

Seminar on environmental fiscal reform
4. February 2015

Environmental fiscal instruments

Theoretical basis

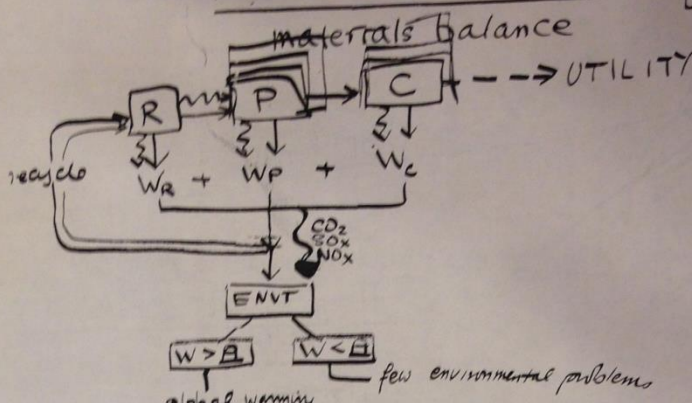
Sándor Kerekes

Kaposvár University

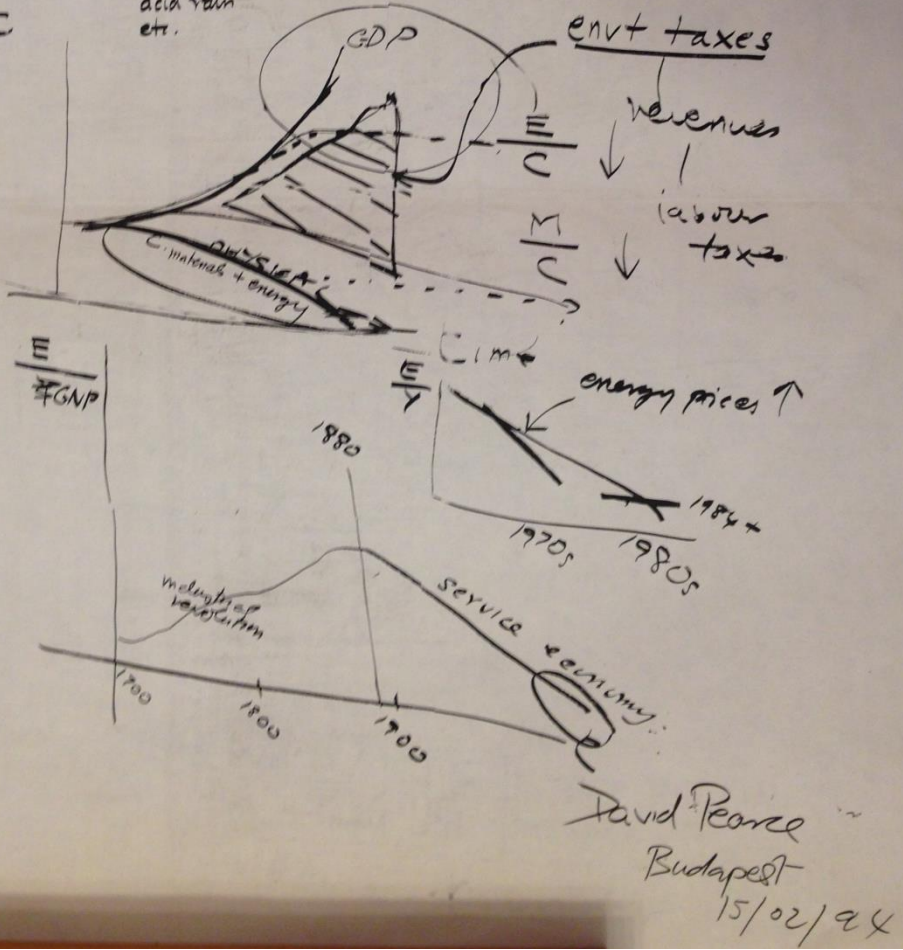
Corvinus University Budapest

ENVU + ECONOMY

BUILDING
1966



C



David William Pearce,
environmental
economist, born
October 11 1941;
died September 8
2005

With two colleagues, Anil Markandya and Ed Barbier, Pearce published his best-selling environmental manifesto, *Blueprint for a Green Economy*, in 1989. It was hailed by this newspaper as a "political event of the first importance". Widely known as the Pearce Report, it was a concise and persuasive statement of the key contributions that economics could make to the reform of environmental policy. It advocated basing policy on the criterion of "sustainability", valuing environmental effects, and making use of market incentives - all recurring themes in Pearce's work.

Economic growth: the wrong measure



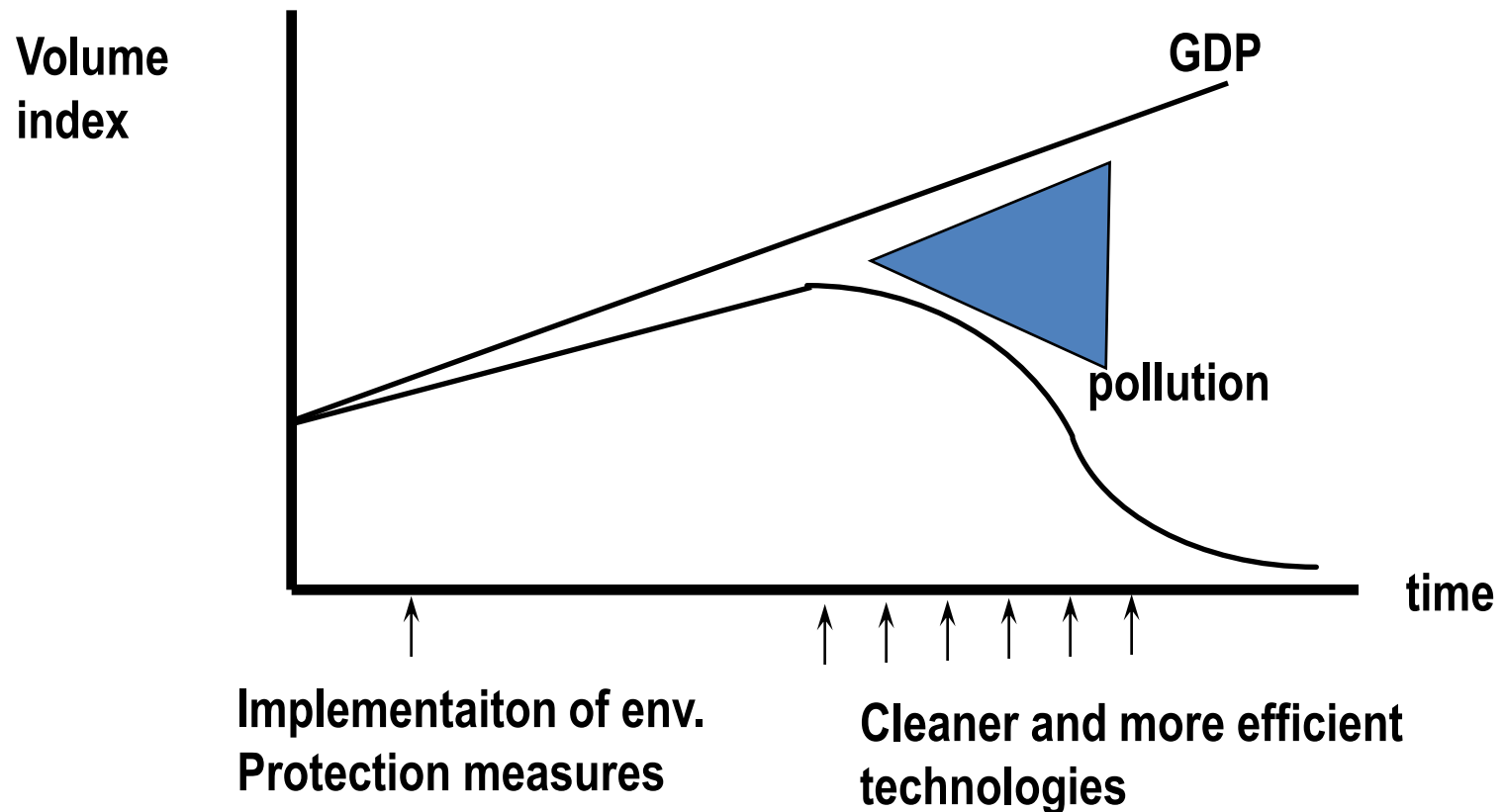
Simon Kuznets
Nobel Laureate 1971

- The EKC hypothesizes that the relation between income per capita and emissions has an inverted U shape.
- At relatively low income levels, emissions increase with income, but after some “turning point”, emissions decrease with income.

