Consumer Economics and Pricing Strategies

Claire Chambolle, Philippe Choné & Laurent Linnemer

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Roadmap

The Class

1. Retail pricing strategies (7h30, Claire)
2. Dynamic pricing (10h30, Philippe)
3. Reputation and advertising (6h, Laurent)

Oral Exam based on research papers (30 minutes)!

5-courses of 1h30

Retailing

→ Retail Pricing Strategies: Multi-product/ Multi-Market (29/01/2020)

→ Empirical Analysis: The Effect of a French Retail Merger on Prices (29/01/2020)

Vertical relations

→ Vertical Relation (Part I) - Contracts (05/02/2020)

→ Vertical Relation (Part II)- Buyer Power (05/02/2020)

→ Empirical Analysis: The effect of Authorizing Wholesale Price Discrimination on Prices (26/02/2020)

Course 1: Retail pricing strategies

Firms (in particular retailers) are intrinsically multi-product => Direct consequences on pricing strategies

1. Loss-leading
2. Bundling

Big retail chains compete on several local markets

3. Local vs uniform pricing (France vs UK)

Loss-Leading

- A practice that is common in many large stores who sell “leader products" at loss;
  - Loss leaders are mainly “staples such as milk and dairy, alcohol, bread and bakery products that consumers purchase repeatedly and regularly;"
  - Loss leaders can also be luxury products (Champagne)
- A practice that is often regulated:
  - In Germany, the highest court upheld in 2002 a decision of the Federal Cartel Office enjoining Wal-Mart to stop selling basic food items (such as milk and sugar) below its purchase cost, confirming that a firm" with superior market power in relation to small and medium-sized competitors" should not price below cost.
  - Resale below cost laws in many countries (France, Ireland, US state laws for specific products...).

- A single product monopoly who faces a demand $q(p)$ sets its price "p" according to the Lerner index:

$$L = \frac{p-c}{p} = 1/\epsilon \;\; \texttt{where} \;\; \epsilon = -\frac{\partial q}{\partial p}\frac{p}{q} \qquad (1)$$

- A multiproduct monopoly who faces a demand $q_i(p_i, p_j)$ for its product i sets its prices p_i and p_j by internalizing the effect of p_j on the demand for good i...
- ...which exists as long as products' demand are "linked"
  - Products are substitutes ($\frac{\partial q_i(p_i,p_j)}{\partial p_j} > 0$ (ex: product within the same product category (Sodas, fresh juices, mineral water...)
  - Products are complements ($\frac{\partial q_i(p_i,p_j)}{\partial p_j} < 0$ (ex: Fries and ketchup, meat and red wine, ...)
  - Products are often "independents" (vegetables & shampoo) but become "complements" due to shopping costs!!

- Formally, assume the marginal costs are c_i and c_j;

The multiproduct monopoly maximizes: $\pi = (p_i - c_i)q_i + (p_j - c_j)q_j$
=>FOC's (for $i = 1, 2$)

$$(p_i - c_i)\frac{\partial q_i}{\partial p_i} = -q_i - (p_j - c_j)\frac{\partial q_j}{\partial p_i}$$

which rewrites:

$$\frac{(p_i - c_i)}{p_i} = L_i = \frac{1}{\epsilon_i} + \frac{(p_j - c_j)}{p_i}\,\frac{\frac{\partial q_j}{\partial p_i} \;\; \lesseqgtr 0}{-\frac{\partial q_i}{\partial p_i} \;\; > 0}$$

Multiproduct monopoly pricing

A multiproduct firm monopoly sets:

- higher prices than separate monopolies (each controlling a single output) when goods are substitutes
- lower prices than separate monopolies when goods are complements

It is possible to have $L_i < 0$=> loss-leading!!

Remember

- One-stop shopping behavior creates complementarity between independent goods
- A retailer sell products with the highest demand elasticity below cost and then sell other products in the store with higher margins!!!
- Such practice naturally arises absent any competition motive!!! It is inherent to the “multi-product" nature of the seller.
- Bliss (1988) extends the Ramsey rule to a framework of imperfect competition when consumers are one-stop shoppers.

