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in Retail Markets**

by

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PRICING BEHAVIOR AND VERTICAL CONTRACTS IN RETAIL MARKETS

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Recent developments in the economic theory of multifirm markets and firm organization have motivated several empirical studies of retail gasoline markets. A growing body of theoretical work suggests that the behavior of firms in markets once viewed as "workably competitive" can diverge significantly from that characteristic of competitive markets. Static models of free-entry markets where firms are horizontally differentiated suggest that the equilibrium price structure will reflect local market power. Dynamic oligopoly models suggest that repeated interaction can sustain (tacitly) collusive outcomes in multifirm industries. Because gasoline stations are strikingly simple firms and data are available on wholesale and retail gasoline prices, this market has proven to be a useful arena for testing pricing predictions from these models. These tests are discussed in Section I.

Another growth area in industrial organization is research on the nature of vertical contracts. This work suggests that the optimal contract between a manufacturer and a retailer will be sensitive to the nature of downstream competition and the available control technology. Imperfect competition downstream can lead to double marginalization, and imperfect monitoring can allow shirking or free-riding. The manufacturer can be expected to choose contractual forms that minimize these effects. Section II discusses efforts to assess the effect of competition and monitoring on the refiner's choice of contractual form for retail outlets.

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While examining contractual form is interesting in itself, policy initiatives provide additional impetus for examining contracts in gasoline retailing. Refiners have long been a favorite target of antitrust enforcement, and complaints regarding restraints imposed on retailers have been viewed sympathetically by the courts. Court decisions have made unlawful exclusive dealing clauses for gasoline and automotive products and various arrangements through which the refiner can control the retail price at franchise outlets. In the last decade, federal and state governments have enacted legislation further restricting the nature of the contract between refiners and the retail outlets for their gasoline. The growth in these restrictions naturally leads to positive questions about the nature and effect of contractual relationships between refiners and dealers.

I. PRICING BEHAVIOR

One view of gasoline retailing is that stations compete in price and behave approximately Bertrand, that is, prices are defined by cost. This view is supported by the observation that stations post prices, competitors can respond immediately to price changes, branded gasoline of a specified octane level is a homogeneous product, and there are many stations. Contrary to this view, there is a growing body of empirical work that suggests these markets depart from the Bertrand paradigm in significant ways.

Price behavior in an isolated market with thirteen stations has been studied by Slade (1986, 1987) using daily observations on price in a period characterized by price instability induced by demand shocks. Slade (1986) estimates a conjectural variations model and finds that price taking behavior can be rejected. She also estimates station demand equations and finds that both own-price and cross-price demand elasticities show substantial variation across stations even though these stations are located along the same heavily traveled commercial strip. Using these data in a dynamic model to estimate

the slopes of linear intertemporal reaction functions, Slade (1987) finds support for the hypothesis that the stations play supergame strategies. In particular, she finds that the estimated reaction function slopes are significantly different from single period best replies and result in higher estimated profits. These results suggest that brand and location provide sufficient local market power to allow firms to price above marginal cost, and that station operators are sufficiently sophisticated to exploit repeated play in order to increase profits.

Gasoline is sold in a variety of grades (regular leaded, regular unleaded, etc.) and can be sold self-service (consumers pump their own gas) or full-service (a station employee pumps the gas). In a perfectly competitive market, each grade and service level would be sold at marginal cost. In a free entry market in which gasoline revenues must cover a fixed cost, prices may be above marginal cost, but will reflect fully allocated fixed cost. A cursory examination of data on retail margins suggests that the price structure is more complex than these cost-based stories would suggest.

Table 1 presents data on retail margins (retail prices minus wholesale prices) by grade and service level. The retail price data are from a cross-sectional census of gasoline stations in Eastern Massachusetts in early 1987 and include observations at over 1500 stations. The wholesale prices are the average weekly fob prices for Boston.¹ The first column reports the number of stations carrying the specified grade. There are, for example, 1232 stations selling regular leaded gasoline. The retail margins reported in the top three rows use the lowest price at the stations for the specified grade. At a station selling both full-service and self-service gasoline, this will be the self-service price. The six rows at the bottom separate full-service and self-service prices. "Mini-service," in which an attendant pumps the gas but will provide no other service, is treated as self-service.

