

Session #5

Fundamentals of Microeconomics

MONOPOLY

November 4, 2019

- ▶ Optimal production and profit of monopoly
- ▶ Market power
- ▶ Welfare and government interventions
- ▶ Price discrimination

MONOPOLISTIC MARKET STRUCTURE IS A COMPLETE OPPOSITE OF PERFECT COMPETITION REGIME

- ▶ In monopolistic market structure, there is only one firm in the market (monopoly), and there is no close substitute for the good it offers.
- ▶ Monopoly covers the total market demand.
- ▶ Monopoly is not a price taker.
- ▶ Monopoly does not compete with other firms and therefore it can produce even when it increases the price.
- ▶ Monopoly can set a price that is higher than its marginal costs, and it has a positive profit.

MONOPOLY IS A MARKET STRUCTURE KNOWN FROM ANCIENT HISTORY



In ancient Egypt, pharaohs had monopoly on sales of food.

MONOPOLY IS A MARKET STRUCTURE KNOWN FROM ANCIENT HISTORY



Greek philosopher Thales had monopoly on olive oil presses.

MONOPOLY'S GOAL IS TO MAXIMIZE THE PROFIT (AS IN ALL MARKET STRUCTURES)

- ▶ Monopoly's profit π is again defined as difference between revenues (R) and costs (C) and depends on the volume of production Q :

$$\pi(Q) = R(Q) - C(Q) .$$

- ▶ The monopoly decides about its optimal production in two steps:
 1. What level of output Q^* maximizes the profit of the firm?
 2. At this level, is it optimal to produce or to interrupt (stop) the production?
- ▶ The monopoly thus maximizes its profit (given market conditions), and if this maximal profit at least lowers the necessary costs, then the firm produces the optimal quantity of output.

AT OPTIMAL PRODUCTION LEVEL, MARGINAL REVENUES ARE EQUAL TO MARGINAL COSTS

- ▶ Necessary condition for the production Q^* to be optimal:

$$\frac{\Delta\pi(Q^*)}{\Delta Q} = \frac{\Delta R(Q^*)}{\Delta Q} - \frac{\Delta C(Q^*)}{\Delta Q} = 0 .$$

- ▶ If we denote marginal revenues $MR = \frac{\Delta R}{\Delta Q}$ and marginal costs $MC = \frac{\Delta C}{\Delta Q}$, we have the condition

$$MR(Q^*) = MC(Q^*) .$$

- ▶ It is the same condition as in the case of perfect competition, but there is a substantial difference on the side of marginal revenues.

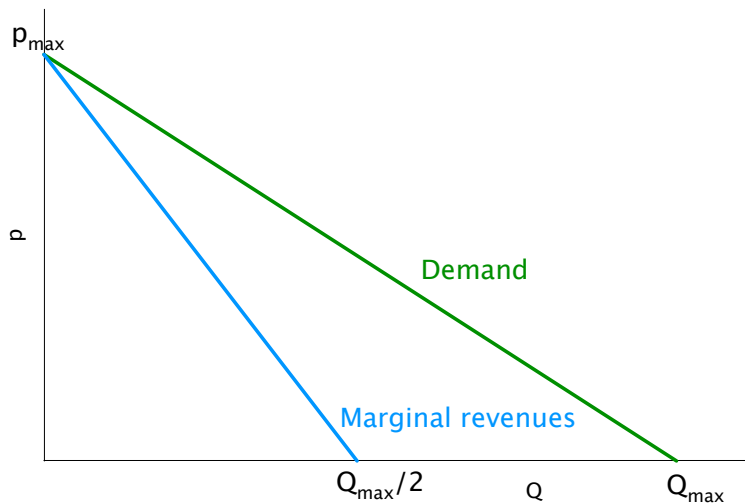
TO FIND MARGINAL REVENUES, WE HAVE TO CONSIDER THE RELATION OF PRICE AND QUANTITY

- ▶ We define monopoly's revenues as the volume of goods sold multiplied by the price: $R(Q) = pQ$.
- ▶ Since the monopoly covers total market demand, it is not a price taker and its decision about production changes also the price at which it can sell the good.
- ▶ The price is a function of quantity produced ($p = p(Q)$), given by market demand.
- ▶ With standard downward-sloping demand, higher price means lower quantity and vice-versa.

