Principles of Economics

Chapter 5: Market Failure

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Winter Term 2025-2026

Agenda

5. Market Failure
   - Market Power
   - Externalities
   - Public Goods

Reading:

- Mankiw/Taylor (2023), Chapters 9, 10, 11
- Varian (2014), Chapters 25, 35, 37

Market Failure

Under ideal conditions, the interaction of consumers and firms on markets results in a resource allocation that maximizes welfare. Under certain circumstances, however, markets fail to maximize welfare.

- Market failure occurs when individual optimization of consumers and firms leads to an outcome that is not optimal from a collective (societal) perspective.
- Market failure can justify government intervention.

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. Hence, the monopolist has market power.
- The monopolist is perfectly informed about (inverse) market demand but cannot identify (inverse) 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:

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

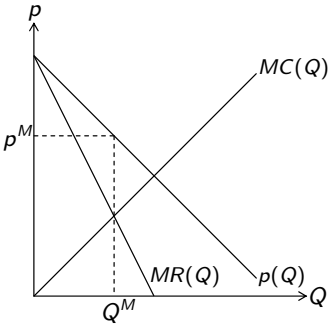
Trade-off: A marginal increase in output has two effects on revenue.

- 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

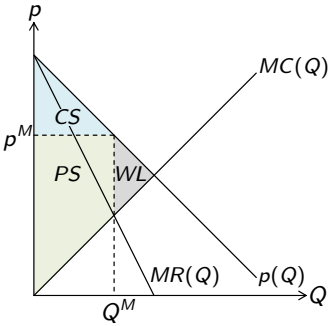
- the monopoly quantity equals market demand $Q^M = Q^D(p^M)$ and, equivalently,
- the monopoly price equals inverse market demand $p^M = p(Q^M)$.



Monopoly and Welfare

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

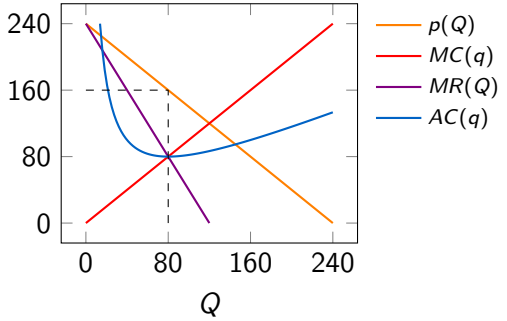
- By choosing the profit-maximizing quantity, the monopolist sets the price above marginal costs.



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 in the relevant output range which means that the desired quantity can be produced less costly by a single firm than by two or more firms.

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

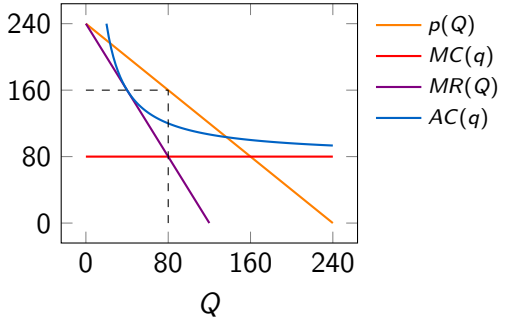
This is the case if average total costs of the monopolist are decreasing at any positive output smaller than or equal to the quantity where inverse market demand is equal to marginal costs.

$$\frac{dAC(Q)}{dQ} < 0 \quad \text{for all} \quad Q \in (0, Q^*], \quad \text{where} \quad p(Q^*) = MC(Q^*)$$

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

- The welfare-maximizing price ceiling induces the monopolist to produce the output Q^* where 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

External Costs: Uncompensated costs resulting from production or consumption choices that affect third parties. An external cost is a negative externality.

- Social marginal costs are the sum of private and external marginal costs.

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

- Private marginal costs $MC(Q)$ represent marginal willingness to accept of the firms active in the market.

External Benefits: Uncompensated benefits resulting from production or consumption choices that affect third parties. An external benefit is a positive externality.

- Social marginal benefits are the sum of private and external marginal benefits.

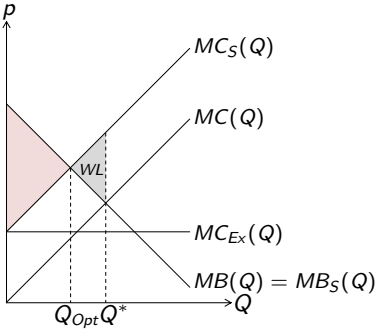
$$MB_S(Q) = MB(Q) + MB_{Ex}(Q)$$

- Private marginal benefits $MB(Q)$ represent marginal willingness to pay of the consumers active in the market.

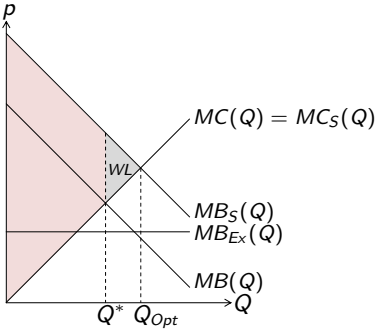
External Effects and Welfare

Welfare Loss: In the presence of negative or positive externalities, social marginal costs and social marginal benefits differ at the market-clearing quantity Q^*.

- In case of a negative (positive) externality, the market-clearing quantity Q^* exceeds (falls short of) the welfare-maximizing quantity Q_{Opt}.



Negative Externality



Positive Externality

Remedies to External Effects

Quantity Regulation: Decision makers can be forced to choose the welfare-maximizing quantity.

- Requires information on social marginal costs and social marginal benefits

Corrective Taxation: A (Pigouvian) tax or subsidy can induce decision makers to choose the welfare-maximizing 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 decision makers to choose the welfare-maximizing quantity, irrespective of the division of property rights. (Coase Theorem)

Public Goods

Public Good: A good that is neither rival nor excludable

- A good is rival if consumption by one individual diminishes the consumption possibilities of other individuals.
- A good is excludable if individuals can be prevented from consuming the good.

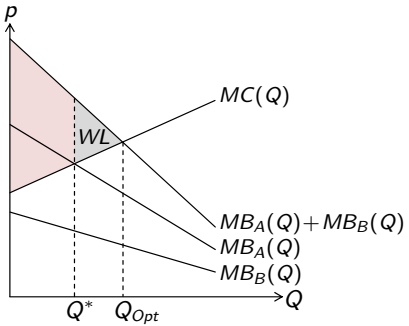
	Excludable	Non-Excludable
Rival	Private Goods	Common-Pool Ressources
Non-Rival	Club Goods	**Public Goods**

Types of Goods

Public Goods and Welfare

Welfare Loss: Private (individual) provision of a public good typically results in an undersupply, as the benefits for others are not taken into account. Therefore, the resulting quantity Q^* falls short of the welfare-maximizing quantity Q_{Opt}.

- Free-Rider Problem: Consumers have an incentive to rely on others to provide the public good.



Public Good

Public Goods and Welfare

Samuelson Condition: Welfare-maximizing public-good provision

- At the welfare-maximizing quantity of the public good Q_{Opt}, the sum of marginal benefits is equal to marginal costs.

$$\sum_{i=1}^{n} MB_i(Q_{Opt}) = MC(Q_{Opt})$$

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