



The American
Antitrust Institute

AAI Working Paper No. 07-03: Competition in U.S. Petroleum Refining and Marketing: Part II – Review of the Economic Literature

Author: Diana L. Moss, Vice-President and Senior Research Fellow, American Antitrust Institute

Abstract: This paper surveys the economic literature on competitive issues in domestic petroleum refining and marketing provides in order to provide some insight into the underlying causes of gasoline price dynamics. The survey examines the four major categories of economic literature: (1) the statistical significance of asymmetry between upstream and downstream petroleum prices; (2) causes of price asymmetry; (3) effects of forced deintegration through open supply and divorcement polices; and (4) price effects of mergers. The research generally indicates that asymmetry is statistically significant, but may be attributable to multiple causes such as consumer search costs, market power, and inventory adjustment costs. Divorcement and open supply policies tend to increase costs and prices, and petroleum mergers have, on balance, increased prices. Merger studies, in particular, have attracted criticism regarding the robustness of their results to differences in estimation technique and other parameters. Even with this caveat, the survey results are useful for addressing the merits of various policy proposals for dealing with competitive concerns and “undesirable” price dynamics.

Date: January 2007

Keywords: competition, market power, market definition, merger, enforcement agencies, regulation, economic analysis, concentration

JEL Classification:

D4 - Microeconomics: Market Structure and Pricing

L1 - Industrial Organization: Market Structure, Firm Strategy, Market Performance

L4 – Antitrust Policy

N5 - Agriculture, Natural Resources, Environment, and Extractive Industries

Q4 - Energy



The American
Antitrust Institute

Competition in U.S. Petroleum Refining and Marketing Part II – Review of the Economic Literature

Diana L. Moss¹
Vice President and Senior Fellow

INTRODUCTION

Perceived “high” petroleum product prices or inexplicable differentials in prices between geographic areas for gasoline continue to raise public policy concerns in the U.S. The intensity of the recent run-up in gasoline prices that began in 1999, coupled with declining domestic crude oil production and increasing reliance on imports (currently at 65 percent of domestic refined product demand), and limited responsiveness of consumer demand to changes in price have sparked numerous inquiries by the Federal Trade Commission (FTC) and Governmental Accountability Office (GAO).

One outcome of the intensifying public policy debate over gasoline prices has been a number of widely disparate state and federal initiatives that target prices directly, or focus on the underlying structure of the refining and marketing industry that could be creating undesirable price dynamics. These proposals raise a number of important questions. First, each purports to have identified the appropriate policy response to high gasoline prices. But it is not clear that there is any consensus on the underlying determinants of “high” gasoline prices or if those prices justify government intervention.

¹ Diana Moss is Vice-President and Senior Fellow of the American Antitrust Institute (AAI) and adjunct professor at the University of Colorado, Department of Economics. Dr. Moss coordinates the energy agenda for AAI and was formerly with the Federal Energy Regulatory Commission. Many thanks to Mike Scherer, Alfred Kahn, Albert Foer, and Darren Bush for helpful review and comments.



The American
Antitrust Institute

Second, if implemented together or in a haphazard manner, such proposals could open a “Pandora’s Box” of competing and potentially conflicting policy objectives, stakeholder agendas, and effects on economic efficiency and consumer welfare. The variety of petroleum industry initiatives also highlights the tension between the objectives and instruments of competition policy versus most broad-based public policies.

Part II of this working paper series surveys the more recent economic literature on competitive issues in refining and marketing, in an attempt to better focus the debate over possible policy directions. The survey looks primarily at analysis produced over the last two decades while recognizing a longer history of economic literature on the subject. Key legal and institutional analyses are also included. The first section provides some background on various competition and gasoline price initiatives. The second section summarizes the four major categories of economic analysis relating to competitive issues in involving refining and marketing. The third section concludes by identifying major themes that emerge from the research and offers suggestions for additional inquiry.

POLICY APPROACHES TO COMPETITION AND HIGH GASOLINE PRICES

Most initiatives that target high gasoline prices implicitly acknowledge that crude oil prices--which made up just over 50 percent of retail gasoline prices in 2006—are determined outside the scope of the domestic industry. However, there have been periodic efforts--first in the late 1970s and most recently in 2001--to authorize the U.S. Department of Justice to enforce the Sherman Act against OPEC.² Most proposals are

² See, e.g., Albert Gore, Jr., “The Cartel Restriction Act of 1979: Response to a Global Economic Problem” 12 *Vand. J. Transnat’l L.*, 1979, pp. 273-314 and *No Oil Producing and Exporting Cartels Act of 2005*, S. 555, 109th Congress. March 8, 2005. Online. Available

adi
The American
Antitrust Institute

directed at the downstream segment of the industry controlled by domestic firms. This includes refining, distribution of refined products to storage terminals, and wholesale and retail marketing. These activities collectively make up 30 percent of the retail gasoline price.³

Proposals to address high concentration and integration in the domestic industry are nothing new. For almost 60 years, economists have probed into the possibility of incentives for anticompetitive conduct at various levels of the industry. For example, Alfred Kahn and Joel Dirlam in 1952 noted the antitrust agencies' concern over potentially exclusionary conduct in gasoline marketing:

“The Department of Justice contends, for example, that the real evil of exclusive dealing is that it gives the major suppliers the power to suppress competition in retail prices [footnote omitted]. Similarly, the FTC argues that price discrimination is monopolistic in origin and consequences.”⁴

The concept of “conscious parallelism” was also applied to gasoline pricing in the 1950s to encourage the FTC to recognize that anticompetitive coordination did not necessarily take the form of a conspiracy.⁵ The price run-ups of the 1970s generated significant

<http://www.govtrack.us/congress/billtext.xpd?bill=s109-555>. Problems associated with these proposals are articulated in, e.g., Spencer Weber Waller, “Suing OPEC,” 64 *Univ. Pitt. L. Rev.*, 2002-2003, pp. 1-52.

³ Taxes account for the remaining 20 percent of the pump price. Transportation of crude to refineries encompasses midstream activities, but these are generally not targeted by the major policy proposals. Kenneth Grant, David Ownby, and Steven R. Peterson, *Understanding Today's Crude Oil and Product Markets*, policy analysis study by Lexecon for the American Petroleum Institute. 2006. Percentage figures are for 2005. See also Energy Information Administration, *Gasoline and Diesel Fuel Update*, August 28, 2006. Online. Available <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>.

⁴ Joel B. Dirlam and Alfred E. Kahn, “Leadership and Conflict in the Pricing of Gasoline,” *Yale L. J.* 61, 1952, pp. 818-855.

⁵ See, e.g., Bob Turner, “Conscious Parallelism in the Pricing of Gasoline,” *Rocky Mtn. L. Rev.* 32, 1959-1960, pp. 206-222.

adi
The American
Antitrust Institute

debate on the merits of vertical and/or horizontal divestiture.⁶ Finally, refusals to deal and the potential incentives to foreclose rivals associated with integrated refining-marketing have been the subject of earlier analysis, as have entry barriers at the refining level.⁷

Current proposals for attacking high gasoline prices vary widely. For example, a number of states have passed anti-price gouging laws to protect consumers.⁸ Divorcement statutes are also in place in at least six states to limit integrated ownership.⁹ So-called “open supply” legislation would enable lessee-dealer gasoline retailers (i.e., stations owned by an integrated refiner-marketer but operated by a residual claimant) to purchase supplies from sources other than the lessor-refiner.

There have also been proposals to create petroleum-specific extensions or amendments to state and federal antitrust statutes.¹⁰ This approach has been recently

⁶ See, e.g., Walter Adams, “Vertical Divestiture of the Petroleum Majors: An Affirmative Case,” *Vand. L. Rev.* 30(6), 1977, pp. 1115-1147 and Jesse W. Markham and Anthony Hourihan, “Horizontal Divestiture in the Petroleum Industry,” *Vand. L. Rev.* 31(2), 1978, pp. 237-247.

⁷ See, e.g., William L. Novotny, “The Gasoline Marketing Structure and Refusals to Deal with Independent Dealers: A Sherman Act Approach,” *Ariz. L. Rev.* 16, 1974, pp. 465-488 and Eugene V. Rostow and Arthur S. Sachs, “Entry into the Oil Refining Business: Vertical Integration Re-examined,” *Yale L. J.* 61, 1952, pp. 856-914.

