Lecture 07 – Market Structure (I)

A. Perfect Competition

1. Study Paradigm of Market (Industrial Organization)

Market Structure (S) / Behaviors or Conduct (C) / Performance (P)

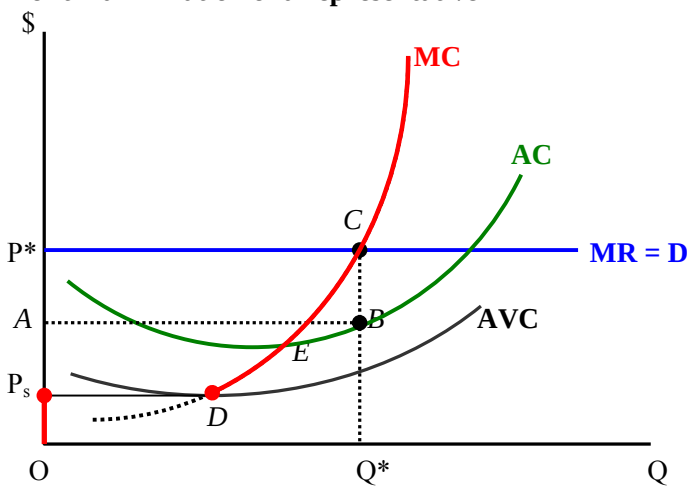
2. Perfect Competition

Conditions or Assumptions

a) *Many buyers and sellers*: fragmented industry so that each company has negligible market share that cannot change the whole structure
b) *Homogeneous (or identical) product*: Consumers will not incur additional costs in collecting additional information. Ex) Gold, silver etc.
c) *Perfect mobility of inputs*: no entry or exit barriers
d) *Perfect information*
e) *No transaction cost*
f) *Price takers:* price is now a parameter

* P.C. is an *ideal type* of market structure with *good predictability* of market.

3. Profit maximization of a representative firm



- Supply curve: MC curve above AVC.
- Point D: Shut-Down Point
- Point E: Beak-Even Point
- Demand curve: MR curve at P*
- Total revenue: □ *P*OQ*C*
- Total costs: □ *AOQ*B*
- Economic profit: □ *P*ABC*
- Any points between D and E: A firm should produce some output even though the firm is facing economic losses. Why?

4. Industry Supply Curve in SR

$$Q_M = Q_1 + Q_2 + \cdots + Q_n = \sum_{i=1}^{n} Q_i \text{ (at a given P)}$$

***5. Residual Demand Elasticities**

(amount demanded from *i-th* firm)=(industry demand) – (amount produced by all other firms)

$x_i = Q_D - Q_S$. Differentiating this equation *w.r.t.* price, $\frac{dx_i}{dP} = \frac{dQ_D}{dP} - \frac{dQ_s}{dP}$ $(\because \varepsilon_i = -\frac{dx_i}{dP}\frac{P}{x_i})$

$$\Rightarrow -\frac{dx_i}{dP}\frac{P}{x_i} = -\frac{dQ_D}{dP}\frac{P}{x_i}\frac{Q_D}{Q_D} + \frac{dQ_S}{dP}\frac{P}{x_i}\frac{Q_D}{Q_S}\frac{Q_S}{Q_D} \Rightarrow \varepsilon_i = -\frac{dQ_D}{dP}\frac{P}{Q_D}\frac{Q_D}{x_i} + \frac{dQ_s}{dP}\frac{P}{Q_S}\frac{Q_S/Q_D}{x_i/Q_D}$$

$$\Rightarrow \varepsilon_i = e_D \cdot \frac{1}{k_i} + e_S \cdot \frac{(1-k_i)}{k_i} \quad (\because \frac{Q_D}{Q_D} = \frac{x_i}{Q_D} + \frac{Q_S}{Q_D}, \text{ and let } \frac{x_i}{Q_D} = k_i, \text{ then } \frac{Q_S}{Q_D} = 1 - k_i)$$

The smaller k_i is, the larger ε_i , which depends on supply elasticities of other firms.

In competitive market,

i) k_i is relatively small.

ii) even if k_i is not small but if e_S is elastic, then ε_i is elastic.

