Sectoral dimensions of sustainable development: Energy and Transport

David Newbery, DAE, Cambridge

UNECE Spring Seminar 2003

http://www.econ.cam.ac.uk/electricity

Energy and pollution

- Energy is a major source of pollution

⇒ reduce energy intensity of growth

⇒ reduce emissions/unit of energy

Pessimistic view:

- Eco-pessimists: tight link: GDP⇒fossil-fuel⇒ pollution
- Economists: Govt chooses costly solutions, costs > benefits, therefore resisted

Optimistic view

- policies are often poorly designed
- market solutions better than targets
- but costs of meeting targets often fall
- high cost solutions lead to benefit tests
  - BAT becomes BATNEEC
- long-run price elasticities may be reasonable

  ⇒ taxes could be quite powerful

Energy policy

- traditionally concerned with
  - security of supply
  - accessibility
  - affordability
- 1973 oil shock and Club of Rome
  - resources finite
  - oil (and energy) prices will rise inexorably

Post-1986 concerns

- oil intensity falls 1973-200
- – Europe: oil share falls 55% to 39% TPES
- oil price collapse of 1986
- rapid growth of gas
- environmental concerns become salient
- – transboundary pollution and climate change

Liberalisation

- Liberalisation: markets to deliver competitive prices

"The (UK) Government's energy policy therefore centres on the creation of competitive markets" *DTI Prospects for Coal (*1993)

- Market failures require market-friendly solutions
  - – taxes or tradable permits where possible

Sustainability

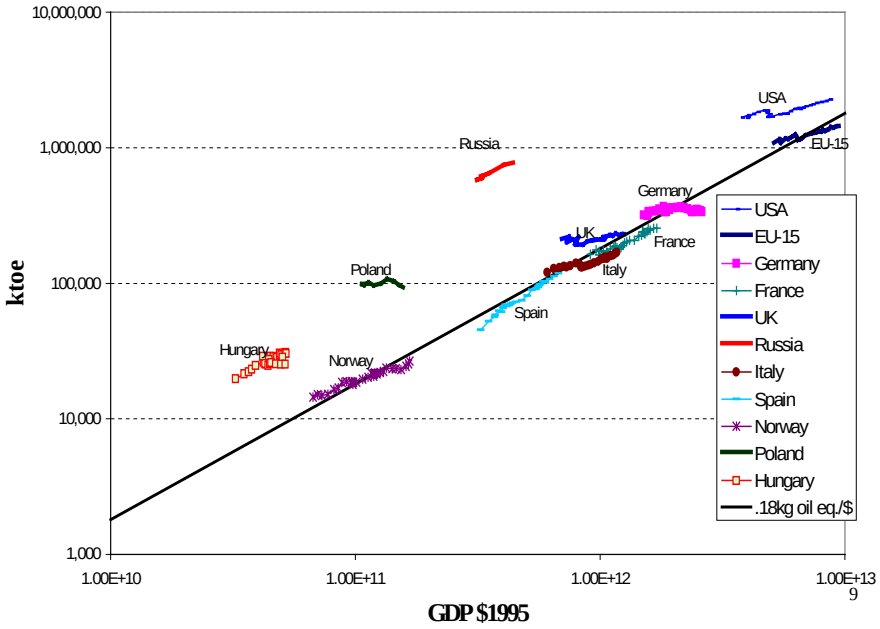
"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

"users pay the full social and environmental cost of their transport decisions, so improving the overall efficiency ... and bringing environmental benefits" *Sustainable Development: the UK Strategy* (1994)

