Environmental Economics

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Contents

Lecture 1: Introduction Lecture

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1 Aims

1. intro to environmental economic policy analysis. Overview, formal techniques, practical applications, case studies
2. critique economic techniques that are used to support decision making in environmental policy context
3. discussion of environmental policy through economic lens
4. research proposal

- what is "good" environmental policy? How is this devised and implemented and especially in developing countries

good economic policy satisfies

- effectiveness - it contributes to improving the environment
- efficiency - it improves the environment at least cost
- equity - there is fairness shown in burden sharing

2 Framework

Difference between natural resource economics and environmental economics

Natural resource economics

- inter-temporal allocation of **renewable and non-renewable resources**
- uses dynamic control methods, fisheries, forests, energy, species, extinction etc
- seminal work on non-renewable resources (1932)
- pioneering work for renewable resources (1976)

Environmental Economics

- the valuation and regulation of **pollution** (*environmental bats*)
- the valuation and regulation of **environmental amenities** (*environmental goods*)

Shifts in focus over time on what are the most pressing issues in environmental economics

Direct risks to human health

- high risk
  - pollinations in drinking water
  - ambient air pollutants
  - worker exposure to chemicals
  - smoking
  - pollution indoors
- Potential
  - Residues in/on food
  - Chemicals in consumer products

Risks to natural ecology and human welfare

- High Risk
  - Habitat destruction
  - Biodiversity loss
  - global climate change
  - ozone depletion
- medium risk
  - Pesticide's
  - Nutrients
  - toxics
  - biochemical oxygen demand (BOD)

- turbidity in surface water (*acid deposition, airborne toxics*

- lower risk
  - groundwater pollution
  - acid runoff to surface water
  - thermal pollution
  - oil spills

Example (Acid Rain one of the main issues in 1970-80). acid rain caused by SO_2 (burning coal/fossil fuel)

damage to buildings (corrosion)

damage to forests, croups, lakes, (change in acidity PH)

adverse health effects in lodger run (smog : asthma, bronchitis etc)

Note (can we/ how to maintain or enhance human well-being in the long run). nature as an asset : making the value of nature readily apparent

incorporating the value of nature in public sector projects and private sector decisions

requires economic thinking

appetite for information by decision-makers

Decision making and the policy process

1. Discovery Phase - preliminary stage, with no uncertainty. Prior to discovery almost
2. Political phase
   - Recognition - Political interest lowest but growing
   - formulation - political interest increasing at flat rate
3. management phase
   - implementation - political interest has peaked, here it declines as uncertainty also decreases
   - control - uncertainty completely diminished, poltiical interest reaches finite point as time progresses

Example. Recognition

1. indoor air pollution urban sprawl

Formulation

1. Global Warming
2. nuclear wastes

Formulation-Implementation

1. Ozone depletion
2. acid deposition
3. toxic chemicals

Implementation

1. municipal wastes
2. air pollution

Control

1. Sewerage
2. water treatment
3. contagious diseases(?)

Stages in the policy life cycle

1. problem recognition
2. policy formulation/ design
   - assessment of alternative solutions
   - comparison and choice of an alternative
3. implementation
4. control
5. evaluation
   - does the implemented policy work?

for each stages we can discuss :

- what information is required to support decision making (and move it to the next stage of the policy life cycle)
- economic theory and analytical methods are available, the analytical tools can be very similar for different environmental topics
- applications : some countries experiences address specific environmental problems

Structure emphasises fact that

- correct problem formulation is crucial
- specific environmental issues can be in different life cycle state's
- *countries can be out of sync*, this is not helpful in setting up international agreements
- shift in focus over time as to what are the main environmental problems

Thus providing insight to identify the kind of information or work needed to support policy (drawing up of research agenda)

Lecture 2: Causes of environmental problems

Wed 07 Feb 09:12

3 Market Failure

Environmental economists model market failures using *either* the theory of public goods or the theory of externalities

if the market is defined as 'environmental quality' then the source of the market failure is that environmental quality is a **public good**

if the market is defined as the good whose production or consumption generates environmental damage (benefits) then the market failure is due to negative (positive) externalities

Recall that economists don't simply view any polluting as an environmental problem, environmental problems must reflect an inefficiency whereby the costs of pollution are exceeded by the benefits.

3.1 the theory of public goods

the type of good depends on

1. Excludability : it is possible to prevent people who have not paid for the good from consuming it
2. Rivalness : when the good is consumed by one individual, another perosn is prevented form consuming it at the same time

it is important to note that for a pure public good (non-excludable, non rival) such as clean air or a lighthouse, in practice there is some rivalry or congestion.

why do public goods lead to market failure

- market demand for a private good is found by horizontally summing the demands of individual consumers
- in contrast, once a public good is produced it is available at the same quantity to all consumers (since it is non rival)
  - this implies we have to *vertically sum* each consumer's demand (marginal benefit) to find market demand
  - But how can this be represented graphically?
- however, marginal benefits are not revealed by the private market because public goods are non-excludable (consumers become free riders)
  - this is known as the "non-revelation of preferences" and leads to market failure due to under supply of public goods

How to obtain demand for a public good?