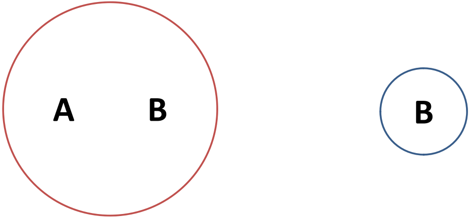
Supermarket vs Hard discount: A simple example

Chen and Rey (2012)

- Two retailers L and S compete in a local market
- L offers a broader range of products (A and B) than S (B)
- S has a lower unit cost on B (Hard-discount): $c_B^L > c_B^S$

Large store: L (Supermarket)

Small store: S (Hard-discount)



$c_B^L = 4$

$c_B^S = 2$

Supermarket vs Hard discount: A simple example

Demand

- Each consumer is willing to buy one unit of A and B
- Homogenous valuations: $u_A = 10$ for A, $u_B = 6$ for B
  $\rightarrow$ eliminates cross-subsidization motive based on different elasticities
- Complete information $\rightarrow$ no role for (informative) advertising
- Heterogeneous shopping costs:
  - Half shoppers have high shopping costs: $h = 4$ per store: One-stop shoppers;
  - The other half incurs no shopping cost: multi-stop shoppers.

Benchmark 1: L is a monopoly who can perfectly discriminate among consumers

L will set lower prices for consumers who have high shopping costs (personalized prices): p^h for the one-stop shoppers and p for the multi-stop shoppers.

- For one-stop shoppers consumers: L sets $U_A + U_B - p^h - h = 0$ and thus $p^h = 12$ with $(p_A^h \leq U_A$ and $p_B^h \leq U_B)$. Its profit is $\pi_L = p^h - c_B^L = 12 - 4 = 8$.
- For multi-stop shoppers: $U_A + U_B - p = 0$ and thus set $p = 16$ with $(p_A \leq U_A$ and $p_B \leq U_B)$. Its profit is $\pi_L = (p - c_B^L) = 12$.

Equilibrium

A monopolist that could discriminate earns at most $\pi_L = \frac{1}{2}8 + \frac{1}{2}12 = 10$

Benchmark 2: L is a monopoly

L can follow two strategies:

- To serve all consumers: $U_A + U_B - p^m - h = 0$ and thus set $p^m = p_A + p_B = 12$ with $p_A \leq U_A$ and $p_B \leq U_B$. Its profit is $\pi_L = p^m - c_B^L = 12 - 4 = 8$.
- To serve only multi-stop shoppers: $U_A + U_B - p = 0$ and thus set $p = 16$. Its profit is $\pi_L = \frac{1}{2}(p - c_B^L) = 6$.

Equilibrium

It is always profitable for L to set $p^m = 12$ with any $p_A \leq U_A$ and $p_B \leq U_B$. L thus also serves one-stop shoppers and gets $\pi_L = 8$

S now is a competitive fringe: $p_S = C_B^S = 2$

Can L follow the previous strategy $p^m = 12$? Assume L sets $p_A = 8$ and $p_B = 4$: What happens? To break indifference (hyp) consumers always prefers to buy the two goods rather than one!

- One stop shoppers:
  - Going to S to buy B : $U_B - h - p_S = 0$
  - Going to L buy A and B : $U_A + U_B - p_A - p_B = h$.
  - All go to L.
- Multi-stop shoppers:
  - Go to L to buy A (as $U_A > p_A$).
  - Go to S to buy B as $U_B - p_B = 2 < U_B - p_S = 4$.

$\Rightarrow$ Although L looses multi-stop shoppers on B, L gets :

$\pi_L = \frac{1}{2}(12 - 4) + \frac{1}{2}8 = 8.$

L can do even better by using loss-leading: $p_A = 10 - \epsilon$ and $p_B = 2 + \epsilon < c_B^L$

- One stop shoppers
  - Going to S to buy B : $U_B - h - p_S = 0$
  - Going to L to buy A and B : $U_A + U_B - p_A - p_B = h$.
  - All go to L.
- Multi-stop shoppers
  - Go at L to buy A (as $U_A > p_A$).
  - Go to S to buy B as $U_B - p_S = 4 > U_B - p_B = 4 - \epsilon$.

