Marketing Tactics : Bundling, Upgrading and Dealerships

Chapter 14. Bundling and Tying

Slides Reference:

Industrial Organization: Markets and Strategies

Chapter 14. Learning objectives

- Identify the difference between bundling (mixed and pure) and tying.
- Understand how a monopolist can use bundling and tying as a price discrimination device.
- Analyse the effects of bundling on competition in oligopolistic markets.
- Understand how bundling, depending on the circumstances, leads to a softer or a tougher price competition.

Selling different products in a single package

- Definitions
  - Bundling → fixed proportions [VS Block Pricing]
    - *Pure* bundling: only the package is available
    - *Mixed* bundling: combined products are also sold separately
    - Example: software suite
  - Tying → proportions might vary in the mix of goods
    - Example: printer and cartridges
- Rationales
  - Strong complementarities between goods
  - Supply side: cost efficiencies
  - Demand side:
    - Entry-deterrent strategy → chapter 8
    - Price discrimination device → what we study here.

Case. Bundling in the information economy

- Content
  - Subscriptions to cable TV, to magazines
  - CDs (bundle of songs), newspapers (of articles)
  - Software: ‘office suite’, integration of various functionalities into the same software platform
  - Theatres forced to buy ‘good’ and ‘bad’ movies from the same distributor
- Infrastructure
  - Computer systems
  - Audio equipment (mixed bundling)
  - Photocopier (machine + maintenance)
  - Early IBM computers (machine + punch-cards $\rightarrow$ tying)

Formal analysis of monopoly bundling

- Bundling ≈ menu pricing
  - If bundle price < sum of prices of components → non linear pricing with quantity discounts
  - Twisted form of menu pricing: set unique price for several goods to ↓ consumer heterogeneity
- Illustration
  - 2 products (produced at zero cost), 2 consumers
  - Valuations

	Product 1	Product 2
Consumer 1	3	2
Consumer 2	2	3

Negative correlation
But result holds more generally

  - Separate sales: $p_1 = p_2 = 2,\ \pi = 8$
  - Bundling: $p = 5,\ \pi = 10$

Formal analysis of monopoly bundling/Tying

- A More Complicated Example
  - 2 products (produced at zero cost), 2 consumers
  - Valuations

	Product X	Product Y
Consumer 1	4	0
Consumer 2	3	3
Consumer 3	0	4

  - Separate sales: $p_X = p_Y = 3,\ \pi = 12;\ p_X = p_Y = 4,\ \pi = 8$
  - Pure Tying: $p^T = 4,\ \pi = 12;\ p^T = 6,\ \pi = 6$
  - Mixed Tying: $p^{MT} = 6\ \&\ p_X = p_Y = 4\ ,\ \pi = 14 > 12$

Formal analysis of monopoly bundling (cont'd)

- **Lesson**: If consumers have heterogeneous but uncorrelated valuations for 2 products, then the monopolist ↑ its profits under pure bundling compared to separate selling. It ↑ its demand by selling the bundle cheaper than the combined price under separate selling.

- **Lesson**: Mixed bundling allows the monopolist to increase its profits even further than pure bundling. Here, bundle is more expensive than under pure bundling and individual components are more expensive than under separate selling.

Mixed tying may yield strictly higher profit levels than pure tying and no tying. But NOT always.

Case. Popcorn in movie theatres

- Why does popcorn cost so much at the movies?
  - Theatres optimally choose to shift profits from admission tickets to concessions because they can ‘meter’ the surplus extracted from a customer by how much of the aftermarket good they demand.
  - If true, positive correlation between willingness to pay for movies and demand for concessions.
  - Hartmann and Gil (2008) confirms this conjecture by analysing a data set with approximately 5 years of weekly attendance, box office revenue and concession revenue for a chain of 43 Spanish movie theatres.

Tying and Foreclosure

- Bundling is often used by competing firms.
- Motivation?
  - Entry deterrence → analyzed in Chapter 8
  - Two firms: produce computers, X and Y
  - One firm produces monitor, Z (compatible with X&Y)
  - Two types of consumers:

$$U^1 \equiv \begin{cases} 3 - p_X - p_Z & \text{buys } X \text{ and } Z \\ 1 - p_Y - p_Z & \text{buys } Y \text{ and } Z \\ 0 & \text{Otherwise} \end{cases} \qquad (14.2)$$

$$U^2 \equiv \begin{cases} 1 - p_X - p_Z & \text{buys } X \text{ and } Z \\ 3 - p_Y - p_Z & \text{buys } Y \text{ and } Z \\ 0 & \text{Otherwise.} \end{cases}$$

