Negative production externalities

RIDLEY COLLEGE
SINCE 1889

Assessment Objectives

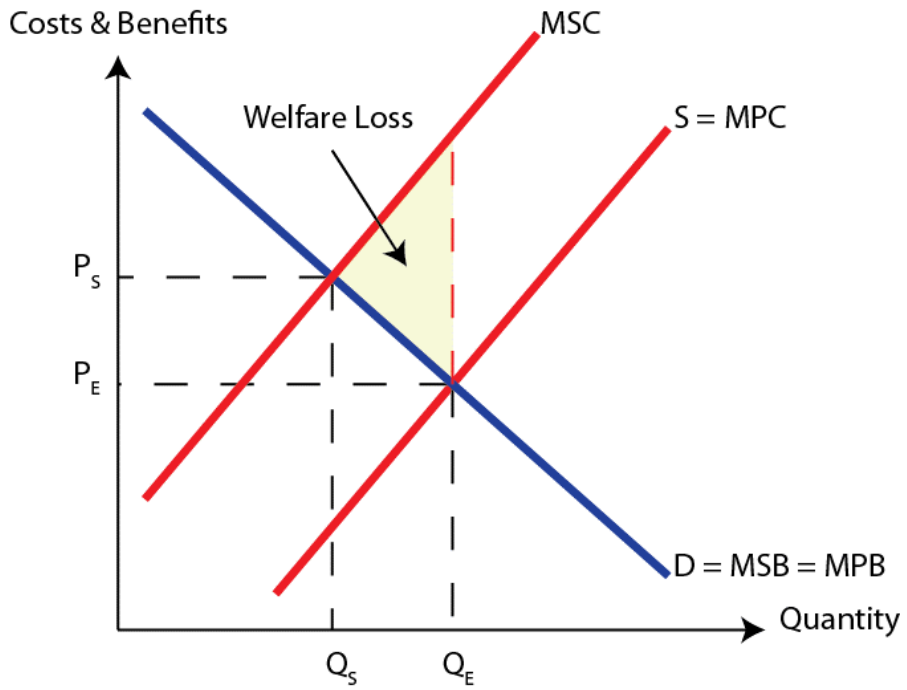
Specific Expectations	
AO2	Explain negative externalities of production
AO4	Draw a diagram illustrating negative externalities of production and welfare loss
AO4	Calculate welfare loss that arises from negative externalities of production
AO2	Explain that negative production externalities of production can be used to illustrate overuse of common pool resources.
AO2	Explain government intervention to correct negative externalities of production and prevent over use of common pool resources including: Indirect (Pigouvian) taxes, Carbon taxes, Tradable permits, Legislation and regulation, Collective self-governance, Education-awareness creation, International agreements.

Assessment Objectives

Specific Expectations	
AO4	Draw diagrams to illustrate the above government responses
AO3	Discuss strengths and limitations of the above government policies with respect to: difficulties in measurement of externalities, degree of effectiveness, consequences of stakeholders.

Negative production externalities

- **Negative production externalities** a negative externality caused by production activities, leading to a situation where marginal social costs are greater than marginal private costs (MSC $>$ MPC).
  - The external costs suffered by others increases the overall social costs which exceed the costs to the individual.



