Commodity Bundling and Tie-In Sales

Chapter 8: Commodity Bundling and Tie-In Sales

Introduction

• Firms often bundle the goods that they offer
  – Microsoft bundles Windows and Explorer
  – Office bundles Word, Excel, PowerPoint, Access
• Bundled package is usually offered at a discount
• Bundling may increase market power
  – GE merger with Honeywell
• Tie-in sales ties the sale of one product to the purchase of another
• Tying may be contractual or technological
  – IBM computer card machines and computer cards
  – Kodak tie service to sales of large-scale photocopiers
  – Tie computer printers and printer cartridges
• Why? To make money!
Bundling: an example

- Two television stations offered two old Hollywood films
  - *Casablanca* and *Son of Godzilla*
- Arbitrage is possible between the stations
- Willingness to pay is:

<table>
<thead>
<tr>
<th></th>
<th>Willingness to pay for <em>Casablanca</em></th>
<th>Willingness to pay for <em>Godzilla</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Station A</em></td>
<td>$8,000</td>
<td>$2,500</td>
</tr>
<tr>
<td><em>Station B</em></td>
<td>$7,000</td>
<td>$3,000</td>
</tr>
</tbody>
</table>

Total willingness to pay:

- *Station A*: $10,500
- *Station B*: $10,000

Bundling: an example 2

<table>
<thead>
<tr>
<th></th>
<th>Willingness to pay for <em>Casablanca</em></th>
<th>Willingness to pay for <em>Godzilla</em></th>
<th>Total Willingness to pay</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Station A</em></td>
<td>$8,000</td>
<td>$2,500</td>
<td>$10,500</td>
</tr>
<tr>
<td><em>Station B</em></td>
<td>$7,000</td>
<td>$3,000</td>
<td>$10,000</td>
</tr>
</tbody>
</table>
Bundling

- Extend this example to allow for
  - costs
  - mixed bundling: offering products in a bundle and separately

Bundling: another example
Chapter 8: Commodity Bundling and Tie-In Sales

Bundling: the example (cont.)

Mixed bundling
Chapter 8: Commodity Bundling and Tie-In Sales

Mixed bundling 2

- Mixed bundling 3
  - What should a firm actually do?
  - There is no simple answer
    - mixed bundling is generally better than pure bundling
    - but bundling is not always the best strategy
  - Each case needs to be worked out on its merits
An Example
Four consumers; two products; MC₁ = $100, MC₂ = $150

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Reservation Price for Good 1</th>
<th>Reservation Price for Good 2</th>
<th>Sum of Reservation Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$50</td>
<td>$450</td>
<td>$500</td>
</tr>
<tr>
<td>B</td>
<td>$250</td>
<td>$275</td>
<td>$525</td>
</tr>
<tr>
<td>C</td>
<td>$300</td>
<td>$220</td>
<td>$520</td>
</tr>
<tr>
<td>D</td>
<td>$450</td>
<td>$50</td>
<td>$500</td>
</tr>
</tbody>
</table>

The example 2

Good 1: Marginal Cost $100

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
<th>Total revenue</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$450</td>
<td>1</td>
<td>$450</td>
<td>$350</td>
</tr>
<tr>
<td>$300</td>
<td>2</td>
<td>$600</td>
<td>$400</td>
</tr>
<tr>
<td>$250</td>
<td>3</td>
<td>$750</td>
<td>$450</td>
</tr>
<tr>
<td>$50</td>
<td>4</td>
<td>$200</td>
<td>-$200</td>
</tr>
</tbody>
</table>

Good 2: Marginal Cost $150

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity</th>
<th>Total revenue</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$450</td>
<td>1</td>
<td>$450</td>
<td>$300</td>
</tr>
<tr>
<td>$275</td>
<td>2</td>
<td>$550</td>
<td>$200</td>
</tr>
<tr>
<td>$220</td>
<td>3</td>
<td>$660</td>
<td>$210</td>
</tr>
<tr>
<td>$50</td>
<td>4</td>
<td>$200</td>
<td>-$400</td>
</tr>
</tbody>
</table>
### The example 3

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Reservation Price for Good 1</th>
<th>Reservation Price for Good 2</th>
<th>Sum of Reservation Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$50</td>
<td>$450</td>
<td>$500</td>
</tr>
<tr>
<td>B</td>
<td>$250</td>
<td>$275</td>
<td>$525</td>
</tr>
<tr>
<td>C</td>
<td>$300</td>
<td>$220</td>
<td>$520</td>
</tr>
<tr>
<td>D</td>
<td>$450</td>
<td>$50</td>
<td>$500</td>
</tr>
</tbody>
</table>

Chapter 8: Commodity Bundling and Tie-In Sales

### The example 4

*Take the monopoly prices $p_1 = $250; $p_2 = $450 and a bundle price $p_B = $500*

