Principles of Economics

Chapter 5: Market Failure

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Agenda

5. Market Failure
   - Imperfect Competition
   - Externalities
   - Public Goods

Reading:

- Mankiw/Taylor (2020), Chapters 8, 9, 11
- Varian (2014), Chapters 25, 35, 37

Monopoly

Monopoly Market: A market served by a single firm, the monopolist

Framework: Consider a monopoly market for an ordinary good.

- All consumers are price takers.
- The monopolist is a price setter: Given inverse market demand, the monopolist's output choice determines the market price.
- The monopolist is perfectly informed about market demand but cannot identify individual demands.
- No price discrimination: The monopolist charges every consumer the same price for all units of the good.

Monopoly Profit

Profit Maximization: The monopolist maximizes profit with respect to output given inverse market demand and total costs.

$$\max_{Q} \quad \pi(Q) = R(Q) - C(Q), \quad \text{with} \quad R(Q) = p(Q)Q$$

Any interior solution of the maximization problem must satisfy the following condition:

$$\underbrace{p(Q) + \frac{dp(Q)}{dQ}Q}_{MR(Q)} = \underbrace{\frac{dC(Q)}{dQ}}_{MC(Q)}$$

Trade-off: A marginal increase in output has two effects on revenue.

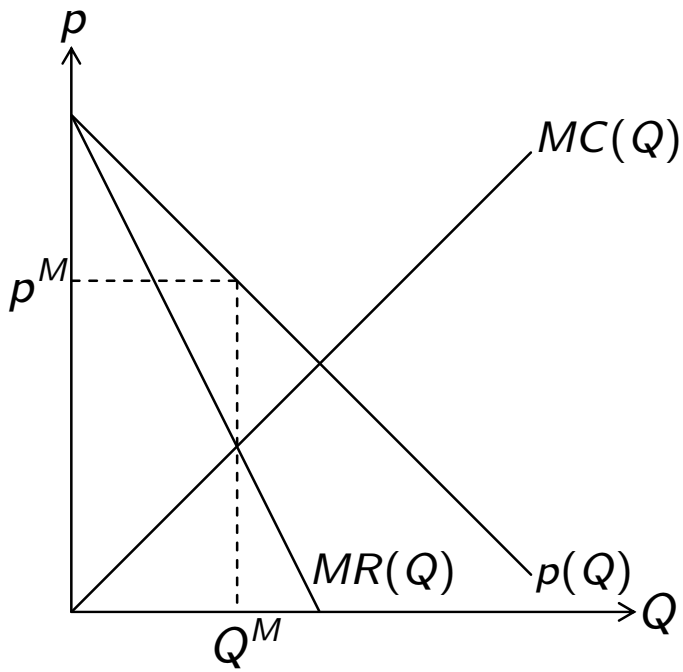
- Revenue increases by the price charged for the marginal unit.
- Revenue decreases by the price reduction aggregated over the inframarginal units.

Monopoly Equilibrium

Market Equilibrium: The monopoly market is in equilibrium at the profit-maximizing quantity Q^M and the corresponding price p^M, where

- the monopoly quantity equals market demand and, equivalently,
- the monopoly price equals inverse market demand.

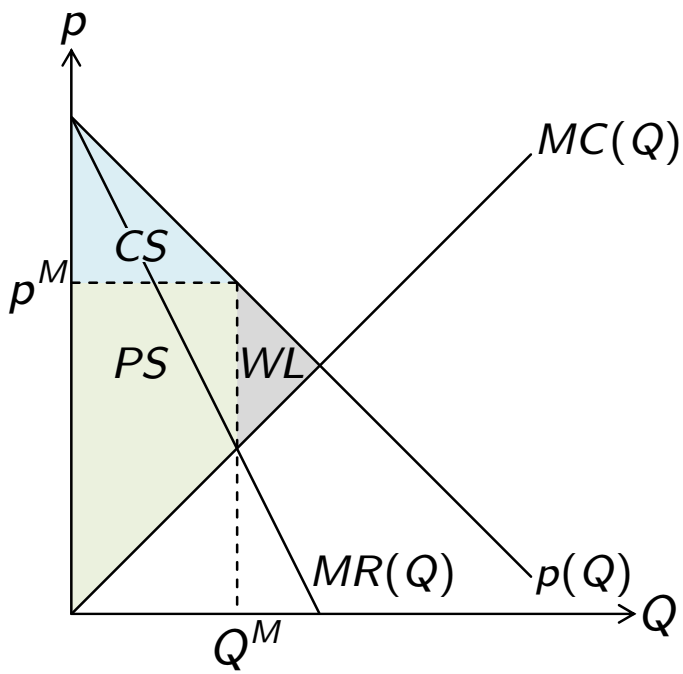
$$Q^M = Q^D(p^M) \quad \Leftrightarrow \quad p^M = p(Q^M)$$



Monopoly and Welfare

Welfare Loss: The profit-maximizing quantity does not maximize total surplus, since not all potential gains from trade are realized.

