Vertical Integration as a Price Discrimination Tool: The Case of Alcoa

History

- Aluminum Company of America (Alcoa) dominated the market for aluminum during the first half of the 20th century
- 1945: Appellate court ruled Alcoa guilty of antitrust violations
- Significant debate as to whether or not Alcoa was a true monopoly (question of secondary market from remelting)
- We know that they had significant market power
- Dominant Firm and Competitive Fringe (domestic entry, imports, secondary aluminum, magnesium)
  **Extent of the fringe matters in terms of Alcoa’s ability to PD**
Key Definitions

- Vertical Integration
  * When a single firm participates in more than one successive stage of the production process (C&P p.395)

- Arbitrage
  * When a consumer purchases a good with the intent to immediately resell in another market at a higher price and enjoy the profit

- Ingot
  * A chunk of metal

Uses of Aluminum Ingots

- Iron and Steel Industry
  * Reducing Agent

- Aircraft Industry
  * Airplane parts

- Electric Cable

- Cooking Utensils
  * Alzheimer’s cookware

- Automobile Parts
The Firm’s Derived Demand

- Each firm has a derived demand curve for aluminum
- Derived demand based on final output price, protection technology, and input costs
- Derived demand obtained by setting value of marginal product of aluminum equal to price and solving for quantity of aluminum

Numeric Example (Lecture Notes)

-Assume Alcoa selling to two customers
  1) Electric Cable (High elasticity because of copper substitute)
     \[ q_e = 60 - p_e \]
  2) Aircraft industry (Inelastic because there were no substitutes)
     \[ q_a = 100 - p_a \]

-Assume Alcoa has a constant marginal cost = 20
Nondiscriminatory Pricing

- Use aggregate demand to find MR curve, set MR=MC, find corresponding price

 Aggregate Demand is: 
\[ P = \begin{cases} 
100 - Q & \text{if } Q < 40 \\
80 - 0.5Q & \text{if } Q > 40 
\end{cases} \]

Use above to find: 
\[ MR = \begin{cases} 
100 - 2Q & \text{if } Q < 40 \\
80 - Q & \text{if } Q > 40 
\end{cases} \]

\[ 80 - Q = 20 \rightarrow Q = 60 \rightarrow Pa = Pe = 50 \]

\[ \pi = 1800 \]

\[ CS_a = 0.5(100-Pa)q_a = 0.5(50)(50) = 1250 \]

\[ CS_e = 0.5(60-Pe)q_e = 0.5(10)(10) = 50 \]
Third Degree Price Discrimination

- Alcoa could have maximized profits by charging separate prices in the two markets
  * Higher price to aircraft industry because demand was more elastic
  * Same parameters as previous example

3rd Degree Price Discrimination

<table>
<thead>
<tr>
<th>Electric Cables</th>
<th>Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p_e = 60 - q_e )</td>
<td>( p_a = 100 - q_a )</td>
</tr>
<tr>
<td>( \text{MR}_e = 60 - 2q_e )</td>
<td>( \text{MR}_a = 100 - 2q_a )</td>
</tr>
<tr>
<td>( \text{MR}_e = \text{MC} )</td>
<td>( \text{MR}_e = \text{MC} )</td>
</tr>
<tr>
<td>( 60 - 2q_e = 20 )</td>
<td>( 100 - 2q_a = 20 )</td>
</tr>
<tr>
<td>( q_e = 20 )</td>
<td>( q_a = 40 )</td>
</tr>
<tr>
<td>( p_e = 40 )</td>
<td>( p_a = 60 )</td>
</tr>
<tr>
<td>( \varepsilon_e = 2 )</td>
<td>( \varepsilon_a = 1.5 )</td>
</tr>
<tr>
<td>( \text{CS}_e = 200 )</td>
<td>( \text{CS}_a = 800 )</td>
</tr>
</tbody>
</table>

\[ \pi = p_eq_e + p_aq_a - c(60) = 2000 \]
3rd Degree PD Graph

Comparison

<table>
<thead>
<tr>
<th>Price Discrimination</th>
<th>Common Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_a = 60$</td>
<td>$p_a = 50$</td>
</tr>
<tr>
<td>$q_a = 40$</td>
<td>$q_a = 50$</td>
</tr>
<tr>
<td>$CS_a = 800$</td>
<td>$CS_a = 1250$</td>
</tr>
<tr>
<td>$p_e = 40$</td>
<td>$p_e = 50$</td>
</tr>
<tr>
<td>$q_e = 20$</td>
<td>$q_e = 10$</td>
</tr>
<tr>
<td>$CS_e = 200$</td>
<td>$CS_e = 50$</td>
</tr>
<tr>
<td>$\pi = 2000$</td>
<td>$\pi = 1800$</td>
</tr>
</tbody>
</table>

Question: Does 3rd degree PD always lead to a less efficient outcome (relative to nondiscriminatory monopoly)?
But, was 3\textsuperscript{rd} degree PD possible for Alcoa?

- NO!
- Arbitrage
  * Easy for members of low price industries to turn around and resell ingots.
  * Question: In the example, who would sell to who?

So, possibilities of arbitrage prevented Alcoa from using standard 3\textsuperscript{rd} degree PD
So what to do?

- Vertical Integration
  * Alcoa could integrate into certain industries to prevent arbitrage
  * Which industries would it have made sense for Alcoa to integrate into?
    ~ If Alcoa integrates into the aircraft industry they must charge a low price to electric cable companies. The cable companies could then use the cheap ingots to produce aircraft parts!
    ~ If Alcoa integrates into the electric cable company they can charge a high price to the aircraft industry. Arbitrage is prevented because of Alcoa’s vertical linkages.

RESULT: Made sense for Alcoa to integrate into industries with elastic derived demand curves.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookware</td>
<td>Elastic ($\varepsilon = -1.6$)</td>
</tr>
<tr>
<td>Electric Cable</td>
<td>Elastic (copper substitute)</td>
</tr>
<tr>
<td>Auto Parts</td>
<td>Elastic ($\varepsilon = -1.5$)</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>Inelastic (no substitutes)</td>
</tr>
<tr>
<td>Aircraft</td>
<td>Inelastic (no substitutes in 1930)</td>
</tr>
</tbody>
</table>

Sources: Perry (1980) & Example 9.4 on p. 298 of text
What did they do?

- Sure enough Alcoa established vertical linkages in the cookware, electric cable, and auto parts industries.
- Alcoa did not vertically integrate into the two industries with inelastic derived demand curves.
- This behavior is consistent with the theory of Perry.
- Total welfare effect is ambiguous

Conclusions

- Alcoa’s integration patterns were consistent with the hypothesis regarding 3rd degree Price Discrimination.
- But, could it have been something else?
  * Correlation is not causation
  * Maybe it was something else about the industries w/ high elasticities that caused Alcoa to integrate
  * Costs of integration?
- A good argument, but strength of empirical evidence is questionable