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Reservation Price for Good 1</th>
<th>Reservation Price for Good 2</th>
<th>Sum of Reservation Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$50</td>
<td>$450</td>
<td>$500</td>
</tr>
<tr>
<td>B</td>
<td>$250</td>
<td>$275</td>
<td>$500</td>
</tr>
<tr>
<td>C</td>
<td>$250</td>
<td>$220</td>
<td>$520</td>
</tr>
<tr>
<td>D</td>
<td>$250</td>
<td>$50</td>
<td>$500</td>
</tr>
</tbody>
</table>
Chapter 8: Commodity Bundling and Tie-In Sales

Try instead the prices $p_1 = $450; p_2 = $450 and a bundle price $p_B = $520

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Reservation Price for Good 1</th>
<th>Reservation Price for Good 2</th>
<th>Sum of Reservation Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$50</td>
<td>$450</td>
<td>$500</td>
</tr>
<tr>
<td>B</td>
<td>$250</td>
<td>$275</td>
<td>$520</td>
</tr>
<tr>
<td>C</td>
<td>$300</td>
<td>$220</td>
<td>$520</td>
</tr>
<tr>
<td>D</td>
<td>$450</td>
<td>$50</td>
<td>$500</td>
</tr>
</tbody>
</table>

Bundling again

- Bundling does not always work
- Mixed bundling is always more profitable than pure bundling
- Mixed bundling is always better than no bundling
- But pure bundling is not necessarily better than no bundling
  - Requires that there are reasonably large differences in consumer valuations of the goods
- Bundling is a form of price discrimination
- May limit competition
Tie-in sales

- What about *tie-in sales*?
  - “like” bundling but proportions vary
  - allows the monopolist to make supernormal profits on the tied good
  - different users charged different effective prices depending upon usage
  - facilitates price discrimination by making buyers reveal their demands

Tie-in sales 2

- Suppose that a firm offers a specialized product – a camera – that uses highly specialized film cartridges
- Then it has effectively tied the sales of film cartridges to the purchase of the camera
  - this is actually what has happened with computer printers and ink cartridges
- How should it price the camera and film?
  - suppose also that there are two types of consumer, high-demand and low-demand, with one-thousand of each type
  - high demand \( P = 16 - Q_h \); low demand \( P = 12 - Q_l \)
  - the company does not know which type is which
Tie-in sales 3

- Film is produced competitively at $2 per picture
  - so film is priced at $2 per picture
- Suppose that the company leases its cameras
  - if priced so that all consumers lease then we can ignore production costs of the camera
    - these are fixed at 2000c
- Now consider the lease terms

Tie-in sales: an example 2

<table>
<thead>
<tr>
<th>High-Demand Consumers</th>
<th>Low-Demand Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand: $P = 16 - Q$</td>
<td>Demand: $P = 12 - Q$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity</th>
<th>$P$</th>
<th>$Q$</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2$</td>
<td>$14$</td>
<td>$16$</td>
<td>$98$</td>
</tr>
<tr>
<td>$12$</td>
<td>$10$</td>
<td>$12$</td>
<td>$50$</td>
</tr>
<tr>
<td>$16$</td>
<td>$2$</td>
<td>$2$</td>
<td>$0$</td>
</tr>
</tbody>
</table>
Tie-in sales example 3

- This is okay but there may be room for improvement
- Redesign the camera to tie the camera and the film
  - technological change that makes the camera work only with the firm’s film cartridge
- Suppose that the firm can produce film at a cost of $2 per picture
- Implement a tying strategy that makes it impossible to use the camera without this film

Tie-in sales: an example 2

Demand: \( P = 16 - Q \)

- High-Demand Consumers
  - \( P = 16 - Q \)
  - \( \$32 \) at \( Q = 8 \)
  - \( \$24 \) at \( Q = 12 \)

- Low-Demand Consumers
  - \( P = 12 - Q \)
  - \( \$32 \) at \( Q = 8 \)
  - \( \$16 \) at \( Q = 12 \)
Tie-in sales example 3

- Why does tying increase profits?
  - high-demand consumers are offered a quantity discount under both the original and the tied lease arrangement
  - but tying solves the identification and arbitrage problems
    - film exploits its monopoly in film supply
    - high-demand consumers are revealed by their film purchases
    - quantity discount is then used to increase profit
    - arbitrage is not an issue: both types of consumers pay the same lease and the same unit price for film

Tie-in sales example 4

- Can the firm do even better?
- Redesign the camera so that the film cartridge is integral
  - offer two types of integrated camera/film package: high capacity and low capacity
  - what capacities?
- This is similar to second-degree price discrimination
  - design two cameras with socially efficient capacities: 10 picture and 14 picture
  - lease these as integrated packages
Chapter 8: Commodity Bundling and Tie-In Sales