⁸ See, e.g., Janice E. Rubin, *Price Gouging, the Antitrust Laws, and Vertical Integration: How They are Related*, CRS Report for Congress, Congressional Research Service, Library of Congress, May 8, 2006; *Anti-Price Gouging Laws and Gasoline Prices*, Wisconsin Legislative Reference Bureau, June 2006. Online. Available <http://www.legis.state.wi.us/lrb/pubs/Lb/06Lb11.pdf>; and 109th Congress, 2nd Session, *To Improve Competition in the Oil and Gas Industry, to Strengthen Antitrust Enforcement With Regard to Industry Mergers, and Other Purposes*, S.2557, April 6, 2006. Online. Available <http://www.govtrack.us/data/us/bills.text/109/s/s2557.pdf>.

⁹ John Geweke, “Empirical Evidence on the Competitive Effects of Mergers in the Gasoline Industry,” University of Iowa, mimeo, July 16, 2003, p. 14. Divorcement statutes are in effect in Connecticut, Delaware, Hawaii, Maryland, Nevada, and Virginia.

¹⁰ See, e.g., California Senate Bill 1274, which attempted to amend the Cartwright Act to, among other things, more closely parallel the federal antitrust statute. The bill was defeated. California State Senate, *Act to Add Section 16720.1 To the Business and Professions Code, Relating to Business Practices*



The American
Antitrust Institute

considered for the U.S. electricity industry where concern over vertical integration and access to bottleneck facilities bears a striking resemblance to refining and marketing. In California, unbundling the sale of gasoline from the marketing of branded gasoline has been proposed, thus allowing all retailers to “shop” for the commodity.¹¹ Finally, there is some current discussion of the merits of federal regulatory intervention in bottleneck segments such as refining.¹² That proposal centers on the establishment of a strategic refinery reserve that would increase capacity during times of supply interruption or shortage.

The various competition and gasoline price initiatives also set up a tension between competition policy and broader public policy approaches. Competition policy views domestic petroleum refining and marketing much like any other commodity. Antitrust analysis would therefore use accepted methodologies and economic tools to evaluate the effect of changes in market structures and conduct on competition and consumers. Such inquiries would focus on two possible questions. One is whether the downstream segment of the industry is host to anticompetitive conduct which further elevates gasoline prices above those already anticompetitive levels determined by OPEC pricing. A second question is whether mergers enhance the incentive or ability of the

(amended), SB 1274, February 9, 2006. Online. Available http://info.sen.ca.gov/cgi-bin/postquery?bill_number=sb_1274&sess=PREV&house=B&site=sen.

¹¹ See, e.g., Justine S. Hastings, *Prepared Statement before the California State Assembly, Select Committee on Gasoline Competition, Marketing, and Pricing*, April 28, 2004 and Richard J. Gilbert, *Prepared Statement before the California State Assembly, Select Committee on Gasoline Competition, Marketing, and Pricing*, April 28, 2004.

¹² See, e.g., H.R. 5365, a bill in the U.S. House that would establish a strategic refinery reserve to enhance U.S. refinery capacity. 109th Congress, *To Provide for the Establishment of a Strategic Refinery Reserve*, H.R. 5365, May 11, 2006. Online. Available <http://www.govtrack.us/congress/billtext.xpd?bill=h109-5365>.



The American
Antitrust Institute

merged firm to exercise market power—either through concentration of ownership at a given level or through vertical integration.

Competitive concerns stand in contrast to legitimate economic factors that can influence gasoline prices. On the supply side, this includes the role of environmental restrictions and requirements for reformulated gasoline, production bottlenecks at the refining level, and resource scarcity at the crude level. Demand side factors that influence prices center on a seemingly unquenchable thirst for gasoline against the backdrop of low sensitivity of consumption to changes in price or income.

Public policy, on the other hand, is more likely to view high gasoline prices as a societal problem. In addition to traditional consumer welfare and economic efficiency concerns, public policy would also consider quality of life, national security, and economic growth as key factors in crafting approaches. Given these concerns, public policy may well view petroleum markets as candidates for special rules or treatment that are not considered in the realm of competition policy.

ECONOMIC ANALYSIS OF COMPETITIVE ISSUES IN PETROLEUM

There is a sizable body of research on competitive issues involving the domestic downstream petroleum industry, much of which has arisen from the debate over high and/or volatile gasoline prices. This research focuses on the organizational structure of domestic firms, behavioral incentives, and the outcomes of merger activity. The research addresses four major topics. One category of analysis attempts to determine if the observed “asymmetry” between various pairs of upstream and downstream prices in the vertically integrated chain is statistically significant. Asymmetry occurs when



The American
Antitrust Institute

downstream (e.g., retail gasoline) prices increase faster than upstream (e.g., crude oil) prices when upstream prices are on the rise, but fall more slowly when upstream prices are on the decline. A second category of analysis extends the asymmetry research by looking into possible explanations for the phenomenon, including market power, search costs, and inventory adjustment costs.

A third category of analysis responds to various proposals to limit integration between refiners and gasoline retailers (i.e., “divorcement” legislation). Other proposals would allow lessee-dealer retailers to purchase gasoline supplies from sources other than the lessor-refiner—otherwise known as “open supply” regulation. A fourth class of studies evaluates the effect of mergers on wholesale and retail gasoline prices. These assessments range over the price effects of increased market concentration, to the role of independent gasoline retailers in disciplining retail gasoline prices, to incentives for exclusionary conduct associated with vertical integration.

Each of the four foregoing categories of economic analysis is summarized in the following sections. Because this survey is broad-based, it opts for coverage at the risk of sacrificing in-depth analysis of particular issues. Instead, the purpose is to distill the major themes in the literature. As with most complex policy issues, there are no easy or definite answers. Rather there are perspectives, assessments of performance to date, and suggestions for future policy directions.

Is There Asymmetry Between Upstream and Downstream Prices?

Eleven major studies address the asymmetry question in U.S. petroleum markets. As many more look into the phenomenon in different countries. This survey focuses on



The American
Antitrust Institute

the U.S. industry because market structures, price determination, and institutional rules and regulations tend to be country-specific.¹³ The empirical work on asymmetry tests the hypothesis that downstream prices rise faster than upstream prices when the latter are on the rise, but that downstream prices fall relatively more slowly when upstream prices are on the decline.

Asymmetry is also known as the “rockets and feathers” effect or downward price “rigidity.”¹⁴ Rapid, symmetric responses between prices or goods or services at various levels signal that markets are operating efficiently because prices fully and instantly incorporate new information. Lack of a symmetric response is characterized by a downstream price response that not only lags the initial upstream shock but is of a different intensity. Shocks may reflect variations in crude oil supply, refining bottlenecks, or variations in demand.¹⁵

In petroleum, prices are observed at the production (crude oil), refinery (spot gasoline), distribution terminal or “rack” (wholesale gasoline), and pump (retail gasoline) stages. Discussions of asymmetry note that price shocks that originate at some upstream level are transmitted downstream through any number of possible upstream-downstream pairings. These include, but are not limited to: (1) crude oil-spot gasoline, (2) crude oil-

¹³ One of the studies reviewed examines gasoline markets in the United Kingdom, but is referenced because it is a seminal contribution to the literature.

¹⁴ Robert W. Bacon, “Rockets and Feathers: The Asymmetric Speed of Adjustment of UK Retail Gasoline Prices To Cost Changes,” *Energy Economics* 13(3), 1991, pp. 211-218.

¹⁵ Nathan S. Balke, Stephen P. A. Brown, and Mine K. Yucel, “Crude Oil and Gasoline Prices: An Asymmetric Relationship?” *Federal Reserve Bank of Dallas Economic Review*, First Quarter 1998, pp. 2-11.

adi
The American
Antitrust Institute

wholesale gasoline; (3) crude oil-retail gasoline, and (4) spot gasoline-retail gasoline, (5) and wholesale gasoline-retail gasoline.