Source: Kuznets Modern economic growth: findings and reflections The American Economic Review 1973

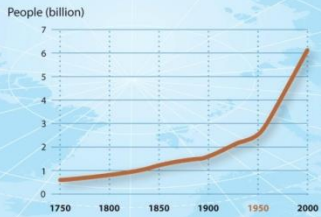
„Kuznets” curves

Theoretic model*



*Source:
OECD 1991
U.S. Environmental Protection Agency 1991. 40. oldal

Population



US Bureau of the Census (2000) International database
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Total real GDP



Nordhaus (1997) The economics of new goods. University of Chicago Press
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Foreign direct investment



World Bank (2002) data and statistics
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Damming of rivers



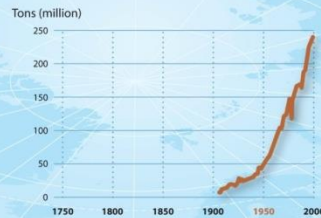
World Commission on Dams (2000)
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Water use



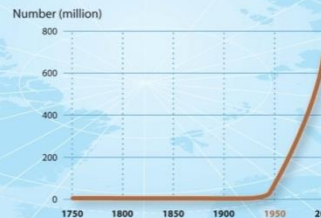
Shikomanov (1990) Global Water Resources
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Paper consumption



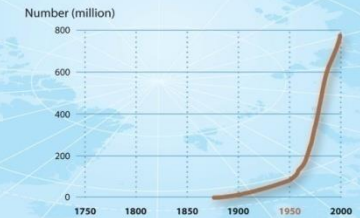
Pulp and paper international (1993)
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Motor vehicles



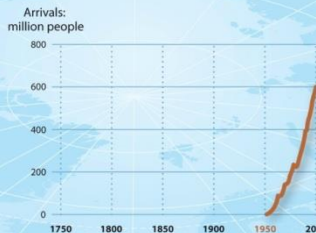
Global environmental outlook (2000)
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Telephones



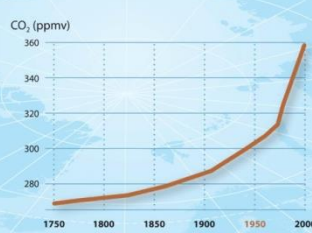
Canning (2001) A database of world infrastructure stocks, 1950-95 World Bank
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

International tourism



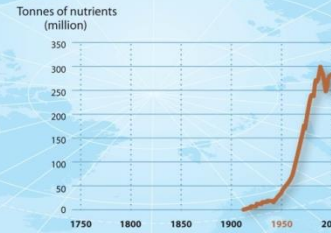
World Tourism Organization (2001) Tourism industry trends
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Atmospheric CO2 concentration



Etheridge et al. Geophys Res 101: 4115-4128
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Fertiliser consumption



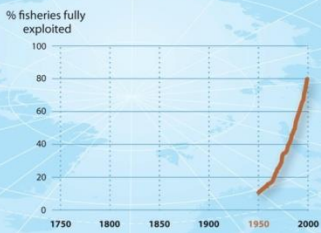
International Fertilizer Industry Association (2002)
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Ozone depletion



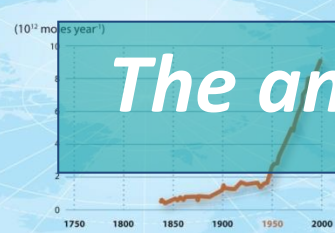
JD Shanklin British Antarctic Survey
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Ocean ecosystems



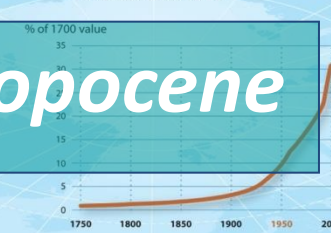
FAO/STAT 2002 Statistical database
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Coastal zone nitrogen flux



Wetzel et al. 2003
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

Tropical rainforest and woodland loss



Richardson, The Earth as a System, Cambridge University Press
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

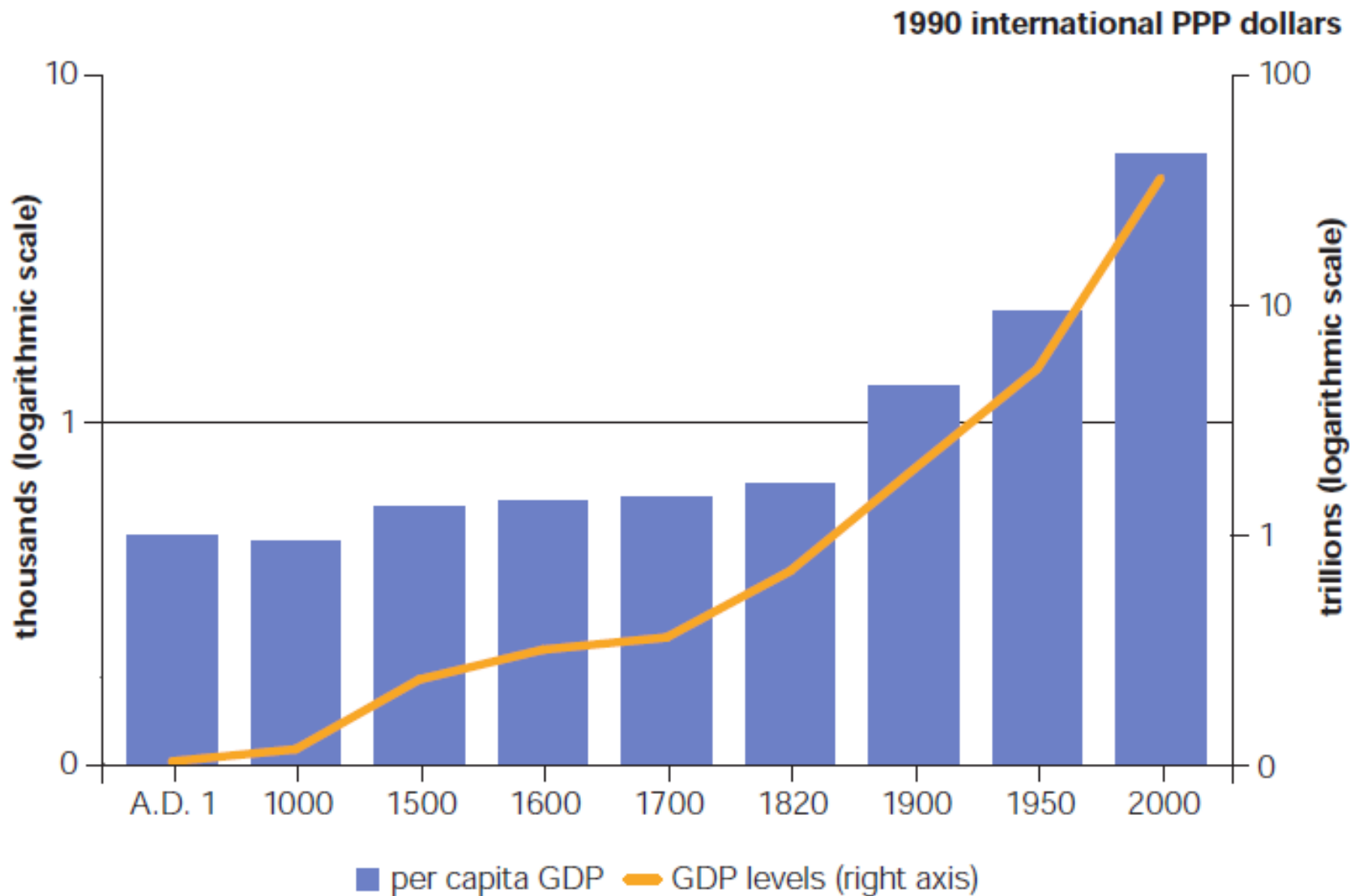
Species extinctions



Wilson, The Diversity of Life
IGBP synthesis: Global Change and the Earth System, Steffen et al 2004

The anthropocene

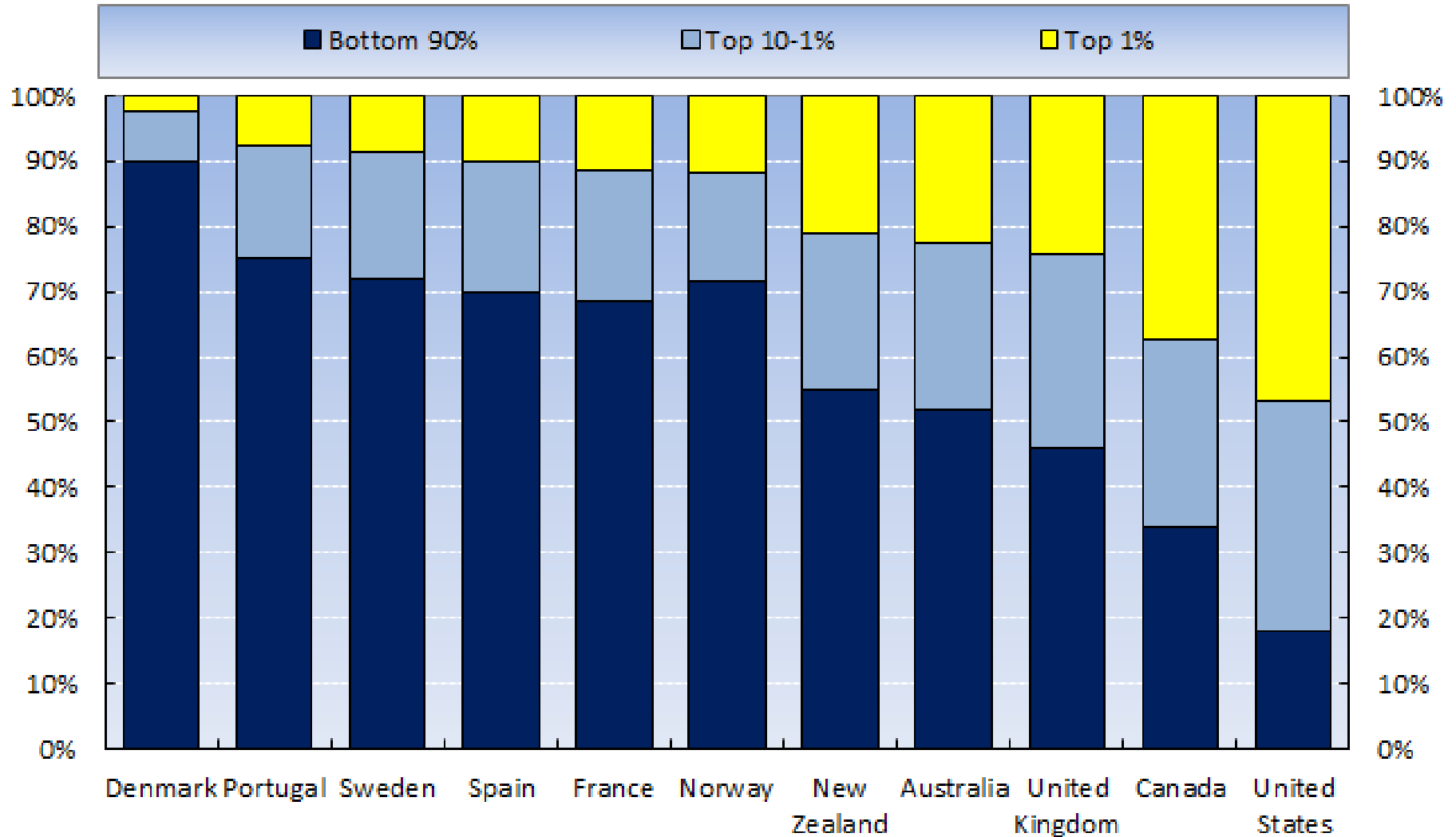
Figure 1 Evolution of Global and Per Capita GDP in the Last 2,000 Years



Source: Maddison, Angus. 2007. *Contours of the World Economy, 1–2030 AD*. Oxford, UK: Oxford University Press.