B. Monopoly

1. Sources of Monopoly

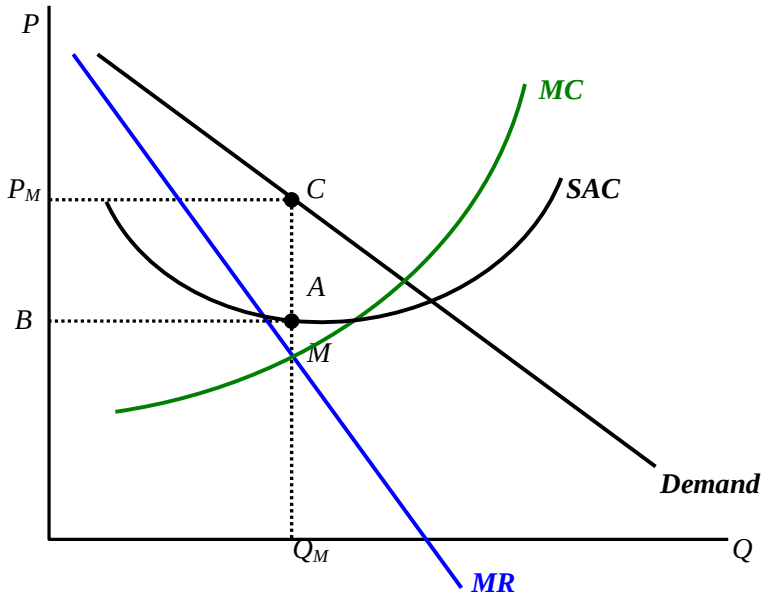
a) Control of Scarce Inputs (OPEC, DeBeers etc.)
b) Patents or Franchise / License Scheme (MD, RN, McDonald's, Burger King etc.)
c) Government Enforced Barriers (MLB, NFL, NBA etc.)
d) Large Economies of Scale: Natural Monopoly
e) Merger and Acquisition (M&A)
f) Illegal ways to sustain monopoly power (Bribe, Lobby, Patent killing, etc.)

2. Short-Run Analysis

a) Derivation

$MR(Q) = \dfrac{dTR(Q)}{dQ} = P + Q\dfrac{dP}{dQ}$ and FOC of profit maximization is $\boxed{MR(Q) = MC(Q)}$

So, $P = MR(Q) - Q\dfrac{dP}{dQ} > MC(Q)$ $(\because dP/dQ < 0)$



3. Marginal cost and price elasticity of demand: Inverse Elasticity Pricing Rule (IEPR)

At point M, $MR(Q) = MC(Q)$. According to Amoroso-Robinson formula, we know

$MR(Q) = MC(Q) = P\left(1 - \dfrac{1}{\varepsilon_D}\right)$. So, $\boxed{\dfrac{P^* - MC^*}{P^*} = \dfrac{1}{\varepsilon_D}}$ (as $\varepsilon_D \to \infty,\ P \to MC$)

The *l.h.s.* of above equation is the monopolist's optimal markup of price over marginal cost, expressed as a percentage of the price. For this reason, this equation is called the inverse elasticity pricing rule(IEPR). And *l.h.s.* is called ***Lerner Index of market power***.

4. Monopolist's Demand for Inputs

If the input market is competitive, then this monopolist should take prices of inputs as given. We can easily derive the relationship using profit as a function of L and K, not Q.

Let $TR(\cdot)$ and $TC(\cdot)$ denote total revenue and total cost function, respectively. Then, we know $TR = TR(Q) = TR(f(L,\ K))$ and $TC = wL + rK$. Based upon these expressions, we can get

$$\pi = \pi(L,\ K) = TR(L,\ K) - TC(L,\ K)$$

1º : $\dfrac{\partial \pi}{\partial L} = \dfrac{\partial \pi}{\partial K} = 0$. So, $\dfrac{\partial TR(L,K)}{\partial L} = \dfrac{\partial TC(L,K)}{\partial L} = w$, $\dfrac{\partial TR(L,K)}{\partial K} = \dfrac{\partial TC(L,K)}{\partial K} = r$

$$\frac{\partial TR(L,K)}{\partial L} = \frac{\partial TR(f(L,K))}{\partial L} = \frac{dTR}{dQ}\cdot\frac{\partial f}{\partial L} = MR\cdot MP_L$$

$$\frac{\partial TR(L,K)}{\partial K} = \frac{dTR}{dQ}\cdot\frac{\partial f}{\partial K} = MR\cdot MP_K$$

