Insights from the COMETR project

COMpetitiveness effects of Environmental Tax Reforms

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COMETR is a Specific Targeted Research Project (STREP) of the 'Scientific Support to Policies' initiative under the EU's Sixth Framework Programme for Research (FP6) 2004-2007

COMETR partners

- Cambridge Econometrics
- Economic and Social Research Inst., Dublin
- Institute for Economic and Environmental Policy, Prague
- Policy Studies Institute, London
- Vienna Institute for International Economics
- NERI, Aarhus University (coordinator)

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Environmental tax reform (ETR) revenue as a share of GDP (1995-2003)

Denmark	1,08%	Finland	0,59%
Germany	0,84%	Netherlands	0,47%
Sweden	0,92%	UK (CCL)	0,07%

Aim of COMETR

This project will advance the understanding of competitiveness effects by undertaking the first comprehensive comparative analysis of Europe's environmental tax reforms from an ex-post perspective. It will use modelling frameworks as well as case studies concerning the existing tax reforms which have taken place.

What do we understand by 'competitiveness' ?

- competitiveness is a relative phenomenon – a question of balance between product price and market demand
- competitiveness: applies to firms or countries ?
- not all sectors of the economy are exposed to international competition to the same extent
- competitiveness is the ability to pass on cost increases to customers
- competitiveness is the ability to adapt and innovate

"the ability to produce the right goods and services of the right quality, at the right price, at the right time. It means meeting customer needs more efficiently and more effectively than other firms" (Budd and Hirmis, 2004)

"the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the longer term" (OECD, 1993)

Kaldor paradox on competitiveness

- Increase in technological capacity (R&D) and productivity correlate better with increased market shares than unit labour costs
- If carbon-energy taxes improve R&D and productivity it may help explain how the test of international markets are met

Porter hypothesis: economic instruments will promote competitiveness

New markets and new framework for industry rivalry

- *directs attention to resource inefficiencies*
- *raises corporate awareness*
- *more certainty for green innovators*
- *overcomes inertia and fosters creativity*
- *improves learning to obtain long-term gains*
- *induces change*

The critics:

- company level gains are small and cannot offset cost increases
- cost-benefit analysis required to identify welfare economic advantages
- too many anecdotes and lack of theoretical rigour

Double dividend hypothesis: (David Pearce, 1991)

- Environmental benefits of ETR are long-term
- More short-term, second dividend in terms of increased employment
- Net welfare economic gain as a result of improved efficiency, when also external effects are considered

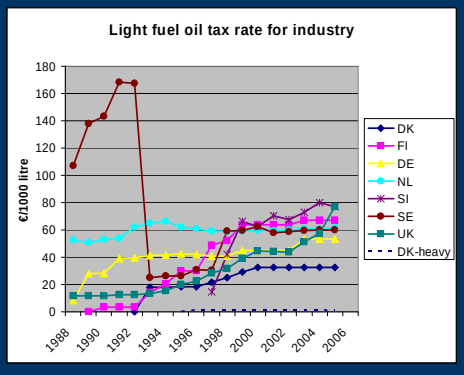
Allocative efficiency: more efficient combination of production factors

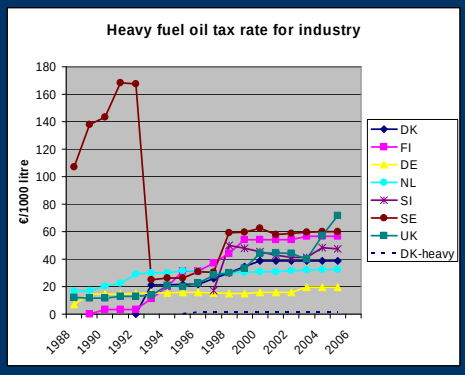
X-efficiency: 'It is one thing to purchase or hire inputs in a given combination, it is something else to get a predetermined output out of them' (Leibenstein, 1966:408)

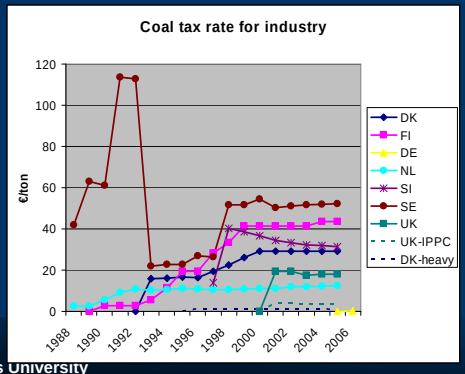
Tax experts: Intelligent design of ETR can mitigate competitiveness impacts

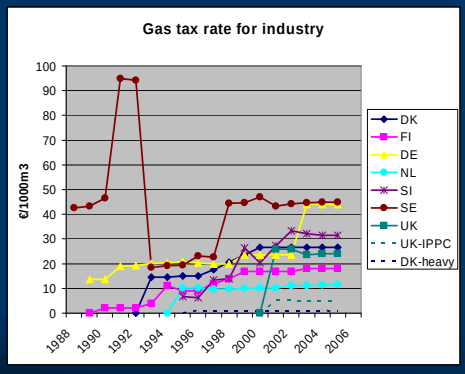
- Some tax experts falsely assume that the excess tax burden a priori is minimised and that external costs are internalised via regulations (Weinbrenner, 1996)
- Labour supply elasticities are not in the direction assumed by Bovenberg and de Mooij (1993) for dual-earner households (Goodstein, 2003)
- Full revenue-recycling can make the tail of the dog (of climate policy) wag (Nordhaus, 1993)
- Double dividend can arise when environmental tax replaces other distortionary tax (Goulder, 1995)
- Inflationary effects on labour salaries can be neutralised when environmental tax replaces social security contributions or other employer cost (Parry, 1995)

COMETR database: unilateral tax rates

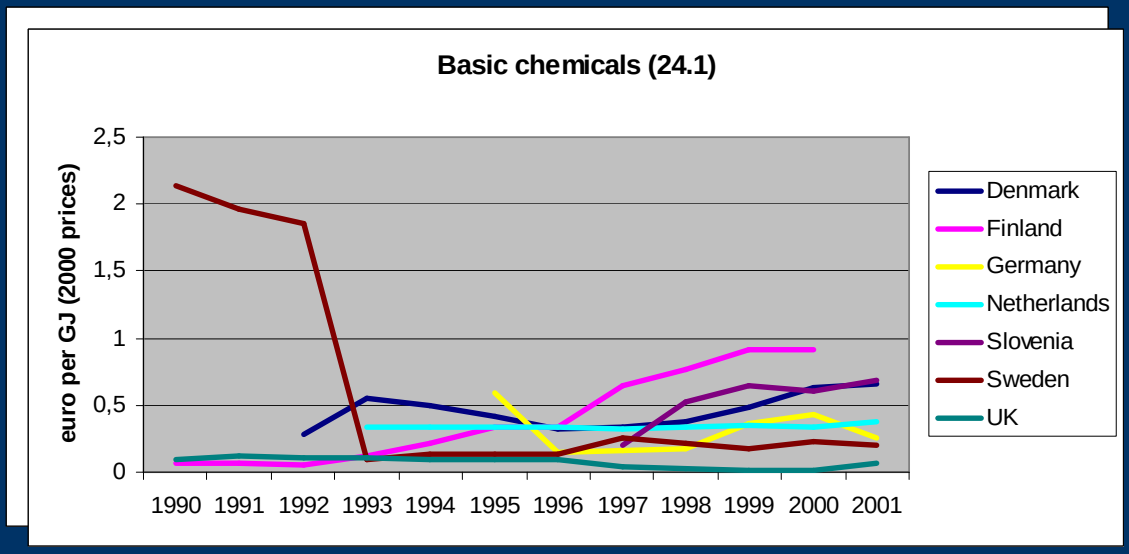






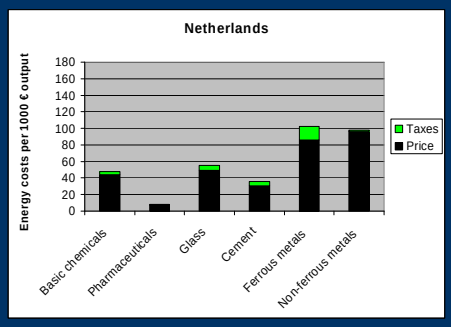


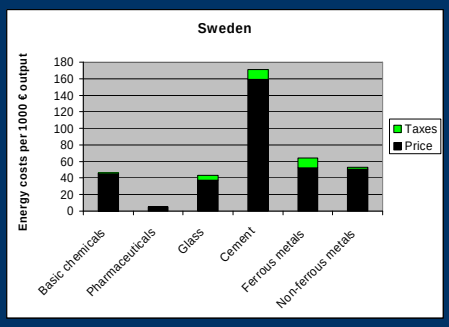
Sectoral tax burden with real fuel mix

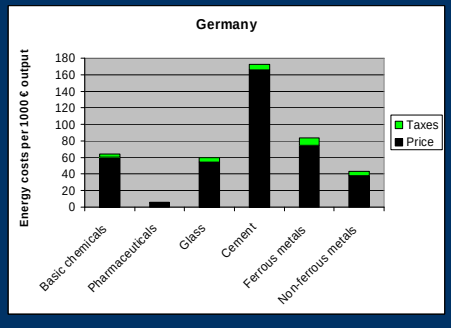


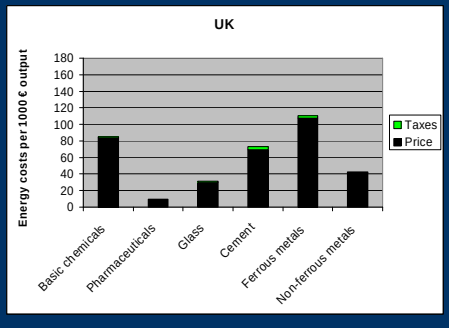
- **Source: COMETR database**
  - sector-specific energy prices and taxes