Note: PPP = purchasing power parity.

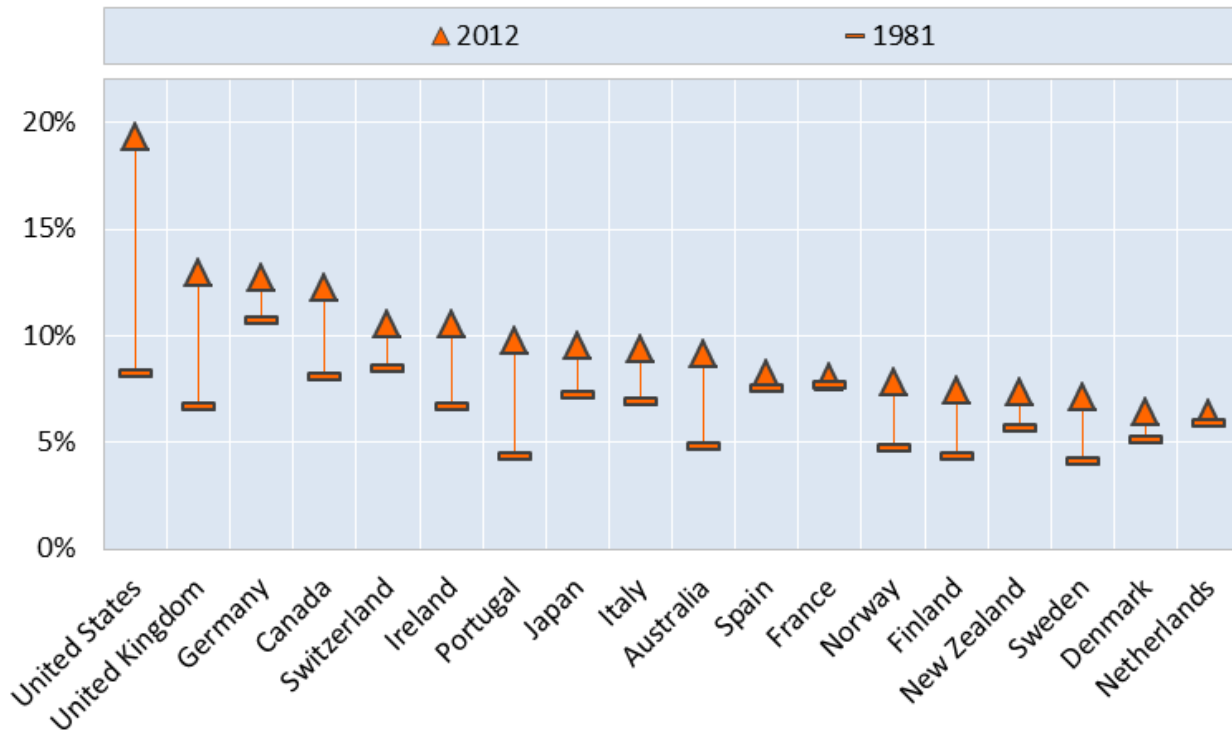
Share of total income growth 1980-2008 captured by



Source: World Top Incomes Database. Incomes refer to pre-tax incomes.

http://fbe.unimelb.edu.au/_data/assets/pdf_file/0008/879929/Corden_lecture_2013_John_Martin_slides.pdf

Shares of top 1% incomes in total pre-tax income, 1981–2012 (or closest)



Note: Incomes refer to pre-tax incomes, excluding capital gains, except Germany (which includes capital gains). Latest year refers to 2012 for the Netherlands, Sweden and the United States; 2011 for Norway and the United Kingdom; 2009 for Finland, France, Italy and Switzerland; 2007 for Germany; 2005 for Portugal; and 2010 for the remaining countries.

Source: OECD calculations based on the World Top Income Database
www.oecd.org/.../OECD2014-FocusOnTopIncomes-Fig.

Weak sustainability vs strong sustainability

- **Weak sustainability** acknowledges the concept of Hicksian income* – limiting consumption to the ‘interest’ or flow of services produced by the capital stock
- But, it assumes maintenance of total capital stock ($MMK + NK$) without regard to proportions
- Each kind of capital is treated as being substitutable for another.



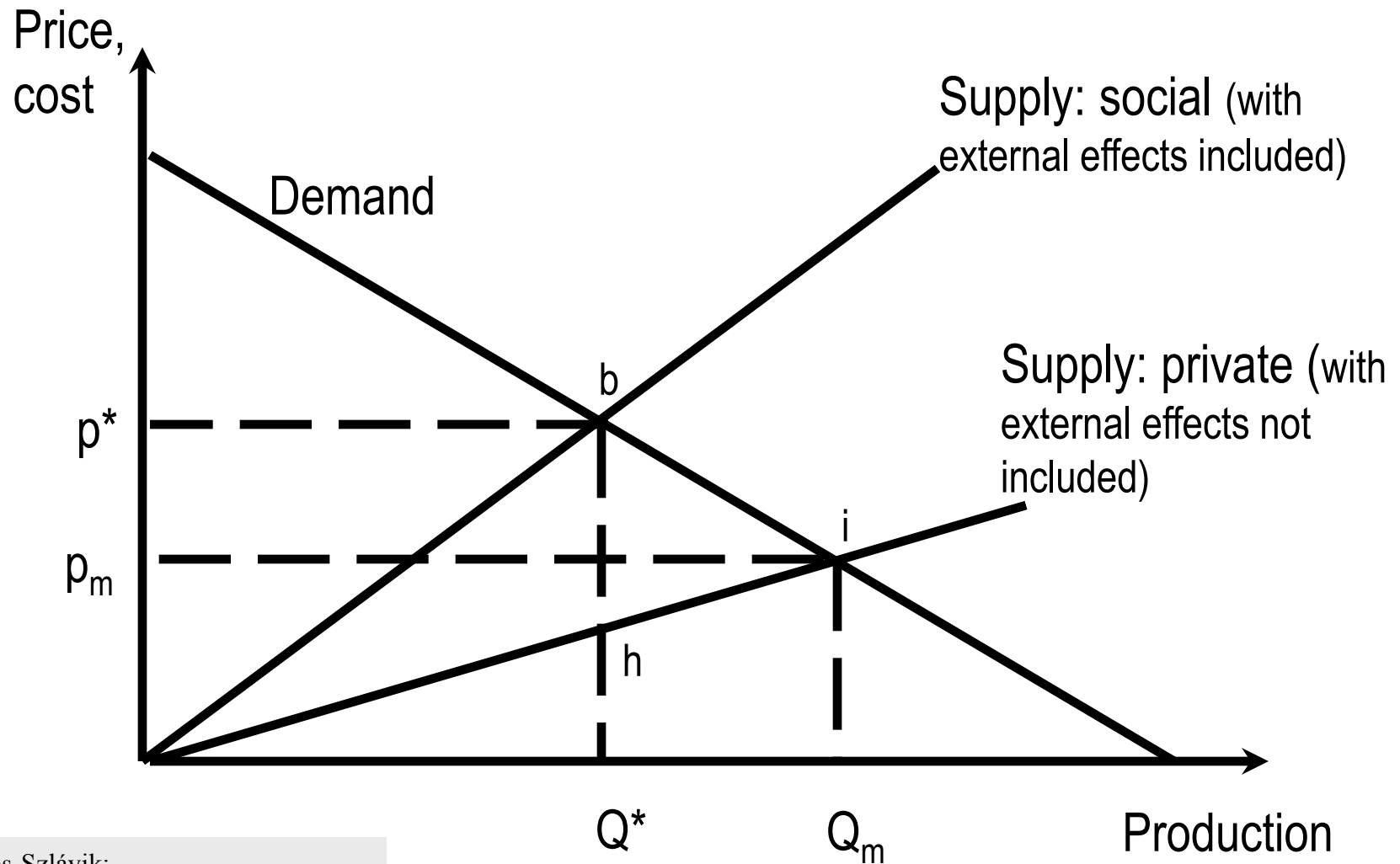
John Hicks

* Hicks, John R. (1939). Value and Capital: An Inquiry Into Some Fundamental Principles of Economic Theory, Oxford: Clarendon Press.

Environmental economics

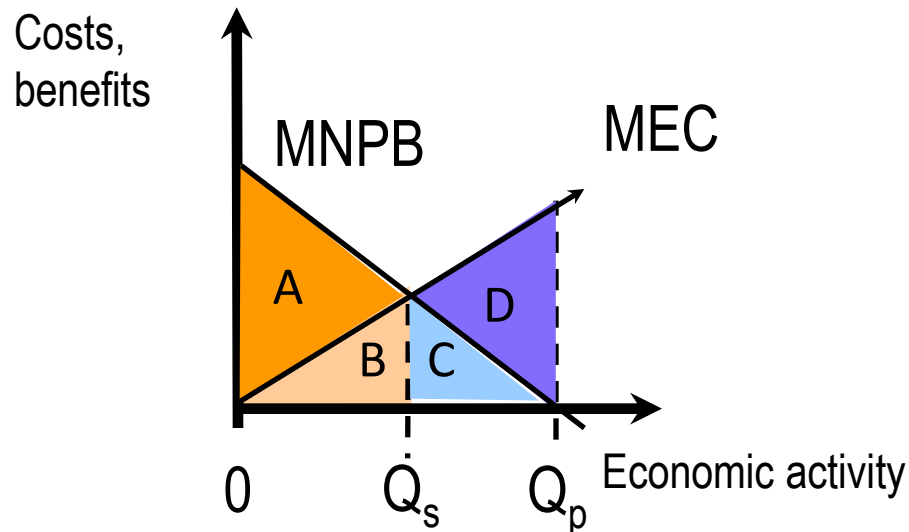
- **The optimal amount of pollution caused by production processes;**
- **Theoretical background of reaching the social optimum;**
- **Practical tools of achieving optimum pollution levels**

Private and social costs of production*



*Source: Kerekes-Szlávik:
Gazdasági útkeresés - környezetvédelmi stratégiák
KJK, 1989 56. o.

