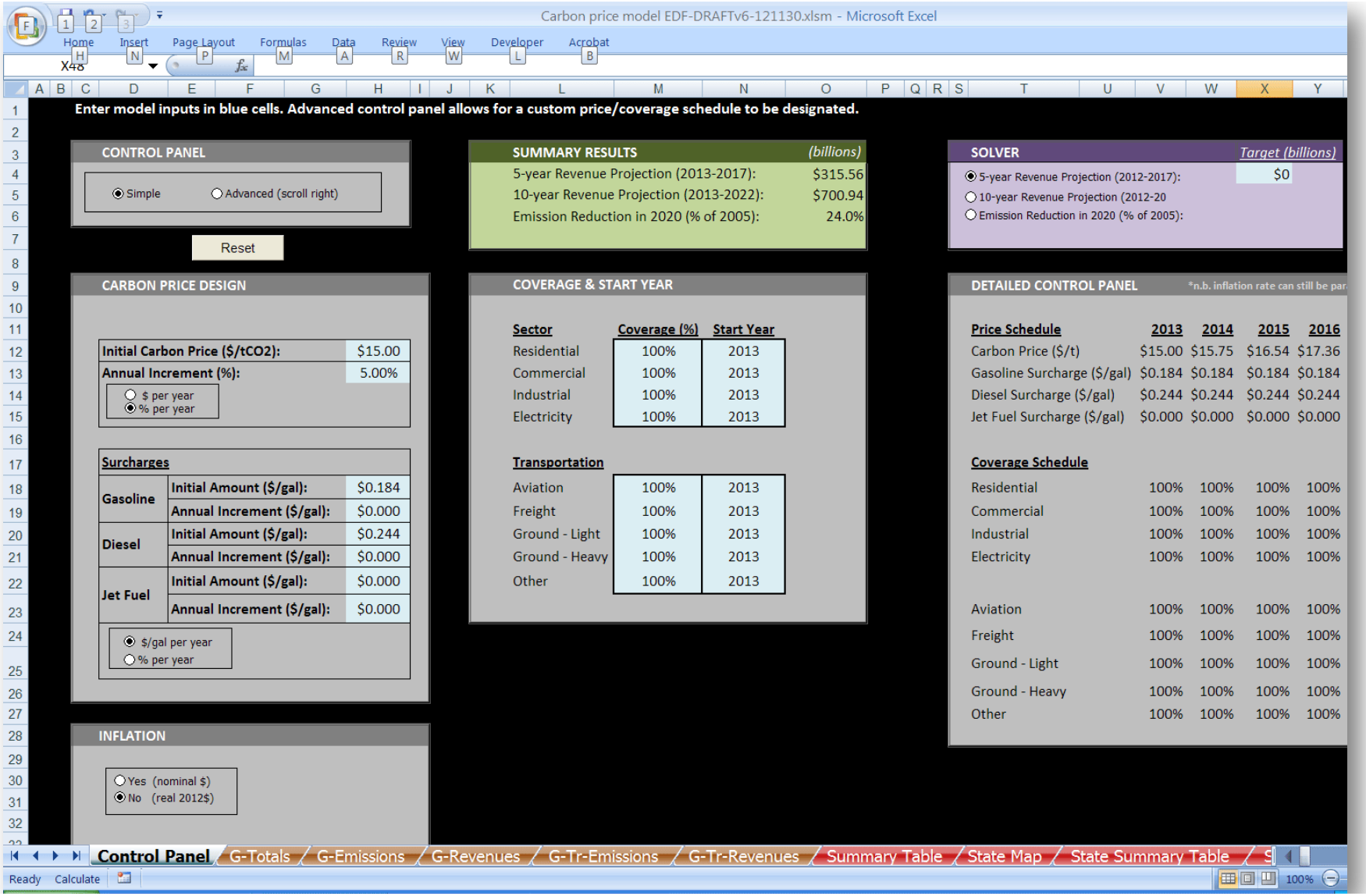
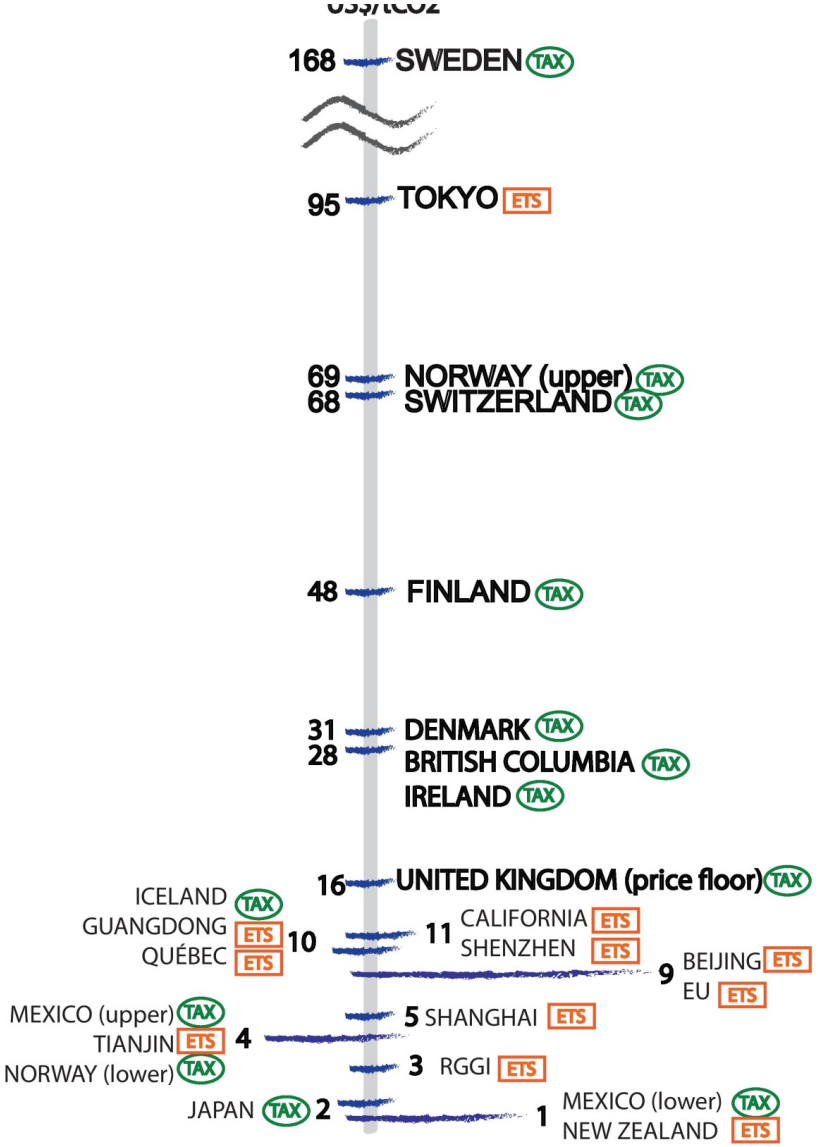
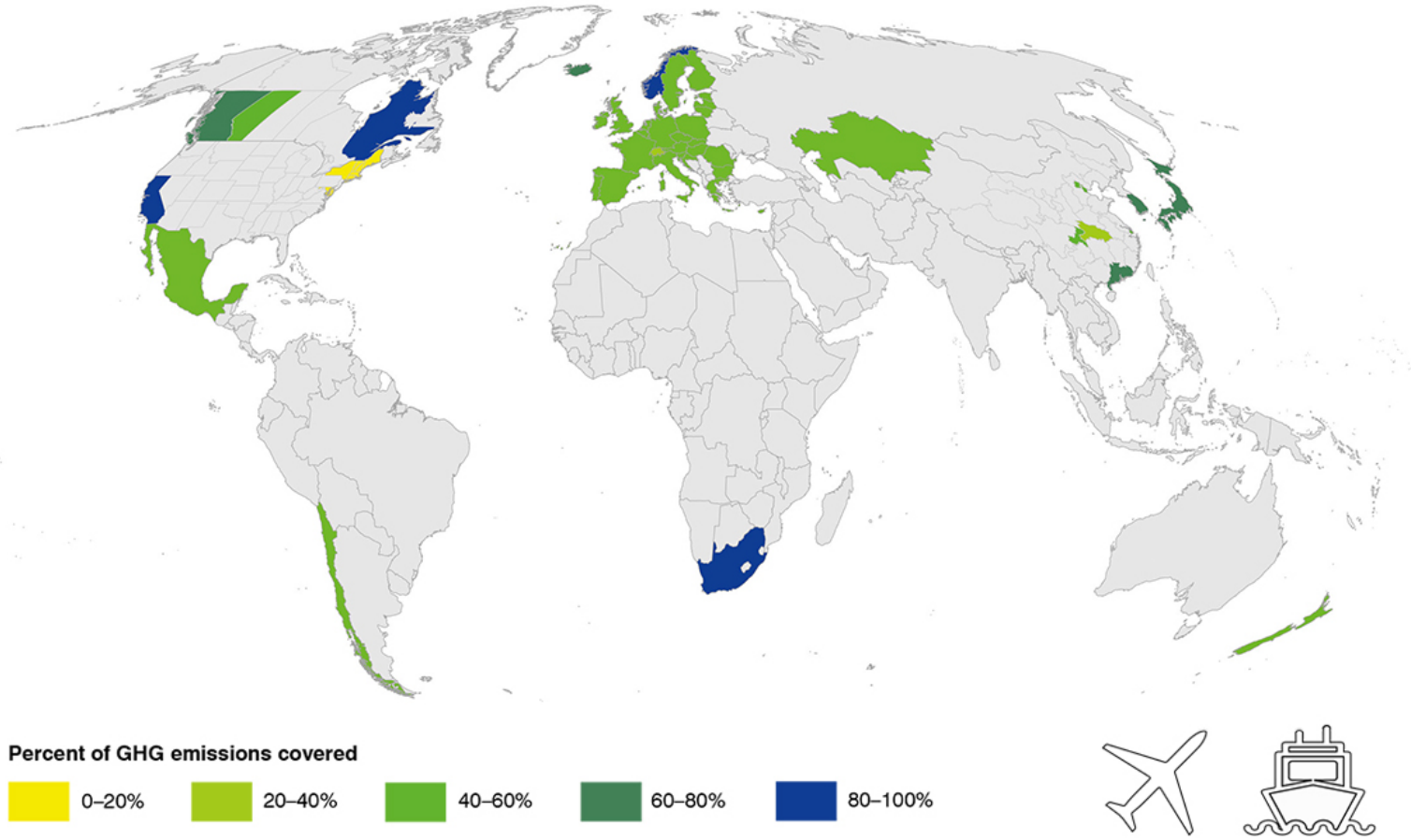