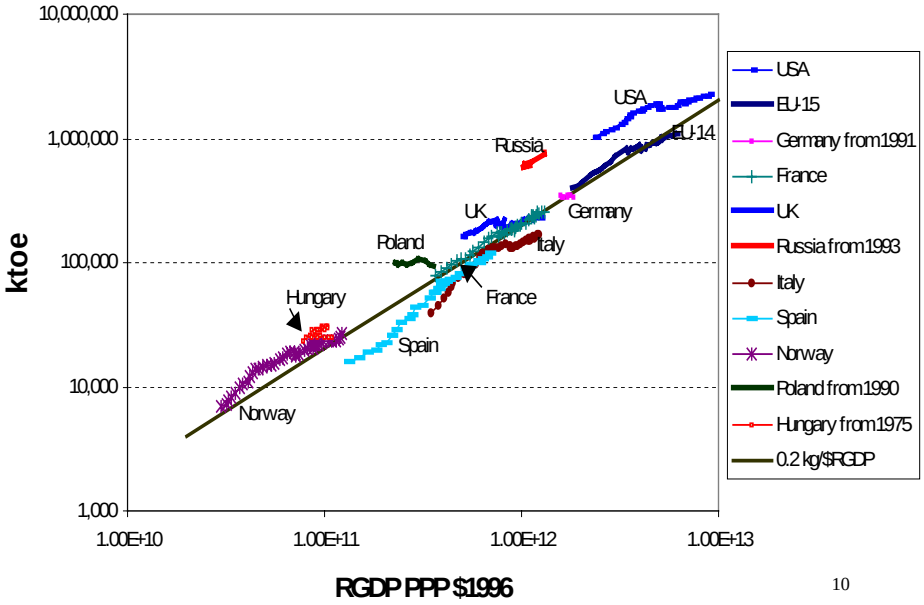
Charging full social and environmental costs

- Can the damage be quantified?
  - – easier for flow than stock pollutants
- Can it be monitored and charged?
  - – easier for large sources
- How responsive is pollution to price?

