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Vertical integration and pricing outcomes in retail gasoline markets

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Abstract

The real world impact of vertical integration on prices for consumers remains a controversial topic. Economic theory suggests that there are multiple effects of vertical integration on prices which work in opposite directions. This paper employs high frequency panel data from a regional U.S. market to determine which effects are dominant at retail gasoline stations. Using two different techniques, I find that vertically-integrated company-operated gasoline stations charge prices five to eleven cents lower than non-integrated, lessee-operated gasoline stations.

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1. Introduction

Vertical integration has the potential to increase market power at the retail level by reducing the number of distinct price-setters in the market. Indeed, some consumers and policy-makers believe that this intuitive relationship drives outcomes in the retail gasoline market. This belief has inspired attempts to reduce vertical integration through legislation mandating divorcement (the separation of vertically integrated retail gasoline stations from the integrated oil companies). Past papers have shown in market-wide studies that such a policy actually results in higher prices (e.g. Vita 2000). The dataset in this paper differentiates between vertically-integrated, company-operated gas stations and non-integrated[1], lessee-operated gas stations. This panel dataset is used to determine if the negative relationship between vertical integration and prices holds at the individual station level and, if so, how large is the price difference between stations that are vertically-integrated and their non-integrated counterparts.

Many papers looking at vertical integration into a downstream market have focused on the principal-agent considerations associated with motivating managers at downstream locations. Papers such as Lafontaine and Slade (2007) and Borenstein and Bushnell (2005) have recognized that other considerations exist, but in the literature they have not been treated as central to the vertical integration decision or outcome. Several considerations may simultaneously be theoretically valid and each may have a price increasing or a price decreasing effect on prices at vertically-integrated stations relative to non-integrated stations.

Economic theory allows the impact of vertical integration on prices to be decomposed into one effect theoretically increasing prices and three effects theoretically decreasing prices. When multiple retailers in the same market are owned by the same price setter (such as an integrated oil company), the stations can be considered different products of a multi-product firm and they would have higher prices than they would otherwise in order to reduce cannibalization between the substitutable products, potentially resulting in a price increasing effect of vertical integration. The three price reducing effects are as follows. The first price decreasing effect of vertical integration is described in Lafontaine and Slade (2007) as a "brand-loyalty demand externality" wherein vertically-integrated stations take into account the positive impact that low prices at one station may have on the future purchasing behavior of consumers at other stations and therefore the vertically integrated stations set lower prices. The second price decreasing effect follows from the ability of an integrated supply chain to avoid double marginalization from multiple price setters each taking their own markup. The third price decreasing effect of vertical integration is motivated by the possibility that if stations owned by the oil company can sell a greater volume of the gasoline the oil company has refined, it improves the oil company's ability to partially foreclose the wholesale market and raise rivals' costs making the oil company's retailers more profitable. This motivation would lead to vertically integrated stations having lower prices in order to sell a greater volume of the refiner's gasoline. In this paper, we find evidence that the price increasing effect of reduced competition at vertically integrated gas stations is outweighed by the price decreasing effects of an integrated supply chain, resulting in lower prices at vertically-integrated gas stations.

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[1] Some may consider lessee-operated stations to be partially-integrated; however, this distinction and terminology are not common, so I will refer to lessee-operated stations as non-integrated and company-operated station as vertically integrated.

In the retail gasoline market, the competing effects of vertical integration on price levels are likely to be relevant and this market is an excellent candidate for empirical assessment of which effects are dominant. In this paper, I use my station-level dataset on the retail gasoline market to test whether prices are higher or lower at vertically integrated stations in the retail gasoline market.

2. Data and methods

The retail petroleum industry could potentially be significantly impacted by any (or all) of the factors affecting vertically-integrated retailers discussed in the Introduction. It is also an industry which has been considered for regulation affecting vertical integration both in terms of divorcement and in terms of anti-trust considerations due to potential partial foreclosure of the wholesale market. An excellent panel dataset, including the level of integration of retailers of a single major brand of gasoline in a large regional market, provides me with a special opportunity to investigate the impact of vertical integration on prices in this market. Daily observations of prices for all stations in a large regional U.S. market from 1999 to 2006, as well as branding and station geocoding, are provided by OPIS. The geocoding enables me to match the stations to their competitors and local population demographics. The dataset contains 956 stations with their integration identified as vertically-integrated or non-integrated as well as geocoding for 7,436 competitors.

In order to investigate the impact of vertical integration on prices, I initially regress retail prices (in cents/gallon and adjusted to remove taxes) on an indicator for whether a station is vertically integrated with controls for demand and supply conditions. The supply-side controls, which may indicate the competitiveness of the market, are the number of major brand competitors within one-quarter mile and the number of minor brand competitors within one-quarter mile[2]. The demand-side controls, which are informative about the elasticity of demand from local consumers, are the local population income and the portion of the population commuting less than one-half hour to work. The pricing data has some daily observations missing for some stations, so to allow for the possibility that secular price changes in the market are correlated with the missing observations, I include time fixed-effects for day of the week and for each month in all regressions.