Carbon price model EDF-DRAFTv6-121130.xlsm - Microsoft Excel
Home Insert Page Layout Formulas Data Review View Developer Acrobat
Enter model inputs in blue cells. Advanced control panel allows for a custom price/coverage schedule to be designated.
CONTROL PANEL
Simple
Advanced (scroll right)
Reset
SUMMARY RESULTS (billions)
5-year Revenue Projection (2013-2017): $315.56
10-year Revenue Projection (2013-2022): $700.94
Emission Reduction in 2020 (% of 2005): 24.0%
SOLVER Target (billions)
5-year Revenue Projection (2012-2017): $0
10-year Revenue Projection (2012-20
Emission Reduction in 2020 (% of 2005):
CARBON PRICE DESIGN
Initial Carbon Price ($/tCO2): $15.00
Annual Increment (%): 5.00%
$ per year
% per year
Surcharges
Gasoline Initial Amount ($/gal): $0.184
Annual Increment ($/gal): $0.000
Diesel Initial Amount ($/gal): $0.244
Annual Increment ($/gal): $0.000
Jet Fuel Initial Amount ($/gal): $0.000
Annual Increment ($/gal): $0.000
$/gal per year
% per year
COVERAGE & START YEAR
Sector Coverage (%) Start Year
Residential 100% 2013
Commercial 100% 2013
Industrial 100% 2013
Electricity 100% 2013
Transportation
Aviation 100% 2013
Freight 100% 2013
Ground - Light 100% 2013
Ground - Heavy 100% 2013
Other 100% 2013
DETAILED CONTROL PANEL
*n.b. inflation rate can still be par
Price Schedule 2013 2014 2015 2016
Carbon Price ($/t) $15.00 $15.75 $16.54 $17.36
Gasoline Surcharge ($/gal) $0.184 $0.184 $0.184 $0.184
Diesel Surcharge ($/gal) $0.244 $0.244 $0.244 $0.244
Jet Fuel Surcharge ($/gal) $0.000 $0.000 $0.000 $0.000
Coverage Schedule
Residential 100% 100% 100% 100%
Commercial 100% 100% 100% 100%
Industrial 100% 100% 100% 100%
Electricity 100% 100% 100% 100%
Aviation 100% 100% 100% 100%
Freight 100% 100% 100% 100%
Ground - Light 100% 100% 100% 100%
Ground - Heavy 100% 100% 100% 100%
Other 100% 100% 100% 100%
INFLATION
Yes (nominal $)
No (real 2012$)
Control Panel G-Totals G-Emissions G-Revenues G-Tr-Emissions G-Tr-Revenues Summary Table State Map State Summary Table
Ready Calculate
100%