Energy intensive industries: energy costs and carbon-energy tax burden (2002)









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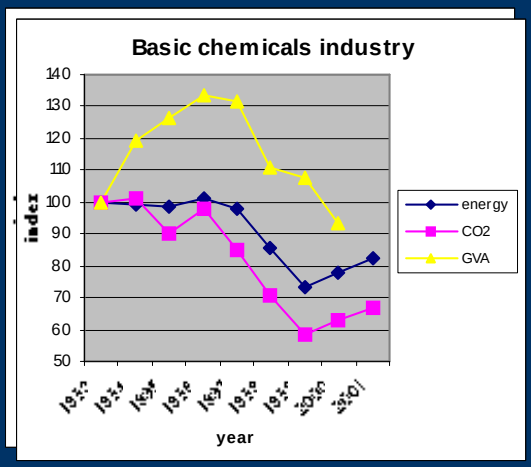
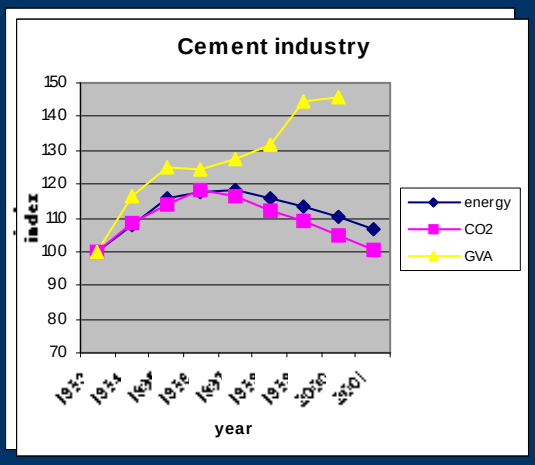
COMETR: a range of methods and research techniques

- Panel-regression analysis of price-setting power in the international market
- Panel-regression analysis of unit energy costs in relation to GVA
- Industrial indicators at subsector level
- Extention of E3ME
  - empirical time-series estimated, disaggregated econometric Energy-Environment-Economy model of EU-25
- Case-studies of energy-intensive sectors and subsectors

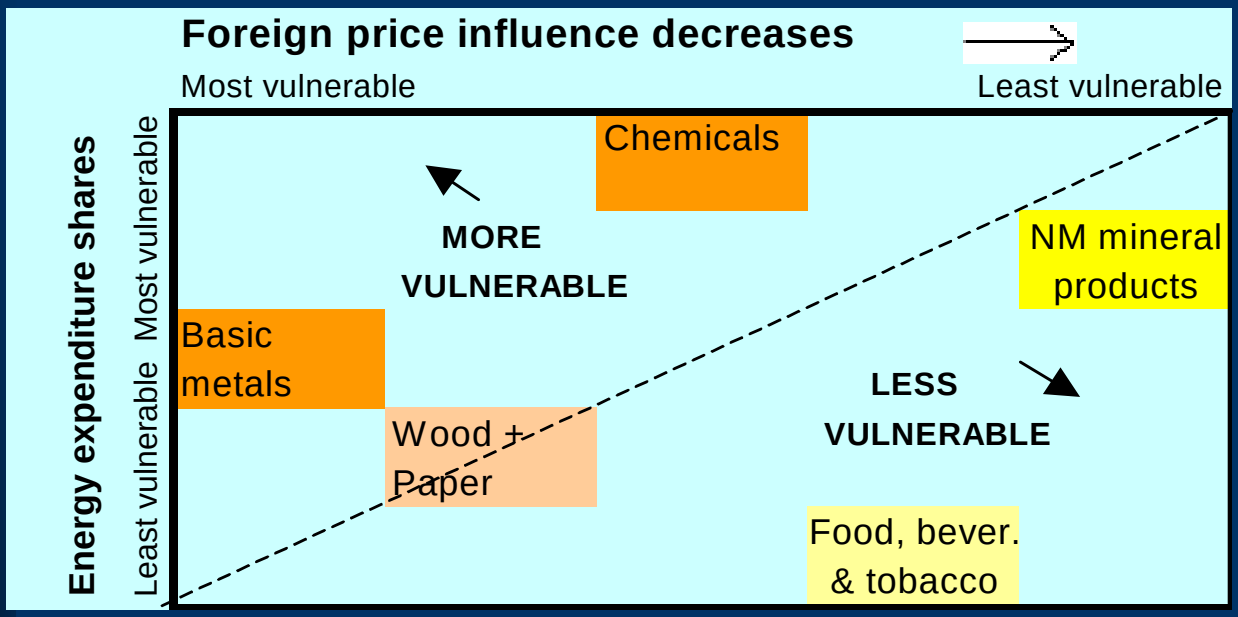
Denmark: strong decoupling in several energy-intensive industries (tax from 93)



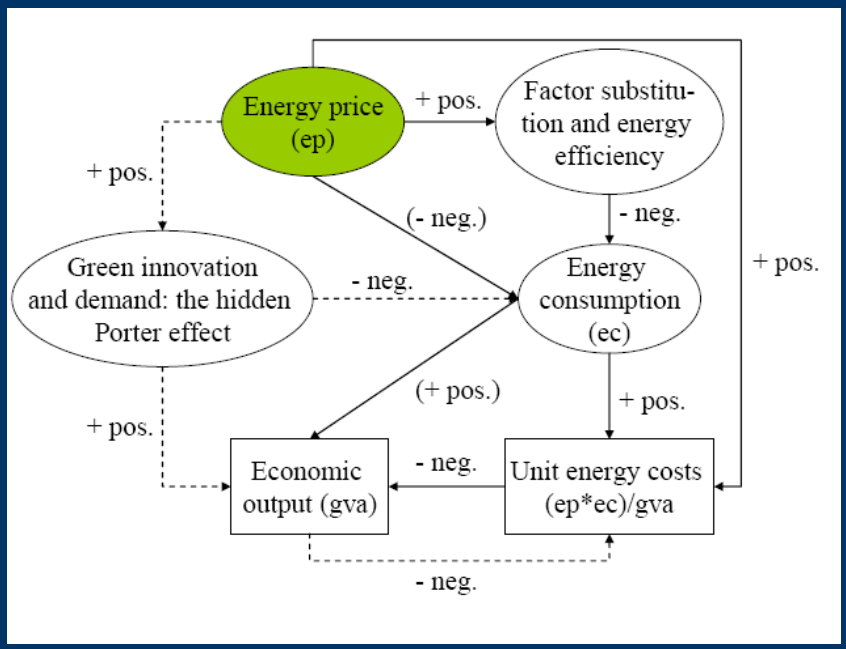


- Nordic Council of Ministers (2006): 10% CO_2-reduction in relation to business-as-usual

Price taker or price setter ?



Green innovation and demand: long term X-efficiency



Panel regression analysis of 56 industry sectors (1995-2003)

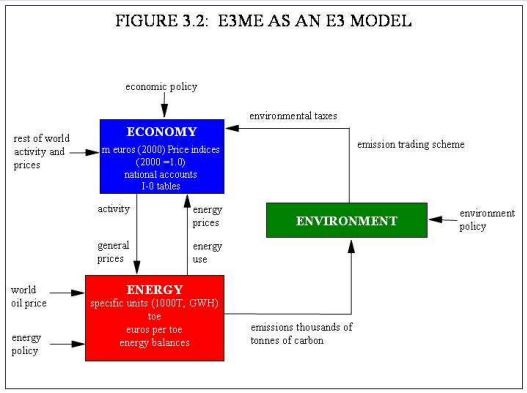
- unit energy costs
  - 1 per cent increase in real energy price leads to 0,77 per cent increase in unit energy costs
  - 1 per cent increase in real energy tax leads to 0,03 per cent increase in unit energy costs

- unit labour costs
  - wage-unit labour cost relation more inelastic than tax-price to unit energy cost relation
- economic output
  - 1 per cent increase in unit input costs leads to 0,3 per cent decline in output

Why would energy taxes differ from energy prices ?

