, 1990, Iraqi invasion of Kuwait further illustrates the effect of increased gasoline prices on the grade of gasoline purchased. For example, an industry official told us that the average premium wholesale price for eight major brands of gasoline in the greater Washington, D.C., market rose from $1.17 to $1.46 per gallon during a 2-1/2-month period after the invasion. (The average price of regular gasoline also increased about the same amount.) During this same time period, greater Washington, D.C., premium gasoline sales, as a percentage of total gasoline sales, dropped from 40 to 20 percent, a 50-percent loss in the market share. Industry officials indicated that the general increase in gasoline prices has significantly lowered premium's market share nationwide. In our opinion, consumer reactions to these price increases could mean that some overbuying may have been occurring.

Overbuying of premium gasoline can be costly to consumers when viewed on a nationwide basis. According to EIA information, approximately 117 billion gallons of gasoline were purchased by consumers in 1989, during which time the price difference between regular and premium amounted to about 14 cents per gallon. If one assumes that the differences between the estimates of premium gasoline sales and the percentage of cars on the road needing premium cited in the above three studies do in fact represent overbuying, then consumers could be spending from $491 million (using API's 3-percent estimate) to about $4.3 billion (using GM's 26-percent estimate) for premium gasoline that the studies show is not required.

Other Reasons Why Consumers Are Using Premium Gasoline

In addition to price, a consultant to the automobile industry told us that consumers may use premium gasoline because it is perceived as a better product for their vehicle. Some consumers may consider premium gasoline to be a luxury item containing properties that regular gasoline does not. Federal Trade Commission (FTC) officials also told us that advertising may encourage the use of premium gasoline. According to FTC officials, most gasoline advertising is tied to premium, which highlights the detergent aspects of gasoline, and premium in particular. FTC officials said claims of more power are also tied to premium gasoline.

Although manufacturers recommend 87 octane gasoline for most automobiles, other factors may also affect the need for higher octane gasoline in today's vehicular fleet. For example, a Society of Automotive Engineers' report states that increased octane need can also stem from

an automobile's aging.[10] In general, as a car ages, its octane requirement increases by about 5 octane points. Most of the increase occurs within the first 15,000 miles. The increase is due primarily to a buildup of carbon deposits in the combustion chamber. These deposits lead to an increase in the compression ratio and thus octane need. These deposits also trap heat and transfer it to the fuel, resulting in premature ignition, or engine knock. Industry officials also told us that variances in the automotive engine manufacturing process could affect the need for a higher octane than recommended by the manufacturer in some cars. To offset these effects, auto manufacturing officials told us that they design and build most of their vehicles so that they do not require an octane rating higher than regular.

Lastly, factors such as ambient weather conditions, altitude, and driving conditions can also affect octane requirements. The automobile octane requirement, on average, decreases with lower temperature, high humidity, or high altitude. Conversely, the automobile octane requirement rises when these conditions are reversed. Octane requirements can also be higher under stressful driving conditions, such as during rapid acceleration or pulling a heavy load up a hill.

[10]Trends in Octane Number Requirement Increase, Society of Automotive Engineers Technical Paper Series (Sept. 1989).

Gasoline Marketing and the Price Differences Between Premium and Regular Gasoline

Because of the manner in which gasoline sales and pricing information is reported by refiners to EIA, we could not develop precise pricing information for premium and regular gasolines as they move through the complex distribution system. However, using nationwide gasoline sales volume and refinery and retail pricing information reported to EIA, we found that the difference between the price of premium and regular gasoline established at the refinery level was about the same as the price difference between the two grades set at the retail level. Furthermore, excluding taxes, the refiner's price[1] for both premium and regular gasoline accounted for an average of 87 percent of the retail gasoline price during the 1984-89 time period.

Complexity of the Gasoline Marketing Network

Generally, refiners sell gasoline directly to a retailer or sell it to a wholesaler, who in turn sells it to a retailer. Retailers who purchase gasoline directly from refiners pay for the cost of the gasoline and all of the transportation costs to deliver it to their retail outlets. Industry calls the price of this delivered gasoline "dealer tankwagon." Wholesalers who purchase gasoline from the refiner and transport it themselves pay for the cost of the gasoline plus the refiner's cost to distribute it to them. Industry calls the price of this undelivered gasoline "rack."