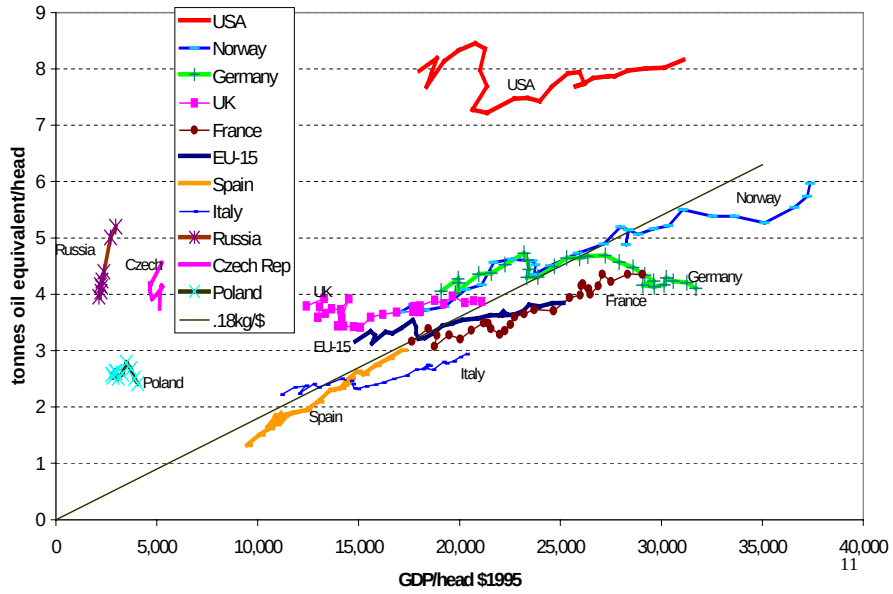
Energy use vs GDP ($1995) 1972-99



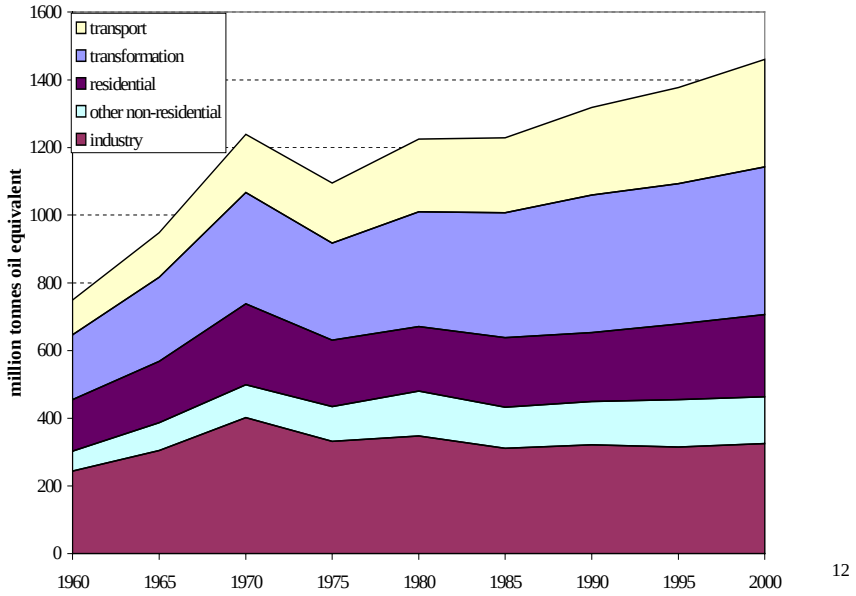
Energy use vs PPP RGDP ($1996) 1960-99



Energy use/hd vs GDP/hd 1972-99



EU 15 Energy consumption 1960-2000

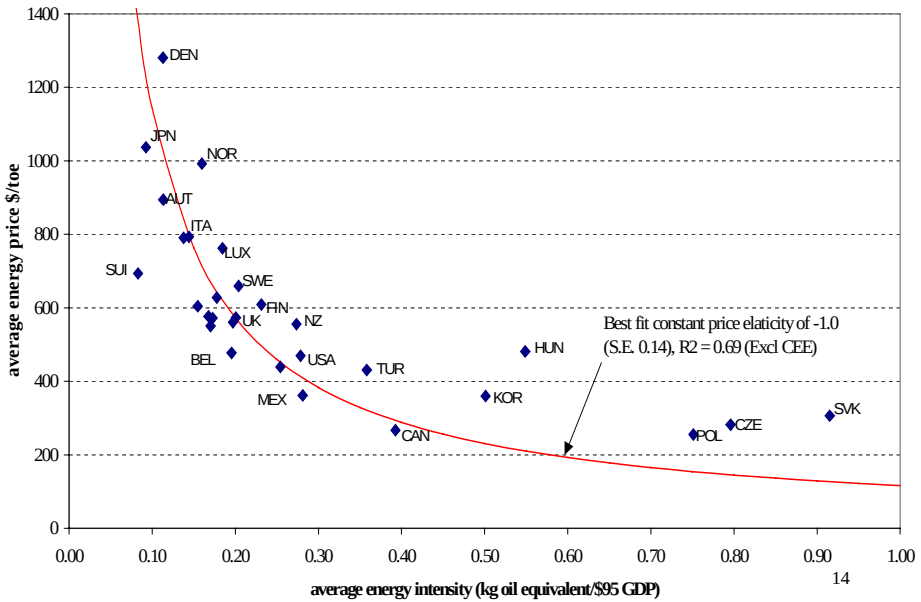


Energy and growth

- Energy intensity
  - varies widely across countries
  - is falling in many countries
  - is very high in Transition Economies (TEs)
- closer fit with PPP GDP for TEs
- result of the under-pricing of energy

Scope for improved energy efficiency

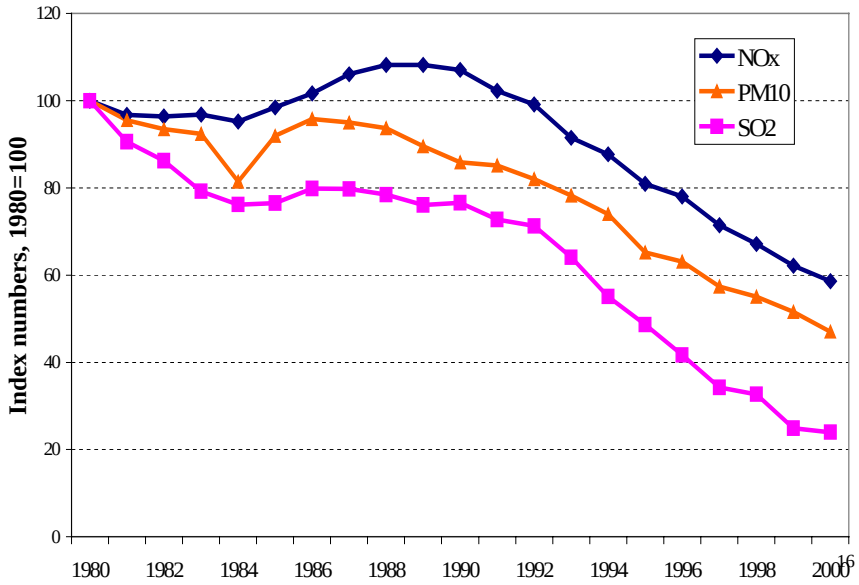
Cross-section relation between average energy intensity and average energy price 1993-99



