Microeconomic Analysis

Seminar 5

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Outline

1. Monopoly Pricing: Several Goods
   - Linked demands, unlinked costs
   - Linked costs, unlinked demand
2. Market Power Assessment
   - The Lerner index
   - The *m*-concentration index
   - The Herfindahl index

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Monopoly Pricing: Several Goods

Suppose a multiproduct firm. To simplify the analysis, suppose a two-product firm.

- Neither demand nor costs are linked across markets.
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In this case the monopolist can just solve two profit-maximization problems separately.

Same conclusion as the mono-product case seen in class with the additional result that the highest markup will be achieved for the product that has the smallest elasticity of demand.

Monopoly Pricing: Several Goods

In general demands and/or costs are linked. We can rewrite the demand functions as $q_1 = Q_1(p_1, p_2)$ and $q_2 = Q_2(p_1, p_2)$ and the cost function as $C(q_1, q_2)$. The objective function to maximise then is

$$\max_{p_1, p_2} \pi = p_1 Q_1(p_1, p_2) + p_2 Q_2(p_1, p_2) - C(Q_1(p_1, p_2), Q_2(p_1, p_2))$$

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The FOC for product i is

$$\underbrace{Q_i + p_i \frac{\partial Q_i}{\partial p_i} + p_j \frac{\partial Q_j}{\partial p_i}}_{MR} = \underbrace{\frac{\partial C}{\partial q_i}\frac{\partial Q_i}{\partial p_i} + \frac{\partial C}{\partial q_j}\frac{\partial Q_j}{\partial p_i}}_{MC} \tag{1}$$

Linked Demands and Unlinked costs

We assume that the costs can be "separated" between the two activities: $C(q_1, q_2) = C_1(q_1) + C_2(q_2)$. Denote $C_i' = \partial C_i / \partial q_i$.

We can rewrite the (1) as

$$(p_i - C_i')\frac{\partial Q_i}{\partial p_i} = -Q_i - (p_j - C_j')\frac{\partial Q_j}{\partial p_i}$$

Dividing both the sides by $p_i(\partial Q_i/\partial p_i)$ and recalling that $\epsilon = -(p_i/Q_i)(\partial Q_i/\partial p_i)$, one obtains

$$\frac{p_i - C_i'}{p_i} = \frac{1}{\epsilon} + \frac{p_j - C_j'}{p_i}\frac{\partial Q_j/\partial p_i}{-\partial Q_i/\partial p_i}$$

Linked Demands and Unlinked costs

$$\underbrace{\frac{p_i - C_i'}{p_i}}_{L_i} = \frac{1}{\epsilon} + \frac{p_j - C_j'}{p_i} \frac{\partial Q_j / \partial p_i}{-\partial Q_i / \partial p_i}$$

The sign of the additional term on the right-hand side is determined by $\partial Q_j / \partial p_i$. Therefore there are two cases to distinguish: *i* and *j* are *substitutes* ($\partial Q_j / \partial p_i > 0$) or *complements* ($\partial Q_j / \partial p_i < 0$).

Linked Demands and Unlinked costs

$$\underbrace{\frac{p_i - C_i'}{p_i}}_{L_i} = \frac{1}{\epsilon} + \frac{p_j - C_j'}{p_i} \frac{\partial Q_j / \partial p_i}{-\partial Q_i / \partial p_i}$$

- **substitutes**: $\partial Q_j / \partial p_i > 0 \Longrightarrow L_i > 1/\epsilon$. The monopolist sets higher prices than separate division (he can internalize the competition effect between the two products!).
- **complements**: $\partial Q_j / \partial p_i < 0 \Longrightarrow L_i < 1/\epsilon$. The monopolist sets lower prices than separate division (he internalizes the positive demand effect between the two products and has more incentives to decrease the prices!).

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Linked Costs and Unlinked Demands

Assume now that $q_1 = Q_1(p_1)$ and $q_2 = Q_2(p_2)$, while $C(q_1, q_2)$.

One potential link between the costs can come from *economies of scope*: an increase in the production of one product reduces at the margin the cost of production of the other product, i.e. $\partial^2 C(q_i, q_j)/\partial q_i \partial q_j < 0$.

Linked Costs and Unlinked Demands

We can rewrite the (1) with the new assumptions. Since the demands are independent, $\partial Q_j / \partial p_i = 0$, it follows that

$$\underbrace{\frac{p_i - C_i'(q_i, q_j)}{p_i}}_{L_i} = \frac{1}{\epsilon}$$

The only difference here is that the Lerner index for product i depends on q_j. The monopolist realizes that by decreasing p_j, it increases q_j and, thereby, reduces $C_i'(q_i, q_j)$ which has the effect of increasing the markup for product i.

In the presence of economies of scope, the multiproduct monopolist has an incentive to set lower prices than separate firm.

Monopoly Pricing: Several Goods

To conclude we can summarise as follows,

A multiproduct firm that has monopoly power over several products sets lower prices than separate firms (each controlling a single product) when the products are complements or when there are economies of scope among the products. It sets higher prices when the goods are substitutes or when there are diseconomies of scope.

How to assess Market Power?

As we have seen before, the *Lerner index* is defined as the markup, or the difference between the price and marginal costs as a percentage of the price,

$$L = \frac{p - C'}{p}$$

The Lerner indx is a snapshot of the intensity of competition. However costs, and therefore marginal costs, are not always observable $\Longrightarrow$ empirical problem!.

Moreover, the Lerner index ignores dynamic considerations: a firm can profitably foregoes short-term gains to be able to raise margins in the future.

How to assess Market Power?

Another way to assess market power of a firm is to look at *concentration indices*.

We can add up the market share of one or a certain number of firms. The *m-firm concentration ratio* is

$$I_m = \sum_{i=1}^{m} \alpha_i$$

where $\alpha_i = q_i/Q$ is the firm i's market share and firms are ordered by decreasing market share. If I_m is close to 1 for m small, the market is quite concentrated.

However, the market conditions may vary across markets so we need to analyse case by case!

How to assess Market Power?

While the *m*-firm concentration ratio adds market shares of a small number of firms in the market, the *Herfindahl index* considers the full distribution of market shares:

$$I_H = \sum_{i=1}^{n} \alpha_i^2$$

It provides a better measure of concentration as it captures both the number of firms and the dispersion of the market shares.