Refiners also sell both branded (the refiner's brand) and unbranded (generic) products. Wholesalers and retailers resell branded gasoline under the refiner's trademark and unbranded gasoline under no trademark or under a private trademark. Branded gasoline contains the specific additive package—detergents, corrosion inhibitors, anti-icing additives, etc.—of a given refiner, while unbranded gasoline does not. These additives increase the cost of branded gasoline. Furthermore, resellers of branded gasoline normally take advantage of name recognition by elevating the price of branded gasoline above unbranded gasoline.

Gasoline Pricing and Sales Information Reported to EIA

EIA is responsible for collecting and analyzing data on gasoline pricing and sales volume under the provisions of the Federal Energy Administration Act of 1974. EIA uses this information to analyze gasoline demand and pricing and presents the data and its analyses in its publication, Petroleum Marketing Monthly, for use by industry, government, and the public.

[1]The refiner's price refers to the refiner's sales to resellers of gasoline, which include wholesalers and retailers.

Before 1983, EIA collected gasoline price and sales volume data from refiners on a nationwide basis. These data reflected sales volume and price breakouts of both dealer tankwagon and wholesale rack gasoline sales separately. In 1983, EIA changed the reporting requirement for U.S. refiners by requiring that, instead of providing EIA nationwide information on gasoline pricing and sales volumes, they provide these data for each state. At the same time, EIA dropped the requirement that refiners separately report gasoline sales volumes and prices by dealer tankwagon and rack sales. An EIA official informed us that state officials, who were the primary users of the information, did not show a strong enough interest in the information to support an EIA proposal to continue collecting it. As mentioned earlier, dealer tankwagon prices include the transportation costs of final gasoline delivery to a retail dealer, while rack prices do not. Thus, refiners now average dealer tankwagon and rack gasoline sales volume and prices by state and report this composite data to EIA.

Since the sales and pricing information reported to EIA no longer distinguishes between refiners' delivered and undelivered gasoline sales and prices, it cannot be used to determine precise price changes for a specific grade of gasoline over time or between two grades of gasoline. For a specific grade of gasoline, the data do not clearly show whether a refiner's price change is a result of an actual price increase or a significant shift in the proportion of gasoline sold at the dealer tankwagon price—which would include additional transportation costs as well as gasoline price increases.

EIA officials believe, however, that the information reported to them can be used to develop overall trend information on gasoline sales and pricing. Understanding its limitations, we have used total sales and pricing information reported to EIA by the petroleum industry for our analyses. Again, while the results of our work can be used to portray the pricing relationships between premium and regular gasoline over time on a nationwide basis, they may not necessarily reflect the conditions in individual states or geographical areas, nor individual refinery or gasoline distribution networks.

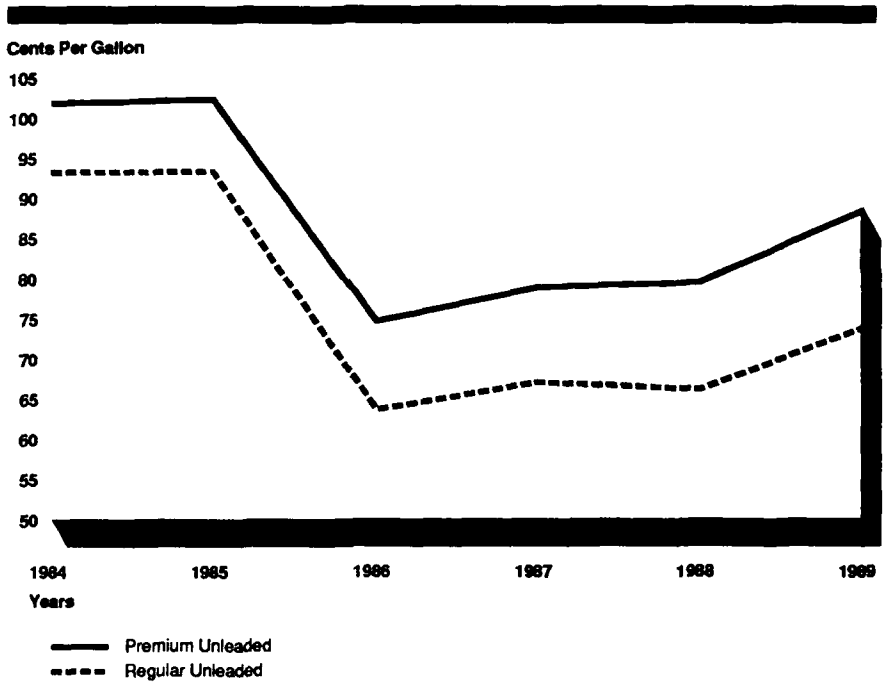
Premium and Regular Gasoline Pricing Relationships

