Large Differences in the Wholesale Price of Gasoline

• Unbranded regular gasoline sold at the distribution rack

• Difference between the lowest and highest price at different cities in the same week can exceed 50% of the national average

• E.g., January 4-8, 1999
  – Los Angeles, Ca: 46.3 cents/ga
  – Bakersfield, Ca: +12 cents/ga
  – Houston, Tx: -12 cents/ga
Max - Min Unbranded Wholesale Prices
10 Western Cities + Houston

Source: OPIS weekly average
This Paper

• Uses detailed data on wholesale gasoline prices, market structure to:
  – Estimate the relationship between horizontal and vertical market structure and wholesale prices
  – Test the “raising rivals’ costs” hypothesis
This Paper

- Uses a “natural experiment” to test the effect of vertical integration
  - Mostly vertical merger of Tosco and Unocal in 1997
- Also analyzes a broad data panel
- Does not examine effects of market structure on retail prices
  - due to data limitations
Conclusions

- Tosco-Unocal transaction
  - Increased “effective” vertical integration in Los Angeles by about 8 percent
  - Associated with an increase in the wholesale price of gasoline in LA of about 3 cents per gallon – or about 4-5 percent
- Similar results from a panel of market data
Four Types of Gasoline Retailers

“Vertically Integrated” stations
1. Refiner-owned and operated (Company-owned and operated)
   – Refiner supplies station and sets retail prices
2. Lessee dealer
   – Refiner owns the station. Supplies the dealer with wholesale gasoline at a contract price. Dealer sets retail price.
Four Types of Gasoline Retailers

3. Branded independent dealer
   – Dealer owns the station and sets the price
   – Buys gasoline from the refiner, or from a “jobber” who contracts with refiner

4. Unbranded independent dealer
   – Dealer owns the station and sets the price.
   – Buys gasoline anywhere, but cannot market a refiner’s brand
Four Types of Gasoline Retailers

Hastings, AER (2004):
Retail pricing behavior is similar for type 1 and 2 stations; differs from type 3 and 4.
Four Types of Gasoline Retailers

We treat unbranded independent dealers (#4) as “independents”

We exclude branded independent dealers (#3)
   Status as “independent” or “integrated” is less clear
   Results don’t depend on whether #3 is included
Unintegrated Case

Upstream - refineries

U1

Downstream – retailers

D1

Own the station, can buy from either refiner

D2

U2
Vertical Integration Case

Integrated refiner-marketer

U1

D1

U2

D2

Independent refiner

Independent retailer

Owns the station and can buy from either refiner
Necessary Conditions for Raising Rivals’ Cost

• Significant upstream market power
  – Plausible where high refiner concentration at distribution terminals

• Imperfect contracting/coordination
  – Upstream firms cannot extract all monopoly rents
  – Refiners sell unbranded product at constant wholesale prices above marginal costs
Necessary Conditions for Raising Rivals’ Cost

• Downstream prices are strategic complements with high cross-elasticity of demand between vertically integrated and independent downstream firms
  – Price-setting firms with integrated retailers in close proximity to independent retailers

• Market share of downstream independents cannot be too large
  – Otherwise double-marginalization will lower upstream profits
  – Requires that integrated retailers account for a large fraction of a refiner’s total sales
Empirical literature on raising rivals’ costs is sparse

Waterman and Weiss (1996); Chipty (2005): Effects of vertical integration on decisions of cable companies to carry competing premium cable channels

Cuellar and Gertler (2000): Effects of vertical integration by physician groups on the cost of medical care

Slade (1986, 1992): Effects of vertical integration on intensity of gasoline competition

Delgado and Waterson (2003): Effects of vertical integration between tire and automobile companies on retail tire prices

Hortacsu and Syverson (2005): Effects of vertical integration on cement and concrete prices
Why gasoline?

- Homogeneous commodity
- Substantial variation in market structure
  - Instances of upstream market power
  - Differing extent of vertical integration
  - Merger activity generated discrete changes in market structure
- Unbranded gasoline sold at constant prices
- A reasonable assumption is that retail prices are strategic complements
- Detailed data
Do Vertical Mergers Raise (Wholesale) Prices?