The meaning of different territories



Private optimum

- Profit of the company: $A+B+C$
- Size of the externality: $B+C+D$
- Net effect for society:

$$A+B+C - (B+C+D) = A-D$$

Social optimum

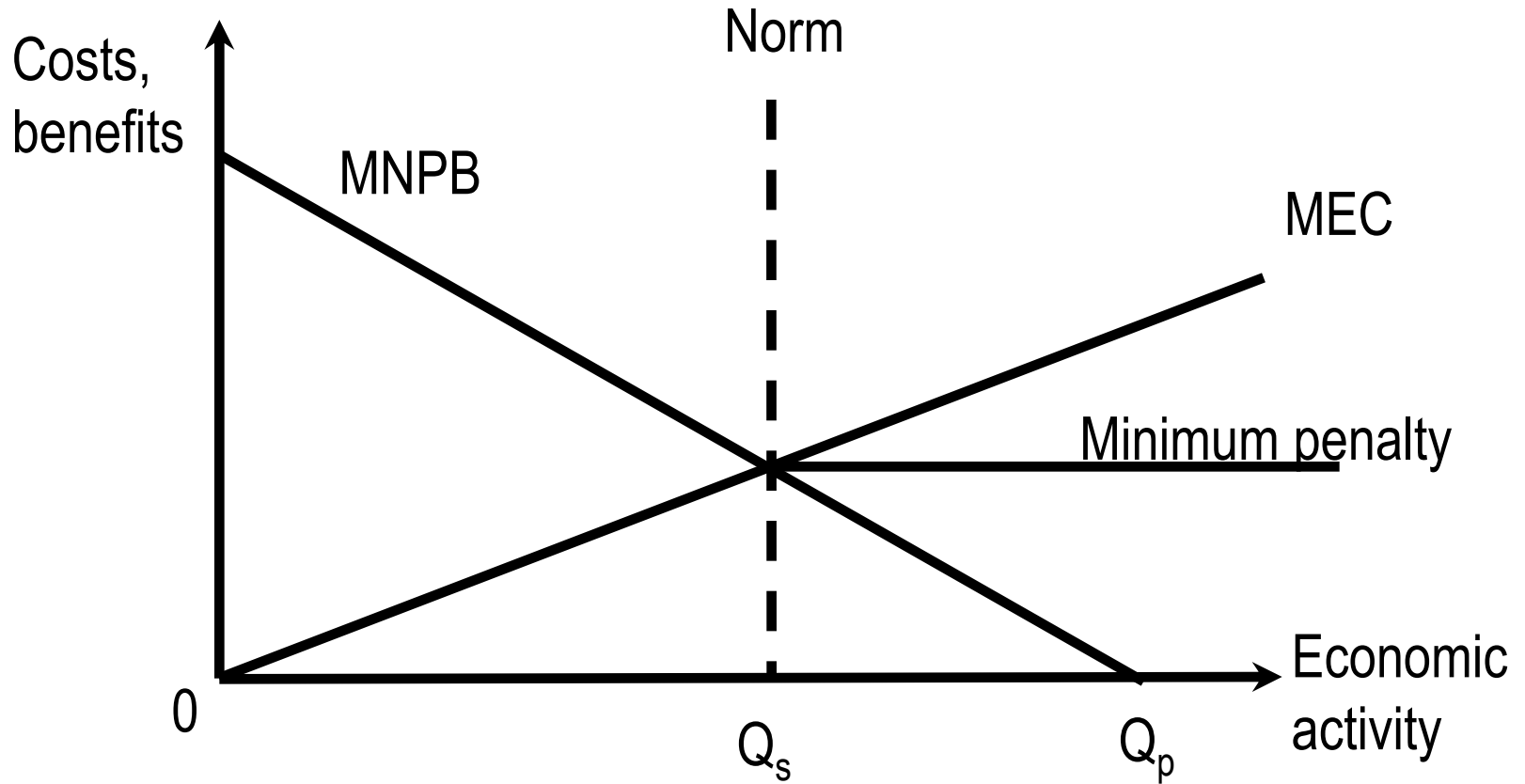
- Profit of the company: $A+B$
- Size of the externality: B
- Net effect for society: $A+B-B=A$

Source: Kerry Turner, David Pearce & Ian Bateman (1993) Environmental Economics

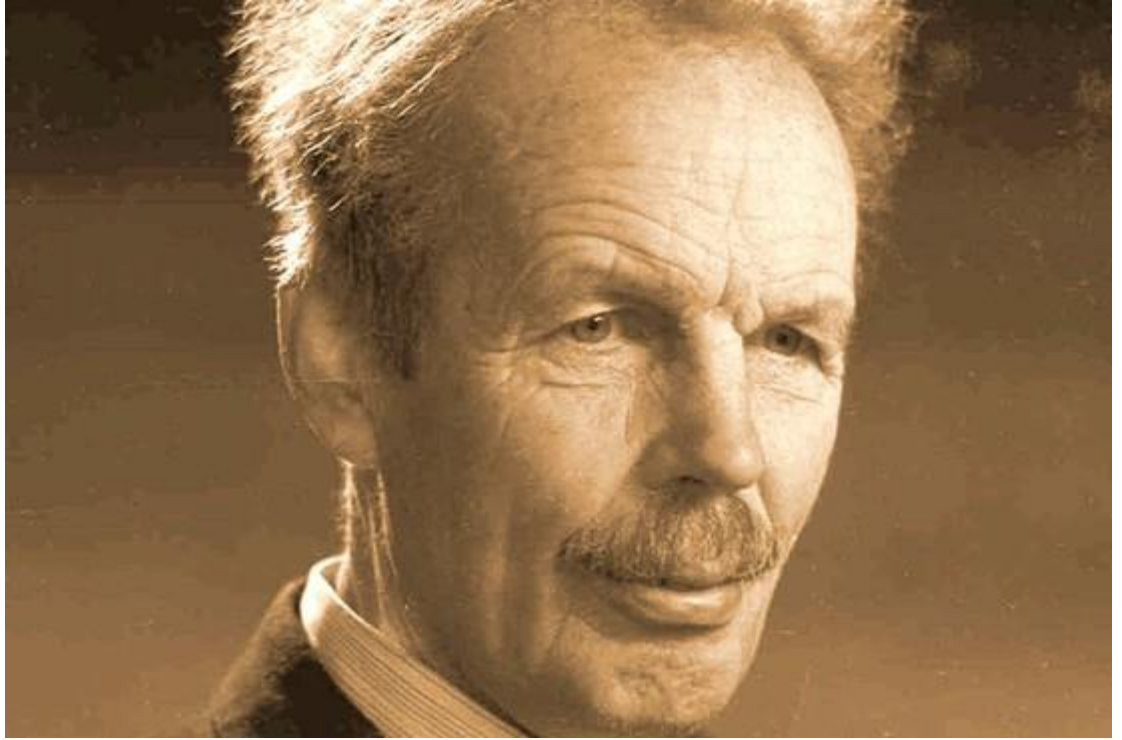
An Elementary Introduction John Hopkins University Press Baltimore

Tom Tietenberg and [Lynne Lewis](#) Environmental & Natural Resource Economics, Addison Wesley; 8 edition (July 31, 2008)

Setting of a norm



The Pigovian tax

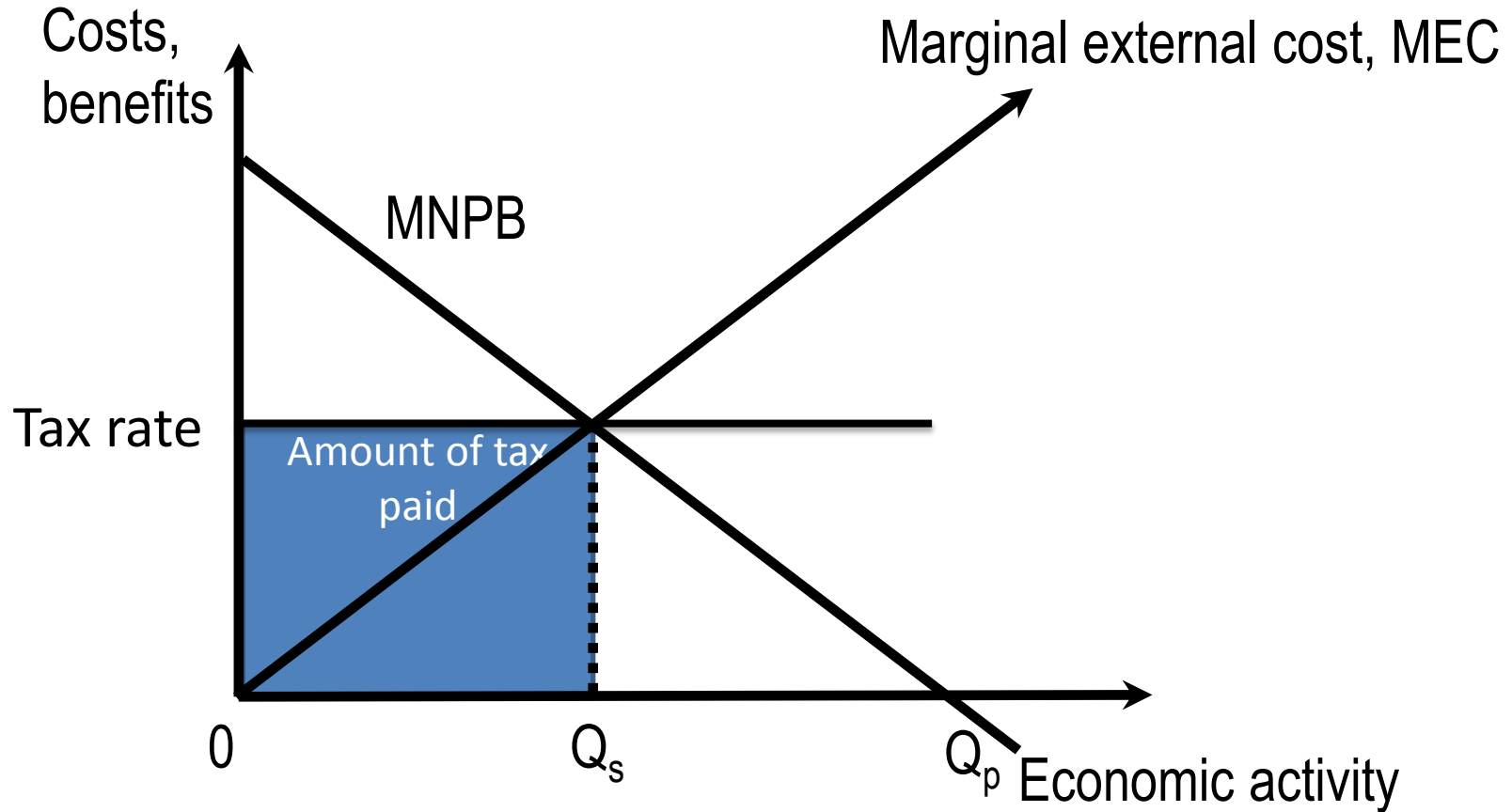


Arthur Pigou (1877-1959)

