Managerial Economics & Business Strategy

Chapter 11
Pricing Strategies for Firms with Market Power
Overview

I. Basic Pricing Strategies
   - Monopoly & Monopolistic Competition
   - Cournot Oligopoly

II. Extracting Consumer Surplus
   - Price Discrimination
   - Block Pricing
   - Two-Part Pricing
   - Commodity Bundling

III. Pricing for Special Cost and Demand Structures
   - Peak-Load Pricing
   - Cross Subsidies
   - Transfer Pricing
   - Price Matching
   - Brand Loyalty
   - Randomized Pricing

IV. Pricing in Markets with Intense Price Competition
Standard Pricing and Profits for Firms with Market Power

Price

Profits from standard pricing = $8

P = 10 - 2Q

MR = 10 - 4Q

MC

Quantity

Michael R. Baye, Managerial Economics and Business Strategy, 5e.
An Algebraic Example

- \( P = 10 - 2Q \)
- \( C(Q) = 2Q \)
- If the firm must charge a single price to all consumers, the profit-maximizing price is obtained by setting \( MR = MC \).
  - \( 10 - 4Q = 2 \), so \( Q^* = 2 \).
  - \( P^* = 10 - 2(2) = 6 \).
  - Profits = \( (6)(2) - 2(2) = $8 \).
A Simple Markup Rule

- Suppose the elasticity of demand for the firm’s product is $E_F$.
- Since $MR = P[1 + E_F]/ E_F$.
- Setting $MR = MC$ and simplifying yields this simple pricing formula:
  \[ P = \left[ E_F/(1 + E_F) \right] \times MC. \]
- The optimal price is a simple markup over relevant costs!
  - More elastic the demand, lower markup.
  - Less elastic the demand, higher markup.
An Example

- Elasticity of demand for Kodak film is -2.
- \( P = \frac{E_F}{1 + E_F} \times MC \)
- \( P = \frac{-2}{1 - 2} \times MC \)
- \( P = 2 \times MC \)
- Price is twice marginal cost.
- Fifty percent of Kodak’s price is margin above manufacturing costs.
Markup Rule for Cournot Oligopoly

- Homogeneous product Cournot oligopoly.
- \( N = \) total number of firms in the industry.
- Market elasticity of demand \( E_M \).
- Elasticity of individual firm’s demand is given by \( E_F = N \times E_M \).
- Since \( P = \frac{E_F}{(1 + E_F)} \times MC \),
- Then, \( P = \frac{NE_M}{(1 + NE_M)} \times MC \).
- The greater the number of firms, the lower the profit-maximizing markup factor.
An Example

- Homogeneous product Cournot industry, 3 firms.
- MC = $10.
- Elasticity of market demand = - ½.
- Determine the profit-maximizing price?
- \( E_F = N \times E_M = 3 \times (-1/2) = -1.5. \)
- \( P = \left[ \frac{E_F}{1 + E_F} \right] \times MC. \)
- \( P = \left[ -1.5/(1-1.5) \right] \times $10. \)
- \( P = 3 \times $10 = $30. \)
First-Degree or Perfect Price Discrimination

- Practice of charging each consumer the maximum amount he or she will pay for each incremental unit.
- Permits a firm to extract all surplus from consumers.
Perfect Price Discrimination

Profits*:
\[0.5(4-0)(10 - 2) = \$16\]

Total Cost* = \$8

* Assuming no fixed costs
Caveats:

- In practice, transactions costs and information constraints make this difficult to implement perfectly (but car dealers and some professionals come close).
- Price discrimination won’t work if consumers can resell the good.
Second-Degree Price Discrimination

- The practice of posting a discrete schedule of declining prices for different quantities.
- Eliminates the information constraint present in first-degree price discrimination.
- Example: Electric utilities

Price

$10
$8
$5

MC

D

Quantity

2

4

Michael R. Baye, Managerial Economics and Business Strategy, 5e.
Third-Degree Price Discrimination

- The practice of charging different groups of consumers different prices for the same product.
- Group must have observable characteristics for third-degree price discrimination to work.
- Examples include student discounts, senior citizen’s discounts, regional & international pricing.
Implementing Third-Degree Price Discrimination

• Suppose the total demand for a product is comprised of two groups with different elasticities, $E_1 < E_2$.
• Notice that group 1 is more price sensitive than group 2.
• Profit-maximizing prices?
  • $P_1 = \left[ \frac{E_1}{1 + E_1} \right] \times MC$
  • $P_2 = \left[ \frac{E_2}{1 + E_2} \right] \times MC$
An Example