(some textbooks are using MPP (marginal physical product) instead of MP)

So, the final expression can be

$$\begin{aligned} MRP_L(L,K) &= MR(Q)\cdot MP_L(L,K) = w \\ MRP_K(L,K) &= MR(Q)\cdot MP_K(L,K) = r \end{aligned} \qquad (1)$$

where MRP is marginal revenue product, which is similar to VMP (value of marginal product, $P\cdot MP$) in perfectly competitive goods market.

Now, we need to think how equation (1) is related to $MR(Q) = MC(Q)$. We have total cost function $TC(Q) = C(f(L,K)) \equiv wL + rK$. Differentiating this function *w.r.t* L and K,

$$\begin{aligned} \frac{dTC(Q)}{dQ}\cdot\frac{\partial f(L,K)}{\partial L} &\equiv w \\ \frac{dTC(Q)}{dQ}\cdot\frac{\partial f(L,K)}{\partial K} &\equiv r \end{aligned}$$

, which can be rewritten as

$$\begin{aligned} MC(Q)\cdot MP_L(L,K) &\equiv w \\ MC(Q)\cdot MP_K(L,K) &\equiv r \end{aligned} \qquad (2)$$

2º : SOC would be $MRP_{LL} < 0,\ MRP_{KK} < 0$

5. Price Discrimination: Non-linear Pricing

a) Conditions

- Firm should be able to divide its consumer group into several subgroups based upon price elasticity and any related factors.
- Resale or transfer between any different subgroups will not be allowed.

b) $TR_1 = TR_1(Q_1),\ TR_2 = TR_2(Q_2)$. $TC = TC(Q) \equiv TC(Q_1 + Q_2)$

$\pi(Q_1,\ Q_2) = TR_1(Q_1) + TR_2(Q_2) - TC(Q_1 + Q_2)$

FOCs of profit maximization are

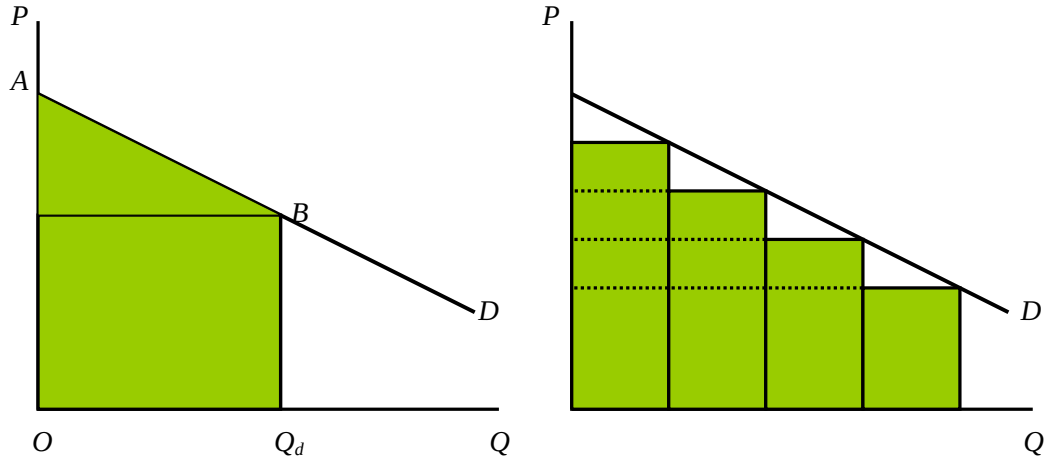
$$\begin{cases} \pi_1(Q_1,\ Q_2) = TR_1'(Q_1) - TC'(Q) = 0 \\ \pi_2(Q_1,\ Q_2) = TR_2'(Q_2) - TC'(Q) = 0 \end{cases} \Rightarrow MR_1(Q_1) = MR_2(Q_2) = MC(Q)$$

