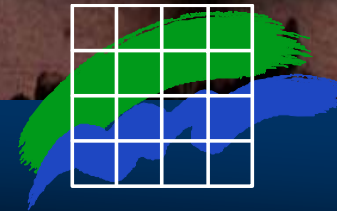




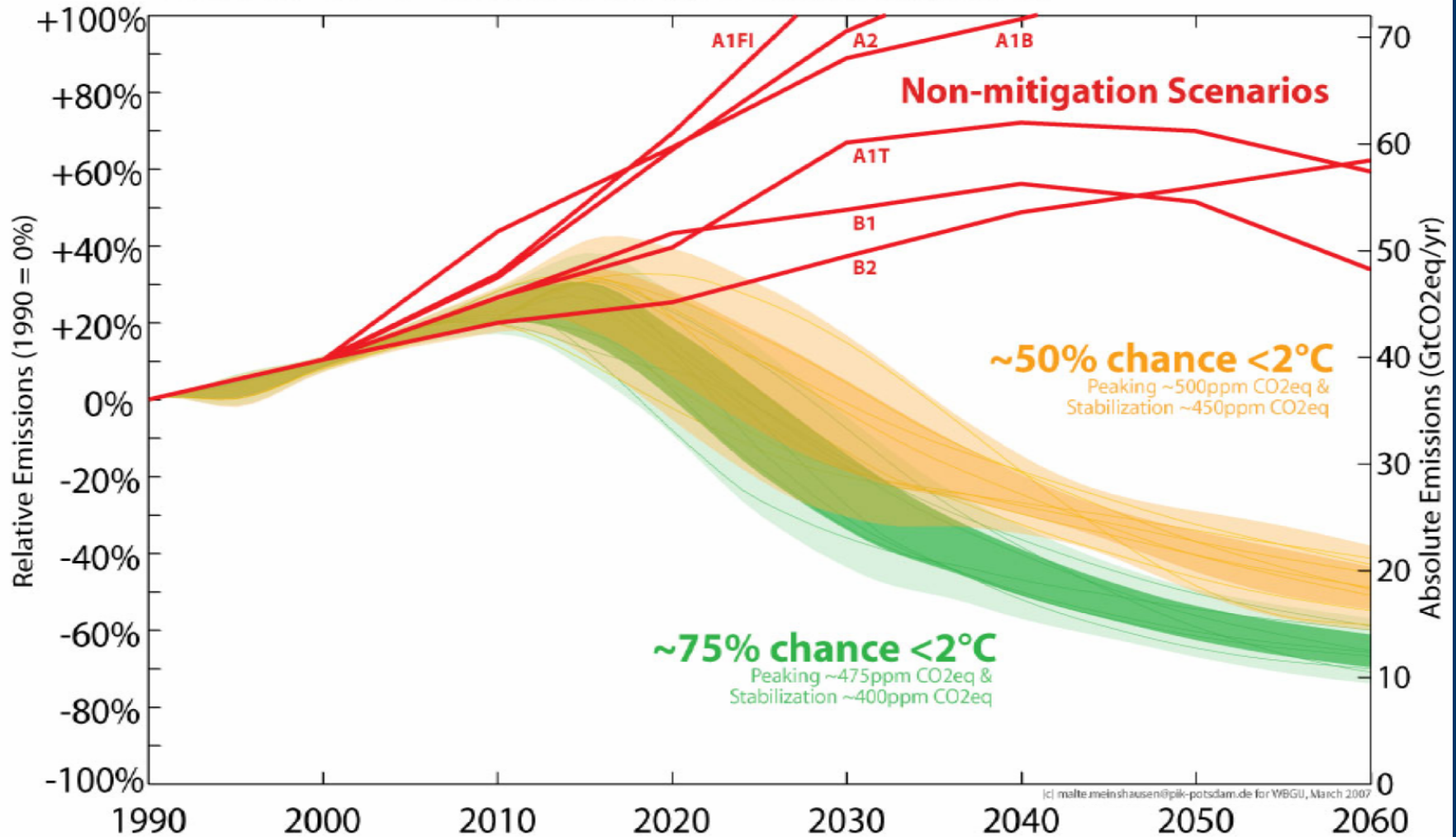
Carbon-energy taxation - some insights

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National Environmental Research Institute & Aarhus University
DENMARK

*member of CCICED Task Force 'Economic instruments for
energy efficiency and the environment'*



Global GHG emissions (Kyoto GHGs including LULUCF)

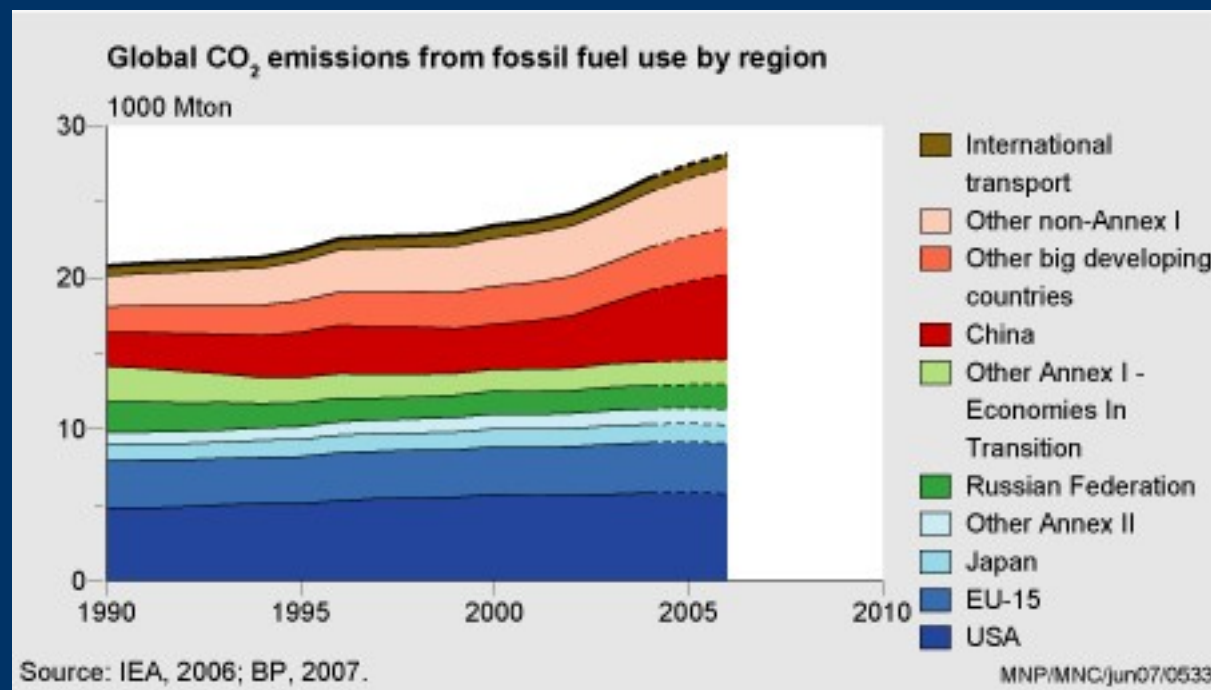


ICJ malte.meinshausen@pik-potsdam.de for WBGU, March 2007

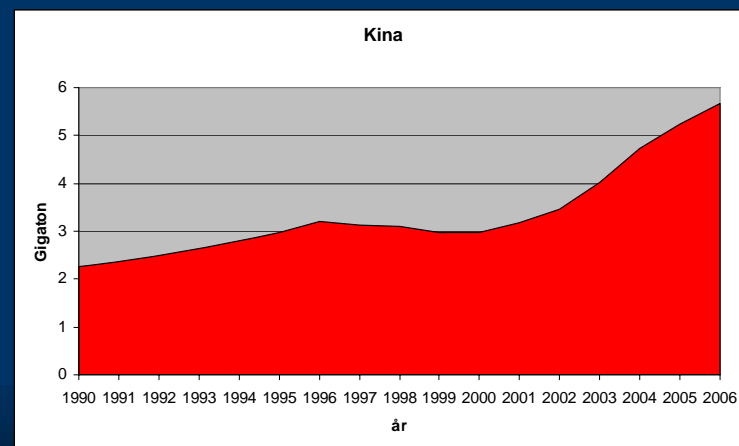


Global CO₂-emissions and China

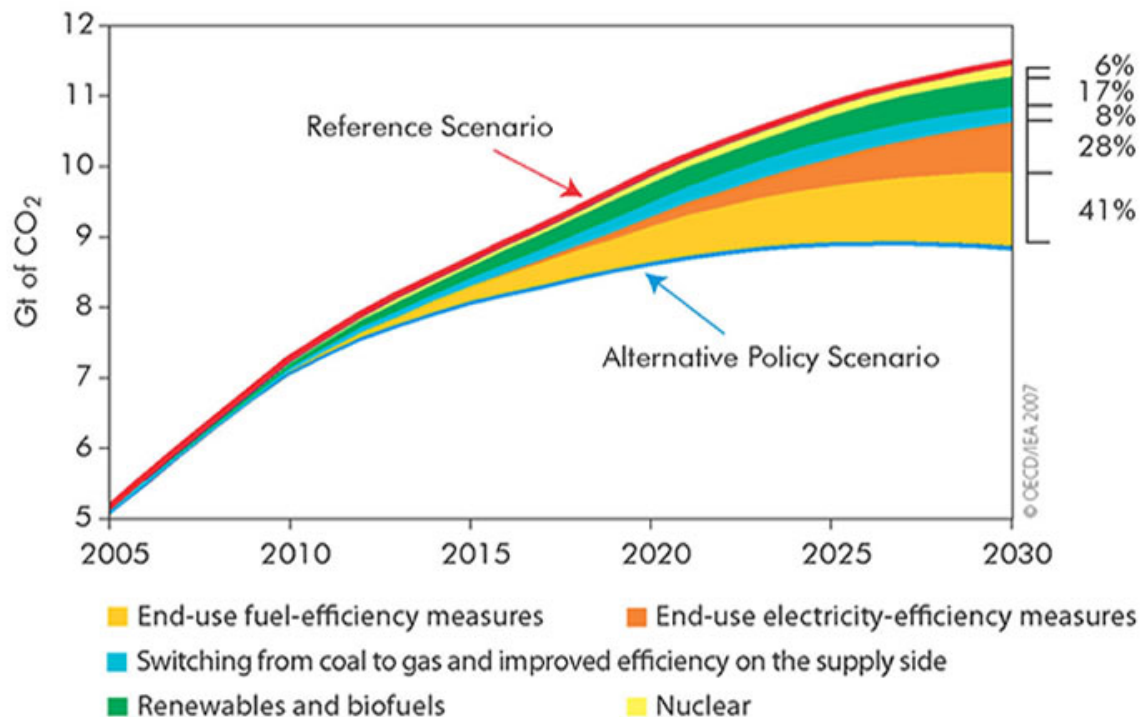
- USA: 20%
- China: 20%
- EU: 12%
- Russia: 6%
- Japan: 4%



