Chapter 5 Pricing Tactics

- Two- Part Tariff
- Nonuniform Pricing
- Peak-Load Pricing

Club-visiting consumers

Consumer's budget constraint

$$m + \phi + pQ \le I$$

Consumer's utility function

$$U = m + 2\sqrt{Q}$$

Consumer's utility-maximization problem

$$\max_{Q} U = I - \phi - pQ + 2\sqrt{Q}$$

Demand function

$$p = \frac{1}{\sqrt{Q^d}}; Q^d = \frac{1}{p^2}$$ ⇨ Firm's profit $\pi = pQ = \frac{1}{\sqrt{Q}} Q = \sqrt{Q}$

Club-visiting consumers

No club annual membership dues

⇨ $\pi = pQ = \frac{1}{\sqrt{Q}} Q = \sqrt{Q}$ (Φ_1)

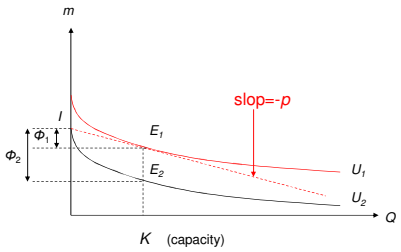
Annual membership dues

$$\max_{\phi} \pi = \phi$$

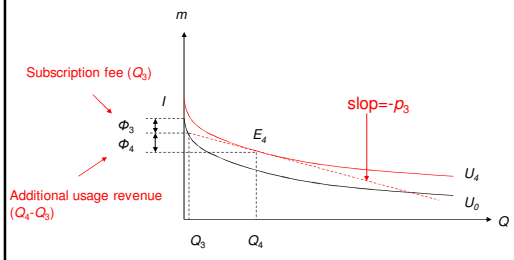
$$s.t.\ \ I - \phi + \sqrt{2Q} \ge I$$

⇨ $\phi = 2\sqrt{Q}$ (Φ_2)

Usage VS Membership pricing

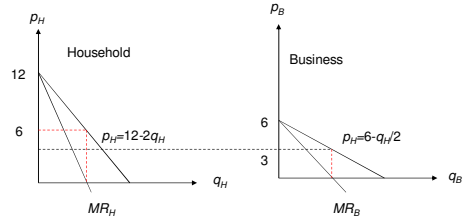


Usage VS Membership pricing



Nonuniform Pricing

Price discrimination



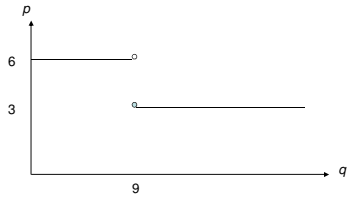
Assume *MC=0*

⇨ $MR_H(Q_H)=MR_B(Q_B)=MC(Q_H+Q_B)=0$

⇨ $p_H=6$, $p_B=3$, $q_H=3$ $q_B=6$

Nonuniform Pricing (cont')

• **Regular Rate program**: Pay 6 cents per phone call
• **Quantity Discount Program**: Pay a reduced rate of 3 cents per phone call but be charged for at least 9 phone calls



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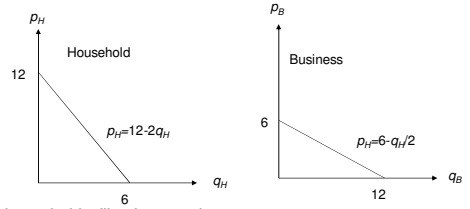
Nonuniform Pricing (cont')



The household will select regular program

$$CS_H(regular, p=6, q=3)=\frac{6\times 3}{2}\geq \frac{12\times 6}{2}-3\times 9=CS_H(discount, p=3, q=9)$$

The business customers will select discount program

$$CS_B(discount, p=3, q=9)=\frac{(6-1.5)\times 9}{2}+1.5\times 9-3\times 9=6.75>0=CS_B(regular, p=6, q=0)$$

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Peak-Load Pricing

- Peak-load pricing tends to be efficient and profitable when demand is periodic, and when the investment in capacity is irrevocable in the short run
- The characteristics of peak-load pricing problem
  - The levels at which demand varies between periods
  - Capital has to be rented or released for a long period
  - The firm's output is too costly or impossible to store

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Peak-Load Pricing (cont')

- Consider a monopoly airline company flying on a single route during high (*H*) and low (*L*) seasons
- p^H, q^H,p^L,q^L denote the price and quantity of tickets in the high and low seasons, respectively, the demand in each season is given by

  $p^H=A^H-Q^H$ and $p^L=A^L-Q^L$,$A^H>A^L>0$

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Peak-Load Pricing (cont')

- The monopoly faces two type of cost
  - Capacity cost (unit capacity cost= *r*)
  - Variable cost (unit operational cost= *c*)
- Airline total cost

