

# ECO 650: Firms' Strategies and Markets

## Vertical Relationships and Bargaining(II)

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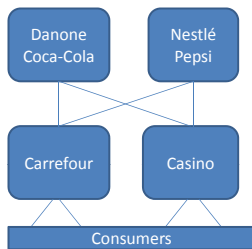


## Buying power of retailers

A retailer is an intermediary: he buys products to suppliers and resells them to consumers.

The high concentration on the retail market  $\Rightarrow$  **buying power** towards suppliers: heterogenous balance of power!!

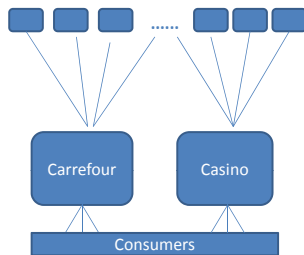
### Big manufacturers vs Big retailers



\*Famous national brands

\*High concentration among manufacturers

### Small producers vs Big retailers



\*Small manufacturers

\*Farmers (fruits and vegetables, meat,...)

## Sources of buyer power

- ▶ Buyer size (larger discount?...)
- ▶ Gatekeeper positions (local monopoly on a market)
- ▶ Constrained capacity shelves space
- ▶ Outside options
  - ▶ Number of alternative suppliers vs alternative retailers.  
OECD (1998): "*Retailer A has buyer power over supplier B if a decision to delist B's product could cause A's profit to decline by 0.1% and B's to decline by 10%.*"
  - ▶ How differentiated ? Loyalty to the brand vs loyalty to the store;  
A survey by INSEE, 1997: When the favorite brand is not in its favorite store's shelves: 56% of consumers choose another brand, 24% will buy it later and 20% buy it in another store.
  - ▶ Private labels (since 70s): products sold under retailer's own brand

# Consequences of Buyer Power: Potential Harms and Benefits

- ▶ Potential harms: Hold-up effect (reduction of investments), Exit of small suppliers in situation of economic dependence (reduction of variety,...).
- ▶ Benefits: A monopolist may prefer dealing with several retailers, and thus favor competition, to obtain higher profits.

## Methodological tool: Bargaining

- ▶ Bargaining: situation in which at least two players have a common interest to cooperate, but have conflicting interests over exactly how to co-operate.
- ▶ How to share a pie? Depends on:
  - ▶ The number of negotiators;
  - ▶ Each negotiator's "ability to negotiate", or "bargaining power";
  - ▶ Each negotiator's "outside option".
- ▶ "Bargaining theory with Applications", Muthoo (2004).

## The Nash program (1950,1953)

- ▶ A bargaining problem with two players
- ▶ A vector  $x = (x_1, x_2) \in \mathbb{R}^2$ ;  $x_i$  is the allocation of player  $i$ .
- ▶ A threat point  $\underline{x} = (\underline{x}_1, \underline{x}_2) \in \mathbb{R}^2$ ;
- ▶ Players utility function  $U_i(x)$ .
- ▶  $F$  is the set of feasible allocations;  
 $F \cap \{(x_1, x_2) \in \mathbb{R}^2 : x_1 \geq \underline{x}_1, x_2 \geq \underline{x}_2\}$  is nonempty and bounded.

### Theorem

*The Nash Bargaining Solution  $x^*$  satisfies:*

$$x^* \in \underset{x \in F}{\operatorname{argmax}} (U_1(x_1) - U_1(\underline{x}_1))(U_2(x_2) - U_2(\underline{x}_2))$$

## Five axioms

- ▶ **Strong Pareto Optimality:** the solution has to be realizable and Pareto optimal.
- ▶ **Individual rationality:** No player can have less than his outside option, otherwise he will not accept the “agreement”.
- ▶ **Invariance by an affine transformation:** The result does not depend on the representation of (Von Neumann Morgenstern) utility functions.
- ▶ **Independence of Irrelevant Alternatives:** Eliminating alternatives that would not have been chosen, without changing the outside option, will not change the solution.
- ▶ **Symmetry:** Symmetric players receive symmetric payoffs.

## Extension: The Nash bargaining solution with asymmetry

Assume that the players have different bargaining powers, say  $\alpha$  and  $1 - \alpha$ .