Loss-Leading is profitable

Although L still looses multi-stop shoppers on B, L gets even more than the monopoly profit: $\pi_L = \frac{1}{2}(12 - 4) + \frac{1}{2}10 = 9$.

Conclusion:

Loss leading appears here as an exploitative device which discriminates multi-stop shoppers from one-stop shoppers.

- Loss-leading allows large retailers to extract additional surplus from consumers
- and hurts smaller rivals as a by-product

When the small store also sets its price strategically, the results hold.

Bundling strategies

Bundling: consists in selling two or more products in a single package.

- A hard drive, keyboard and screen embedded in a laptop, a pay-TV contract offering a package of channels, ...
- Many major supermarkets in the U.S. and in UE offer grocery-gasoline bundled discounts!

Tying: make the sale of one of its product conditional upon the buyer also purchasing some other products from it.

- Microsoft selling its Windows operating system only in combination with Internet Explorer; Access to Google play through android license conditional to pre installing Google search.
- Full-line forcing: The TCCC makes conditional the purchase of its famous Coca-Cola drinks to also buying other less famous soft drinks.

Bundling strategies are:

- A form of second-degree price discrimination (Monopoly)
- Bundling may soften competition or lead to exclusion (Competition).

Monopoly Bundling

Adams and Yellen (1976)

A simple model: Assumptions

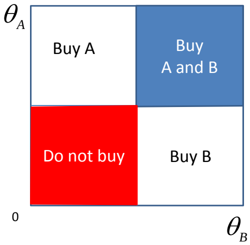
- Consider a monopoly firm producing two goods A and B at zero cost.
- A unit mass of consumers have preferences over the two goods: each consumer is identified by a couple (θ_A, θ_B) uniformly distributed over $[0, 1]^2$.
- The two goods valuations are independent and thus a consumer valuation for the bundle is $\theta_A + \theta_B$.
- We compare 3 strategies:
  1. Separate selling,
  2. Pure bundling,
  3. Mixed bundling.

1. Separate selling

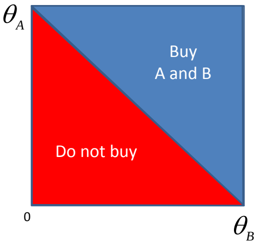
- Demand for A is: $D_A = \int_{p_A}^{1} d\theta_A$ and thus p_A is chosen to maximize $p_A(1 - p_A)$
- Similar for good B and thus $p_B = p_A = \frac{1}{2}$
- Profit with separate selling: $\pi_s = \frac{1}{2}$

2. Pure Bundling

- The retailer can replicate the same profit by setting $p = p_A + p_B = 1$ for the bundle!
- Profit is the same but consumers who buy are not the same!

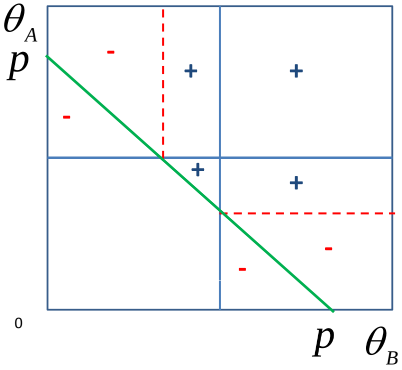


Separate selling



Pure bundling: p=1

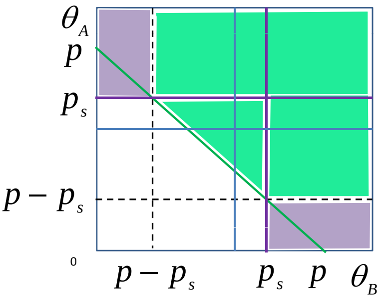
- The monopolist can reach higher profits by setting $p < 1$
- Consumers buy when $\theta_A > p - \theta_B$, thus $D = 1 - \frac{p^2}{2}$
- Thus p is chosen to maximize $p(1 - \frac{p^2}{2}) => p = \sqrt{\frac{2}{3}} \approx 0.82$
- The profit of the optimal bundling is $\pi_b = \frac{2}{3}\sqrt{\frac{2}{3}} \approx 0.544 > \pi_s$
- Total consumers surplus increases



