Waters

Drink waters out of thine own cistern, and running waters out of thine own well. — Proverbs 5:25
# Externalities

- Externalities
  - Waters
  - Definition
  - Coase Theorem
  - Graph
  - CE
  - CE1
  - CE2
  - CE3
  - First Theorem
  - Market Failure
  - Solutions
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- Water pollution
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- Water pollution
- Air pollution
Externalities

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- Water pollution
- Air pollution
- Noise pollution
Externalities

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- Water pollution
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- Noise pollution
- Waste pollution
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- Water pollution
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- Noise pollution
- Waste pollution
- Scenic view pollution
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- Water pollution
- Air pollution
- Noise pollution
- Waste pollution
- Scenic view pollution
- Common pool resources
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- Water pollution
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- Common pool resources
- Congestion with excludable resources
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- Water pollution
- Air pollution
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- Scenic view pollution
- Common pool resources
- Congestion with excludable resources
- Congestion with non-excludable resources
Externalities

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- Water pollution
- Air pollution
- Noise pollution
- Waste pollution
- Scenic view pollution
- Common pool resources
- Congestion with excludable resources
- Congestion with non-excludable resources
- Angry dog
The Coase Theorem

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- Definition
- **Coase Theorem**
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The Coase Theorem

- Nice cottage beside a train track.
The Coase Theorem

- Nice cottage beside a train track.
- Fresh white laundry hung out to dry
The Coase Theorem

- Nice cottage beside a train track.
- Fresh white laundry hung out to dry
- Coal burning steam locomotive passing by
Graphical Analysis
Graphical Analysis

Demand

MC\textsubscript{Private}

Price

Quantity

Externalities – 5
Graphical Analysis

The diagram illustrates the concept of externalities, comparing private and social marginal costs (MC) with demand. The graph shows:

- **MC Private** represents the private marginal cost curve.
- **MC Social** represents the social marginal cost curve, which accounts for externalities.
- **Demand** is the demand curve, indicating consumer preferences.

The diagram highlights how externalities affect the market equilibrium, showing the difference between private and social outcomes. The point where the demand curve intersects with the MC Social curve indicates the socially optimal quantity, which is different from the quantity determined by the private market. This highlights the importance of considering externalities in economic analysis.
Graphical Analysis

- Demand
- MC Private
- MC Social

Price vs. Quantity

- MC Private and MC Social curves intersect at a quantity of 8 units.
- At this quantity, the price is $14.

**Externalities – 5**
Graphical Analysis

[Graph showing demand curve with price on the y-axis and quantity on the x-axis. The demand curve is represented by a red line, and the point of interest is marked on the curve.)
Graphical Analysis

MC_{Social}

Demand

Price

Quantity
Competitive Equilibrium

There are three requirements for a competitive equilibrium, corresponding to the requirements that producers optimize, consumers optimize, and that "markets clear" at the equilibrium prices. An equilibrium will then consist of a production plan $y^j$ for each firm, a consumption vector $x^i$ for each consumer, and a price vector $p$. 
Competitive Equilibrium

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The allocation $(x_1^*, x_2^*, \ldots, x_I^*, y_1^*, y_2^*, \ldots, y_J^*)$ and price vector $p^* \in \mathbb{R}^L$ constitutes a competitive or *Walrasian* equilibrium if the following conditions are satisfied.
Competitive Equilibrium

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- For every firm the set of inputs used and outputs produced maximize profit at those prices given the firms technology. Specifically, for each firm \(j\), \(y_j^*\) solves

\[
\max_{y_j^*} \left[ \sum_{\ell=1}^{L} p_{\ell}^* y_{\ell}^{j*} \right] \text{ such that } [y_j^* \in Y_j^]\]
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Competitive Equilibrium

The allocation \((x^1, x^2, \ldots, x^I, y^1, y^2, \ldots, y^J)\) and price vector \(p^* \in \mathbb{R}^L\) constitutes a competitive or *Walrasian* equilibrium if the following conditions are satisfied.
Competitive Equilibrium

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- For each consumer the consumption bundle is maximal for \(\succeq_i\) in the budget set defined by the initial endowment (valued at the equilibrium prices) and their share of the profits of the \(J\) firms in the economy. Specifically, for each consumer \(i\), \(x^i\) solves

\[
\max_{x^i} v^i(x^i) \\
\text{such that } \sum_{\ell=1}^{L} p^*_\ell x^i_\ell \leq \sum_{\ell=1}^{L} p^*_\ell \omega^i_\ell + \sum_{j=1}^{J} \theta^i_j p^*_\ell y^j_\ell
\]
Competitive Equilibrium

The allocation \((x_1^*, x_2^*, \ldots, x_I^*, y_1^*, y_2^*, \ldots, y_J^*)\) and price vector \(p^* \in \mathbb{R}^L\) constitutes a competitive or *Walrasian* equilibrium if the following conditions are satisfied.
The allocation \((x_1^*, x_2^*, \ldots, x_I^*, y_1^*, y_2^*, \ldots, y_J^*)\) and price vector \(p^* \in \mathbb{R}^L\) constitutes a competitive or \textit{Walrasian} equilibrium if the following conditions are satisfied.

- The total consumption of products by consumers is equal to initial endowments plus the net output of firms. Specifically, for each good \(\ell = 1, 2, \ldots, L,\)

\[
\sum_{i=1}^{I} x_{i\ell}^* \leq \sum_{i=1}^{I} \omega_i^\ell + \sum_{j=1}^{J} y_{j\ell}^*
\]

\Rightarrow \sum_{i=1}^{I} x_{i\ell}^* \leq \omega_{\ell} + \sum_{j=1}^{J} y_{j\ell}^*
First Theorem of Welfare Economics

If the price $p^*$ and allocation $\left( x_1^1, x_1^2, \ldots, x_1^I, q_1^1, q_1^2, \ldots, q_1^J \right)$ constitute a competitive equilibrium, then this allocation is Pareto optimal.
Market Failure

If the various assumptions of the First Theorem of Welfare Economics do not hold then we have what is called a *market failure*.

- Public goods
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- Public goods
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- Public goods
- Externalities
- Natural monopoly
## Possible Solutions to Market Failure

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- **Taxes**
Possible Solutions to Market Failure

- Taxes
- Subsidies
Possible Solutions to Market Failure

- Taxes
- Subsidies
- Quotas
Possible Solutions to Market Failure

- Taxes
- Subsidies
- Quotas
- Tradable permits