The Nash bargaining solution can be extended to that situation. It is the unique Pareto-optimal vector that satisfies:

$$x^* \in \underset{x \in F}{\operatorname{argmax}} (U_1(x_1) - U_1(\underline{x}_1))^\alpha (U_2(x_2) - U_2(\underline{x}_2))^{1-\alpha}$$

### Split-The-Difference-Rule

- ▶ Let  $V$  denote the cake to be shared such that  $x_1 = V - x_2$ ,
- ▶  $U_i(x_i) = x_i$  (Risk neutral);  $(\alpha, 1 - \alpha)$  the bargaining powers.

The Nash bargaining solution  $(x_1^N, x_2^N)$  is:

$$x_1^N = \underline{x}_1 + \alpha(V - \underline{x}_1 - \underline{x}_2)$$

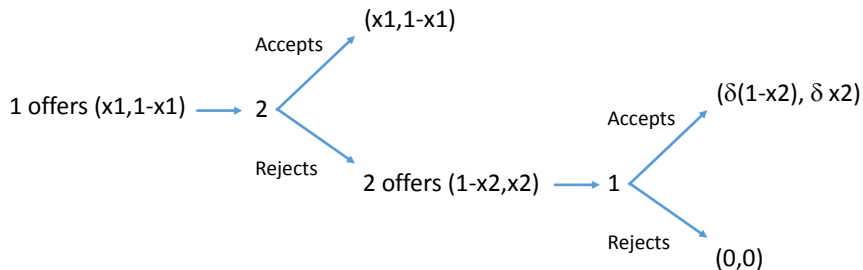
$$x_2^N = \underline{x}_2 + (1 - \alpha)(V - \underline{x}_1 - \underline{x}_2)$$



## The Rubinstein (1982) bargaining model

- ▶ Two players, 1 and 2, have to reach an agreement on the partition of a pie of size 1.
- ▶ Each of them has to make in turn a proposal as to how it should be divided:
  - At each period, one offer is made;
  - They alternate making offers.
  - Player 1 makes the first offer.
- ▶ Finite number  $T$  of periods.
- ▶ There is a discount factor  $\delta$  by period.

## The Rubinstein (1982) game for $T = 2$



## Resolution of the Rubinstein game

- ▶ Assume  $T = 2$ ; in the second period, there is an equilibrium where 1 accepts any nonnegative offer by 2; 2 thus offers  $(0, 1)$  (or  $(\varepsilon, 1 - \varepsilon)$  to select equilibria); in period 1, 1 offers  $(1 - \delta, \delta)$  and 2 accepts.
- ▶ Assume  $T = 3$ ; in the third period, 1 makes the last offer and 2 accepts any nonnegative offer; 1 thus offers  $(1, 0)$ ; in period 2, 2 offers  $(\delta, 1 - \delta)$  and 1 accepts; in period 1, 1 offers  $(1 - \delta(1 - \delta), \delta(1 - \delta))$  and 2 accepts.
- ▶ By iteration, there is an equilibrium where 1 offers in the first period  $(x_1 = 1 - \delta + \dots + (-1)^{T-1}\delta^{T-1}, 1 - x_1)$ .

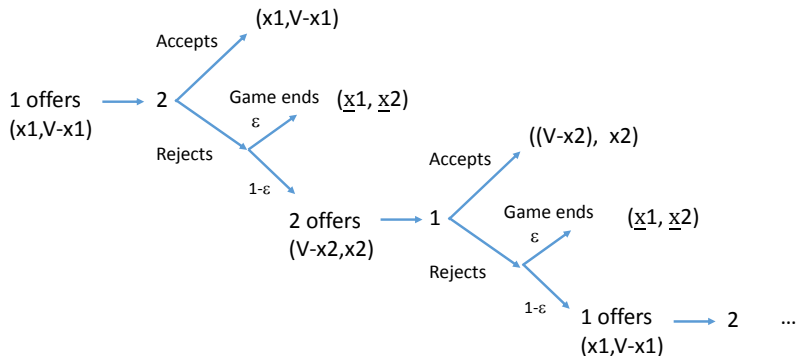
## Solution of the Rubinstein game

- ▶ At the limit, when  $T \rightarrow +\infty$ , the sharing of the pie is  $(x_1 = \frac{1}{1+\delta}, 1 - x_1)$ ;
- ▶ Impatience is the driving force that leads to an agreement, and it increases the power of the first player:
  - ▶ When the two players are infinitely patient, their situations become symmetric: when  $T \rightarrow +\infty$  and  $\delta = 1$ , the sharing of the pie is  $(\frac{1}{2}, \frac{1}{2})$ ;
  - ▶ When the two players are infinitely impatient, player 1 gets the whole pie: when  $T \rightarrow +\infty$  and  $\delta = 0$ , the sharing of the pie is  $(1, 0)$ .

