Intermediate Microeconomics

Market Structure: Monopoly

Agribusiness Teaching Center

Easter Term 2015

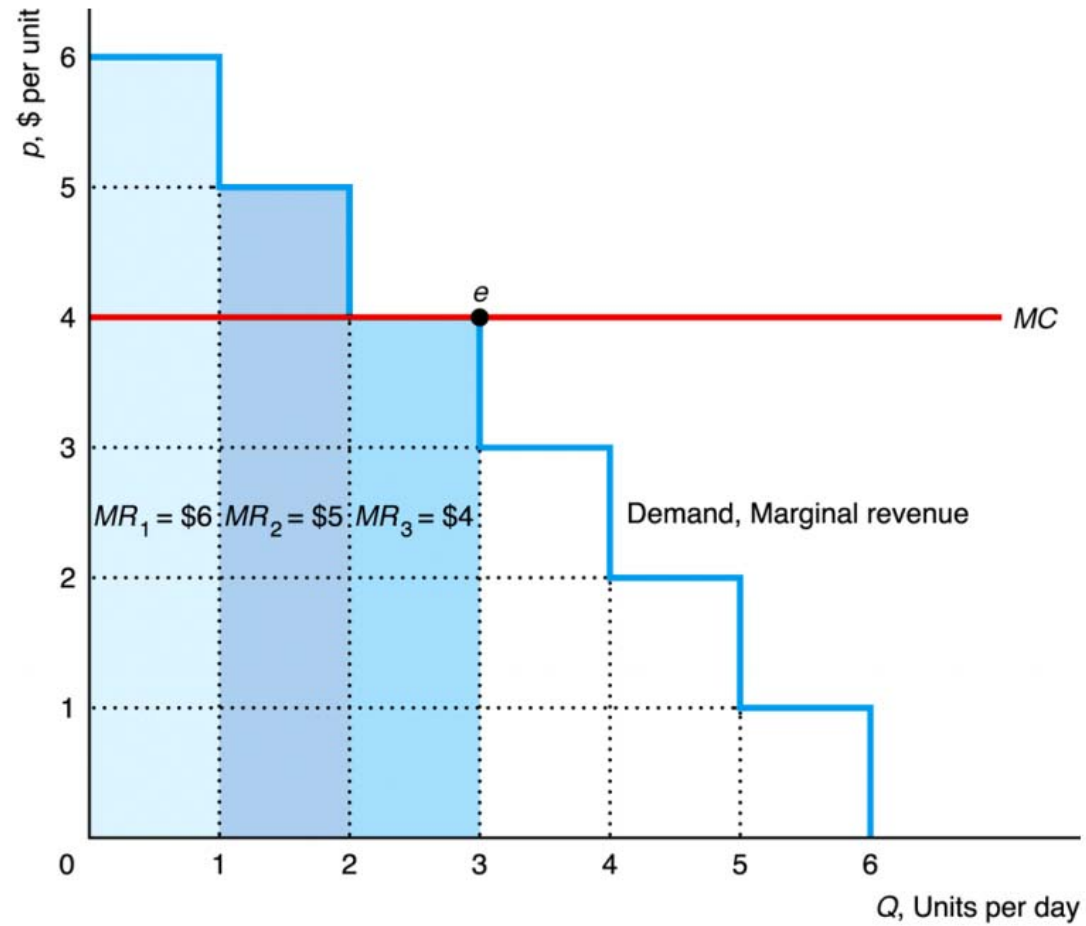# Monopoly

Definition

A situation where a market is dominated by a single seller of a product is known as a **monopoly.**

Fact

The monopolist (the sole producer) faces market demand, and thus, has to choose the price and produce the demanded quality (or vice versa).

Perfect discrimination

Arbitrage Pricing

ARBITRAGE

The process of buying a commodity and then reselling at a favorable price.

If resale possible, then arbitrage implies a single price in market.