Optimal pure budling

3. Mixed Bundling

- The analysis is restricted to the case $p_A = p_B = p_s$
- Consumers who prefer buying one good k than nothing are such that $\theta_k > p_k$
- Consumers who prefer buying the bundle rather than A alone are such that $\theta_A + \theta_B - p > \theta_A - p_s => \theta_B > p - p_s$
- Consumers who prefer buying the bundle rather than B alone are such that $\theta_A > p - p_s$
- Consumers who prefer buying the bundle than nothing are such that $\theta_A + \theta_B - p > 0$



Optimal mixed bundling

- Demands are:

$$D_A = D_B = (1 - p_s)(p - p_s)$$
$$Db = (1 - p_s)^2 + 2(2p_s - p)(1 - ps) + \frac{(2p_s - p)^2}{2}$$

- The monopolist chooses (p_s, p) which maximizes $\pi = p_s(D_A + D_B) + pD_b$:
- $p_s = \frac{2}{3}$ and $p = \frac{4-\sqrt{2}}{3} \approx 0.86$;
- The profit $\pi_{mb} = 0.549 > \pi_b > \pi - s$
- Consumers are worse off in the mixed bundling case compared to the pure bundling case.

Bundling

Mixed bundling allows the monopolist to increase its profit even further than pure bundling.
Consumers may be worse off under mixed bundling than under pure bundling.

Remember

- Bundling strategies arise in a monopoly situation for a discrimination purpose (absent any competition motive!!).
- The discrimination motive only requires consumers' heterogeneity in their valuations for the goods.
- It is a form of second degree price discrimination. Instead of setting a menu of prices to better cater for consumers' heterogeneity, bundling tends to reduce consumers' heterogeneity.
  - Bundling is more profitable when valuations for the two goods are perfectly negatively correlated.
    - In that case, every consumer has a total valuation for the two goods of 1 and bundling its product at a price $p = 1$, the monopolist obtains the maximal profit of 1.
    - Bundling makes consumers perfectly homogenous.
  - It is less profitable as valuations become positively correlated.

Bundling competition

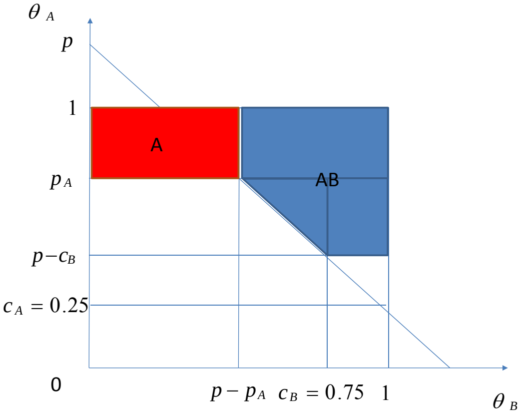
Chen (1997)

- Assumptions
  - Good A is offered by two firms denoted 1 and 2 at marginal cost $c_A < 1$.
  - Good B is produced by a perfectly competitive industry at marginal cost c_B. Firms 1 and 2 may also offer it at marginal cost c_B.
- The game
  1. Firms 1 and 2 simultaneously choose their marketing strategy (A only, A and B in bundle, sell A and the bundle)
  2. Price competition.
- In 5/9 subgames, no profit!!
  1. If 1 and 2 only sell A, $p_A = c_A$;
  2. If 1 and 2 only sell the bundle AB, $p = c_A + c_B$;
  3. If 1 and 2 sell A and the bundle AB, $p_A = c_A$, $p = c_A + c_B$
  4. If 1 or 2 specializes while the other adopts mixed bundling: $p_A = c_A$, $p = c_A + c_B$

