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A Global Carbon Market?

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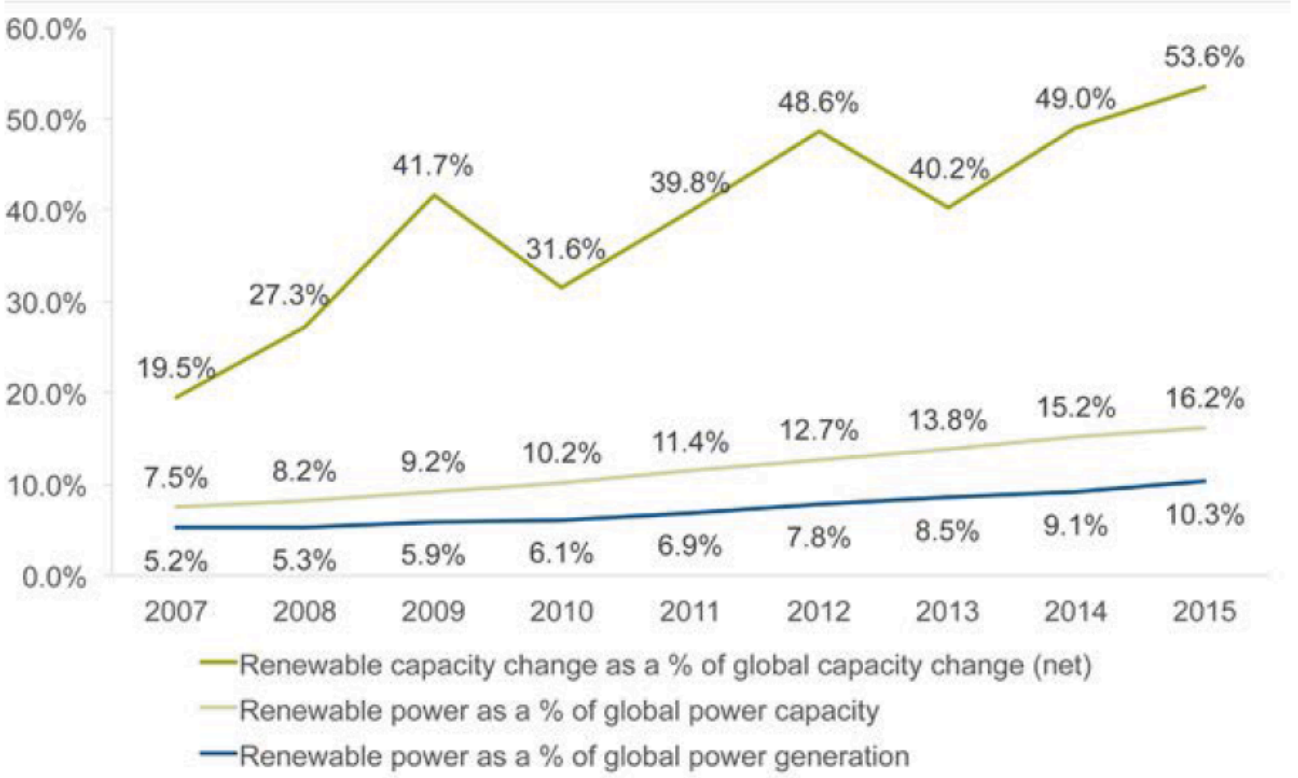
7th Atlantic Workshop on Energy and Environmental Economics (AWEEE)

A Toxa

Spain

An energy transition: global trends in power sector investment

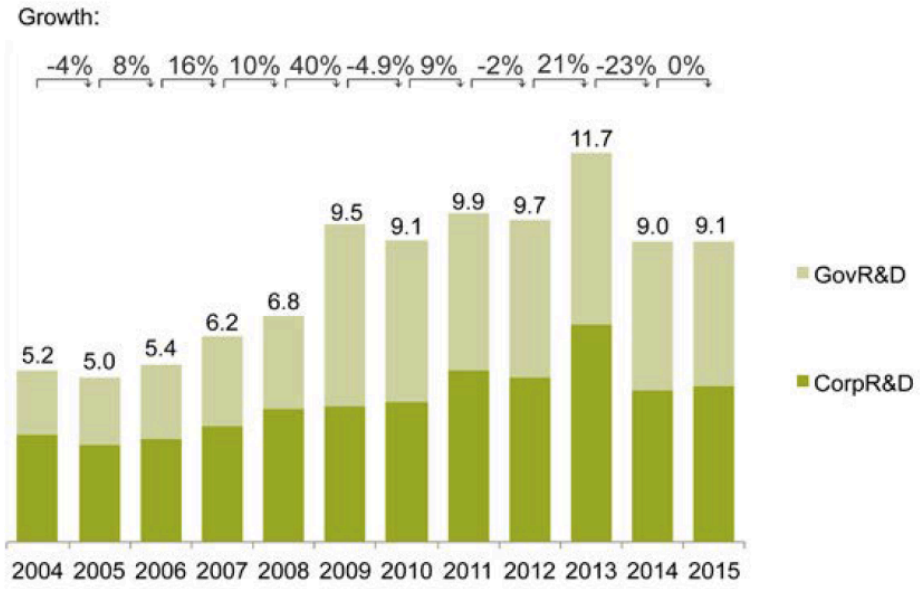
FIGURE 24. RENEWABLE POWER GENERATION AND CAPACITY AS A SHARE OF GLOBAL POWER, 2007-2015 %