The supply chain that spans the production of crude oil through the distribution of gasoline at retail covers many intermediate levels, each with unique markets and institutional environments. The location of observed asymmetry in the supply chain can therefore reveal much about what explains the asymmetric response and provide some opportunity for policy responses to address the specific factors that influence price behavior.¹⁶ While there are numerous price pairings examined in the literature, the most tested relationship appears to be wholesale gasoline-retail gasoline, followed by crude oil-spot gasoline and crude oil-retail gasoline.¹⁷

A finding of asymmetric price response appears to be sensitive to a number of factors. The time period analyzed is important because some years display more intense shocks or volatility due to supply and demand fluctuations, production bottlenecks, environmental factors, and merger activity. Periods analyzed in the studies range from broader spans of 13, 14, and 17 years,¹⁸ to smaller spans of only three years.¹⁹ Overall, the periods studied are between 1982 through 2003.

¹⁶ Severin Borenstein, A. Colin Cameron, and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" *Quarterly Journal of Economics* 112(1), February 1997, pp. 305-339. General Accounting Office, *Analysis of the Pricing of Crude Oil and Petroleum Products*, Washington D.C. GAO/RCED-93-17, March 1993.

¹⁷ Spot gasoline to retail gasoline and spot gasoline to wholesale gasoline price pairings were infrequently evaluated, probably because spot prices are essentially wholesale prices, but established at the refinery gate, as opposed to a separate distribution terminal or at the Dealer Tank Wagon (DTW).

¹⁸ See, for example, Robert K. Kaufmann and Cheryl Laskowski, "Causes for an Asymmetric Relation Between the Price of Crude Oil and Refined Petroleum Products," *Energy Policy* 33, 2005, pp. 1587-1596; Lance J. Bachmeier and James M. Griffin, "New Evidence on Asymmetric Gasoline Price Responses," *Review of Economics and Statistics*, August 2003, 85(3), pp. 772-776; Li-Hsueh Chen, Miles Finney, and

adi
The American
Antitrust Institute

Study results are also potentially sensitive to the periodicity or frequency of the data. For example, relatively infrequent observations can miss price shocks that occur in smaller time periods. About one-half of the analyses utilized weekly data, while the other half used a mix of daily, bi-monthly, or monthly data.²⁰ Finally, the econometric model and estimation technique appear to be a critical factor in comparing study results. Models generally incorporate a simple markup of downstream price over upstream price and a lagged adjustment process represented by a linear, non-linear, or error correction model.²¹

Table 1 summarizes the results of the studies on price asymmetry. About 80 percent that tested for an asymmetric price response of retail gasoline prices to changes in wholesale gasoline prices found statistically significant evidence of asymmetry. About 75 percent of the studies found that price asymmetry between crude oil-retail gasoline prices

Kon S. Lai, "A Threshold Cointegration Analysis of Symmetric Price Transmission From Crude Oil to Gasoline Prices," *Economics Letters* 89, 2005, pp. 233-239; and Stanislav Radchenko, "Oil Price Volatility and the Asymmetric Response of Gasoline Prices to Oil Price Increases and Decreases," *Energy Economics* 27, 2005, pp. 708-730.

¹⁹ Michael Burdette and John Zyren, "Gasoline Price Pass-Through," Energy Information Administration, Department of Energy, January 2003. Online. Available http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2003/gasolinepass/gasolinepass.htm.

²⁰ Kevin T. Duffy-Deno, "Retail Price Asymmetries in Local Gasoline Markets," *Energy Economics* 18, 1996, pp. 81-92. Given limitations on data availability, some studies tested for whether (and concluded that they did not) daily prices added information about the underlying structure of the price relationships. See also Jeffrey Karrenbrock, "The Behavior of Retail Gasoline Prices: Symmetric or Not?" *Federal Reserve Bank of St. Louis Review* 72, 1991, pp. 19-29 and Donald Norman and David Shin, *Price Adjustment in Gasoline and Heating Oil Markets*, American Petroleum Institute, Research Study No. 060, 1991.

²¹ See Balke, Brown, and Yucel, op. cit., p. 3. In later studies, more sophisticated estimation procedures enabled testing for the stability of long-run relationships between prices and causality in price movements.



The American
Antitrust Institute

is statistically significant.²² And about 60 percent of studies concluded that spot gasoline prices respond asymmetrically to changes in crude oil prices.

Table 1
Results of Studies on Price Asymmetry

Study Authors/Year	Results on Asymmetry (A = asymmetry, S = symmetry)				
	C - R	C - S	C - W	S - R	W - R
1. Bacon [1991]	A	-	-	-	-
2. Karrenbrock [1991]	-	-	-	-	A
3. Norman and Shin [1991]	S	-	-	-	S
4. GAO [1993]	-	A	-	S	-
5. Duffy-Deno [1996]	-	-	-	-	A
6. Borenstein, Cameron, and Gilbert [1997]	-	A	A	-	A
7. Balke, Brown, and Yucel [2000]	A	S	-	-	-
8. Bachmeier and Griffin [2003]	-	S	-	S	-
9. Kaufmann and Laskowski [2005]	-	A	-	A	-
10. Radchenko [2005]	A	-	-	-	-
11. Chen, Finney, and Lai [2005]	-	-	-	S	A
Percent of Studies That Find Asymmetry	75%	60%	-*	25%	80%
Key to Abbreviations: C - R = crude oil/retail gasoline, C - S = crude oil/spot gasoline, C - W = crude oil/wholesale gasoline, S - R = spot gasoline/retail gasoline, W - R = wholesale gasoline/retail gasoline, *not calculated when there is only a single study available.					

Possible Explanations for Price Asymmetry

Three major theories have been put forward in six major analyses to explain asymmetric price responses: market power, consumer search costs, and inventory adjustment costs. The market power theory revolves around oligopolistic coordination, positing that firms engaged in tacit collusion pass on price increases more quickly to

²² At least one study notes that the less conclusive results on asymmetry between crude oil and wholesale gasoline prices or crude oil and retail gasoline prices are likely attributable to differences in periodicity of the data or in model specification. See, e.g., Bachmeier and Griffin, op. cit., p. 776 and Balke, Brown, and Yucel, op. cit., p. 3.



The American
Antitrust Institute

signal that they are adhering to a collusive agreement. Fearing a signaled departure from an agreement, firms are less willing to cut prices below a prevailing “focal point.”

This theory could explain the transmission of price changes between any number of price pairings. If spot gasoline or wholesale gasoline prices are downwardly rigid, then a market power explanation would need to address coordination at the refining level.²³

While skeptics might expect collusion among refiners to be stymied by lost sales and pressure from jobbers and independent retailers, there are important factors to consider in the alternative.²⁴ For example, refining concentration (discussed in Part I of this working paper series) in some regions of the U.S. has risen substantially. Moreover, some refining markets are extremely concentrated, which exacerbates their bottleneck characteristics. The possibility of oligopolistic coordination at the refining level would also be affected by the presence of homogeneous wholesale products, stable demand, relative transparency in rival refiner’s costs structures, and the role of inventory fluctuations in dealing with demand changes without attendant price changes that could undermine an agreement.²⁵

If retail prices respond asymmetrically, then retailer coordination might be suspected. Increasing brand concentration and transparency in retail pricing could lend some support to an oligopolistic coordination story, but spatial and brand-driven product

²³ Severin Borenstein and Andrea Shepard, “Dynamic Pricing in Retail Gasoline Markets,” *RAND Journal of Economics* 27(3), August 1996, pp. 429-451. The authors find that when refiners have market power they lower *and* raise prices more slowly.

²⁴ Borenstein, Cameron, and Gilbert, *op. cit.*, p. 326.

²⁵ See e.g., F. M. Scherer, “Orders Backlogs, Inventories, and Oligopolistic Coordination,” in *Industrial Market Structure and Economic Performance*, Houghton Mifflin, 1990, pp. 268-273.



The American
Antitrust Institute

differentiation would reduce its plausibility. One study finds that retail price asymmetry *declines* with increases in upstream crude oil price volatility. This could support a theory of oligopolistic coordination, since increased price volatility might make it more difficult for retail station operators to reach pricing agreements.²⁶ Another study relates asymmetric price responses to some measure of market competitiveness such as numbers of competitors or market concentration.²⁷ It concludes (undefinitively) that while fewer competitors are associated with more asymmetry, more concentrated markets actually produce less asymmetry.²⁸

Another explanation for price asymmetry at the retail level is consumer search costs.²⁹ For example, an initial price increase induces consumers to search for lower cost supplies, which increases demand faced by retailers that have not yet raised their prices.³⁰ This demand increase triggers a price hike—and so on--such that price increases are passed on more quickly to consumers. However, since price decreases do not trigger the

²⁶ Radchenko, *op. cit.*, p. 713.