From the last expression, we can get important result using Amoroso-Robinson formula

$MR_1 = P_1\left(1-\frac{1}{\varepsilon_1}\right) = P_2\left(1-\frac{1}{\varepsilon_2}\right) = MR_2$. So the ratio of equilibrium prices will be

$\frac{\overline{P}_1}{\overline{P}_2} = \frac{1-\frac{1}{\varepsilon_2}}{1-\frac{1}{\varepsilon_1}} = \frac{(\varepsilon_2-1)}{(\varepsilon_1-1)}\cdot\frac{\varepsilon_1}{\varepsilon_2}$. So, $\begin{cases} \text{If } \varepsilon_1 > \varepsilon_2, \text{ then } \overline{P}_1 < \overline{P}_2. \\ \text{If } \varepsilon_1 < \varepsilon_2, \text{ then } \overline{P}_1 > \overline{P}_2. \end{cases}$ (3^{rd}-degree discrimination)

c) 1^{st}-degree and 2^{nd}-degree Price Discriminations



d) Price Discrimination using hurdles

Using "very cheap" devices that make customers reveal their own price elasticities.

Ex) Coupons, Sale, mail-in rebates, matinee etc.

6. Other Sales Strategies

a) Two-part Tariff Pricing

The consumer pays a **fixed (access) fee** for service, plus a **variable charge** per unit purchased.

Ex) utilities (electricity and gas), amusement parks and theme parks, sports clubs (racquet courts, aerobic classes, golf clubs etc).

b) Tying and Bundling

• Tying: a seller's conditioning the purchase of one product on the purchase of another.

Technological ties: specific plug-in interface may be hard to copy or actually protected from copying by IPR. ex) ink-jet printers

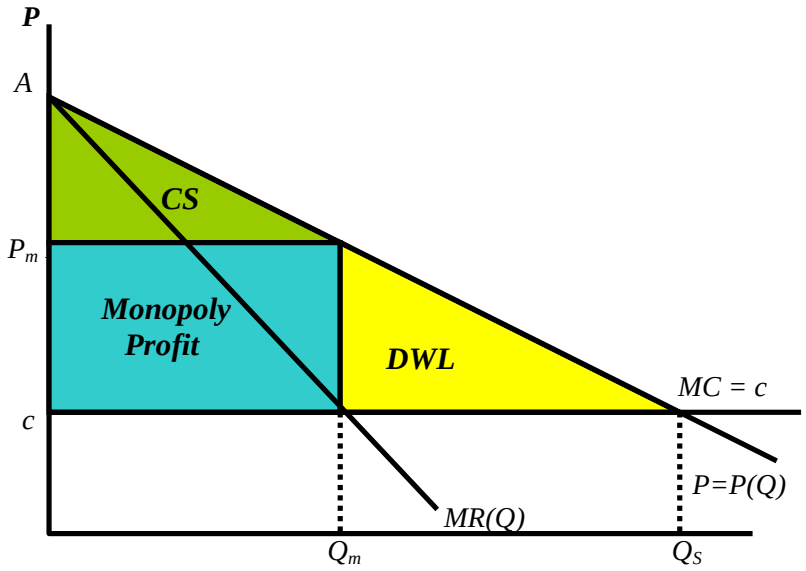
Contractual ties: consumer is bound by contract to consume both products from the same Source. ex) Harley-Davidson Motorcycles.

7. Quality Discrimination

A firm will try to reduce the quality of the lower-quality good (economy air service) so as to reduce the incentive of people with a high willingness to pay to switch from the high-quality good (first or business class) when the firm increases its price.

8. Welfare Issues in Monopoly

The major concern is that monopoly misallocates resources by producing the "wrong" amount of a good, where price does not equal marginal cost.