Source:
UNEP/BNEF (2016) *Global Trends in Renewable Energy Investment*, 2016, p.30.

An energy transition: Global R&D in Renewables

FIGURE 54. R&D INVESTMENT IN RENEWABLE ENERGY, 2004-2015, $BN



Source: Bloomberg, Bloomberg New Energy Finance, IEA, IMF, various government agencies

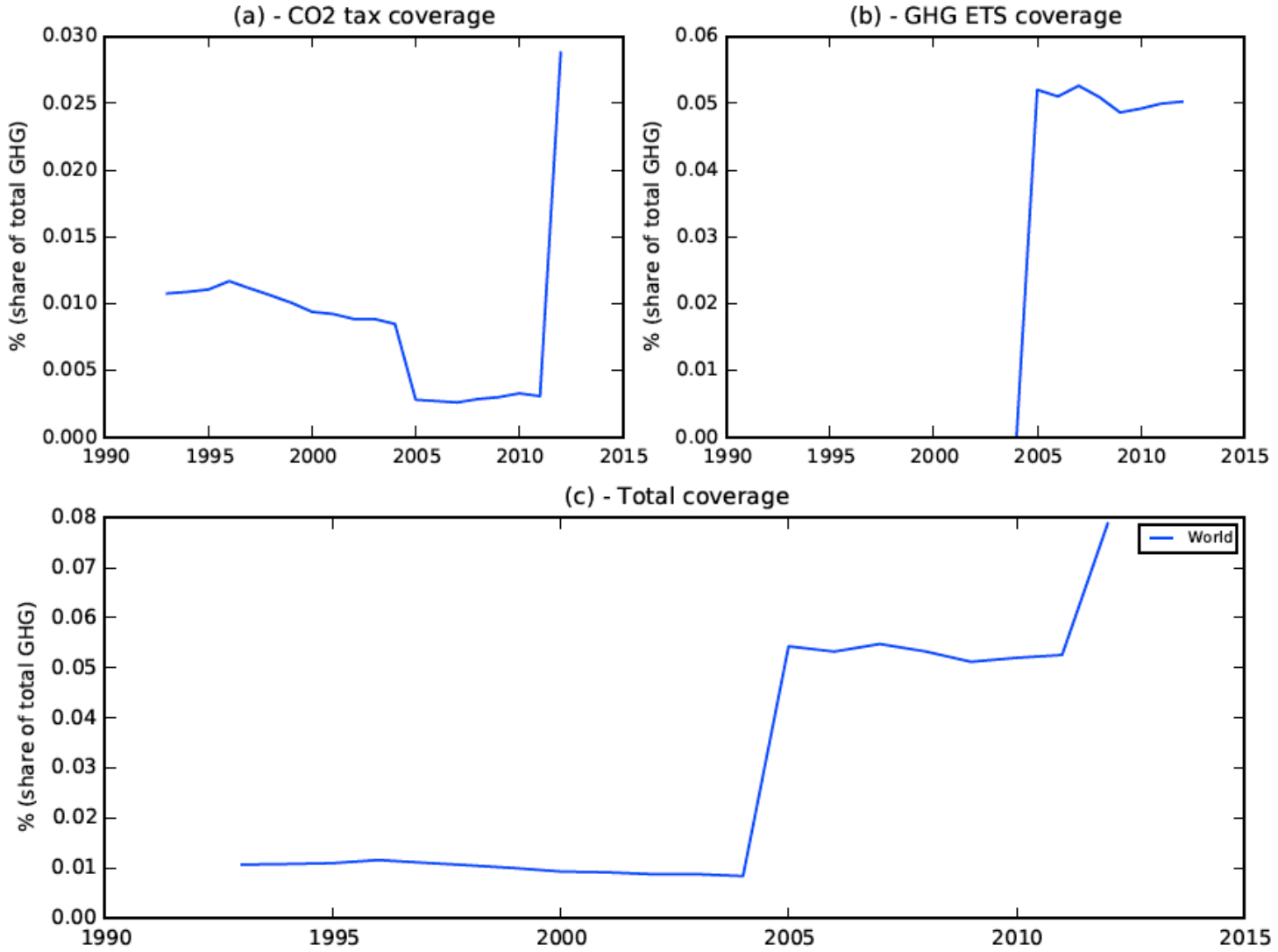
Source:
UNEP/BNEF (2016) *Global Trends in Renewable Energy Investment*, 2016, p.72.