In the second specification, I regress retail prices (in cents/gallon and adjusted to remove taxes) on an indicator for whether a station is vertically integrated and station-specific fixed effects[3]. Because the station-specific fixed effects account for all differences between stations, the coefficient on the vertically-integrated dummy variable reflects only price differences at stations which change operation type either from vertically-integrated, company-operated stations to non-integrated, lessee-operated stations or from non-integrated, lessee-operated stations to vertically-integrated, company-operated stations. This isolates the impact of vertical integration from any between station heterogeneity correlated with the level of vertical

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[2] Following Barron et al. (2004), geocoded data were used to match stations to their nearest (geographically) competitors. Competitors were grouped into two categories: majors and minors. They were categorized as majors if they belonged to one of the other two major brands operating in this market. All competitors not belonging to one of the three major brands were categorized as minors.

[3] Although the fixed-effects regression relies on stations that change integration for identification of the vertically-integrated parameter, all stations are included in the regression in order to improve identification of the time fixed effects.

integration. If operation type were correlated with location such that stations of one operation type were systematically located in locations with a greater propensity for higher prices (e.g. because of less elastic demand) the basic regressions would not be able to differentiate this effect from the impact of vertical integration itself. The fixed effects regression would be able to isolate the effect of vertical integration in such instances because all unobserved station-specific factors are controlled for[4].

Table 1: Estimation of the effect of vertical integration on prices at each station

VARIABLES	Pooled OLS	Fixed-effects
Vertically-integrated	-5.170***	-10.76***
	(0.340)	(0.778)
# Major-brand Competitors (1/4 mile)	-0.095	
	(0.300)	
# Off-brand Competitors (1/4 mile)	-0.262	
	(0.294)	
Local Population Income (logged)	0.000204***	
	(1.79e-05)	
Portion of Non-commuters in Local Population	2.529	
	(1.820)	
Observations	1736671	1847076
R-squared	0.948	0.859
Number of Stations	890	956

Notes: Standard errors clustered by station shown in parentheses. Day and month-year time fixed-effects are not shown. *** Statistically significant at the 1% level.

3. Results and Conclusion

Pooled OLS results in Table 1 show the estimated impact of vertical integration was a reduction in prices of roughly five cents. The fixed-effects result is even larger than the pooled OLS specification. The fixed-effects regression detects price changes at stations that change between levels of vertical integration and this change was most often from non-integrated lessee-operated stations to vertically-integrated company-operated stations. This larger coefficient suggests that there is some selection either of lessee operated stations into locations that are higher priced because of unobserved factors or of lessee-operated stations with dramatically higher prices being most likely to switch to being company operated. Specifications (not shown) expanding

[4] However, the fixed effects regression may suffer from a different bias if the identity of stations that switch operation type were correlated with pricing behavior. Specifically, since most switchers go from lessee operated to company operated, it may be that oil companies exert any power that they have (given the limitations imposed by the Petroleum Marketing Practices Act) to convert higher priced lessee stations to company operated stations. A similar case arises if lessee operators who know they will be converted use their remaining time as lessee operators to charge excessive prices without regard for the impact on the station's reputation.

the dataset to include other levels of integration (open dealers) and other brands did not significantly affect the 5 cent reduction in prices at vertically integrated stations.

Using statewide monthly data for the United States, Vita (2000) finds that divorcement regulation preventing oil companies from fully vertically integrating raises the price of retail gasoline by about 2.6 cents per gallon. Noting that the unit of analysis for my paper is an individual stations not an entire markets, the results of my paper can be more closely compared to the results in Vita (2000) by looking at the impact of vertical integration (and the implied price difference) upon the surrounding local market. A regression of average competitor prices within one mile of the vertically-integrated or non-integrated stations shows that the competitors of vertically-integrated stations priced 1.9 cents per gallon lower than competitors of non-integrated stations. Considering that many of the competitors' stations are likely to themselves be lessee operated, we can anticipate that the impact of divorcement legislation in this market would be to raise the market-wide prices by more than the 1.9 cent difference found for competitors of the stations. The results found here with high frequency station level data are consistent with the results found in Vita (2000) using statewide monthly data.

Vertically-integrated stations not only adhere more closely to oil companies' own objectives than non-integrated stations, but the results in this paper suggest that they also provide lower prices to consumers. I discussed four potential effects of vertical integration on prices earlier in the paper and clearly some differences in pricing behavior exist in this market, suggesting that these theoretical effects may be important. Future work should investigate what portion of the difference in prices is created by each of the four effects of vertical integration. Preliminary results showed that price differences did vary over short-term time intervals. Therefore, it would also be valuable to use high frequency data to investigate the relationship between operation type and pricing dynamics.

List of References

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

Borenstein, S. and J. Bushnell,. (2005). "Retail policies and competition in the gasoline industry" Center for the Study of Energy Markets.

Lafontaine, F., and M. Slade (2007). "Vertical integration and firm boundaries: the evidence" *Journal of Economic Literature*, 629-685.

Vita, M. G. (2000). "Regulatory restrictions on vertical integration and control: The competitive impact of gasoline divorcement policies" *Journal of Regulatory Economics* **18**(3), 217-233.