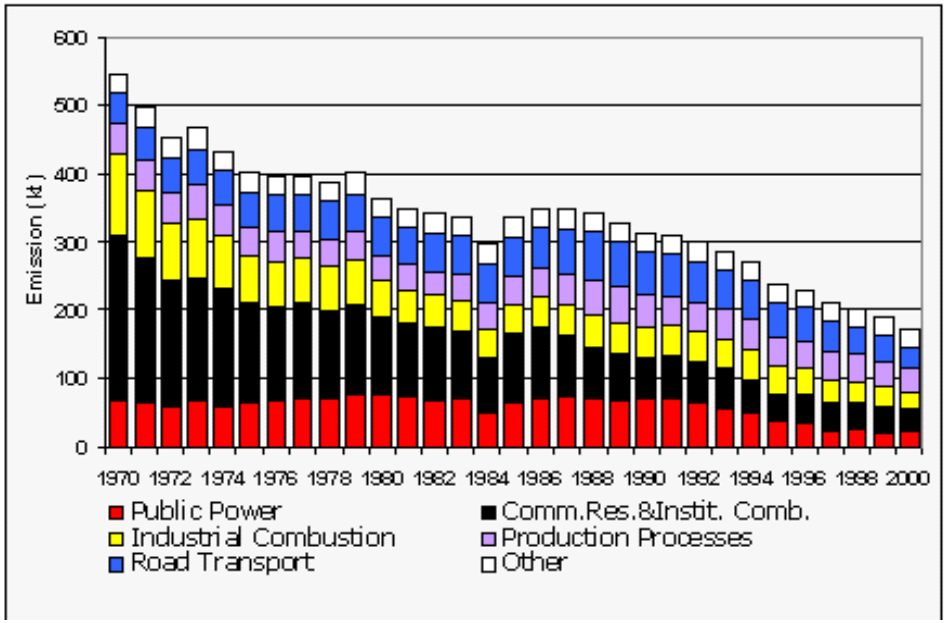
Transboundary air pollutants

- SO_2 and NO_x travel great distances
- damage: acidification and health
- UNECE LRTAP: Nordics press for SO_2 ⇓
- 1985 Protocol signed - 30% reduction
- Germans press for LCP limits (competitiveness)
- EU LCP Directive for SO_2 and NO_x
- driven by ecologists, helped by gas

