Chapter 3: Public Good, Market Failure and Externalities

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Public Goods

- A ***public good*** is one that is nonexclusive (no one can be excluded from its benefits) and non-rival (consumption by one does not preclude consumption by others.
  - The closest example is national defense.
- Once a pure public good is supplied to one individual, it is simultaneously supplied to all.
  - A private good is only supplied to the individual who bought it.
  - With public goods, the focus is on groups.
  - With private goods, the focus is on the individual.

Figure 1 Four Types of Goods

Excludable? \ Rival?	Yes	No
Yes	Private Goods • Ice-cream cones • Clothing • Congested toll roads	Natural Monopolies • Fire protection • Cable TV • Uncongested toll roads
No	Common Resources • Fish in the ocean • The environment • Congested nontoll roads	Public Goods • Tornado siren • National defense • Uncongested nontoll roads

Properties of Public goods

- Two characteristics of goods and services are relevant to the public/private question.
- These are rivalry and excludability. What we call rivalry is sometimes referred to in the literature as divisibility.
  - Rivalry refers to whether one agent's consumption is at the expense of another's consumption.
  - Excludability refers to whether agents can be prevented from consuming. The question of excludability is a matter of law and convention, as well as physical characteristics.
- Pure private goods exhibit both rivalry and excludability.
- Pure public goods exhibit neither rivalry nor excludability. An example is the services of the national defence force.

Free rider problem

- Since people cannot be excluded from enjoying the benefits of a public good, individuals may withhold paying for the good hoping that others will pay for it.
- The free-rider problem prevents private markets from supplying public goods.
- **Solving the Free-Rider Problem**
- The government can decide to provide the public good if the total benefits exceed the costs.
- The government can make everyone better off by providing the public good and paying for it with tax revenue.

Tragedy of the Commons

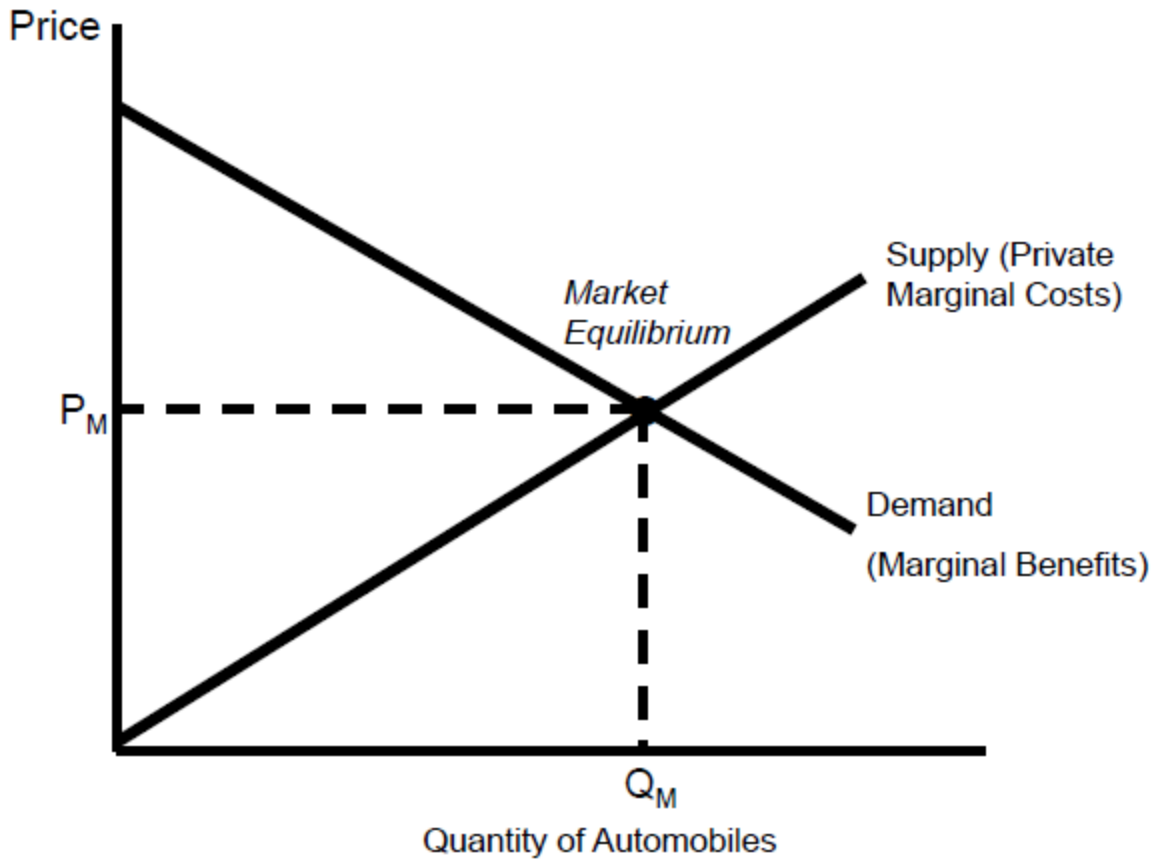
- The *Tragedy of the Commons* is a parable that illustrates why common resources get used more than is desirable from the standpoint of society as a whole.
  - Common resources tend to be used excessively when individuals are not charged for their usage.
  - This is similar to a *negative externality*.