## The Binmore-Rubinstein-Wolinsky (1986) bargaining model

- ▶ Two players 1 and 2 want to share a "pie" of value  $V$
- ▶ Outside option: player  $i$  has a utility  $\underline{x}_i$  if negotiation breaks, where  $\underline{x}_1 + \underline{x}_2 < V$ ;
- ▶ Players alternate making the same offers 1 offers  $(x_1, V - x_1)$  and 2 offers  $(V - x_2, x_2)$ ;
- ▶ Infinite horizon; each time an offer is rejected, there is an exogenous risk of breakdown (end of the game) with a probability  $\varepsilon$  (no discounting).

## Binmore-Rubinstein-Wolinsky (1986) game



## Binmore-Rubinstein-Wolinsky (1986): results

- ▶ Any subgame perfect equilibrium involves player  $i$  indifferent between accepting or rejecting the offer of player  $j$ .

$$V - x_1^* = \epsilon x_1 + (1 - \epsilon)x_2^*$$

$$V - x_2^* = \epsilon x_2 + (1 - \epsilon)x_1^*$$

- ▶ The solution satisfies:

$$x_i^* = x_i + \frac{1}{2 - \epsilon}(V - x_1 - x_2)$$

- ▶ If both firms have the same bargaining power ( $\epsilon \rightarrow 0, \alpha = 1/2$ ), in equilibrium, equal sharing of the surplus:

$$\left(x_1 + \frac{V - x_1 - x_2}{2}; x_2 + \frac{V - x_1 - x_2}{2}\right).$$

This is the symmetric Nash bargaining solution.

- ▶ If  $\epsilon \rightarrow 1$ , the player that plays first has all the power and the other player gets its disagreement payoff.

## Applications-Roadmap

- ▶ Bargaining within buyer-seller relationship : The hold-up problem + Exercise 1.
- ▶ Bargaining power in a vertical chain with upstream competition : Strategic restriction of retailer's shelf space capacity
- ▶ Bargaining power in a vertical chain with downstream competition : creating a buying group



# The hold-up Problem

## Assumptions

*Asset specificity: An investment brings more value when used by a particular buyer (matching, compatibility,...)*

- ▶ An upstream seller  $S$  can produce a unit of good at cost  $C(I)$ .
- ▶ By investing  $I$  the unit cost decreases  $C'(I) < 0$  but at a decreasing rate  $C''(I) > 0$ .
- ▶ We assume that the investment  $I$  is "specific":
  - The cost is  $C(I)$  if  $S$  makes a deal with a "specific" buyer  $B$ .
  - The cost is  $C(\lambda I)$  if  $S$  makes a deal with any other buyers with  $\lambda \in [0, 1]$ .
  - $\lambda$  is the degree of specificity of the investment for  $B$  with a complete specificity when  $\lambda = 0$  and no specificity when  $\lambda = 1$ .

# Bargaining in a vertical chain

## Assumptions

*Incomplete contracts: Contracts cannot be written ex ante, i.e. before the investment decision is taken*

- ▶ Irrespective of the buyer, an agreement between  $S$  and a buyer brings a value  $V$ .
- ▶ Formally we have a sequential stage game :
  1. An upstream seller  $S$  chooses its investment level  $I$ . Once the investment is realized, it is sunk.
  2.  $S$  bargains with  $B$ , following a Nash bargaining, over a contract  $T$ .

## Bargaining stage

Maximize the Nash bargaining product:

$$\text{Max}_T [V - T][T - C(I) - (V - C(\lambda I))]$$

⇔ the split-the-difference-rule:

$$V - T = T - C(I) - (V - C(\lambda I)) \Rightarrow T = V + \frac{C(I) - C(\lambda I)}{2}$$

In stage 2, the profit of the buyer is

$$\Pi_B = \frac{C(\lambda I) - C(I)}{2}.$$

$\Pi_B$  increases if  $\lambda$  decreases, i.e. as the specificity of the investment increases. The profit of the seller is

$$\Pi_S = V - \left( \frac{C(I) + C(\lambda I)}{2} \right) - I$$

decreases with the specificity of the investment. 