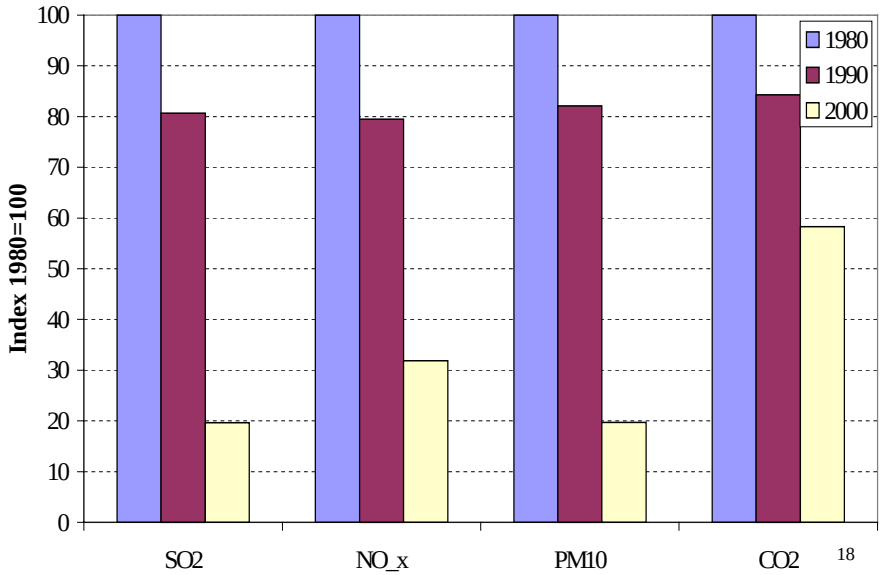
UK Air pollutants, 1980-2000



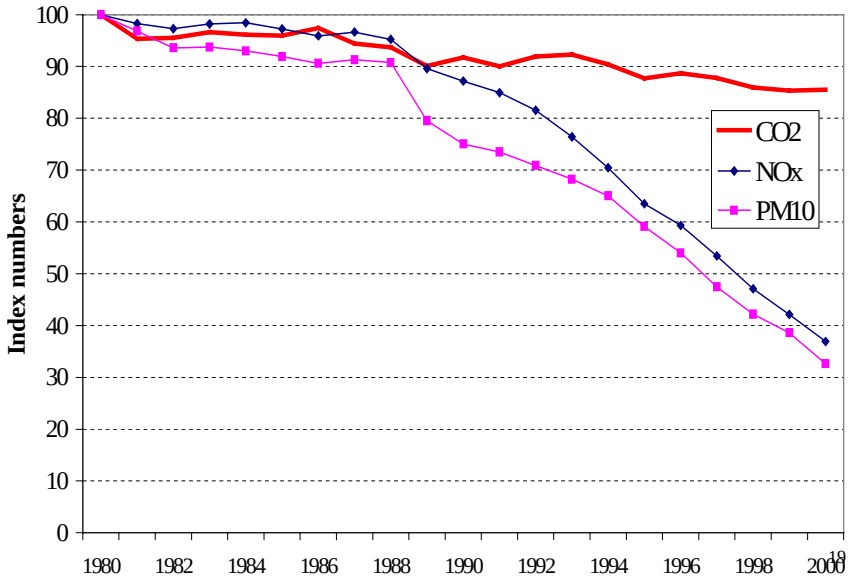
UK particulate emissions 1970-2000



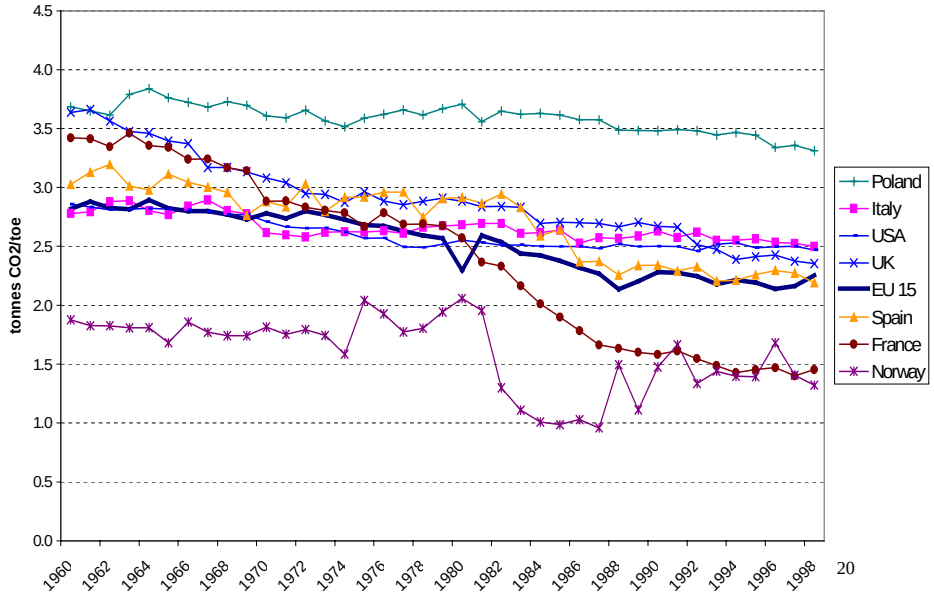
Pollutants per kWh UK 1980-2000

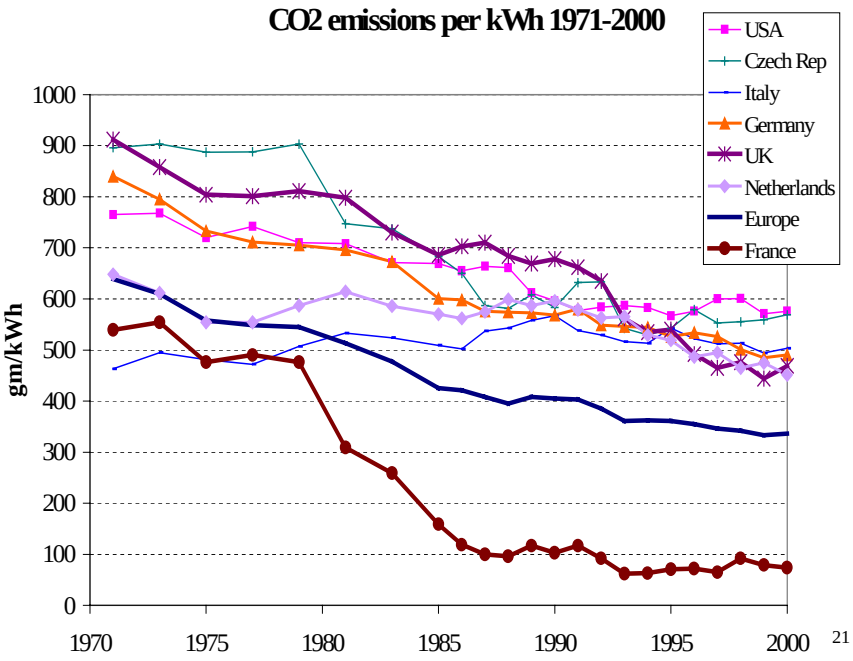


Pollutants per vehicle km UK 1980-2000

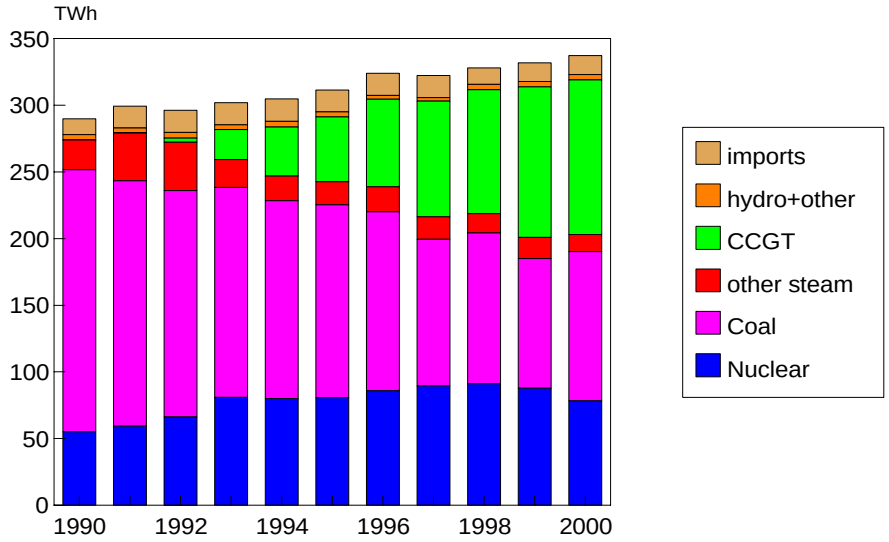


CO2/tonne oil equivalent



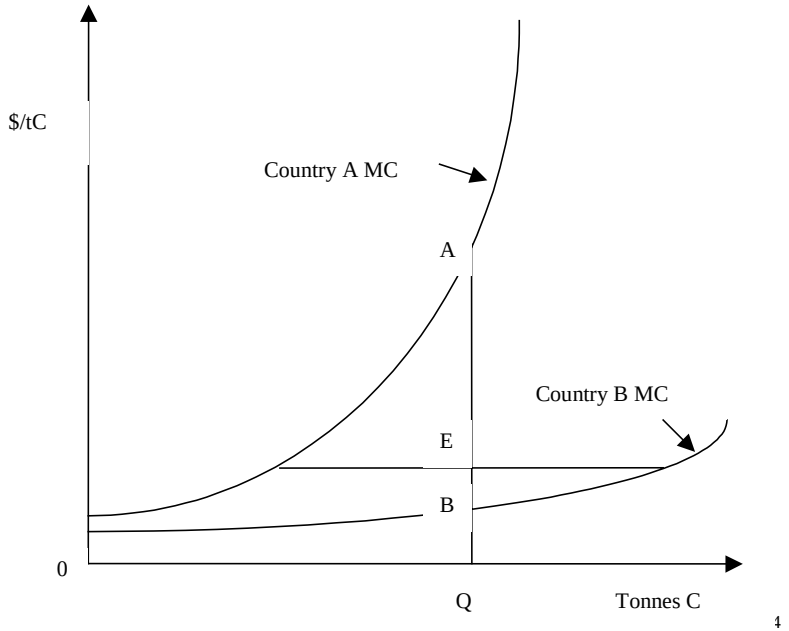