  - Three independent firms:

$p_X = p_Y = 2$, $p_Z = 1$; $\pi_X = \pi_Y = \pi_Z = 2$

$(p_X, p_Y, p_Z) = (1,1,2)$, $(0,0,3)$ and $(3,3,0)$

When bundling toughtens price competition

- Firm X takes over firm Z
  - $p_{XZ} = 3$, No one wants a computer with no monitor, so firm Y will be out of business. (p_Y =0)
  - Tying can serve as a tool for foreclosing a competing firm.
  - However, π_{XZ} =3<2+2. So foreclosure is not profitable for the tying firm.

When bundling toughtens price competition

- ε-Foreclosing
  - Firm X still takes over firm Z, but
  - $p_{XZ} = 3-\varepsilon$, so that firm Y can charge $p_Y = \varepsilon$ and stay in the market.
  - Not completely foreclose firm Y, instead let him stay in the market and leave him a small amount of profit.
  - $\pi_{XZ} = 2(3-\varepsilon)$ both consumers buy
  - $p_Y = \varepsilon$, $\pi_Y = \varepsilon$ consumer2 buys system XY and then use computer 2 to replace computer 1 in the bundle
  - ε-Foreclosing equilibrium yields a higher profit level to the forcloseing firm than does the total foreclosure equilibrium.

When bundling toughtens price competition (cont'd)

- Tying and International Market Segmentation
  - A world monopoly serving two countries, with one consumer in each country.
  - The monopoly can sell product only or tied with product service
  - Utility function of the consumer in country k, k=1, 2, is:

$$U_k = \begin{cases} B_k + \sigma - p_k^S & \text{if he or she buys the product with service} \\ B_k - p_k^{NS} & \text{if he or she buys with no service} \\ 0 & \text{if he or she does not purchase the product} \end{cases} \quad (14.3)$$

  - Assume that conusmer in country 1 is willing to pay a higher price for the basic product than the consumer in country 2, that is B1>B2.

When bundling toughtens price competition (cont'd)

- No Attempt to segment the market
  - Charge identical price(uniform pricing) to avoid arbitrage
  - $$p_k^{NS} = \begin{cases} B_2 & \text{if } B_1 < 2B_2 \\ B_1 & \text{if } B_1 > 2B_2 \end{cases} \quad \pi^{NS} = \begin{cases} 2B_2 & \text{if } B_1 < 2B_2 \\ B_1 & \text{if } B_1 > 2B_2. \end{cases} \quad (14.4)$$

- Segmenting the market through Tying
  - Open dealership in each country selling product tied with local service
  - $p_k^S = B_k + \sigma \quad \text{and} \quad \pi^S = B_1 + B_2 + 2(\sigma - w). \qquad (14.5)$
  - A sufficient condition for the international monopoly to segment the international market into two national markets bit providing local services is that B1 > B2 + 2(w - σ).
- Room for arbitrage after segmentation?
  - $B_1 - p_2 < B_1 + \sigma - p_1, \quad \text{implying that } p_1 - p_2 < \sigma,$
  - $B_1 - B_2 < \sigma, \qquad (14.6)$ valuation of service is higher than the difference in valuation for two basic products.

When bundling softens price competition (cont'd)

- Tying as product differentiation
  - Choice of tie product with service
  - Consumers value service differently, s ϵ[0,1]
  - $$U^s = \begin{cases} B - p^N & \text{if the product is bought without services} \\ B + s - p^S & \text{if bought tied with services.} \end{cases} \quad (14.7)$$

- Both firms tie services, or neither does
  - pN = m, or pS = m + w.
  - Both firms have zero profit.
- One firm ties services
  - Marginal consumer: indifferent between two products
  - $$\hat{s} = \begin{cases} 1 & \text{if } p^S - p^N \geq 1 \\ p^S - p^N & \text{if } 0 < p^S - p^N \leq 1 \\ 0 & \text{if } p^S \leq p^N. \end{cases} \quad (14.8)$$
  - π_S=(ps-m-w)(1-s) π_N=(pN-m)*s
  - Focs: $0 = \frac{\partial \pi^S}{\partial p^S} = 1 - 2p^S + p^N + m + w$ and $0 = \frac{\partial \pi^N}{\partial p^N} = p^S - 2p^N + m.$ (14.9)