1920: *The Economics of Welfare*

Social cost should be internalised through the introduction of a tax based on the unit of production.

The optimal size (amount) of the Pigovian tax is double than the created damage



Source: Kerry Turner, David Pearce & Ian Bateman (1993) Environmental Economics
An Elementary Introduction John Hopkins University Press Baltimore

Tom Tietenberg and [Lynne Lewis](#) Environmental & Natural Resource Economics, Addison Wesley; 8 edition (July 31, 2008)

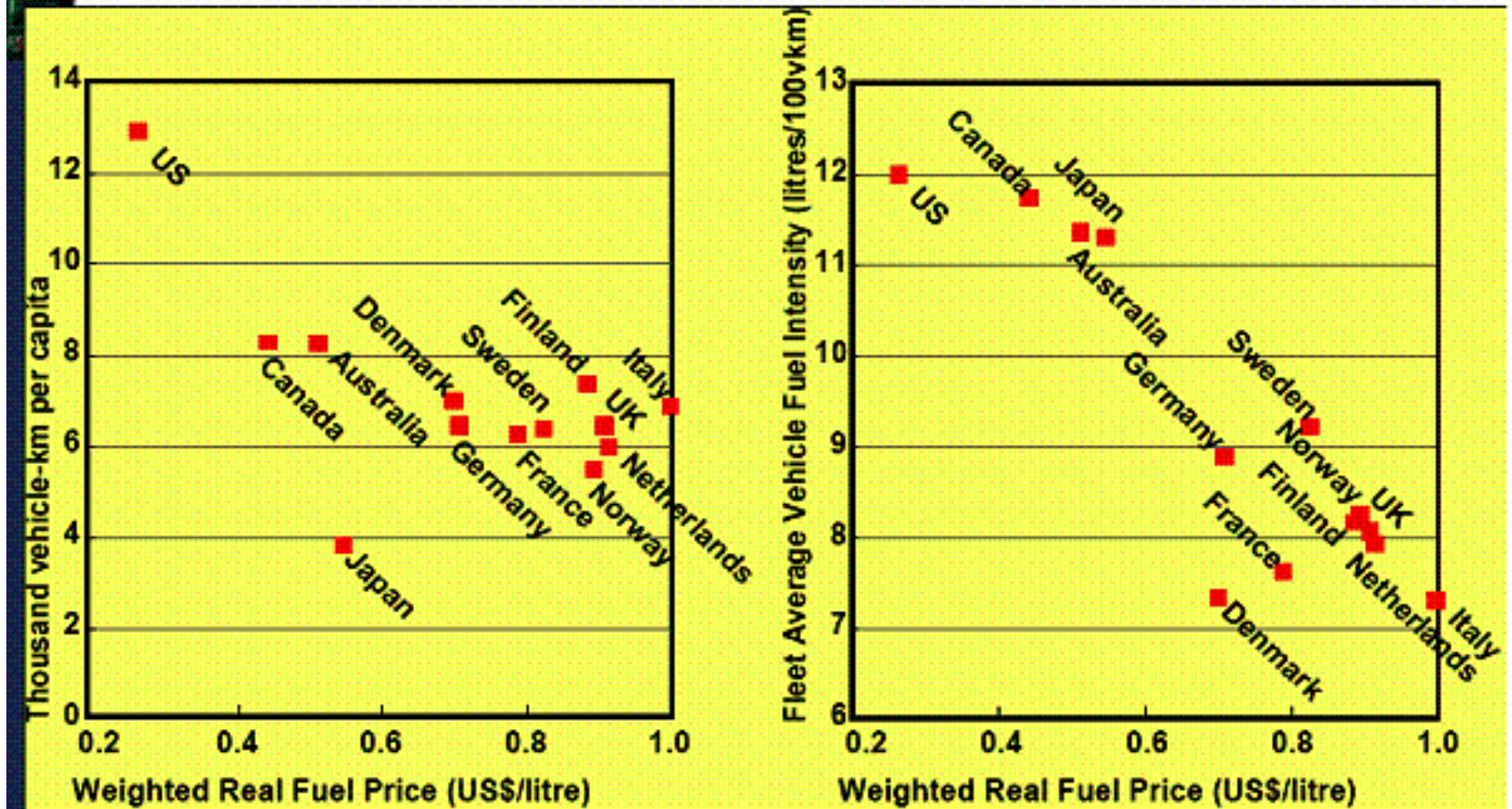
Weaknesses of the theory of Pigou

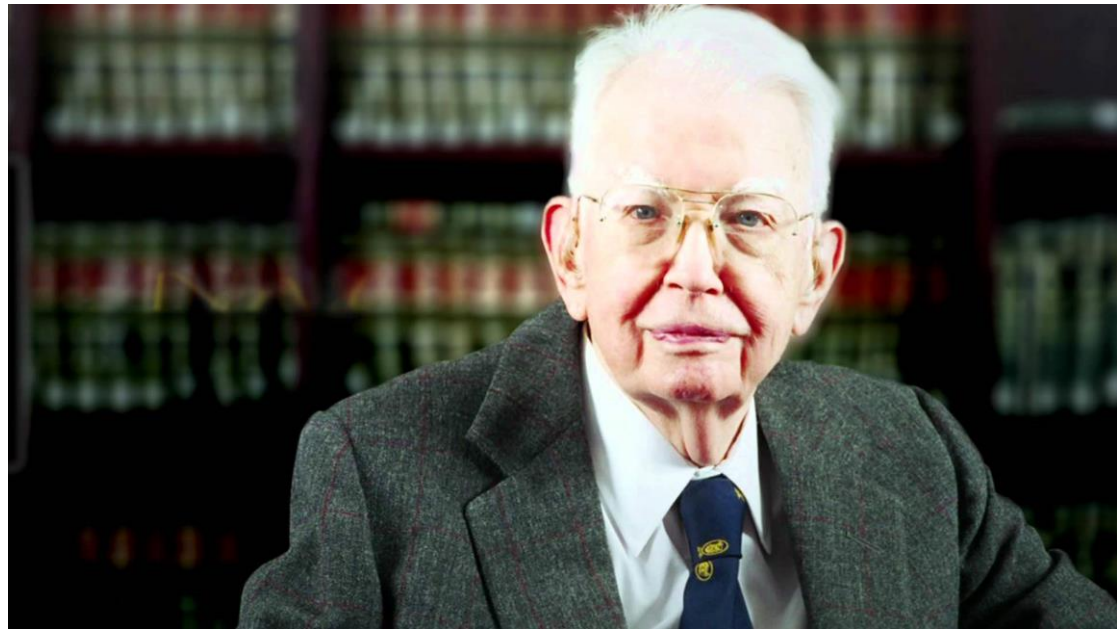
- The identification of the MEC curve
- Asymmetric information
- Pollution is not proportionate with production
- Lack of perfect competition
- Does not really motivate environmental innovation
- MEC can be several times higher than MC

The misleading information

Car Use, Fuel Intensity vs. Fuel Price, 1998

Source IEA





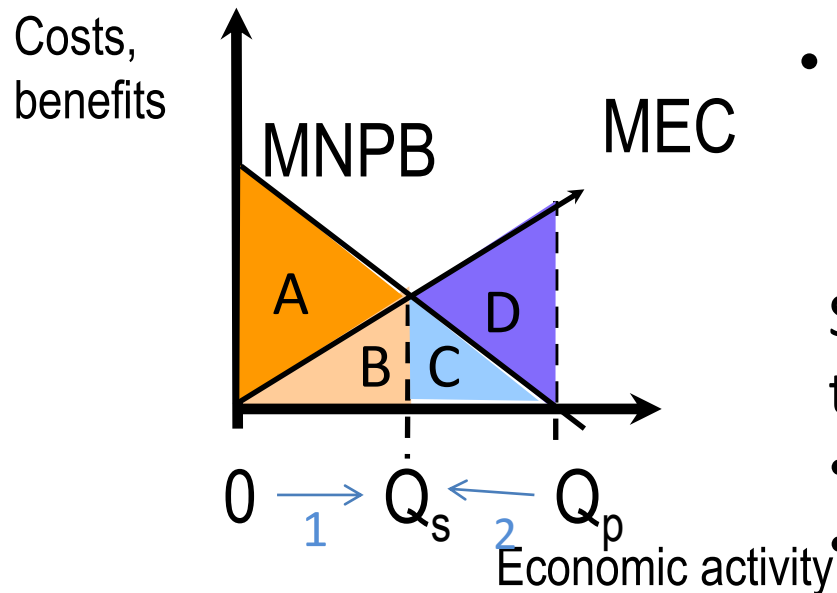
Ronald Coase (1910-2013)

The Coaseian bargain

1960: The Problem of Social Cost

As a result of a bargaining process the system reaches the social optimum independent of who owns the property rights.