Generation in England and Wales by fuel type



Efficient carbon taxes/prices

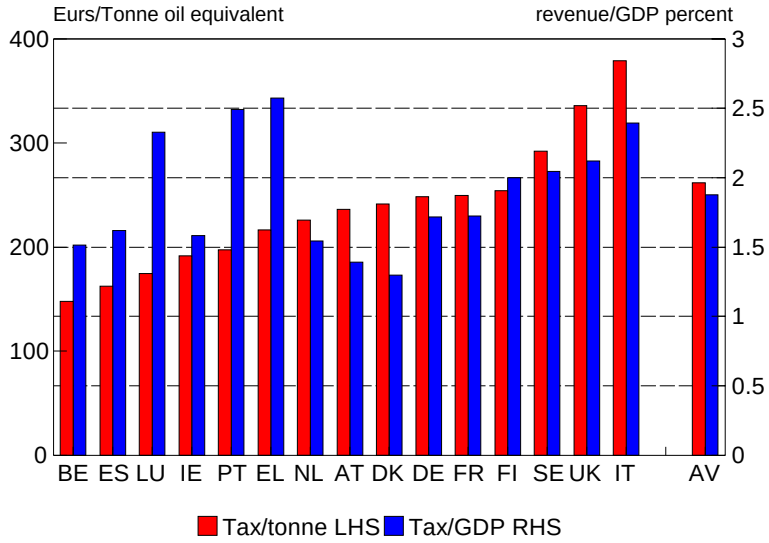
- set price at marginal social cost of damage
- carbon - damage independent of location
- disputed MSC: $6/tC - $160/tC
- EU proposal for $75/tC:
  - = $7.5/MWh CCGT, $20/MWh coal
  - – UK renewables premium: $60-75/MWh = $750/tC!
  - – contains large subsidy for R&D
- EU Emissions Trading Directive promising