- China: Doubling projected by IPCC for 2025 was a reality in 2007



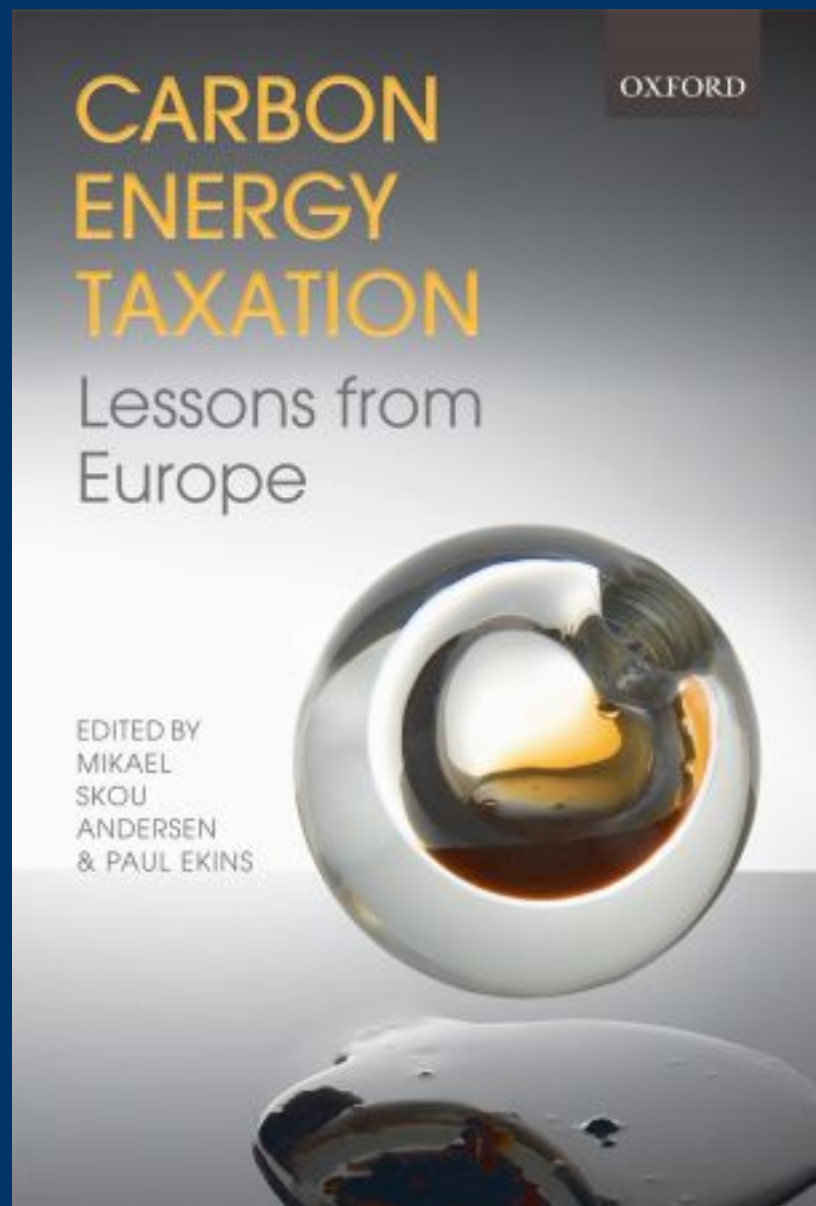
China's CO₂ Emissions in the Alternative Policy Scenario Compared with the Reference Scenario



- Five-year plan (2006-2010) aims at a quadrupling of GDP before 2020, while energy consumption may only double

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

Denmark	1,1%	Finland	0,6%
Germany	0,8%	Netherlands	0,5%
Sweden	0,9%	UK (CCL)	0,1%
		Slovenia	-



Taxation literature: Tax switch can mitigate competitiveness impacts

- 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)

Carbon-energy revenue recycling

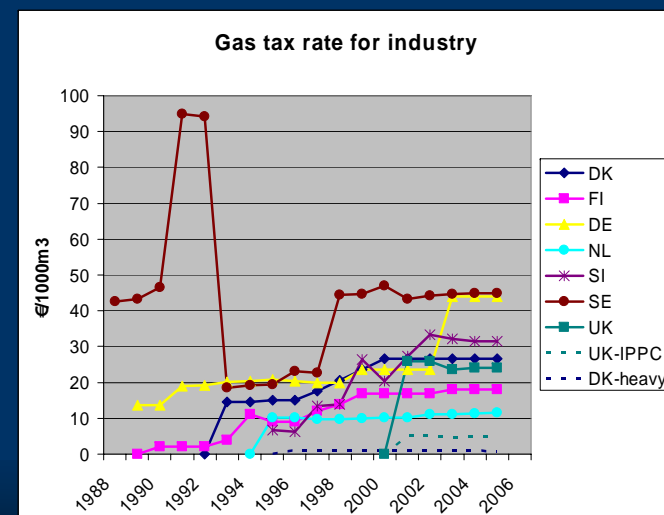
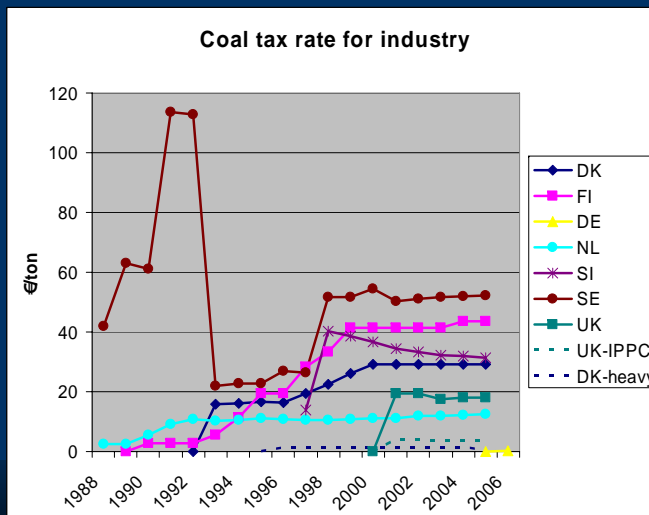
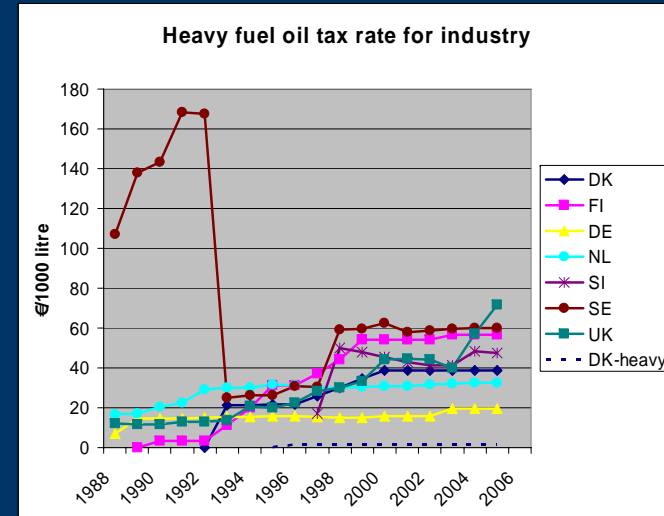
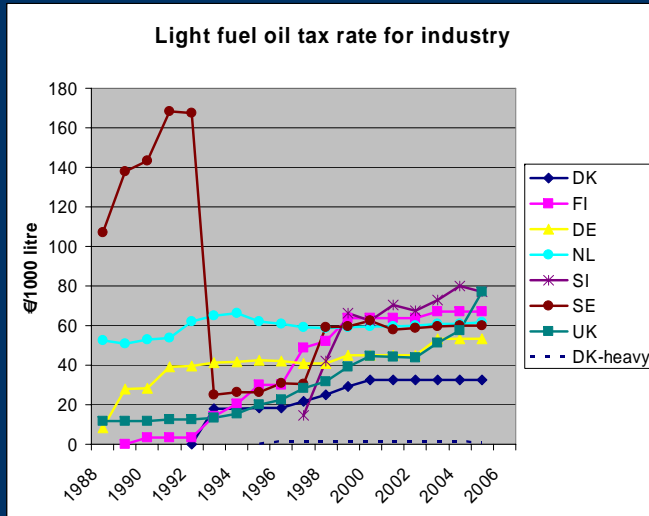
Sweden & Finland: reduced income taxes

UK and Denmark: reduced social security contributions (ssc)