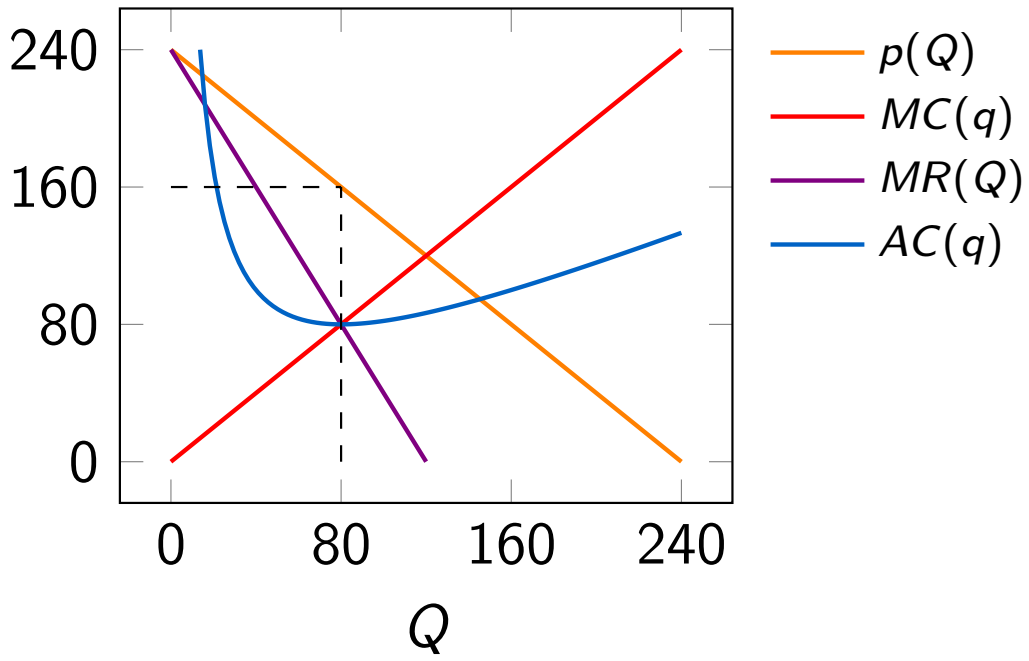
- By choosing the profit-maximizing quantity, the monopolist sets the price above marginal costs.



Monopoly

Example: Consider a monopoly market where inverse market demand is $p(Q) = 240 - Q$, and total costs are $C(Q) = 3{,}200 + \frac{1}{2}Q^2$.

- The profit-maximizing quantity is $Q^M = 80$, the corresponding price is $p^M = 160$, and the resulting profit is $\pi = 6{,}400$.



Natural Monopoly

Natural Monopoly: A market, where total costs are subadditive, such that the desired output can be produced less costly by a single firm, i.e. the monopolist, than by two or more firms.

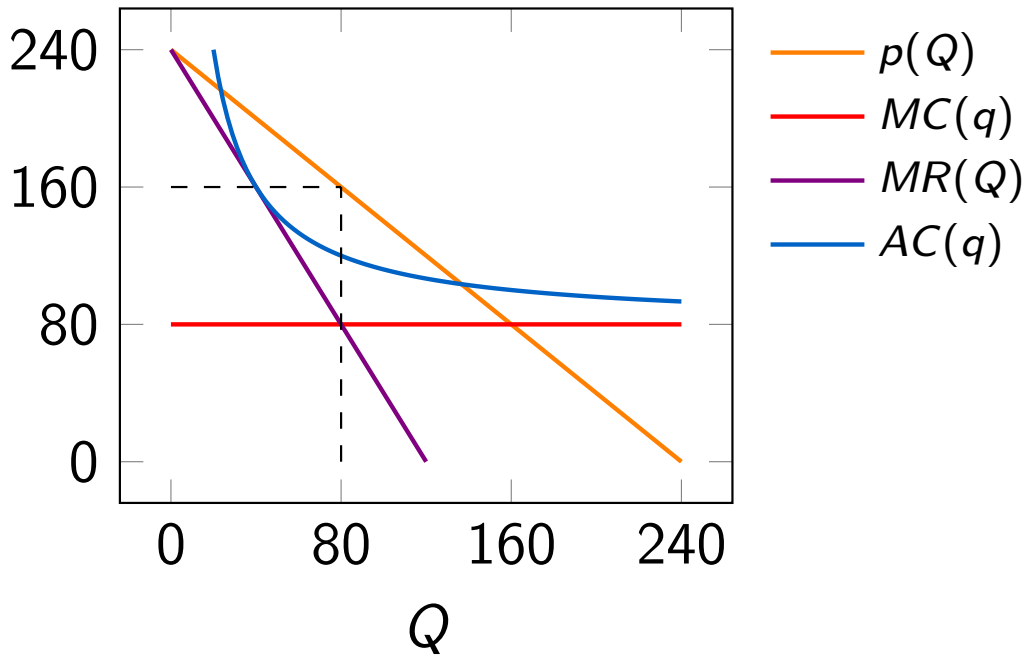
$$C(Q) < \sum_{i=1}^{n} C(q_i), \quad \text{where} \quad Q = \sum_{i=1}^{n} q_i$$