²⁷ This has been more exhaustively explored for interest rates for bank deposits. See, e.g., William E. Jackson III, "Market Structure and the Speed of Price Adjustments: Evidence of Non-Monotonicity," *Review of Industrial Organization* 12, 1997, pp. 37-57 and David Neumark and Steven A. Sharpe, "Market Structure and the Nature of price Rigidity: Evidence from the Market for Consumer Deposits," *The Quarterly Journal of Economics* 107(2), May 1992, pp. 657-680.

²⁸ Sam Peltzman, "Prices Rise Raster Than They Fall," *The Journal of Political Economy*, 108(3), June 2000, pp. 466-502. Peltzman argues that because the HHI statistic is a "numbers equivalent," the difference between coefficients on HHI and number of competitors provides a summary measure of the effect of more competition. That difference, he finds, is statistically insignificant from zero.

²⁹ For an early analysis of gasoline price effects related to consumer responses to imperfect, costly information see, e.g., Howard Marvel, "The Economics of Information and Retail Gasoline Price Behavior: An Empirical Analysis," *Journal of Political Economy* 84(5), 1976, pp. 1033-1060.

³⁰ Michael C. Davis and James D. Hamilton, "Why are Prices Sticky? The Dynamics of Wholesale Gasoline Prices," *Journal of Money, Credit, and Banking* 36(1), February 2004, pp. 17-37.

adi
The American
Antitrust Institute

same intensity of consumer search as price increases, prices fall more slowly than they rise and return to competitive levels only when consumers have engaged in costly search for the lowest price supplies.³¹ The presence of search costs implies that retail service stations have some degree of locational market power, which is reduced as consumers expand their search range in response to higher prices.

A final explanation for price asymmetry is inventory adjustment costs, or that refiners incur high costs from reducing inventories below a certain level in response to price changes. For example, if demand increases unexpectedly, prices rise sharply because inventory constraints limit the supply response. If demand decreases, prices fall more slowly as refiner spread their inventory adjustment costs over several periods.³² A similar story can be told for the supply side. If, for example, there is a decline in crude supply, refiners will cut gasoline production quickly because inventory reductions are costly. This would produce a rapid increase in gasoline prices.³³ For either the demand or supply shock scenario, costly inventory adjustment is central to the speed of the price adjustment. As a result, inventories “buffer” downstream price movements less when prices are rising than when they are falling.³⁴

³¹ Ronald N. Johnson, “Search Costs, Lags and Prices at the Pump,” *Review of Industrial Organization* 20(1), February 2002, pp. 33-50. See also Borenstein, Cameron, and Gilbert, op. cit., p. 328-9. Price volatility may dampen searching because consumers may believe that volatility results from changes in crude oil price changes (over which retailers have little control), as opposed to relative retail prices.

³² Kaufmann and Laskowski, op. cit., p. 1593. The authors found that refinery utilization rates and inventory behavior were a significant determinant of asymmetry between crude oil and retail gasoline.

³³ Stephen P. A. Brown and Mine K. Yucel, “Gasoline and Crude Oil Prices: Why the Asymmetry?” *Economic and Financial Review*, Federal Reserve Bank of Dallas, Third Quarter 2000, pp. 23-29.

³⁴ Brown and Yucel, op. cit., p.27.



The American
Antitrust Institute

Table 2 summarizes the general findings on the three major explanations for price asymmetry. Slightly more than half of these studies evaluate possible explanations for asymmetry between wholesale and retail gasoline prices. The remainder test for asymmetry between crude oil and retail prices. However, the research shows roughly equal support for market power, search costs, and inventory adjustment costs as possible explanations for asymmetry.

Table 2
Results of Studies on Explanations for Price Asymmetry

Study Authors/Year	Prices Studied	Explanation for Asymmetry		
		Market Power	Search Costs	Inventory/ Adjustment Costs
1. Peltzman [2000]	W-R*	Ambiguous	-	-
2. Johnson [2002]	W-R	Ambiguous	yes	-
3. Borenstein and Shepard [2002]	C-R	No	-	yes
4. Davis and Hamilton [2004]	W-R	-	yes	-
5. Kaufmann and Laskowski [2005]	C-S	-	-	yes
	S-R			
6. Radchenko [2005]	C-R	Yes	-	-

*This study used the Producer Price Index (PPI) and Consumer Price Index (CPI) as proxies for wholesale and consumer (retail) prices, respectively.

Forced Deintegration -- Divorcement, and Open Supply

Another category of the economic literature on the petroleum industry focuses on vertical integration as another dimension of market structure. Generally, vertical integration may create efficiencies associated with the elimination of successive monopolies (i.e., double mark-ups), securing greater control over production or eliminating information deficiencies, coordinating design or production between inputs and outputs, and eliminating the hold-up problem. At the same time, however, integration

adi
The American
Antitrust Institute

can create strategic incentives to disadvantage rivals through, for example, exclusive contracts or foreclosure.

The six major studies on forced deintegration focus on the refiner-retailer relationship, via (1) ownership of retail outlets or (2) supply contracts under which lessee-dealer retail outlets must purchase gasoline supplies from the lessor-refiner. Divorcement restricts integration of refiners and gasoline retailers and statutes are in effect in at least six states that displayed (at the time legislation was passed) high prices or increasing numbers of vertically-integrated retail service stations.³⁵

Divorcement is motivated by concerns that refiner-owned retailers will—through a system of dual distribution to co-op (company-owned) and lessee-dealer stations—exercise control of the retail market. This control takes the form of integrated refiners “preying” on their franchised lessee-dealers by pricing gasoline at co-op stations at lower levels than at lessee-dealer outlets.³⁶ Generally, the studies find that retail gasoline prices would rise as a result of restrictions on integration (compared to states where there are no restrictions) or that divorcement policies would impose significant costs on consumers.³⁷

³⁵ See, e.g., Michael G. Vita, “Regulatory Restrictions on Vertical Integration and Control: The Competitive Impact of Gasoline Divorcement Policies,” *Journal of Regulatory Economics* 18(3), 2000, pp. 217-233. At the time of writing, divorcement statutes were in effect in Hawaii, Connecticut, Delaware, Maryland, Nevada, and Virginia (at p. 1) and Jeffrey L. Spears, “Arguments for and Against Legislative Attacks on Downstream Vertical Integration in the Oil Industry,” *Ky. L. J.* 80, 1991-1992, pp. 1075-193.

³⁶ Navid Soleymani, “Legislature Takes Aim and California’s Higher Gas Prices: Misguided Measures to Increase Competition in the California Retail Gasoline Market,” *S. Cal. L. Rev.* 74, 2000-2001, pp. 1395-1436.

³⁷ Vita, *op. cit.*, p. 231, Asher A. Blass and Dennis W. Carlton, “The Choice of Organization Form in Gasoline Retailing and the Costs of Laws Limiting That Choice,” NBER Working Paper No. 7435, December 1999, and Margaret E. Slade, “Strategic Motives for Vertical Separation: Evidence from Retail Gasoline Markets,” *Journal of Law, Economics, and Organization* 14(1), 1998, pp. 84-113.



The American
Antitrust Institute

A second approach to deintegration is “open supply” regulation that would allow lessee-dealer stations to purchase gasoline supplies at wholesale from sources other than the lessor-refiner.³⁸ Open supply requirements are motivated by the fact that lessee-dealers can specify their own retail price, so procurement costs are a determinant of price-setting.³⁹ Results of the open supply research are generally consistent with the divorcement research. The effect of exclusive lessee-dealer contracts is to reduce transportation costs (incurred in arbitraging price differentials between different geographic sources of supply) and to increase inventory holdings that can decrease price volatility. Imposition of open supply requirements would work against these effects, resulting in higher retail prices for stations with multiple sources of supply.⁴⁰

Table 3 summarizes the major results of the research on divorcement and open supply. The research appears to show that forced deintegration of refiners and retailers is associated with higher costs and/or consumer prices.