Two opposing effects:

(i) **Strategic Effect**
- Vertically integrated firm raises wholesale price and/or supplies less wholesale product to increase downstream prices
- This implies that vertical integration **increases** the equilibrium wholesale price

(ii) **Substitution Effect**
- Vertical integration eliminates double-marginalization, which lowers the retail price of the vertically integrated firm. This reduces demand for the unintegrated firm’s retail product and reduces wholesale demand.
- This implies that vertical integration **reduces** the equilibrium wholesale price
Define:

\[ p_i = \text{the downstream price for sales by firm } i = 1, 2 \]

\[ q_i = \text{the downstream quantity sold by firm } i \]

\[ w = \text{the upstream price} \]

\[ x_i = \text{sales of the upstream good by firm } i \]

\[ X = \text{total sales of the upstream good} \]
Vertical Integration Case

Integrated refiner-marketer

- **U1**: Integrated refiner-marketer
- **U2**: Independent refiner
- **D1**: Independent retailer
- **D2**: Independent retailer
  - Owns the station and can buy from either refiner

Variables:
- $w$: unknown
- $x_1$: unknown
- $x_2$: unknown
- $p_1$: unknown
- $p_2$: unknown
Profit functions

Unintegrated downstream firm:

\[ \pi_i^d(p_1, p_2) = (p_i - w)q_i(p_1, p_2) \]

Unintegrated upstream firm:

\[ \pi_i^u = w(x_1 + x_2)x_i \]

Integrated firm:

\[ \Delta^1(b^1, b^5) = b^1d^1(b^1, b^5) + n_b(\chi^1 + \chi^5)\chi^1 \]
Reaction Functions: Unintegrated Case

Upstream

\[ \frac{d \pi^u_1}{dx_1} = w + x_1 \frac{\partial w}{\partial x_1} = 0 \]

\[ \frac{d \pi^u_2}{dx_2} = w + x_2 \frac{\partial w}{\partial x_2} = 0 \]

Downstream

\[ \frac{d \pi^d_1}{dp_1} = q_1 + (p_1 - w) \frac{\partial q_1}{\partial p_1} = 0 \]

\[ \frac{d \pi^d_2}{dp_2} = q_2 + (p_2 - w) \frac{\partial q_2}{\partial p_2} = 0 \]
Reaction Functions:
Vertical Integration Case
(Firm 1 is vertically integrated)

Define: $R_1(p_1, p_2) \equiv p_1 q_1(p_1, p_2)$

Upstream

$$\frac{d \pi_1}{dx_1} = \left( w + x_1 \frac{\partial w}{\partial x_1} \right) + \left( \frac{\partial R_1}{\partial p_2} \frac{\partial p_2}{\partial x_1} \right) \frac{\partial w}{\partial x_1} \leq 0$$

$$\frac{d \pi_2^u}{dx_2} = w + x_2 \frac{\partial w}{\partial x_2} = 0$$

Downstream

$$\frac{d \pi_1^d}{dp_1} = q_1 + p_1 \frac{\partial q_1}{\partial p_1} = 0$$

$$\frac{d \pi_2^d}{dp_2} = q_2 + (p_2 - w) \frac{\partial q_2}{\partial p_2} = 0$$
The Tosco-Unocal Merger
• Asset purchase announced November 1996 and completed April 1997
• Tosco was a refiner with only a few retail outlets in most metropolitan areas in California
• Unocal owned both refinery and retail outlets
• Acquisition created an integrated refiner-marketer with significant retail market share
  – Tosco acquired all of Unocal’s refining assets and the Union 76 brand in all West Coast markets, plus Arizona and Nevada
• Data on 12 West Coast metropolitan areas whose market structure was affected by the acquisition
• Tosco-Unocal merger is an attractive case study to examine vertical effects because
  – The transaction was mainly vertical
  – Data are not confounded by other factors, such as the introduction of CARB gasoline requirements
• Tosco-Circle K acquisition was purely vertical, but occurred in May 1996, soon after CARB introduction
  – Involved a lot of geographic markets
• Tosco-BP acquisition in 1993 involved only a few market areas
Tosco-Unocal Merger: Data