  $TC(Q^H,Q^L,K)=c(Q^H+Q^L)+rK$

  for $0<Q^L<Q^H<K$

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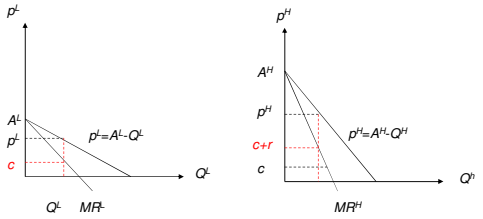
Peak-Load Pricing (cont')



$$\Rightarrow\quad p^H=\frac{A^H+c+r}{2}>\frac{A^L+c}{2}=p^L$$

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Control the Season

- Consider an industry selling a particular service in two time periods, say, during the day, or during the night
- Denote p_D the price of service sold during the day and p_N the price sold during the night
- A continuum of consumers and uniformly distributed on the closed interval $[a,b]$, where $b>a>=0$ and $b>1$. We denote by δ a particular consumer indexed on [a,b].
- The utility of consumer δ is given by

$$U^{\delta} = \begin{cases} \beta\delta - p_D & \text{if she buys a day service} \\ \beta - p_N & \text{if she buys a night service} \\ 0 & \text{if she does not buy any service} \end{cases}$$

Control the Season (cont')

- All day and nigh services
  - are vertically differentiated if $a>=1$
  - are horizontal differentiated if $0=<a<1$
- The consumer index by $\hat{\delta}$ denotes the consumer who is indifferent about whether to buy a day service or a night service at the given market prices for these services

$$\hat{\delta} = \frac{\beta + p_D - p_N}{\beta}$$

- All consumer indexed by $\delta \in [a, \hat{\delta})$ purchase the night service, whereas all consumers indexed by $\delta \in (\hat{\delta}, b]$ buy the day service

Control the Season (cont')

- Denote n_D the number of consumers buying a daytime service and by n_N the number of consumers buying nighttime service. $n_D + n_N <= b-a$
- Denote K the capacity of a service-producing firm. $n_D<K$ and $n_N<K$.
- Denote r the cost of a unit capacity facing the firm. c_D the per customer operation cost of producing a day service, and by c_N the cost of night service

Control the Season (cont')

- Assume that all consumers are served

$$n_N = \hat{\delta} - a \qquad n_D = b - \hat{\delta}$$

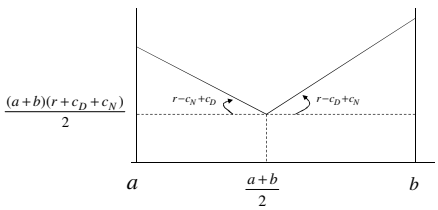
- The total cost is given by

$$TC(\hat{\delta}) = r\max\{\hat{\delta} - a, b - \hat{\delta}\} + (\hat{\delta} - a)c_N + (b - \hat{\delta})c_D$$

- The marginal cost as a function of the indifferent consumer is given by

$$MC(\hat{\delta}) = \begin{cases} -r + c_N - c_D & \text{if } \hat{\delta} < (a+b)/2 \\ +r + c_N - c_D & \text{if } \hat{\delta} > (a+b)/2 \end{cases}$$

Control the Season (cont')



Control the Season (cont')

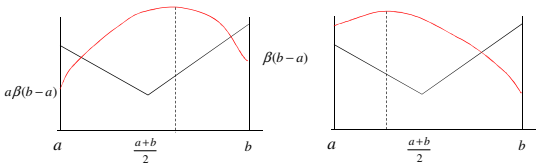
- The monopoly seeks to extract maximum surplus from consumer
  - Charge a price of $p_N = \beta$ for a night service
  - Charge a price of $p_D = \beta\hat{\delta}$ for a day service
- The revenue is given by

$$TR(\hat{\delta}) = p_N n_N + p_D n_D = \beta(\delta - a) + \beta\hat{\delta}(b - \delta)$$

- The marginal revenue is given by

$$MR(\hat{\delta}) = \beta(1+b) - 2\beta\delta$$

Control the Season (cont')



Horizontal : a<1

Vertical : a >1

Control the Season (cont')

- Given $\gamma > |c_D - c_N|$, a monopoly that maximizes profit will set prices so that services are purchased in both periods such that
  - Under vertical differentiation

$$\hat{\delta} = \min\{\frac{\beta(1+b)+r+c_D-c_N}{2\beta}; \frac{a+b}{2}\}$$

  - Under horizontal differentiation

$$\hat{\delta} = \max\{\frac{\beta(1+b)-r+c_D-c_N}{2\beta}; \frac{a+b}{2}\}$$