MONOPOLY CAN MAXIMIZE ITS PROFIT WITH RESPECT TO PRICE OR QUANTITY

- ▶ Because of the relation between price and quantity (given by market demand), the monopoly can set either the price (and determine the corresponding quantity from market demand) or the quantity (and determine the corresponding price).
- ▶ We say that the monopoly maximizes its profit either by setting the price or the quantity (it is equivalent).
- ▶ If the monopoly sets higher price, it will sell lower quantity, and vice-versa.
- ▶ Profit is maximized in the point where increasing price compensates for decreasing quantity.

WITH LINEAR DEMAND, MARGINAL-REVENUES CURVE IS ALSO LINEAR



WE CAN FIND OPTIMAL PRODUCTION OF MONOPOLY GRAPHICALLY USING MR AND MC CURVES

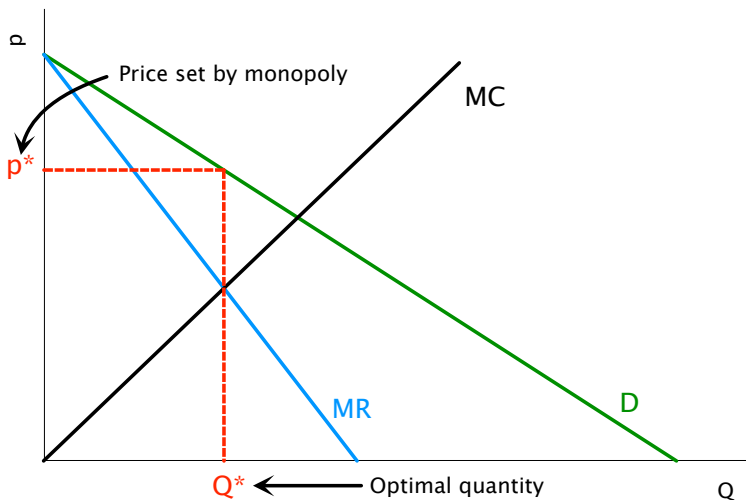
- ▶ Given the condition

$$MC(Q^*) = MR(Q^*) ,$$

optimal production of monopoly Q^* is the horizontal coordinate of the point of intersection between marginal-revenues and marginal-costs curve.

- ▶ The corresponding price can be then determined from the demand curve as $p(Q^*)$.

WE CAN FIND OPTIMAL PRODUCTION OF MONOPOLY GRAPHICALLY USING MR AND MC CURVES



MONOPOLY PRODUCES IF REVENUES IN OPTIMUM ARE LARGER THAN VARIABLE COSTS

- ▶ At the optimal solution Q^* , the profit of the firm (generated by production) has to be larger than the loss given by fixed costs (that the firm has to pay even if it does not produce):

$$\pi(Q^*) = R(Q^*) - C(Q^*) \geq -FC ,$$

where FC are necessary fixed costs.

- ▶ It holds then:

$$R(Q^*) \geq C(Q^*) - FC = VC(Q^*) ,$$

where $VC(Q)$ are variable costs. .

THE FIRM PRODUCES IF REVENUES IN OPTIMUM ARE LARGER THAN VARIABLE COSTS

- ▶ Given that

$$R(Q^*) = p^* Q^*$$

and

$$VC(Q^*) = \frac{VC(Q^*)}{Q^*} Q^* = AVC(Q^*) Q^* ,$$

the condition $R(Q^*) \geq VC(Q^*)$ is equivalent to

$$p^* \geq AVC(Q^*) .$$

- ▶ In the long run (with zero fixed costs), the monopoly produces if the optimum price is higher than average costs:

$$p^* \geq ATC(Q^*) .$$

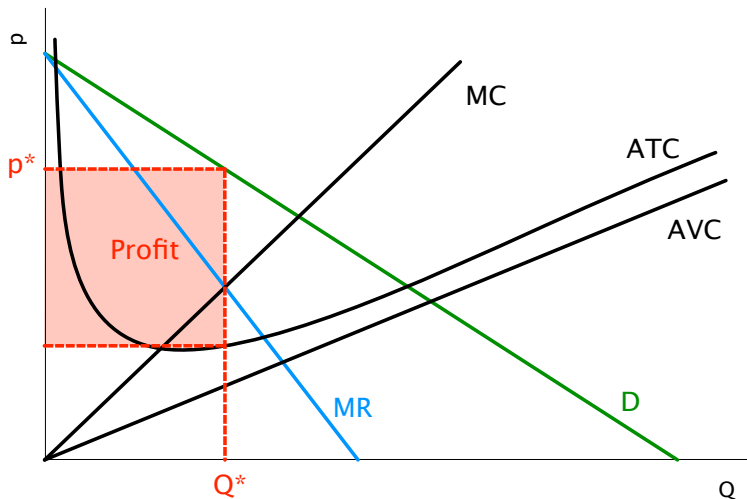
WE CAN REPRESENT THE PROFIT OF A COMPETITIVE FIRM GRAPHICALLY USING COST AND MR CURVES

- ▶ Profit of the firm can be written as

$$\begin{aligned}\pi(Q) &= pQ - \frac{TC(Q)}{Q}Q = pQ - ATC(Q)Q \\ &= (p - ATC(Q))Q .\end{aligned}$$

- ▶ Profit in optimum is thus equal to the area of a rectangle with one side of length Q^* and the second side of length given by the difference between the optimal price and the average-total-cost curve in optimum ($p^* - ATC(Q^*)$).
- ▶ This optimum is given by the intersection of marginal-costs and marginal-revenues curve.

WE CAN REPRESENT THE PROFIT OF A COMPETITIVE FIRM GRAPHICALLY USING COST AND MR CURVES



- ▶ Optimal production and profit of monopoly
- ▶ **Market power**
- ▶ Welfare and government interventions
- ▶ Price discrimination

MONOPOLY HAS A MARKET POWER BECAUSE IT IS A PRICE MAKER, AND HAS A POSITIVE PROFIT

- ▶ Monopoly does not compete with other firms and therefore it can produce even when it increases the price.
- ▶ Monopoly can set a price that is higher than its marginal costs, and it has a positive profit.
- ▶ We call the ability to set the price higher than marginal costs “market power”.
- ▶ Market power depends on the elasticity of demand - lower elasticity implies higher market power.

MARKET POWER OF A MONOPOLY IS GIVEN BY THE UNIQUENESS OF THE GOOD IT OFFERS

- ▶ If lower elasticity implies higher market power, the situation is more favorable for the monopoly if the good it produces is difficult to substitute, or when it is difficult to find substitutes at least in the given locality.
- ▶ Market power of a monopoly is weakened when:
 - ▶ products that can substitute the monopoly's products are introduced in the market,
 - ▶ new firms enter the market,
 - ▶ firms with similar services operate closer to the original monopoly.

MONOPOLISTIC MARKET STRUCTURE CAN BE REPLACED BY COMPETITION



- ▶ In 1979, USPS had monopoly for over-night package delivery.
- ▶ Today, its market share is 4%.

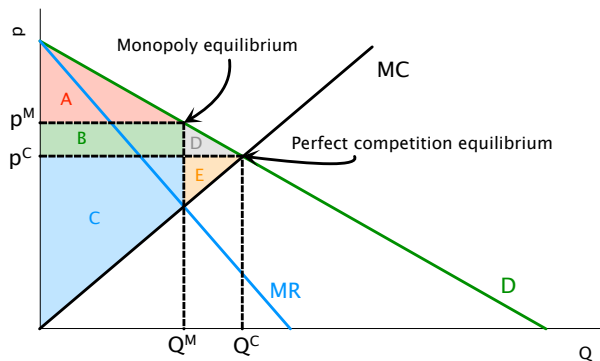


- ▶ Optimal production and profit of monopoly
- ▶ Market power
- ▶ **Welfare and government interventions**
- ▶ Price discrimination