- increased energy prices also have an impact on unit costs via prices on imported raw materials
- from an increased energy price no revenue can be recycled to lower distortionary taxes
- psychologically the signalling effect of tax is probably stronger than of price
- accompanying policy measures differ

E3ME: Two main scenarios



- **Baseline (B): endogenous for 1994-2012**
  - **including environmental tax reform**
  - **1994-2003: ex-post analysis**
  - **2003-2012: ex-ante analysis**
- **Reference (R): counterfactual, without ETR**
- **Difference between R and B is effect of ETR**

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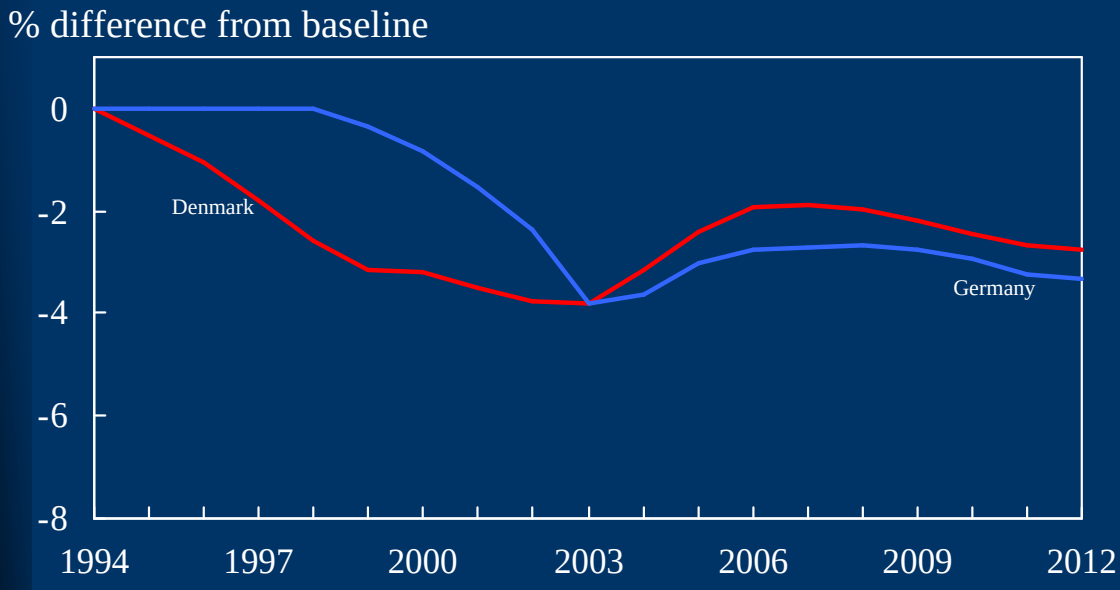
Effect of ETR on total fuel demand



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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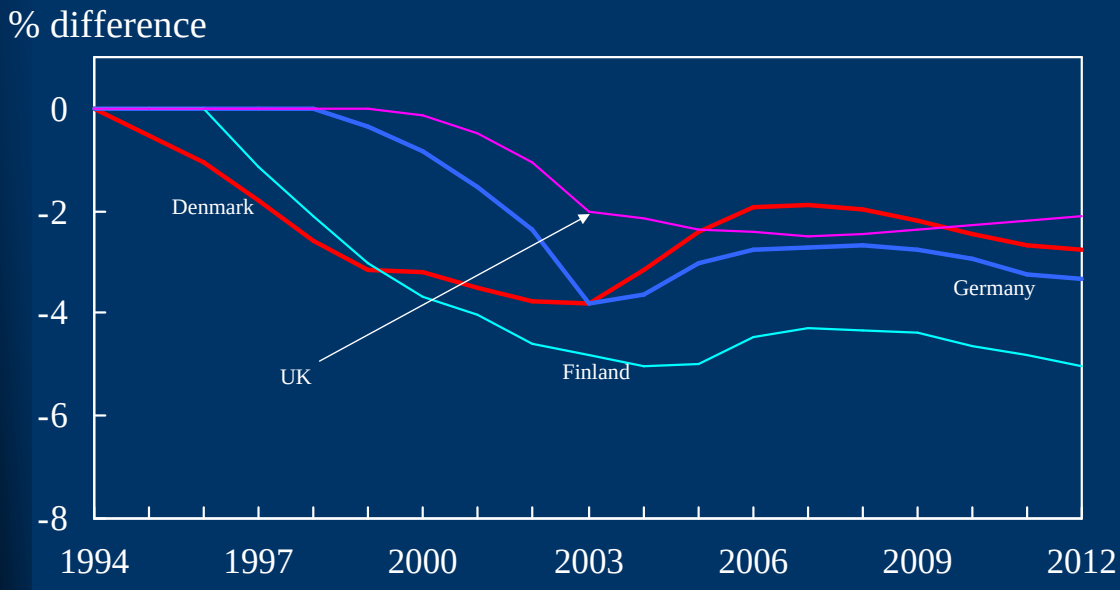
Effect of ETR on total fuel demand



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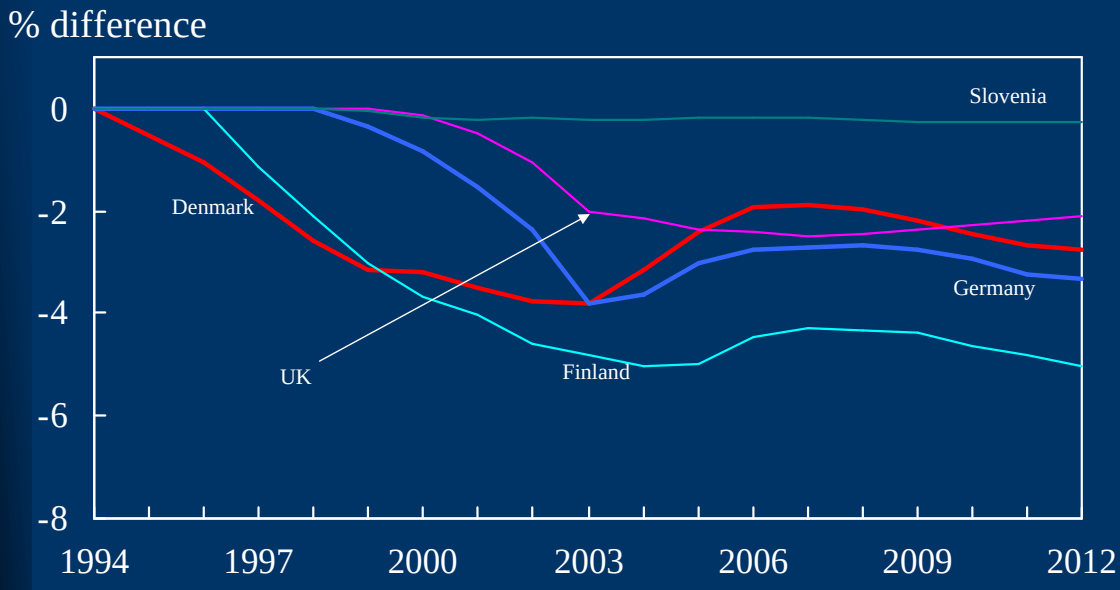
Effect of ETR on total fuel demand



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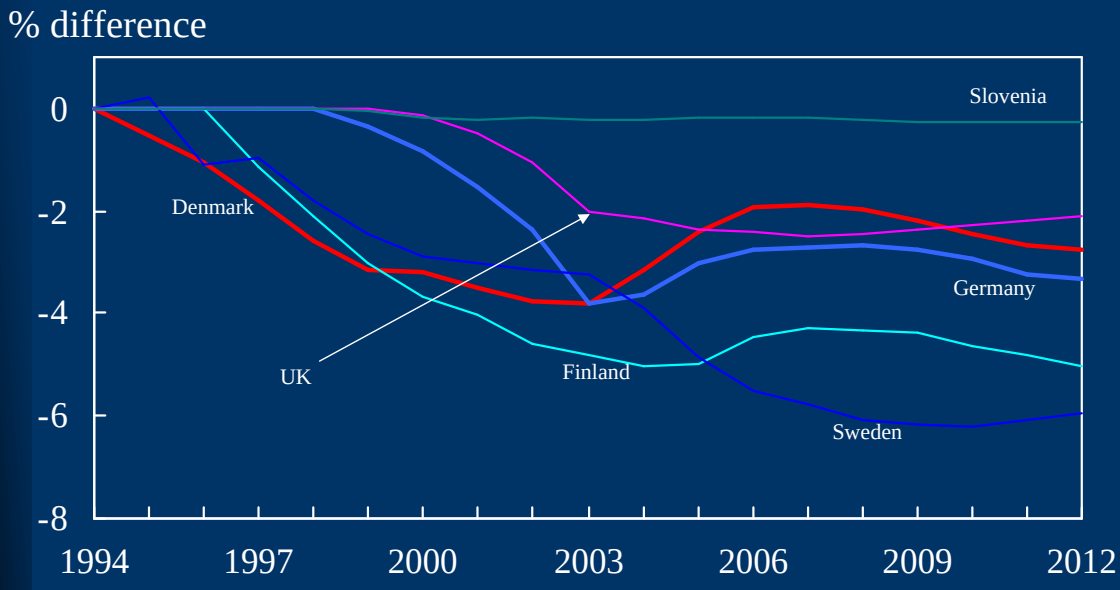
Effect of ETR on total fuel demand