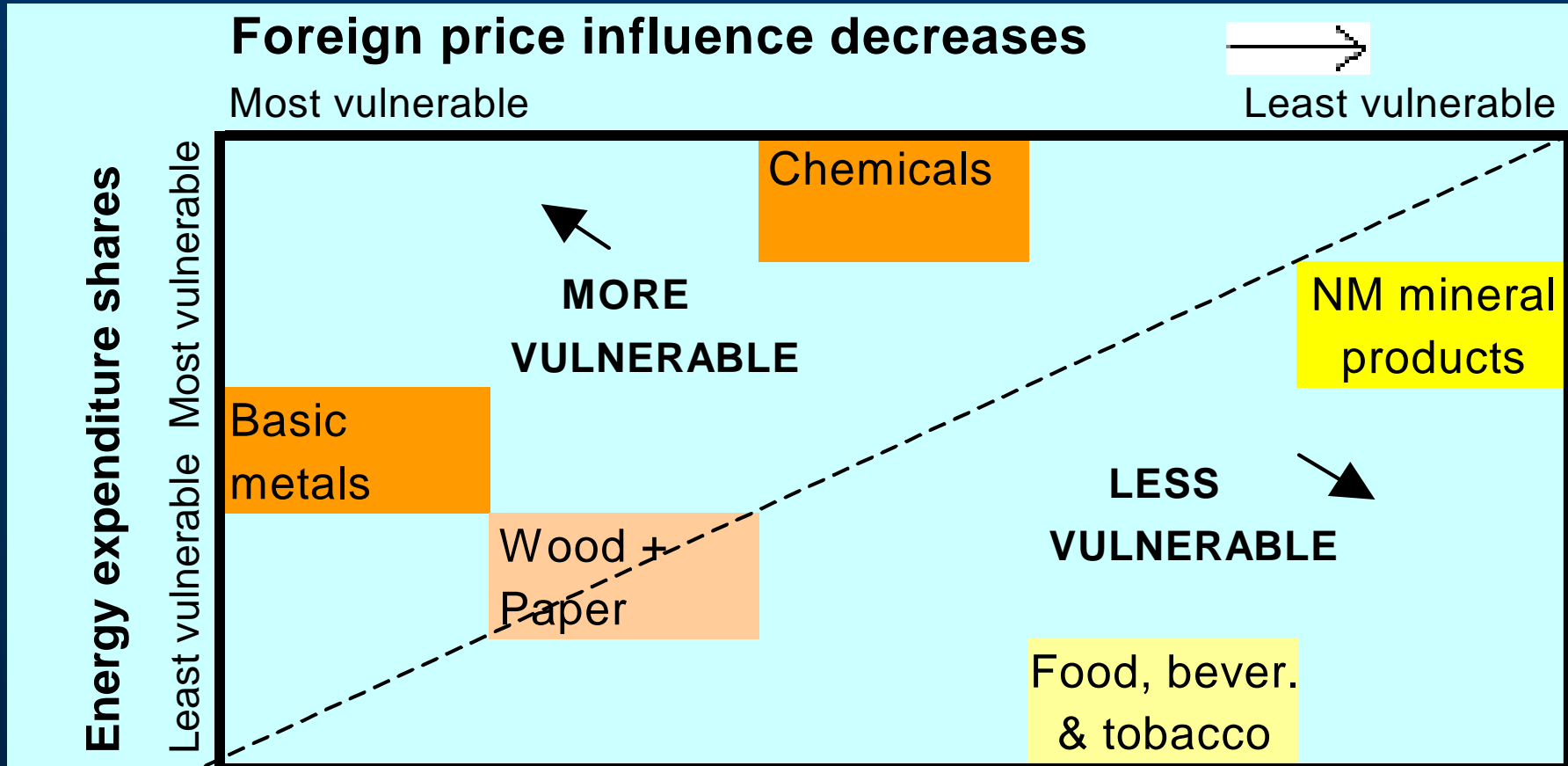
Germany & Netherlands: mix of both

Slovenia: energy taxes renamed into CO₂-taxes

COMETR database: unilateral tax rates



Price taker or price setter ?



Green innovation and demand: long term X-efficiency

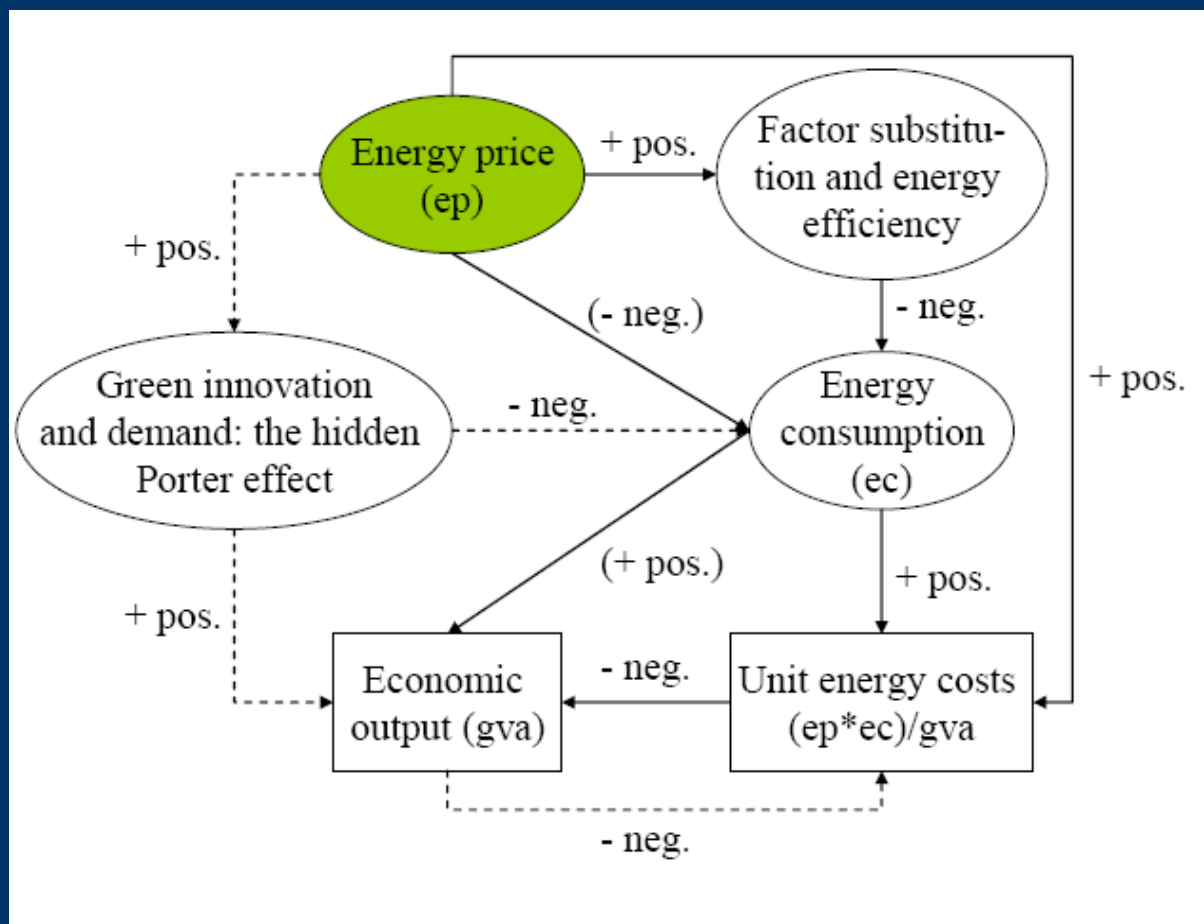
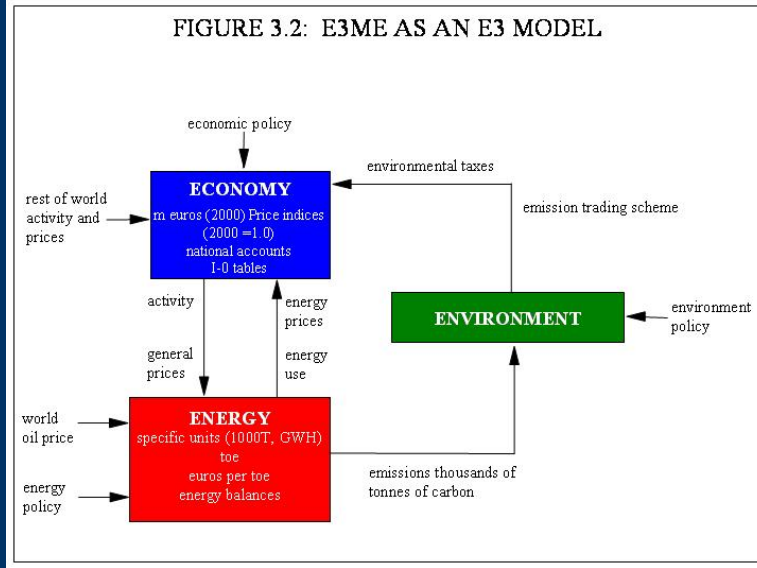