The Theory of Externalities

- **Externalities:** an effect of a market transaction that changes the utility, positively or negatively, of those outside the transaction -**third-party effects**
- Externalities can be either positive or negative. The most common example of a **negative externality** is pollution.
- Without any regulation, the production decisions of companies will not account for the social and ecological damages of pollution.

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- In a basic economic analysis of markets, demand and supply curves represent the costs and benefits of a transaction.
- Equilibrium where:
- PMB=PMC

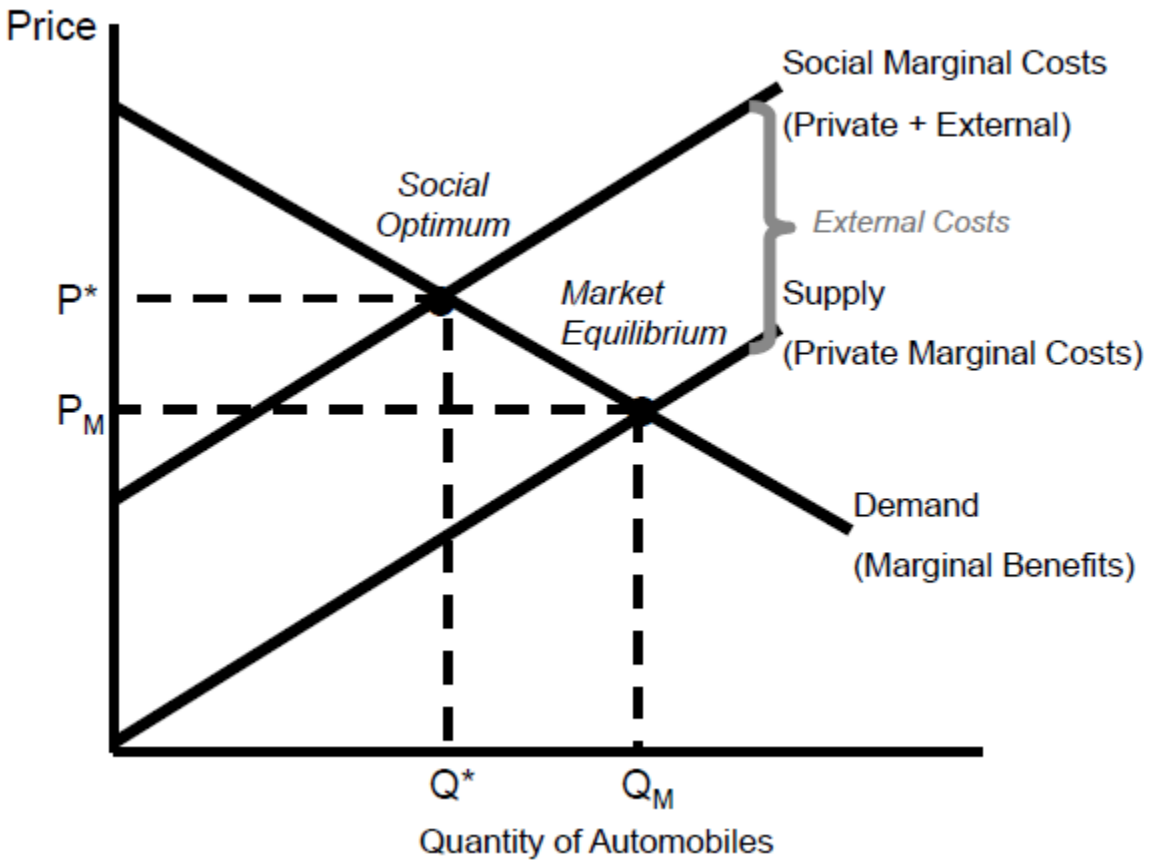


- This equilibrium represents a situation of **economic efficiency** because it maximizes benefits to buyers and sellers in the market—if there are no externalities.

Accounting for Environmental Costs

- But this market equilibrium does not tell the whole story. The production and use of automobiles create numerous negative externalities. Automobiles are a major contributor to air pollution, including both urban smog and regional problems such as acid rain. In addition, their emissions of carbon dioxide contribute to global warming.
- Where do these various costs appear in Figure above? The answer is that they do not appear at all. Thus the market overestimates the net social benefits of automobiles because the costs of the negative externalities are not considered. So we need to find ways of **internalizing externalities**—bringing the **external costs** into our market analysis.

With negative externality



Internalizing Environmental Costs

- The most common way to internalize a negative externality is to impose a tax. This approach is known as a **Pigovian tax**, after Arthur Pigou, a well-known British economist who published his *Economics of Welfare* in 1920.
- It is also known as the **polluter pays principle**, since those responsible for pollution pay for the damages they impose upon society.
- By forcing manufacturers to pay a tax for each automobile produced, we have essentially increased their marginal production costs. So a tax can shifts the private marginal cost curve upward.