When bundling softens price competition

- Result
  - $$p^S = \begin{cases} p^N & \text{if } p^N > m+w+1 \\ \frac{1}{2}(1+m+w+p^N) & \text{if } m+w-1 \le p^N \le m+w+1 \\ [p^N+1, \infty) & \text{if } p^N < m+w-1 \end{cases} \quad (14.10)$$

    $$\text{and} \quad p^N = \begin{cases} p^S - 1 & \text{if } p^S > m+2 \\ \frac{1}{2}(m+p^S) & \text{if } m \le p^S \le m+2 \\ [p^S, \infty) & \text{if } p^S < m. \end{cases}$$

    $$\bar{p}^S = \frac{2}{3}(1+w)+m; \quad 1-\bar{s} = \frac{1}{3}(2-w); \quad \bar{\pi}^S = \frac{1}{9}(2-w)^2 \quad (14.11)$$

    $$\bar{p}^N = \frac{1}{3}(1+w)+m; \quad \bar{s} = \frac{1}{3}(1+w); \quad \bar{\pi}^N = \frac{1}{9}(1+w)^2.$$

  - The first stage: tying versus not tying
  - Both firms enjoy positive profit due to product differentiation.

When bundling softens price competition

- Social optimal service level
  - ps=m+w pn=m
  - S*=ps-pn=w
  - When w>1/2, s>s*
  - When w<1/2, s<s*
  - Nonservicing firm charges a higher markup

$$\frac{\bar{p}^S-(m+w)}{m+w}=\frac{2-w}{3(m+w)}<\frac{1+w}{3m}=\frac{\bar{p}^N-m}{m}. \qquad (14.12)$$

Killing off Markets for Used Textbooks

- Two period Model
  - Each generation has n students. The utility of generation t student is:
  - $$U_t \equiv \begin{cases} V - p_t & \text{if the student buys a book} \\ 0 & \text{if the student does not buy the book.} \end{cases} \qquad (14.13)$$
  - Unit production cost of a book is c>0
  - In the second period, the monopoly can invest an amount of F to revise the textbook and to introduce a new edition.
  - In period 1, monopoly chooses p1; in period 2 monopoly determines whether to introduce the new edition, with price p2N or P2U.

Killing off Markets for Used Textbooks

- 2nd period decision
  - Introduce new edition: $\pi_2^N|_{p_2^N=V} = n(V-c) - F.$ (14.14)
  - Selling old edition: $p_2^U = c$ and $\pi_2^U = 0.$ (14.15)
  - New edition if F<n(V-c)
  - Publisher's profit from two-periods is:

$$\pi = n(p_1 - c) + \pi_2 = \begin{cases} n(V-c) + n(V-c) - F & \text{if } F < n(V-c) \\ n(V+c-c) + 0 & \text{if } F > n(V-c). \end{cases} \quad (14.17)$$

  - Note: when selling old version in period 2, publisher charges V+c in period 1.
  - Social welfare:

$$W \equiv U_1 + U_2 + \pi = \begin{cases} n(V-c) + n(V-c) - F & \text{new edition} \\ nV + n(V-c) & \text{no revision.} \end{cases} \quad (14.18)$$

  - Thus, *A new edition is socially undesirable*.

Different types of dealerships:

- The common, vertical restraints, arrangements between manufacturers and distributors are:
  - Exclusive territory:

    - only dealer serves an exclusive territory.
  - Exclusive dealership:

    -Dealer can't sell competing brands.
  - Full-line forcing:

    -Dealer is committed to sell all the varieties of the manufacturers' products.
  - Resale price maintenance

    - Dealer agrees to sell in a certain price range, i.e. either a minimum or maximum price set by the manufacturer.

Double Marginalization

- Demand for the product: p=a-Q
  - Unit procument cost: d
  - $\max_Q \pi^d \equiv p(Q)Q - dQ = (a-Q)Q - dQ.$ (14.19)
  - $0 = \frac{\partial \pi^d}{\partial Q} = a - 2Q - d.$
  - $Q^d = \frac{a-d}{2}$, $p^d = \frac{a+d}{2}$, and $\pi^d = \frac{(a-d)^2}{4}$. (14.20)
- Manufacturer's problem:
  - $\max_d \pi^M \equiv (d-c)Q^d = (d-c)\left(\frac{a-d}{2}\right)$. (14.21)
  - $0 = \frac{\partial \pi^M}{\partial d} = a - 2d + c$ yielding $d^M = \frac{a+c}{2}$. (14.22)
  - $Q^d = \frac{a-c}{4}$, $p^d = \frac{3a+c}{4}$, $\pi^d = \frac{(a-c)^2}{16} < \pi^M = \frac{(a-c)^2}{8}$. (14.23)
- Manufacturer's profit > dealer profit
- Direct-marketing profit >manufacturer+dealer profit: two markup, p is too high, q is too small