Suppose we are given the demand function as $P(Q) = A - bQ$, and the cost is fixed at c. With this information, we are required to solve the following questions:

a) $MR(Q) = A - 2bQ$ b) $Q_m = \frac{A-c}{2b}$ c) $P_m = \frac{A+c}{2}$ d) $\pi_m = \frac{(A-c)^2}{4b}$

e) $DWL = \frac{(P_m - c)(Q_S - Q_m)}{2} = \frac{(A-c)^2}{8b}$ $(\because Q_S = \frac{A-c}{b})$

f) $CS = \frac{(A - P_m)Q_m}{2} = \frac{(A-c)^2}{8b}$

9. Determinants of DWL

$$DWL = \frac{1}{2} dP \cdot dQ = \frac{1}{2} dP \cdot dQ \cdot \left(\frac{dP}{dQ}\right) \cdot \left(\frac{P}{P}\right) \cdot \left(\frac{Q}{Q}\right) \cdot \left(\frac{P}{P}\right)$$

If we assume constant costs, so that $dP = P_m - c$, then upon gathering terms, this is equivalent to

$DWL = \frac{1}{2} \cdot \varepsilon_D \cdot P_m \cdot Q_m \cdot L^2$, where L is *Lerner Index*.

This suggests that the inefficiency associated with monopoly pricing is greater, the larger the elasticity of demand, the larger the Lerner index, and the larger the industry (as measured by the firm's revenues). However, such an interpretation would be incorrect since L depends on the elasticity of demand. As ε increases, a profit-maximizing monopolist responds by decreasing L.

Starting with Harberger (1954), estimates of the economy-wide loss from the exercise or market power have been calculated based on the above equation. Harberger estimated that the *DWL* in the manufacturing sector in U.S. was approximately 0.1% of GDP. The relatively small estimates are due to low observed values of L and his assumption that the elasticity of demand was one. Small values of L are consistent with profit maximizing if demand is relatively elastic, not unity.

Cowling and Mueller (1978) observe that if a firm is a monopolist and profit maximizes, then

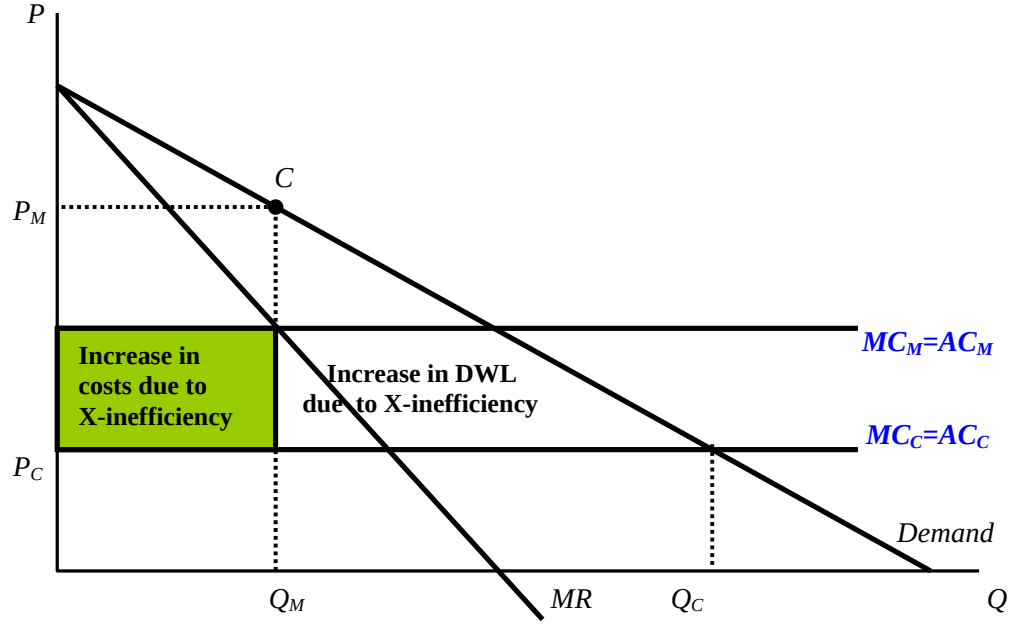
$\varepsilon_D = 1/L$ and the equation will be $DWL = \frac{\pi_m}{2}$. Their estimates based on this equation suggest that *DWL* could be on the order of 4% of GNP. However, the use of this assumes that all firms are monopolists, and this is clearly as unsatisfactory as assuming that *L* is independent of the elasticity of demand.