In general, nationwide EIA information on gasoline pricing and sales indicates that from 1984 to 1989, the difference between the price of premium and regular gasoline established at the refinery level was about the same as the price difference between the two grades set at the retail pump. This assumes no discernible difference in the proportion of the

two grades of gasoline sold through rack or dealer tankwagon. Furthermore, on average over the 1984-89 period, the refiner's pricing accounted for 87 percent of the retail gasoline price, excluding federal, state, and local taxes, for both premium and regular grades of gasoline.

Figure II.1 shows that the average retail price difference between premium and regular grades of gasoline increased from about 9 cents a gallon in 1984 to about 14 cents a gallon in 1989—an increase of about 5 cents. After adjusting 1989 prices to reflect 1984 price levels, the average retail price difference increased about 3 cents a gallon.

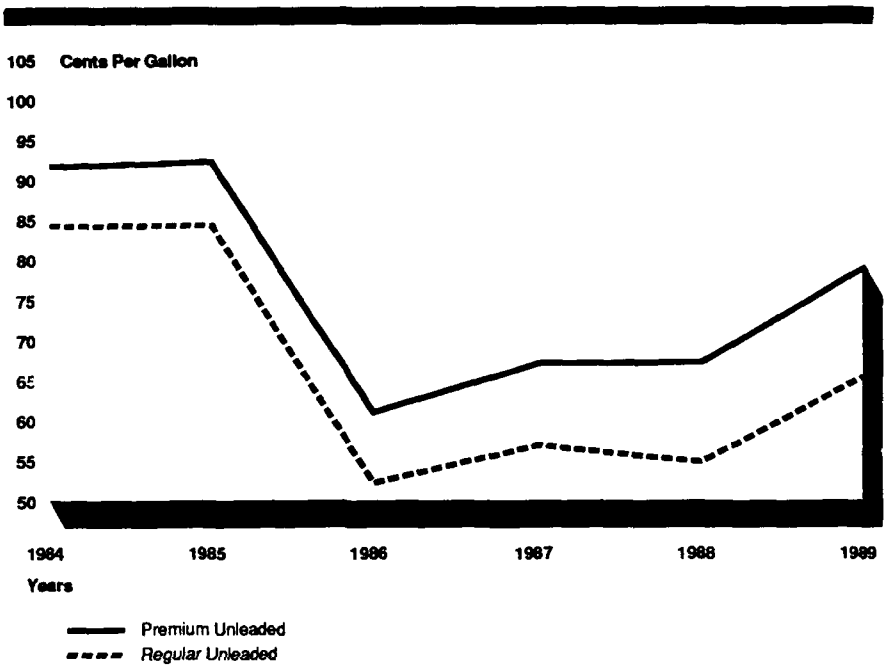
Figure II.1: U.S. Average Retail Premium and Regular Gasoline Prices



Gasoline prices do not include Federal, State, and Local taxes.

Figure II.2 shows that the average refiner's price difference between premium and regular grades of gasoline increased from about 8 cents a gallon to about 14 cents—an increase of about 6 cents. After adjusting 1989 prices to reflect 1984 price levels, the average refiner's price difference increased about 4 cents a gallon.