³⁸ Similar proposals address branded open-supply legislation, which would allow retailers to obtain suppliers from any point on its affiliated refiners distribution network. See, e.g., William S. Comanor and Jon M. Riddle, “The Costs of Regulation: Branded Open Supply and Uniform Pricing of Gasoline” *Journal of the Economics of Business* 10(2), July 2003, 125-155.

³⁹ Hastings and Gilbert, op. cit., p. 472.

⁴⁰ John M. Barron, Beck A. Taylor, and John R. Umbeck, “Will Open Supply Lower Retail Gasoline Prices” *Contemporary Economic Policy* 22(1), January 2004, pp. 63-77; Howard P. Marvel, “On the Economics of Branded Open Supply,” *International Journal of the Economics of Business* 10(2), 2003, pp. 213-223.

Table 3
Results of Studies on Divorcement and Open Supply

Study Authors/Year	Results
Divorcement Findings:	
1. Spears [1991]*	Divorcement laws result in subsidization of gasoline product middlemen, at the expense of consumers.
2. Slade [1998]	Divorcement is associated with high retail gasoline prices.
3. Blass and Carlton [1999]	Vertical integration is motivated by efficiency, not predation. Costs of divorcement are high.
4. Vita [2000]	Divorcement policies raise retail gasoline prices.
Open Supply Findings:	
5. Marvel [2003]	Enforceable open supply requirements can increase inventory holding, protect against price volatility, and reduce gasoline transportation costs.
6. Barron, Taylor and Umbeck [2004]	Retail stations with the most sources of supply have higher retail prices.
*Based on non-empirical analysis	

Price Effects of Mergers

A final category of studies looks into the price effects of horizontal and vertical integration resulting from the spate of merger activity in the domestic industry over the last two decades. Mergers can have *both* horizontal and vertical components if they involve integrated firms. Horizontal mergers increase concentration and, in some instances, the ability and incentive of the merged firm to restrict output and raise price—either unilaterally or in coordination with other firms who are highly interdependent. Vertical mergers can increase the ability and incentive of the merged firm to restrict downstream rivals’ access to inputs (or upstream rivals’ access to customers), raising

adai
The American
Antitrust Institute

their costs or forcing them to operate below viable scale--ultimately increasing downstream prices.⁴¹

Fourteen analyses of horizontal or vertical mergers examine both specific mergers and panels of data involving multiple mergers over time to analyze wholesale and retail gasoline price effects. These prices cover conventional and reformulated gasoline, as well as branded and unbranded fuels. Five of these analyses examine the effects of horizontal consolidation on wholesale and retail prices. The research lends support to the notion that horizontal consolidation at the producer, refining, and retailing levels has increased wholesale and retail prices.

For example, one study finds that retail mergers increased price differentials across states and, on balance, raised retail prices.⁴² The same study also finds that among variables such as taxes, speed limit requirements, and pollution laws, mergers had the largest effect on wholesale prices. Moreover, the adverse price effects related to specific mergers tend to dominate merger-related price decreases.⁴³ Two GAO reports—one published in 1986 and one in 2004—based on a panel of data find that wholesale price increases were attributable to merger-induced increases in concentration.⁴⁴ Only one

⁴¹ The profitability of a foreclosure strategy depends on the degree to which the integrated firm can make up for lost sales due to exclusionary behavior by through revenues earned from higher prices.

⁴² See, e.g., Hayley Chouinard and Jeffrey M. Perloff, “Gasoline Price Differences: Taxes, Pollution Regulations, Mergers, Market Power, and Market Conditions,” Department of Agricultural & Resource Economics, University of California, Berkeley, Working Paper No. 951, 2002, p. 17. Analysis is based on eight producer mergers in five states and 27 retail mergers in 19 states.

⁴³ Chouinard and Perloff, *op. cit.*, p. 17.

⁴⁴ General Accounting Office, *Gasoline Price Increases in Early 1985 Interrupted Previous Trend*, GASO/RCED-86-165BR, September 1986, p. 47. The GAO characterized prices increases of .5 cents per gallon as “small.” General Accounting Office, *Effects of Mergers and Market Concentration in the U.S.*



The American
Antitrust Institute

merger study (for which GAO found related price increases) concludes that increased concentration at the terminal or retailing level did not increase prices.⁴⁵ On the whole, wholesale and retail price increases relating to the horizontal effects of mergers ranged from less than one cent per gallon to up to seven cents to gallon.

The remaining nine studies consider the effects of vertical mergers on wholesale and retail prices. They take various approaches, ranging from identifying merger-related price increases to modeling specific mechanisms such as foreclosure that could result from vertical integration. At the most general level is a GAO study of eight vertical mergers that occurred in the late 1990s and early 2000s.⁴⁶ Increases in wholesale gasoline prices occur in 18 post-merger scenarios, while decreases are identified in only eight.⁴⁷ A separate study, however, finds no increase in retail prices for one of the vertical transactions studied by the GAO (Marathon-Ashland).⁴⁸

Another set of analyses examine the price effects of vertical mergers that change downstream retail gasoline market structure. Here, the assumption is that the acquisition

Petroleum Industry, GAO-04-96, May 2004, p. 90. Increases were on the order of .1 cents per gallon to 1.3 cents per gallon, mostly for branded gasoline.

⁴⁵ John Simpson and Christopher T. Taylor, "Michigan Gasoline Pricing and the Marathon-Ashland and Ultramar Diamond Shamrock Transactions, Federal Trade Commission Working Paper No. 278, July 2005.

⁴⁶ Cases include: USD-Total, Marathon-Ashland, Shell-Texaco I, Shell-Texaco II, BP-Amoco, Marathon-Ashland/Ultramar Diamond Shamrock, Exxon-Mobil, and Tosco-Unocal.

⁴⁷ John A. Karikari, Godwin Agbara, Hashem Dezhbakhsh, and Barbara El-Osta, "The Impact of Mergers in U.S. Petroleum Industry on Wholesale Gasoline Prices," *Contemporary Economic Policy*, 2006, p. 7 and GAO, 2004, op. cit., p. 132-134. Cases included branded and unbranded gasoline for conventional, reformulated, and CARB gasoline. Increases ranges from .1 to 5 cents per gallon.

⁴⁸ Christopher T. Taylor and Daniel S. Hosken, "The Economic Effects of the Marathon-Ashland Joint Venture: The Importance of Industry Supply Shocks and Vertical Market Structure," mimeo, March 17, 2004. The authors note that this merger is an example of consolidation in a moderately concentrated market that does not raise consumer prices.

adi
The American
Antitrust Institute

of downstream retail assets (e.g., co-ops or lessee-dealers) by a vertically-integrated firm may increase the incentive of the merged company to engage in strategic behavior to exclude rivals. One study concludes that an increase in number of leased retail stations by an integrated refiner-marketer increases wholesale and retail prices.⁴⁹ Another examines the loss of Thrifty independent retailers in Southern California via their conversion to ARCO co-op stations and finds that the independent stations had retail prices that were five cents lower before the acquisition. Loss of independent retailers resulting from the merger, therefore, raises retail prices, but the analysis does not prove that an increase in retail market share raises prices.⁵⁰

Four studies deal directly or indirectly with the prices effects associated with incentives to foreclose competitors. Two develop structural oligopoly models of upstream and downstream markets when vertically-integrated firms have “captive” downstream consumption. One study using data from the Exxon-Mobil merger finds that the merged firm could restrict upstream wholesale capacity, increase markups, and raise downstream prices, although no post-merger study is available to verify these results.⁵¹ Another, similar study of the Shell-Star-Texaco merger on two of the Hawaiian islands finds small

⁴⁹ Chouinard and Perloff, op. cit., p. 14. Wholesale price increases associated with a one percent increase in ownership of lessee-dealer retailers leads to a 2.9 cent per gallon or 4.9 cent per gallon increase in wholesale and retail prices, respectively.

⁵⁰ Justine S. Hastings, “Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California,” *American Economic Review* 94(1), March 2004, p. 325. The presence of independent retailers decreases prices by five cents per gallon.