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- The new equilibrium results in a higher price of P^* and a lower quantity of Q^*. The tax has resulted in the optimal level of automobile production.
- Our story tells a convincing argument in favor of government regulation in the presence of negative externalities. The tax is an effective policy tool for reaching a more efficient outcome for society.
- **But should the government always impose a tax to counter a negative externality?**

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- But two factors suggest we probably should not put a Pigovian tax on all products.
- First, recall that we need to estimate the tax amount in monetary terms, which requires economic research and analysis, perhaps along with toxicological and ecological studies. Some products cause relatively minimal environmental damages and the small amount of taxes collected may not be worth the costs of estimating the "right" tax.
- Second, we need to consider the administrative costs of imposing and collecting the tax. Again, if a product does not cause much environmental damage, then these costs might outweigh the revenues we would collect.

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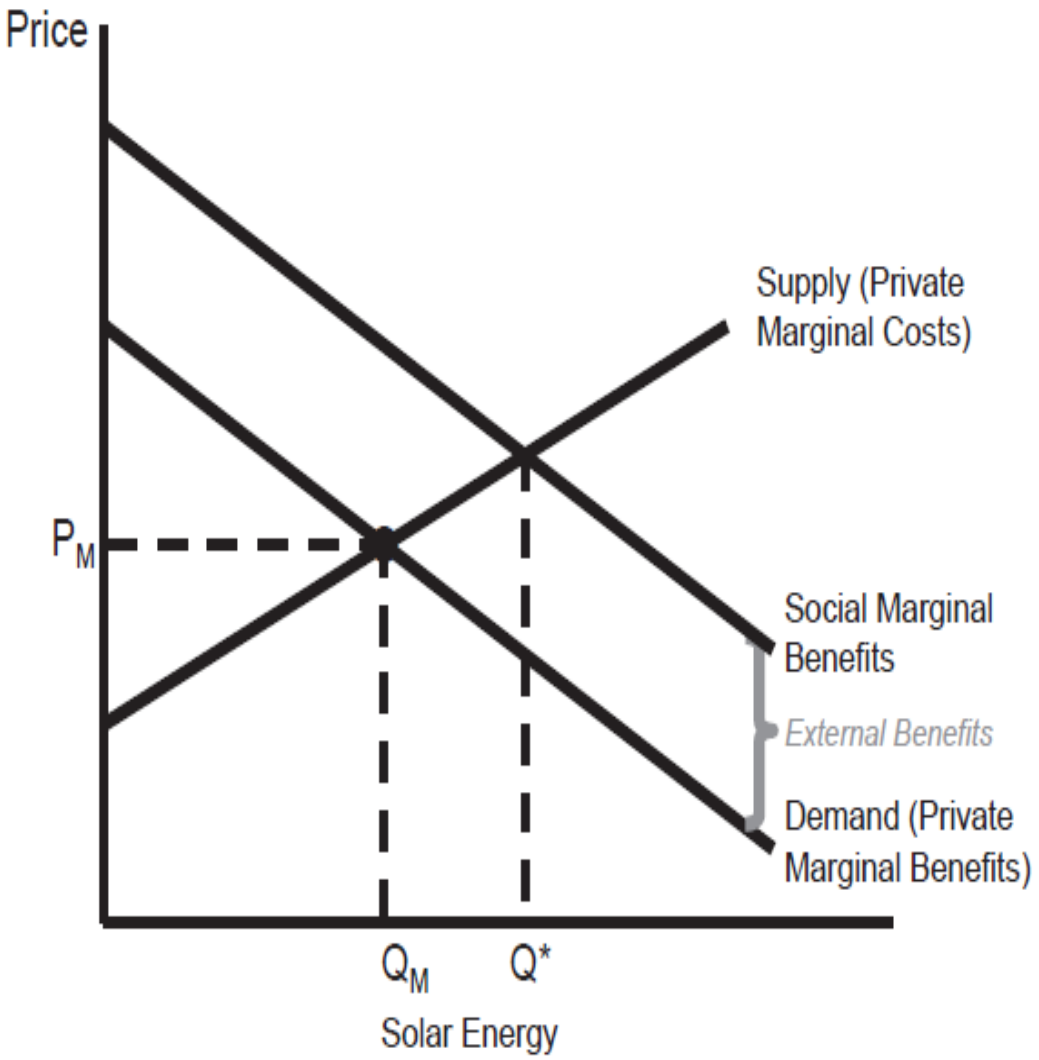
- Rather than looking at the final consumer product, economists generally recommend applying Pigovian taxes as far upstream in the production process as possible.
- An **upstream tax** is imposed at the level of the raw production inputs, such as the crude oil or cotton used to make a shirt.
- If we determine the appropriate Pigovian tax on cotton, then this cost will be reflected in the final selling price of the shirt.

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- We could focus our taxation efforts on those raw materials that cause the most ecological damage. So we might tax fossil fuels, various mineral inputs, and toxic chemicals. This limits the administrative complexity of tax collection and avoids the need for estimating the appropriate tax for a multitude of products.
- The tax burden may fall more heavily on producers, while in other cases the burden may fall mostly on consumers.
  - It depends on the **elasticities of supply and demand** with respect to price—how responsive supply and demand are to price changes.