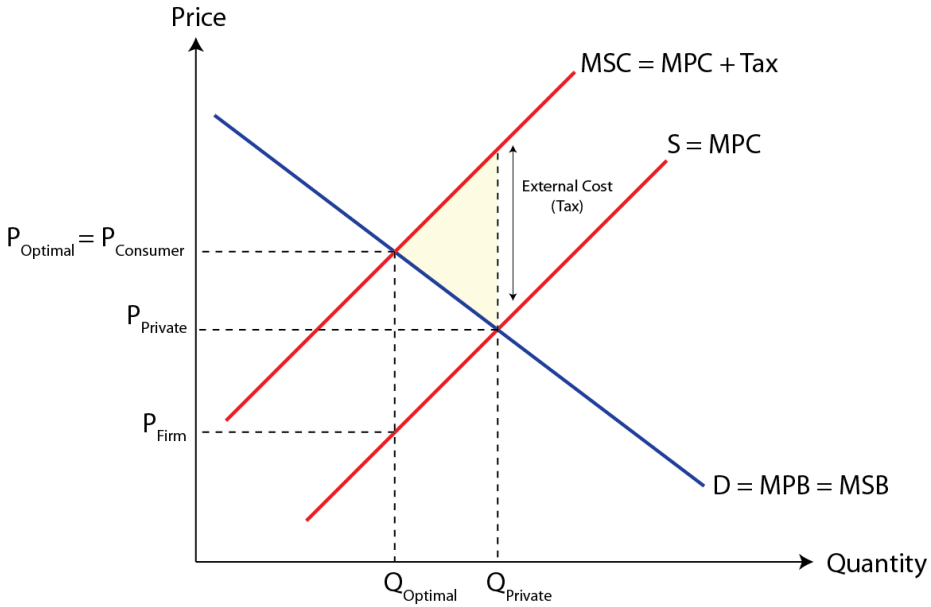
Negative production externalities

- When there is a negative production externality, the free market overallocates resources to the production of the good and too much of it is produced relative to the social optimum.
  - This is shown by $Q_E > Q_S$ and MSC $>$ MSB at the point of production Q_E.
  - For all units of output greater than Q_S, MSC $>$ MSB, meaning that society would be better off if less were produced.
  - The welfare loss is equal to the difference between MSC and MSB for the amount of output that is overproduced $(Q_S - Q_E)$.
  - It is a loss of social benefits due to overproduction of the good caused by the externality.
  - If the externality were corrected, so that the economy reaches the social optimum, the loss of benefits would disappear.

Policies to correct negative production externalities

- An important group of policies that can be pursued by governments rely on the market to correct negative production externalities and promote sustainable use of common pool resources.
  - Market-based policies work by changing the incentives face by firms.
  1. **Pigouvian taxes** – indirect taxes designed to correct negative externalities of production or consumption.
     - The tax results in an upward shift of the supply curve from S = MPC to MSC = MPC + Tax.
     - The optimal tax policy is to impose a tax that is exactly equal to the external cost, so the MPC curve shifts upward until it overlaps with MSC.
     - The new after-tax equilibrium results in the lower, optimal quantity of the good produced, $Q_{Optimal}$, and higher, optimal price, $P_{Optimal}$.
     - Indirect tax in the present context are intended to lead to allocative efficiency.