⁵¹ See, e.g., Kenneth Hendricks and R. Preston McAfee, “A Theory of Bilateral Oligopoly, with Applications to Vertical Mergers,” Department of Economics, University of British Columbia, June 2000. Divestiture of one of the merging companies’ refineries remedied the problem.

adi
The American
Antitrust Institute

price increases and small decreases in consumer welfare resulting from a vertical merger.⁵²

The two remaining analyses directly consider a foreclosure scenario under which the integrated refiner-marketer raises wholesale gasoline prices to competing, independent retailers that purchase unbranded gasoline at the rack. One analysis finds that a refiner's price for unbranded gasoline is an increasing function of competition with independent retailers. Moreover, geographical proximity between independent and integrated retailers is a key determinant of the integrated firm's ability to capture lost sales from foreclosure. Analysis of the Tosco-Unocal merger in California and an additional panel of vertical mergers that affected 26 metropolitan areas both indicate increases in wholesale gasoline prices.⁵³ These results are confirmed by another study of foreclosure effects (which dominate efficiency gains from vertical integration) associated with vertical mergers that affected the Rocky Mountain and West Coast regions.⁵⁴

Table 4 summarizes the results of the research on merger-related price effects. These results appear to support the notion that merger activity in the U.S.—particularly since the mid-1990s and largely involving refiner-marketer combinations—has increased

⁵² Mark D. Manuszak, "The Impact of Upstream Mergers on Retail Gasoline Markets," Carnegie Mellon University, Pepper School of Business, mimeo, December 2001.

⁵³ Justine S. Hastings and Richard J. Gilbert, "Market Power, Vertical Integration and the Wholesale Price of Gasoline," *The Journal of Industrial Economics* 53(4), December 2005, p. 481 and 490. Event study results show price increases as high as four cents per gallon in Los Angeles. The broad panel results indicate that a one percent increase in downstream market share of integrated wholesalers increase wholesale prices by about .2 cents per gallon.

⁵⁴ Zava Aydemir and Stefan Buehler, "Estimating Vertical Foreclosure in U.S. Gasoline Supply," University of Zurich, Socioeconomic Institute, Working Paper No. 0212, November 2002. The authors find wholesale price increases of .2 to .6 cents per gallon using a model of vertically related oligopolies.



The American
Antitrust Institute

wholesale and, sometimes, retail prices. While the magnitude of estimated price increases described by various studies may seem small, they can translate into a significant loss of welfare in a market that amounts to billions of dollars in annual retail gasoline sales.⁵⁵

⁵⁵ Borenstein and Gilbert and Vita both make this point.



The American
Antitrust Institute

Table 4
Results of Studies on Horizontal and Vertical Mergers

Study Authors/Year	Results
Horizontal Mergers:	
1. General Accounting Office [1986]	<i>Panel study:</i> increases in concentration would have a relatively small effect on wholesale gasoline prices.
2. Chouinard and Perloff [2002]	<i>Merger study:</i> producer and retail mergers, on balance (i.e., accounting for efficiencies), increase retail prices. Mergers have the largest effect on wholesale prices relative to, e.g., taxes, speed limits, and pollution control laws. Wholesale prices, on balance, also increase.
3. Government Accountability Office [2004]	<i>Panel study:</i> increases in concentration in broadly defined U.S. regions such as the East Coast, Gulf Coast, West Coast, and Rocky Mountains.
4. Simpson and Taylor [2005]	<i>Merger study:</i> consolidation of terminals and retailers does not increase prices.
5. Hosken and Taylor	<i>Merger study:</i> consolidation of terminals and retailers does not increase prices.
Vertical Mergers:	
6. Manuszak [1991]	<i>Merger study:</i> integration results in prices increases that are not offset by efficiency gains.
7. Hendricks and McAfee [2000]	<i>Merger study:</i> integration results in capacity restrictions, high markups, and higher retail prices, which is cured by refinery divestiture.
8. Adymir and Buehler [2002]	<i>Panel study:</i> Strategic foreclosure of independent retailers by integrated refiners raises wholesale prices, which are not tempered by efficiency gains from integration.
9. Chouinard and Perloff [2002]	<i>Merger study:</i> an increase in number of leased stations leads to wholesale and retail price increases
10. Hastings [2004]	<i>Merger study:</i> acquisition of independent by integrated refiner-marketer shows that the presence of independents decreases retail prices.
11. Hosken and Taylor [2004]	<i>Merger study:</i> consolidation of refining and marketing assets in a joint venture does not raise retail prices.
12. Hastings and Gilbert [2005]	<i>Merger study and panel study:</i> Strategic foreclosure effect increases wholesale prices.
13. Government Accountability Office [2004]	<i>Merger studies:</i> six of eight mostly vertical mergers increase wholesale prices, while two mergers decrease wholesale prices.
14. Karikari, Agbara, Dezhbakhsh, and El-Osta [2006]	See results for previous entry



The American
Antitrust Institute

SUMMARY

The foregoing survey of the economic literature on competitive issues highlights a number of key observations. First, industry advocates have put forth arguments that legitimate economic factors are the driving force behind gasoline price dynamics.⁵⁶ And some studies also find that crude oil prices still explain much of the variation in gasoline prices.⁵⁷ These findings should receive full consideration in developing policy approaches such as stimulating conservation and adoption of alternative energy technologies. However, they are not so equivocal that they shut the door on other explanations, including market power.

Second, the research on price asymmetry indicates that statistically significant asymmetric responses occur not only between wholesale and retail gasoline prices, but also between crude oil and retail prices, and crude oil and spot gasoline prices. These results implicate any number of explanations, including market power at the retail or refining level, refinery inventory adjustment costs, and consumer search costs. Because the analysis appears to equally support the foregoing explanations, it does not yield much of a roadmap for better explaining the causes of gasoline price dynamics, at least if testing for asymmetry is the method of choice.

Third, the economic research on the price effects of mergers appears to support the notion that consolidation (largely involving refining and marketing) has increased

⁵⁶ See, e.g., Red Cavaney, “The State of the U.S. Oil and Natural Gas Industry,” State of the Industry Speech presented at the 10th annual Ohio Energy Management and Restructuring Conference, March 1, 2006.

⁵⁷ Chouinard and Perloff and Justine S. Hastings, *Prepared Statement before the California State Assembly, Select Committee on Gasoline Competition, Marketing, and Pricing*, April 28, 2004.



The American
Antitrust Institute

wholesale and retail prices.⁵⁸ The recent wave of large mergers involving integrated assets and downstream refining-marketing appears to have eliminated major competitors. And in the process of restructuring, the integrated “majors” have spun off assets, many of which have been acquired by unintegrated “independents,” which are now significant market players. Here, it is important to note that merger studies show adverse price affects from incremental market power while higher costs and/or prices would result from forced deintegration. This likely indicates that some degree of vertical integration is efficiency enhancing.

Finally, the economic research on mergers has been extensively critiqued. For example, the 2004 GAO study referenced above was ill-received by the FTC. Then Chairman Timothy Muris stated that:

“In 30 years as an antitrust enforcer, academic, and consultant on antitrust issues, I have rarely seen a report so fundamentally flawed as the GAO study of several mergers that the Federal Trade Commission investigated under my predecessor, Robert Pitofsky.”⁵⁹

And in a lengthy rebuttal, the FTC staff expressed concerns about the robustness of the GAO’s findings to different econometric specifications.⁶⁰ The agency convened a conference in early 2005 to formalize the debate, at which a panel of experts emphasized

⁵⁸ Not all studies evaluate the net effect of mergers on retail prices, which would provide some sense of the consumer welfare impact of mergers.

⁵⁹ Federal Trade Commission, “Statement of Federal Trade Commission Chairman Timothy J. Muris on the GAO Study on 990s Mergers and Concentration Released Today,” May 27, 2004. Online. Available <http://www.ftc.gov/opa/2004/05/gaostatement.htm>.

⁶⁰ FTC Staff Technical Report, “Robustness of the Results in GAO’s 2004 Report Concerning Price Effects of Mergers and Concentration Changes in the Petroleum Industry,” December 21, 2004, p. 2.