Positive Externalities

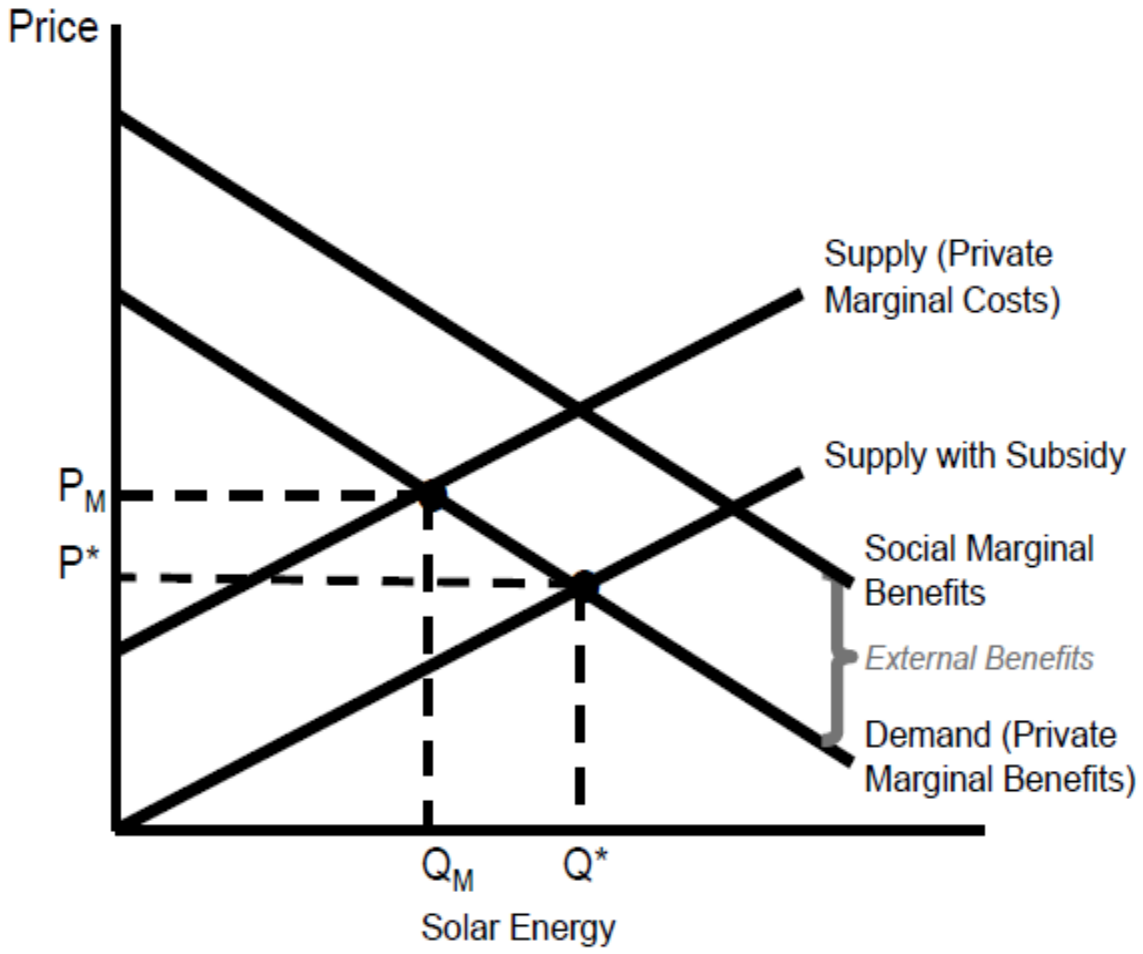
- Just as it is in society's interest to internalize the social costs of pollution, it is also socially beneficial to internalize the social benefits of activities that generate positive externalities.
- As with a negative externality, the free market will also fail to maximize social welfare in the presence of a positive externality.
- Similarly, a policy intervention will be required to reach the efficient outcome.



- The market equilibrium price is *PM*, and quantity is *QM*. But notice in this Figure that between *QM* and *Q**, marginal social benefits exceed the marginal costs.
- Thus the optimal level of solar energy is *Q**, not *QM*. So we can increase net social benefits by increasing the production of solar energy.

