CARBON TAXATION SCHEMES – AN OVERVIEW OF DESIGN SCHEMES THROUGHOUT THE WORLD

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Content

- Something on the theory behind carbon taxation
- The political reality – existing carbon taxation schemes
- Academia/science versus political reality - how to deal with the 'interface between science and policy'
- Reflections

Economic theory – carbon taxation scheme

Economic theory for having a cost-effective and efficient carbon taxation scheme: all sources would be covered by the and the tax rate '*would be set equal to the marginal benefits of emission reduction, represented by estimates of the social cost of carbon*' (Aldy and Stevens, 2012)

Key characteristics of an optimal carbon taxation scheme:

- Tax levied on all (theoretically) sources of emissions
- Tax based on emissions and not on energy content or value (i.e. ad-valorem tax)

CO2 tax implemented upstream (at the earliest point in the production process) and not downstream (emitters)

Tax based on the carbon content of the energy products

Existing CO2 taxes – how are they implemented?

- Adding to existing energy taxation schemes (excise tax on energy products): Denmark, Norway, British Columbia, Mexico, etc.
- Substituting part of existing energy taxation schemes (excise tax on energy products) – Sweden when CO2 tax was introduced; increase in CO2 tax rate in Finland (2013 – heating fuel) was offset by reduction in energy tax rates

Design issues:

- Adding to existing excise tax (energy) but increase based on achieving / non-achieving quantitative (reduction) targets (Switzerland)
- Linking to emission trading scheme (ETS)
  - Setting CO2 tax rates (Iceland)
  - Carbon floor price (UK)
- Carbon tax/fee but companies can offset tax liabilities via offset credits, i.e. part of a climate policy legislation (Alberta as well as in the South African CO2 tax proposal)

CO2 taxes - coverage of economic sectors in selected countries

Country (year of introduction)	economic sector					
	industry - EU ETS	industry - non EU ETS	electricity generation	service	transport	households
Finland (1990)		x		x	x	x
Norway (1991)	partly (petroleum sector)	x				
Sweden (1991)		x		x	x	x
Denmark (1992)		x		x	x	x
UK - CCL (2001)	x	x				
Canada - Alberta (2007)	x	x				
Switzerland (2008)		x		x		x
Canada - British Columbia (2008)	x	x		x	x	x
Iceland (2009)				x	x	x
Ireland (2010)		x		x	x	x
UK - CRC (2010)		x		x		
UK – CPF (carbon price floor) (2013)			x			
Japan (2012)	x	x		x	x	x
France (2014)		x		x	x	x
~~Australia (repealed 2014)~~	~~x~~	~~x~~	~~x~~			
Mexico (2014)	x	x		x	x	x
South Africa (planned from 2016)	x	x	x	x	x	x
Chile (planned from 2017)			x			

Source: Speck (forthcoming)

CO2 taxes - coverage of energy products in selected countries

Country	energy products					
	oil - transport	oil - heating	coal	natural gas	electricity	emissions / consumption (limit)
Finland (1990)	X	X	X	X		
Norway (1991)	X	X	X	X		
Sweden (1991)	X	X	X	X		
Denmark (1992)	X	X		X	X (households)	
UK - CCL (2001)		X (LPG)	X	X	X	
Canada - Alberta (2007)						X
Switzerland (2008)		X	X	X		
Canada - British Columbia (2008)	X	X	X	X		
Iceland (2009)	X	X				
Ireland (2010)	X	X	x	X		
UK - CRC (2010)				X	X	> 6000 MWh per year
UK – CPF (2013)		X	X	X		
Japan (2012)	X	X	X	X		
France (2014)	X	X	X	X		
Mexico (2014)	X	X	X			
~~Australia (repealed 2014)~~		~~X~~	~~X~~	~~X~~		
South Africa (planned from 2016)	X	X	X	X	X	
Chile (planned from 2017)						>50 MW thermal power plants capacity

Source: Speck (forthcoming)

CO2 taxes – rates and coverage of CO2/GHG emissions

	CO2 tax rate - € per tonne CO2	coverage – in % of CO2 emissions	comments
Finland (2014)	70 - 35	33	differentiation between transport and heating
Norway (2014)	28 – 51	75	Diesel – natural gas/offshore
Sweden (2014)	119.2	41	
Denmark (2013/4)	22.4	59	
UK - CCL (2014)	5.2 – 18.6	35	LPG - electricity
Canada - Alberta (2007)	10.1		
Switzerland (2014)	49.2	35	possible increase – up to €98 (2016-2018)
Canada - British Columbia (2014)	20.1	70	
Iceland (2014)	7		
Ireland (2014)	20	60	
UK - CRC (2014)	14.8 (21.8;14.7)	10 (GHG)	Electricity; natural gas
UK – CPF (2014)	12 (22)		tax £9.55 (carbon price floor £18) – fixed until 2019/2020
Japan (2012)	1.5		Increase to €2.3 (JPY 289) in 2016
France (2014)	7.0		€14.5 (2015); €22 (2016)
Mexico (2014)	2.6		Tax offset by CDM projects
~~**Australia (repealed 2014)**~~	~~15.54~~	~~60 (GHG emissions)~~	
South Africa (planned from 2016)	10.3		annual increase 10% until 2019 / offset scheme to reduce tax liability
Chile (planned from 2017)	3.7		