The retail margin is higher for full-service than self-service: the

difference in means is nine to ten cents per gallon for each grade.² Since full-service sales involve a higher labor input than self-service, it would be surprising if this were not the case. More interesting is the difference in margins by grade; the margin on premium unleaded is over forty percent higher than the margin on regular leaded. This difference might be cost-based if gasoline were priced to cover grade-specific fixed cost and the sales volume of premium unleaded were much smaller than the sales volume of regular leaded. Premium unleaded sales, however, were almost fifty percent higher than regular leaded sales for the state as a whole in late 1986 (U.S. Department of Energy, Petroleum Marketing Monthly). The margin differences might also be cost-based if buyers of premium unleaded have a higher demand for service. If, for example, a premium gasoline purchaser is more likely to have the station attendant check her oil. But since service comes only with the purchase of full-service gas, this would imply greater margin difference for full-service purchases. As shown in Table 1, however, the difference is approximately the same for full-service and self-service.

Another possible explanation for this dispersion in retail margins is that stations have sufficient local market power to price discriminate. Consumers of leaded and unleaded gas are segmented by law and by the technology embodied in automobiles. Premium versus regular unleaded purchasers may also be segmented by technology--some producers of high performance cars recommend premium fuel--but the segmentation seems less clear. Consumers also might be separable based on willingness to pay for quality. If unleaded premium and regular gasolines are perceived as vertically differentiated goods, a higher margin on the superior product would allow the firm to extract additional consumer surplus.

The hypotheses that the difference in leaded and unleaded regular margins is due to price discrimination is investigated by Borenstein (1989), who argues that purchasers of leaded gas have lower search costs (less brand/

location loyalty) than purchasers of unleaded gas. The difference in standard deviations reported in Table 1 is consistent with this argument; more search should reduce the variation in price. The difference in search cost implies differing price elasticities, allowing stations with local market power to price discriminate. Borenstein exploits the fact that in recent years an increasing number of stations have stopped carrying leaded gas. As the distribution of leaded gas outlets becomes relatively less dense, the cost of search will rise and the difference in margins should decline. Using panel data on average margins and surveys of consumer purchasing, he finds the difference in retail margins was rising or constant until 1986 when it began to decline, and the change in availability--controlling for differences in income-- explains from one to two thirds of the drop in the margin difference over the 1986-1989 period.

Another way in which stations might be able to price discriminate is through willingness to pay for service. Shepard (1989) develops a model in which stations with local market power carrying both full- and self-service gasoline are able to price discriminate while stations carrying only full-service or only self-service gasoline cannot. As a result, the difference in full-service and self-service prices will be larger at stations offering both service types than the difference across stations offering only one service type. This prediction is tested using the Eastern Massachusetts cross-sectional data on station prices and characteristics. Controlling for a variety of station characteristics, these data indicate that the differential is at least ten cents higher at stations with both service types. Since the wholesale price does not vary by station type, it is difficult to argue that a differential this large can be cost-based. The data base includes location information on each station that is used to control for local deviations in input prices, demand, and competitive environment. The differential remains even when the comparison is restricted to stations within a half mile radius.

Because the larger differential comes from higher full-service prices, the presence of both full-service-only and multi-service stations explains some of the difference in the variance in full-service and self-service prices evident in Table 1.

The results of Shepard and Borenstein lend support to the argument that price discrimination, although most commonly modeled in a monopoly setting, occurs in multi-firm markets in which market power comes from location and brand preference.

II. CONTRACTUAL FORM

Gasoline is sold in a mixed distribution system, that is a system where there are a variety of contractual forms for the vertical relationship between retailers and refiners. These forms are usually categorized by the industry as: open dealer (OD) contracts in which the station is owned and operated by an independent dealer who contracts with a refiner for her gasoline supply; lessee dealer (LD) contracts in which the capital at the station is owned by the refiner and leased by the self-employed dealer; and company outlets (CO) at which the capital is owned by the refiner and the station operator is employed by the refiner. Note that the only form in which the refiner can directly control the retail price is the company outlet. The franchise agreement and capital ownership at lessee dealer stations provide greater scope for control of non-price attributes than does the supply contract signed with open dealers. Ownership of capital allows the supplier to build-in auxiliary services (e.g., convenience stores, automotive service bays) and determine the capacity of the station (the number of pumps and islands). Ownership of capital also gives the supplier a convenient mechanism for imposing a franchise fee. The franchise contract gives the supplier some additional rights to define the quality of service. Although the allowable scope of these contracts varies from state-to-state, suppliers can sometimes

set the hours of operation, specify maintenance and cleanliness standards, enforce credit card policies and take some sorts of disciplinary action in response to violations of the contract.