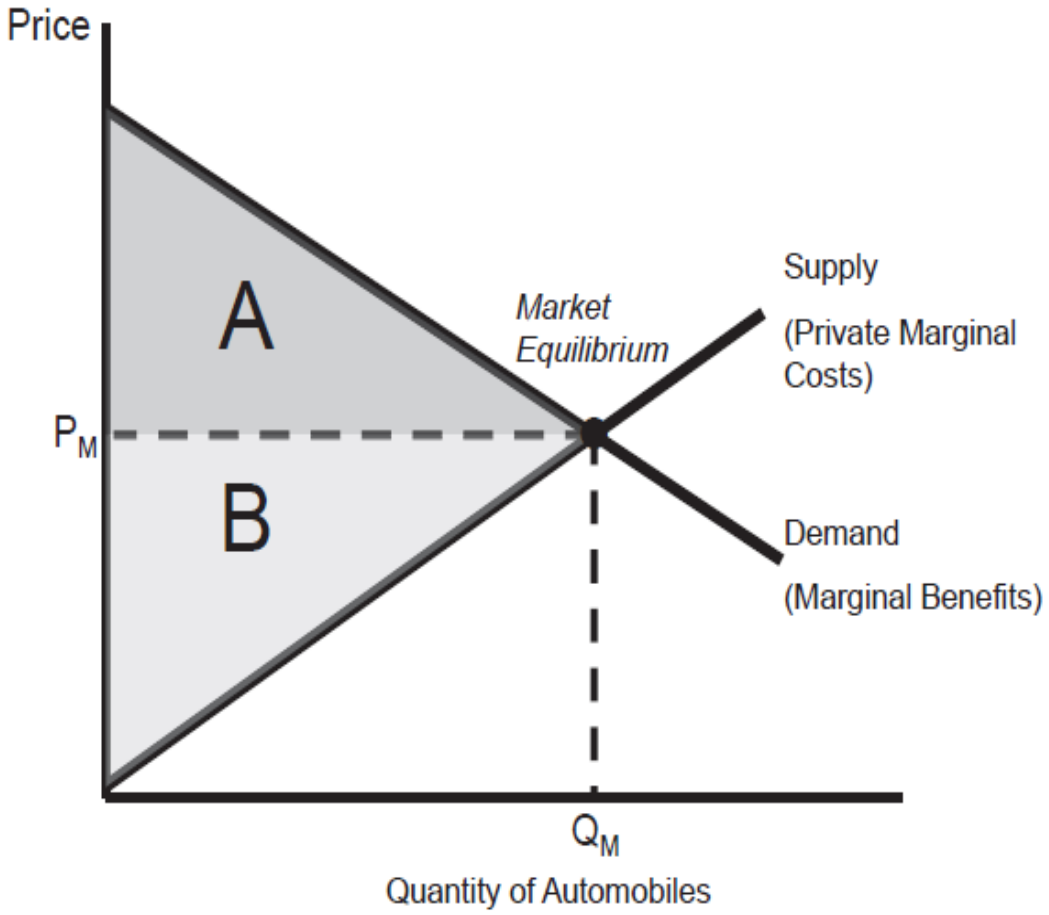
- In the case of a positive externality, the most common policy to correct the market inefficiency is a subsidy. A **subsidy** is a payment to a producer to provide an incentive for it to produce more of a good or service.

Welfare Analysis of Externalities



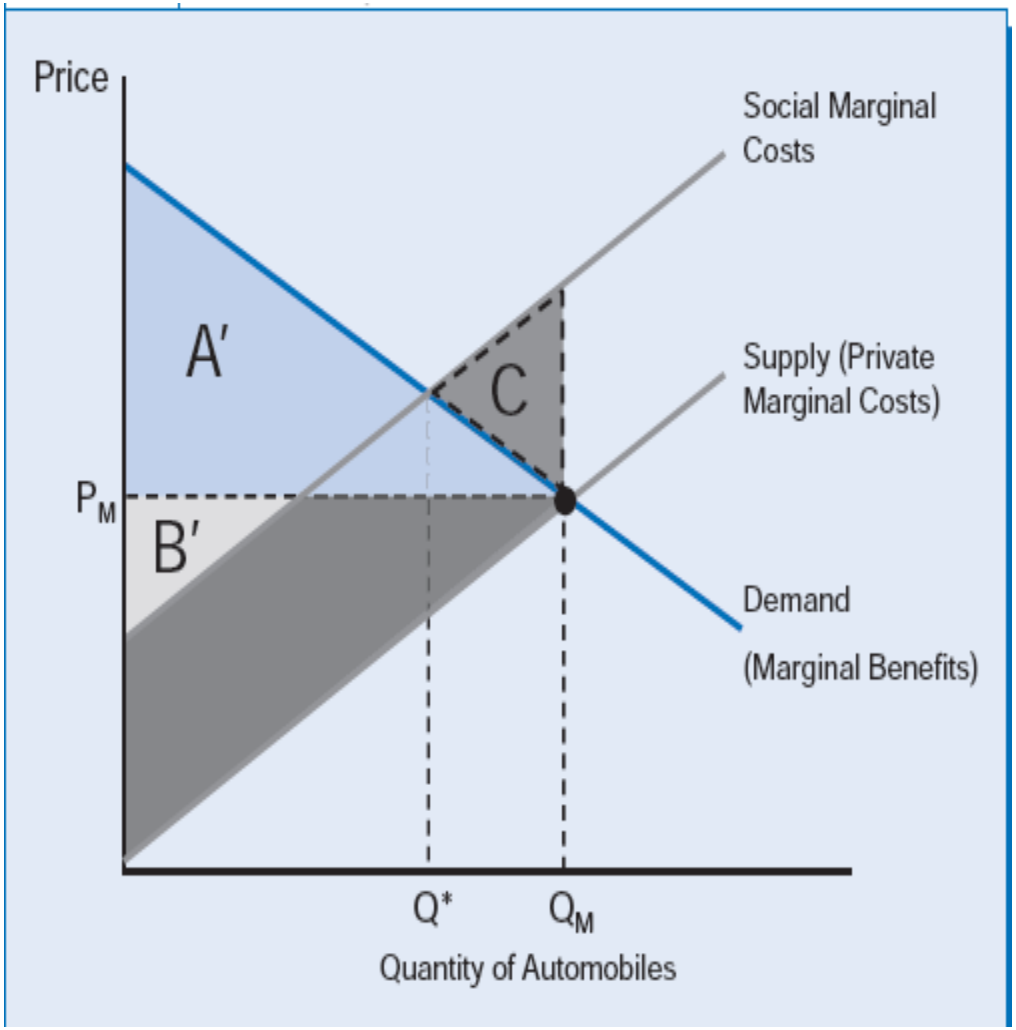
- **Welfare analysis:** an economic tool that analyzes the total costs and benefits of alternative policies to different groups, such as producers and consumers.