CO2 tax Sweden 130 $/Ton

Sweden’s tax is exceptional



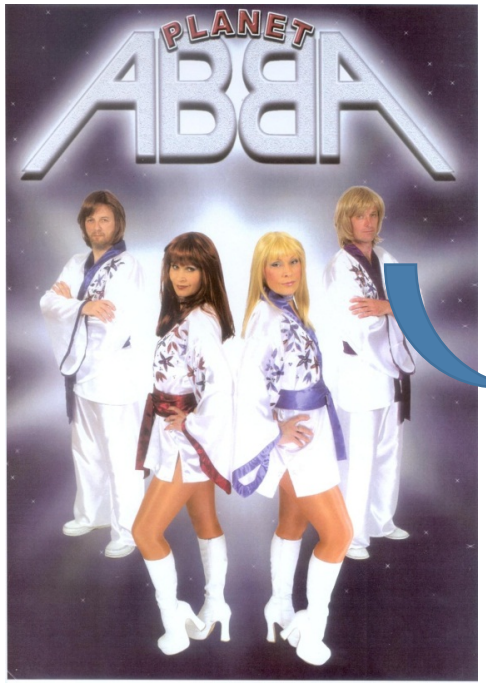
CO2 taxes (coverage)



a big FAT Carbon TAX

- Nordhaus: 17 $/tonne
- Stern speaks of 20-50 $/tonne
- 2017: RGGI 3.00 Chicago 2-3 EU ETS : ~ 5 $
- French Tax: 30 €/tonne
- US 10 or 20
- Swedish Tax **130 $/ton + energy tax, Sulfur tax, N fee, fuel tax VAT etc. Gasoline costs 6$/gal (300-435 $/t)**

SO WHAT?



I wonder how high is the CO2 tax today

Oh no, not one more day
with high CO2 taxes !!

We want to know

- How come tax was passed?
- Political context. EFR. No fossil interests
- What were Effects?
- Complex to say. Taxes have varied. Many other policies too.

CONTEXT Parlament also

- Abolished wealth tax, inheritance tax,
- Modified property tax
- Broadened tax base for VAT etc
- includes Services, energy, télévis., heat etc
- Reduced profit taxes for companies
- Total 10 billion € (30% environnemental)

Applies to

- Coal, Coke, oil, gasoline etc, natural gas, fuels. Household waste 12.6%

Exceptions

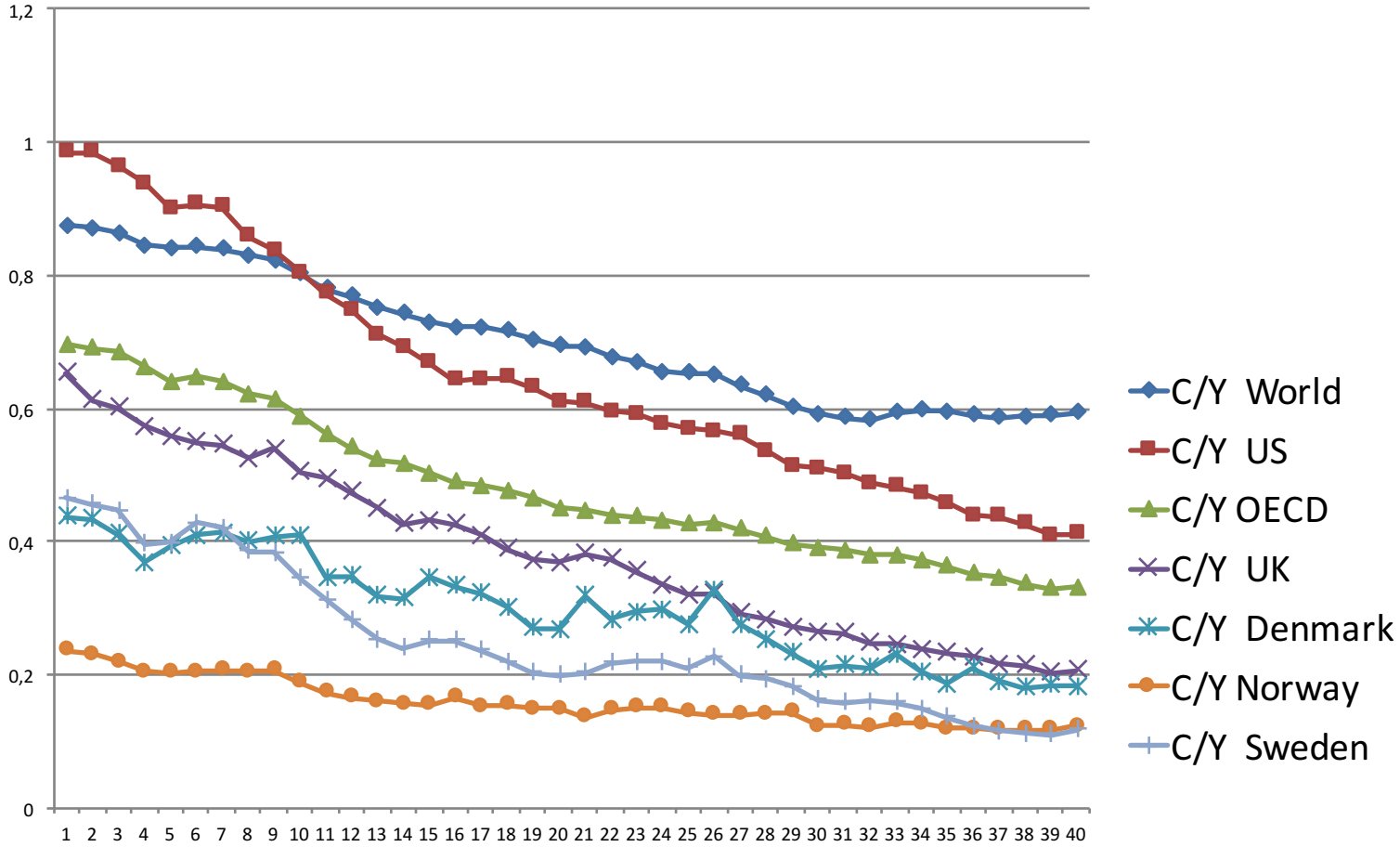
- Industry in ETS.
- Trade exposed business (25%)
- Biofuels
- CH_4, N_2O
- Fishing fleet, Some ag
- Some ships, Airplanes,
- Some rail..