Figure II.2: U.S. Average Refiners' Premium and Regular Gasoline Prices



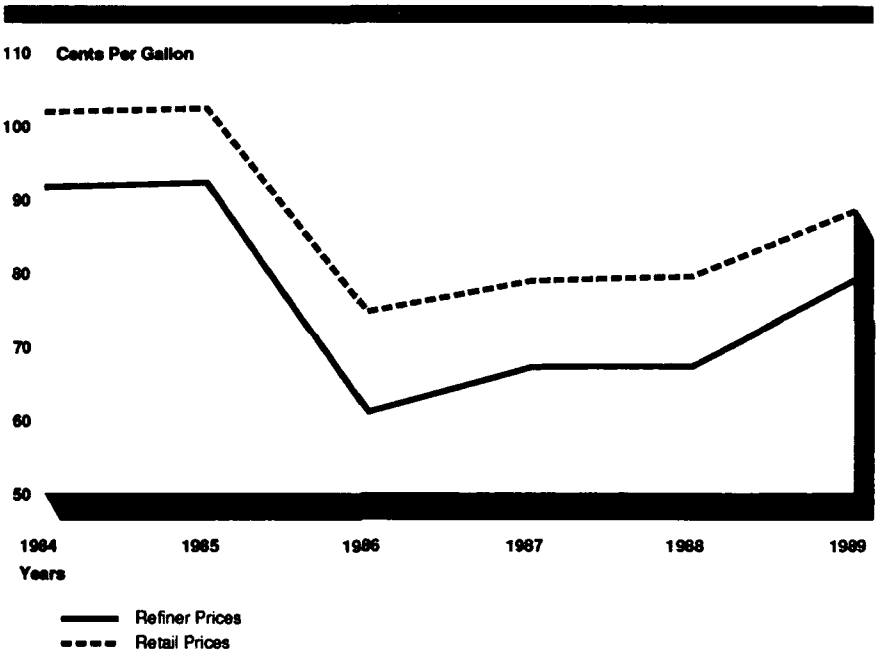
Gasoline prices do not include Federal, State, and Local taxes.

Combining the information portrayed in figures II.1 and II.2 shows that in 1984, the average price difference between premium and regular gasoline set at the refinery was 8 cents a gallon, whereas the average price difference between the two grades of gasoline at the retail pump was 9 cents—a 1-cent increase over the price difference established by the refinery. By 1989, the average refiner's price difference between the two grades of gasoline had increased to 14 cents per gallon. Correspondingly, the average price difference between the two grades at the retail pump increased to 14 cents—no increase over the refiner's price difference. The average price difference between the two grades of gasoline at the retail pump for these 6 years, 1984-89, appears to be reflective of the prices set at the refinery level.

Our analyses also indicate that refiners' pricing has accounted for the larger portion of the retail price of both premium and regular gasoline over the 1984-89 time period. For example, figure II.3 shows that the average refiner's price for premium gasoline, excluding federal, state, and local taxes, was 92 cents in 1984 and 79 cents in 1989. In 1984, the average retail price for premium gasoline was $1.02 a gallon, or 10 cents

higher than the refiner's price. In 1989, the average retail price for premium gasoline was 88 cents, or 9 cents higher than the refiner's price. For these 2 years, the refiner's price represented 90 percent of the average retail price of a gallon of premium gasoline. On average, the refiner's price represented 87 percent of the retail price of a gallon of premium gasoline for the 6 years included in our analyses. As stated above, we could not adjust the refiner's price to reflect variations in the distribution cost of the two grades of gasoline over these years.