• 12 metropolitan areas ("racks")
  – Oil Price Information Service
  – Weekly observations on average unbranded wholesale rack prices for regular gasoline
  – July 1996 – December 1998; about 12 months before to 18 months after the merger

• Phoenix used as control
  – No change in upstream market structure during the time period considered
  – Unocal acquisition had no significant effect on downstream market structure
  – Supplied by refineries in Los Angeles, hence similar cost characteristics
Tosco-Unocal Merger: Data

• Number of wholesale suppliers
  – Oil Price Information Service

• Downstream market structure + “downstream market contact”
  – Whitney Leigh retail gasoline station annual census data
Downstream Market Contact Variable = 

\{\text{Change in Tosco’s retail market share (\%)}\} \times \{\text{fraction of Tosco’s post-acquisition retail outlets that are within one driving mile of an independent retailer}\}
Table I: Characteristics of Metropolitan Areas Affected by Tosco-Unocal Merger.

<table>
<thead>
<tr>
<th>Distribution Rack</th>
<th>Tosco’s Pre-Merger Downstream Market Share*</th>
<th>Unocal’s Pre-Merger Downstream Market Share</th>
<th>Tosco’s Post-Merger Downstream Market Share</th>
<th>Change in Downstream Market Share Times Percent of Stations within one Mile of an Independent</th>
<th>Unocal Competed with Tosco at the Distribution Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Jose</td>
<td>0.00</td>
<td>0.15</td>
<td>0.15</td>
<td>5.56</td>
<td>No</td>
</tr>
<tr>
<td>San Francisco</td>
<td>0.08</td>
<td>0.07</td>
<td>0.15</td>
<td>3.32</td>
<td>No</td>
</tr>
<tr>
<td>Fresno</td>
<td>0.01</td>
<td>0.11</td>
<td>0.12</td>
<td>5.69</td>
<td>Yes</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>0.02</td>
<td>0.16</td>
<td>0.18</td>
<td>8.33</td>
<td>Yes</td>
</tr>
<tr>
<td>Sacramento</td>
<td>0.06</td>
<td>0.08</td>
<td>0.14</td>
<td>2.77</td>
<td>Yes</td>
</tr>
<tr>
<td>San Diego</td>
<td>0.03</td>
<td>0.11</td>
<td>0.14</td>
<td>4.40</td>
<td>Yes</td>
</tr>
<tr>
<td>Stockton</td>
<td>0.03</td>
<td>0.07</td>
<td>0.11</td>
<td>3.47</td>
<td>Yes</td>
</tr>
<tr>
<td>Santa Barbara</td>
<td>0.01</td>
<td>0.19</td>
<td>0.20</td>
<td>9.12</td>
<td>NA**</td>
</tr>
<tr>
<td>Phoenix</td>
<td>0.29</td>
<td>0.02</td>
<td>0.31</td>
<td>0.00</td>
<td>No</td>
</tr>
<tr>
<td>Tucson</td>
<td>0.39</td>
<td>0.06</td>
<td>0.45</td>
<td>0.66</td>
<td>No</td>
</tr>
<tr>
<td>Reno</td>
<td>0.00</td>
<td>0.08</td>
<td>0.08</td>
<td>4.20</td>
<td>Yes</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>0.06</td>
<td>0.05</td>
<td>0.11</td>
<td>0.51</td>
<td>No</td>
</tr>
<tr>
<td>Seattle</td>
<td>0.22</td>
<td>0.02</td>
<td>0.24</td>
<td>0.10</td>
<td>No</td>
</tr>
<tr>
<td>Portland</td>
<td>0.13</td>
<td>0.05</td>
<td>0.18</td>
<td>1.11</td>
<td>No</td>
</tr>
</tbody>
</table>

* Downstream Market Share is measured as percent of total stations in the metropolitan area
** Firms did not post separate prices for the Santa Barbara distribution rack.
Regression Specification

\[ p_{it} = \mu + \alpha_i + \beta d_{it} + \gamma u_{it} + \delta r_{it} + \varepsilon_{it} \]

\[ \varepsilon_{it} = \rho \varepsilon_{it-1} + \zeta_{it} \]

\( p_{it} \) = Tosco's weekly average wholesale price of unbranded gasoline in city \( i \) (less the price in Phoenix in week \( t \))