- Coverage – 50%

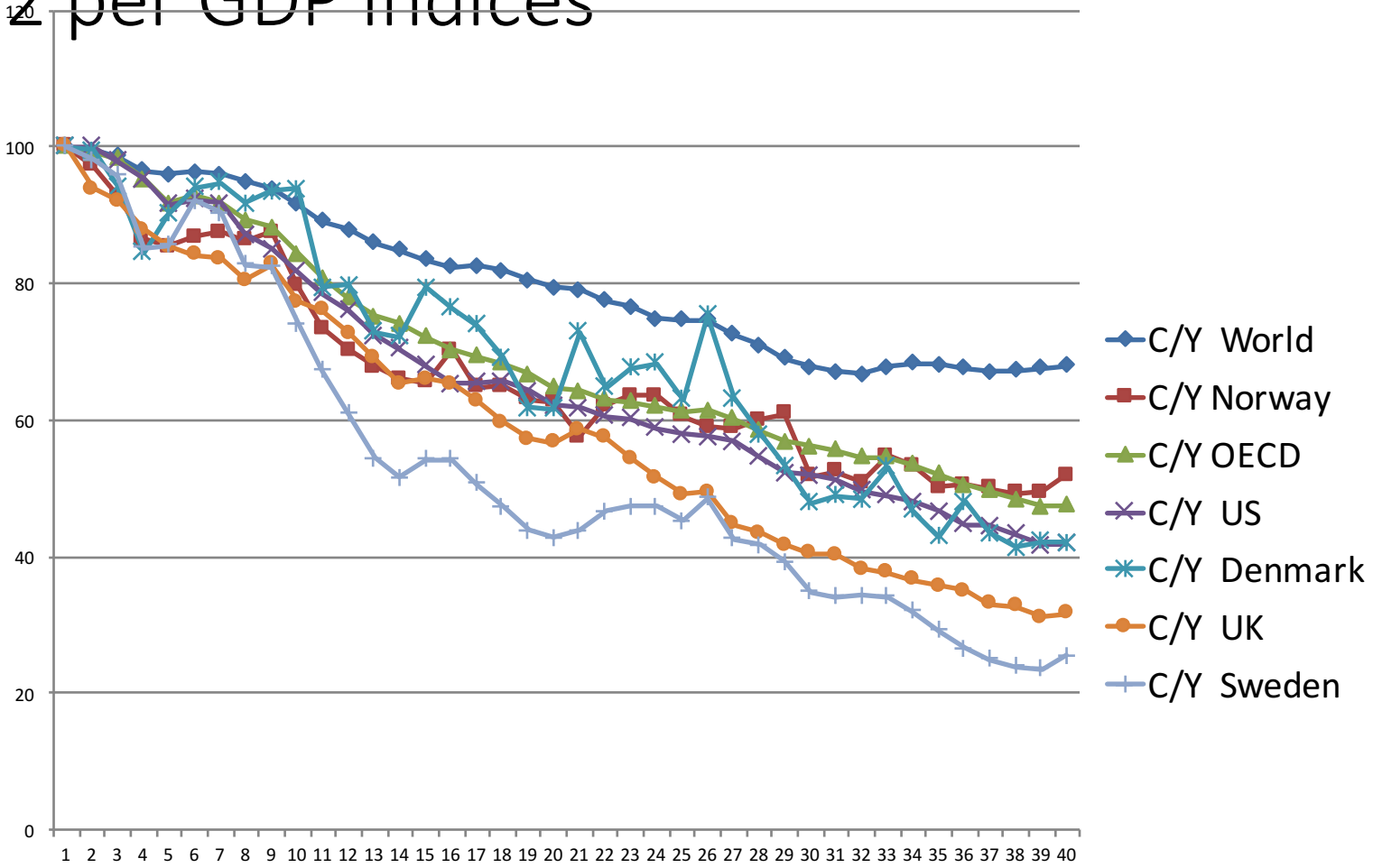
Effect: DECOUPLING

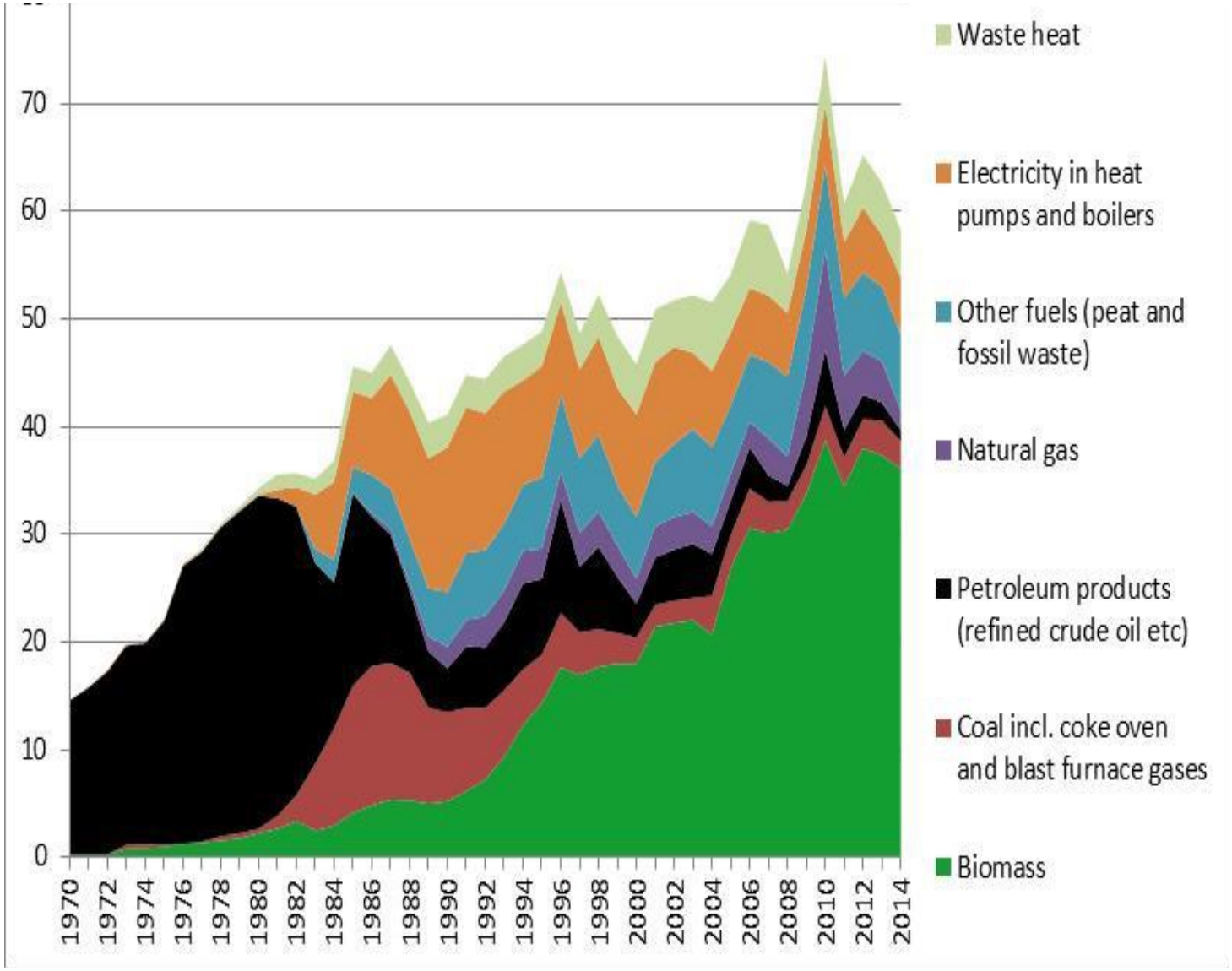
- Se

Tons CO2 / $ GDP