Both state and federal laws and regulations restrict the contracts refiners can offer. These policies have been initiated and supported by organizations representing dealers with LD or, to a lesser extent, OD contracts. The context for this rise in dealer activism is a sharp decline in the number of stations; from 1973 to 1982 the number of stations in the U.S. declined by over one third, and the remaining stations have higher sales volumes (U.S. Department of Energy, Petroleum Market Shares). While many analysts view this shift toward fewer and higher volume stations as a rationalization of the distribution system, dealers are understandably unhappy. One result of their efforts is the federal Petroleum Marketing Practices Act (1978) disallowing unilateral dealer terminations (even at contract renewal) except in specifically defined circumstances and limiting the refiner's ability to extract downstream rents with station-specific franchise fees. To the extent that these restrictions bind, a clear effect would be to push refiners toward company outlets as the preferred contractual form. Perhaps in recognition of this effect, dealer organizations have convinced several states to prohibit company outlets.

Shepard (1990) uses the cross-sectional, Eastern Massachusetts data to test for relationships between station price and quality characteristics and the choice of contractual form. The refiner's problem is treated as a two stage decision. First, she chooses the station price and quality characteristics that maximize profit at any given location; she then chooses the contractual form that maximizes profit conditional on the desired station type. Because local market power will lead to double marginalization³ when some of the rent must be extracted via the wholesale price, stations intended to be high-volume, low-price stations can be run optimally as company outlets.

Stations intended to provide complex services that are difficult to monitor but affect the brand's reputation will be run optimally under an LD contract which gives some control over quality to the refiner but makes the dealer a residual claimant for service income. Using a multinomial choice model, Shepard finds that a low price increases the probability that the station will be a company outlet relative to either other type but has no effect on the probability ratio of LD to OD. Stations that provide automotive service, on the other hand, are less likely to be company outlets and more likely to be LD outlets relative to OD outlets.

Another line of research exploits the regime change when legislation prohibiting company outlets goes into effect. Barron and Umbeck (1984), for example, use data on prices at outlets that were company stores prior to the prohibiting legislation in Maryland and became LD or OD outlets after the prohibition went into effect. They compare these prices to those at nearby stations over approximately the same time periods. They find that prices at COs were lower relative to nearby stations before prohibition than they were after prohibition. They interpret this result as evidence of double marginalization at stations where refiners cannot control the retail price.

III. DIRECTIONS FOR FURTHER RESEARCH

The sparse empirical work on vertical organization suggests that refiners are choosing vertical contracts that minimize total organizational costs (monitoring costs plus the cost of retailers failing to internalize the refiner's profit). It also suggests that one effect of prohibiting company outlets might be to increase the average retail price. It is less clear what other effects these prohibitions and other restrictions have on the structure and behavior of the retail sector. It may be possible to identify these effects by exploiting the variation in the nature of the restrictions across states.

The studies of retail pricing rely on product differentiation as a source of market power, but they do not directly investigate the nature of spatial and brand competition. The effect on pricing of station density relative to demand could be investigated. Models of differentiation suggest that suppliers of a homogeneous product will want to soften price competition by spatially differentiating, but also want to locate at high demand areas. It might be that these opposing forces lead stations to cluster in high demand areas but differentiate with respect to brand and type of service. Because gas stations (and other retail outlets) have clearly defined locations they appear to be particularly well-suited for investigating these issues.

TABLE 1: RETAIL MARGINS

(in cents)

<u>Gasoline</u>	<u>Number of Stations</u>	<u>Average Margin*</u>	<u>Standard Deviation</u>
All gasoline:			
Regular Leaded	1232	28.4 (0.21)	7.2
Regular Unleaded	1512	35.6 (0.22)	8.6
Premium Unleaded	1441	40.0 (0.24)	9.0
Self-service gasoline:			
Regular Leaded	472	24.5 (0.21)	4.5
Regular Unleaded	518	30.7 (0.24)	5.3
Premium Unleaded	500	35.1 (0.27)	6.1
Full-service gasoline:			
Regular Leaded	969	33.3 (0.29)	9.2
Regular Unleaded	1230	40.7 (0.29)	10.2
Premium Unleaded	1174	44.8 (0.29)	10.1

*Standard errors in parentheses.

ENDNOTES

¹Although prices at any given station in the census were reported only once, data collection extended over thirteen weeks. The wholesale price used to construct retail margins is the price for the week in which the retail price was observed.

²All differences in means or variances mentioned in the text satisfy statistical significance at the 0.001 level.

³Mathewson and Winter (1984) argue that in free entry markets, excessive entry will lead to dealers choosing prices that are too low from the manufacturer's perspective, not prices that are too high. In gasoline retailing, however, refiners can directly control entry.

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