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Lecture 3

Market power – part I

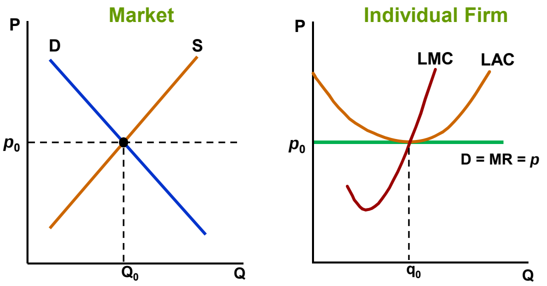
microeconomics II

first module

Review of PC

* Assumptions
  * Large number of buyers and sellers
  * Homogenous product
  * No barriers
* Zero Market Power
  * Price taking
  * $p = MC$
  * Zero economic profits in the long-run

L-R equilibrium



Monopoly

A market is a ***pure monopoly*** when

1. ***One seller*** – many buyers
2. ***One product*** without close substitutes
3. ***Barriers*** to entry
   * Patents, copyright, licensing,
   * Economies of scale, market size,
   * Access to resources

Characteristics of monopoly

* The monopolist is the ***entire supply-side*** of the market

  has ***complete control*** over the amount offered for sale
* Monopolist ***sets price***

  is ***not a price-taker*** but ***must consider*** consumer demand
* What is the ***profit maximization condition*** under monopoly?

Revenue function

* Revenue

$$R = p(q) \cdot q$$

* Average revenue

$$AR = \frac{R}{q} = \frac{p(q) \cdot q}{q} = p(q)$$

price received per unit sold, is the ***market demand curve***

* Marginal Revenue

$$MR = \frac{dR}{dq} = \frac{d(p(q) \cdot q)}{dq} = \frac{dp(q)}{dq} \cdot q + p(q)$$

change in revenue resulting from a unit change in output

MR for linear demand

- Consider a ***linear*** demand

$$p = a - bq$$

(intercept: a, slope: b)

- Revenue is

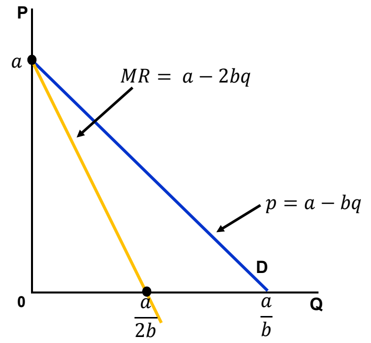
$$R = q \cdot (a - bq) = aq - bq^2$$

- Then, ***marginal revenue*** is

$$MR = (aq - bq^2)' = a - 2bq$$

- ***When*** demand is a straight line, then…

AR & MR (graph)



*Numerical example

Price	Quantity	R	AR	MR
5	0	0	-	-
4	1	4	4	4
3	2	6	3	2
2	3	6	2	0
1	4	4	1	-2

Price and MR

- In PC,

$$MR = p$$

- In monopoly,

$$MR < p$$

- ***Why?***
- Because in monopoly, you serve the ***entire demand***
  - You cannot sell an extra unit ***unless you drop*** the price
  - This was ***not the case*** in PC
- You do not drop the price for the ***extra unit only***

  for ***all*** units!

Profit maximization in monopoly

- In monopoly the ***revenue*** from each extra unit ***is not*** $\bar{p}$
- Therefore, the PC maximization condition ***does not work***
- Under monopoly, we revert to the ***generalized*** profit maximization condition

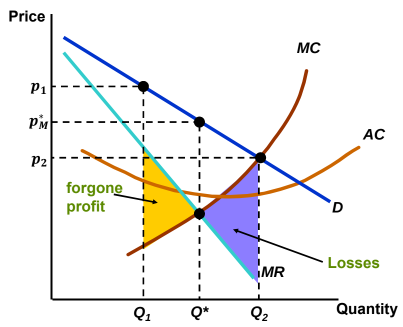
$$MR = MC$$

profit maximization implies that equilibrium is at the ***intersection*** of MR with MC

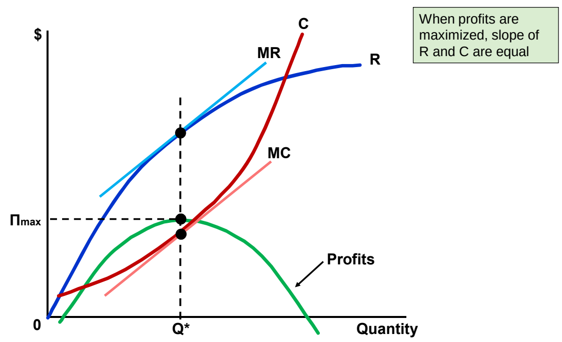
Stability of equilibrium

- Assume that q_M^* is the production level where $MR = MC$
- For every $q < q_M^*$
  - The ***increase in revenue*** from producing an extra unit is greater than the ***increase in cost***
  - The extra unit yields extra ***profit***
- For every $q > q_M^*$
  - The ***decrease in revenue*** from producing a unit less is lower than the ***decrease in cost***
  - Units over q_M^* result in ***losses***