The Coase-theorem



Scenario 1: everyone has the right for a clean environment

- Starting point of bargain: 0
- End point of bargain: Q_s
- Polluter pays to the sufferer
 - Minimum: B
 - Maximum: A+B

Scenario 2: everyone has the right to use (pollute) the environment

- Starting point of bargain: Q_p
- End point of bargain: Q_s
- Sufferer pays to the polluter
 - Minimum: C
 - Maximum: C+D

The chance for reaching agreement

- Theoretically equal in both situations
- In practice, willingness to pay must be accompanied by the *ability* to pay
- Therefore, chances for reaching agreement are smaller when the rights are with the polluter and the sufferer has to pay

Weaknesses of the theory of Coase

- assumes perfect competition
- the identification of the participants of the bargaining process poses problems:
 - high number of interested parties
 - identification of those who cause the damage and those who suffer from it
 - interests of future generations
- transaction costs are often high
- only a few practical examples

Tax or norm? (imperfect information)

Martin Weitzman

Assumptions

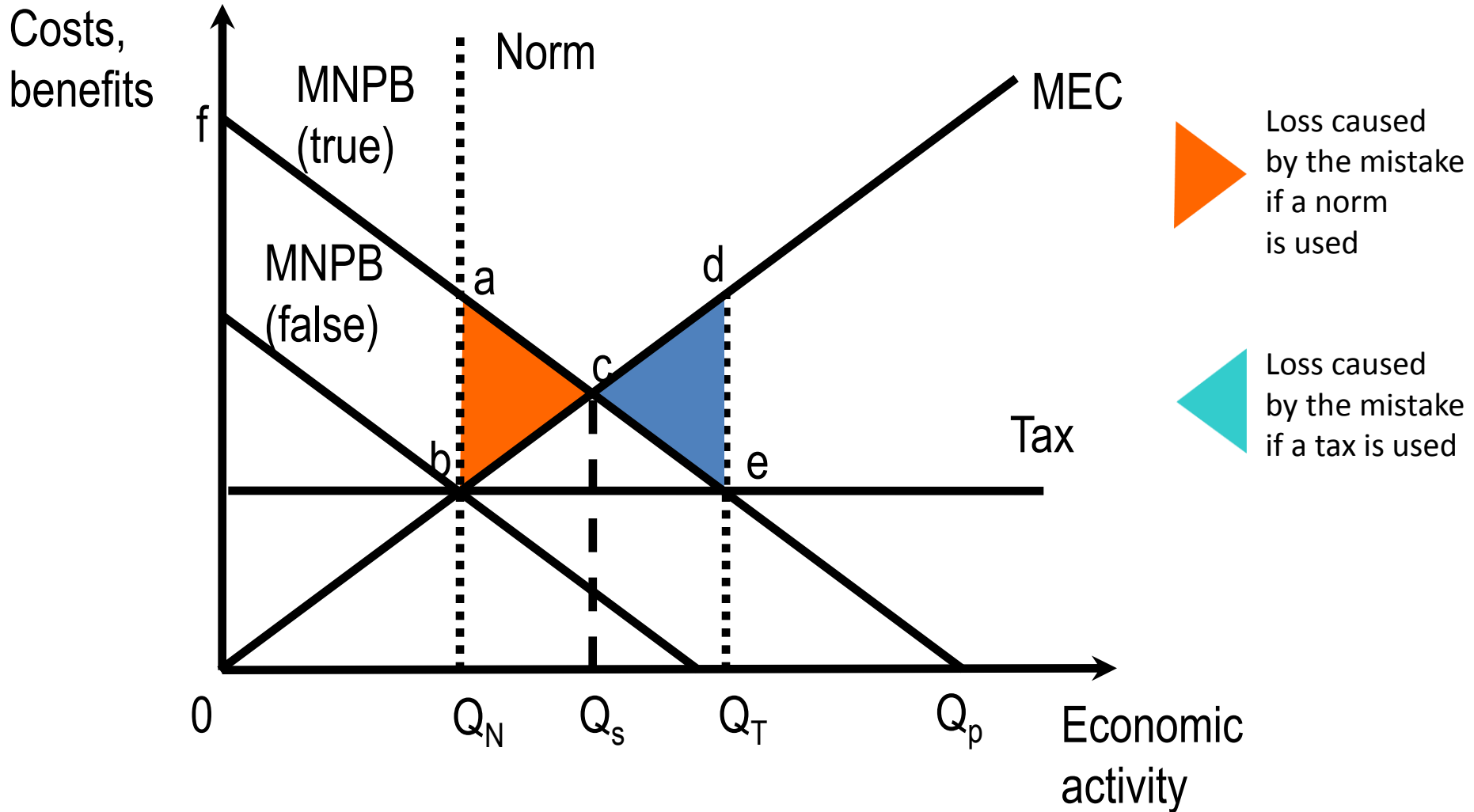
- The authorities know MEC
- The authorities underestimate MNPB
- The company complies with the norm

The choice between the two policy tools should be based on the steepness of the two curves. **In case or dangerous (steep MEC curve) pollutants like pesticides, the norms should be preferred! (K.S.)**