Policies to correct negative production externalities

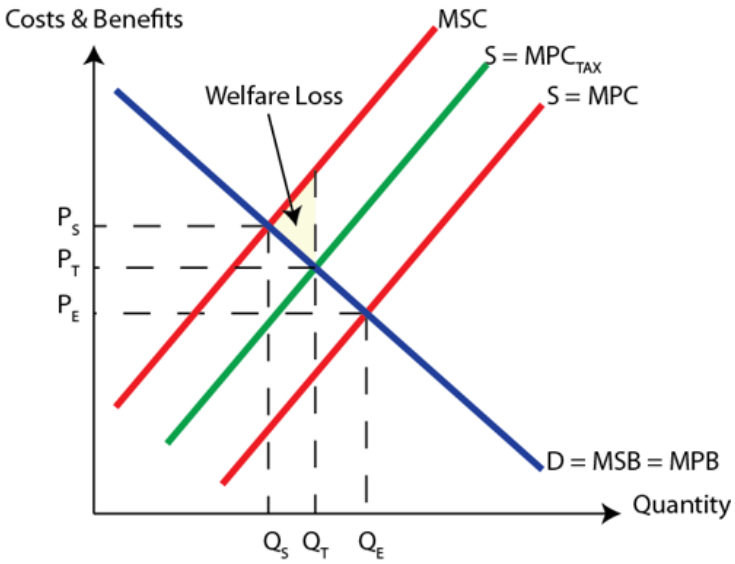


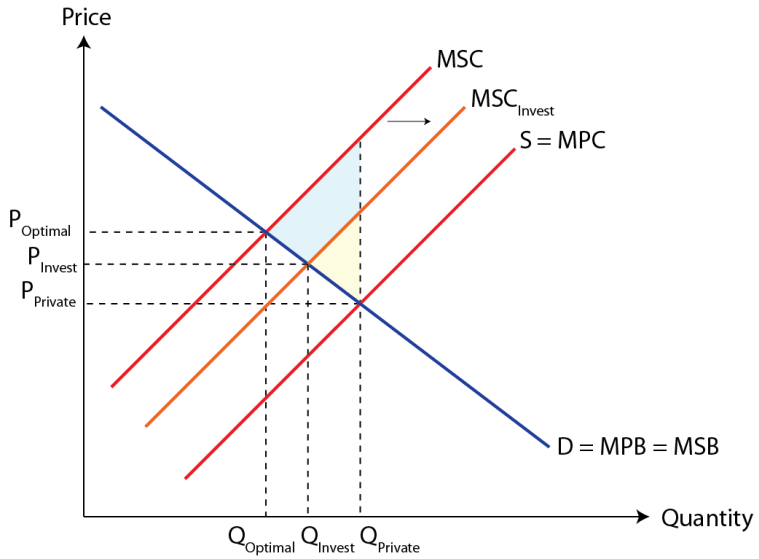
2. **Carbon tax** – a tax per unit of carbon emissions of fossil fuels, considered by many countries as a policy to deal with the problem of climate change.

   - A tax on carbon (or on emissions) has the effect of creating incentives for producers to reduce the amount of pollution they create by purchasing less polluting resources (such as fossil fuels), and switch to less polluting technologies (alternative energy sources).

Policies to correct negative production externalities

- This reduces the size of the negative externality and increases the optimum quantity of output.
- A tax on the output of the polluter does not have this effect; it corrects the overallocation of resources to the good, reducing the quantity of output produced.



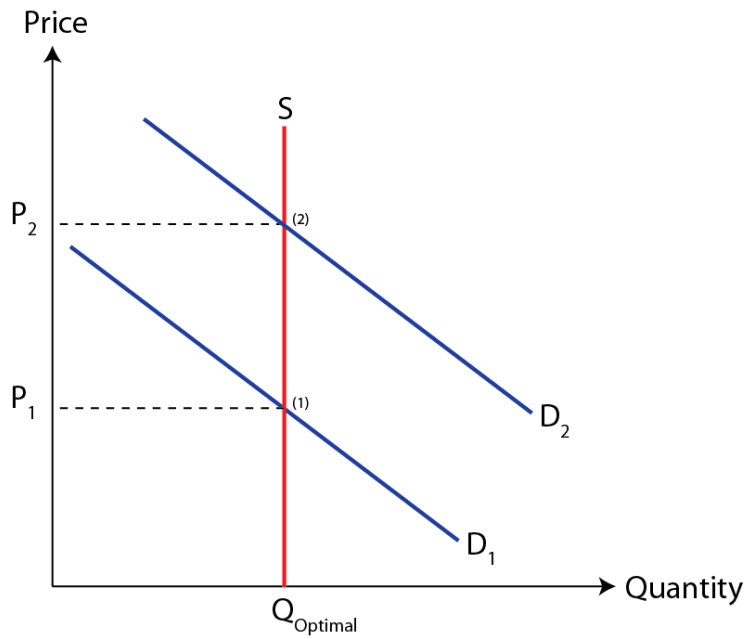


Policies to correct negative production externalities

3. **Tradable permits** – permits that can be issued to firms by a government authority or an international body, and that can be traded (bought and sold) in a market, the objective being to limit the total amount of pollutants emitted by firms.

   - If a firm can produce its product by emitting a lower level of pollutants than the level set by its permits, it can sell its extra permits in the market.
   - If a firm needs to emit more pollutants than the level set by its permits, it can buy more permits in the market.
   - With respect to pollutants, the price of such rights is determined by the demand for the right to discharge the pollutants and a perfectly inelastic supply curve of such rights.
   - The supply of permits is determined by the restricted quantity established by the government.