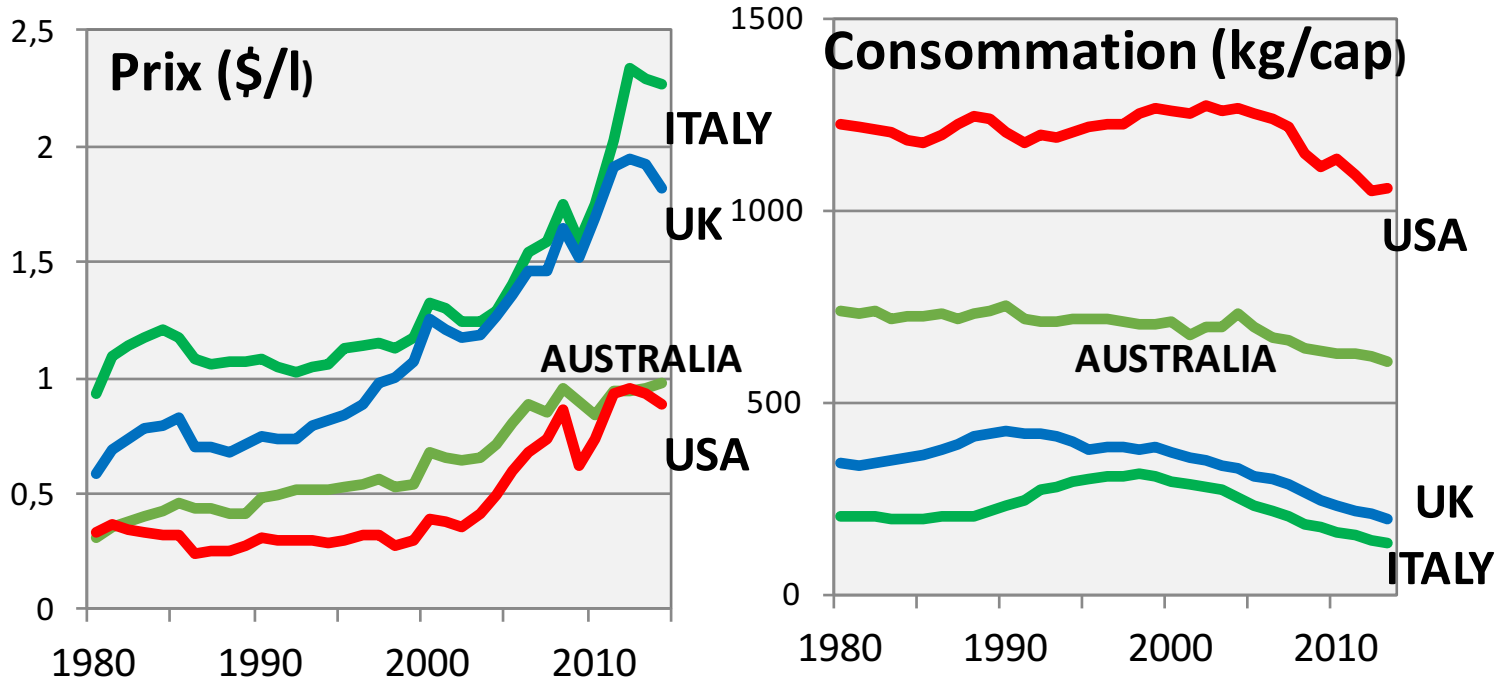

1,2
1
0,8
0,6
0,4
0,2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
C/Y World
C/Y US
C/Y OECD
C/Y UK
C/Y Denmark
C/Y Norway
C/Y Sweden