With no negative externality



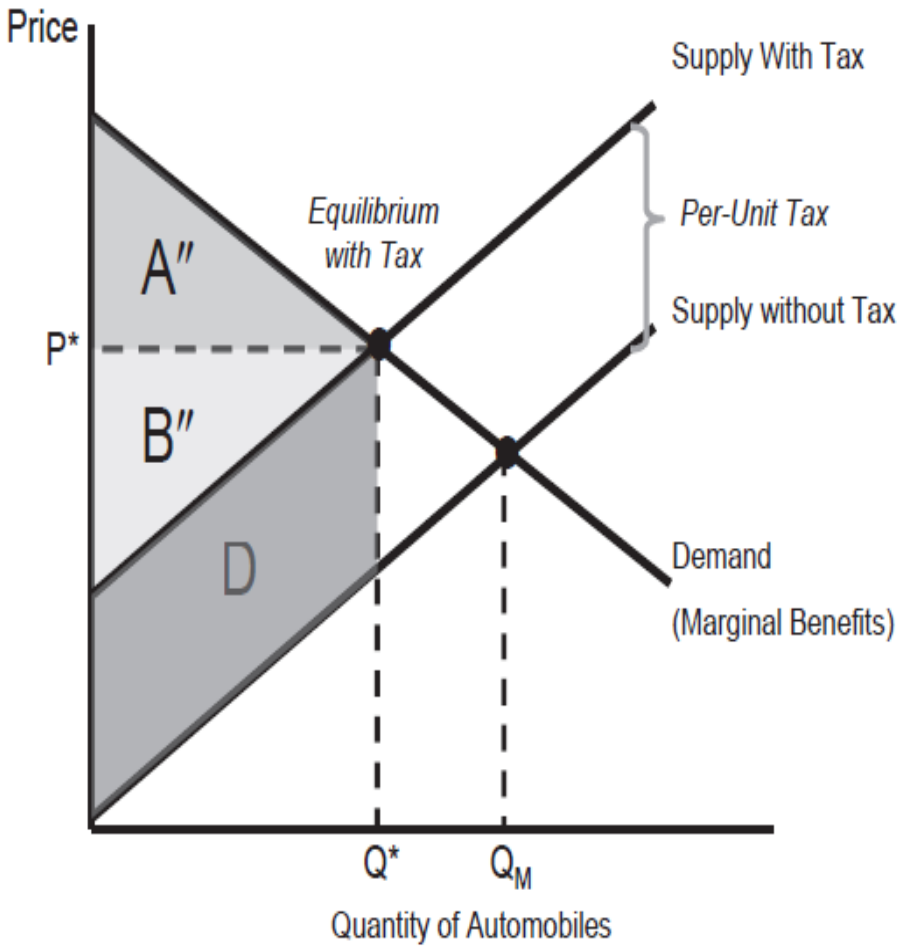
- In the absence of externalities, the market equilibrium is economically efficient because it maximizes the net social benefit (areas A + B).
- But if we introduce externalities, the market equilibrium is no longer economically efficient.

Welfare Analysis of the Automobile Market with Externalities



- Net social welfare in the presence of the negative externality is(A' + B' – C), where C is just the triangular area to the right of *Q**.
- Area C represents a net loss, because between *Q** and *QM* social marginal costs exceed marginal benefits

The Welfare-Improving Effect of a Pigovian Tax



- Now consider the imposition of a Pigovian tax to internalize the externality. The tax will shift the equilibrium from *QM* to *Q**.
- We can prove that net social welfare has increased as a result of the tax by comparing the net welfare before the tax, area (A' + B '– C) from Figure above, to net welfare in this Figure.
- With price at *P** and quantity at *Q**, our new consumer surplus is A'' and producer surplus is B''.
- Note that the sum of A'' and B'' is greater than the sum of A' and B' the above Figure —as we will see shortly, this point is critical to our analysis.

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- As we are only producing Q^* automobiles instead of QM, the externality damages are now area D, which is less than the externality damages with no pigovian tax.
- The per unit tax is the vertical distance between the two supply curves. This tax is collected on a quantity of Q^* automobiles. Thus the total tax revenue is represented by area D. The tax revenue exactly equals the externality damages.
- In other words, the tax revenue is exactly sufficient to fully compensate society for the externality damages.
- The net social welfare is the sum of consumer and producer surplus, minus the externality damages, plus the benefit of the tax revenue, or:
- *Net Social Welfare* $= A'' + B'' - D + D$

$= A'' + B''$

Property Rights and the Environment

- The idea of a Pigovian tax, which forces polluters to pay for the cost of their social and environmental damages, is intuitively appealing.
- Implicit in the imposition of a Pigovian tax is the idea that society has a legitimate right to be compensated for any pollution damages. Many people would contend that this is the appropriate allocation of rights.
- In other words, society has a right to clean air, but the polluters do not have a right to emit whatever they want into the atmosphere.