Optimisation

$$MC = MR$$

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

Arbitrage Pricing

$MR = MC$

$R = p(q) \cdot q$

$$
\begin{aligned}
MR &= p(q) \cdot \frac{\partial q}{\partial q} + q \cdot \frac{\partial p(q)}{\partial q} \\
&= p(q) + q \cdot \frac{\partial p}{\partial q} \\
&= p(q) \left[1 + \frac{q}{p} \cdot \frac{\partial p}{\partial q} \right]
\end{aligned}
$$

Optimality Condition

$MR = MC$

$R = p(q) \cdot q$

$$
\begin{aligned}
MR &= p(q) \cdot \frac{\partial q}{\partial q} + q \cdot \frac{\partial p(q)}{\partial q} \\[2mm]
&= p(q) + q \cdot \frac{\partial p}{\partial q} \\[2mm]
&= p(q) \left[1 + \frac{q}{p} \cdot \frac{\partial p}{\partial q} \right]
\end{aligned}
$$

$$
MR = p(q) \left[1 + \frac{1}{\varepsilon_p(q)} \right] = p(q) \left[1 - \frac{1}{|\varepsilon_p(q)|} \right] = MC
$$

Monopoly Pricing

$$MC = p(q)\left[1 - \frac{1}{|\varepsilon_p(q)|}\right]$$

$$p(q) = \frac{MC}{\left[1 - \frac{1}{|\varepsilon_p(q)|}\right]}$$
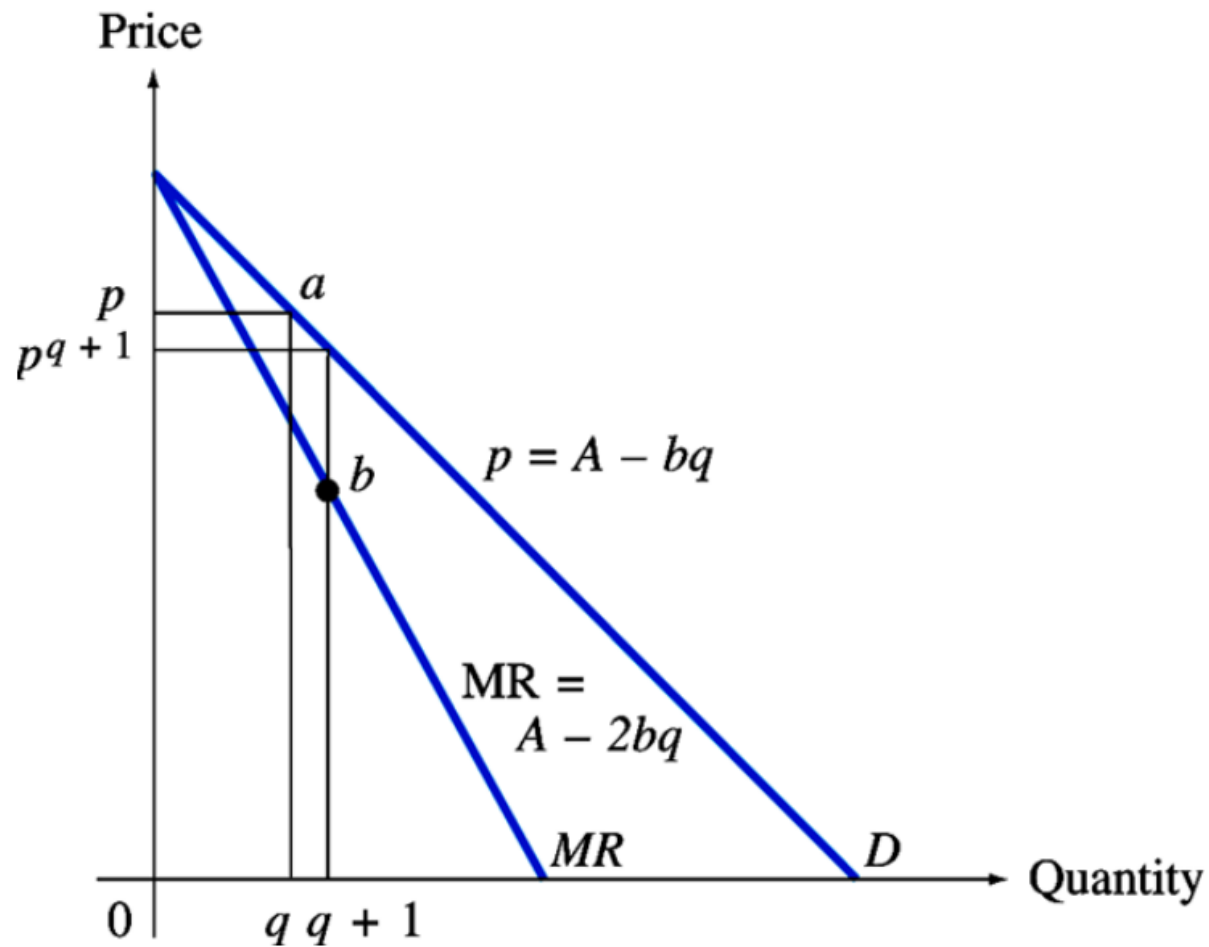
Lemma (Pricing Rule 1: The Elasticity Rule for Monopoly Pricing)