This is the case if the market demand curve intersects the average total cost curve where the latter is downward sloping.

Natural Monopoly

Example: Consider a monopoly market where inverse market demand is $p(Q) = 240 - Q$, and total costs are $C(Q) = 3{,}200 + 80Q$.

- The profit-maximizing quantity is $Q^M = 80$, the corresponding price is $p^M = 160$, and the resulting profit is $\pi = 3{,}200$.



Patent Monopoly

Patent Protection: Right of an inventor to prevent others from utilizing the invention

- If fixed costs are higher for the inventor than for potential imitators, patent protection is necessary for the inventor to make non-negative profits.
- Trade-off between prospective welfare (resulting from future inventions) and present welfare (resulting from existing inventions).

Monopoly Regulation

Price Regulation: A price ceiling that induces the monopolist to increase output increases welfare.

- The welfare-maximizing price ceiling induces the monopolist to produce the output for which inverse market demand equals marginal costs; $p(Q) = MC(Q)$.
- In case of a natural monopoly, the welfare-maximizing price ceiling implies losses for the monopolist, calling for either subsidization or nationalization.

External Effects

Externality: Uncompensated effect of production or consumption choices on others' profit or utility

Framework: Consider price-taking decision makers whose choices may have external effects.

- Marginal costs comprise private and external marginal costs.

$$MC(Q) = MC_{Pr}(Q) + MC_{Ex}(Q)$$

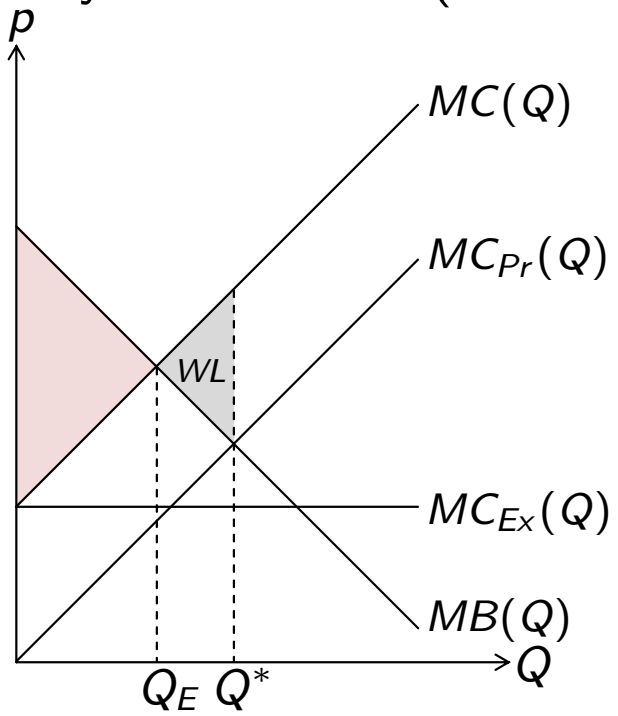
- Marginal benefits comprise private and external marginal benefits.