FIGURE 3.2: E3ME AS AN E3 MODEL

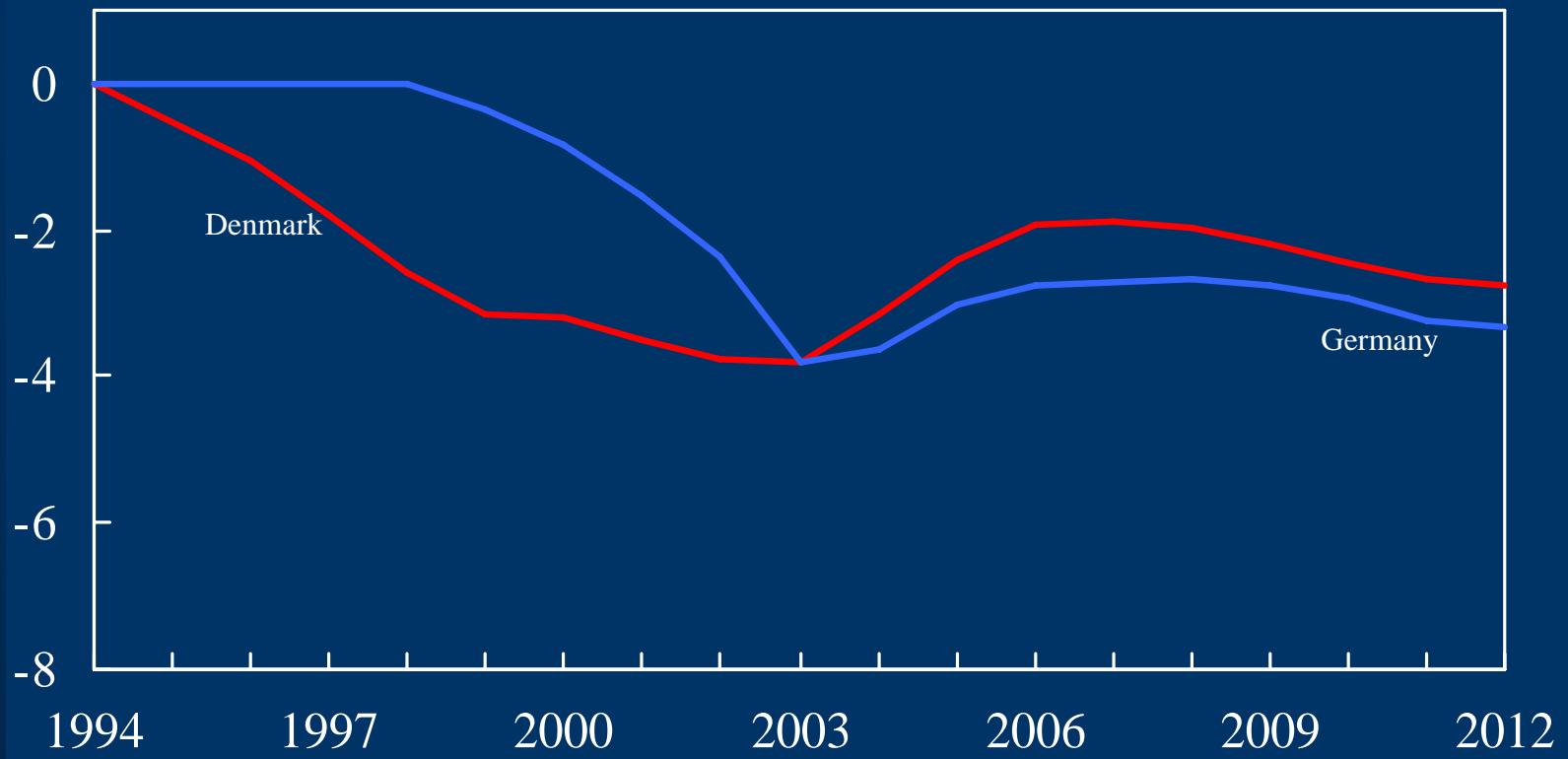


E3ME: Two main scenarios

- **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**

Effect of ETR on total fuel demand

% difference from baseline



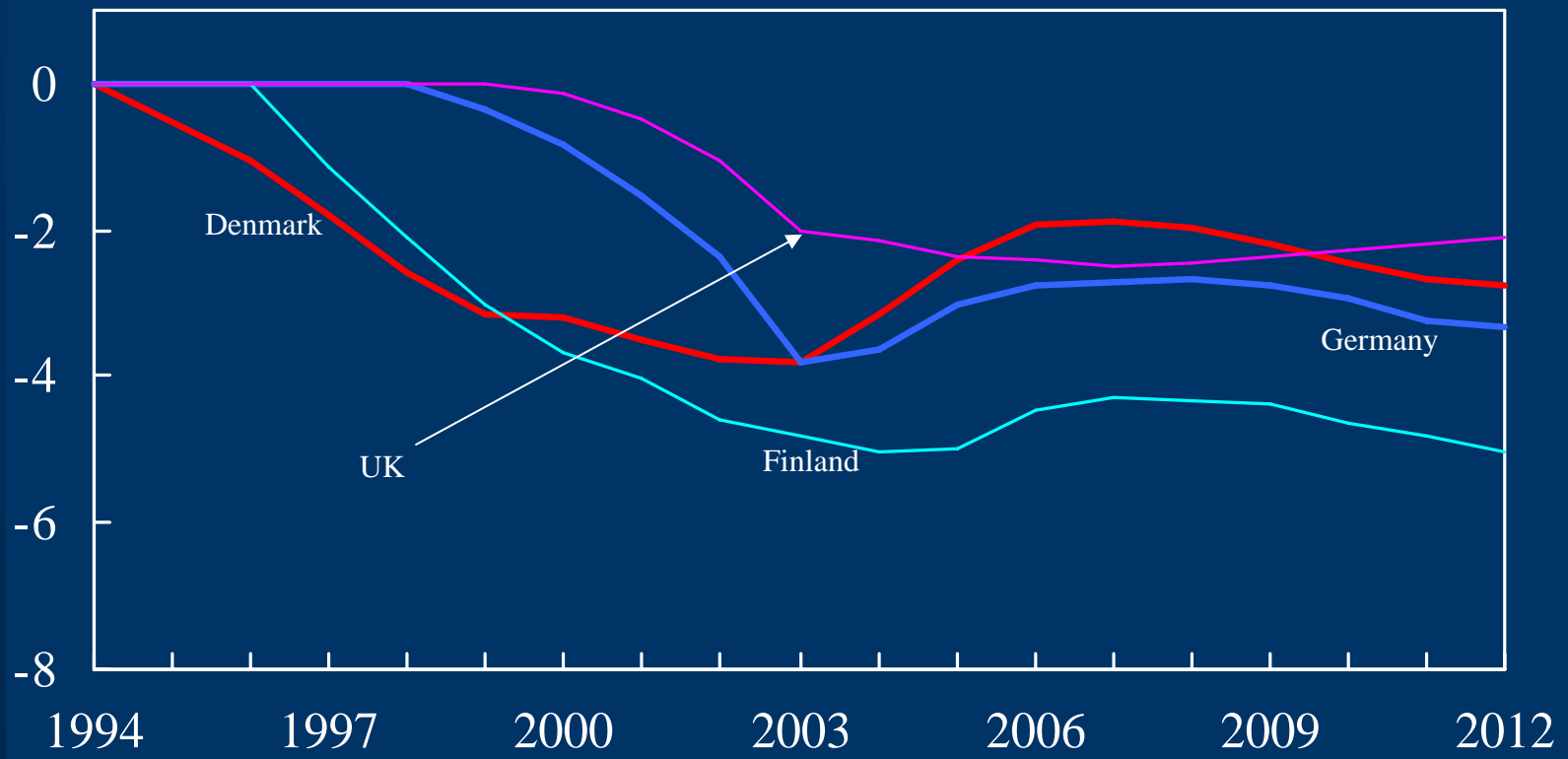
Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Environment and Development Conference, Beijing - Oct. 27-29th 2009

Effect of ETR on total fuel demand

% difference

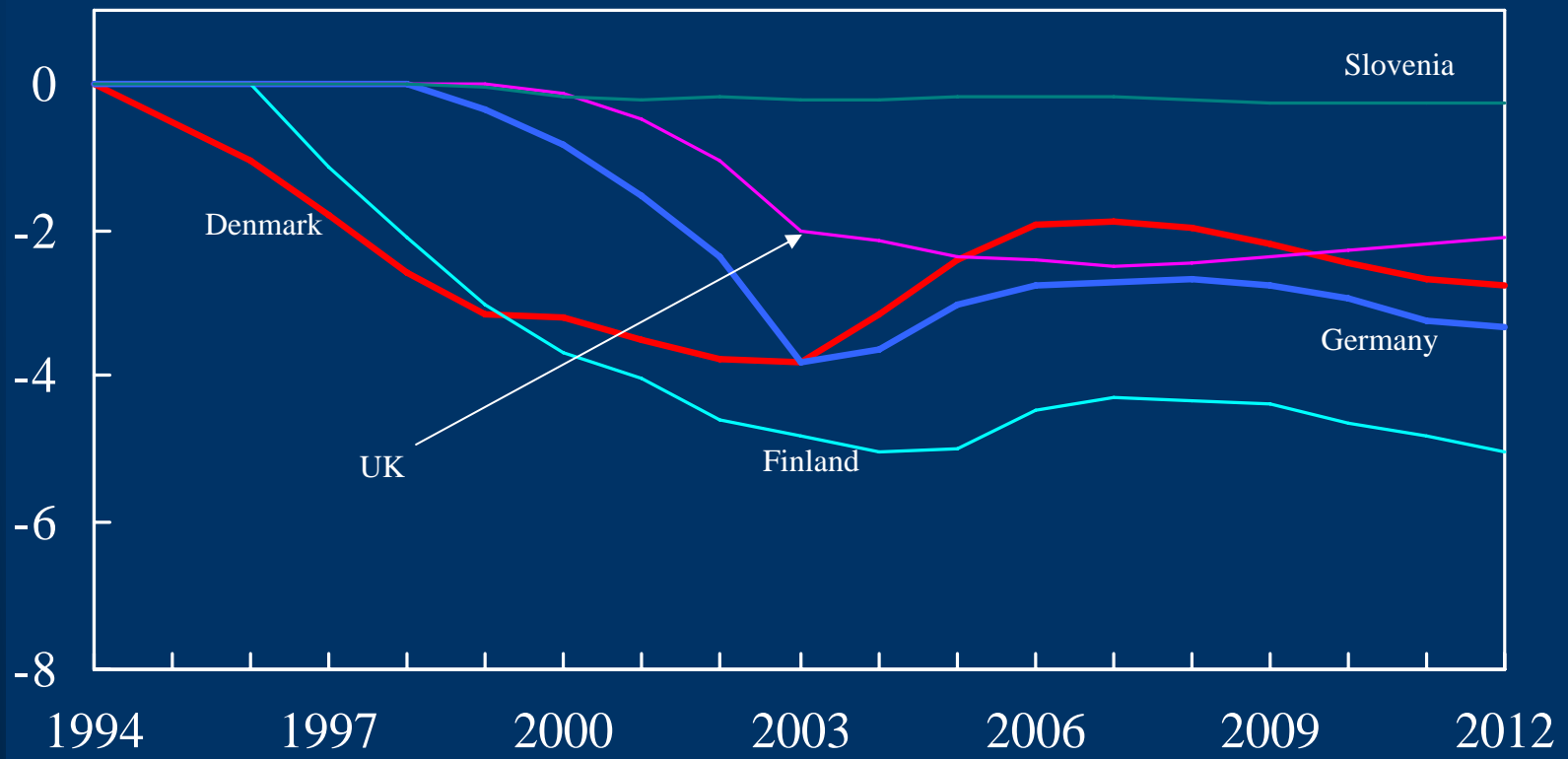


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect of ETR on total fuel demand