MONOPOLY GENERATES DEADWEIGHT LOSS (AS COMPARED TO PERFECT COMPETITION)

- ▶ Monopolistic firm sets a price that is higher than firm's marginal costs.
- ▶ Production is then lower than in case of perfect competition.
- ▶ Monopoly sells lower quantity at higher price - because it is the optimal solution, higher price has to compensate loss given by lower production. Producer surplus increases.
- ▶ On the other hand, higher price and lower quantity decreases consumer surplus.
- ▶ Decrease of consumer surplus is not compensated by increase of producer surplus - monopoly generates deadweight loss.

AS COMPARED TO PERFECT COMPETITION, MONOPOLY CREATES A DEADWEIGHT LOSS



	Q^C (Competition)	Q^M (Monopoly)	Change
CS	A+B+D	A	$\Delta CS = -B-D$
PS	C+E	C+B	$\Delta PS = B-E$
W=CS+PS	A+B+C+D+E	A+B+C	$\Delta W = -D-E = DWL$

NATURAL MONOPOLIES ARE CREATED BECAUSE OF COST ADVANTAGES

- ▶ Monopoly can be created naturally or as a consequence of government intervention.
- ▶ Monopoly is created for example in a situation when one firm fully controls some of the inputs necessary for production or has some technological or organizational advantage over others.
- ▶ Natural monopoly arises when one of the firms is able to produce the whole market supply at costs that are lower than when several firms are producing:

$$C(Q) < C(q_1) + C(q_2) + \dots + C(q_n) ,$$

where $Q = q_1 + q_2 + \dots + q_n$.

GOVERNMENT CAN ENCOURAGE CREATION OF MONOPOLY BY ENTRY RESTRICTIONS OR BY PATENTS

- ▶ If the government limits the entry of firms in the market (for example by issuing licenses), it strengthens the monopolistic character of existing firms.
- ▶ Profit created by these monopolies can be transferred to the government (for example in the form of a license fee).
- ▶ Government can also issue patents that ensure monopoly for a given product during a certain fixed and limited time.
- ▶ Profit created by the monopoly of firms that have the patent is a compensation and motivation for development of new technologies and processes.

BY LIMITING THE FREE ENTRY IN THE MARKET, GOVERNMENT ENCOURAGES MONOPOLY

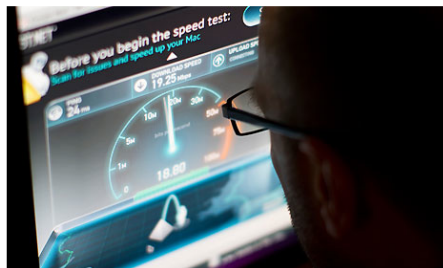
Disappointing 4G mobile broadband auction leaves Treasury £1.2bn short

Mobile operators must pay £2.3bn for the extra bandwidth they need – but George Osborne had been pencilling in £3.5bn

- Poll: Will you be signing up for 4G this year?

Juliette Garside, telecoms correspondent
guardian.co.uk, Wednesday 20 February 2013 08.27 GMT

 Jump to comments (410)



BY ISSUING PATENTS (CREATING MONOPOLY), GOVERNMENT MOTIVATES DEVELOPMENT



- ▶ Dr. Alan Scott worked on development of botulinum toxin since the 60s of the 20th century.
- ▶ In 2002, US allowed this substance to be used for cosmetic purposes, and in the subsequent two years, the number of injections increased by 166%.
- ▶ All the profit from sales of botox goes to Allergan, Inc., for which Dr. Scott developed this substance.

INTELLECTUAL PROPERTY RIGHTS ARE A TYPE OF PATENT THAT IS HARD TO ENFORCE



- ▶ From the short-run perspective, violation of intellectual property rights can have serious consequences (if only those users who would never buy the product download it illegally).
- ▶ From the long-run perspective, it can weaken the motivation of authors.