Two-part Tariff to Resolve Double Marginalization

- Two-part tariff contract:
  - $d = c \quad and \quad \phi = \frac{(a-c)^2}{4}$
  - *yields the pure monopoly profit to the manufacturer and no loss to the dealer*
  - Why?
  - Same logic as before:

    fixed part extract surplus; variable part to cover production cost;

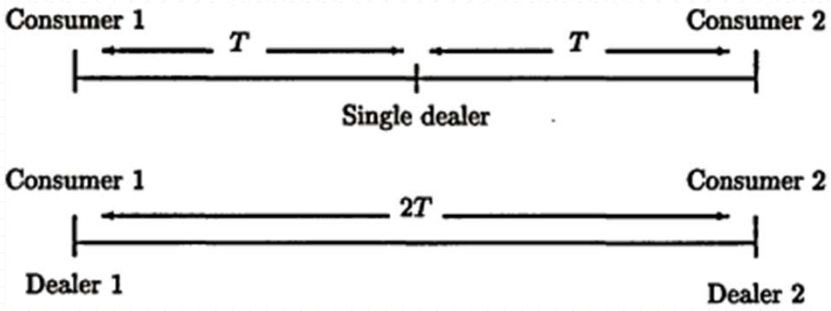
    monopoly quantity is achieved; while dealer profit =0,

Resale Price Maintenance and Advertising

- Resale Price Maintenance (RPM)
  - Two goals: resolve low industry profit under double marginalization; induce dealer's marketing efforts
  - One manufacturer sells to two dealers competing in price (Bertrand competition)
  - P=sqroot(A)-Q, which A=A1+A2 denotes aggregate advertising level.
  - Without RPM, two dealers compete away all profits, no one advertises.
  - RPM Pf>=d
  - Dealer profit: $\max_{A_i} \pi_i^D = \frac{\sqrt{A_i + A_j} - p^f}{2}(p^f - d) - A_i.$
  - FOC: $0 = \frac{\partial \pi_i^D}{\partial A_i} = \frac{p^f - d}{4\sqrt{A_i + A_j}} - 1,$
  - Thus $A_1 + A_2 = \left(\frac{p^f - d}{4}\right)^2.$ (14.25)
  - Advertising spending (marketing effort) increases in pf

Territorial Dealerships

- Single vs multiple dealers
  - Dealer needs to invest F
  - Dealership possible location:



  - Demand

$$U^i \equiv \begin{cases} B - T - p & \text{if he or she buys from center dealer} \\ B - p_i & \text{if he or she buys from the nearby dealership} \\ B - 2T - p_j & \text{if he or she buys from the other side of town} \\ 0 & \text{if he or she does not buy.} \end{cases} \quad (14.26)$$

Exclusive Territory Dealership (town center)

- Dealer is monopoly for selling the product in town
  - PD=B-T, dealer profit=2(B-T-d)-F
  - Manufacturer charges wholesale price d, such that
  - 2(B-T-d)-F=0, so we have d=(B-T)-F/2
  - Manufacturer's profit=2(B-T)-F
- Two Dealerships case:
  - Undercutting proof equilibrium
  - $\pi_1^D = p_1^D - d - F \geq 2(p_2^D - 2T - d) - F$ and $\pi_2^D = p_2^D - d - F \geq 2(p_1^D - 2T - d) - F.$
  - each dealer sells to the nearby consumers, not profitable to undercut the rival dealer by 2T
  - When above condition holds, dealer/manufacturer are monopoly, we have

PD=B, d=B-F, which holds when F<4T or T>F/4

Territory Dealerships

- Two dealerships vs one dealer ship
  - Large town if T>F/4
  - Manufacturer profit=2(B-T)-F VS profit=2(B-F)
  - 2T<F<4T, one dealer at town center; F<2T, two dealers at town edges.
- Small town case: T<F/4

  when T>F/4, $\pi_i^D = B-(B-F)-F \geq 2[B-2T-(B-F)]-F$

  when T<F/4, price competition leads to negative profit for dealers
  - Small town: one dealer at the center of the town
- Imposed territorial-exclusive dealerships

  The manufacturer can impose territorial exclusive dealerships (i.e. each seller only serves half of the town [0, ½) or (1/2, 1]). Yet, manufacturer's profit is higher under single dealership.