



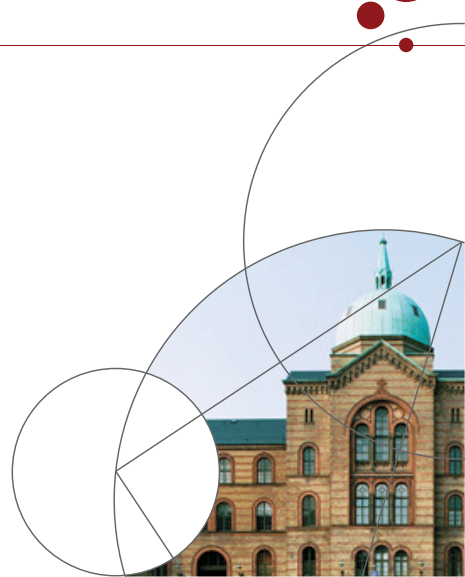
UNIVERSITY OF COPENHAGEN



Mikro II, lecture 6b

Monopolies, elasticities, prices and taxes

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Plan for the lecture

- 1 Useful results about demand elasticities and monopolies
- 2 Taxation of a monopolist
- 3 Monopoly regulation



Elasticities

- We will now study the role of demand elasticities in monopolies.
- Warm-up 1: Remember demand elasticities if quantity is x^* and price is $p^* = p(x^*)$ (Note: elasticity may vary with quantity):

$$\varepsilon(x^*) = \frac{\text{\%-change in demand}}{\text{\%-change in price}} = \frac{dx/x^*}{dp^*/p^*} = \frac{D'(p^*)p^*}{D(p^*)}$$

- Warm-up 2: Differentiate both sides of the equation $D(p(x)) = x$ wrt x (remember p is the inverse of D):

$$D'(p(x))p'(x) = 1 \iff D'(p(x)) = \frac{1}{p'(x)}$$



The monopolist's optimum

- Now look at a monopolist whose optimal supply, x^* , (and price $p^* = p(x^*)$) is characterized by the first-order condition (from before):

$$MR(x^*) = MC(x^*)$$

- Marginal costs are positive, so it follows that when the monopolist has chosen her supply, it must always apply that:

$$MR(x^*) \geq 0$$



Rewrite

- Now insert for $MR(x)$ and rewrite:

$$MR(x^*) \geq 0 \iff$$

$$p(x^*) + p'(x^*)x^* \geq 0 \iff$$

$$p(x^*) \geq -p'(x^*)x^* \iff$$

$$-\frac{p(x^*)}{p'(x^*)x^*} \geq 1 \iff$$

$$\frac{D'(p(x^*))p(x^*)}{x^*} \leq -1 \iff$$

$$\frac{D'(p^*)p^*}{D(p^*)} \leq -1 \iff$$

$$\varepsilon(x^*) \leq -1 \iff$$

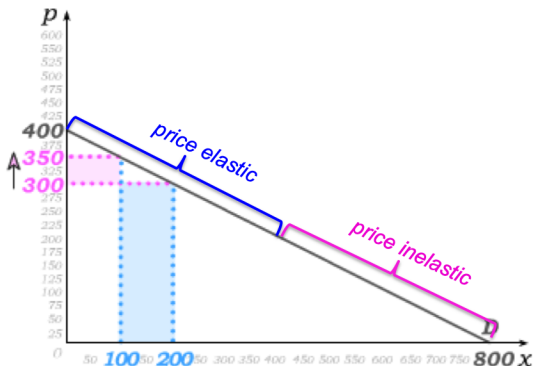


Elasticity and optimum

- We see that a monopolist whose optimum is an internal solution will never choose a price and quantity where demand is inelastic (where $\varepsilon(x^*)$ is less than one in absolute terms)
- Intuition: If demand is inelastic at a given price and quantity then it will always be optimal to raise the price a bit more:
 - Increase the price by 1 % $\Rightarrow$ quantity decreases by less than 1 % (inelastic demand)
 - Revenue is price times the quantity $\Rightarrow$ revenue increases with higher price
 - Costs decrease simultaneously (less produced) $\Rightarrow$ the higher price gives higher profit



Graphical example, linear curve



- Linear demand curve has constant slope: constant effect of increasing the price by one unit on the amount demanded.
- Elasticity = percent effect on demand of 1 *percent* higher price.
- (Absolute value of the) Elasticity *decreases* going to the right along the linear curve.
- The result shows in which area the monopolist will produce (regardless of the cost).