## Investment stage

The seller maximizes its profit with respect to  $I$

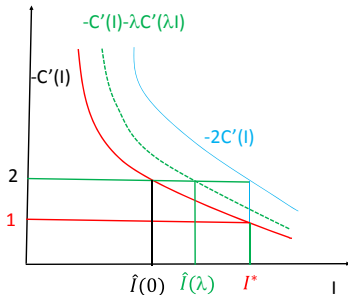
$$\text{Max}_I V - \left( \frac{C(I) + C(\lambda I)}{2} \right) - I$$

The FOC is:

$$-C'(I) - \lambda C'(\lambda I) = 2$$

The FOC of an integrated firm is:

$$-C'(I) = 1$$



## Remember

- ▶ Investments in specific assets and incomplete contracts may generate **hold-up**, i.e. **expropriation of part of the rent of the investment by a partner**, which triggers under-investment!
- ▶ The hold-up effect is stronger as the specificity of investment increases.
- ▶ Here specificity of investment by the producer is a source of buyer power!
- ▶ Vertical integration is a solution to hold-up.



## Exercise 1: Solution

- Given the contract  $(w, F)$ , determine the optimal price set by the retailer in stage 2. Determine the stage-2 equilibrium profits of firms  $\pi_U(w) + F$  and  $\pi_D(w) - F$ .
  - In stage 2, the retailer maximizes  $\max_p (p - w)(1 - p) - F$ ;
  - The FOC is:  $1 - 2p + w = 0 \Rightarrow p = \frac{1+w}{2}$ ;
  - Profits are  $\pi_U(w) = (w - c)\left(\frac{1-w}{2}\right)$  and  $\pi_D(w) = \left(\frac{1-w}{2}\right)^2$ .

2. Write down the Nash program and determine the optimal contract  $(w, F)$ . Is it efficient?

▶ The Nash program in stage 1 is

$$\max_{(w, F)} (\pi_U(w) + F)(\pi_D(w) - F)$$

▶ FOCS are:

$$-(\pi_U(w) + F) + (\pi_D(w) - F) = 0 \quad (1)$$

$$\frac{\partial \pi_U(w)}{\partial w} (\pi_D(w) - F) + \frac{\partial \pi_D(w)}{\partial w} (\pi_U(w) + F) = 0 \quad (2)$$

▶ (1) is the split the difference rule,  $F$  is used to share profits equally.

▶ Plugging (1) into (2):  $\underbrace{\left( \frac{\partial \pi_U(w)}{\partial w} + \frac{\partial \pi_D(w)}{\partial w} \right)}_0 \underbrace{(\pi_D(w) - F)}_{>0} = 0$ .

▶  $w$  is set to maximize joint profits  $w^* = c$ : Efficiency!



## Exercise 1: Solutions

2. Write down the Nash program and determine the optimal contract  $(w, F)$ . Is it efficient?

▶ Joint profits are  $\pi_U(w) + \pi_D(w) = \left(\frac{1-w}{2}\right)\left(\frac{1+w-2c}{2}\right)$ .

▶ Deriving this joint profit w.r.t  $w$  gives:

$$-(1+w-2c) + (1-w) = 0 \Rightarrow w^* = c.$$

▶ Gross profits are:  $\pi_U(c) = 0, \pi_D(c) = \frac{(1-c)^2}{4}$

▶ Using (2), we have :  $F^* = \frac{\pi_D(c) - \pi_U(c)}{2} = \frac{(1-c)^2}{8}$ .

▶ In equilibrium both firms obtain a profit  $\frac{(1-c)^2}{8}$ .

## Strategic shelf capacity's restriction

### Assumptions:

- ▶ Two producers offering products differentiated in quality  $H$  and  $L$  with  $H > L$  to a monopolist retailer  $D$ .
- ▶ We denote  $\Pi^X$  the maximum profit of a vertically integrated structure (monopoly profit) when only one product  $X$  is sold, with  $\Pi^H > \Pi^L > 0$ .
- ▶  $D$  can also offer the two products and in that case the integrated profit is  $\Pi^{HL}$ .
- ▶ Products are imperfect substitutes :  $\Pi^H < \Pi^{HL} < \Pi^H + \Pi^L$ .
- ▶  $D$  can either open two slots or restrict its capacity to one single slot.

### Research issue

Does  $D$  have an incentive to restrict its capacity to one slot?