$$MB(Q) = MB_{Pr}(Q) + MB_{Ex}(Q)$$

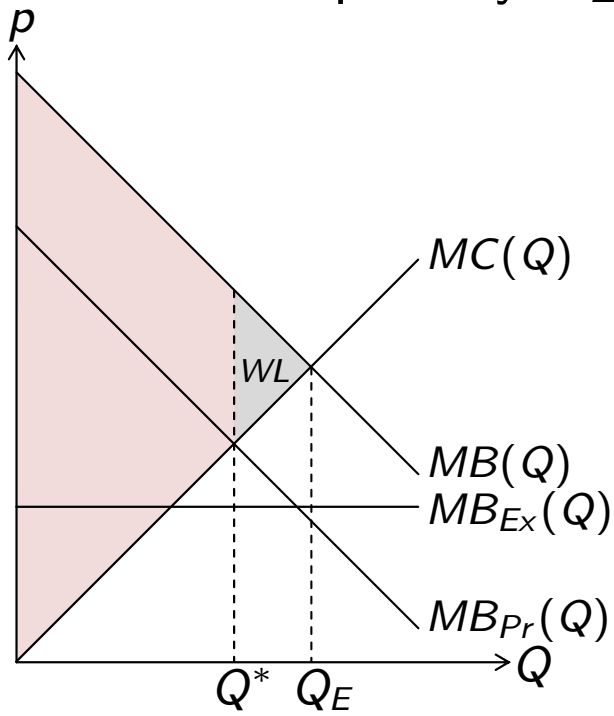
External Effects and Welfare

Welfare Loss: In the presence of externalities, individual maximization results in a quantity that does not maximize total surplus as it fails to align marginal costs and marginal benefits.

- In case of a negative (positive) externality, the equilibrium quantity Q^* exceeds (falls short of) the efficient quantity Q_E.



Negative Externality



Positive Externality

Remedies to External Effects

Quantity Regulation: Decision makers can be forced to choose the efficient quantity.

- Requires information on marginal costs and marginal benefits

Corrective Taxation: A (Pigouvian) tax or subsidy can induce individuals to choose the efficient quantity.

- Requires information on external marginal costs and external marginal benefits

Bargaining: If property rights are well defined, bargaining between those affected by an externality and those causing it can induce individuals to choose the efficient quantity, irrespective of the division of property rights. (Coase Theorem)

Public Goods

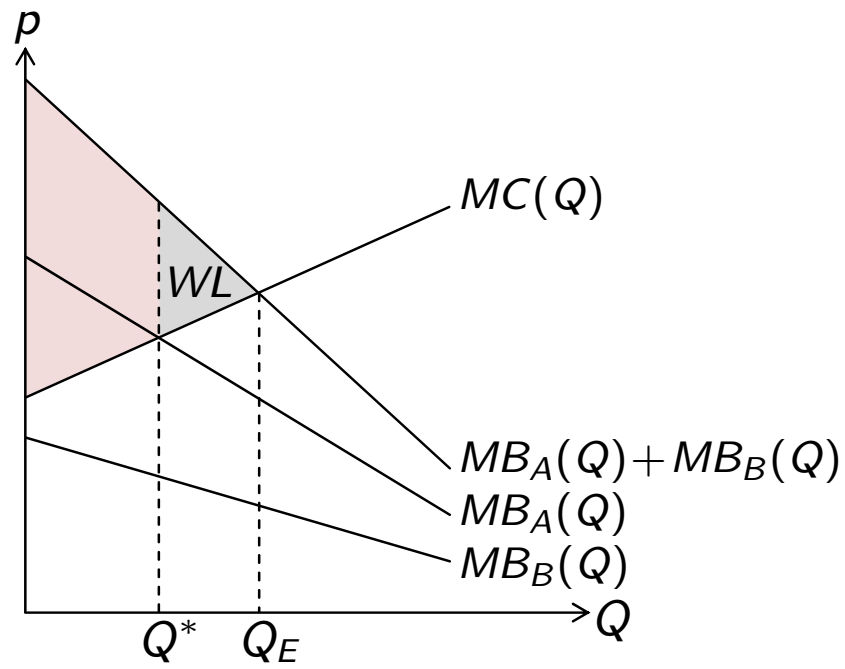
Public Good: A good that is non-rival and non-excludable with respect to consumption

- Non-Rivalry: Consumption by one individual does not diminish the consumption possibilities of other individuals.
- Non-Excludability: It is effectively impossible to prevent any individual from consuming a public good.

Public Goods and Welfare

Welfare Loss: Individual provision entails a positive externality and thus results in an undersupply of the public good; the equilibrium quantity Q^* falls short of the efficient quantity Q_E.

- Free-Rider Problem: Incentive of individuals to rely on others to provide the public good



Public Goods and Welfare

Samuelson Condition: Welfare maximizing public good provision

- At the efficient quantity of the public good Q_E, the sum of consumers' marginal benefits equals marginal costs.

$$\sum_i MB_i(Q_E) = MC(Q_E)$$

- Public (collective) provision according to the Samuelson condition requires information on marginal benefits and marginal costs of the public good.