Energy taxes are very variable

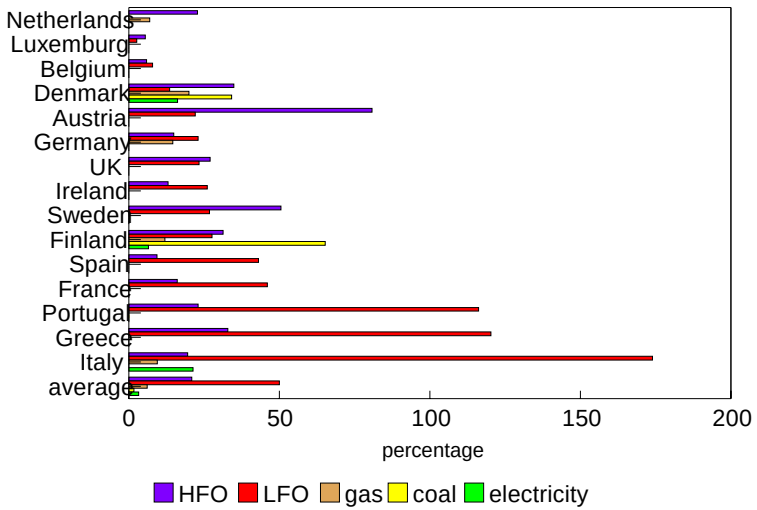
- by fuel *within* each country
- for each fuel *across* countries
- Some taxes internalise externalities
- Some are convenient revenue raisers
- Some for security of supply
- Some are designed to protect local coal

Average mineral oil excise 1997



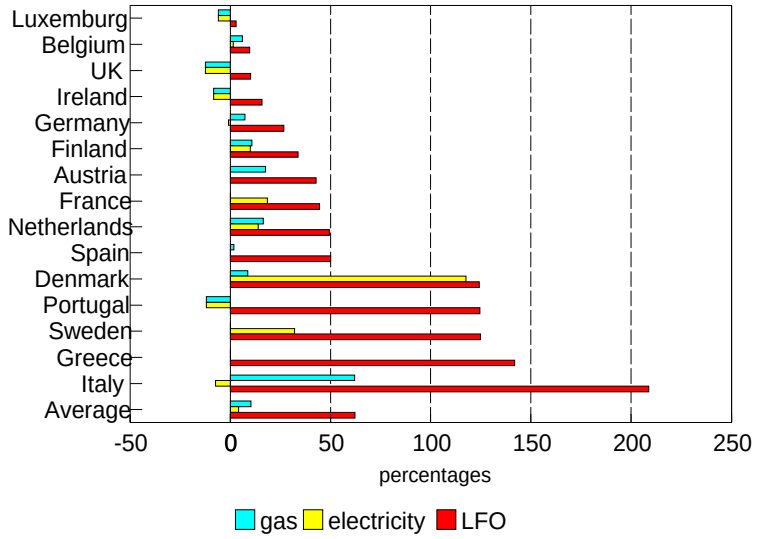
EC Excise Tax Duty Tables, July 2001
ranked by tax rate