Source: Speck (forthcoming)

Sciene/academic vs political reality

Our goal is to consider the design of an ideal [carbon] *tax, a tax that best trades off the internalization of emissions externalities with administrative and collection costs. We do not generally consider the political concessions that will be necessary to enact the tax, leaving that to the give-and-take of the political process* (Metcalf and Weisbach, 2009).

Political economy analysis, in which the interaction of economics and political reality is emphasised, explains the gap between theoretical ideals and practical reality. …. The end-result may well be nth-best solutions which simply have to be 'lived with'. But there may also be room for design improvements that still honour the political constraints of policy design (Pearce, 2006).

Reflections

- Academic focus is regularly driven to calculate the *optimal tax* (social cost of carbon – follows the tradition of a Pigouvian tax)
- Focusing only on carbon taxation schemes is somehow too 'short' - Ministry of Finance / Sweden (2010):

  The energy tax and CO2 taxes are to be seen in combination, as two tax components rather than as two separate taxes. …. Sweden has used the taxes as instruments to support various objectives.
- Still a long way to go to understand carbon taxation scheme:

KPMG Green Tax Index, 2013 - a carbon tax: *India's carbon tax is specific to coal only (50 Indian rupees per ton of coal produced or imported);* tax rate was increased to 100 INR (€1.3) in the meantime) – BUT why listed as a carbon tax?

Reflections

Political reality is rather different and challenging

- trade-off / compromise between different government interventions (ETS, energy taxes, Feed-in Tariff schemes, fossil fuel/energy subsidies)

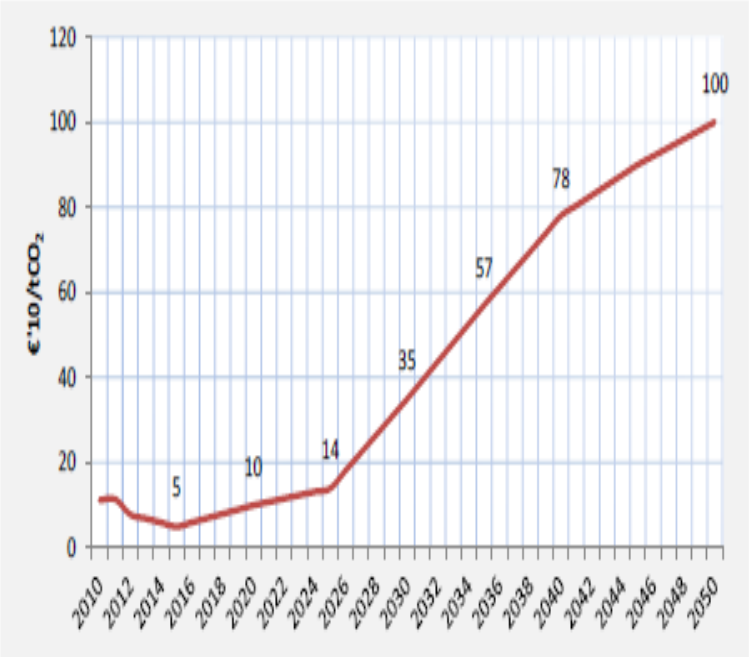
- EU's commitment of GHG emission reduction by 80% to 95% by 2050 – Baumol and Oates: standard price approach (examples: Switzerland and Metcalf's (2009) proposal of a 'Responsiveness Emission Autonomous Carbon Tax (REACT)')

- Focus should more directed to the analysis of long-term trend of carbon prices

Reflections

- ETS price development – annual average increase by 8% between 2020 and 2050 – achieving the EU ETS reduction target (decrease of 1.74% p.a. during the period)
- Social cost of carbon – annual average increase by 1.4%

FIGURE 11: PROJECTION OF THE ETS PRICE



Source: EC, 2014

Revised Social Cost of CO_2, 2010 – 2050 (in 2007 dollars per metric ton of CO_2)

Discount Rate	5.0%	3.0%	2.5%	3.0%
Year	Avg	Avg	Avg	95th
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

Source: Interagency Working Group on Social Cost of Carbon, November 2013