\( \alpha_i \) = city-specific error component, fixed or random effect specification

\( d_{it} \) = downstream market contact with rival independents in city \( i \) in week \( t \)

\( u_{it} \) = number of refiners selling unbranded gasoline in city \( i \) in week \( t \)

\( r_{it} \) = percent of stations that are independent retailers in city \( i \) in week \( t \)

\( \varepsilon_{it} \) = autoregressive error component

\( \zeta_{it} \) = white noise error term
Table II: Regression of Effects of Raising Rivals' Costs  
Dependent Variable: Weekly average unbranded wholesale rack price for Tosco less the rack price in Phoenix.

<table>
<thead>
<tr>
<th></th>
<th>Fixed Effects</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parameter Estimates</td>
<td>Parameter Estimates</td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.95</td>
<td>-0.572</td>
</tr>
<tr>
<td></td>
<td>(0.484)</td>
<td>(1.365)</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
<td>[0.675]</td>
</tr>
<tr>
<td>Downstream Market Contact with Independent Retailers</td>
<td><strong>0.445</strong></td>
<td><strong>0.369</strong></td>
</tr>
<tr>
<td></td>
<td>(0.089)</td>
<td>(0.080)</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>Number of Wholesale Suppliers</td>
<td>-0.083</td>
<td>-0.403</td>
</tr>
<tr>
<td></td>
<td>(0.278)</td>
<td>(0.203)</td>
</tr>
<tr>
<td></td>
<td>[0.766]</td>
<td>[0.048]</td>
</tr>
<tr>
<td>Market Share of Independent Retailers</td>
<td>0.129</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>(0.166)</td>
<td>(0.059)</td>
</tr>
<tr>
<td></td>
<td>[0.437]</td>
<td>[0.156]</td>
</tr>
<tr>
<td>Autocorrelation Coefficient</td>
<td>0.824</td>
<td>0.8 24</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.814</td>
<td>0.237</td>
</tr>
<tr>
<td>Hausman Test:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2 = 7.83$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob. &gt; $\chi^2$ = 0.0497</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Observations</td>
<td>N=12</td>
<td>T=128</td>
</tr>
</tbody>
</table>

Standard errors in parentheses. P-Values in brackets.
### Table III: Regression of Effects of Raising Rivals' Costs

**Dependent Variable:** Weekly average unbranded wholesale rack price for Tosco

<table>
<thead>
<tr>
<th>Parameter Estimates</th>
<th>Fixed Effects</th>
<th>Random Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.041</td>
<td>2.475</td>
</tr>
<tr>
<td></td>
<td>(0.487)</td>
<td>(1.565)</td>
</tr>
<tr>
<td></td>
<td>[0.933]</td>
<td>[0.114]</td>
</tr>
<tr>
<td>Tosco’s Unbranded Wholesale Price in Phoenix</td>
<td><strong>0.945</strong></td>
<td><strong>0.952</strong></td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>Downstream Market Contact with Independent Retailers</td>
<td><strong>0.372</strong></td>
<td><strong>0.296</strong></td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
<td>(0.082)</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>Number of Wholesale Suppliers</td>
<td>-0.010</td>
<td>-0.378</td>
</tr>
<tr>
<td></td>
<td>(0.278)</td>
<td>(0.203)</td>
</tr>
<tr>
<td></td>
<td>[0.971]</td>
<td>[0.062]</td>
</tr>
<tr>
<td>Market Share of Independent Retailers</td>
<td>0.177</td>
<td>0.094</td>
</tr>
<tr>
<td></td>
<td>(0.166)</td>
<td>(0.059)</td>
</tr>
<tr>
<td></td>
<td>[0.288]</td>
<td>[0.110]</td>
</tr>
<tr>
<td>Autocorrelation Coefficient</td>
<td>0.827</td>
<td>0.827</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.982</td>
<td>0.926</td>
</tr>
<tr>
<td>Hausman Test</td>
<td>$\chi^2 = 16.01$</td>
<td>Prob. $&gt; \chi^2 = 0.0030$</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>N=12</td>
<td>T=128</td>
</tr>
</tbody>
</table>

Standard errors in parentheses. P-Values in brackets.
Empirical results from Tosco-Unocal merger robust to:

- Definition of downstream market contact variable (one mile vs. 1.5 mile assumption)

- Measure of upstream market competition
  - Also used refinery capacity HHIs defined for larger metropolitan markets (e.g., Northern, Southern CA)
Panel Data
Broad Panel

- 26 metropolitan areas
- January 1993 – June 1997: data aggregated to quarterly level
- Semi-monthly average unbranded wholesale prices
  - Lundberg wholesale price reports
- Number of wholesale suppliers
  - Oil Price Information Service
- Downstream market structure
  - Whitney Leigh annual census of retail gasoline stations
- Crude Prices
  - Energy Information Administration, Cushing OK
Table IV: Summary Statistics of Market Concentration and Vertical Integration Variables for the Entire Panel of Data

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std Dev</th>
<th>Max</th>
<th>75th Percentile</th>
<th>Median</th>
<th>25th Percentile</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of Stations that are Vertically Integrated*</td>
<td>0.49</td>
<td>0.13</td>
<td>0.84</td>
<td>0.58</td>
<td>0.47</td>
<td>0.39</td>
<td>0.27</td>
</tr>
<tr>
<td>Percent of Stations that are Independent Retailers</td>
<td>0.21</td>
<td>0.085</td>
<td>0.44</td>
<td>0.27</td>
<td>0.20</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>Number of Vertically Integrated Wholesalers</td>
<td>2.18</td>
<td>1.05</td>
<td>5.00</td>
<td>3.00</td>
<td>2.00</td>
<td>2.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Number of Unintegrated Wholesalers</td>
<td>2.45</td>
<td>1.84</td>
<td>9.00</td>
<td>3.00</td>
<td>2.00</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Average Downstream Market Share for Integrated Suppliers**</td>
<td>0.10</td>
<td>0.05</td>
<td>0.39</td>
<td>0.12</td>
<td>0.09</td>
<td>0.07</td>
<td>0.01</td>
</tr>
<tr>
<td>Maximum Downstream Market Share of Integrated Suppliers**</td>
<td>0.14</td>
<td>0.07</td>
<td>0.47</td>
<td>0.16</td>
<td>0.13</td>
<td>0.09</td>
<td>0.01</td>
</tr>
</tbody>
</table>

* Percent of Stations that are Vertically Integrated is defined as the number of refiner-owned stations in the retail census divided by the total number of stations in the retail census, for each metropolitan area.

** Downstream Market Share for an Integrated Supplier is defined as the number of stations in the retail census that the refiner owns, divided by the total number of stations in the retail census, for each metropolitan area.
Table V: Correlation Coefficients for Upstream and Downstream Market Variables for Broad Panel Regression

<table>
<thead>
<tr>
<th>Percent Vertically Integrated Retailers</th>
<th>Percent Independent Retailers</th>
<th>Number of Unintegrated Refiners</th>
<th>Number of Vertically Integrated Refiners</th>
<th>Average Downstream Market share of Integrated Suppliers</th>
<th>Maximum Downstream Market share of Integrated Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Vertically Integrated Retailers</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Independent Retailers</td>
<td>-0.50</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Unintegrated Refiners</td>
<td>0.33</td>
<td>0.24</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Vertically Integrated Refiners</td>
<td>0.14</td>
<td>-0.08</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Average Downstream Market Share of Integrated Suppliers</td>
<td>-0.15</td>
<td>-0.14</td>
<td>-0.09</td>
<td>-0.22</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum Downstream Market Share of Integrated Suppliers</td>
<td>0.12</td>
<td>-0.28</td>
<td>-0.12</td>
<td>0.14</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Table VI: Variance Components Estimates for Market Structure Variables of Interest

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Percent of Variation Attributable to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>City</td>
</tr>
<tr>
<td>Number of Unintegrated Suppliers</td>
<td>0.832</td>
</tr>
<tr>
<td>Number of Vertically Integrated Suppliers</td>
<td>0.627</td>
</tr>
<tr>
<td>Percent Independent Retailers</td>
<td>0.602</td>
</tr>
<tr>
<td>Mean Downstream Market Share of Integrated Suppliers</td>
<td>0.561</td>
</tr>
</tbody>
</table>
Table VII: Cell Means by Combinations of Market Structure Variables
Dependent Variable: Quarterly average price of unbranded wholesale gasoline by rack less the spot price of crude oil