## Strategic shelf capacity's restriction

The timing of the game is the following:

1.  $D$  chooses the size of its shelves' (one or two slots).
  - ▶ i)  $D$  selects the product(s) accordingly (  $H$  or  $L$  for 1 slot and  $HL$  for 2 slots).
  - ▶ ii) If only one slot, manufacturers may offer slotting fees  $S$  to be selected. If  $D$  accepts a slotting fee, he must offer the product.
2. The retailer bargains simultaneously with the selected supplier(s) over a fixed fee  $T$  (  $\alpha$  denotes the retailer's buyer power).
  - ▶ Nash bargaining over secret contract and passive beliefs.

We look for the optimal equilibrium assortment of the retailer.

We solve the game backward. Stage 2 bargaining is as follows.

**Bargaining for HL** Two negotiations takes place simultaneously, one for the pair  $H - D$  and another for the pair  $L - D$ . The Nash program are as follows:

$$\max_{T_H} (\Pi^{HL} - T_H - T_L - (\Pi^L - T_L))^\alpha T_H^{(1-\alpha)}$$

$$\max_{T_L} (\Pi^{HL} - T_H - T_L - (\Pi^H - T_H))^\alpha T_L^{(1-\alpha)}$$

Firms obtain the following profits

$$\pi_D^{HL} = (2\alpha - 1)\Pi^{HL} + (1 - \alpha)(\Pi^H + \Pi^L), \quad \pi_H^{HL} = (1 - \alpha)(\Pi^{HL} - \Pi^L),$$

$$\pi_L^{HL} = (1 - \alpha)(\Pi^{HL} - \Pi^H)$$

**Bargaining for X** One negotiation takes place between the pair  $X - D$ . The Nash program are as follows:

$$\max_{T_X} (\Pi^X - T_X)^\alpha T_X^{(1-\alpha)}$$

Firms obtain the following profits  $\pi_D^X = \alpha\Pi^X$ ,  $\pi_X^X = (1 - \alpha)\Pi^X$ .

We solve stage 1 (i).

Comparing the profit of  $D$  in all cases, we obtain that  $\pi_D^{HL} > \pi_D^H > \pi_D^L$  and therefore  $D$  always offers two slots and sells the two products.

### (i) No capacity restriction

Without slotting fee,  $D$  has no incentive to restrict its capacity to one slot. He always offer the two goods and this is strictly profitable for two reasons:

- ▶  $D$  chooses the structure that maximizes the industry profit.
- ▶  $D$  can use one producer as a status-quo in its negotiation with the other.

We solve stage 1 (ii).

**If  $D$  selects one slot** A competition between the two producers takes place for the slot.

- ▶  $H$  is ready to offer at most  $\bar{S}_H = \pi_H^H$ ;
- ▶  $L$  is ready to offer at most  $\bar{S}_L = \pi_L^L$ .

Comparing these offers for  $D$ :

$$\pi_D^H + \bar{S}_H = \Pi^H > \pi_D^L + \bar{S}_L = \Pi^L \Rightarrow H \text{ wins.}$$

In equilibrium  $H$  offers  $S_H^* = \max\{\Pi^L - \pi_D^H, 0\}$  such that  $D$  is just indifferent between the two options.  $S_H^* > 0$  only when  $\alpha < \alpha^s = \frac{\Pi^L}{\Pi^H}$  and in that case the profit of  $D$  amounts to  $\pi_D^H + \Pi^L - \pi_D^H = \Pi^L$ .

## (ii) Capacity restriction

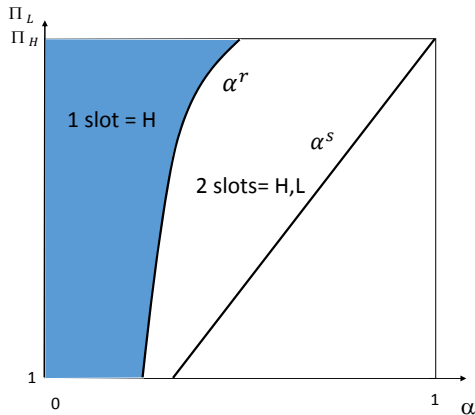
With slotting fees,  $D$  may have incentive to restrict its capacity to one slot when  $\alpha < \alpha^r = \frac{\Pi^{HL} - \Pi^H}{2\Pi^{HL} - \Pi^H - \Pi^L} \in [0, 1]$ . BOUTON

- ▶ By creating a competition for slots among suppliers  $D$  may obtain a larger share of a smaller pie.