Back to the monopolist's optimum

- Now we go back to the monopolist's first-order condition and rewrite it:

$$\begin{aligned}
 MR(x^*) &= MC(x^*) && \Longleftrightarrow && p(x^*) + p'(x^*)x^* = MC(x^*) && \Longleftrightarrow \\
 1 + \frac{p'(x^*)x^*}{p(x^*)} &= \frac{MC(x^*)}{p(x^*)} && \Longleftrightarrow && 1 + \frac{D(p^*)}{D'(p^*)p^*} = \frac{MC(x^*)}{p^*} && \Longleftrightarrow \\
 1 + \frac{1}{\varepsilon(x^*)} &= \frac{MC(x^*)}{p^*} && \Longleftrightarrow && \frac{\varepsilon(x^*) + 1}{\varepsilon(x^*)} = \frac{MC(x^*)}{p^*} && \Longleftrightarrow \\
 p^* = \frac{\varepsilon(x^*)}{\varepsilon(x^*) + 1} MC(x^*) &\Rightarrow && p^* = \frac{1}{1 - \frac{1}{|\varepsilon(x^*)|}} MC(x^*)
 \end{aligned}$$



Markup

$$p^* = \frac{1}{1 - \frac{1}{|\varepsilon(x^*)|}} MC(x^*)$$

- The monopolist sets a price equal to the marginal cost times a constant, a *markup*
- The markup (and thus the price) is smaller, the more elastic demand is
Idea: The less elastic demand, the more market power
- Perfectly elastic demand ($|\varepsilon(x^*)| = \infty$) $\Rightarrow$ price equals marginal costs (perfect competition)



Socratic Quiz Question

True or false: Think of a situation where demand is linear and marginal cost is constant, and the monopolist produces and makes positive profits. If the marginal cost curve shifts upward by a constant amount, the elasticity of demand at the monopolist's optimal level of production will increase.



Monopolists and taxation I

- It is straightforward to analyze what taxation does to a monopolist:
- Apply e.g. a unit tax of t per unit sold:

$$\max_x p(x)x - tx - C(x)$$

- First-order condition:

$$MR(x) = MC(x) + t$$



Monopolists and taxation II

- Taxes can affect the market price differently under monopoly than under complete competition
- Complete competition: Consumer price increases between 0 and t when the tax is introduced
- Monopoly: Consumer price may increase by *more* than t
- Can be understood via the markup equation: The tax increases MC of the company. The resulting price change depends on the demand elasticity (and may be larger than the tax itself)

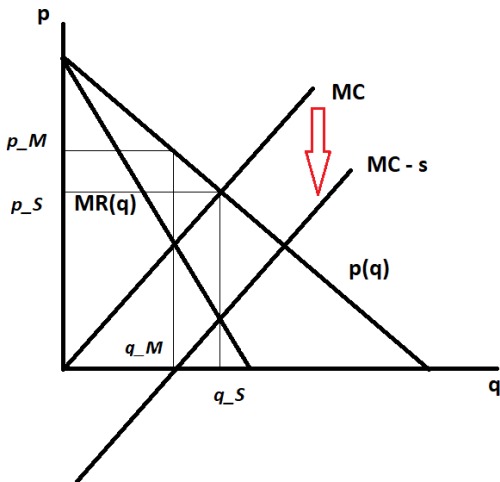


Regulation of a monopoly I

- Monopoly results in a deadweight loss; Can we overcome this with policies? Yes, in principle several solutions:
 - Force the monopolist to increase production to the optimal level (perfect competition level) by law
(or let the government directly take over production)
 - Introduce price controls (price ceiling) to keep the price at the level of perfect competition
 - Introduce a subsidy (negative tax) which causes the monopolist to raise production to the efficient level
(the optimal subsidy is $p'(x^*)x^*$ where x^* is the efficient level of production, check yourself that this implements x^*)



Effect of a subsidy, graphically



Socratic Quiz Question

True or false: Even though a subsidy may remove the deadweight loss, it will necessarily increase the profits of the firm and therefore have unintended distributional consequences.



Regulation of a monopoly II

- The solutions to monopoly obviously require the government to have a lot of information about preferences / technology etc.
- Another (better?) solution is just to avoid the existence of monopolies $\Rightarrow$ competition law (block mergers, for example)
- However, thinking about slides 6b, sometimes we have “natural” monopolies and it may be a good idea to have them.



What have we learned?

- What demand elasticity must be at the monopolist's optimal price and quantity
- How the monopolist sets his price as a mark-up over marginal costs
- Calculate what happens when a monopolist is taxed
- Simple regulation options for monopolies