<table>
<thead>
<tr>
<th></th>
<th>Few Integrated Suppliers</th>
<th>Many Integrated Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small Downstream Market Share**</td>
<td>Large Downstream Market Share**</td>
</tr>
<tr>
<td>Few Unintegrated Suppliers</td>
<td>Few Independent Retailers***</td>
<td>19.75 (1.02) N=32</td>
</tr>
<tr>
<td></td>
<td>Many Independent Retailers***</td>
<td>18.33 (2.36) N=6</td>
</tr>
<tr>
<td>Many Unintegrated Suppliers</td>
<td>Few Independent Retailers</td>
<td>17.54 (0.86) N=45</td>
</tr>
<tr>
<td></td>
<td>Many Independent Retailers</td>
<td>15.30 (0.71) N=67</td>
</tr>
</tbody>
</table>

* Standard errors in parentheses.
** Average downstream market share of the vertically integrated suppliers.
*** Measured by share of all retail outlets.
Table VII: Cell Means by Combinations of Market Structure Variables
Dependent Variable: Quarterly average price of unbranded wholesale gasoline by rack less the spot price of crude oil*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Few Unintegrated Suppliers</td>
<td>Few Independent Retailers***</td>
<td>19.75 (1.02) N=32</td>
<td>22.49 (1.13) N=26</td>
<td>20.70 (1.40) N=17</td>
<td>22.22 (1.54) N=14</td>
</tr>
<tr>
<td>Many Independent Retailers***</td>
<td>18.33 (2.36) N=6</td>
<td></td>
<td>22.29 (2.36) N=6</td>
<td>17.31 (0.96) N=36</td>
<td>18.65 (2.59) N=5</td>
</tr>
</tbody>
</table>

| Many Unintegrated Suppliers | Few Independent Retailers | 17.54 (0.86) N=45                                      | 19.29 (0.88) N=44                                       | 13.10 (1.11) N=27                                      | 13.19 (1.09) N=28                                       |
|                            | Many Independent Retailers | 15.30 (0.71) N=67                                      | 16.27 (0.66) N=78                                       | 11.61 (1.29) N=20                                      | 14.38 (1.40) N=17                                       |

* Standard errors in parentheses.
** Average downstream market share of the vertically integrated suppliers.
*** Measured by share of all retail outlets.
Table VIII: Broad Panel Regression Results  
Dependent Variable: Quarterly average unbranded wholesale price by metropolitan area, less the spot price of crude oil

<table>
<thead>
<tr>
<th></th>
<th>OLS with Robust Standard Errors*</th>
<th>City-Specific Fixed-Effects Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>22.56 (1.118)</td>
<td>21.770 (3.123)</td>
</tr>
<tr>
<td>Number of Vertically Integrated Suppliers</td>
<td>-1.588 (0.244)</td>
<td>-0.117 (0.381)</td>
</tr>
<tr>
<td>Number of Unintegrated Suppliers</td>
<td>-1.006 (0.152)</td>
<td>-0.429 (0.334)</td>
</tr>
<tr>
<td>Avg Downstream Mkt Share of Integ. Suppliers</td>
<td>12.309 (5.613)</td>
<td>17.902 (7.896)</td>
</tr>
<tr>
<td>Market Share of Independent Retailers</td>
<td>-6.485 (3.512)</td>
<td>-1.786 (5.204)</td>
</tr>
<tr>
<td>California Reformulated Gasoline Requirement</td>
<td>5.782 (1.055)</td>
<td>6.328 (0.874)</td>
</tr>
<tr>
<td>Adjusted R-Square</td>
<td>0.287</td>
<td>0.460</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>N=26 T=18</td>
<td>N=26 T=18</td>
</tr>
</tbody>
</table>

*Newey-West standard errors are reported in parentheses, correcting for serial correlation and heteroskedasticity.
Conclusions

• Tosco-Unocal transaction
  – Increased “effective” vertical integration in Los Angeles by about 8 percentage points
  – Corresponded to an increase in the wholesale price of gasoline in LA of about 3 cents per gallon, and increase of about 4-5 percent in the price of unbranded wholesale gasoline