Fossil Fuel subsidies globally, $493bn in 2014.
Renewable Subsidies globally, $112bn in 2014.
Source: IEA (2015) WEO.

Basic Thesis

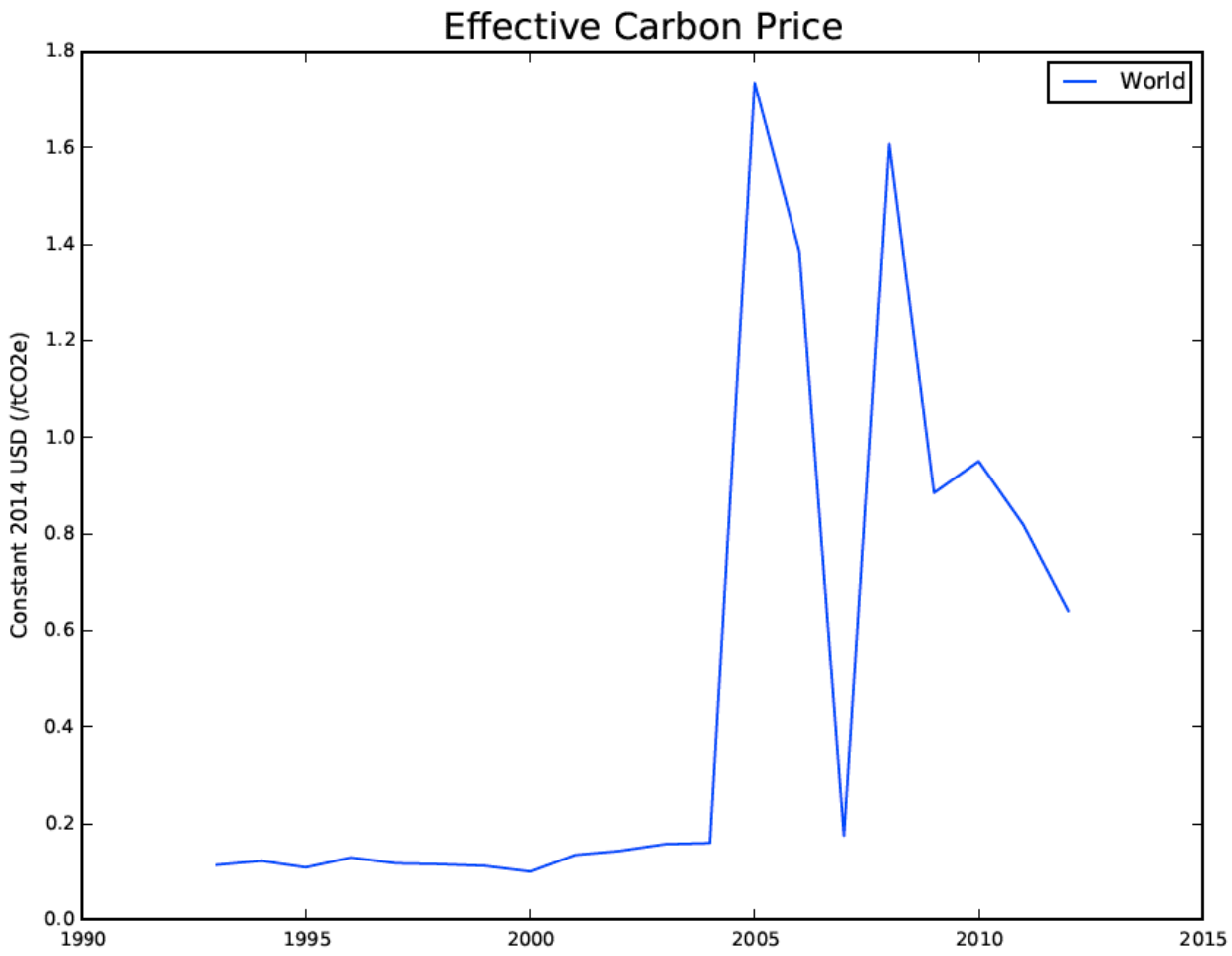
- The policy solution to excessive emissions of GHGs is well established:
  - In theory
  - In (*very* large scale) experiments
- The policy community (a.k.a. climate scientists) should stop suggesting that we do not know what to do about climate change. In 2015 we spent est. $9.1bn p.a. on RES RD+D and in power global RES investment is closing in on global fossil investment (UNEP/BNEF, 2015).
- We should (simply!) implement a reasonably comprehensive set of quantity restrictions on CO2e, building on EUETS experience.