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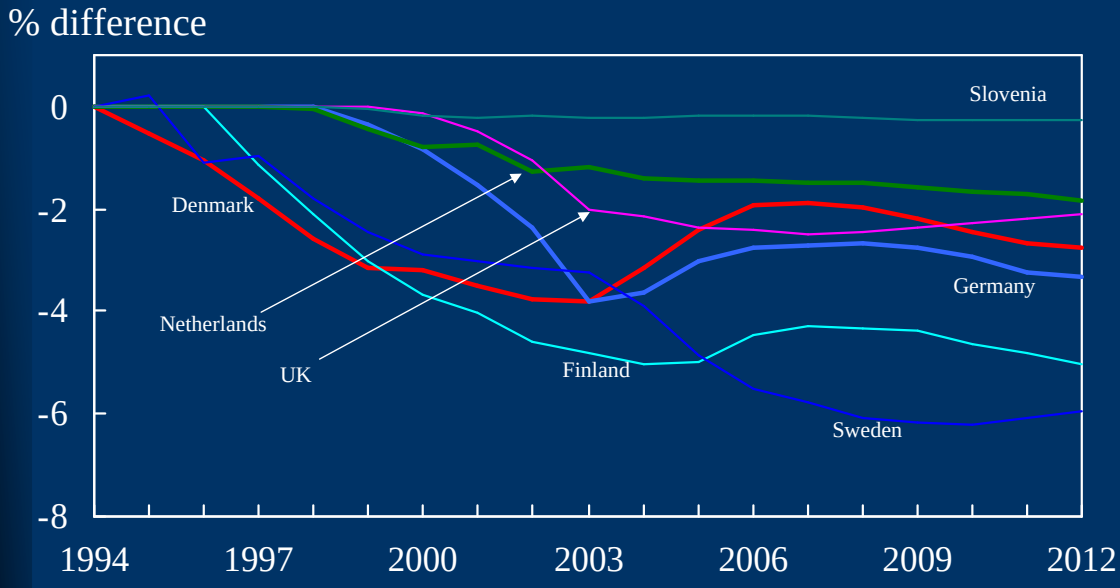
Effect of ETR on total fuel demand



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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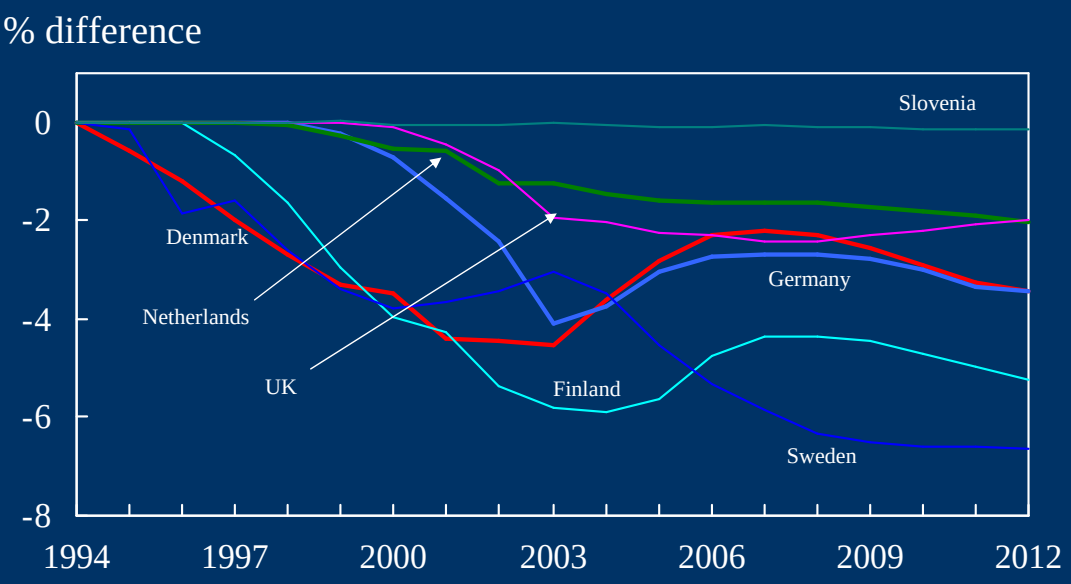
Effect of ETR on GHG emissions



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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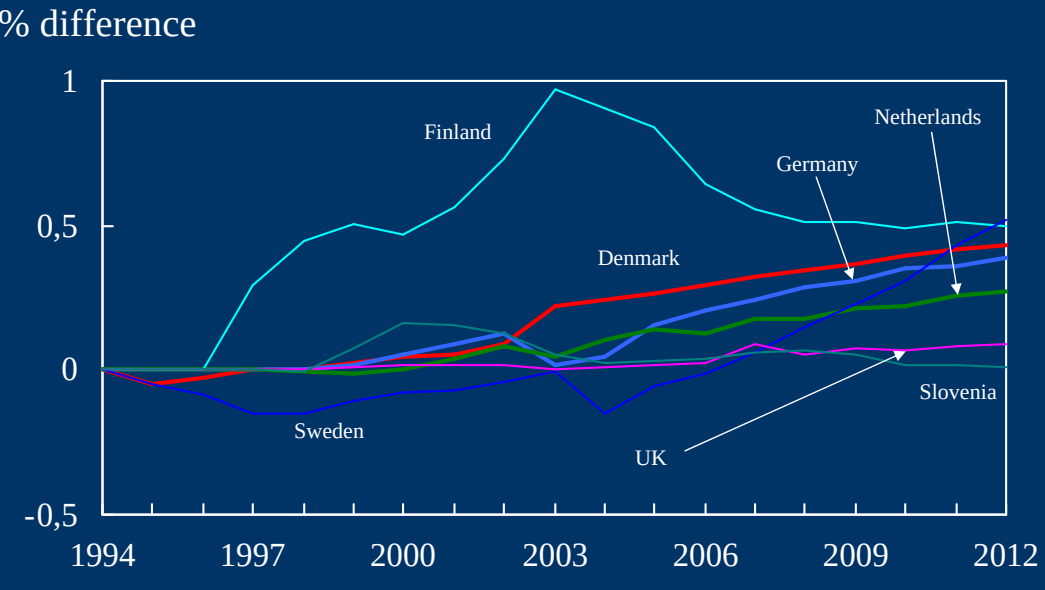
Effect of ETR on GDP



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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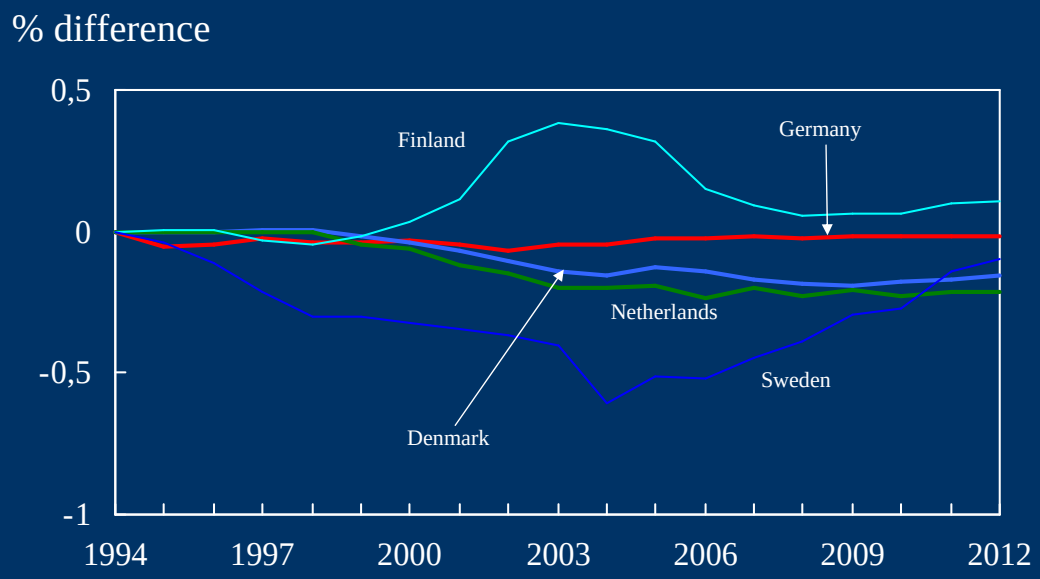
Without Revenue Recycling: Effect of ETR on GDP



Note(s) : % difference is the difference between the base case and the no revenue recycling case.