% difference

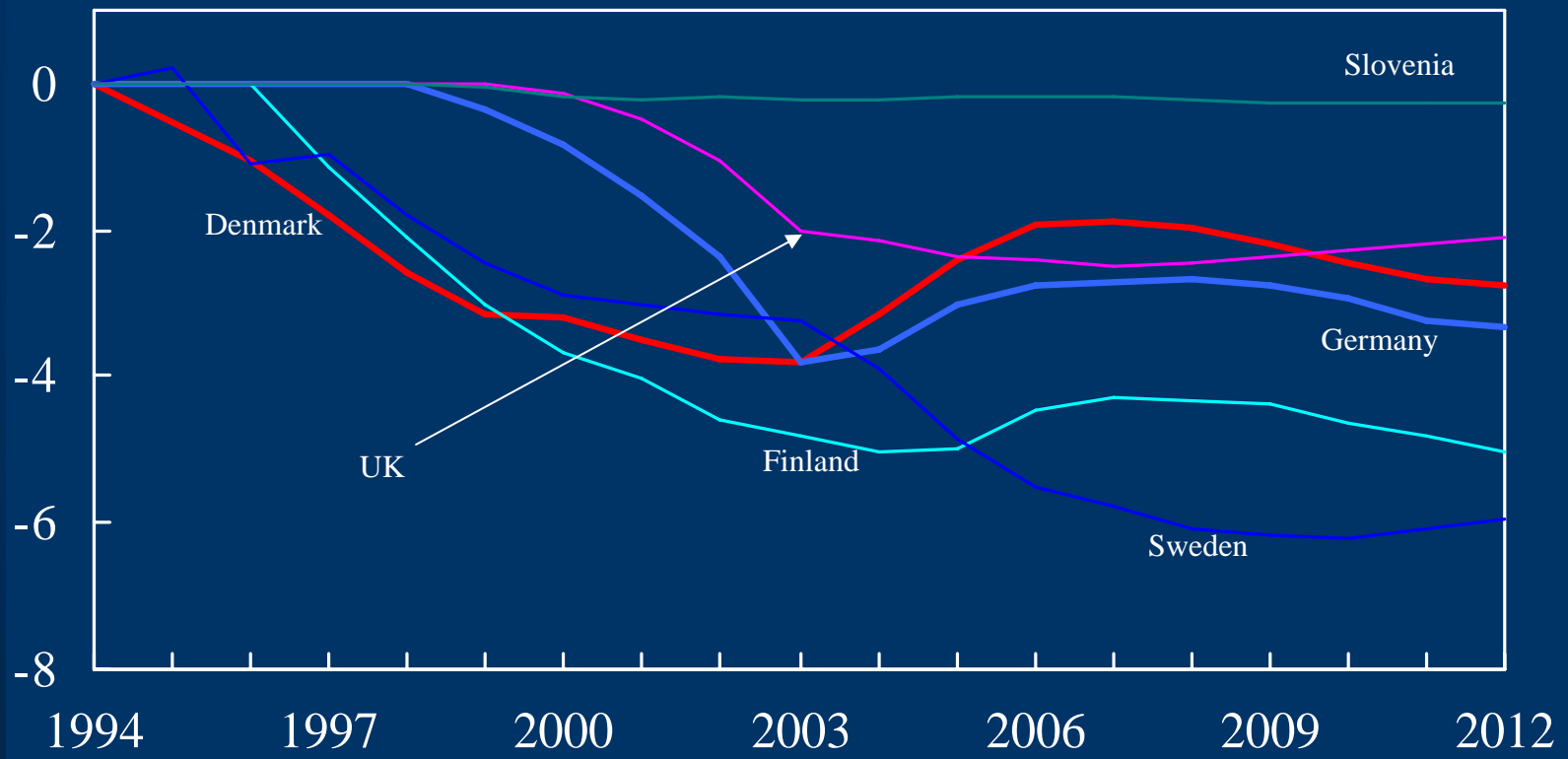


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect of ETR on total fuel demand

% difference

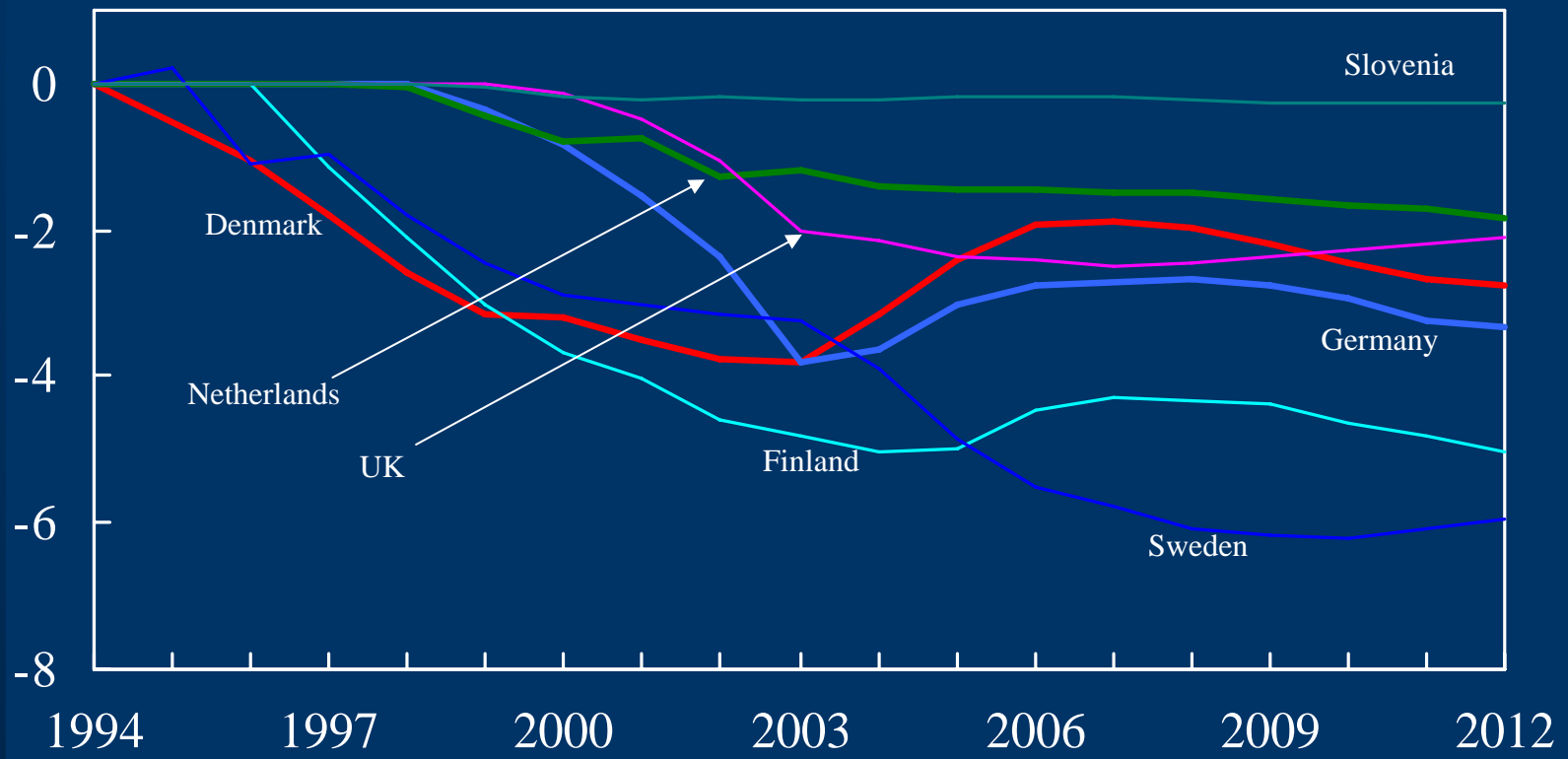


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect of ETR on total fuel demand