Policies to correct negative production externalities



- Potential polluters have a monetary incentive not to pollute because they must pay for the right to discharge pollutants.
- Rising price of pollution rights should stimulate the search for improved pollution control techniques and technology.
- Growing revenue from the sale of a fixed quantity of pollution rights can be devoted to environmental improvements.

Advantages of market-based policies

- Both taxes and tradable permits have the effect of internalizing the externality, meaning the costs that were previously external are made internal, because they are now paid for by producers and consumers who are parties to the transaction.
- Taxes on emissions such as a carbon tax are superior to taxes on output.
  - Taxes on output only provides incentives to producers to reduce the quantity of output produced with a given technology and given polluting resources, but not to reduce the amount of pollution they create or switch to less polluting resources.
  - Taxes on pollutants emitted provide incentives to firms to economize on the use of polluting resources (such as fossil fuels) and use production methods that pollute less.
  - Taxation leads to lower pollution levels at a lower overall cost to society since firms that will switch to clean forms of energy are the ones that can do it more cheaply.

Disadvantages of market-based policies

- Taxes and tradeable permits are simple in theory, in practice they are faced with numerous technical difficulties.
  - A serious problem with carbon taxes is that they are usually set too low to make a significant impact.
  - It is often politically difficult to impose carbon taxes that are high enough to make the necessary difference.
- An effective tax policy requires answers to the following questions:

1. **What production methods produce pollutants?**
   - It is necessary to identify what production methods produce which pollutants, which is technically very difficult.
2. **Which pollutants are harmful?**
   - There is much controversy among scientists over the extent of harm done by each type of pollutant

Disadvantages of market-based policies

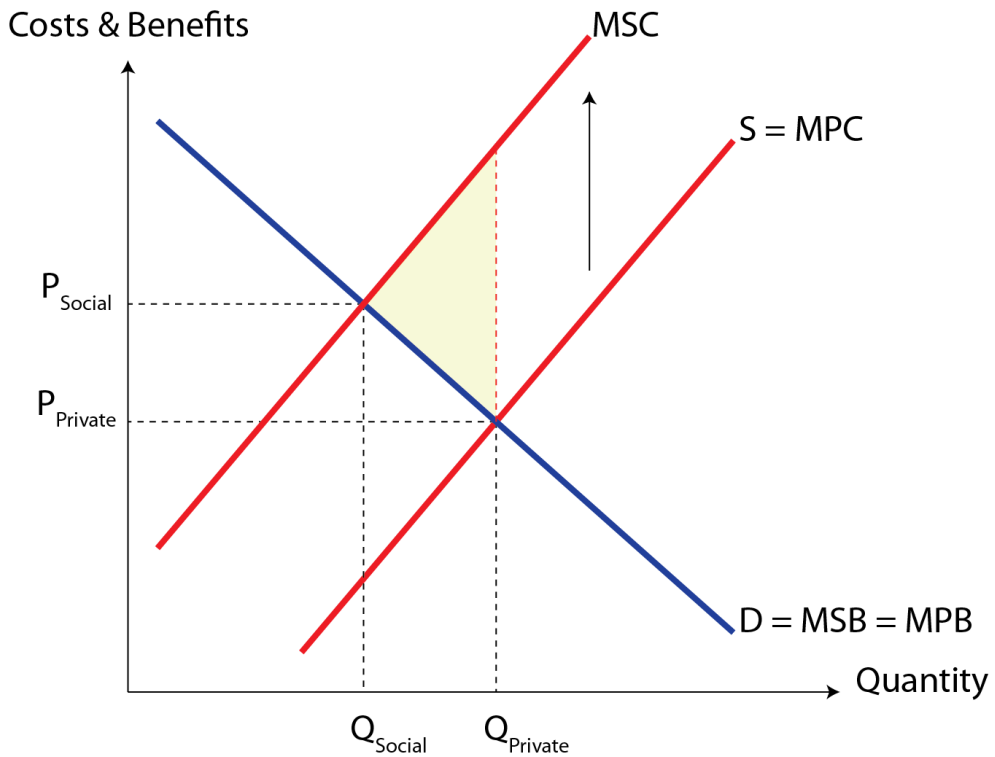
3. **What is the value of the harm?**
   - It is necessary to attached a monetary value to the harm.
4. **What is the appropriate amount of the tax?**
   - It is necessary to determine the size of the tax to make it equal to the value of harm.
5. **How will consumers be affected?**
   - Indirect taxes are regressive meaning that lower income people have to pay a higher proportion of their income in tax than higher income people, which is considered inequitable.