10. X-inefficiency

A monopoly may spend "too much" on advertising, product differentiation, or investment in excess production capacity. Tullock (1967) and Posner (1975) argue that the welfare costs of monopoly include expenditures on lobbying and campaign contributions intended to obtain tariff protection, patent protection, and other preferential government treatment. In the extreme, a firm would be willing to spend an amount up to the potential monopoly profits to become a monopolist. Such rent-seeking activities would increase the welfare costs of monopoly.

Cowling and Mueller considered this issue carefully. They used advertising expenditures to approximate the costs of monopolization to society. Adding these costs to their estimate of DWL, they estimated that the welfare cost of monopolization may be as high as 13 percent of GDP.

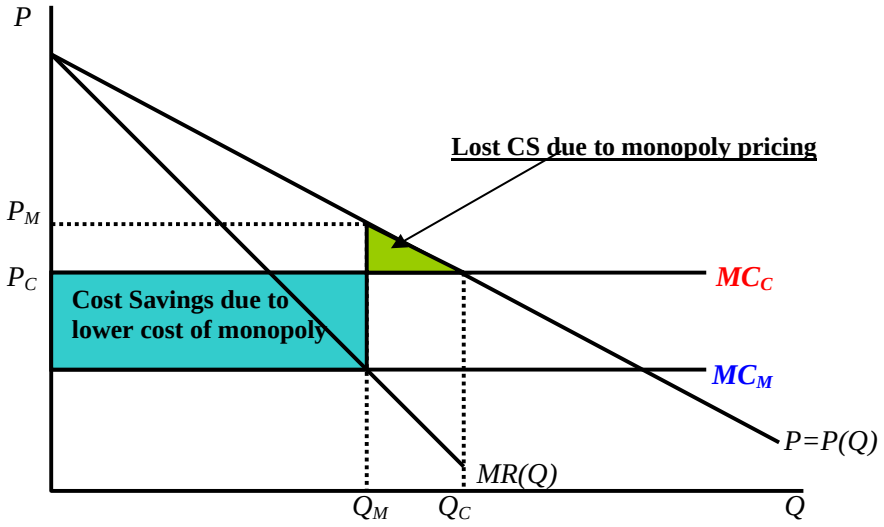
In less competitive markets, there is less pressure on firms to use inputs efficiently. Inefficient monopolists may not be driven out of the market even in the long run. We consider this effect on costs, called ***X-inefficiency*** (by Leibenstein, 1966). If monopolization raises costs, the DWL is larger. In addition, the costs of producing the monopoly output level are higher. The important welfare point is that if increasing competition in monopolized markets would lead to reduced costs, then estimates of welfare loss based on DWL triangles such as Harberger's will be far too low. While the controversy over the welfare cost of market power has not been resolved, it is possible to step back and make three observations. First, even a relatively small percent of GNP represents a considerable amount of resources. Second, any strategic behavior on the part of firms intended to obtain or protect their monopoly positions raises the costs of monopolization substantially. Third, in some industries, the potential gains to society from decreasing monopoly power are large.



11. Benefits of Monopoly

a) Scale Economies

Oliver Williamson (1968) has suggested that if a merger to monopoly results in a decrease in industry-wide costs, these cost savings could easily compensate for any increase in allocative inefficiency.



It is the value of the resources that were required under competition to produce Q_M units, but are not required to produce that output level under monopoly. Williamson's point is that it does not take very large cost savings to compensate for the allocative inefficiency.

b) Research and Development (R&D)

Joseph Schumpeter (1965) argued that market power is a necessary incentive for research and development. He contended that without the lure of monopoly profits firms would have insufficient incentives to undertake research and development. Moreover, it was a mistake to focus on allocative inefficiency if that inefficiency made possible innovation of new products and technologies. For it is this kind of innovation that is responsible for economic growth and substantial qualitative increases in living standards.

12. Regulating Monopoly

a) Marginal Cost Pricing

b) Average Cost Pricing

c) Two-tier Pricing

d) Rate-of-Return Regulation