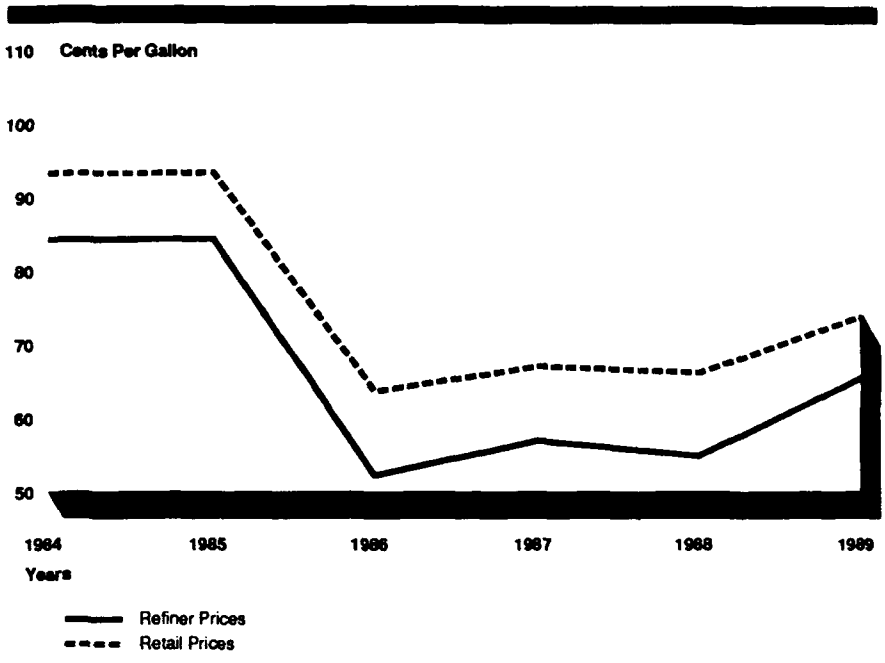
Figure II.3: U.S. Average Retail and Refiners' Prices of Premium Gasoline



Gasoline prices do not include Federal, State, and Local taxes.

Figure II.4 shows that the average refiner's price for regular gasoline was 84 cents in 1984 and 65 cents in 1989. In 1984, the average retail price for regular gasoline was 93 cents a gallon, or 9 cents higher than the refiner's price. And in 1989, the average retail price was 74 cents, or 9 cents higher than the refiner's price. For these 2 years, the refiner's price constituted 90 and 88 percent of the average retail price of regular gasoline, respectively. On average, the refiner's price represented 87 percent of the retail price of a gallon of regular gasoline for the 6 years included in our analyses.

Figure II.4: U.S. Average Retail and Refiners' Prices of Regular Gasoline



Gasoline prices do not include Federal, State, and Local taxes.

Reasons for the Higher Price of Premium Gasoline

According to EIA and industry officials, two factors that contribute to the higher price of premium gasoline are the costs of additional processing to increase the octane level and, to a lesser extent, the cost of more or better additives that may be added to premium gasoline.

Cost to Increase Octane

According to industry officials, the cost of the additional refining to increase the octane level of gasoline accounts for a major portion of the refiner's price difference between premium and regular gasoline. Basically, the cost of increasing the octane will vary depending on the method of octane enhancement employed and the additional amount of crude oil feedstock used in the refinery process. An official from a major refinery told us that to increase the octane level of gasoline from regular to premium, refiners incur costs that can range from 4 to 13 cents a gallon.

Refiners use blending components to enhance the octane of their gasoline. Reformate, a high-octane hydrocarbon, is one of the cheaper blending components. Reformate is a product of the refining process which is captured and mixed with other petroleum products to produce gasoline. Reformate, however, contains large proportions of aromatics,[1] which have negative impacts on the environment. An oxygenate[2] such as methyl tertiary butyl ether (MTBE) is one of the more expensive octane-enhancing blending components. Oxygenates, unlike reformate, reduce harmful automotive emissions. Several of the major refiners have increased the use of oxygenates in their high-octane gasolines in recent months and have marketed these products to the public as being better for the environment.

The production of premium gasoline may also require more crude oil than is needed to produce regular gasoline. In general, refiners require more crude oil feedstock to produce a gallon of premium gasoline than a gallon of regular gasoline. Loss of net gasoline volumes stems from the use of more severe reforming to boost octane levels. One industry analyst estimated that to raise gasoline 4 octane points from a regular grade to a premium grade, the refiner's yield of gasoline falls about 3.7 percent. However, as refiners have begun to use oxygenates to boost octane, less additional crude oil is needed to produce premium gasoline.