# Strategic capacity restriction

$$\Pi_{HL} = 4$$

$$\Pi_H = 3$$



## Buying group

### Assumptions:

- ▶  $U$  offers a good at a unit cost 0.
- ▶  $D_1$  and  $D_2$  are two downstream firms that compete à la Cournot.
- ▶ Demand is  $P = 1 - q_1 - q_2$ .
- ▶ The game is as follows:
  1.  $U$  and each  $D_i$  bargain over a linear tariff contract  $w_i$ .
  2. Wholesale prices are observed and each  $D_i$  chooses its quantity  $q_i$ .
- ▶ The Nash bargaining takes place simultaneously and secretly. We consider an asymmetric Nash bargaining framework with a parameter  $(\alpha, 1 - \alpha)$ .

### Profitability of a buying group?

A buying group consists in bargaining together and then compete on the downstream market.



## Without buying group

- ▶ If the two firms have accepted their contract. Firm  $i$  chooses  $q_i$  to maximize  $\max_{q_i}(1 - q_i - q_j - w_i)q_i$ .

- ▶ Best reaction functions are:

$$q_i(q_j) = \frac{1 - q_j - w_i}{2}$$

for  $i = 1, 2$ :

- ▶ We obtain the Cournot equilibrium quantities  $q_i^C(w_i, w_j) = \frac{1+w_j-2w_i}{3}$  for  $i = 1, 2$ .
- ▶ Profits are:  $\pi_i^C = \frac{(1+w_j-2w_i)^2}{9}$  and  $\pi_U^C = \sum_{i=1,2} w_i q_i^C(w_i, w_j)$
- ▶ If only one firm  $i$  has accepted the contract  $w_i$ , firm  $i$  chooses  $q_i$  to maximize  $\max_{q_i}(1 - q_i - w_i)q_i$  with respect to  $q_i$ .
  - ▶ The monopoly quantity is  $q_i^M(w_i) = \frac{1-w_i}{2}$ ;
  - ▶ Profits are  $\pi_i^M = \frac{(1-w_i)^2}{4}$  and  $\pi_U^M = w_i q_i^M(w_i)$

## Bargaining stage

The asymmetric Nash product is:

$$\max_{w_i} \pi_i^C(w_i, w_j)^{(1-\alpha)} (\pi_U^C(w_i, w_j) - \pi_U^M(w_j))^\alpha$$

Simplifying with ln,

$$\max_{w_i} (1 - \alpha) \ln(\pi_i^C(w_i, w_j)) + \alpha \ln(\pi_U^C(w_i, w_j) - \pi_U^M(w_j))$$

Deriving with respect to  $w_i$ , we obtain:

$$(1 - \alpha) \frac{\frac{\partial \pi_i^C(w_i, w_j)}{\partial w_i}}{\pi_i^C(w_i, w_j)} + \alpha \frac{\frac{\partial \pi_U^C(w_i, w_j)}{\partial w_i}}{\pi_U^C(w_i, w_j) - \pi_U^M(w_j)} = 0 \quad (3)$$

In equilibrium wholesale unit prices are  $w_i = w_j = \frac{\alpha}{2}$ . Thus equilibrium profits are  $\pi_i^C = \frac{(8-7\alpha)^2}{36(4-3\alpha)^2}$  and  $\pi_U^C = \frac{\alpha(8-7\alpha)}{6(4-3\alpha)^2}$ .

## With buying group

The bargaining succeeds either with both firms or none. The bargaining stage is thus rewritten as follows:

$$\max_{w_i} \pi_i^C(w_i, w_j)^{(1-\alpha)} (\pi_U^C(w_i, w_j))^\alpha$$

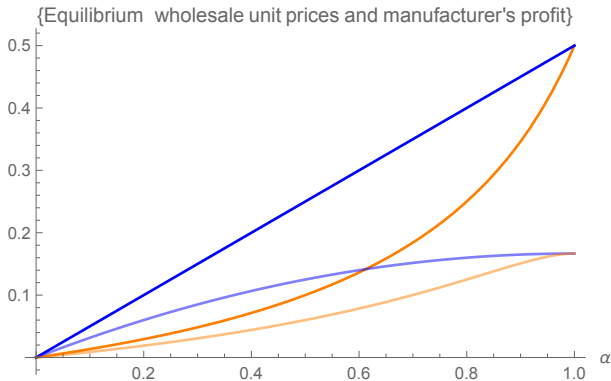
We simplify with ln :

$$\max_{w_i} (1 - \alpha) \ln(\pi_i^C(w_i, w_j)) + \alpha \ln(\pi_U^C(w_i, w_j))$$

