Analysis of a Carbon Tax in Estonia

Results from CGE Model for Estonia

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Objectives of Analysis

- To develop a CGE model for Estonia that can be used for the analysis of tax changes and for the analysis of environmental effects.
- To apply the model to the carbon tax, with different variations in the ways the tax is used and in different combinations with other energy taxes.

Results So Far

- The model has been developed and calibrated and ‘works’ -- i.e. produces reasonable results in the application made.
- Several scenarios have been analysed for the carbon tax.

Scenarios Analysed

- I: Business as Usual: All tax rates at 1997 levels + from 2003 CO2 tax at 7.5 EEK/ton for limited sectors and average excise tax on fuels of 20%.
- IA: BAU + CO2 tax is raised to 11.1 EEK/Ton for all sectors.
- IB: IA + revenues recycled through subsidies for environmental investment.
- IC: IA + taxes are refunded in the form of lower social security payments.

Scenarios Analysed

- IIA : BAU + CO2 tax rate is 80 EEK/ton and average fuel excise tax is 30% (I.e. energy directive)
- IIB: IIA +revenues recycled through subsidies for environmental investment
- IIC: IIA + taxes are refunded in the form of lower social security payments.

Scenarios Analysed

- IIIA : BAU + CO2 tax rate is 210 EEK/ton and average fuel excise tax is 10%
- IIIB: IIIA +revenues recycled through subsidies for environmental investment
- IIC: IIIA + taxes are refunded in the form of lower social security payments.
- Not intended to be realistic but included to test sensitivity of results.

Method of Analysis

- CGE model 300 non-linear equations, 200 parameters, 1200 endogenous variables
- The model is calibrated so that it ‘fits’ the data for 1997.
- A BAU run is made
- Each scenario run is carried out and reported as a deviation from the BAU
- The results are not dynamic: the show what will happen at a fixed date in the future: 2012 is the nominal date in the modelling.

BAU Results

Indicator	1997	2012	% Change
GDP Bln EEK	64	94	47
Employment (000)	617	689	12
CO2 MMT	22.5	28.2	25

Key Macro Results: % Deviation From BAU

Scenario	GDP	Employment	CO2
IA	0.02	0.00	<1 (-)
IB	-0.60	0.29	<1 (-)
IC	-0.20	0.00	<1 (-)
IIA	-0.40	0.15	-2
IIB	+0.20	1.16	-3
IIC	-0.22	0.44	-2
IIIA	-1.10	0.15	-4
IIIB	0.82	0.87	-4
IIIC	-0.19	0.29	-3

Key Macro Results: Comments

- The impact on GDP is very small, and could be negative or positive. It is positive for IIIB (high CO2 tax, low excise tax and environmental recycling)
- The employment effects are small, of the order of one percent (Ca. 6,000 jobs). Bigger employment effects arise with the environmental recycling than with labour tax cuts. Slightly surprising result and needs further investigation. IIB and IIIB are about equal.
- Employment effects are for non-manual labour. Manual labour is fully employed.

Key Macro Results: CO2

- CO2 reductions increase as we move from scenario I to scenario II to scenario III. Expected result, as higher CO2 taxes and/or energy taxes are levied.
- CO2 reductions are bigger when tax is recycled via environmental subsidies than when it is recycled via cuts in labour taxes.
- Reduction of 4% would represent about one million tons, with value of around €12 million/year in Emissions Trading at €12 per ton CO2

Other Key Macro Results: % From BAU

Scenario	Welfare Change	Environmental Benefits	Production
IA	0.1	0.03	0
IB	-5	0.05	0
IC	-1	0.02	0
IIA	-6	0.41	0
IIB	-26	0.58	2
IIC	-8	0.34	-1
IIIA	-11	0.56	-1
IIIB	-22	0.90	3
IIIC	-8	0.65	-1

Other Key Macro Results: Comments

- Welfare effects of the taxes on households are negative when no account is taken of environmental benefits. Higher energy prices hurt them. Effect is biggest with environmental recycling and smallest when CO2 taxes are recycled via lower labour taxes.
- However, there are environmental benefits, which go the other way (biggest with environmental recycling). But environmental benefits are a lot less than loss of welfare from price increases.

Other Key Macro Results: Comments

- Production may decline slightly but there is no overall major decline under any scenario.
- Pre tax input prices decline for all inputs except non-manual labour, which goes up (demand for it increases). For other factors including energy the tax results in the pre tax price falling as one would expect.

Sectoral Impacts

- The price of oil shale rises substantially, progressively more as we go from scenarios I to II to III. Most affected are mineral products and heating sectors
- The relative costs of production are little affected across the scenarios
- Consumer prices rise most for timber and paper, chemicals and refining and oil shale.
- Household demand falls across most sectors.

Sectoral Impacts

- Household demand falls substantially for heating in scenarios where revenues are recycled in an environmental way. This may be a matter for concern.
- Although household demand falls quite a lot in the different scenarios, production falls much less (scope for export to absorb production is important).

Some Conclusions

- Initial results suggest that a carbon tax would not have a major ‘double dividend’.
- But it would not have any major negative consequences either.
- Recycling via subsidies to new environmentally friendly technology looks attractive.
- The reduction in CO2 is modest but real
- Other ‘micro’ factors will determine more the choice of design. (household support, excise versus CO2 tax). Work is needed on these before implementing a tax.