Cont'd

- In other cases, the appropriate allocation of rights may be less clear cut.
  - Suppose a farmer drains a wetland on his property to create a field suitable for growing crops. His downstream neighbor complains that without the wetland to absorb heavy rainfall, her land now floods, damaging her crops. Should the first farmer be obliged to pay the second the value of any crop damages? Or does he have the right to do whatever he wants on his own land?

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- We can see that this is an issue not just of externalities but also of the nature of property rights. Does the ownership of land include a right to drain wetlands on that land? Or is this right separate, subject to control by the community or other property owners?
- The property rights in this case could be allocated in one of two ways.

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- Suppose we say that the first farmer (call him X) *does* have the right to drain the wetland on his land.
- Assume that the net value of crops grown on drained wetland is $5,000. Further, let's suppose that the second farmer (call her Y) would suffer crop losses of $8,000 if the land were drained.
- Even though Mr. X has the right to drain the wetland, Ms Y could potentially pay Mr. X not to drain it. Specifically, she would be willing to pay Mr. X up to $8,000 to keep the wetland intact, because that is the value of the damage she would suffer if he exercises his right to drain it.
- Meanwhile, Mr. X would be willing to accept any amount higher than $5,000, because that is what he stands to gain by draining the wetland.

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- Between $5,000 and $8,000 lies sufficient negotiation space for Mr. X and Ms. Y to reach an agreement that satisfies both of them.
- Let's say that Mr. X accepts an offer of $6,000 from Ms. Y to keep the wetland intact. He gains $1,000 relative to what he would have made by draining the wetland.
- Ms. Y is not happy about paying $6,000, but she is better off than she would be if the wetland were drained and she lost $8,000.
- In effect, Ms. Y purchases the right to say how the wetland will be used (without having to purchase the land).

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- We can also assign the relevant right to Ms. Y, by passing a law stating that no one can drain a wetland without the agreement of any affected parties downstream.
- In that case, Mr. X would have to reach an agreement with Ms. Y before he could drain the wetland.

Solution to Externalities

Government Intervention

- Internalize externality by:
  - Assigning property rights, OR
  - Set policy prescription, such as:
    - Set standards on pollution allowed
    - Tax polluter equal to MEC at Q_E called Pigovian taxes
    - Establish a market and price for pollution

Environmental ethics

- **Ethics**= the study of good and bad, right and wrong
  - Moral principles or values held by a person or society
  - Promoting human welfare, maximizing freedom, minimizing pain and suffering
- **Relativists**= ethics varies with social context
- **Universalists**= right and wrong remains the same across cultures and situations
- Ethics is a *prescriptive pursuit*: it tells us how we *ought* to behave

Why consider ethics?

- The question ‘What will happen to petrol consumption if the tax on it is increased by x%?’ is a question for positive economics. It does not entail any ethical considerations.
- The question ‘Should the tax on petrol be increased?’ is a question for normative, or welfare, economics. It can only be answered using ethical criteria.
- Much of environmental and resource economics is about questions of the ‘should’ type – questions about the targets and instruments of policy.

Ethical standards: judging right and wrong

  - **Ethical standards**= criteria that help differentiate right from wrong
- **Categorical imperative**: the golden rule
  - Most world religions teach the same lesson
  - How would you feel if your sacred homeland was defiled with a uranium mine?
- **Principle of utility** = something right produces the most practical benefits for the most people
  - A uranium mine could benefit thousands of people

We value things in two ways

- **Instrumental(utilitarian) value**: valuing something for its pragmatic benefits by using it
  - Animals are valuable because we can eat them
- **Intrinsic(inherent) value:** valuing something for its own sake because it has aright to exist
  - Animals are valuable because they live their own lives
- Things can have both instrumental and intrinsic value
  - But different people emphasize different values
- How we value something affects how we treat it

Environmental ethics

- **Environmental ethics** = application of ethical standards to relationships between human and non human entities
- Hard to resolve: it depends on the person's ethical standards and domain of ethical concern

Should we conserve resources for future generations?

Is is OK to destroy a forest to create jobs for people?

Should humans drive other species to extinction?

Is it OK for some communities to be exposed to excess pollution?

Weak and strong sustainability

Are *not* different kinds of sustainability – both refer to constant consumption/utility.

The distinction *is* between assumptions about substitution possibilities.

For weak sustainability the assumption is that these possibilities are as for the Cobb Douglas production function so that sustainability is feasible via the substitution of K for R.

For strong sustainability the assumption is that these possibilities are as for the Leontief production function.

More generally

$Q = Q(L, K_N, K_H)$

where K_N is natural capital, and K_H is human-made, or reproducible, capital and the weak/strong sustainability distinction is in terms of the substitution possibilities between K_N and K_H

Proponents of strong sustainability argue that K_N must be non-declining, while for proponents of weak sustainability it is $K_H + K_N$ that must be non-declining.