% difference

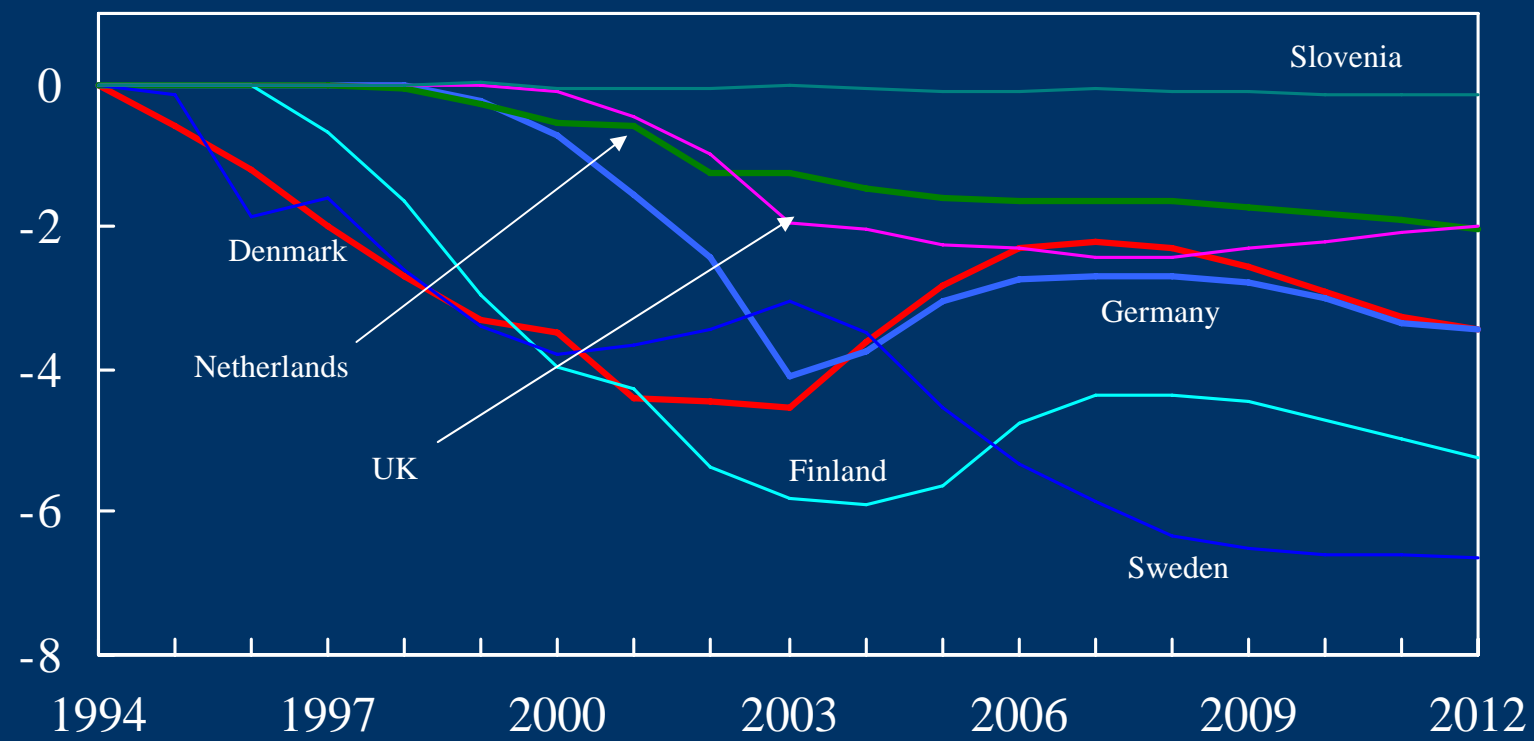


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect of ETR on GHG emissions

% difference

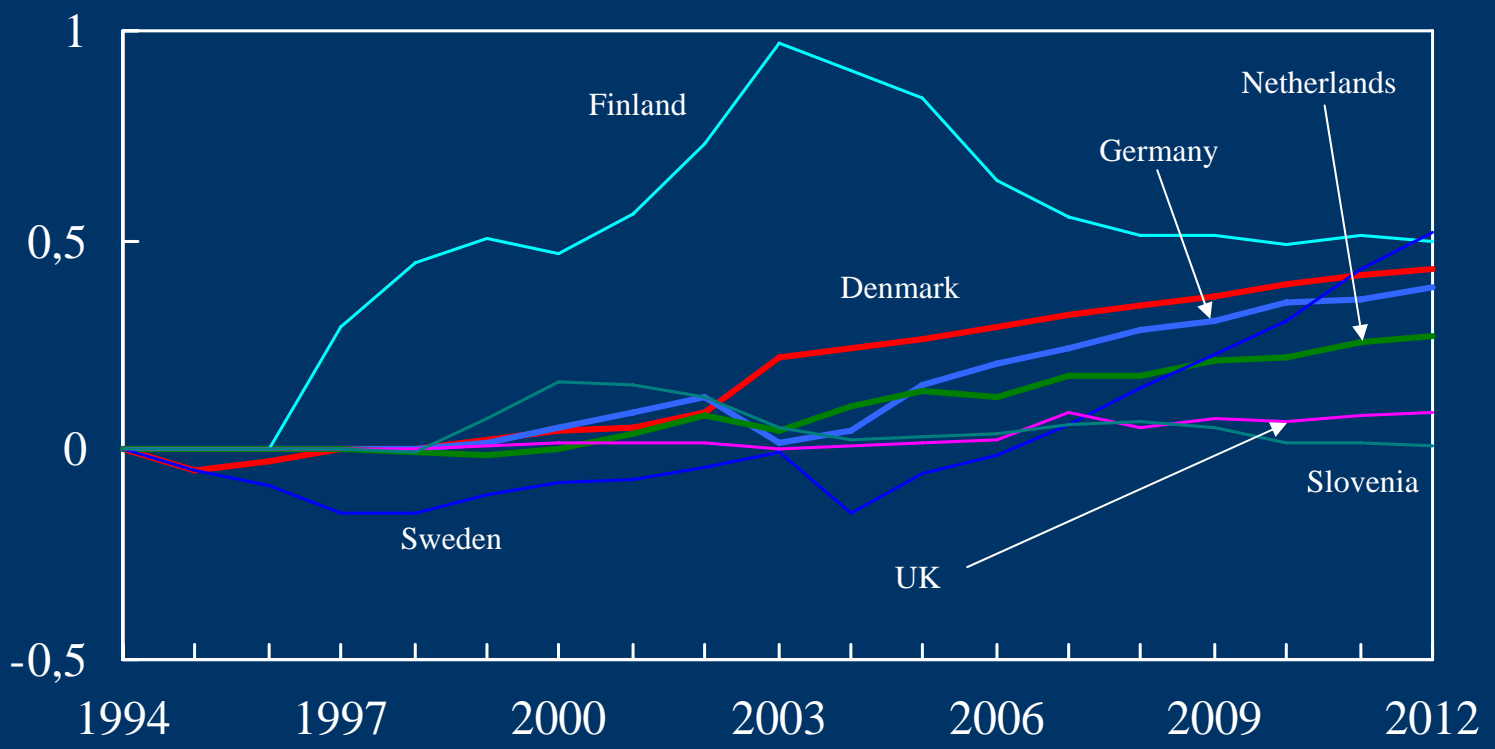


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect of ETR on GDP

% difference

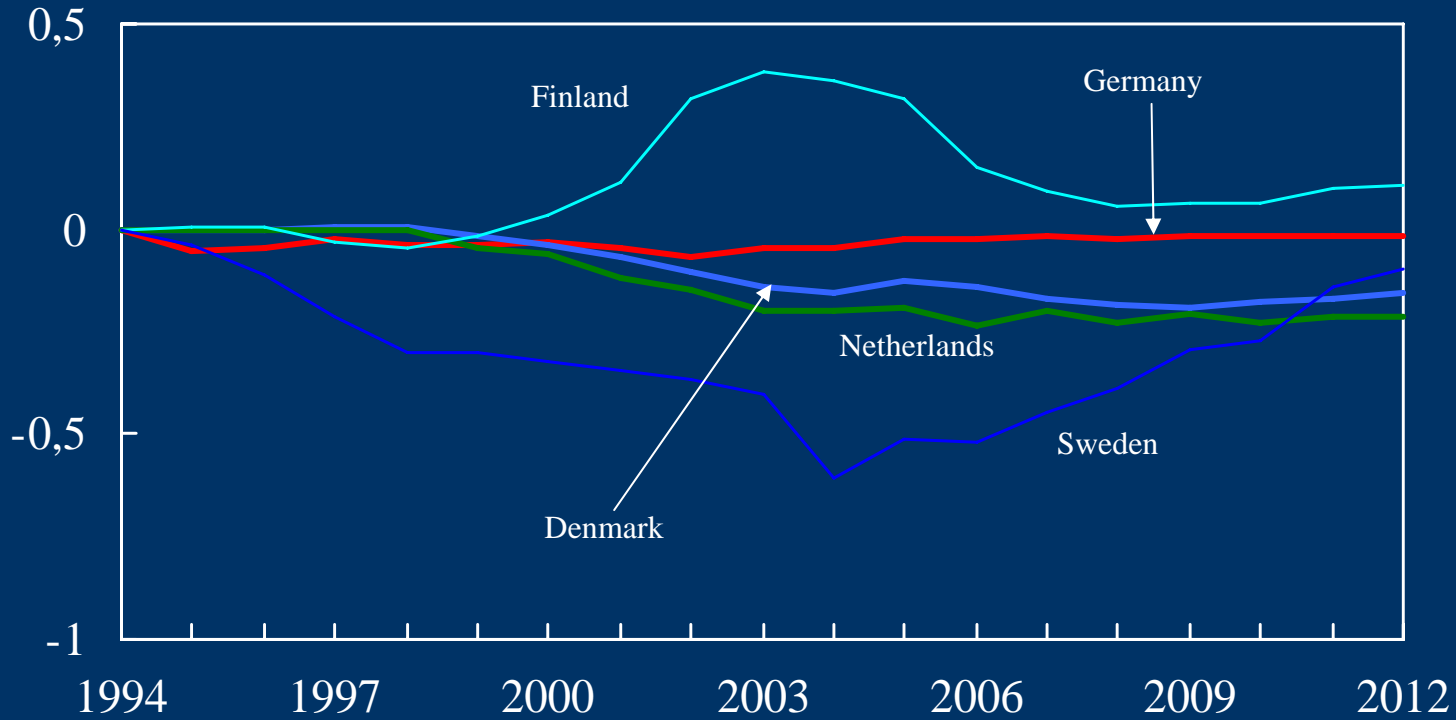


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Without Revenue Recycling: Effect of ETR on GDP