[1]A class of high-octane hydrocarbons that currently constitutes about 35 percent of gasoline. The chief aromatics in gasoline are benzene, toluene, and xylene.

[2]This term applies to any gasoline additive containing oxygen. Oxygen in gasoline tends to reduce carbon monoxide emissions from vehicles.

The addition of oxygenates extends the gasoline supply. Currently, an oxygenate such as MTBE can account for as much as 11 percent of the volume of a gallon of gasoline.

The quality of the crude oil feedstock used in the refinery process can also affect the cost of increasing the octane level of gasoline. Lower quality feedstocks force refiners to process their petroleum more thoroughly to produce gasoline of satisfactory octane level. This general increase in the production cost of gasoline raises the marginal cost of producing more refined products.

Detergent Additives and Advertising Can Affect Cost

In addition to the octane enhancement costs, industry officials told us that more expensive detergents may be added to premium gasoline, further increasing the cost of premium gasoline over regular gasoline that does not contain these detergents. However, there is no consistency in the industry because some refiners put the same detergents in all grades of gasoline, while others do not. These more expensive detergents are represented as being more effective in keeping the internal working parts of an automotive engine clean. Lastly, an industry official informed us that refiners tend to advertise premium gasoline rather than regular gasoline. This official also said that refiners generally allocate the costs of advertising to their premium product rather than allocating these costs over all of their grades of gasoline. Thus, the price of premium would generally carry a higher advertising cost than regular.

Organizations and Companies Contacted by GAO

The companies, associations, and government agencies we contacted for information in performing our review are shown below.

Automobile Manufacturers

Chrysler Motors Corporation

Ford Motor Company

General Motors Corporation

Trade Associations

American Petroleum Institute

Coordinating Research Council

Greater Washington Maryland Service Station and Automotive Repair Association, Inc.

Motor Vehicle Manufacturers Association

National Institute for Petroleum Energy Research

National Petroleum Refiners Association

Service Station Dealers of America

Society of Automotive Engineers Incorporated

Society of Independent Gasoline Marketers of America

Government Agencies

California Air Resources Board

California Energy Commission

South Coast Air Quality District

U.S. Department of Energy

U.S. Department of Transportation

U.S. Environmental Protection Agency

	U.S. Federal Trade Commission
Universities	University of California
	University of Houston
	University of Michigan
Detergent Manufacturers	E.I. DuPont Specialty Chemical Division
	Ethyl Petroleum Additives
Petroleum Companies	Amoco Oil Company
	Atlantic Richfield Company (ARCO)
	Mobil Oil Company
	Shell Oil Company
	Sun Refining and Marketing Company
Consumer Groups	American Automobile Association
	Consumer/Labor Energy Coalition
	Consumer Reports
Data Consultants	Data Research Institute
	HyOx Incorporated
	Lundberg Survey Incorporated
	Oil Price Information Service
	Pace Consultants Incorporated

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.	Judy A. England-Joseph, Associate Director James A. Fowler, Assistant Director Francis J. Kovalak, Assignment Manager
Detroit Regional Office	Anthony A. Krukowski, Evaluator-in-Charge Fern A. Harris, Evaluator Daniel J. Martin, Evaluator Victor D. Elizalde, Evaluator

Related GAO Products

Gasoline Marketing: Uncertainties Surround Reformulated Gasoline As a Motor Fuel (GAO/RCED-90-153, June 14, 1990).

Gasoline Marketing: Consumers Have Limited Assurance That Octane Ratings Are Accurate (GAO/RCED-90-50, Apr. 16, 1990).

Gasoline Marketing: States' Programs for Gasoline Octane Testing (GAO/RCED-89-91FS, Apr. 12, 1989).

Gasoline Marketing: States' Programs for Pump Labeling of Gasoline Ingredients (GAO/RCED-89-6, Jan. 12, 1989).

Gasoline Marketing: Octane Mislabeling in New York City (GAO/RCED-87-180BR, Aug. 18, 1987).