BY INTERVENING, THE GOVERNMENT CAN ALSO DECREASE MARKET POWER OF A MONOPOLY

- ▶ If the government sets the maximum price at which monopoly can sell, it decreases its market power and protects consumers.
- ▶ By setting the maximum price, demand and thus the marginal-revenues curve is regulated.
- ▶ Price has to be set so that it is equal to the price determined in the perfect competition regime and so that the market returns to the competitive equilibrium.
- ▶ This increases the society's welfare.

- ▶ Optimal production and profit of monopoly
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MONOPOLY CAN USE ITS MARKET POWER ALSO FOR PRICE DISCRIMINATION AMONG CONSUMERS

- ▶ Monopoly produces a suboptimal quantity of output and compensates it by setting higher price.
- ▶ This means that it does not cover the demand by customers that are not willing to pay this increased price.
- ▶ If the monopoly could sell its products at different prices, it could set higher price for consumers with higher willingness to pay, and a lower one for the others.
- ▶ It could thus increase the quantity produced and cover also the remaining part of demand.
- ▶ In such case, we talk about price discrimination.
- ▶ We recognize three degrees of price discrimination.

UNDER PRICE DISCRIMINATION OF THE FIRST DEGREE, EACH CUSTOMER PAYS A DIFFERENT PRICE

- ▶ Price discrimination of the first degree means that the monopoly sells its product at prices which are different for each customer.
- ▶ Each customer pays the maximum price he/she is willing to pay - the price coincides with the demand curve.
- ▶ In such market, there is no consumer surplus, all the surplus goes to the producer.
- ▶ Production is at optimal level and the society's welfare is maximized.

UNDER PRICE DISCRIMINATION OF THE SECOND DEGREE, PRICE DEPENDS ON QUANTITY SOLD

- ▶ Price discrimination of the second degree means that price per unit produced is not constant, but depends on the quantity sold.
- ▶ Such form of discrimination is often used in public services (for example in the case of electricity prices).
- ▶ In this regime, the consumer that purchases the largest quantity pays the lowest price.

UNDER PRICE DISCRIMINATION OF THE THIRD DEGREE, PRICES DIFFER FOR GROUPS OF CONSUMERS

- ▶ Price discrimination of the third degree is a regime in which the monopolist identifies several groups of consumers and it sells its product at different price for each group.
- ▶ Example: student or senior discount.
- ▶ The monopoly decides what quantity to sell to the different groups at what price.
- ▶ Higher price is paid by the group of consumers with less elastic demand.
- ▶ Price discrimination leads to higher level of production, the monopoly sells even to the part of the market that would not accept a higher price and would not buy the good.



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Admission fees

Category	Daily ticket	Annual ticket
Adults	200,- CZK	700,- CZK (12x entry/year - 1 entry daily)
Children 3-15 years, students, retired, handicaped people	150,- CZK	450,- CZK (12x entry/year - 1 entry daily)
Retiree over 70 years old	1,- CZK	-
Retiree up to 70 years old and handicaped people	1,- CZK (every first monday/month)	-
Families (2 adults + 2 children)	600,- CZK (+ 100,- CZK another child)	1.800,- CZK (48x entry/year - 4 entries daily)

EXERCISE

Johnny Rockabilly has just finished recording his latest CD. His record company's marketing department determines that the demand for the CD is as follows:

Price (in \$)	Number of CDs
24	10,000
22	20,000
20	30,000
18	40,000
16	50,000
14	60,000

The company can produce the CD with no fixed cost and a variable cost of \$5 per CD.

1. Find total revenue for quantity equal to 10,000, 20,000, and so on. What is the marginal revenue for each 10,000 increase in the quantity sold?
2. What quantity of CDs would maximize profit? What would the price be? What would the profit be?
3. If you were Johnny's agent, what recording fee would you advise Johnny to demand from the record company? Why?