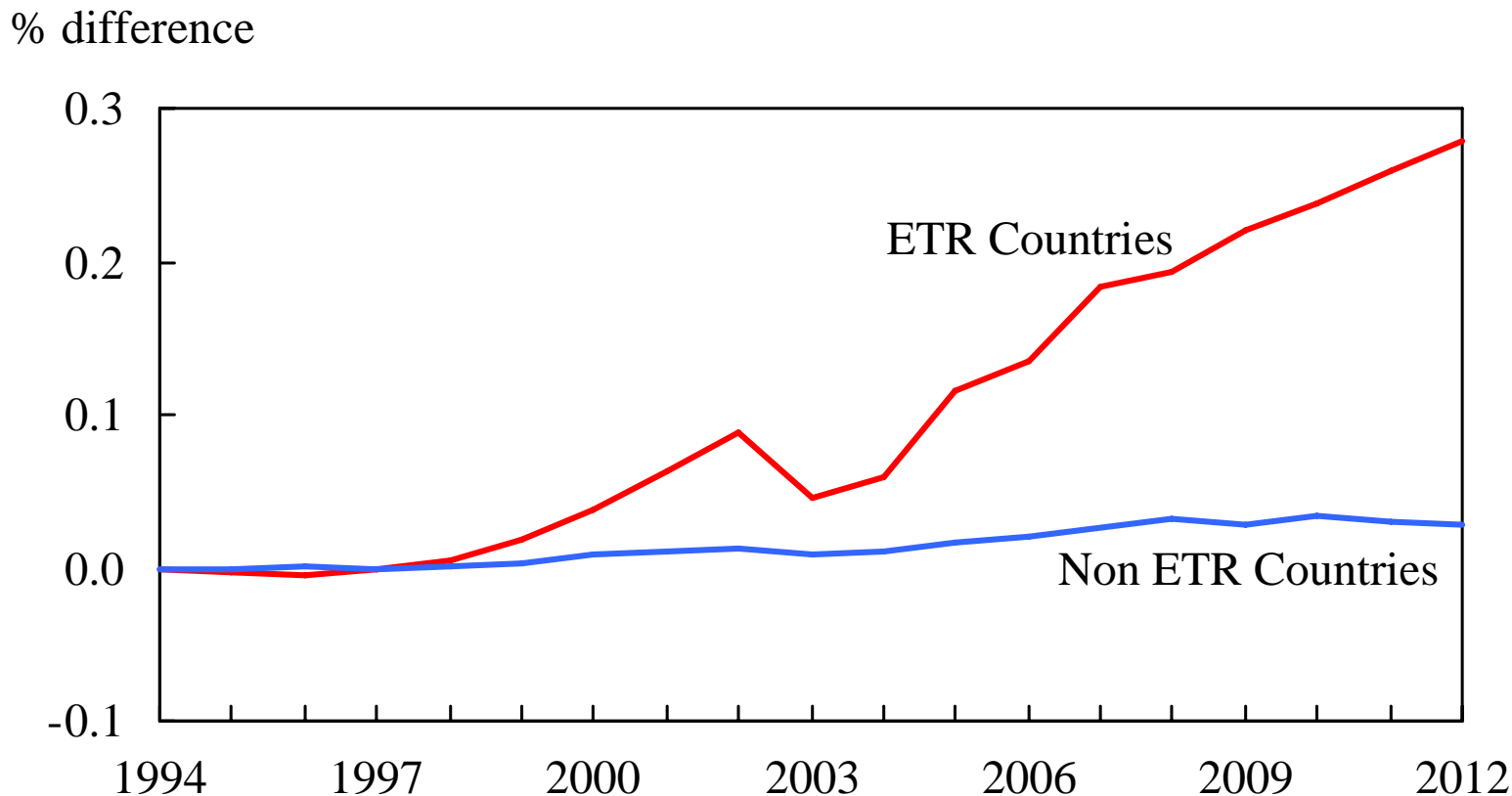
% difference



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

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

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

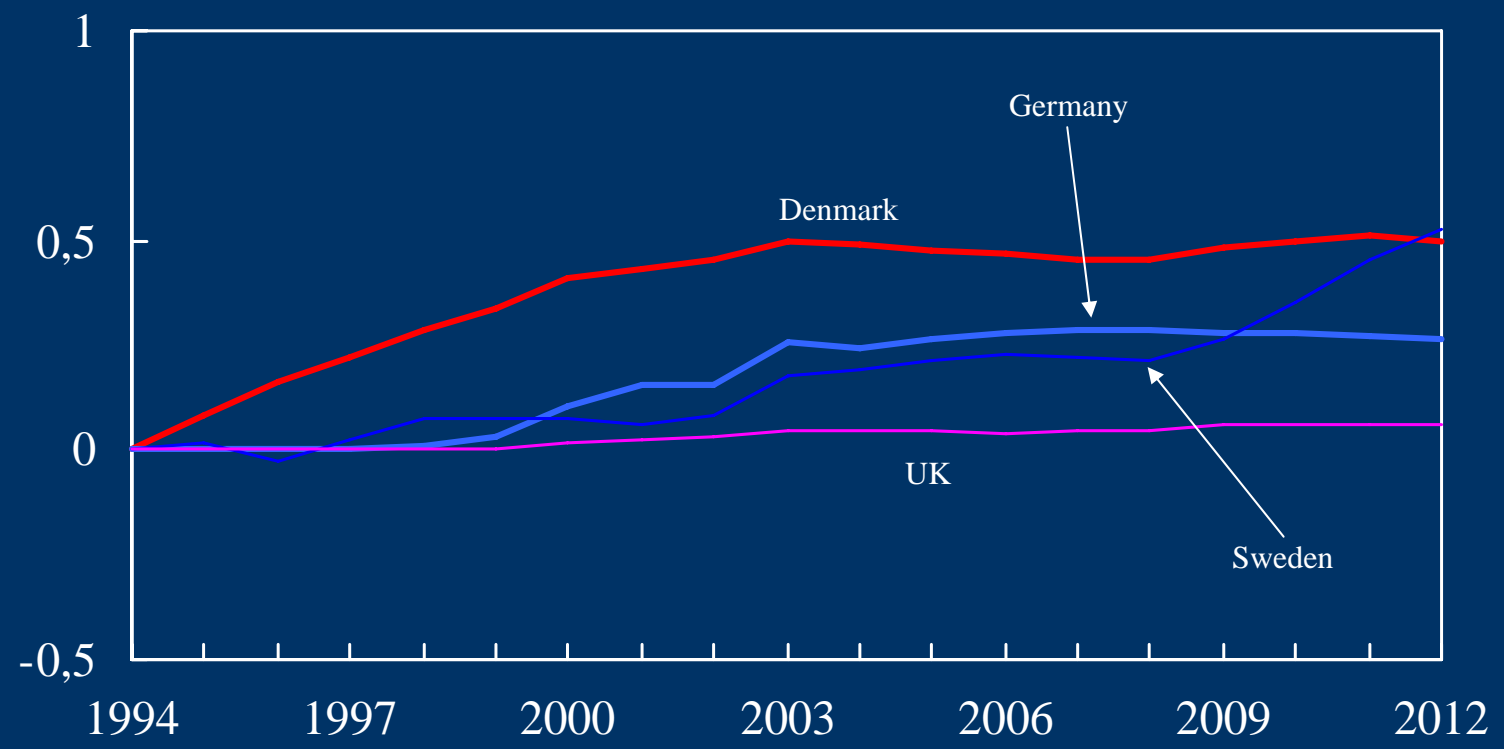


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

The Effect of ETR on Employment

% difference

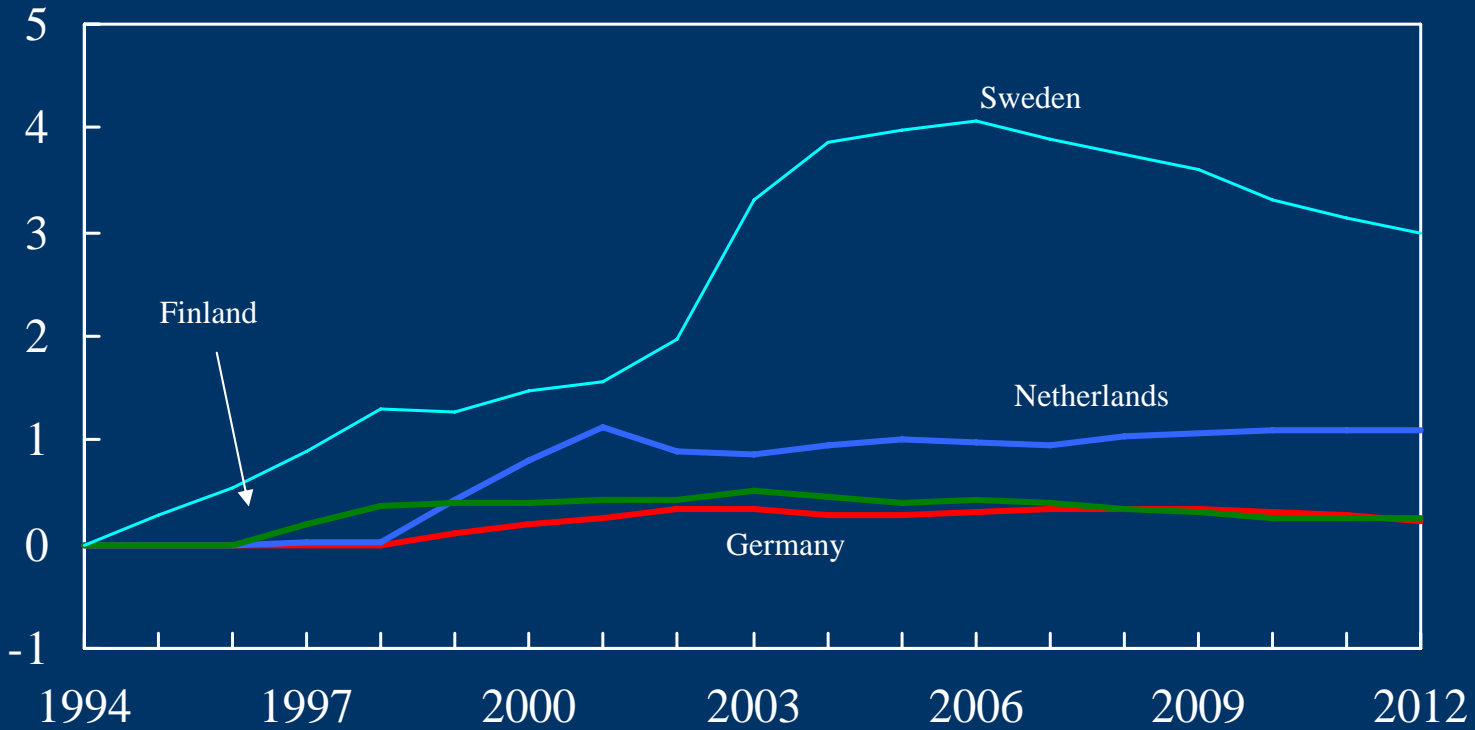


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK

Effect on Consumer Price Index

% difference

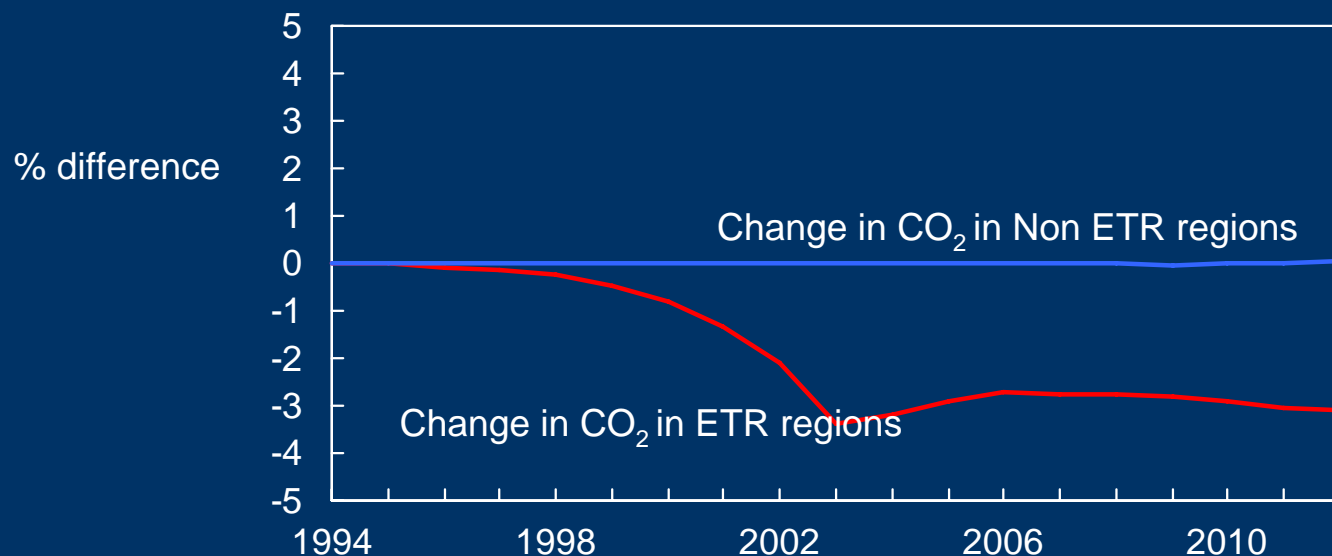


Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.
National Environmental Research Institute & Aarhus University, DENMARK



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 CO₂ reduction of 60 mill. tonnes
- a significant contribution to EU-15 Kyoto target

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



How carbon-energy taxes differ from energy prices