Coverage of carbon pricing



Source: Dolphin et al., 2016.

Effective Global Carbon Price



Source: Dolphin et al., 2016.

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Outline

- A global carbon market?
- The EU ETS: Progress and Prospects
- The Australian Carbon Tax Lessons
- Issues

Basic facts of carbon markets

- Carbon markets have most value in the early stages of decarbonisation. They help with:
  - the mix of sectors to decarbonise
  - the mix of existing low carbon technologies per sector
  - the mixing demand side reduction and substitution
  - guiding consumer and climate NGO pressure.

- They are about identification of low cost decarbonisation within a general equilibrium (i.e. multiple interconnected markets) setting.

Basic facts of carbon markets

- Many don't like carbon markets precisely because they deal so effectively with the general equilibrium issues.
- They are transparent and highlight:
  - Differences between included and non-included parties
  - Incidence of final costs and prices, especially to consumers
  - Financial flows within and between countries
  - The cost impact of political interventions
  - Lowest cost interventions and restrain special interests
- Basically, political opposition to the use of carbon markets is based on the fact that they do work in a predictable way.

A global carbon market?

- What are the characteristics of a global market?
- All that needs to be true is that markets are interconnected enough for major price differences between significant regions to be arbitraged.
- This does not require a single trading platform or integrated regional platforms (as for oil, or foreign currency).
- It can involve a combination of markets and administered prices (i.e. taxes).
- Over time price convergence is likely, though not certain, if costs of non-alignment are large.

A Global Carbon Market?

Basic parameters:

- Global carbon market:
- 49,000 m tonnes CO2e in 2014
- *$100 per tonne CO2e (true cost of carbon?)
- =$4900 bn per year
- *In reality perhaps 10,000 m tonnes at $80 per tonne, with 10% traded = $80 bn p.a. traded (memo: Aid budget: $135bn)*
- For comparison: Global oil market:
- 85 million barrels per day
- * 365 days * $100 per barrel
- = $3102 bn per year

Top ten emitters of GHGs globally (inc LUFC) 2012 (WRI CAIT database)

China	22.4%
US	12.2%
EU	8.7%
India	6.1%
Indonesia	4.2%
Russia	4.7%
Brazil	3.8%
Japan	2.5%
Canada	1.8%
Mexico	1.6%
Total	68%