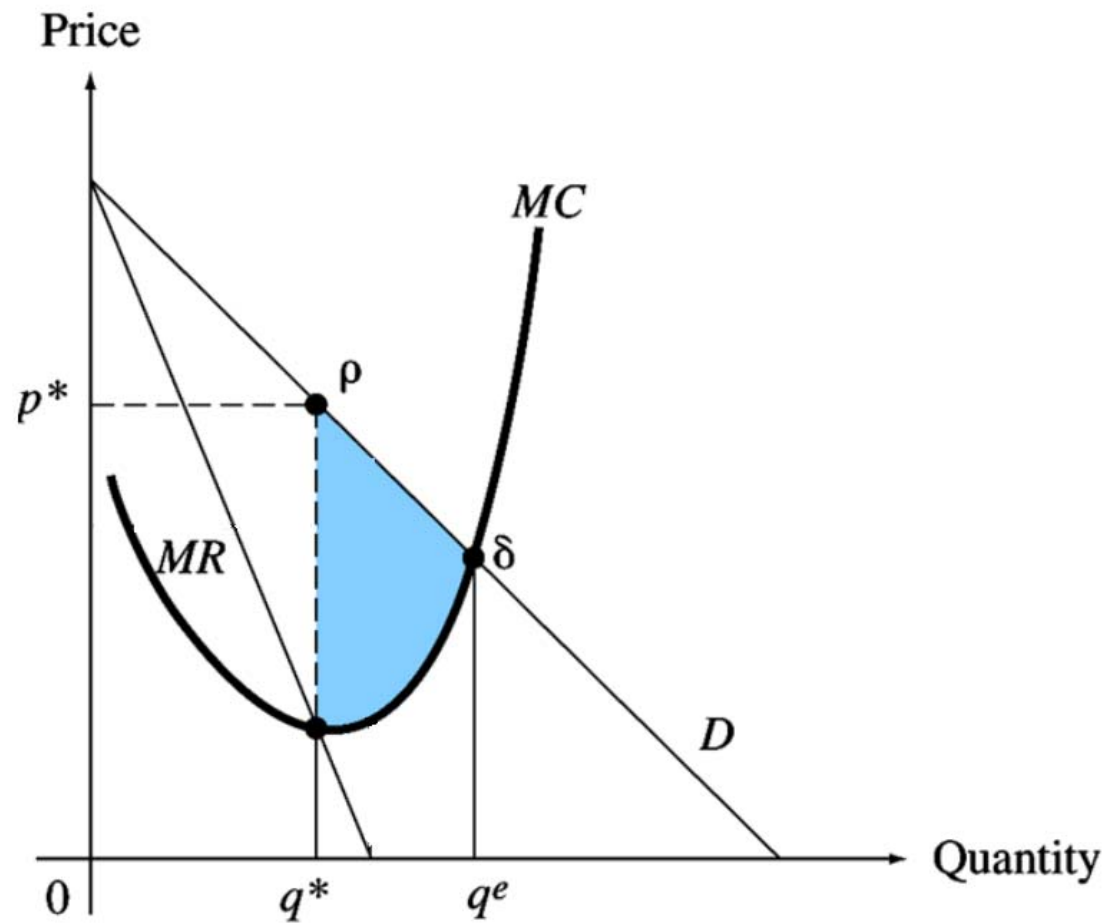*Never price on the inelastic portion of the demand curve.*

Lemma (Pricing Rule 2: Markup Pricing)

The optimal price for a monopolist is the price that is on the demand curve at the optimal quantity point.