- Suppose the elasticity of demand for Kodak film in the US is $E_U = -1.5$, and the elasticity of demand in Japan is $E_J = -2.5$.
- Marginal cost of manufacturing film is $3$.
  - $P_U = \left[\frac{E_U}{1 + E_U}\right] \times MC = \left[\frac{-1.5}{1 - 1.5}\right] \times 3 = $9
  - $P_J = \left[\frac{E_J}{1 + E_J}\right] \times MC = \left[\frac{-2.5}{1 - 2.5}\right] \times 3 = $5
- Kodak’s optimal third-degree pricing strategy is to charge a higher price in the US, where demand is less elastic.
Two-Part Pricing

- When it isn’t feasible to charge different prices for different units sold, but demand information is known, two-part pricing may permit you to extract all surplus from consumers.
- Two-part pricing consists of a fixed fee and a per unit charge.
  - Example: Athletic club memberships.
How Two-Part Pricing Works

1. Set price at marginal cost.
2. Compute consumer surplus.
3. Charge a fixed-fee equal to consumer surplus.

Fixed Fee = Profits = $16
Block Pricing

• The practice of packaging multiple units of an identical product together and selling them as one package.

• Examples
  ■ Paper.
  ■ Six-packs of soda.
  ■ Different sized of cans of green beans.
An Algebraic Example

• Typical consumer’s demand is \( P = 10 - 2Q \)
• \( C(Q) = 2Q \)
• Optimal number of units in a package?
• Optimal package price?
Optimal Quantity To Package: 4 Units

Price

Quantity

MC = AC

D
Optimal Price for the Package: $24

Consumer’s valuation of 4 units = .5(8)(4) + (2)(4) = $24
Therefore, set P = $24!
Costs and Profits with Block Pricing

Price

10
8
6
4
2

Quantity

1  2  3  4  5

Profits = \[0.5(8)(4) + (2)(4)\] – (2)(4) = $16

Costs = (2)(4) = $8

MC = AC
Commodity Bundling

• The practice of bundling two or more products together and charging one price for the bundle.

• Examples
  ■ Vacation packages.
  ■ Computers and software.
  ■ Film and developing.
An Example that Illustrates Kodak’s Moment

- Total market size for film and developing is 4 million consumers.
- Four types of consumers
  - 25% will use only Kodak film (F).
  - 25% will use only Kodak developing (D).
  - 25% will use only Kodak film and use only Kodak developing (FD).
  - 25% have no preference (N).
- Zero costs (for simplicity).
- Maximum price each type of consumer will pay is as follows:
Reservation Prices for Kodak Film and Developing by Type of Consumer

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
</tr>
</tbody>
</table>
Optimal Film Price?

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
</tr>
</tbody>
</table>

Optimal Price is $8; only types F and FD buy resulting in profits of $8 x 2 million = $16 Million.

At a price of $4, only types F, FD, and D will buy (profits of $12 Million).

At a price of $3, all will types will buy (profits of $12 Million).
Optimal Price for Developing?

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
</tr>
</tbody>
</table>

At a price of $6, only “D” type buys (profits of $6 Million).
At a price of $4, only “D” and “FD” types buy (profits of $8 Million).
At a price of $2, all types buy (profits of $8 Million).

Optimal Price is $3, to earn profits of $3 x 3 million = $9 Million.
Total Profits by Pricing Each Item Separately?

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
</tr>
</tbody>
</table>

Total Profit = Film Profits + Development Profits
= $16 Million + $9 Million = $25 Million

Surprisingly, the firm can earn even greater profits by bundling!
Pricing a “Bundle” of Film and Developing
### Consumer Valuations of a Bundle

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
<th>Value of Bundle</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
<td>$11</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
<td>$12</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
<td>$10</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
<td>$5</td>
</tr>
</tbody>
</table>
What’s the Optimal Price for a Bundle?

