

# 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 20<sup>th</sup> 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 re-melting)
  - 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, production 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:  $P = 100 - Q$  if  $Q < 40$   
 $P = 80 - 0.5Q$  if  $Q > 40$

Use above to find:  $MR = 100 - 2Q$  if  $Q < 40$   
 $MR = 80 - Q$  if  $Q > 40$

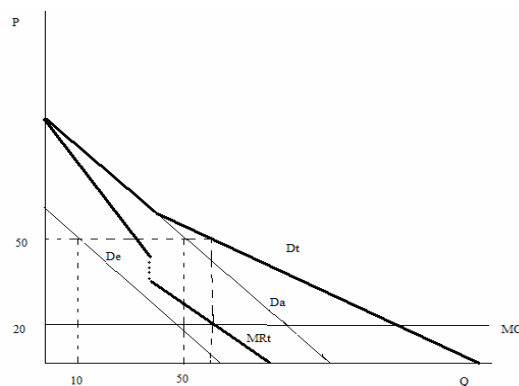
$80 - Q = 20 \rightarrow Q = 60 \rightarrow P_a = P_e = 50$

$\pi = 1800$

$CS_a = .5(100 - P_a)q_a = .5(50)(50) = 1250$

$CS_e = .5(60 - P_e)q_e = .5(10)(10) = 50$

## Nondiscriminatory Pricing Graph



## 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

## 3<sup>rd</sup> Degree Price Discrimination

### Electric Cables

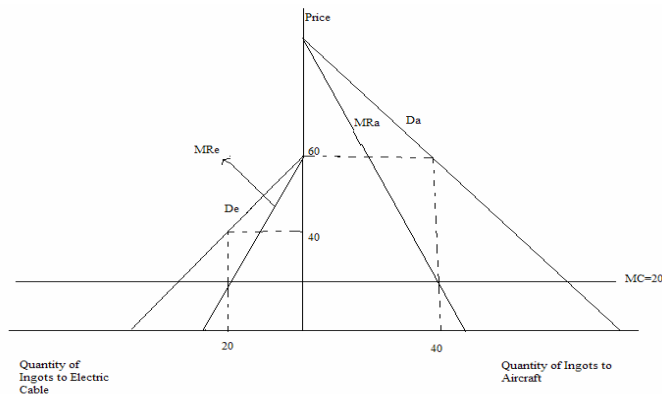
$$\begin{aligned}p_e &= 60 - q_e \\MR_e &= 60 - 2q_e \\MR_e &= MC \\60 - 2q_e &= 20 \\q_e &= 20 \\p_e &= 40 \\ \epsilon_e &= 2 \\CS_e &= 200\end{aligned}$$

### Aircraft

$$\begin{aligned}p_a &= 100 - q_a \\MR_a &= 100 - 2q_a \\MR_a &= MC \\100 - 2q_a &= 20 \\q_a &= 40 \\p_a &= 60 \\ \epsilon_a &= 1.5 \\CS_a &= 800\end{aligned}$$

$$\pi = p_e q_e + p_a q_a - c(60) = 2000$$

## 3<sup>rd</sup> Degree PD Graph



## Comparison

### Price Discrimination

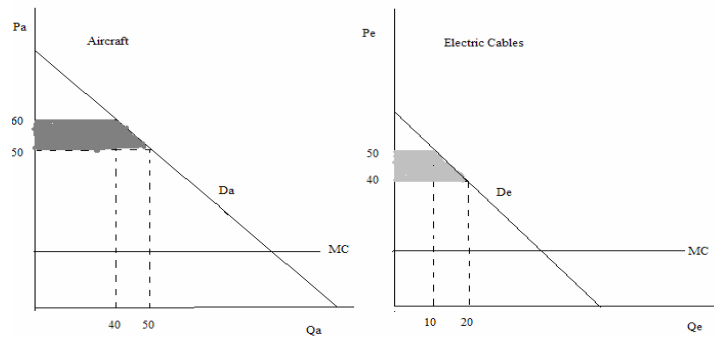
$p_a = 60$   
 $q_a = 40$   
 $CS_a = 800$   
 $p_e = 40$   
 $q_e = 20$   
 $CS_e = 200$   
 $\pi = 2000$

### Common Price

$p_a = 50$   
 $q_a = 50$   
 $CS_a = 1250$   
 $p_e = 50$   
 $q_e = 10$   
 $CS_e = 50$   
 $\pi = 1800$

Question: Does 3<sup>rd</sup> degree PD always lead to a less efficient outcome (relative to nondiscriminatory monopoly)?

## Comparison Graph



But, was 3<sup>rd</sup> 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<sup>rd</sup> 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.

## Relative Elasticities

<u>Industry</u>	<u>Elasticity</u>
Cookware	Elastic ( $\epsilon = -1.6$ )
Electric Cable	Elastic (copper substitute)
Auto Parts	Elastic ( $\epsilon = -1.5$ )
Iron and Steel	Inelastic (no substitutes)
Aircraft	Inelastic (no substitutes in 1930)

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 3<sup>rd</sup> 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