CO2 per GDP indices




70
60
50
40
30
20
10
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
Waste heat
Electricity in heat pumps and boilers
Other fuels (peat and fossil waste)
Natural gas
Petroleum products (refined crude oil etc)
Coal incl. coke oven and blast furnace gases
Biomass

Prix de l'essence et émissions



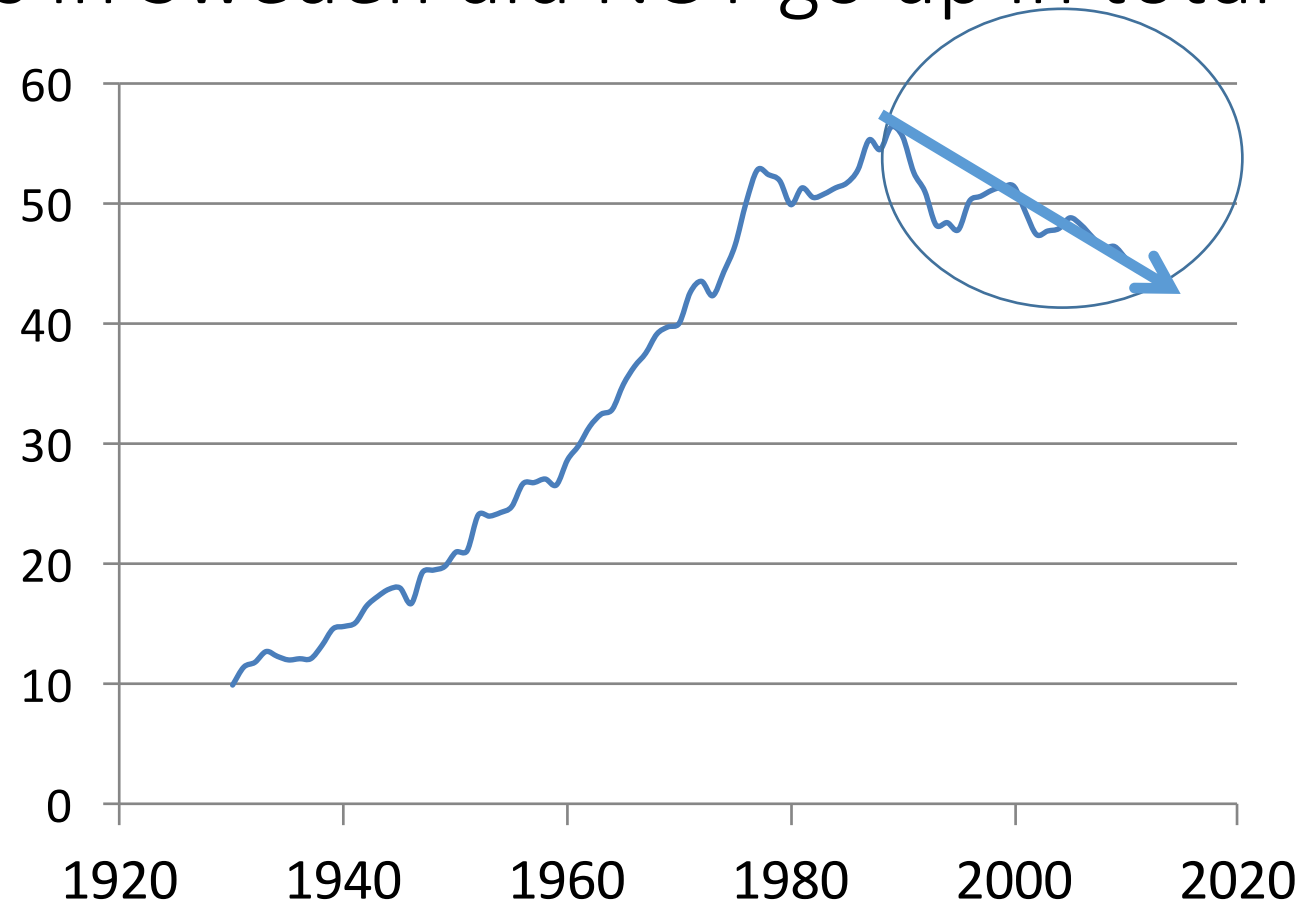
Transport Fuel Use in OECD
Gtons fuel (and ~C*(12/14))