Bundling competition

If 1 specializes on A and 2 sells the bundle only:

- Bundle/A: $\theta_A + \theta_B - p > \theta_A - p_A => \theta_B > p - p_A$;
- Bundle/B: $\theta_A + \theta_B - p > \theta_B - c_B => \theta_A > p - c_B$;
- Bundle/A and B: $\theta_A + \theta_B - p > \theta_A + \theta_B - p_A - c_B => p \leq c_B + p_A$;
- Bundle/nothing: $\theta_A + \theta_B - p \geq 0$.



Bundling competition

- There is not always a Nash equilibrium!
- Demands are:

$$
\begin{aligned}
D_A &= (1-p_A)(p-p_A) \\
D_{AB} &= (1-p_A)(1-p+p_A)+\tfrac{1}{2}(2+p_A-p-c_B)(c_B-p+p_A)
\end{aligned}
$$

- Each firm maximize its profit respectively $\pi_1 = (p_A - c_A)D_A$ and $\pi_2 = (p - c_A - c_B)D_{AB}$:
- For $(c_A, c_B) = (\frac{1}{4}, \frac{3}{4})$, $p_A^* = 0.529$ and $p^* = 1.213$; $(p_A^* + c_B = 1.279 > p^*)$
- The profit $\pi_1^* = 0.09 > \pi_2^* = 0.035$
- Two sources of deadweight loss:
  1. $p_A^* > c_A$
  2. Some consumers with $\theta_B < c_B$ buy B through the bundle.

Conclusion:

Bundling strategies may enable to soften retail competition!

Bundling as a barrier to entry

Nalebuff (2004)

Assumptions:

- Same framework as in Adams and Yellen, two products with independent valuations uniformly distributed over$[0, 1]$ but TWO firms I and E. No production cost for I or E.
- Two-stage Game
  1. The incumbent (I) offers A and B and sets its prices;
  2. An entrant (E) can enter at a fixed cost F and sell a single product (either A or B) and set its price.

Without entry threat: the monopolist sets $p_A = p_B = \frac{1}{2}$ and obtains a profit $\pi_I^M = \frac{1}{2}$ (see slide 18).

If E enters and I did not change its behavior: E sets $p_E = \frac{1}{2} - \epsilon$ on product A or B and gets $\pi_E = \frac{1}{4}$ and I gets $\pi_I = \frac{1}{4}$. Entry would occur for $F < \frac{1}{4}$.

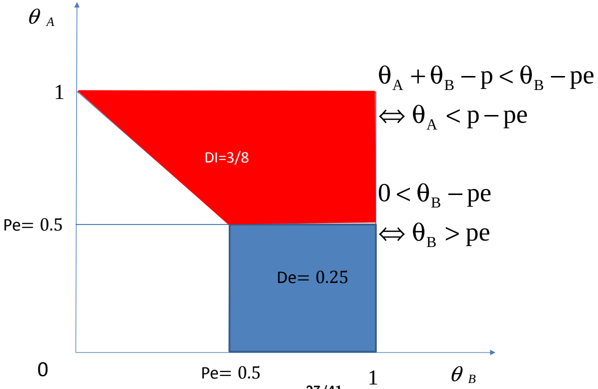
If I changes its behavior to prevent entry: I sets $p_A = p_B = p$ to get a profit $2p(1 - p) = 2F$.

Bundling as a barrier to entry

Bundling has two effects vis-à-vis the entrant

1. Pure bundling effect
2. Bundling discount effect

1-Pure bundling effect Assume I offers only the bundle at a price $p_A + p_B = p = 1$ and E still offers B at price $p_e = \frac{1}{2} - \epsilon$. E gets a profit $\frac{1}{8}$ and entry is deterred for $\frac{1}{8} < F < \frac{1}{4}$.