- use valuation methods to calculate willingness to pay (WTP) of consumers:
  1. stated preference methods (eg contingent valuation and choice experiments)
  2. revealed preference methods (eg hedonic pricing methods, travel cost method)
- however, imperfect information can provide an added complication :
  - consumers themselves may not be fully aware of the full benefits of consumptino, and so their WTP may underestimate the true value of the good

3.2 The theory of externalities

- if the production or consumption of a good or service generates environmental damage outside the market transaction, then the market failure is due to a **negative externally**
- the damage that occurs outside the market transaction is not captured by the price of the commodity
- How can we represent a negative (or positive) externally graphically?

what is the relationship between public goods and externalities?

- externalities affect air, water, or land, all of which have public goods characteristics
- if the externality affects a broad segment of society and its effects are non-rival and nonexcludable, the externally is itself a public good
- if external effects are only felt by a narrow range of individuals or firms, then those effects are more appropriately modelled as an externality

how to adress the market failure?

Coase

Starting from the public good idea

Bargaining : the source of the environmental problem in private markets is that property rights are not defined. Ronald Coase (1960) demonstrated that proper assignment of property rights to any good, even in the presence of externalities, will allow *bargaining* between the affected parties that will obtain an efficient solution, no matter which party holds the rights. Thus : Negotiation will overcome market failure! *but how useful is this in practice?*

Pigou

Starting from the control of externalities

Regulation : Taxes, tradable permits, information nudges etc

Coase Theorem

How relevant and useful is the Coase Theorem to pollution problems *in practice*?

- Key assumptions underlying the theorem include
  - No transaction costs
  - Perfect information
- Vittel watter in North-eastern France provides an example of the Coase theorem

> **Example.** In the 80s Vittel initiated a program to reduce agricultural water pollution in locality of the source of its bottled water
>
> Vittel paid 26 local farmers, offered technical assistance and equipment to reduce pollution (ie switch to organic pesticides)
>
> as a result, vittel water benefits from improved water quality

In summ,

- From an economic perspective environmental problems exist because they are market failures

- There are two basic explanations for environmental problems as market failures:
  - environmental quality as a public good
  - environmental externalities from the production or consumption of polluting generating goods
- solution to market failure will typically involve government intervention

4 Government or Regulatory Failure

- government policies can create market inefficiencies
- Further, government policies can lead to unintended environmental consequences
  - Negative externalities are created or intensified
  - common example is a production subsidy to reduce price of market goods with negative environmental effects (fossil fuel)

Example (Case Study : US Ethanol Policy). Ethanol is an oxygenate that is used as an additive to reformulated gasoline

ethanol production has long been supported in the US

- tariffs and subsidies were in place 2004-12
- grants, loan guarantees, cost shares, tax credits, technical fuel standards and ethanol mandates remain in place. Of the petrol sold in the US, 95-95 % is sold within concentrations of E10
- the intended consequences to supporting ethanol production are :
  1. enhance energy security by reducing dependence on imported oil and reduce gasoline prices
  2. reduce net greenhouse emissions
  3. rural development

Griffin (2013) assesses the three intended benefits, finding

1. Benefits to motorists are insignificant
2. benefits to oil security is small and ill-suited to dealing with supply disruptions
3. minimal reduction in $C0_2$ emissions which could in fact increase due to changing land use

Also finding a negative unintended consequence on world food prices

- Corn is diverted from food to ethanol use, and other crop land is diverted to corn production
- although it is difficult to measure precisely, even conservative estimates suggest mandates lead to a substation al increase in world food prices
- world's poor are particularly impacted due to a lack of substituting possibilities
- the unintended consequence far outweighs any intended benefits

Chen, Huang, Khanna, Onal (2014) consider the welfare effect and GHG emissions of two policies to induce biofuel production in the US

- Renewable Fuel standard (RFS) established in 2007, which sets targets for blending of specigic types of biofuels with fossil fuels
- a low carbon fuel standard (LCFS) aims to reduce the GHG intensity of transportation fuel
- in contrast to these polciies, a **carbon price** policy could be used to directly target a reduction in GHG

In sum,

- Government or regulatory failure refers to the situation where market inefficiencies are created by government policies
- governments use policy tool to reduce prices of market goods, these incentives are justified if there are (net) positive externalities. If this is not the case the right hand of government undoes what the left hand has just accomplished

Exercise 1 (Microecinomics and the environment revision exercise)**.** Application

Case Studies of 18 countries in Central and Eastern Europe

- CIS countries (Belarus, Estonia, Lithuania, Latvia, Moldova, Ukraine)
- CE countries (Poland, czech republic, slovakia, hungaria)

Trade off of ecosystem services showing non convexities. Non convexity in practice does hold up

Z axis agricultural output. So would expect this shape, but we don't see it here at all, we see that if you have.

If want to do research in ecosystem servcies, have to look at shape of PPF. In order to base regulation off of this.