Example: Linear Demand

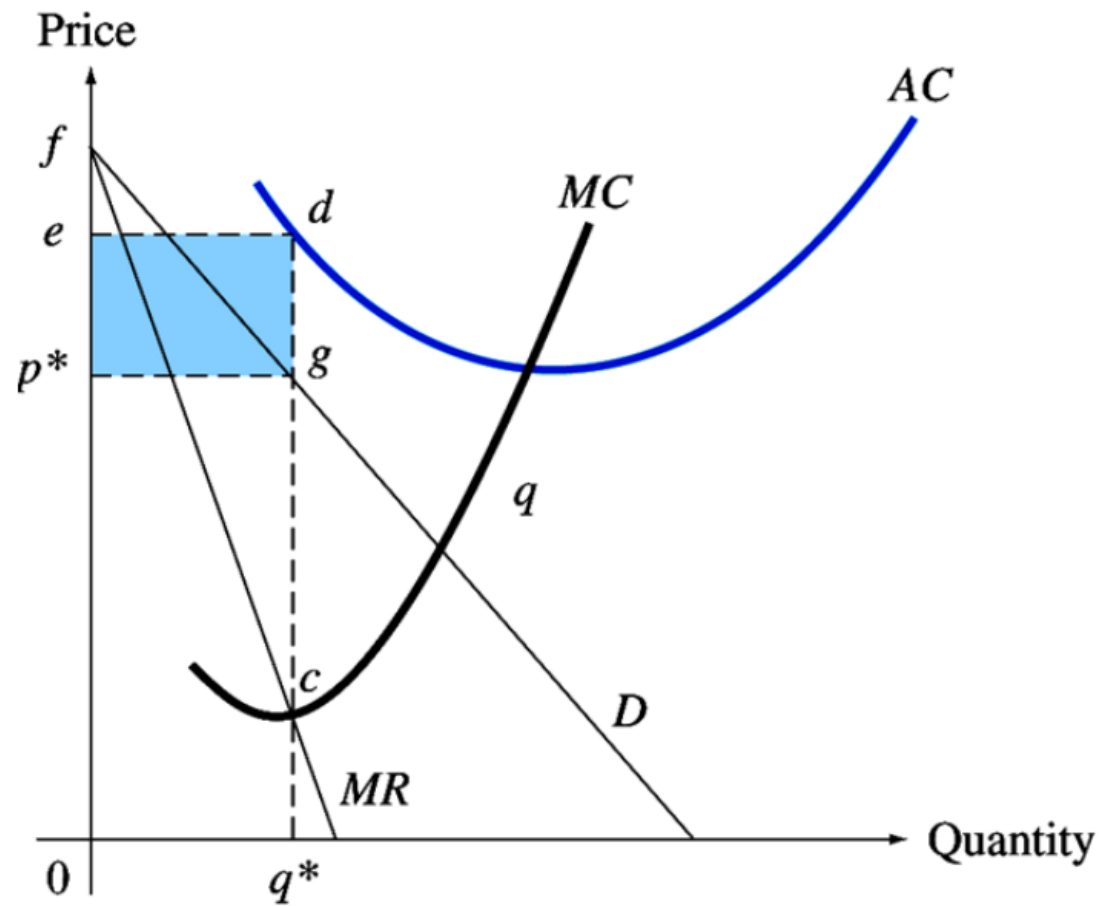# Monopoly Pricing and Deadweight Loss

Profitability Condition

$$\pi \;=\; p\,(q^*)\,q^* - C(q^*)$$

$$=\; p\,(q^*)\cdot q^* - AC\cdot q^*$$
$$=\; (p\,(q^*) - AC)\cdot q^*$$

$$\pi > 0 \iff p > AC$$

Profitability Condition

Market Structure

WHY DO MONOPOLIES EMERGE?

Market Structure

Problem

Why do monopolies emerge?

Solution

Among others:
- *Minimum efficiency scale and Natural monopoly*
- *Inertia shopping and Contestable markets*
- *Governmental licences and historical reasons*
- *Cartels*

Natural Monopoly

Definition

A **natural monopoly** is a monopoly that develops because the cheapest way to produce any given level of output in this market is to have one firm to do it.

