Carbon Tax and Equity
The Importance of Policy Design

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Research rationale

• Carbon tax (auctioned permits) has been advocated for decades by economic science as an efficient policy instrument

• Some successes but also an impressive list of failures inc. the latest French endeavour + pending US legislation

• Beyond specific contexts and circumstances 2 main counterarguments:
  • competitiveness issues: carbon leakage... and job drain!
  • distributional issues: the poor bear the brunt of the policy
The poor more vulnerable to a carbon tax?

Annual energy budget, euros (€)

<table>
<thead>
<tr>
<th>2001 France</th>
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</thead>
<tbody>
<tr>
<td>T1</td>
</tr>
<tr>
<td>12%</td>
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</tbody>
</table>

Annual energy budget share (%)

INSEE 2001 data, authors’ calculation

IEW 2010, 21 juin 2010
Static budget shares overlook three sources of discrepancies

- **Responses to price signals** (the very point of a carbon tax reform): impact unclear?
  - Lower classes more responsive to prices but ‘physical’ constraints

- **Propagation of the price signal** in the IO matrix and compounding effect: more regressive

- **Rebating of the tax proceeds** to households or not, following some rule of thumb: potentially mighty lever
  - Political appeal of the green check option, cf. France, Cantwell-Collins US bill

Interactions and feedbacks require a general equilibrium framework: IMACLIM-S modelling
IMACLIM-S: key features

A compact static computable general equilibrium model (CGEM) of climate policy analysis, with key features

• **Endogenous technical change**: ‘hybrid’ factor substitution together with Hicks-neutral induced technical change; ‘hybrid’ consumption trade-off (4 productions)

• **Static decreasing returns**: factor consumptions increase with real output

• **Equilibrium unemployment**: real wages and unemployment correlated by a wage curve

• **Extended to secondary distribution of income** between households (20 classes), firms, public adm. and the RoW
IMACLIM-S: key parameters & assumptions

- **Parameters**
  - Behavioural elasticities + asymptotes (prod. and cons.)
  - Elasticity of exports and imports to domestic prices (fixed international prices)
  - Elasticity of wage to unemployment

- **Assumptions**
  - Wage curve: wage relative to foreign prices (rather than to domestic prices) correlated to unemployment
  - Pre-existing excise taxes and transfers (pensions, unemployment benefits, other) indexed on average wage
  - Public expenditures constant share of GDP
  - Recycling conditional to constant public debt to GDP ratio
Six rebating schemes of same €300/tCO$_2$ tax

Comparative statics of a €300/tCO$_2$ tax on 2004 France, considering 6 alternate rebating schemes

• To frame the issue: what if tax proceeds are ‘not rebated’? A lower public debt option

• Two contrasted schemes: lower payroll tax (academic #1) vs. extended green check (political #1)

• Three compromise schemes aiming at a balance of the equity and efficiency impacts
Framing the issue:

A lower public debt option

(€300/tCO₂)
Direct regressivity confirmed...  
...but is it really the point?

<table>
<thead>
<tr>
<th></th>
<th>Lower public debt</th>
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</thead>
<tbody>
<tr>
<td>€300/tCO₂ tax rebated in</td>
<td></td>
</tr>
<tr>
<td>CO₂ emissions</td>
<td>-38.5%</td>
</tr>
<tr>
<td>GDP</td>
<td>-6.5%</td>
</tr>
<tr>
<td>Consumption</td>
<td>-9.5%</td>
</tr>
<tr>
<td>Employment</td>
<td>-5.7%</td>
</tr>
</tbody>
</table>

IMACLIM-S modelling

Consumption (class total)

Gini index +1.3%

Lower public debt

T1  
T2-7  
T8-13  
T14-19  
T20
Income structures channel macro impacts

INSEE 2001 data, authors’ calculation
Academics vs. politics:

A lower payroll tax vs.

an extended green check option

(€300/tCO$_2$)
Efficiency of lower payroll tax option confirmed

<table>
<thead>
<tr>
<th></th>
<th>€300/tCO₂ tax rebate in</th>
<th>Lower payroll taxes</th>
<th>Extended green check</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ emissions</td>
<td>-34.1%</td>
<td>-34.8%</td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>+1.9%</td>
<td>-0.7%</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>+1.5%</td>
<td></td>
<td>+0.4%</td>
</tr>
<tr>
<td>Employment</td>
<td>+3.5%</td>
<td></td>
<td>+0.3%</td>
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</table>

**IMAACLIM-S modelling**

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But ext. green check induces higher equity

**Consumption (class total)**

- **Gini index** +2.0%
- **Gini index** -5.5%

**Lower payroll taxes**

**Extended green check**

IMACLIM-S modelling

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An equity-efficiency trade-off

- €0/tCO₂ - Actual 2004 France
- €300/tCO₂ - Lower payroll taxes
- €300/tCO₂ - Extended green check

IMACLIM-S modelling
Three compromise schemes

(€300/tCO₂)
Three compromise schemes

- **Mixed recycling**
  - firms rebated what they paid in lower payroll taxes
  - households rebated what they paid in *per capita* lump-sum

- **Generalised tax credit (TC)**
  - lump-sum rebate that covers the average car commute + a similar share of residential consumption

- **Targeted TC & measures**
  - same tax credit limited to T1-16
  - remaining proceeds to payroll tax reduction
  - any budget margin in accompanying measures to T1-T16
The 3 schemes reduce CO₂ emissions by 34%

Targeted TC & measures seems superior
Crux of the matter: limiting the resources devoted to compensation

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<th>Mixed recycling</th>
<th>Gᵣ tax credit</th>
<th>Targeted TC &amp; measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of proceeds to compensation</td>
<td>37.5%</td>
<td>17.8%</td>
<td>26.5%</td>
</tr>
<tr>
<td>Domestic vs. international price of non-E production</td>
<td>+0.8%</td>
<td>-0.2%</td>
<td>+0.3%</td>
</tr>
</tbody>
</table>

*IMA CLIM-S modelling*
Energy vulnerability ill-explained by income (LS)

INSEE 2001 data, authors’ calculation
Conclusion

• Direct impact of a carbon tax (slightly) regressive

• Politically appealing rebate to consumer comes at the cost of efficiency as maintained purchasing power turns to foreign goods

• Targeting efficiency offers room for manoeuvre to tackle equity—for most European economies this implies considering at least a partial recycling in lower payroll taxes

• Potential for win-win reforms
... vs. other ‘nicer’ options

Economic impact

[Graph showing economic impact with markers for Welfare, Consumption, and GDP, and categories for Investment financing, Lump-sum transfer to hholds, Public debt reduction, Capital tax cuts, and VAT cuts.]

Greenhouse gas emissions

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