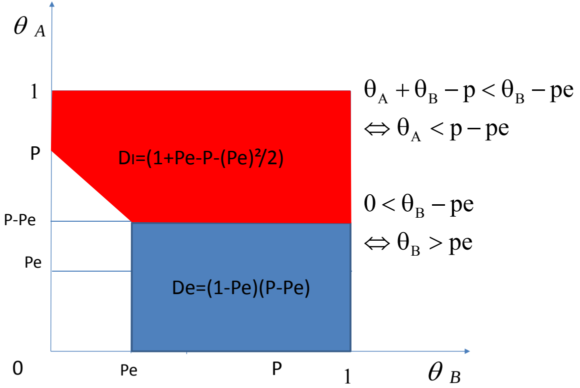


Bundling as a barrier to entry

Bundling has two effects vis-à-vis the entrant

2-Bundling discount effect Assume I now offers only the bundle at a price $p_A + p_B = p = \sqrt{\frac{2}{3}} \approx 0.82$ which brings the highest profit if entry is deterred $\pi_b = \frac{2}{3}\sqrt{\frac{2}{3}} \approx 0.544$ What is the entrant's best response?

$p_e \approx 0.3$ and $\pi_e = 0.105 < \frac{1}{8}$



Bundling as a barrier to entry

Bundling discount effect The entrant E maximizes its profit

$\pi_e = p_e(1 - p_e)(p - p_e)$ according to the level of p.

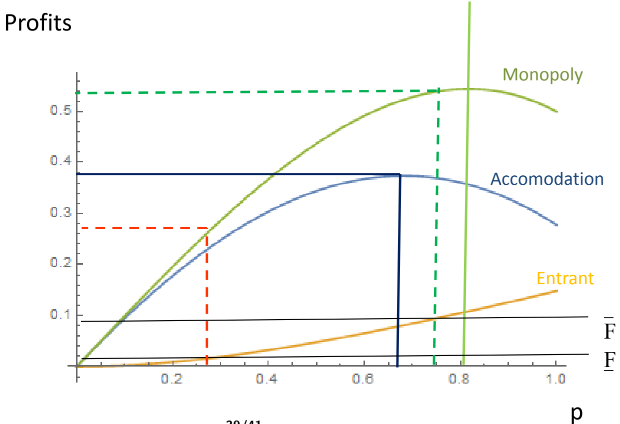
$$p_e = \frac{1+p}{3} - \frac{1}{3}\sqrt{1 + p^2 - p}$$

The incumbent obtains:

$$\pi_I = p(1 - p + p_e - \frac{p_e^2}{2})$$

p	p_e	I's profit|No entry	I's profits|entry	E's profit
1.	0.33	0.5	0.277	0.148
0.8	0.295	0.544	0.361	0.105
0.68	0.265	0.523	0.374	0.080
0.5	0.211	0.437	0.34	0.048
0.41	0.17977	0.375	0.30	0.034

- If $F = \overline{F}$, I sets a constrained bundling price below 0.8 to prevent entry.
- If $F = \underline{F}$, I sets $p = 0.68$ the optimal accomodation price, and E enters.



Remember

- Chen (1997) show that bundling strategies may soften competition enabling firm's to differentiate their assortment rather than competing head-to-head (it rather attracts entry in that case).
- Nalebuff (2004) shows that an incumbent may use bundling to prevent an efficient entry. (But ex ante commitment on one price is key !)
- The antitrust debate
  - 1950: The leverage theory: a firm with market power on one market can leverage it to monopolise or gain market power in another market.
  - The **Chicago School Critique** heavily criticised this theory arguing that such a firm could not find profitable to do so (too costly if the rival is more efficient).
  - Nalebuff (2004) opposes the Chicago School argument in a context of entry!!

Local vs Uniform pricing

Dobson and Waterson (2005)

PRICING STRATEGIES

Local pricing: adjusting prices at store-level according to degree of local competition (Micro marketing data mining))

Uniform pricing: setting common prices that apply across all their stores.