Source(s) : CE.

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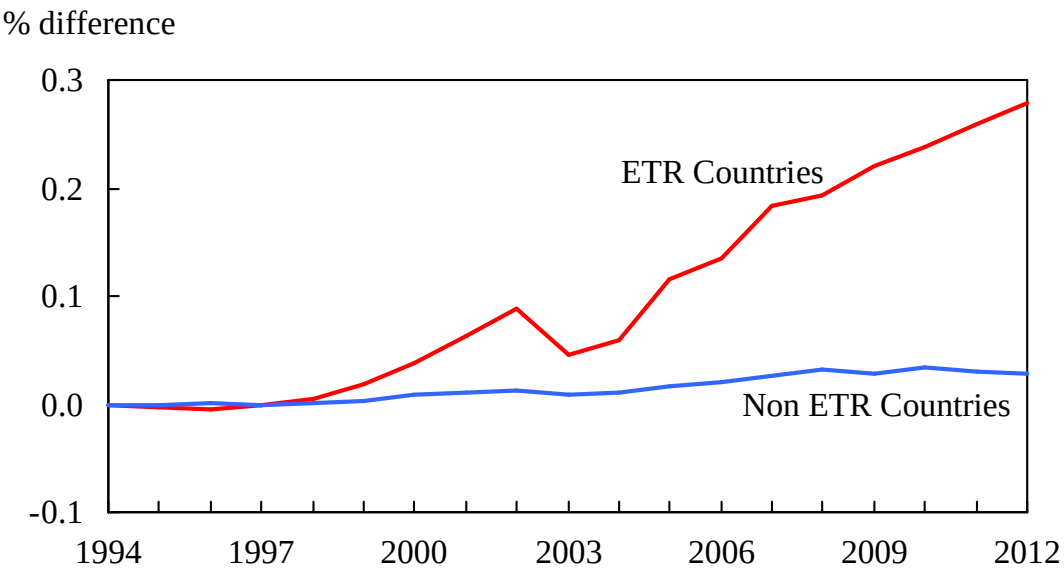
CHART 7.28: THE EFFECTS OF ETR: GDP IN ETR AND NON ETR COUNTRIES



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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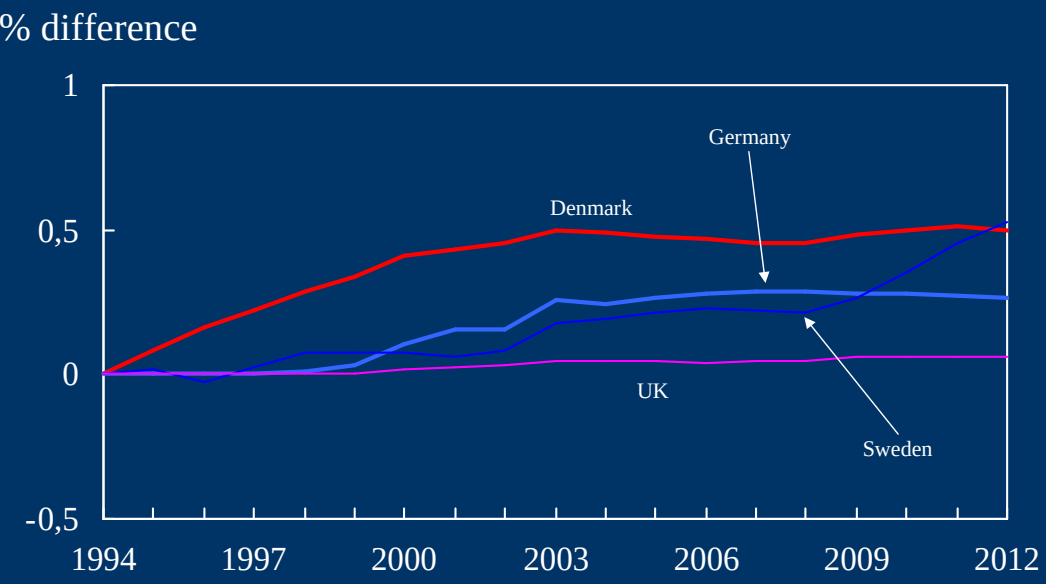
The Effect of ETR on Employment



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

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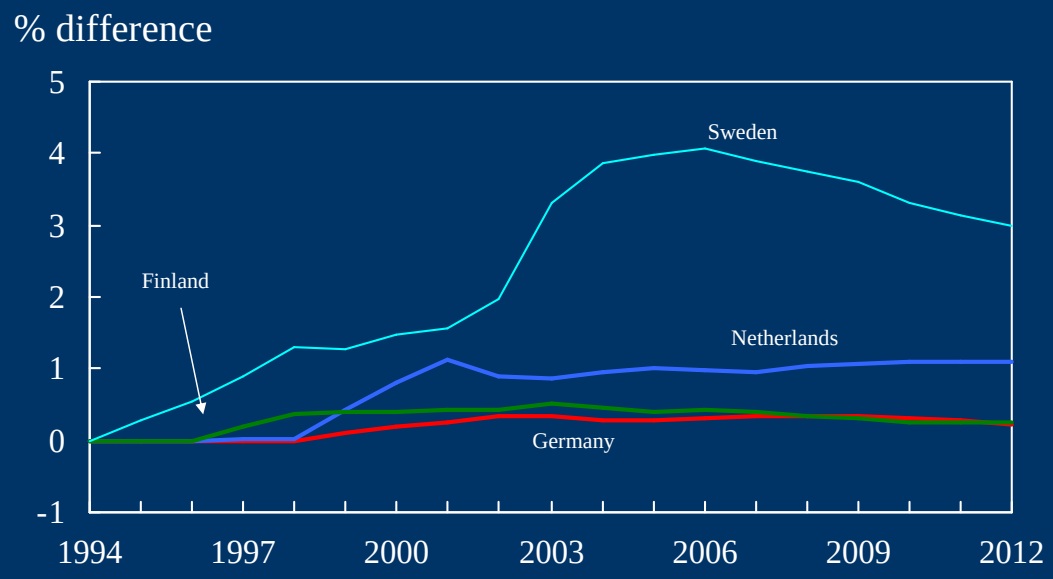
Effect on Consumer Price Index



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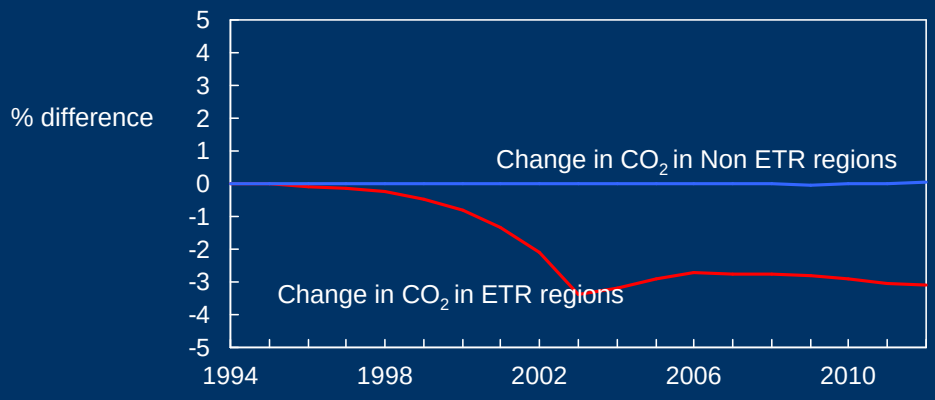
Carbon leakage rate within EU



- **Leakage rate of 2-4% (corresponds to IEA studies finding leakage rates of 20-40% for higher tax rates)**
- **ETR contributed CO_2 reduction of 60 mill. tonnes**
- **a significant contribution to EU-15 Kyoto target**

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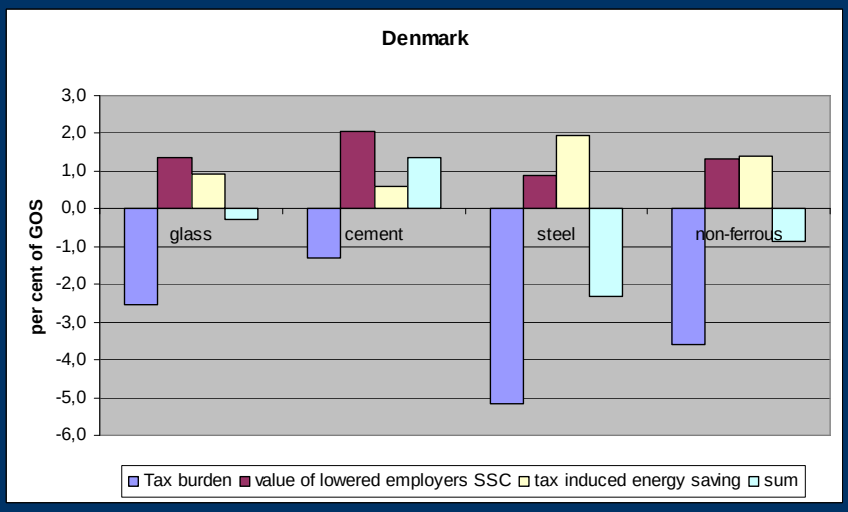
Why should we have faith in E3ME results ?