Ecologists on sustainability

Sustainability is a relationship between human economic systems and larger dynamic, but normally slower changing, ecological systems in which 1) human life can continue indefinitely, 2) human individuals can flourish, and 3)human cultures can develop, but in which effects of human activities remain within bounds, so as not to destroy the diversity, complexity, and function of the ecological life support system. (Costanza et al 1991)

In effect, ecologists judge the possibilities for substituting K_H for K_N to be limited, especially in regard to the 'ecological life support system'.

Sustainability requires resilience – the maintenance of the ecosystem's functional integrity in the face of exogenous disturbance. Resilience is not guaranteed by following standard economic criteria.

Ecologists, and strong sustainability proponents, argue for for explicit protection for 'critical' natural capital.

Ethical Perspective

1. Anthropocentric
2. Stewardship
3. Biocentric
4. Animal Rights
5. Ecocentric

Anthropocentric

- Humans are placed in domination of nature and have the right to use resources and abuse nature as we choose.



Stewardship

- Humans have the responsibility to manage and care for nature. Humans and non-human forces must act together in order to sustain life.
- Humans are part of nature rather than masters.



Biocentrism

- All living organisms have intrinsic values and rights regardless whether they are useful or not.





Animal Rights

- Each individual organism is of value not the group

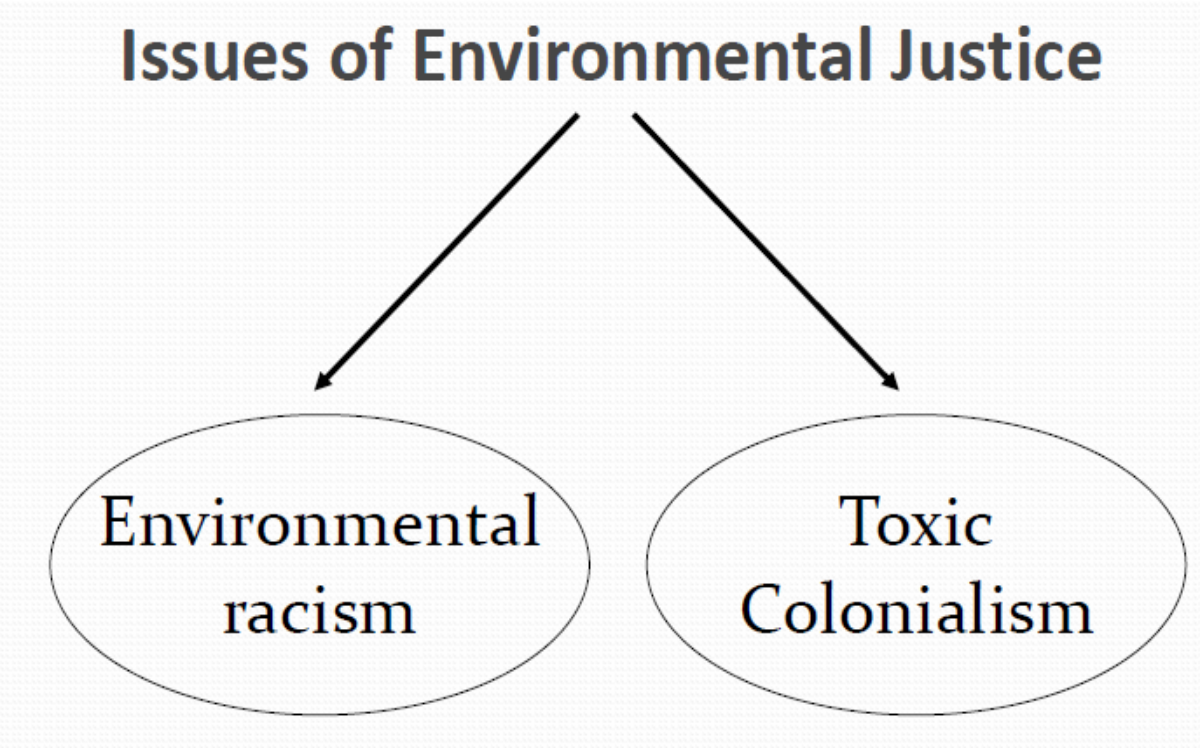
Ecocentric

- Based on the view that one should do everything what supports one's own interest and profit
  - The whole is more important than its individual parts
  - Only oneself has an intrinsic value
  - Other human and nature have instrumental value
  - Any action is based on one's personal wealth


Where do you
stand?

Environmental Justice

- **Environmental justice**= the fair and equitable treatment of all people regarding environmental issues. It is a civil rights with environmental protection to demand a safe, healthy, life-giving environment for everyone.
  - Wealthy nations dump hazardous waste in poorer nations with uninformed residents
  - The poor and minorities have less information, power, and money
  - The poor and minorities are exposed to more pollution, hazards, and environmental degradation


Issues of Environmental Justice
Environmental racism
Toxic Colonialism

Environmental Racism

- is placement of low-income or minority communities in proximity of environmentally hazardous or degraded environments, such as toxic waste, pollution and urban decay
- are competing views as to an exact definition, the interplay between environmental issues and social indicators are key to its understanding



Toxic Colonialism

- refers to the use of underdeveloped states as inexpensive alternatives for the export or disposal of hazardous waste pollution by developed states



End of chapter three:

Thank you!!