Monopolist's output decision – graph



Profit maximization graph



*Example: monopoly equilibrium

- Suppose that ***cost*** is $C(Q) = 50 + Q^2$ and ***demand*** is $p = 40 - Q$
- Marginal cost

$$\mathrm{MC} = dC/dQ = 2Q$$

- Revenue

$$R = p \cdot Q = 40Q - Q^2$$

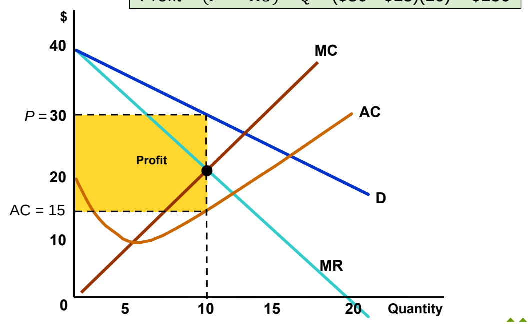
- Marginal revenue

$$MR = dR/dQ = 40 - 2Q$$

- From $MC = MR$ we can estimate that $Q = 10$
- From the demand we can calculate that $p = 30$

Example – graph

Profit = $(P - AC) \cdot Q$ = ($30 - $15)(10) = $150



A "rule-of-thumb" for pricing

- The output for which $MR = MC$ may be ***impractical*** for the monopolist to estimate
- We can ***transform*** the profit maximization condition into a ***rule of thumb*** that can be more easily ***applied*** in practice

MR manipulation

- We have ***previously*** calculated the marginal revenue as

$$MR = \frac{dR}{dQ} = \frac{d(p \cdot Q)}{dQ} = p + Q\frac{dp}{dQ}$$

- Let's ***multiply*** the last term with p/p

$$MR = p + p\frac{Q}{p}\frac{dp}{dQ}$$

- ***Notice*** that $\frac{Q}{p}\frac{dp}{dQ} = \frac{1}{\varepsilon_d}$, thus

$$MR = p + \frac{p}{\varepsilon_d} \Rightarrow MR = p\left(1 + \frac{1}{\varepsilon_d}\right)$$

MR = MC condition manipulation

Rule of thumb

- We know that the profit is maximized when $MC = MR$
- The profit maximization condition ***can be written*** as

$$MC = p\left(1 + \frac{1}{\varepsilon_d}\right)$$

- Which can be ***manipulated*** to yield

$$p - MC = p - p\left(1 + \frac{1}{\varepsilon_d}\right) \Rightarrow p - MC = p\left(-\frac{1}{\varepsilon_d}\right)$$

- And some more

$$\frac{p - MC}{p} = \frac{1}{p}p\left(-\frac{1}{\varepsilon_d}\right) \Rightarrow \frac{p - MC}{p} = -\frac{1}{\varepsilon_d}$$

The rule-of-thumb

Rule of thumb

$$\frac{p - MC}{p} = -\frac{1}{\varepsilon_d}$$

- The LHS is the ***profit margin*** as a percentage of p

  profit is ***maximized when*** the profit margin is set equal to the inverse of the elasticity of demand
- You can ***easily prove*** with simple algebra that

$$p = MC \cdot \left(1 - \frac{1}{\varepsilon_d + 1}\right)$$

- The green fraction in the parenthesis is the ***markup***

  how much you should ***mark your cost up*** in order to maximize your profit ***depends*** on ε_d

*Example

Rule of thumb

- If $\varepsilon_d = -4$ and $MC = 9$
- The ***profit margin*** is $-\frac{1}{-4} = 25\%$
- Or you can calculate the ***markup*** as $-\frac{1}{-4+1} = 33.\overline{3}\%$
- ***Price*** will be $p = MC(1 + markup) = 9 \cdot 1.\overline{3} = 12$
- Thus, from the total price of 12, the 25% is ***profit***

Pricing: monopoly vs. PC

- Monopoly

$$p > MC$$

  price exceeds MC by an amount that depends inversely on the ***elasticity*** of demand
- Perfect Competition

$$p = MC$$

  demand for the firm is ***perfectly elastic*** at $p = MC$

Monopoly and elasticity

Monopoly

- If $|\boldsymbol{\varepsilon_d}| > \mathbf{1}$ for the entire range of demand, there is ***little benefit*** to being a monopolist

  the larger the elasticity, the closer to a perfectly competitive market
- However, a monopolist will never ***limit production*** at the ***inelastic portion*** of demand curve ($|\varepsilon_d| < 1$)
- At the inelastic portion

$$\frac{dQ}{q} < \frac{dp}{p}$$

  the monopolist, can ***increase revenue*** by increasing p and decreasing q (and also cost), till $|\varepsilon_d|$ exceeds 1

Thank you!

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