Tie-in sales: an example 2

Complementary goods

- Complementary goods are goods that are consumed together
  - nuts and bolts
  - PC monitors and computer processors
- How should these goods be produced?
- How should they be priced?
- Take the example of nuts and bolts
  - these are perfect complements: need one of each!
- Assume that demand for nut/bolt pairs is:
  \[ Q = A - (P_B + P_N) \]
Chapter 8: Commodity Bundling and Tie-In Sales

Complementary goods 2
This demand curve can be written individually for nuts and bolts
For bolts: \( Q_B = A - (P_B + P_N) \)
For nuts: \( Q_N = A - (P_B + P_N) \)
This gives the inverse demands: \( P_B = (A - P_N) - Q_B \)
\( P_N = (A - P_B) - Q_N \)
These allow us to calculate profit maximizing prices
Assume that nuts and bolts are produced by independent firms
Each sets \( MR = MC \) to maximize profits
\( MR_B = (A - P_N) - 2Q_B \)
\( MR_N = (A - P_B) - 2Q_N \)
Assume \( MC_B = MC_N = 0 \)

Complementary goods 3
Therefore \( Q_B = (A - P_N)/2 \)
and \( P_B = (A - P_N) - Q_B = (A - P_N)/2 \)
by a symmetric argument \( P_N = (A - P_B)/2 \)
The price set by each firm is affected by the price set by the other firm
In equilibrium the price set by the two firms must be consistent
Chapter 8: Commodity Bundling and Tie-In Sales

Complementary goods 4

\[ P_B = \frac{A - P_N}{2} \]
\[ P_N = \frac{A - P_B}{2} \]
\[ \therefore P_N = \frac{A}{2} - \frac{A - P_N}{4} = \frac{A}{4} + \frac{P_N}{4} \]
\[ \therefore 3P_N/4 = A/4 \]
\[ \therefore P_N = A/3 \]
\[ \therefore P_B = A/3 \]
\[ \therefore P_B + P_N = 2A/3 \]

Profit of the Bolt Producer
\[ = P_BQ_B = \frac{A^2}{9} \]

Profit of the Nut Producer
\[ = P_NQ_N = \frac{A^2}{9} \]

Complementary goods 5

What happens if the two goods are produced by the same firm?
The firm will set a price \( P_{NB} \) for a nut/bolt pair.
Demand is now \( Q_{NB} = A - P_{NB} \) so that \( P_{NB} = A - Q_{NB} \)

\[ \therefore MR_{NB} = A - 2Q_{NB} \]
\[ MR = MC = 0 \]
\[ \therefore Q_{NB} = \frac{A}{2} \]
\[ \therefore P_{NB} = A/2 \]

Profit of the nut/bolt producer is \( P_{NB}Q_{NB} = \frac{A^2}{4} \)
Complementary goods 6

- Don’t necessarily need a merger to get these benefits
  - product network
    - ATM networks
    - airline booking systems
  - one of the markets is competitive
    - price equals marginal cost in this market
    - leads to the “merger” outcome
- There may also be a countervailing force
  - network externalities
    - value of a good to consumers increases when more consumers use the good

Network externalities

- Product complementarities can generate network effects
  - Windows and software applications
    - substantial economies of scale
    - strong network effects
  - leads to an applications barrier to entry
    - new operating system will sell only if applications are written for it
    - but...
- So product complementarities can lead to monopoly power being extended
Anti-trust and bundling

• The Microsoft case is central
  – accusation that used power in operating system (OS) to gain control of browser market by bundling browser into the OS
  – need to show
    • monopoly power in OS
    • OS and browser are separate products that do not need to be bundled
    • abuse of power to maintain or extend monopoly position
  – Microsoft argued that technology required integration
  – further argued that it was not “acting badly”
    • consumers would benefit from lower price because of the complementarity between OS and browser

Microsoft and Netscape

• Complementarity products
  – so merge?
  – what if Netscape refuses?
  – then Microsoft can develop its own browser
  – MC ≈ 0 so competition in the browser market drives price close to zero
  – but then get the outcome of merger firm through competition

• So Microsoft is not “acting badly”
• But
  – JAVA allows applications to be run on Internet browsers
  – Netscape then constitutes a threat
  – need to reduce their market share
And now…

- This view gained more force and support in Europe
  - bundling of Media Player into Windows
  - Competition Directorate found against Microsoft
    - no on appeal

Antitrust and tying arrangements

- Tying arrangements have been the subject of extensive litigation
- Current policy
  - tie-in violates antitrust laws if
    - there exists distinct products: tying product and tied one
    - firm tying the products has sufficient monopoly power in the tying market to force purchase of the tied good
    - tying arrangement forecloses or has the potential to foreclose a substantial volume of trade