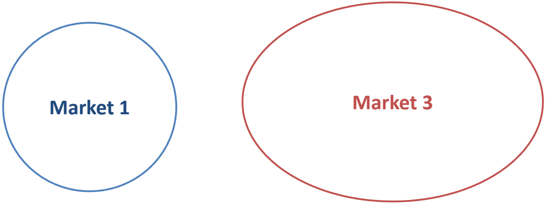
- Pricing by supermarkets in UK (Competition Commission)
  - Among the 15 leading supermarket chains, 7 used local pricing, 8 used national pricing in 2000;
  - Local pricing deemed anti-competitive by UK C.C in 2000 (exploit local market power), but no remedy offered;
  - By 2004, the 4 first supermarket chains made public commitment to uniform national pricing.
- In France, no uniform pricing in supermarkets: supermarket chains adapt to local conditions.
- IKEA commits to uniform pricing in a given country (catalog).

Chains' statements

- We [Tesco] understand that customers want low prices, but they also want fair prices. That is why we charge the same prices up and down the country. [...] Even in the few locations [...] where we are the only supermarket in town, we continue to operate on the basis of our national price list.
- Asda pricing does not discriminate by geography, store size or level of affluence- we have one Asda price across the entire country.
- Sainsbury's sets prices nationally by format and does not use price-flexing to exploit areas of higher or lower market share.
- We [Morrisons] have a long established value-based national pricing policy with the same single price for every product in each store, wherever a store is located.

A monopoly

- Retailer 1 is a monopoly on two separated local markets 1 and 3.
- Market 1 is smaller than market 3 (larger population) ($\alpha \in [\frac{1}{3}, 1[$).
- Simple linear demand function. No cost.
- Two alternative pricing strategies Uniform (U) vs Local (L) pricing.



$q_1 = \alpha - p_1$ and $\alpha < 1$ $\qquad$ $q_{13} = 1 - p_{13}$

A monopoly

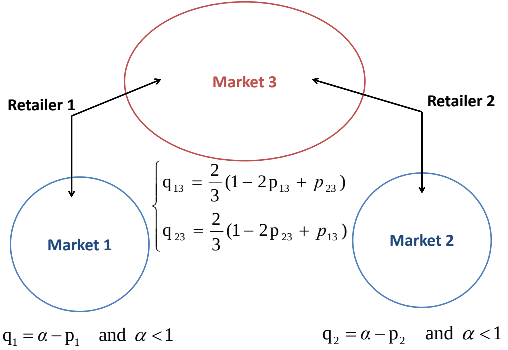
- Under (L):
  - 1 chooses p_1 to maximize $p_1(\alpha - p_1) \Rightarrow p_1 = \frac{\alpha}{2}$;
  - 1 chooses p_{13} to maximize $p_{13}(1 - p_{13}) \Rightarrow p_{13} = \frac{1}{2}$;
  - 1 thus obtains a profit $\pi_L = \frac{1+\alpha^2}{4}$.
- Under (U):
  - 1 chooses $p_1 = p_{13} = p$ to maximize $p(\alpha - p) + p(1-p) \Rightarrow p = \frac{\alpha+1}{4}$;
  - 1 obtains a profit $\pi_U = \frac{(1+\alpha)^2}{8}$.

(L)>(U) for a monopoly on different local markets

If the retailer is in a monopoly position on all local markets, we know that price discrimination is the profit maximizing conduct.

$\Rightarrow$ What happens if a rival firm is present on market 3?

A duopoly



- **Stage 1**: Retailers 1 and 2 choose simultaneously (publicly) their pricing strategy (U) or (L)
- **Stage 2**: Retailers 1 and 2 compete in price according to their strategy.