Definition

A **cost function is subadditive** if

$$C(q) < C(q') + C(q'')$$

for all levels q, q' and q'', such that $q = q' + q''$.

Natural Monopoly

Definition

A Natural monopoly that has a cost function $C(q)$ and faces demand function of $D(p)$ is sustainable if there is a price of p and an output of q such that

1. at any price the firm satisfies all the demand in the market:

$$q = D(p)$$

2. covers its cost:

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

3. a competing firm will incur loss if enters to the market:

$$p' \cdot q' < C(q')$$

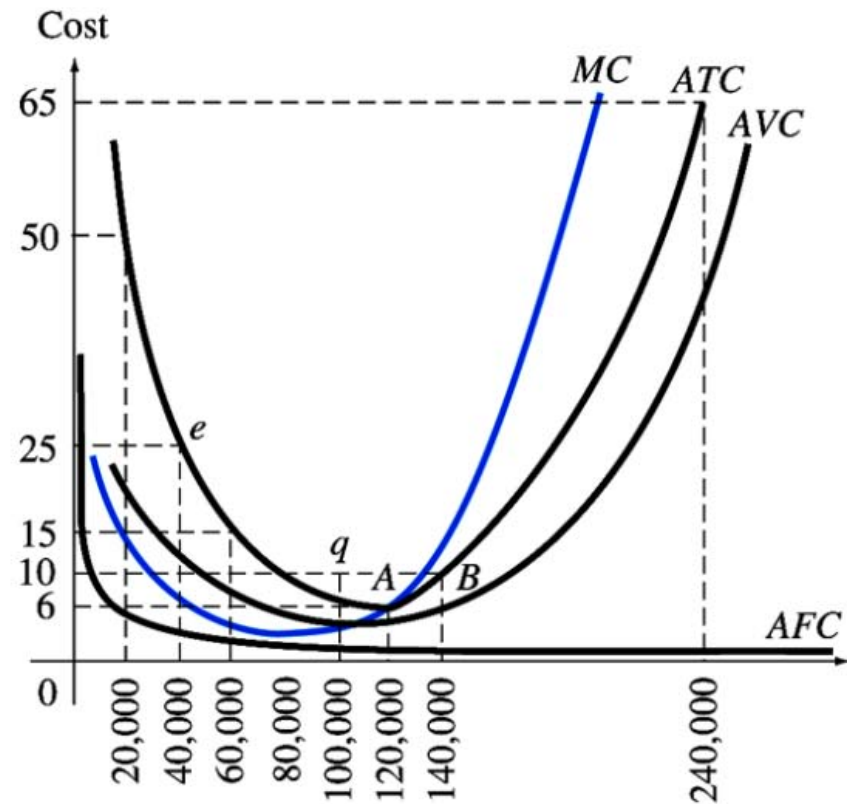for all $p' < p$ and $q' \leq D(p')$

Natural Monopoly
Minimum Efficiency Scale

Definition

Minimum efficiency scale (MES) is the level of output that minimizes average cost.
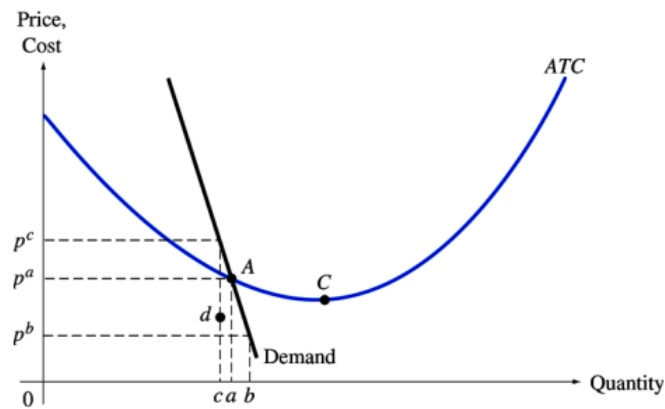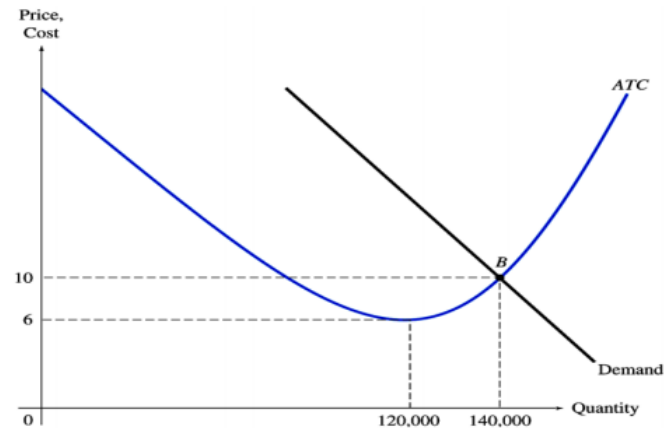
Fact