- Ex-post approach
- Macro-econometric model based on time-series data
- Good representation of fuel carriers; high sectoral disaggregation
- ETR modelled with official figures for revenues, not nominal tax rates
- Technological progress indicator represents impact via improved R&D
- Standard impact assessment tool for EU

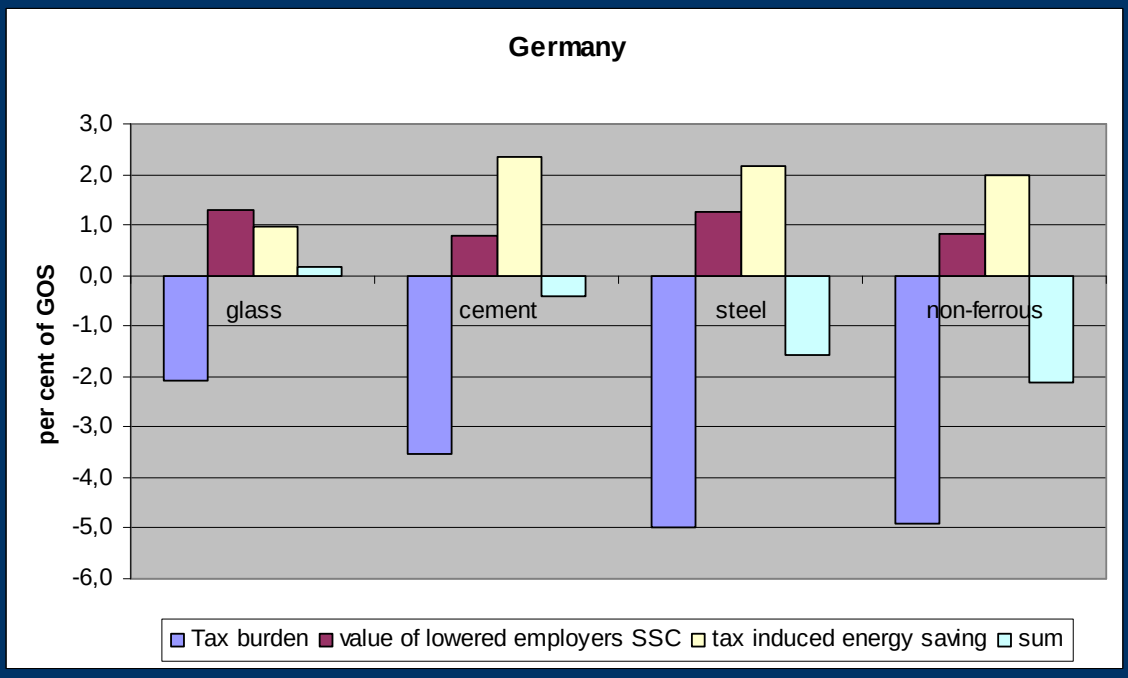
Key political problem for ETR tax shift

- 20% of companies consume 60% of energy
- Energy-intensive industries are usually not very labour-intensive
- At company-level revenue-recycling will not be neutral; ETR creates winners and losers
- Competitiveness effects are negative and positive

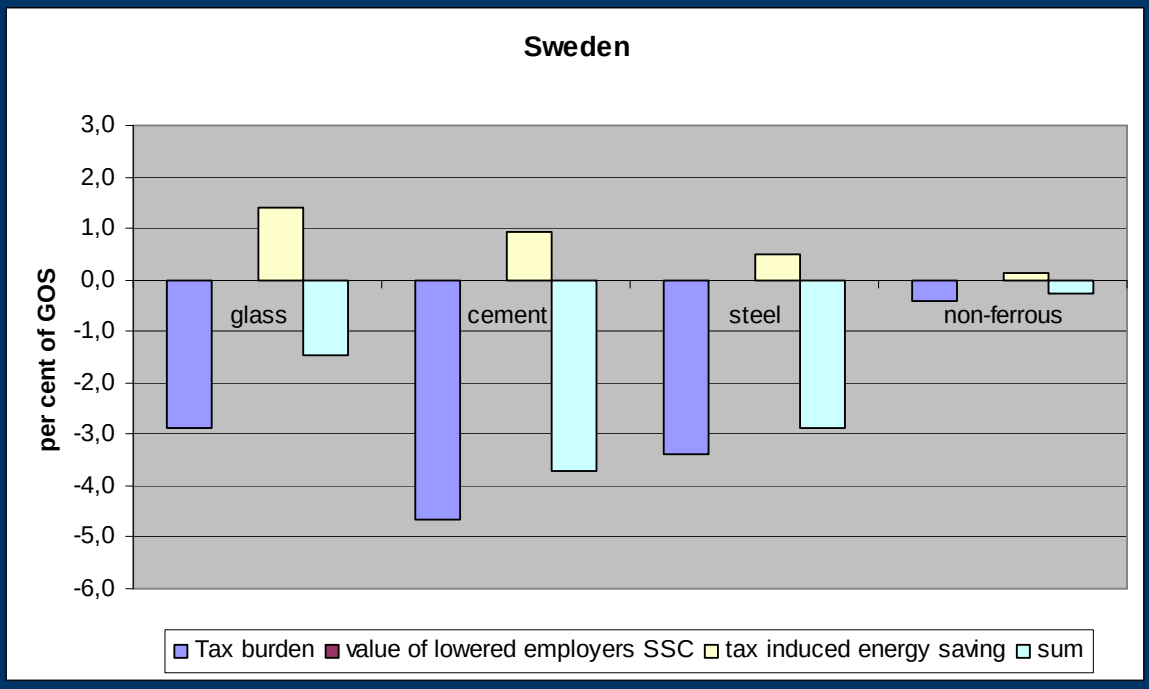
ETR burden net of recycling and tax induced energy savings



- **Denmark: ETR costs are 1-2 per cent of gross operating surplus for some energy-intensive industries**



- **Germany:**
  - **net ETR burden up to 2% of gross surplus**
  - **value of spitzensteuer-ausgleich (peak tax adjustment) not included**



- **Sweden:**
  - **higher burden – up to 4% gross operating surplus**
  - **no SSC; revenue recycling via reduced income taxes**
  - **cement and steel increase energy use per value added**

Mitigation approaches

Nordic model (SE; FI): reduced income taxes

- cap on tax liability (above 0,8 per cent of total)
- cap exchanged by threshold because of minimum rates required by Energy Taxation Directive

Fiscal conventionalists (UK; DK): reduced SSC

- agreements as condition for reduced tax rates in energy-intensive industries
- recycling of revenue for energy efficiency measures, e.g. Carbon Trust