	Real	UK prices	US prices
Fuel use	**1,13**	0,72	1,47
		-36%	+30%

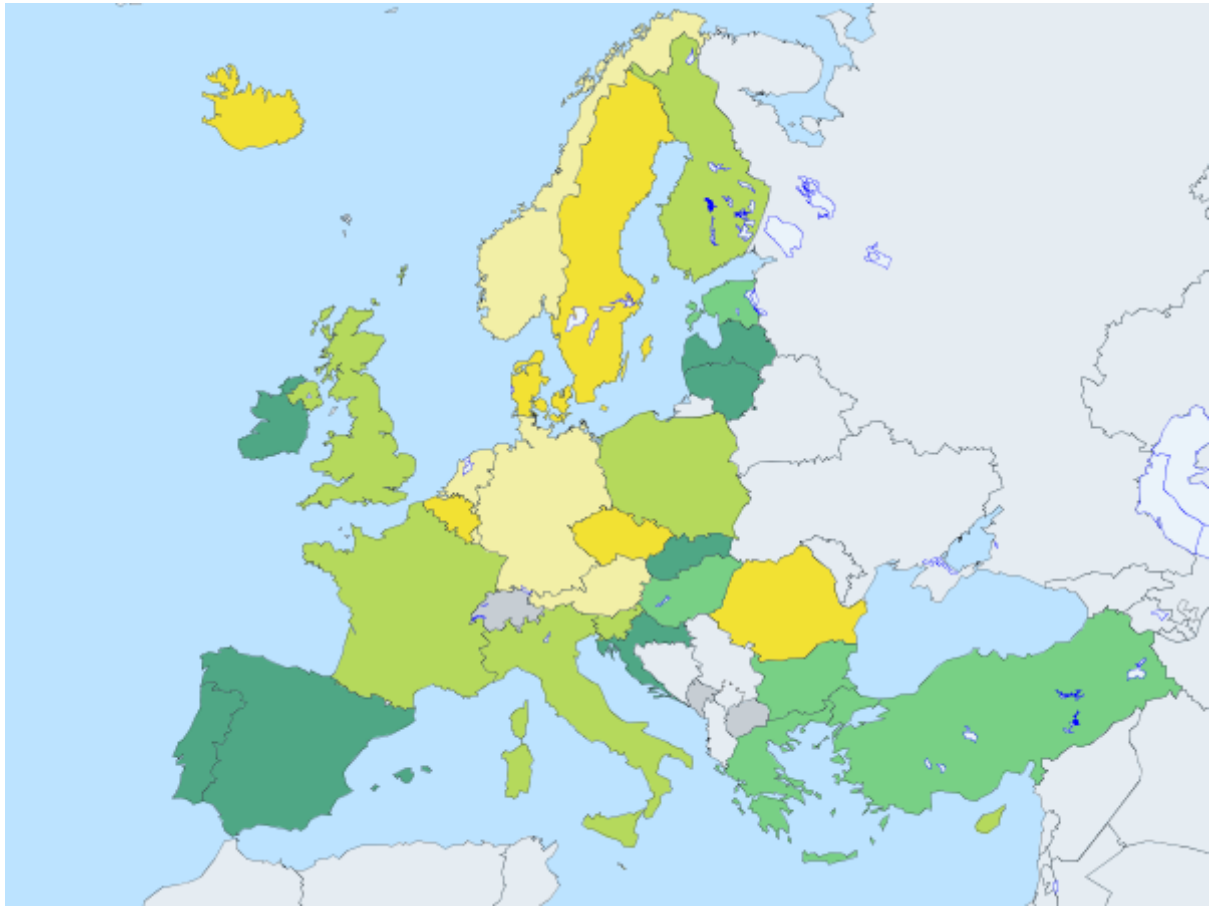
Carbon Tax

	Billion €
CO2	3
Tot Env	10
Tot Taxes	111
GDP	367

Taxes in Sweden did NOT go up in total



Unemployment not higher



Is this all due to Carbon taxes?

- Green Certificates,
- Regulations
- Efficiency Subsidies to municipalities
- Hydro and nuclear; no fossil
- Susidies to renewables
- ETS

- Hard because policies are – broadly speaking – collinear.
- Many decisions taken at different levels of jurisdiction

Fiscal Federalism & Interjurisdictional Externalities

Air Quality Regulations in Sweden

Jessica Coria, Magnus Hennlock and Thomas Sterner
University of Gothenburg
May 2017

Coexistence of federal and local policies

- Nature of overlap,
- Relative stringency
- Type of instruments

Conclusions

- Local regulation weaker than Federal
- Results holds regarless of regulatory timing.
- Williams III (2012). J of Pub Econ 96:1092-9

National /local policies for NOx in Sweden

- High tax AND stringent ELVs
- Theoretical model of combined effects
- Actual data to test hypotheses.

First Best

- Let us assume that the regulatory objective is to minimize the sum over all the counties of pollution plus the costs of reducing emissions:

$$\min_{e_i} \sum_{i=1}^{n} \left[C_i(e_i) + D_i(e_i, E) \right],$$

FOC for e_i:

$$-\frac{\partial C_i(e_i)}{\partial e_i} = \frac{\partial D_i(e_i, E)}{\partial e_i} + \sum_i \frac{D_j(e_j, E)}{\partial E}.$$

Differentiated taxes

$$\tau_i = \frac{\partial D_i(e_i, E)}{\partial e_i} + \sum_j \frac{\partial D_j(e_j, E)}{\partial E}.$$

But Federal level sets ONE (average) tax and local level optimizes ELVs

$$T = \frac{1}{n}\sum_{i=1}^{n}\frac{\partial D_i(e_i, E)}{\partial e_i} + \sum_{j}\frac{\partial D_j(e_j, E)}{\partial E}.$$

$$-\frac{\partial C_i(e_i)}{\partial e_i} = \frac{\partial D_i(e_i, E)}{\partial e_i} + \frac{\partial D_i(e_i, E)}{\partial E} + T\left[1 - r_i\right]. \tag{6}$$