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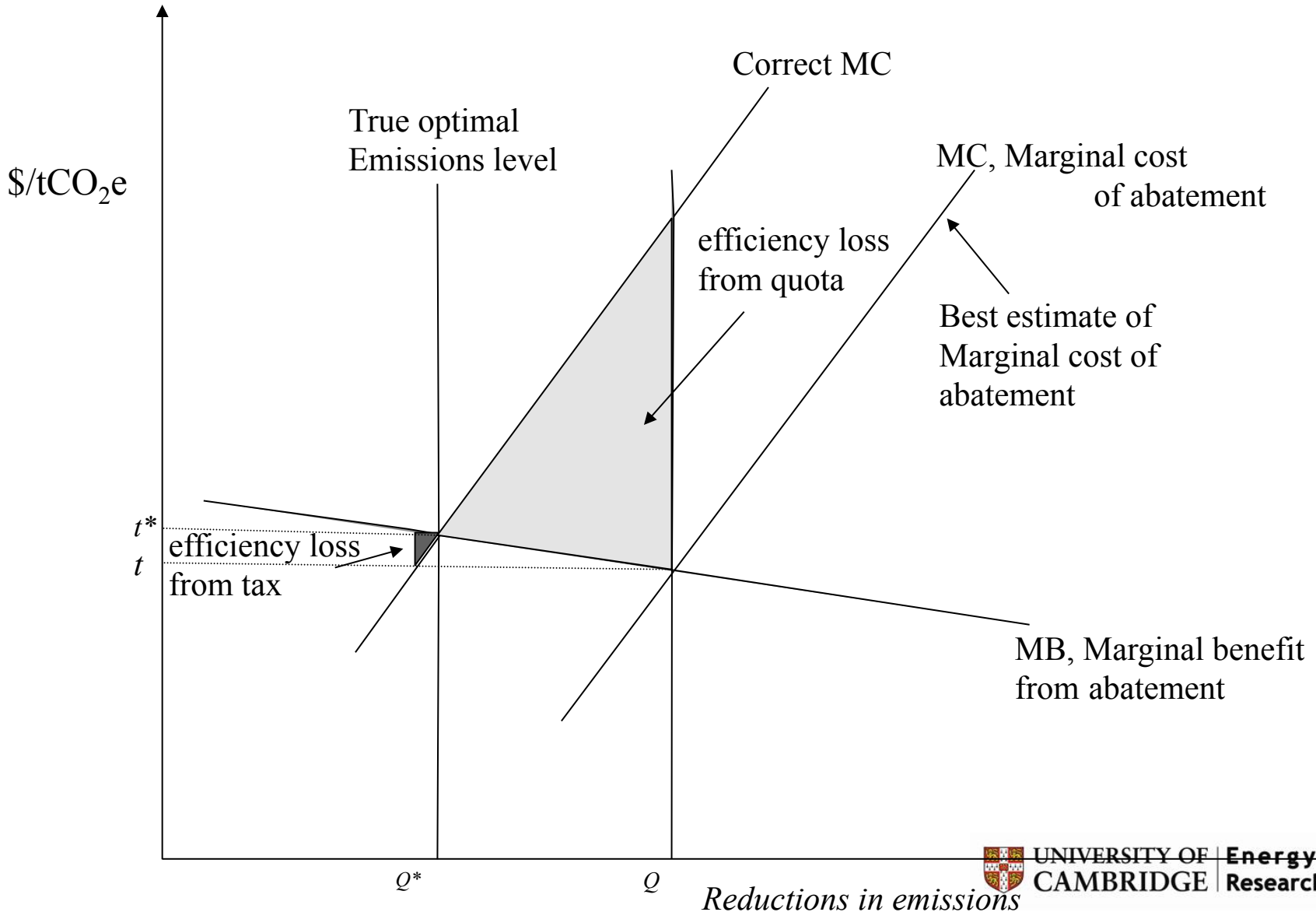
Basic Numbers for carbon markets

- There are c.190 states in the world
- G20 + Spain = 85% of world GDP
- G20 + Spain = 77% of world CO2e (exc LUCF)
- Plus next 10 country emitters =85% of world CO2e

- The EUETS has 31 countries participating.
- Of the G21, 6 (inc. EU) are in the EUETS.
- Of the OECD-34, 21 are in the EUETS.
- Of the rest many are in the spheres of influence of the largest 31 emitting countries.
- This is not primarily a problem of negotiation

Carbon Taxes or Carbon Markets? Weitzman argument: Costs of errors setting quantities



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Is coordinating on price is better than on quantities?

- If the slope of the marginal cost (MC) of abatement curve is steeper than the slope of the marginal benefit (MB) of abatement curve, then better to set tax than set quantity if there is uncertainty in MC curve (Weitzman, 1974).