Pragmatic model (DE; NL): mix

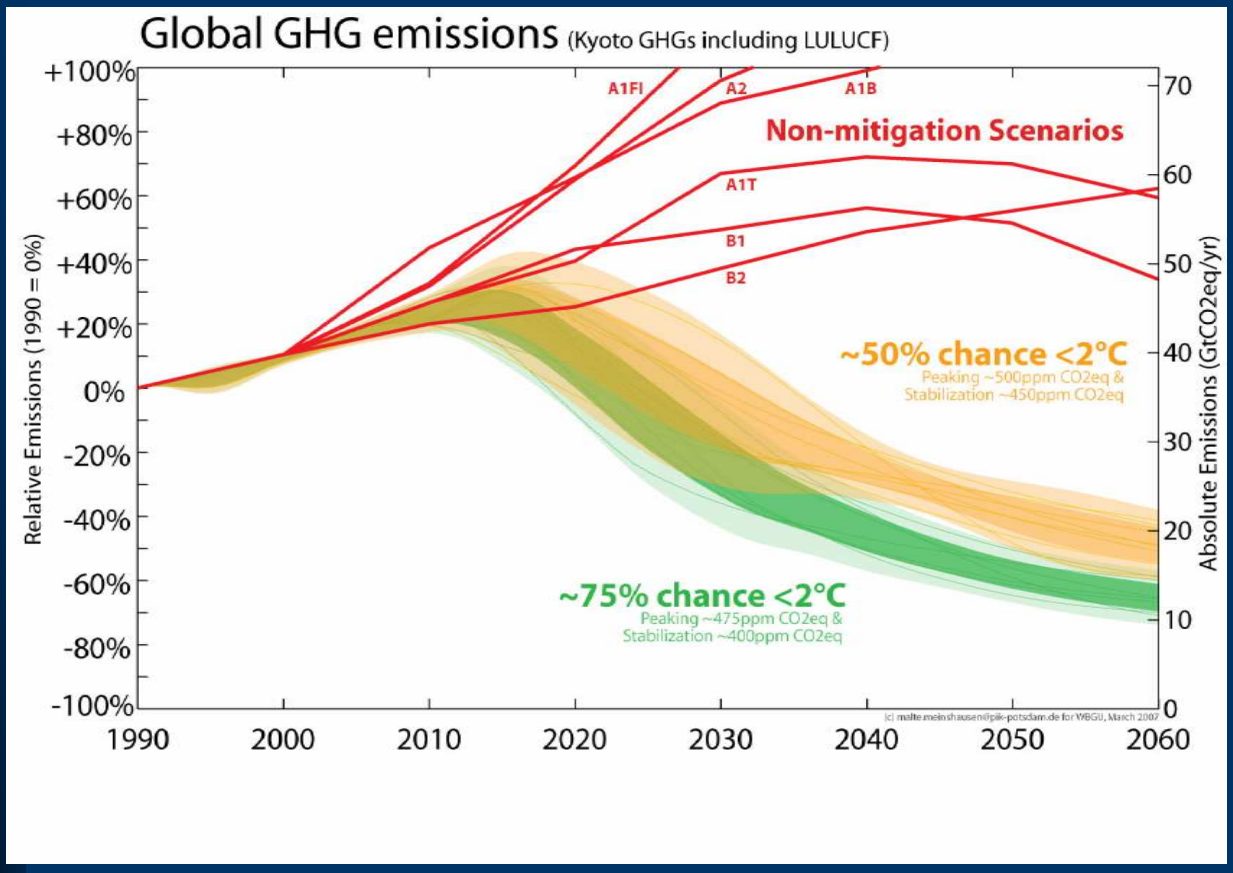
- DE: spitzensteuer-ausgleich (peak tax adjustment) conditional on self-commitment
- NL: Long-Term Agreements and adjustments in corporate taxation

Observations

- In Sweden cement and steel sectors increase their energy consumption per unit of value added
  - a response to the lowering of CO2-taxes from 1993 ?
  - no reductions in SSC to offset directly the costs of ETR
- Cement and steel are the key challenges to address under ETR – other sectors not
  - IEA report on energy efficiency indicates that alternative technologies are available
  - Yet, grandfathered ETS provides ”the wrong signal” e.g. for electric arc furnaces in steel
- Transparent ETR with revenue recycling and targeted subsidies for tecnology upgrade in cement and steel the recommended mitigation approach, cf. Danish experience

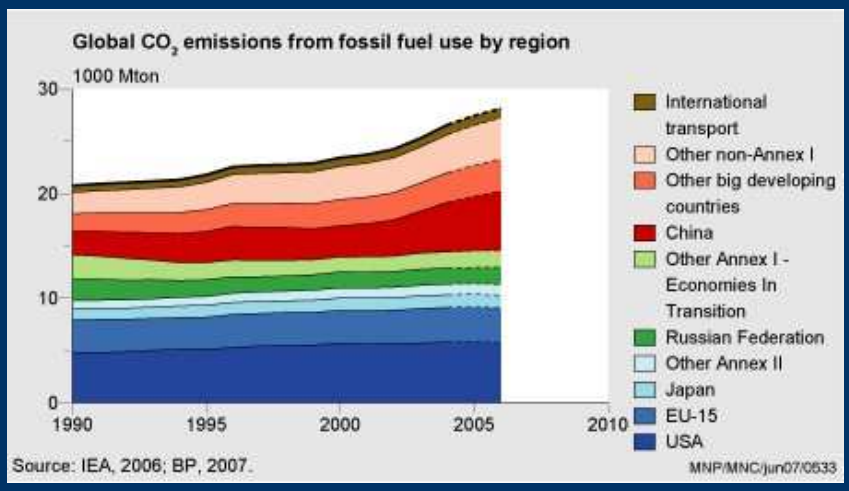
Conclusions COMETR

- ETR lead to modest drop in fuel use in six countries, more so in Sweden and Finland
- Drop in GHG little more than for fuel demand, largest cuts due to highest tax rates
- Finland and Sweden show largest GHG cuts
- Macroeconomic impact depends on revenue recycling
  - a rise in GDP < 0,5 pp

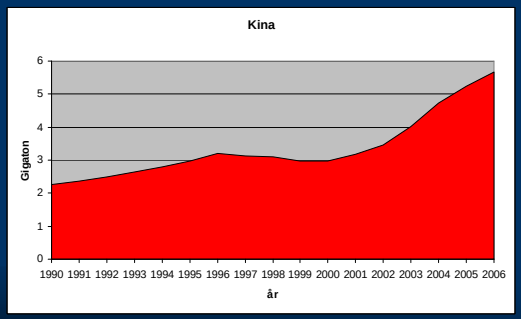


Global CO_2-emissions

- USA: 20%
- China: 20%
- EU: 12%
- Russia: 6%
- Japan: 4%



- China: Doubling projected for 2025 a reality in 2007



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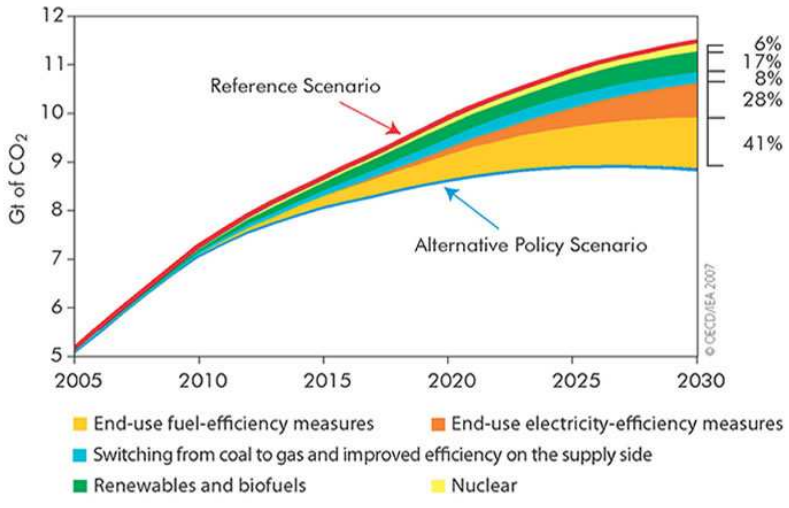
China's CO_2 Emissions in the Alternative Policy Scenario Compared with the Reference Scenario

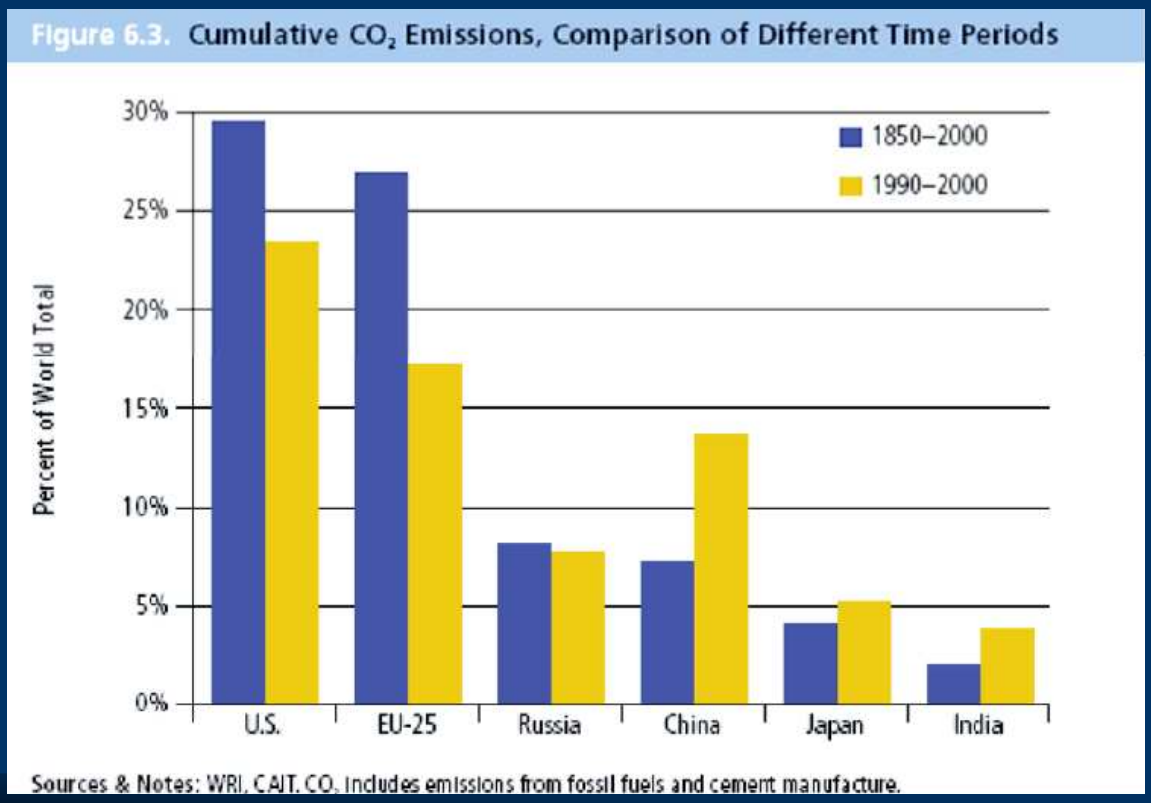


- Sixth five-year plan (2006-2010) aims at a quadrupling of GDP before 2020, while energy consumption may only double
- Energy-intensity to be reduced with 4% per year and with 20 % before 2010