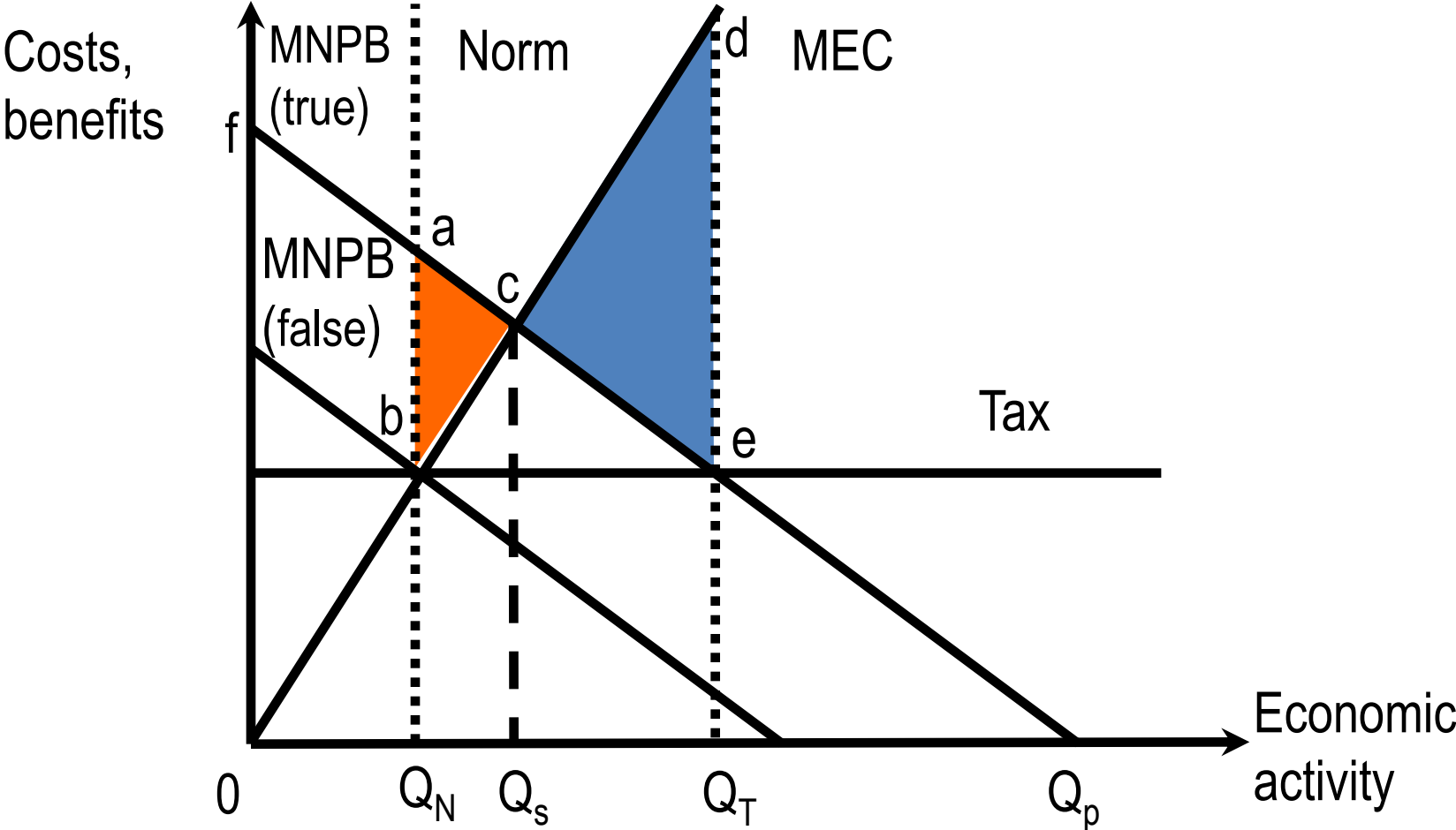


Martin Weitzman
1942-

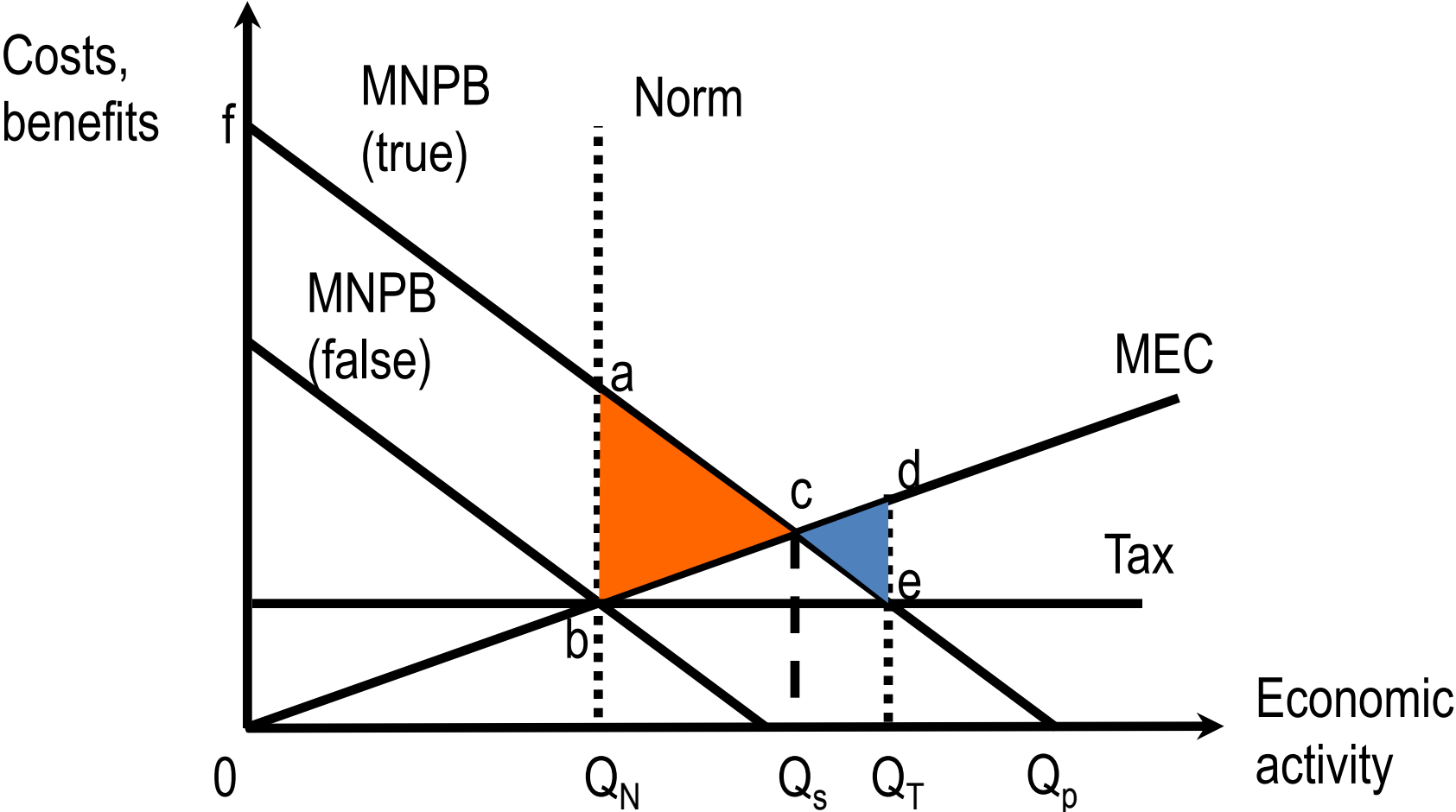
MNPB and MEC: similar steepness



The case of steep MEC



The case of steep MNPB



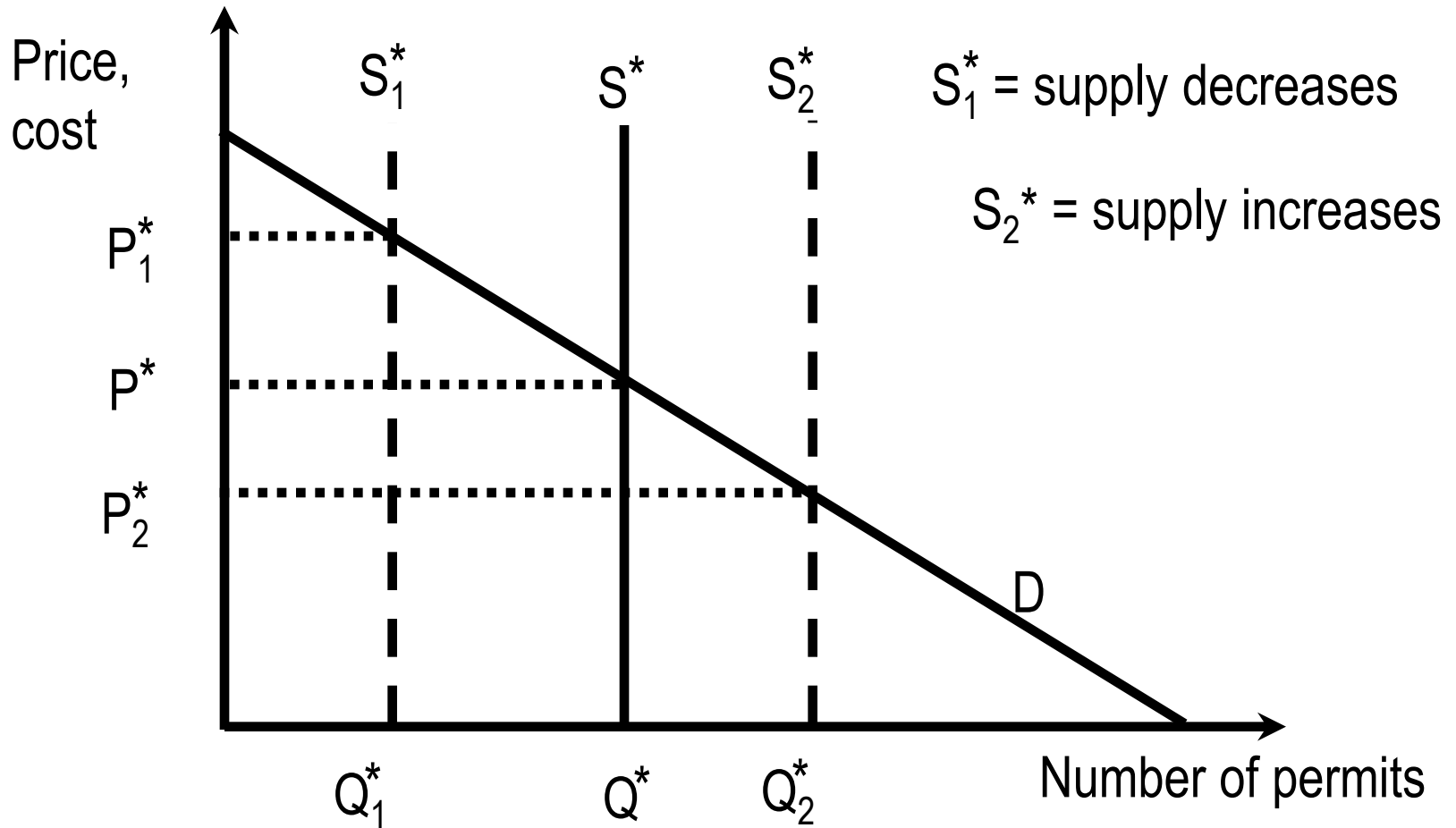
The distribution of pollution abatement among several polluters

- What is the cheapest way to achieve a certain pollution reduction if there is more than one polluter?
- Those with lower abatement costs should reduce pollution more than those for whom reduction is very expensive.
 - Equal distribution (norm) is not cost effective, it is better to use economic instruments.

Tradable pollution permits

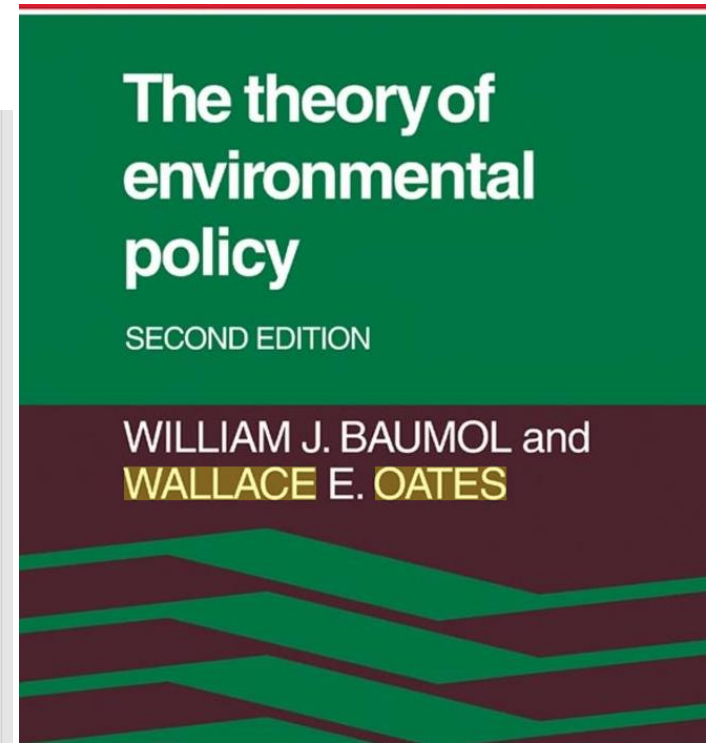
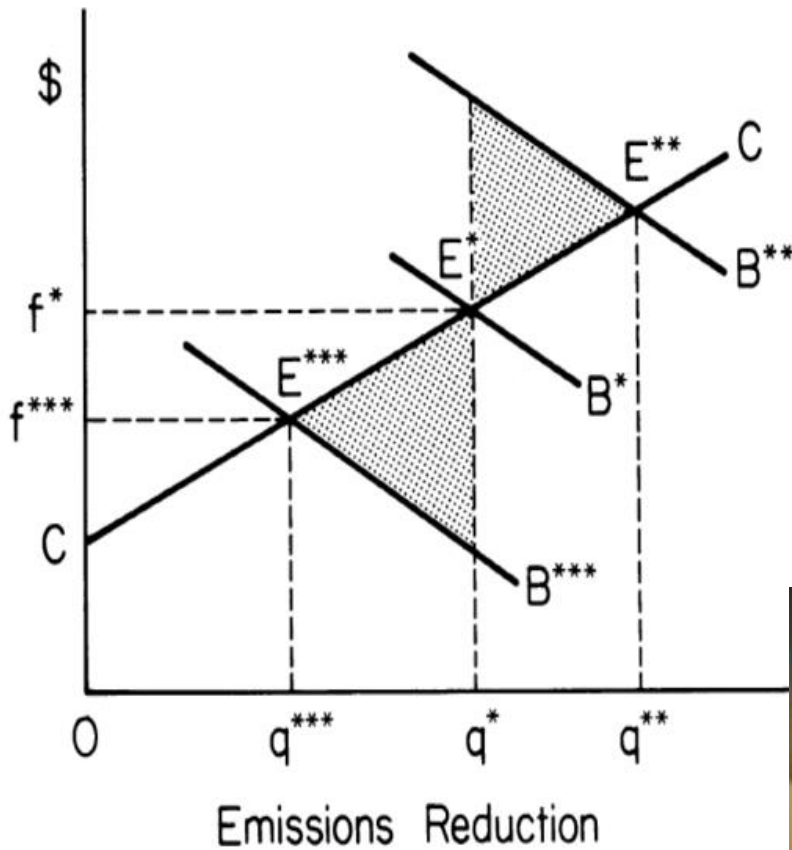
- Also known as emissions trading or quota trading
- the regulatory authority distributes pollution permits in the amount of allowed pollution
- companies and other stakeholders may trade these pollution permits
 - Each company will decide whether to reduce pollution or to buy permits (or a combination of the two – reduce as far as that is cheaper and buy permits for the remaining amount of pollution)