• Similar but weak results from a panel of market data
Questions and Caveats

• We don’t have an explanation for large wholesale price differences
  – Estimated RRC effects are fairly small, on the order of a few cents per gallon
  – But prices differences can exceed 25 cents per gallon
• Why not more arbitrage?
  – Large price differences appear to be strongly influenced by differences in horizontal market structure. Perhaps vertical integration limits potential for arbitrage.
• Effects on retail prices?
• Horizontal/vertical interactions
  – Tosco-Unocal was not a purely vertical merger
  – Other examples?
Unbundled Supply:
A Proposal to Enhance Competition
Refiner Margins
March 2004

• California
  – 60 cents per gallon

• National Average
  – 33 cents per gallon

Refiner margin = spot wholesale gasoline price minus cost of crude
The Price of a Gallon of Gasoline, March 2004

California

Crude Oil Cost
Taxes
Retail Margin
Refiner Margin

Nationwide

Crude Oil Cost
Taxes
Retail Margin
Refiner Margin
Primary Causes

• Few refiners in California

• Environmental standards and geography isolate California from other supplies

• Tightly controlled, branded supply from refiner to dealer
Independent retailers appear to be a competitive force in retail gasoline

• In a broad cross-section of cities, retail gasoline prices are generally lower when there are more independent retailers.

• E.g., Salt Lake City and San Diego have about the same refiner concentration, but independent retailers have a much larger share in Salt Lake City and it has much lower prices.
## Vertical Market Structure

<table>
<thead>
<tr>
<th>Structure</th>
<th>Los Angeles, CA</th>
<th>San Diego, CA</th>
<th>San Antonio, TX</th>
<th>Salt Lake City, UT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refiner owned and operated</td>
<td>21%</td>
<td>41%</td>
<td>36%</td>
<td>22%</td>
</tr>
<tr>
<td>Refiner owned, Lessee dealer operated</td>
<td>44%</td>
<td>32%</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td>Branded Open Dealer, Direct Delivery</td>
<td>18%</td>
<td>11%</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Branded Open Dealer, Jobber Supplied</td>
<td>6%</td>
<td>3%</td>
<td>32%</td>
<td>45%</td>
</tr>
<tr>
<td>Independent Unbranded Dealer</td>
<td>11%</td>
<td>13%</td>
<td>28%</td>
<td>20%</td>
</tr>
</tbody>
</table>

From Hastings Testimony, Sacramento, April 28, 2004
From Hastings Testimony, Sacramento, April 28, 2004
From Hastings Testimony, Sacramento, April 28, 2004
San Antonio Average Prices

From Hastings Testimony, Sacramento, April 28, 2004
What Can We Do?

• Regulate gasoline
• More antitrust scrutiny
• Eliminate zone pricing
• Open Supply
• Vertical Divorcement
What Can We Do?

• Little evidence that these proposals will lower prices

• Can do more harm than good
Unbundled Supply

• The problem:
  – Branded retailers have limited alternatives for gasoline supply.
  – Branded refiners have limited incentives to compete for sales.
  – Unbranded retailers face limited supplies.
  – Unbranded suppliers face few retail outlets.
Unbundled Supply

The solution:

Unbundle the supply of gasoline from the supply of the brand of gasoline.
Unbundled Supply

How it works:

– Wholesale gasoline suppliers offer generic, unbranded gasoline for sale at the distribution terminal.

– Branded dealers pay separately for the additives that identify the brand.
Unbundled Supply

Why it works:

- All wholesale suppliers can compete to sell generic gasoline to any retailer, branded or unbranded.
  
  • Including importers of unbranded gasoline

- All retailers can buy gasoline from any supplier.
Unbundled Supply

• Does not change the current gasoline distribution system.
• Refiners produce generic gasoline.
  – Trade with each other.
  – Store gasoline in commingled facilities.
• Brands are distinguished by additives that are blended at the distribution terminal.
Unbundled Supply

• Does not prevent branded refiner/retailers from selling branded gasoline and charging extra for the brand.

• Improves market transparency.

• We believe it will lower gasoline prices.

• Does no harm.