Deriving with respect to  $w_i$ , we obtain:

$$(1 - \alpha) \frac{\frac{\partial \pi_i^C(w_i, w_j)}{\partial w_i}}{\pi_i^C(w_i, w_j)} + \alpha \frac{\frac{\partial \pi_U^C(w_i, w_j)}{\partial w_i}}{\pi_U^C(w_i, w_j)} = 0 \quad (4)$$

Comparing (4) with (3) it is immediate that the equilibrium  $w$  decreases with the buying group. In equilibrium we find that wholesale unit prices are  $w_i = w_j = \frac{\alpha}{2(4-3\alpha)}$ . Thus equilibrium profits are  $\pi_i^C = \frac{(2-\alpha)^2}{36}$  and  $\pi_U^C = \frac{\alpha(2-\alpha)}{6}$ .



**Legend:** Blue - No Buying Group; Orange- Buying Group. Bold: Wholesale prices.

Forming a Buying group enhances retailer's buyer power.

They obtain lower input prices and capture a larger share of profit to the detriment of the manufacturer.

## Exercise 2: Buyer size and buyer power

### Assumptions:

- ▶ A manufacturer  $U$  produces a good at a unit cost  $C(Q)$ , with  $C'(Q) > 0$  and  $C''(Q) > 0$ .
- ▶ Two retailers  $D_1$  and  $D_2$  are active on separate markets and face an inverse demand  $P(Q)$  with  $P'(Q) < 0$ .
- ▶ The two retailers must buy from the manufacturer to offer the product to consumers.
- ▶ We consider the following one-stage game: Each manufacturer-retailer pair bargain simultaneously and secretly over a quantity forcing contract  $(q, F)$ ;
- ▶ Use  $P(Q) = 1 - Q$  and  $C(Q) = \frac{Q^2}{2}$  for numerical application.
  1. Determine the optimal contracts  $(q_1, F_1)$  and  $(q_2, F_2)$ . Compute the equilibrium profit of each firm

## Solutions

- Determine the optimal contracts  $(q_1, F_1)$  and  $(q_2, F_2)$ . Compute the equilibrium profit of each firm
  - Nash-bargaining with separate firms
    - $\Pi_U = F_1 + F_2 - C(q_1 + q_2)$ ,  $\Pi_1 = P(q_1)q_1 - F_1$ , and the status quo profit of firm  $U$  is  $\Pi_U^{sq} = F_2 - C(q_2)$ .
    - $U - D_1$  maximizes the Nash product:  $\max_{q_1, F_1} [\Pi_U - \Pi_U^{sq}][\Pi_1]$
    - FOCS are:

$$F_1 - C(q_1 + q_2) + C(q_2) = P(q_1)q_1 - F_1$$

and

$$C'(q_1 + q_2) = P'(q_1)q_1 + P(q_1)$$

- Numerical application :  $q_1^* = q_2^* = \frac{1}{4}$ ,  $F_1^* = F_2^* = \frac{9}{64}$ ,  $\Pi_U^* = \frac{5}{32}$ ,  $\Pi_1^* = \Pi_2^* = \frac{3}{64}$ .



### 3. Compare the profits obtained in (1) and (2) and comment.

Each retailer obtains a higher profit thanks to the merger. Buyer size leads to a discount!

- ▶ This is because of the convex cost function! No effect with a linear cost and reverse effect with a concave cost.
- ▶ When separated, each retailer bargains for the marginal quantity on the highest portion of the cost function.
- ▶ The merge unit bargain for the whole quantity, that is both the marginal quantity and the infra marginal quantity (less costly).

BOUTON



## Remember

- ▶ The relative outside options are key to determine the sharing of profits within the channel.
  - ▶ Restricting the shelf capacity may be a way for a retailer to enhance competition among manufacturers and obtain a larger share of a smaller pie.
  - ▶ Forming a buying group may be a way for retailers to obtain lower input prices from manufacturer (Caution: linear wholesale unit prices or convex production cost!)

## References

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