Change in the supply of the permit



Advantages of emission rights/permits

- Combines the benefits of the norm and the tax:
 - the amount of pollution can be determined by the authorities (there are no surprises even if the government does not know the companies' MAC curves)
 - the desired pollution reduction can be achieved at the lowest possible cost (MACs will be equal)
- Automatically handles inflation and new entries to the market (the permit price will change, the total amount of pollution will not)

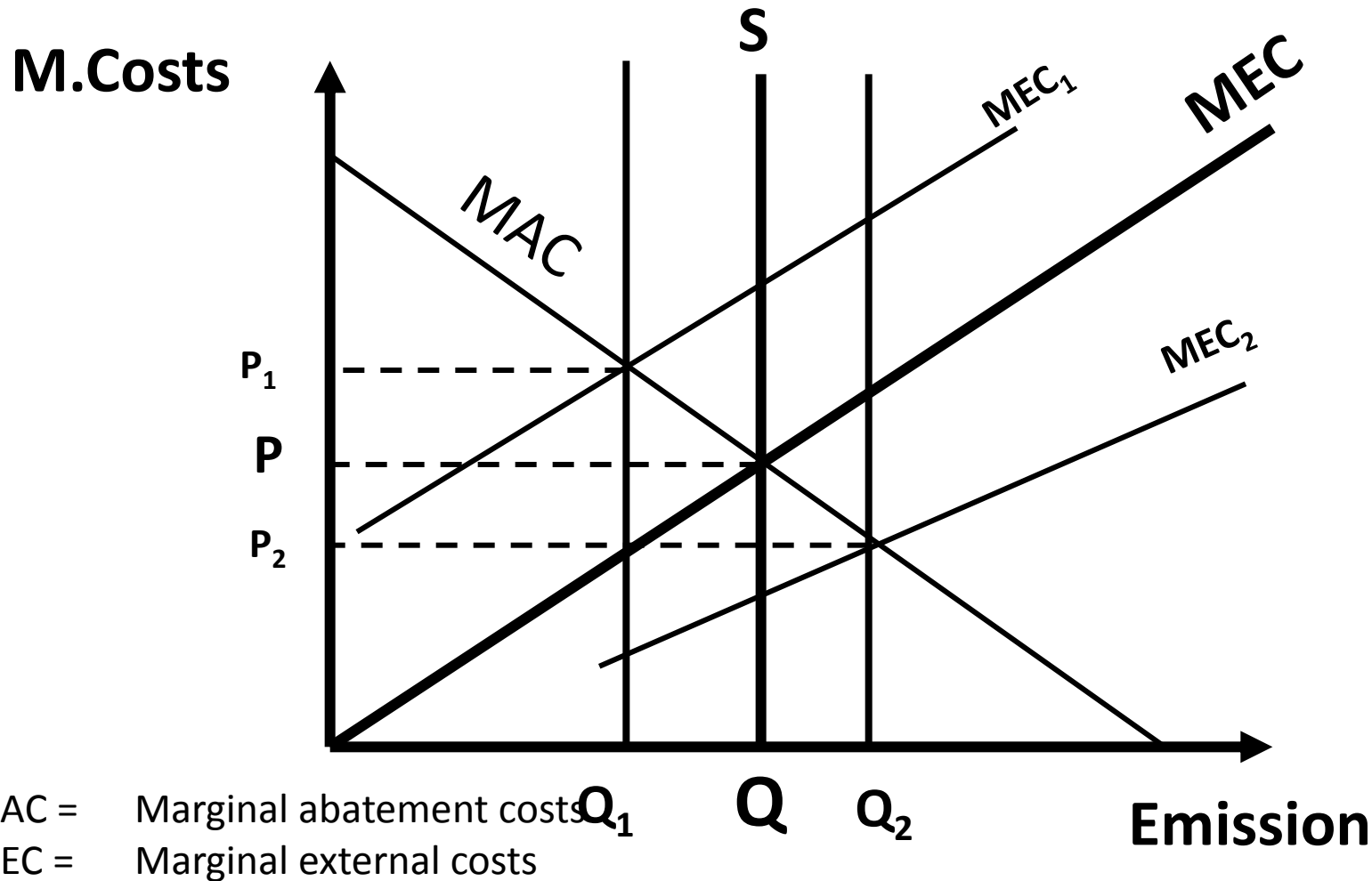


Fiscal Federalism

[Wallace E. Oates](#)

Wallace E. Oates, Professor of Economics, University of Maryland, College Park and University Fellow, Resources for the Future, US

Wallace Oates: Environmental federalism



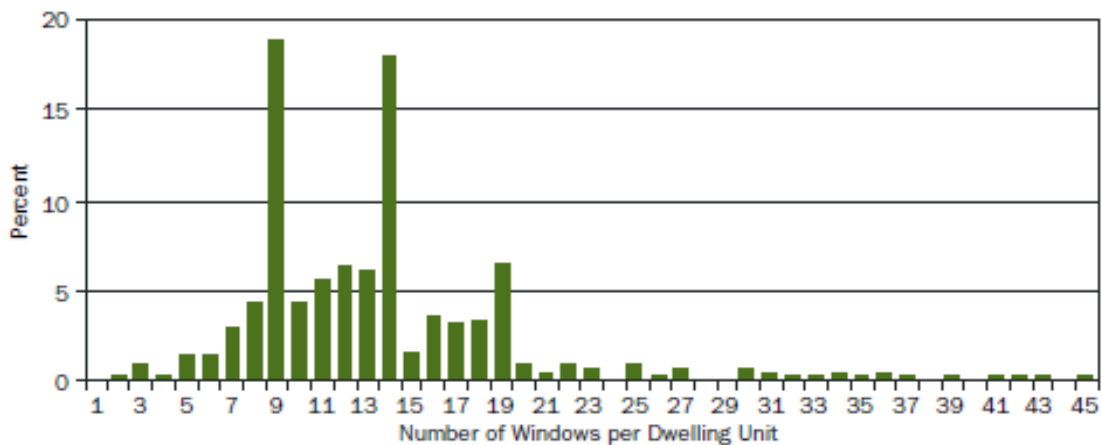
The Window Tax

A Transparent Case of Excess Burden

In 1696, King William III of England, in dire need of additional revenues, introduced a dwelling unit tax determined by the number of windows in an abode.

People chose the number of windows not to satisfy their own preferences, but to avoid paying higher levels of taxes. The window tax, in short, generated a real “excess burden.” In some dwellings, entire floors were windowless, leading to very serious and adverse health effects.

FIGURE 1
Distribution of the Number of Windows per Dwelling Unit 1747–1757



Source: Authors' calculations using local tax data in Ludlow, England.



Wallace E. Oates and Robert M. Schwab

APRIL 2014 • *Land Lines* • LINCOLN INSTITUTE OF LAND POLICY

Reactive and preventive environmental policy

Characteristics	Reactive	Preventive
Theoretic background	Pigouvian taxation Penalties, norms, tax	Institutionalism (Coase) emission trading, voluntary regulation (EMAS, ISO 14000 etc)
How it works?	Differentiation by media and by pollution types	Integrated, holistic
Typical activity of the authorities	Controlling, penalizing, permitting, damage control	Planning, collaborative problem solving, consulting

Federalisms and subsidiarity!?

- **Unified environmental regulations , ignoring the differences in natural and economic conditions are not optimal either social or economic terms at the European level.**
- **The municipalities also have environmental management rights to which the personal and material conditions have not been met.**
- **The development the necessary institutional system in harmony with the subsidiary principle is time-consuming.**



Kenneth Boulding

Quaker economist and theorist

1910-1993

Kenneth Boulding was trained as an economist and also became recognized as an expert in conflict studies, systems theory, and ethics.

And yet the politicians shudder
To think of one hand on one rudder,
Because nobody can agree
On whose the guiding hand should be.

The missing system-thinking

- If we consider the total economy of a settlement or region as a single industrial ecological system, quite different solutions and economies of scale obtain than would be offered by any respectable planner trying to resolve apparently isolated environmental and sustainability problems.

The necessity of regionalism

- **highly varied geographic, social and economic factors would suggest the wider application of the principle of regionalism. As regional disparities in environmental quality lead to social and economic inequalities, prudent area and urban planning could play a crucial role in the prevention and resolution of development problems.**

2013 (Muff)

- “we should try to produce our product with less energy and waste” without ever asking whether the products were needed at all.”
- **Based on their opinion the real question is** “What kind of world do I want to create?” Increasing number of companies and even business schools saw themselves as being stakeholders in the creation of a very different kind of world, a sustainable world where people lived well. All of them.”

(Muff, K., Dyllick, T., Drewall, M., North, J., Shrivastava, P., and Haertle, J. (2013), “Management education for the world: A vision for business schools serving people and planet”, Cheltenham, U.K., Edward Elgar.)