For the monopoly to emerge the MES should be small relative to the size of demand.

Sustainable Monopoly
Minimum Efficiency Scale

Sustainable Monopoly

Fact (technical)

A natural monopoly is sustainable if, for an output of q, average costs are declining at every level up to that quantity.

Fact (intuitive)

A sustainable price-output combination must be a point at which the demand curve intersects the average cost curve.

Problem

Why do monopolies price the commodities higher than the average costs?

Inertia Shopping Rule

Example

There is an incumbant in the market. The potential entrant will suffer sunk costs once enters the market. And the consumers follow the inertia shopping rule. Incumbent has to decide whether to set monopolistic or sustainable price. Potential entrant decides. Incumbent, observing entrant's decision chooses new price or keeps the same.

Definition (Inertia-shopping Rule)

Buy from the firm that charges the lowest price, but if you are already buying from a firm and another firm enters the market and offers you a lower price, give your current firm a chance to meet the entrant's price before shifting.

Contestable Market

Example

There is an incumbent in a contestable market. The consumers have no loyalty to sellers. The entrants can use hit-and-run strategy, i.e. enter with lower price, make profit, and go out of the market (with little costs) once the incumbent decreases his price.

Definition

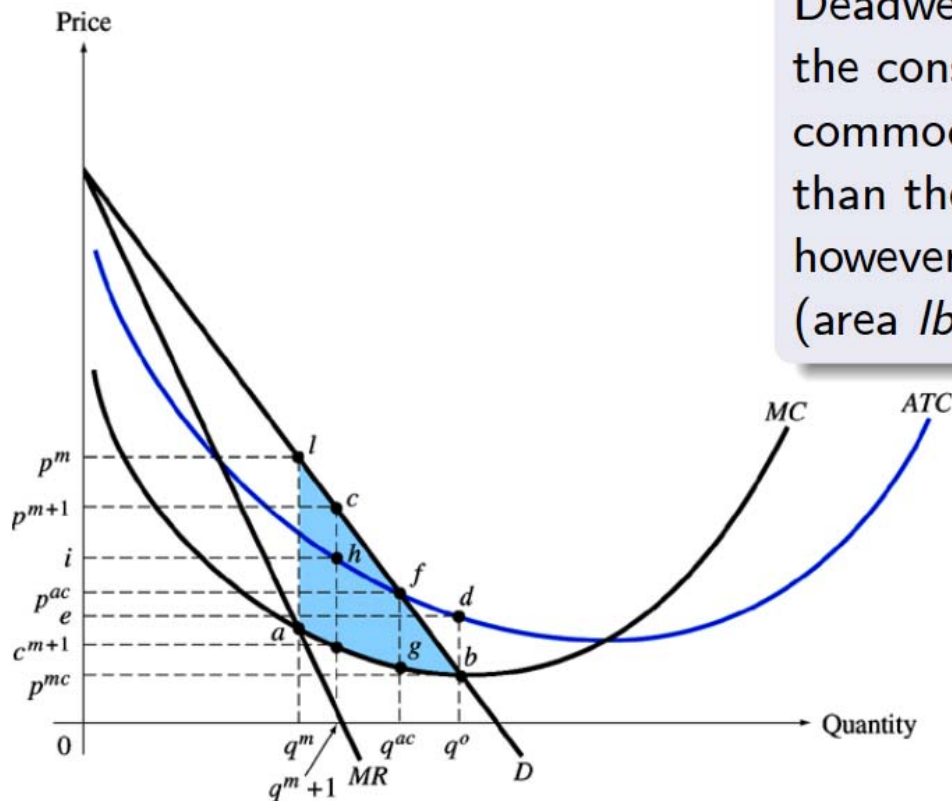A market that competitors can easily enter and leave is known as a **contestable market**.