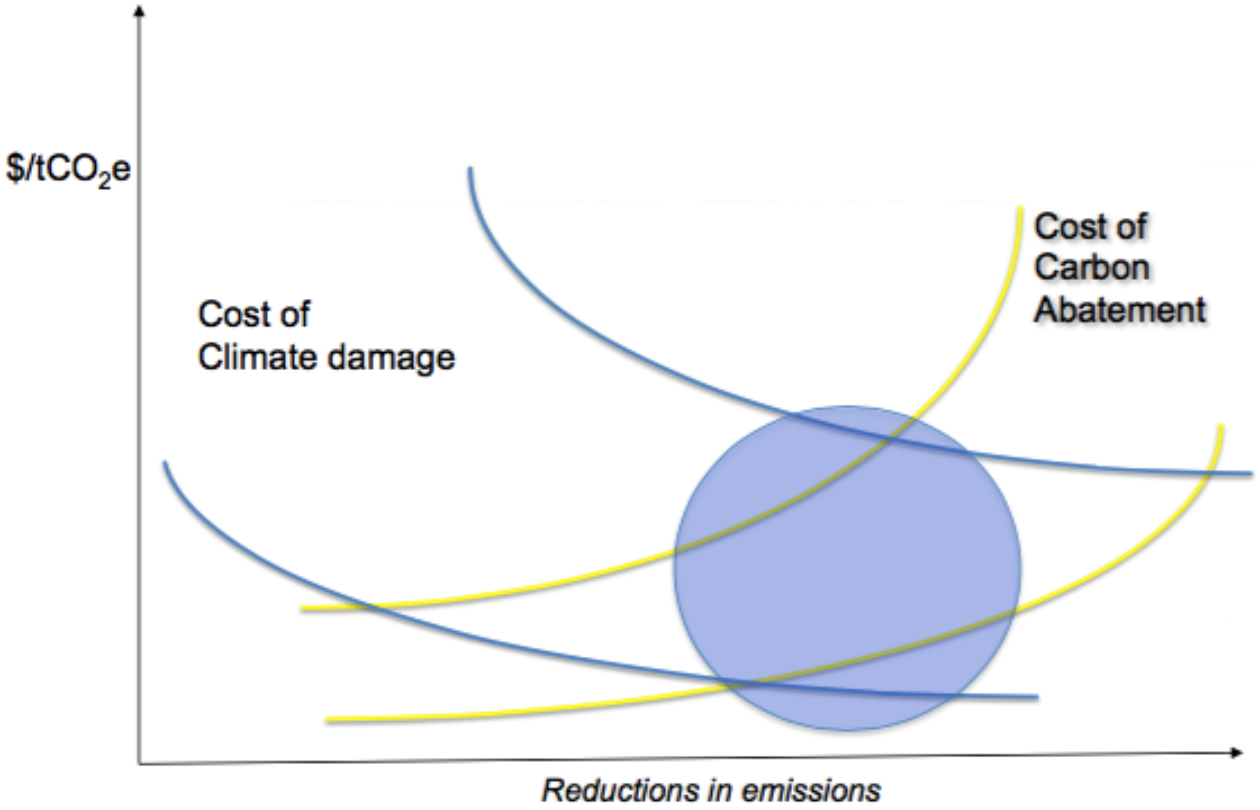
- ***But…***
- The Weitzman result depends on relative slopes of two curves and he suggests extreme cases where relative costs of setting taxes is high is more 'likely' than extreme cases where setting quantities is bad.
- If there is no uncertainty in the MC curve but only in the MB curve then cost of mistakes same under both.
- If the MB curve is kinked (due to discrete jumps in costs of climate change) then better to set quantities.

Is coordinating on price is better than on quantities?

- ***Implies that…***
- If there is a lot of uncertainty in the marginal benefit curve (i.e. we don't know where the climate damage effects exactly kick in or how world society would adjust if they did) and…
- If the marginal cost of abatement is actually well defined / lower than we predict then unlikely that mistake in quantity worse than in price.
- In fact, quantities would be tightened over time, leading to incorporation of learning on position of curves.

In a picture….

Figure 2: A Better Argument?
Prices Harder to Identify than Dangerous Quantity



Source: Grubb and Newbery (2008, p. 282)