A duopoly

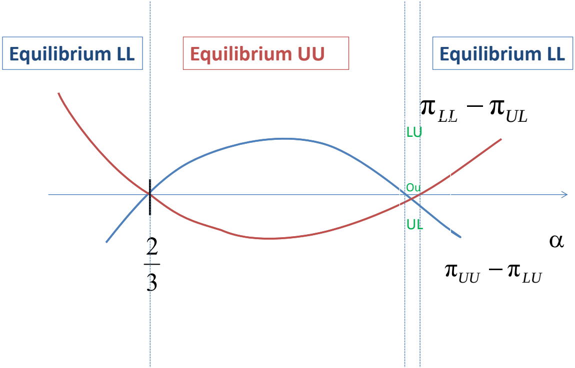
- Under (L,L)
  - $p_1 = p_2 = \frac{\alpha}{2}$ on the local monopoly markets
  - On the duopoly market, each retailer i chooses p_{i3} to maximize $p_{i3}\frac{2}{3}(1 - 2p_{i3} + p_{j3})$ with $j \neq i$ and thus set symmetric prices $p_{13} = p_{23} = \frac{1}{3}$.
  - Firms 1 and 2 obtain $\pi_{LL} = \frac{\alpha^2}{4} + \frac{4}{27}$
- Under (U,U)
  - $p_{13} = p_1$ and $p_{23} = p_2$ and thus each retailer i chooses p_i to maximize $p_i(\frac{2}{3}(1 - 2p_i + p_j) + (\alpha - p_i))$ with $j \neq i$ and thus set symmetric prices $p_1 = p_2 = \frac{\alpha}{4} + \frac{1}{6}$.
  - Firms 1 and 2 obtain $\pi_{UU} = \frac{7}{432}(2 + 3\alpha)^2$
- Under (L,U)
  - $p_1 = \frac{\alpha}{2}$ and retailer 1 chooses p_{13} to maximize $p_{13}\frac{2}{3}(1 - 2p_{13} + p_2)$.
  - $p_{23} = p_2$ and thus retailer 2 chooses p_2 to maximize $p_2(\frac{2}{3}(1 - 2p_2 + p_{13}) + (\alpha - p_2))$ with $j \neq i$.
  - $p_{13} = \frac{\alpha}{18} + \frac{8}{27}$ and $p_2 = \frac{2\alpha}{9} + \frac{5}{27}$
  - Retailer 1 gets $\pi_{LU} = \frac{\alpha^2}{4} + \frac{(16+3\alpha)^2}{2187}$ and retailer 2 gets $\pi_{UL} = \frac{7(5+6\alpha)^2}{2187}$

A duopoly

Subgame	Monopoly markets			Duopoly market		
	$\alpha = \frac{1}{2}$	$\alpha = \frac{2}{3}$	$\alpha = \frac{4}{5}$	$\alpha = \frac{1}{2}$	$\alpha = \frac{2}{3}$	$\alpha = \frac{4}{5}$
LL	0.25	0.33	0.4	0.33	0.33	0.33
UU	0.29	0.33	0.37	0.29	0.33	0.37
LU,UL						
L	0.25	0.33	0.36	0.32	0.33	0.34
U	0.30	0.33	0.36	0.30	0.33	0.36

- For $\alpha = \frac{2}{3}$ firms set the same price $\frac{1}{3}$ whatever the market and the subgame: even with local pricing, there is no price discrimination!!
- When local markets are smaller $\alpha < \frac{2}{3}$, prices are lower on the monopoly market/ duopoly market.
- When local markets are larger $\alpha > \frac{2}{3}$, prices are higher on the monopoly market/ duopoly market.

A duopoly



Equilibrium LL
Equilibrium UU
Equilibrium LL
$\pi_{LL} - \pi_{UL}$
LU
Ou
UL
$\frac{2}{3}$
α
$\pi_{UU} - \pi_{LU}$

Remember

Uniform pricing might be optimal

The retailers might refrain from price discriminating and set instead a uniform price on all markets.

When local market size is intermediary, uniform pricing may as a credible way to raise prices and thus soften competition on the duopoly market.

- If the local monopoly market is too small, a uniform pricing strategy rather intensifies competition on the duopoly market.
- If the local monopoly market is too large, a uniform pricing strategy becomes too costly.

Consumers on different markets are affected in opposite ways when going from uniform to local pricing: the impact on welfare is ambiguous.

Main References

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