Deadweight loss and Government

Why do governments tend to
control monopolies?
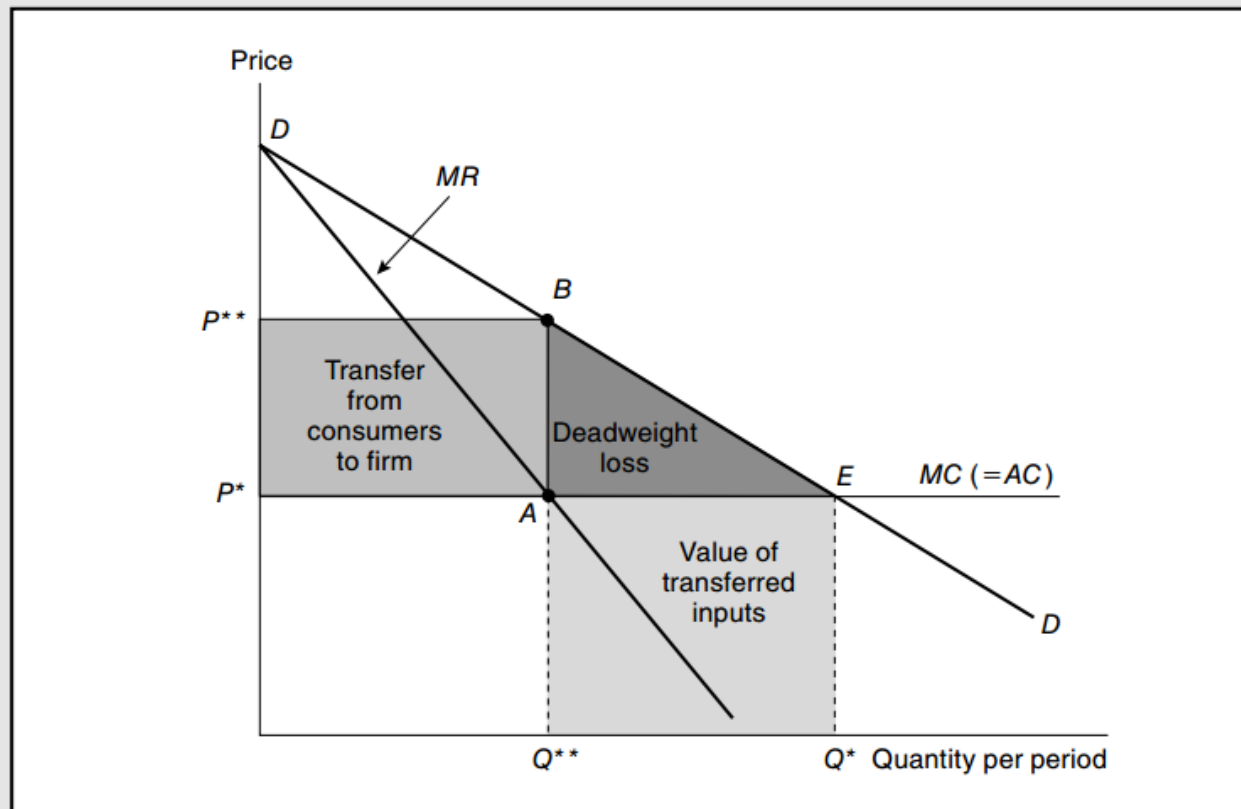
Deadweight Loss
Government Regulation

Definition

Deadweight loss occurs when the consumers demand commodity with higher price than the costs of production, however it is not produced (area *lba*).

Monopoly and deadweight loss

Monopolization of this previously competitive market would cause output to be reduced from Q^* to Q^{**}. Consumer expenditures and productive inputs worth AEQ^*Q^{**} are reallocated to the production of other goods. Consumer surplus equal to $P^{**}BAP^*$ is transferred into monopoly profits. There is a deadweight loss given by BEA.