<table>
<thead>
<tr>
<th>Type</th>
<th>Film</th>
<th>Developing</th>
<th>Value of Bundle</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>$8</td>
<td>$3</td>
<td>$11</td>
</tr>
<tr>
<td>FD</td>
<td>$8</td>
<td>$4</td>
<td>$12</td>
</tr>
<tr>
<td>D</td>
<td>$4</td>
<td>$6</td>
<td>$10</td>
</tr>
<tr>
<td>N</td>
<td>$3</td>
<td>$2</td>
<td>$5</td>
</tr>
</tbody>
</table>

Optimal Bundle Price = $10 (for profits of $30 million)
Peak-Load Pricing

- When demand during peak times is higher than the capacity of the firm, the firm should engage in *peak-load pricing*.
  - Charge a higher price ($P_H$) during peak times ($D_H$).
  - Charge a lower price ($P_L$) during off-peak times ($D_L$).
Cross-Subsidies

• Prices charged for one product are subsidized by the sale of another product.
• May be profitable when there are significant demand complementarities effects.
• Examples
  ■ Browser and server software.
  ■ Drinks and meals at restaurants.
Double Marginalization

• Consider a large firm with two divisions:
  ■ the upstream division is the sole provider of a key input.
  ■ the downstream division uses the input produced by the upstream division to produce the final output.

• Incentives to maximize divisional profits leads the upstream manager to produce where $MR_U = MC_U$.
  ■ Implication: $P_U > MC_U$.

• Similarly, when the downstream division has market power and has an incentive to maximize divisional profits, the manager will produce where $MR_D = MC_D$.
  ■ Implication: $P_D > MC_D$.

• Thus, both divisions mark price up over marginal cost resulting in a phenomenon called double marginalization.
  ■ Result: less than optimal overall profits for the firm.
Transfer Pricing

• To overcome double marginalization, the internal price at which an upstream division sells inputs to a downstream division should be set in order to maximize the overall firm profits.

• To achieve this goal, the upstream division produces such that its marginal cost, $MC_u$, equals the net marginal revenue to the downstream division ($NMR_d$):

$$NMR_d = MR_d - MC_d = MC_u$$
Upstream Division’s Problem

- Demand for the final product $P = 10 - 2Q$.
- $C(Q) = 2Q$.
- Suppose the upstream manager sets $MR = MC$ to maximize profits.
- $10 - 4Q = 2$, so $Q^* = 2$.
- $P^* = 10 - 2(2) = $6, so upstream manager charges the downstream division $6 per unit.
Downstream Division’s Problem

- Demand for the final product $P = 10 - 2Q$.
- Downstream division’s marginal cost is the $6 charged by the upstream division.
- Downstream division sets $MR = MC$ to maximize profits.
  - $10 - 4Q = 6$, so $Q^* = 1$.
  - $P^* = 10 - 2(1) = $8, so downstream division charges $8 per unit.
Analysis

- This pricing strategy by the upstream division results in less than optimal profits!
- The upstream division needs the price to be $6 and the quantity sold to be 2 units in order to maximize profits. Unfortunately,
- The downstream division sets price at $8, which is too high; only 1 unit is sold at that price.
  - Downstream division profits are $8 \times 1 - 6(1) = $2.
- The upstream division’s profits are $6 \times 1 - 2(1) = $4 instead of the monopoly profits of $6 \times 2 - 2(2) = $8.
- Overall firm profit is $4 + $2 = $6.
Upstream Division’s “Monopoly Profits”

Price

10
9
8
7
6
5
4
3
2
1

Quantity

1
2
3
4
5
6
7
8
9
10

Profit = $8

MR = 10 - 4Q

MC = AC

P = 10 - 2Q

Profit = $8
Upstream’s Profits when Downstream Marks Price Up to $8

\[ P = 10 - 2Q \]

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Profit = $4

MC = AC

MR = 10 - 4Q

MC = AC

P = 10 - 2Q
Solutions for the Overall Firm?

- Provide upstream manager with an incentive to set the optimal transfer price of $2 (upstream division’s marginal cost).

- Overall profit with optimal transfer price:

\[
\pi = 6 \times 2 - 2 \times 2 = 8
\]
Pricing in Markets with Intense Price Competition

• Price Matching
  ■ Advertising a price and a promise to match any lower price offered by a competitor.
  ■ No firm has an incentive to lower their prices.
  ■ Each firm charges the monopoly price and shares the market.

• Randomized Pricing
  ■ A strategy of constantly changing prices.
  ■ Decreases consumers’ incentive to shop around as they cannot learn from experience which firm charges the lowest price.
  ■ Reduces the ability of rival firms to undercut a firm’s prices.
Conclusion

• First degree price discrimination, block pricing, and two part pricing permit a firm to extract all consumer surplus.

• Commodity bundling, second-degree and third degree price discrimination permit a firm to extract some (but not all) consumer surplus.

• Simple markup rules are the easiest to implement, but leave consumers with the most surplus and may result in double-marginalization.

• Different strategies require different information.