The American
Antitrust Institute

the need for additional research in order to "test the validity of assumptions that underlie existing methodologies used to estimate merger price effects."⁶¹

The FTC's response to the GAO study reveals a corner into which economists often back themselves. In a review of many of the studies discussed above, one author states succinctly:

"...it is unlikely that relationships between horizontal concentration and vertical integration, on one hand, and retail or wholesale gasoline prices, on the other, will be self-evident. At the end of the day many questions will come down to the reliability of standard errors and hypothesis tests. .
"⁶²

This controversy (which is likely to continue) implies that the results of merger studies are probably best viewed as a reason why merger activity should receive significant antitrust scrutiny.

RECOMMENDATIONS

It is useful to ask what the foregoing survey results mean for policy analysis and possibilities for further research. One logical extension of the work on price asymmetry would be to focus more closely on the wholesale gasoline-retail gasoline price relationship since consolidation and restructuring has significantly changed refining and gasoline marketing market structures. Analysis should also attempt to directly model factors such as market power (or proxies for) that explain asymmetry, as opposed to

⁶¹ Luke M. Froeb, James C. Cooper, Mark W. Frankena, Paul A. Pautler, and Louis Silvia, "Economics at the FTC: Cases and Research, with a Focus on Petroleum" *Review of Industrial Organization* 27, 2005, pp. 237.

⁶² Geweke, op. cit., p. 20.



The American
Antitrust Institute

largely drawing inferences about its cause.⁶³ At the same time, however, even the most sophisticated price asymmetry studies may be limited in what they can reveal about the underlying causes of price dynamics. If this is the case, it is possible that using structural models of downstream refining and marketing might be a better approach.

A second observation is that policies designed to deintegrate refiner/marketers (contractually or by ownership) are not likely to be the most effective in dealing with vertical competitive concerns unless it can be determined that such integration creates incentives for anticompetitive conduct. Rather, the survey results point in the direction of other policy options. These could include facilitating price transparency in wholesale gasoline procurement by unbundling the sale of the commodity from the sale of branding additives. Monitoring incremental enhancement of market power through more intense antitrust scrutiny of mergers that involving refining and marketing assets is also likely to be a better approach than forced deintegration.

Third, analysis of petroleum mergers can probably be improved within the existing framework of the antitrust agency *Guidelines*, as opposed to crafting special rules or approaches. More rigorous approaches to market definition that account for refining bottlenecks, the use of simulation models to evaluate alternative scenarios of strategic firm interaction, and assessments of market demand and supply to evaluate the

⁶³ A recent phenomenon has been increased reporting through TV, radio, and the internet of local gasoline prices at specific stations. This may have the effect of expanding the information available to consumers, allowing them to shift demand more rapidly to lower priced outlets and influencing gas stations to watch not only the prices at rival stations in the immediate vicinity but anywhere within the local market.



The American
Antitrust Institute

incentives for unilateral or coordinated withholding—if not already in use—would improve competitive analysis of mergers involving refining and marketing.

Fourth, petroleum is an industry in which there have been numerous joint ventures and alliances that have raised the threshold competitive issues litigated, for example, in the Supreme Court’s recent *Texaco v. Dagher* decision.⁶⁴ There has been little research, however, that focuses on the ways that joint ventures may reduce the intensity of competition without necessarily being reflected in concentration statistics. Future cases involving joint ventures should be informed by the fundamental changes in industry structure and incentives for firm conduct that are detailed above.

⁶⁴ *Texaco v. Dagher*, 126 S. Ct. 1276 (2006). The joint venture formed the Equilon and Motiva companies. As part of the consent agreement, Texaco agreed to sell 60 retail outlets in southern California and Hawaii and Shell sold its Anacortes, Washington refinery. See, e.g., EIA, *Gasoline and Diesel Fuel Update*.



The American
Antitrust Institute

REFERENCES

Articles and Volumes:

Adams, Walter, "Vertical Divestiture of the Petroleum Majors: An Affirmative Case," *Vand. L. Rev.* 30(6), 1977, pp. 1115-1147.

Zava Aydemir and Stefan Buehler, "Estimating Vertical Foreclosure in U.S. Gasoline Supply," University of Zurich, Socioeconomic Institute, Working Paper No. 0212, November 2002.

Bachmeier, Lance J. and James M. Griffin, "New Evidence on Asymmetric Gasoline Price Responses," *Review of Economics and Statistics* 85(3), August 2003, pp. 772-776;

Bacon, Robert W., "Rockets and Feathers: The Asymmetric Speed of Adjustment of UK Retail Gasoline Prices To Cost Changes," *Energy Economics* 13(3), 1991, pp. 211-218.

Balke, Nathan S., Stephen P. A. Brown, and Mine K. Yucel, "Crude Oil and Gasoline Prices: An Asymmetric Relationship?" *Federal Reserve Bank of Dallas Economic Review*, First Quarter 1998, pp. 2-11.

Barron, John M., Beck A. Taylor, and John R. Umbeck, "Will Open Supply Lower Retail Gasoline Prices" *Contemporary Economic Policy* 22(1), January 2004, pp. 63-77.

Blass, Asher A. and Dennis W. Carlton, "The Choice of Organization Form in Gasoline Retailing and the Costs of Laws Limiting That Choice," NBER Working Paper No. 7435, December 1999.

Borenstein, Severin, A. Colin Cameron, and Richard Gilbert, "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" *Quarterly Journal of Economics* 112(1), February 1997, pp. 305-339.

Borenstein, Severin and Andrea Shepard, "Dynamic Pricing in Retail Gasoline Markets," *RAND Journal of Economics* 27(3), August 1996, pp. 429-451.

Brown, Stephen P. A. and Mine K. Yucel, "Gasoline and Crude Oil Prices: Why the Asymmetry?" *Economic and Financial Review*, Federal Reserve Bank of Dallas, Third Quarter 2000, pp. 23-29.

Burdette, Michael and John Zyren, "Gasoline Price Pass-Through," Energy Information Administration, Department of Energy, January 2003. Online. Available http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2003/gasolinepass/gasolinepass.htm.



The American
Antitrust Institute

Cavaney, Red, “The State of the U.S. Oil and Natural Gas Industry,” State of the Industry Speech presented at the 10th annual Ohio Energy Management and Restructuring Conference, March 1, 2006.

Chen, Li-Hsueh, Miles Finney, and Kon S. Lai, “A Threshold Cointegration Analysis of Symmetric Price Transmission From Crude Oil to Gasoline Prices,” *Economics Letters* 89, 2005, pp. 233-239.

Chouinard, Hayley and Jeffrey M. Perloff, “Gasoline Price Differences: Taxes, Pollution Regulations, Mergers, Market Power, and Market Conditions,” Department of Agricultural & Resource Economics, University of California, Berkeley, Working Paper No. 951, 2002.

Comanor, William S. and Jon M. Riddle, “The Costs of Regulation: Branded Open Supply and Uniform Pricing of Gasoline” *Journal of the Economics of Business* 10(2), July 2003, pp. 125-155.

Davis, Michael C. and James D. Hamilton, “Why are Prices Sticky? The Dynamics of Wholesale Gasoline Prices,” *Journal of Money, Credit, and Banking* 36(1), February 2004, pp. 17-37.

Dirlam, Joel B. and Alfred E. Kahn, “Leadership and Conflict in the Pricing of Gasoline,” *Yale L. J.* 61, 1952, pp. 818-855.

Duffy-Deno, Kevin T., “Retail Price Asymmetries in Local Gasoline Markets,” *Energy Economics* 18, 1996, pp. 81-92.

Froeb, Luke M., James C. Cooper, Mark W. Frankena, Paul A. Pautler, and Louis Silvia, “Economics at the FTC: Cases and Research, with a Focus on Petroleum” *Review of Industrial Organization* 27, 2005, pp. 237.

Geweke, John, “Empirical Evidence on the Competitive Effects of Mergers in the Gasoline Industry,” University of Iowa, mimeo, July 16, 2003.

Gilbert, Richard, J., *Prepared Statement before the California State Assembly, Select Committee on Gasoline Competition, Marketing, and Pricing*, April 28, 2004.