Deadweight Loss
Government Regulation
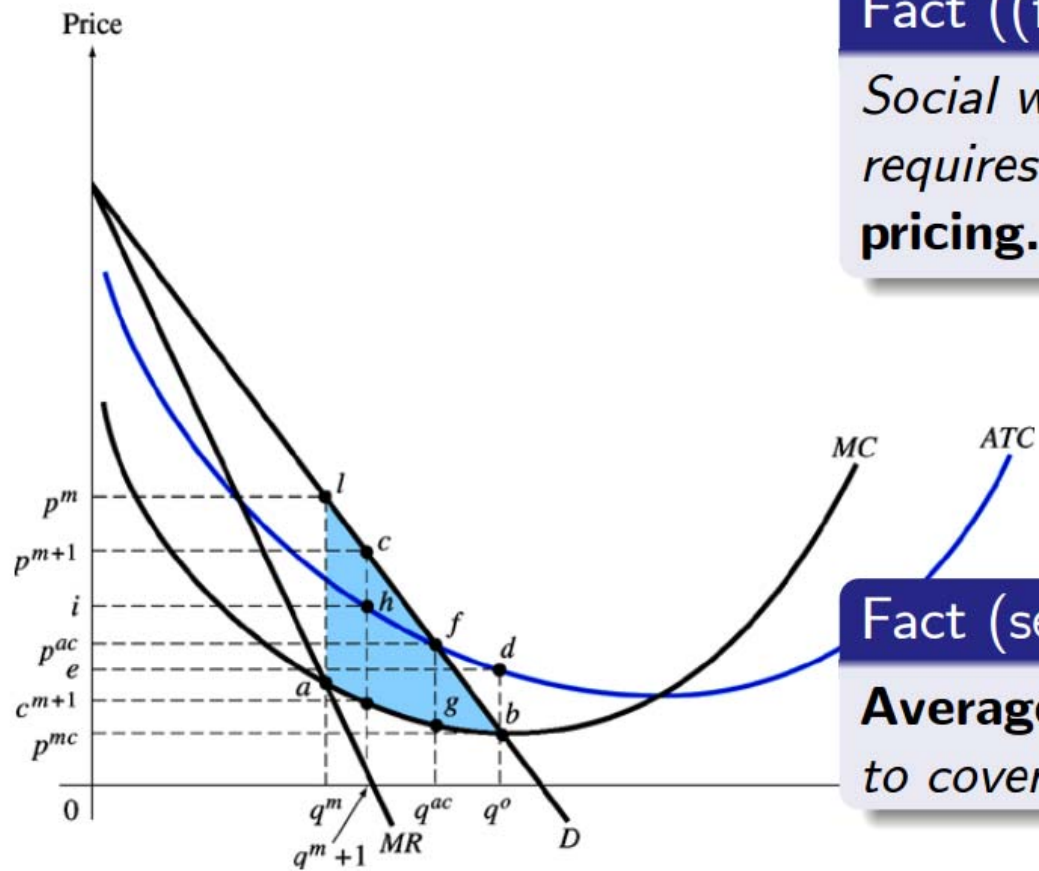
Fact ((first-) best result)

Social wealfare maximisation requires **marginal-cost pricing.**

Fact (second-best result)

Average-cost pricing *is used to cover the total costs.*

Demand Elasticity and Markup

- Revenue:

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

- Marginal revenue:

$$MR = \frac{\partial p}{\partial Q} q + \frac{\partial q}{\partial q} p$$

$$MR = p \left(1 + \frac{\partial p}{\partial Q} \frac{Q}{p} \frac{q}{Q} \right)$$

$$MR = p \left(1 - \frac{s}{|\varepsilon|} \right)$$

$$p = MR \div \left(1 - \frac{s}{|\varepsilon|} \right)$$

- Pricing:

$$\boxed{p = MC \div \left(1 - \frac{s}{|\varepsilon|} \right)}$$

Lerner Index and Market Power

Definition

Lerner Index,

$$\mathcal{L} = \frac{p - MC}{p},$$

is a measure of market power: the firm's ability to raise price above marginal cost.

Lemma

Lerner Index:

- *Monopoly:* $\mathcal{L} = \frac{1}{|\varepsilon|}$
- *Oligopoly:* $\mathcal{L} = \frac{s}{|\varepsilon|}$
- *Competitive firm:* $\mathcal{L} = 0$

Lerner Index

EXPLAIN WHY THE BOUNDARIES ON LERNER INDEX ARE 0 AND 1