Why coordinating on quantities is better than on prices

- *Some different theory:*

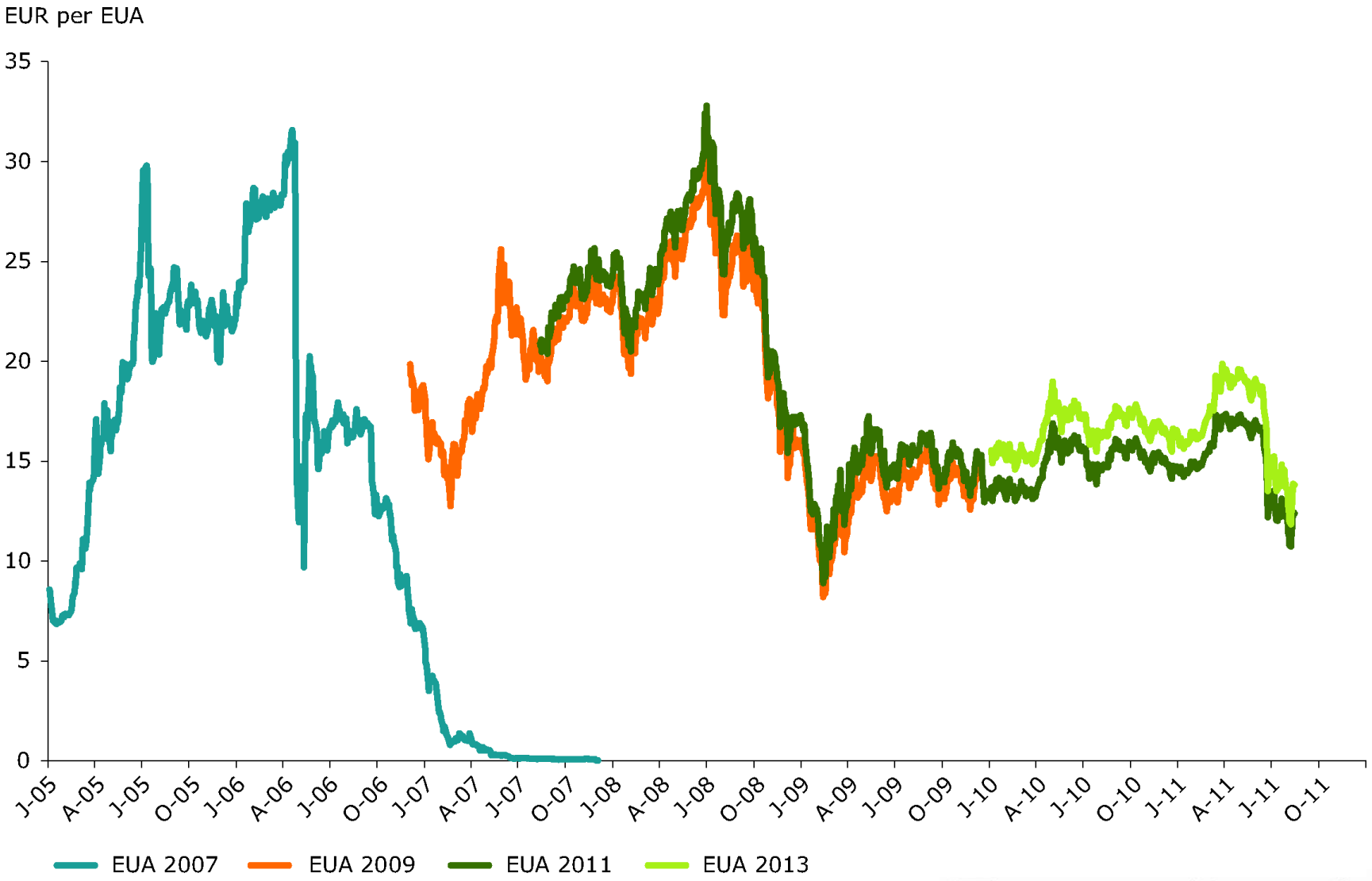
- *Climate Science* can and does frame the problem as being about the specific quantity of GHGs emitted (e.g. Max = c.1000 GTC) (e.g. Allen et al., 2009). Quantity limitation coordinates the economic framing and the scientific framing.
- *Legal precedents* especially on ownership and sovereignty must be respected. Tradable quantities with initial allocations of pollution rights are consistent with the current basis of property rights and trade in a way that a coordinated tax rate is not.

Why coordinating on quantities is easier than prices

- *A lot of evidence:*

- The EU could not agree on a carbon tax but could on a trading system.
- No example globally of any exact coordination on taxes.
- Taxes difficult to adjust and coordinate within countries.
- Energy taxation on different fuels shows wide variance within and between countries…
- Specifically vested interests find it easy to keep taxes at a low level or gain lots of exemptions, due to lack of transparency…
- Carbon taxation has had only limited application and proved domestically controversial…

EU ETS – price history



Source: http://www.eea.europa.eu/data-and-maps/figures/eua-future-prices-200520132011/eua-future-prices-200520132011-eps-file/image_original.

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Evolution of EU ETS rules

- Now an EU wide cap with allocations of auction shares.
- Free allocations, now only residual to trade impacted sectors.
- Increasingly using linkage rather than offsets.

- However substantial overhang of allowances, banked for future use.

EU 2030 Targets

- from EU Commission:
  - 40% reduction in GHG emissions (relative to 1990)
    = 25% reduction from 2020 target in 10 years
    ⇒43% reduction of ETS sector relative to 2005
  - EU-wide RE target of 27%
    - Unclear enforcement; Delivered by GHG reduction

    (with Energy price + premium and auctioning)
  - Energy Efficiency target of 27% relative to business as usual (up from 20% in 2020)

A setback in the outback: Australian carbon tax

- Introduced in July 2012 at AUD 24.15 (c.16 Euros) per tonne CO2e, with view to move to cap and trade in July 2015. Coverage: 60%.
- Conservative led government wins with mandate to abolish carbon tax.
- Robson (2014) gives an interesting analysis of the failure of the Australian carbon tax, suggesting that other measures (such as subsidies to renewables) might have been more effective.
- Taxes clearly not superior to cap and trade: no policy certainty and the basic economics was not effected by price volatility.
- Starting at low carbon prices has political advantages. The initial price was high for an energy intensive open economy.
- The fiscal transfers were poorly targeted.