- increased energy prices have an additional impact 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 stronger than of price
- accompanying policy measures differ

Green tax switch: real tax burden per cent of gross operating surplus (GOS)

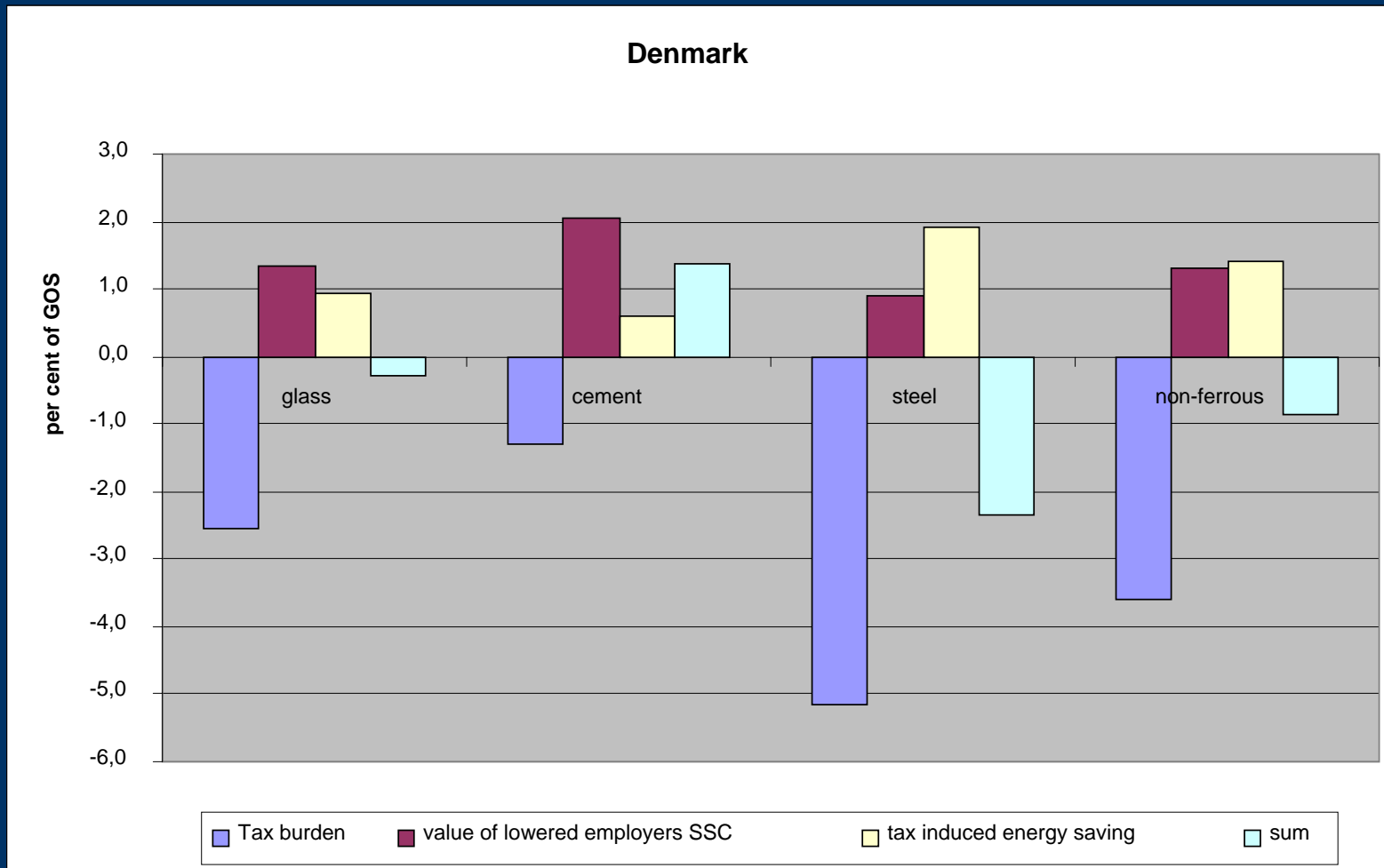
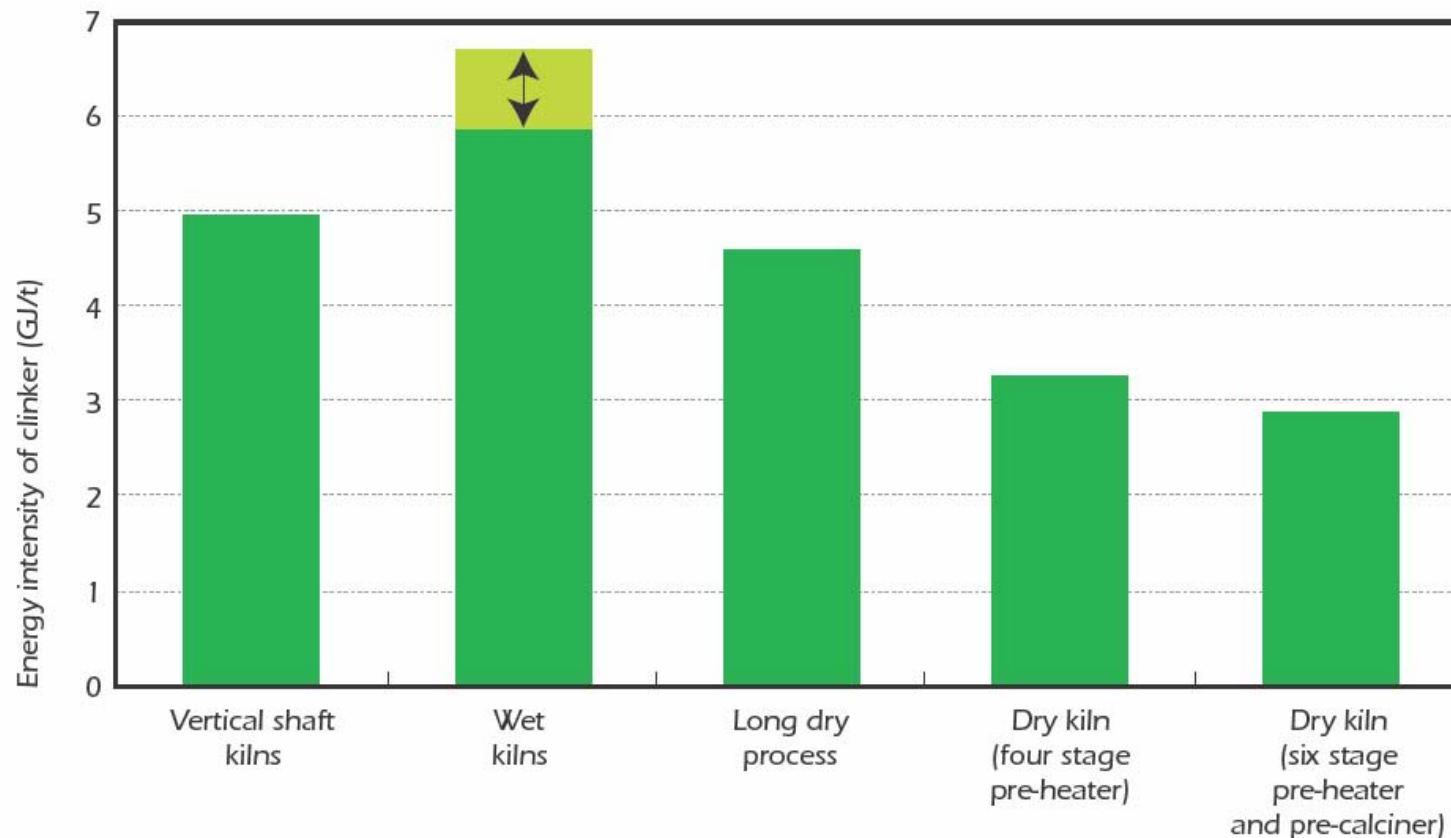


Figure 6.1 ▶ *Energy Efficiency of Various Cement Clinker Production Technologies*

Key point: Modern dry process cement kilns use half as much energy as the wet process to produce a tonne of cement.



Note: For wet kilns, the arrow represents the range of energy consumption for different wet kiln types.

Source: FLSmidth, 2006.

Environmental agreements

Partial reimbursement of tax if:

- Binding energy saving target
- Energy management system
 - with energy audit, staff training, procurement policies and annual progress report

RESULT: 60 per cent higher energy savings than in companies subject to tax only

(Bjørner and Togeby, 1999)



... improving resource productivity !