Tax rates on industrial fuels
EU 1997, excluding VAT



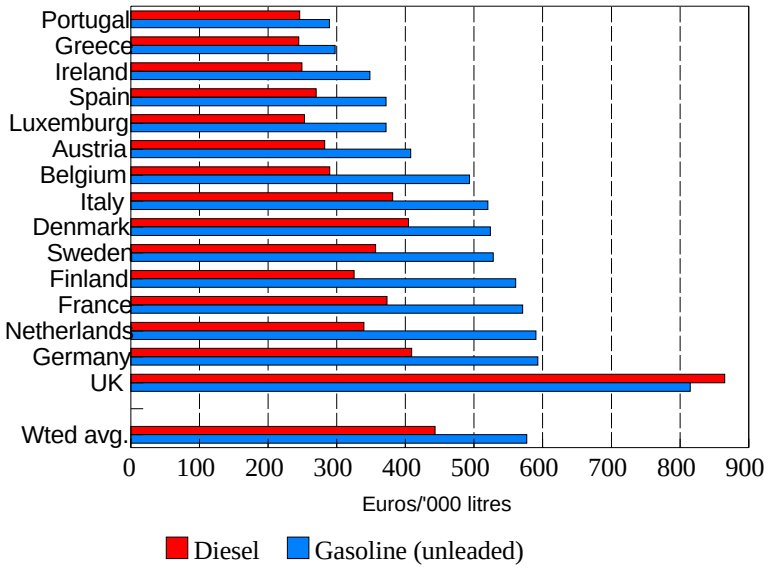
IEA Energy Prices and Taxes
ranked by tax on LFO

Effective tax rates on domestic fuel
EU 1997, net of standard VAT



IEA Energy Prices and Taxes

Road fuel taxes 2001



European Commission

Designing efficient energy taxes

- sulphur: DK, NO, SW 2.5-4 Euro/kgS
  - BeTa: 3 Euro/kgS (city of 100,000)
  - cap and trade lowers cost dramatically in US
  - but caps determined by ecology not economics
- Carbon: $25-75/tC = 66% to 200% coal price
  - DK, FI, NO have "carbon taxes" with rebates
  - DK: 50 Eur/tC for private consumption
  - price under Emissions Trading Directive unclear

Energy taxes - 2

- NO_x: cap and trade needs price cap
  - $80,000/ton in Cal 2000 vs $400/ton in East
  - EC MSC = 4,200 Eur/tonne
- particulates:
  - UK health costs: $60/kg PM_{10}?
  - BeTa GB: 114 Eur/kg $PM_{2.5}$ = 45 Eur/kg PM_{10}?

External costs of transport

- GB 2000 emissions:
  - 75 gm C/km @ 50 eur/tC = 0.4 cents/km
  - 0.07 gm PM_{10}/km @ 60 eur/kg = 0.4 c/km
  - 1.34 gm NO_x/km @ 4.2 eur/kg = 0.6 c/km
- total: 1.4 cents/km= 13cents/litre
- duty = 78 cents/litre

Conclusions-Market economies

- Liberalisation: constituency for pricing damage
- targeted taxes or emissions trading for sustainable energy use
- Transport is fastest growing energy user
- EU transport taxes near efficient levels?
- Aim to reduce other energy tax irrationalities:
  - Particularly coal, gas and non-transport oil

Conclusions-Transition Economies

- Transition countries: subsidise energy

$\Rightarrow$ high energy intensities

- popular resistance to raising prices
- energy use has fallen
- but so has GDP $\Rightarrow$ high energy intensity
- liberalisation and accession should help

Sectoral dimensions of sustainable development: Energy and Transport

David Newbery, DAE, Cambridge

UNECE Spring Seminar 2003

http://www.econ.cam.ac.uk/electricity