China: position in climate negotiations

- ’right to development’
- low technological standards
- low per capita emissions
- annex-1 has ’historical responsibility’
- industrial nations must first meet reduction targets
- economic support and technology transfer required

Cumulative CO_2 emissions



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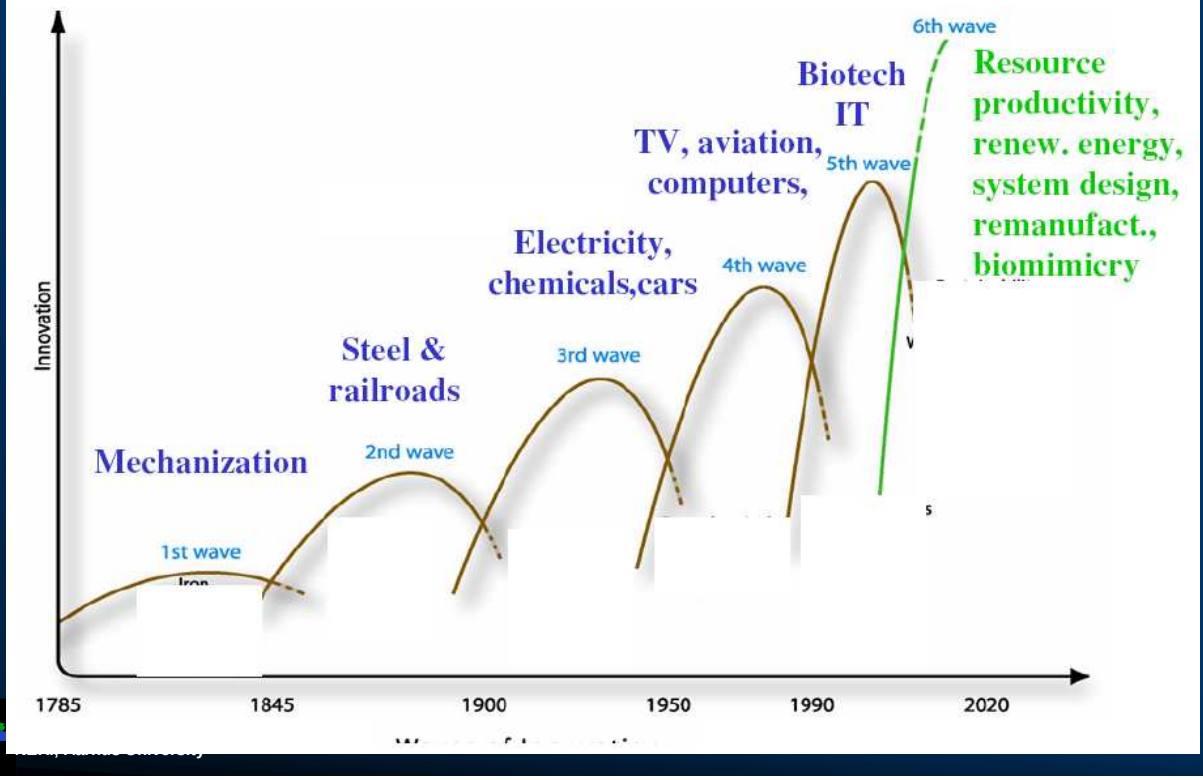
What are the options ?

- Carbon border-tax arrangement for Chinese and other non-annex1 products (Sarkozy)
  - some arrangements could be WTO-acceptable, but defensive approach not addressing growth in China emissions
- Per capita emission-right with international trade (Merkel)
  - but China refuses cap and is not likely to trade emissions with countries with higher purchasing power
- Extend CDM as an instrument for technology-transfer and provide support for energy efficiency and transition to new energy technologies
  - solution favoured by China, but the required transfers are huge

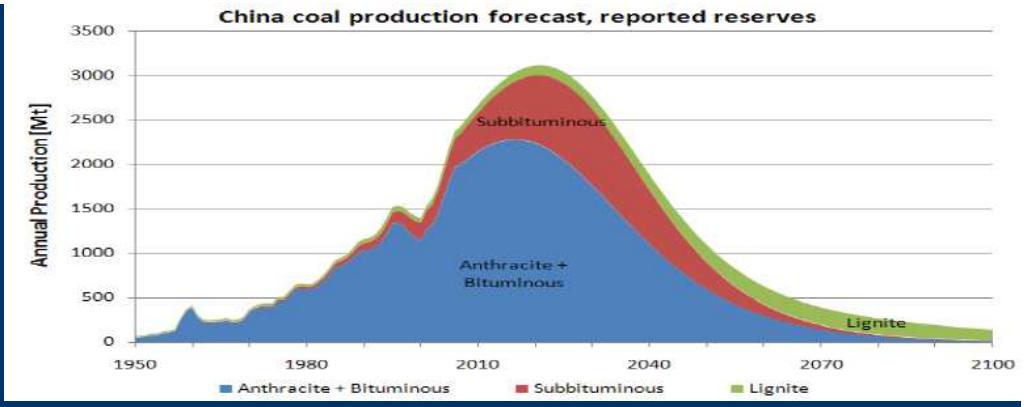
Differential pricing of carbon

- Annex-1 countries: Increase from current level of 15-20 €/tCO2 to 30-40€/tCO2 in 2020, either via ETR or ETS with auctioning
- Developing countries incl. China:
  - same carbon-energy tax on sources related to exports for Annex-1 countries (own BTA)
  - Introduce domestic ETR with low carbon-energy tax for domestic sources

Challenge: improve ressource productivity



peak coal ?



Year	USA	China	India	FSU	Australia	S. Africa	Germany	Poland	UK
1987	131,971	156,400	12,610	108,800	29,138	58,404	23,919	28,300	9,000
1988	131,971	156,400	12,610	108,800	29,138	58,404	23,919	28,300	9,000
1989	131,971	156,400	12,610	108,800	29,138	58,404	23,919	28,300	9,000
1990	129,543	152,831	60,098	102,496	44,893	54,811	23,698	28,182	8,602
1991	129,543	152,831	60,098	102,496	44,893	54,811	23,698	28,182	8,602
1992	112,668	62,200	60,648	104,000	45,340	55,333	23,698	29,600	3,300
1993	112,668	62,200	60,648	104,000	45,340	55,333	23,919	29,600	3,300
1994	106,495	62,200	60,047	104,000	45,340	55,333	23,919	29,100	2,000
1995	106,495	62,200	60,047	104,000	45,340	55,333	24,000	29,100	2,000
1996	106,495	62,200	60,047	104,000	45,340	55,333	24,000	29,100	2,000
1997	106,495	62,200	60,047	104,000	45,340	55,333	24,000	29,100	2,000
1998	111,338	62,200	72,733	96,476	47,300	55,333	24,000	12,113	1,000
1999	111,338	62,200	72,733	96,476	47,300	55,333	24,000	12,113	1,000
2000	115,891	62,200	72,733	96,476	47,300	55,333	24,000	12,113	1,000
2001	115,891	62,200	82,396	96,476	42,550	49,520	23,000	20,300	1,000
2002	115,891	62,200	82,396	96,476	42,550	49,520	23,000	20,300	1,000
2003	115,891	62,200	82,396	96,476	42,550	49,520	23,000	20,300	1,000
2004	111,338	62,200	90,085	93,513	38,600	48,750	183	14,000	220
2005	111,338	62,200	90,085	93,513	38,600	48,750	183	14,000	220
2006	112,261	62,200	52,240	92,609	37,100	48,000	152	6,012	155

- From 2007 China a net importer of energy
  - 40 % of global coal consumption
  - but only 13% of global coal reserves
  - China's coal-reserves are not updated since 1992

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Mikael Skou Andersen and Paul Ekins, eds.
Carbon-energy taxation: lessons from Europe,
Oxford University Press 2009 (in press)

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