Carbon-energy taxation - some insights

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Global GHG emissions (Kyoto GHGs including LULUCF)

Non-mitigation Scenarios

~50% chance <2°C
Peaking ~500ppm CO2eq & Stabilization ~450ppm CO2eq

~75% chance <2°C
Peaking ~475ppm CO2eq & Stabilization ~400ppm CO2eq

Relative Emissions (1990 = 0%)

Absoute Emissions (GtCO2eq/yr)

1990  2000  2010  2020  2030  2040  2050  2060
Global CO\textsubscript{2}-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
• 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)

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<tbody>
<tr>
<td>Denmark</td>
<td>1.1%</td>
<td>Finland</td>
<td>0.6%</td>
</tr>
<tr>
<td>Germany</td>
<td>0.8%</td>
<td>Netherlands</td>
<td>0.5%</td>
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<tr>
<td>Sweden</td>
<td>0.9%</td>
<td>UK (CCL)</td>
<td>0.1%</td>
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<tr>
<td>Slovenia</td>
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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

Swedish & 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

- **Light fuel oil tax rate for industry**
  - Graph showing tax rates from 1988 to 2006 for different countries.
  - Data points represent tax rates in €/1000 litre.

- **Heavy fuel oil tax rate for industry**
  - Graph showing tax rates from 1988 to 2006 for different countries.
  - Data points represent tax rates in €/1000 litre.

- **Coal tax rate for industry**
  - Graph showing tax rates from 1988 to 2006 for different countries.
  - Data points represent tax rates in €/ton.

- **Gas tax rate for industry**
  - Graph showing tax rates from 1988 to 2006 for different countries.
  - Data points represent tax rates in €/1000 m³.
Price taker or price setter?

Foreign price influence decreases

Most vulnerable

Chemicals

MORE

VULNERABLE

Basic metals

Wood + Paper

Energy expenditure shares

Least vulnerable

Food, bever. & tobacco

LESS

VULNERABLE

NM mineral products
Green innovation and demand: long term X-efficiency
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

-8  -6  -4  -2  0  2  4  6  8


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

Source(s) : CE.
Effect of ETR on total fuel demand

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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.
Effect of ETR on GHG emissions

% difference


Denmark
Netherlands
UK
Finland
Germany
Slovenia
Sweden

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

% difference

-0.5 0 0.5 1


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

% difference

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

Source(s): CE.
CHART 7.28: THE EFFECTS OF ETR: GDP IN ETR AND NON ETR COUNTRIES

% difference

ETR Countries
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.
Effect on Consumer Price Index

% difference


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

Source(s): CE.

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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 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.

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!