Gore, Albert Jr., “The Cartel Restriction Act of 1979: Response to a Global Economic Problem” 12 *Vand. J. Transnat’l L.*, 1979, pp. 273-314



The American
Antitrust Institute

Grant, Kenneth, David, Ownby, and Steven R. Peterson, *Understanding Today's Crude Oil and Product Markets*, policy analysis study by Lexecon for the American Petroleum Institute. 2006.

Hastings, Justine S., "Vertical Relationships and Competition in Retail Gasoline Markets: Empirical Evidence from Contract Changes in Southern California," *American Economic Review* 94(1), March 2004, pp. 317-328.

Hastings, Justine S., *Prepared Statement before the California State Assembly, Select Committee on Gasoline Competition, Marketing, and Pricing*, April 28, 2004.

Hastings, Justine S. and Richard J. Gilbert, "Market Power, Vertical Integration and the Wholesale Price of Gasoline," *The Journal of Industrial Economics* 53(4), December 2005, pp. 469-492.

Hendricks, Kenneth and R. Preston McAfee, "A Theory of Bilateral Oligopoly, with Applications to Vertical Mergers," Department of Economics, University of British Columbia, June 2000.

Karikari, John A., Godwin Agbara, Hashem Dezhbakhsh, and Barbara El-Osta, "The Impact of Mergers in U.S. Petroleum Industry on Wholesale Gasoline Prices," *Contemporary Economic Policy*, 2006.

Karrenbrock, Jeffrey, "The Behavior of Retail Gasoline Prices: Symmetric or Not?" *Federal Reserve Bank of St. Louis Review* 72, 1991, pp. 19-29.

Kaufmann, Robert K. and Cheryl Laskowski, "Causes for an Asymmetric Relation Between the Price of Crude Oil and Refined Petroleum Products," *Energy Policy* 33, 2005, pp. 1587-1596.

Jackson III, William E., "Market Structure and the Speed of Price Adjustments: Evidence of Non-Monotonicity," *Review of Industrial Organization* 12, 1997, pp. 37-57.

Johnson, Ronald N., "Search Costs, Lags and Prices at the Pump," *Review of Industrial Organization* 20(1), February 2002, pp. 33-50.

Manuszak, Mark D. "The Impact of Upstream Mergers on Retail Gasoline Markets," Carnegie Mellon University, Pepper School of Business, mimeo, December 2001.

Markham, Jesse W. and Anthony Hourihan, "Horizontal Divestiture in the Petroleum Industry," *Vand. L. Rev.* 31(2), 1978, pp. 237-247.



The American
Antitrust Institute

Marvel, Howard P., "On the Economics of Branded Open Supply," *International Journal of the Economics of Business* 10(2), 2003, pp. 213-223.

Howard Marvel, "The Economics of Information and Retail Gasoline Price Behavior: An Empirical Analysis," *Journal of Political Economy* 84(5), 1976, pp. 1033-1060.

Neumark, David and Steven A. Sharpe, "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits," *The Quarterly Journal of Economics* 107(2), May 1992, pp. 657-680.

Norman, Donald and David Shin, *Price Adjustment in Gasoline and Heating Oil Markets*, American Petroleum Institute, Research Study No. 060, 1991.

Novotny, William L., "The Gasoline Marketing Structure and Refusals to Deal with Independent Dealers: A Sherman Act Approach," *Ariz. L. Rev.* 16, 1974, pp. 465-488.

Peltzman, Sam, "Prices Rise Faster Than They Fall," *The Journal of Political Economy* 108(3), June 2000, pp. 466-502.

Radchenko, Stanislav, "Oil Price Volatility and the Asymmetric Response of Gasoline Prices to Oil Price Increases and Decreases," *Energy Economics* 27, 2005, pp. 708-730.

Rostow, Eugene V. and Arthur S. Sachs, "Entry into the Oil Refining Business: Vertical Integration Re-examined," *Yale L. J.* 61, 1952, pp. 856-914.

Rubin, Janice E. *Price Gouging, the Antitrust Laws, and Vertical Integration: How They are Related*, CRS Report for Congress, Congressional Research Service, Library of Congress, May 8, 2006.

Scherer, F. M., "Orders Backlogs, Inventories, and Oligopolistic Coordination," in *Industrial Market Structure and Economic Performance*. Houghton Mifflin, 1990, pp. 268-273.

Simpson, John and Christopher T. Taylor, "Michigan Gasoline Pricing and the Marathon-Ashland and Ultramar Diamond Shamrock Transactions, Federal Trade Commission Working Paper No. 278, July 2005.

Slade, Margaret E., "Strategic Motives for Vertical Separation: Evidence from Retail Gasoline Markets," *Journal of Law, Economics, and Organization* 14(1), 1998, pp. 84-113.



The American
Antitrust Institute

Soleymani, Navid, "Legislature Takes Aim and California's Higher Gas Prices: Misguided Measures to Increase Competition in the California Retail Gasoline Market," *S. Cal. L. Rev.* 74, 2000-2001, pp. 1395-1436.

Spears, Jeffrey L., "Arguments for and Against Legislative Attacks on Downstream Vertical Integration in the Oil Industry," *Ky. L. J.* 80, 1991-1992, pp. 1075-193.

Taylor, Christopher T. and Daniel S. Hosken, "The Economic Effects of the Marathon-Ashland Joint Venture: The Importance of Industry Supply Shocks and Vertical Market Structure," mimeo, March 17, 2004.

Turner, Bob, "Conscious Parallelism in the Pricing of Gasoline," *Rocky Mtn. L. Rev.* 32, 1959-1960, pp. 206-222.

Waller, Spencer Weber, "Suing OPEC," 64 *Univ. Pitt. L. Rev.*, 2002-2003, pp. 1-52.

Vita, Michael G., "Regulatory Restrictions on Vertical Integration and Control: The Competitive Impact of Gasoline Divorcement Policies," *Journal of Regulatory Economics* 18(3), 2000, pp. 217-233.

Agency Reports:

Energy Information Administration, *Gasoline and Diesel Fuel Update*, August 28, 2006. Online. Available <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>.

Federal Trade Commission, "Statement of Federal Trade Commission Chairman Timothy J. Muris on the GAO Study on 990s Mergers and Concentration Released Today," May 27, 2004. Online. Available <http://www.ftc.gov/opa/2004/05/gaostatement.htm>.

Federal Trade Commission, Staff Technical Report, "Robustness of the Results in GAO's 2004 Report Concerning Price Effects of Mergers and Concentration Changes in the Petroleum Industry," December 21, 2004.

General Accounting Office, *Gasoline Price Increases in Early 1985 Interrupted Previous Trend*, GASO/RCED-86-165BR, September 1986.

General Accounting Office, *Analysis of the Pricing of Crude Oil and Petroleum Products*, Washington D.C. GAO/RCED-93-17, March 1993.

General Accounting Office, *Effects of Mergers and Market Concentration in the U.S. Petroleum Industry*, GAO-04-96, May 2004.

Legislation:



The American
Antitrust Institute

No Oil Producing and Exporting Cartels Act of 2005, S. 555, 109th Congress. March 8, 2005. Online. Available <http://www.govtrack.us/congress/billtext.xpd?bill=s109-555>. Wisconsin Legislative Reference Bureau, *Anti-Price Gouging Laws and Gasoline Prices*, June 2006. Online. Available <http://www.legis.state.wi.us/lrb/pubs/Lb/06Lb11.pdf>.

To Improve Competition in the Oil and Gas Industry, to Strengthen Antitrust Enforcement With Regard to Industry Mergers, and Other Purposes, Senate Bill S.2557, 109th Congress, April 6, 2006. Online. Available <http://www.govtrack.us/data/us/bills.text/109/s/s2557.pdf>.

An Act to Add Section 16720.1 To The Business and Professions Code, Relating to Business Practices (amended), SB 1274, California State Senate, February 9, 2006. Online. http://info.sen.ca.gov/cgi-bin/postquery?bill_number=sb_1274&sess=PREV&house=B&site=sen.

To Provide for the Establishment of a Strategic Refinery Reserve, H.R. 5365, 109th Congress, May 11, 2006. Online. Available <http://www.govtrack.us/congress/billtext.xpd?bill=h109-5365>.

Court Cases:

Texaco v. Dagher, 126 S. Ct. 1276 (2006).