Government legislation and regulation

- **Government legislation and regulation** rely on the "command approach", where government uses its authority to enact legislation and regulation in the public's interest.
  - Restrictions on emissions of pollutants from factories and industrial production by setting a maximum level of pollutants permitted.
  - Banning the use of harmful substances.
  - Issuing licenses or permits for particular activities (such as hunting).
  - Prohibiting construction (such as housing) or industry in agriculture in protected areas.
  - Restrictions on the quantity of logging.
  - Restrictions in the form of quotas for fishing (maximum permissible quantity of fish that can be caught).
  - Establishment of protected areas for the protection of biodiversity and endangered ecosystems.

Government legislation and regulation

- The government's policy objective is to make the MPC curve upwards until it coincides with the MSC curve.
  - The quantity produced declines to Q_{Social}, price increases from $P_{Private}$ to P_{Social}, and the problem of overallocation of resources to the production of the good is corrected.



Government legislation and regulation

- Correction of negative externalities by market-based approaches or government legislation usually involve shifting the MPC curve upward toward the MSC curve through a variety of policies.
  - For allocative efficiency to be achieved, the quantity of the good produced and consumed must fall to Q_{Social} as price increases to P_{Social}.
- **Advantages**
  - Simple to implement and oversee.
  - Force firms to comply and reduce their harmful activities.
- **Disadvantages**
  - Cannot distinguish between firms that have lower or higher costs of reducing pollution, which would limit the overall costs of reducing pollution.
  - Informational asymmetry on the costs, types, and amounts of pollutants emitted.
  - Costs of monitoring and supervision to detect possible violations.

Collective Self-Governance

- **Collective self-governance** a solution to the use of common pool resources where users take control of the resources and use them in a sustainable way.
  - Runs counter to the idea of tragedy of the commons.
  - This solution presupposes that the users of the resources can communicate with each other, resulting in rules about the use of the resources along with sanctions for violations of the rules.
  - **Advantages**
    - Cooperative solutions can be achieved in the absence of private ownership of resources and in the absence of government-owned property, but it is important to have a legal system of land rights.
  - **Disadvantages**
    - Requires that stakeholders by able to communicate with each other to create rules for the use of the common pool resources, and there must be a boundary for the resource.

Education and awareness creation

- Education of the public and provision of information regarding the polluting activities of firms (or other activities with negative external effects) often makes consumers turn away from the products, with negative effects on the firms' sales.
  - As a result the firms are forces to take consumers opinions into consideration and change their production methods in order to reduce externalities.
- **Advantages**
  - Firms are influenced by the opinions of consumers and want to keep them happy, otherwise they will suffer drops in sales.
- **Disadvantages**
  - Can only make a small difference in terms of solving the problem of production externalities and sustainability.
  - Problems of a more general and broad nature, such as the use of fossil fuels that cause climate change plus a host of other environmental problems, require more comprehensive solutions.

International Agreements

- Negative production externalities and the overuse of common pool resources very often has international repercussions, in which case co-operation among governments and international agreements are crucially important to control and prevent negative consequences on certain resources.
  - Co-operation among governments is very important for the development and diffusion of new technologies intended to deal with global environmental issues.
  - However, less comprehensive policies are often made by national governments.
- **Examples**
  - European Union Emissions Trading System (2005)
  - Kyoto Protocol (2005 – 2012)
  - Paris Agreement (2019)