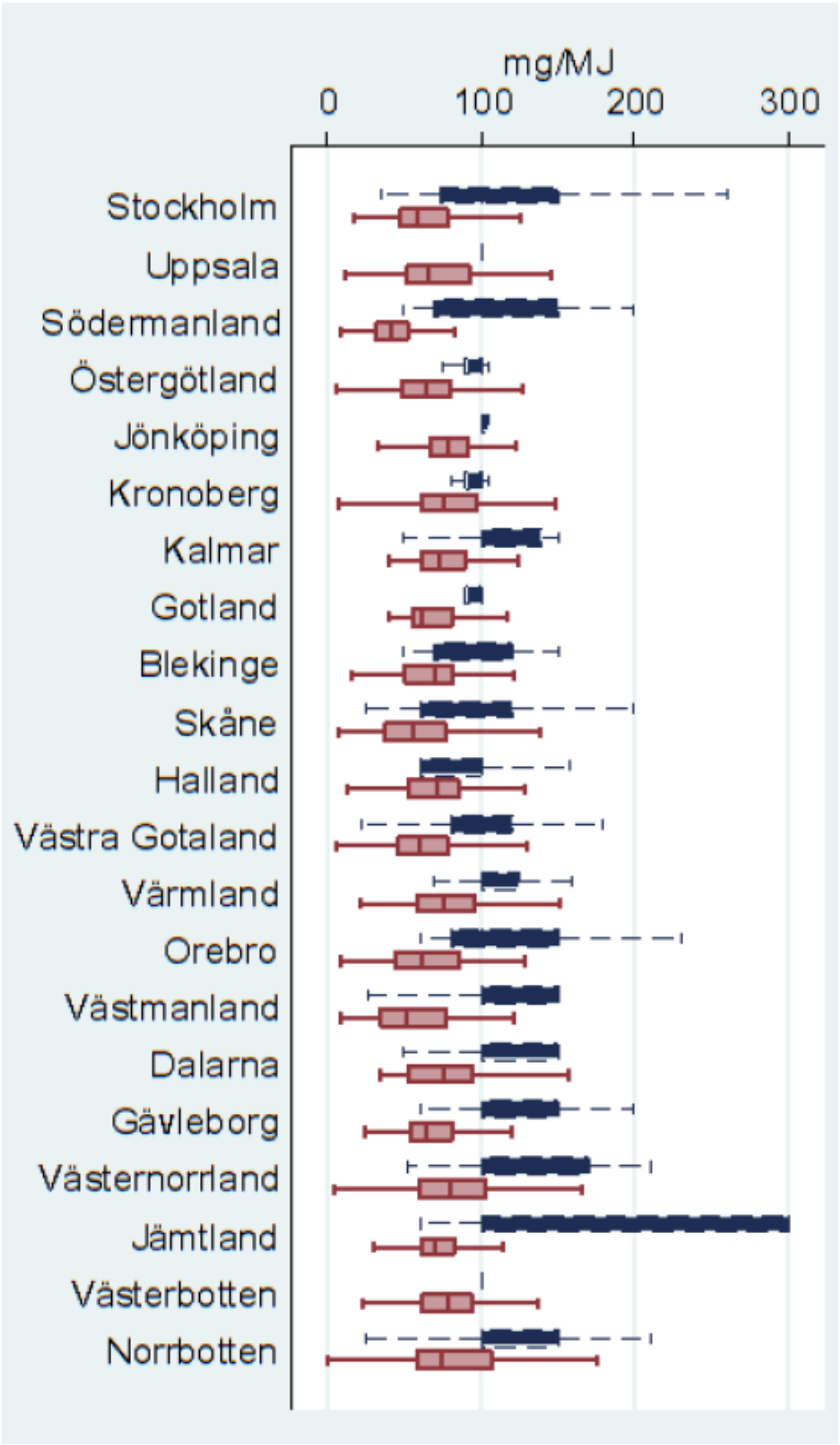
From equation (6) we know that counties set emission limits such that marginal cost equals marginal damage (including only damages within the county and not damage to other counties) plus

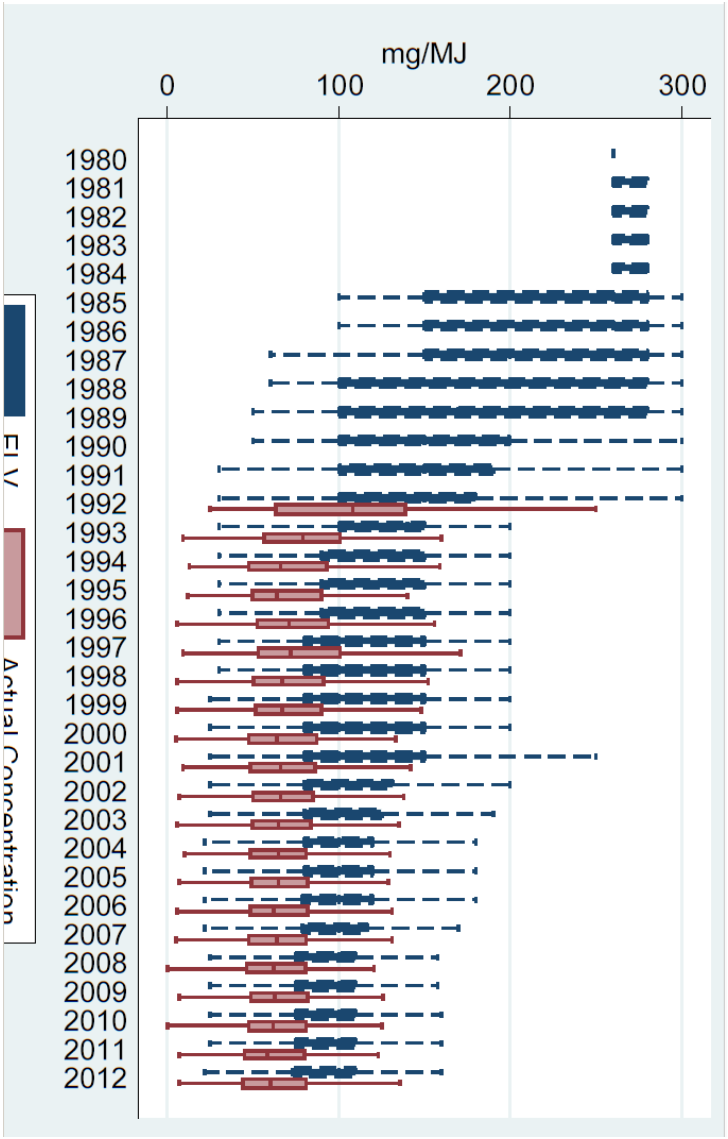
Emission Limit Values

- Introduced in the 1980s . Determined by county authorities; boiler specific, vary with sector.
- We collected information about ELVs for the firms regulated under the NOx charge for the period 1980-2012.
- We focus on ELVs expressed in mg NOx per MJ added energy (to make it comparable to the NO_x charge).

Classify plants

- G_1: in operation before 1992, ELV enforced before the implementation of the charge and **never** been subject to the charge.
- G_2: in operation before 1992, ELV enforced before the implementation of the charge and also subject to the charge after 1992.
- G_3: started operations after 1992 that have only been subject to the NOx charge.
- G_4: started operations after 1992, subject to both regulations, but ELV implemented first.
- G_5: started operations after 1992, subject to both regulations, but charge implemented first.


mg/MJ
0
100
200
300
Stockholm
Uppsala
Södermanland
Östergötland
Jönköping
Kronoberg
Kalmar
Gotland
Blekinge
Skåne
Halland
Västra Gotaland
Värmland
Orebro
Västmanland
Dalarna
Gävleborg
Västernorrland
Jämtland
Västerbotten
Norrbotten


mg/MJ
0
100
200
300
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
ELV
Actual Concentration

Psychological aspects to the setting of ELVs