No fiscal dividend: Fiscal impact negative…

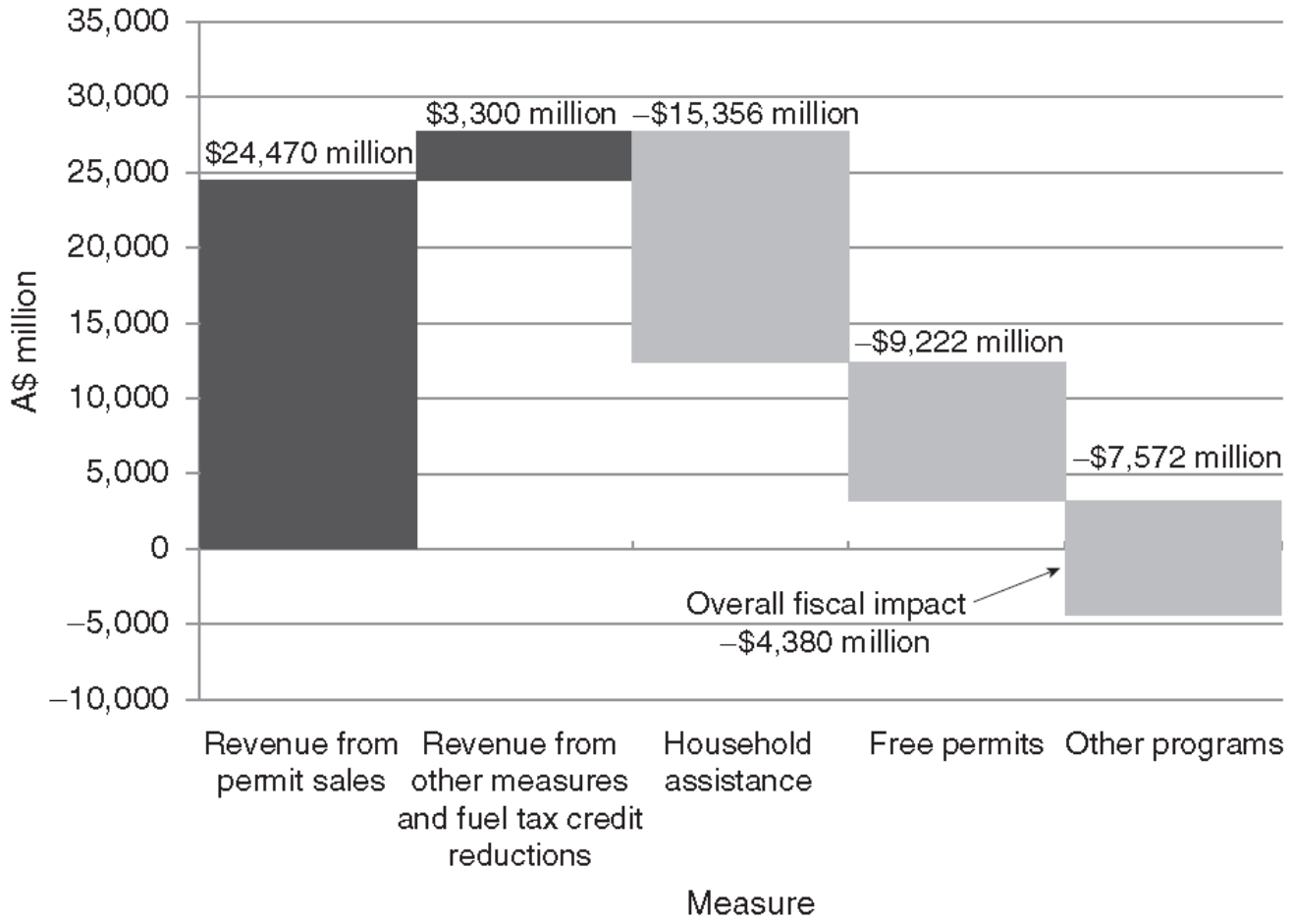


Figure 4: Expected cumulative fiscal impact of the carbon tax and associated policies, 2011–12 to 2014–15.
Source: Department of Climate Change and Energy Efficiency (2011, pp. 131, 135 (Table 1)).

Source: Robson (2014, p.42)

Conclusions

- The idea of using the market to deliver carbon reductions is an potent one relative to the alternatives (of subsidies to low carbon technologies).

- It has had significant *apparent* setbacks in the EU ETS and in Australia.

- The policy instrument to solve the climate problem is not rocket science; economists worked out the policy answer to excessive emissions years ago…

Issues with carbon markets…

- Are we just playing with (or being played by) carbon markets, as a sop to economic rationality and 'greenwash'?
- Will incumbents successfully frustrate carbon pricing, as they have done over fuel taxes?
- Is some carbon pricing worse than no carbon pricing?
- Will the energy transition proceed anyway, with relatively limited impact from carbon pricing, as so far?

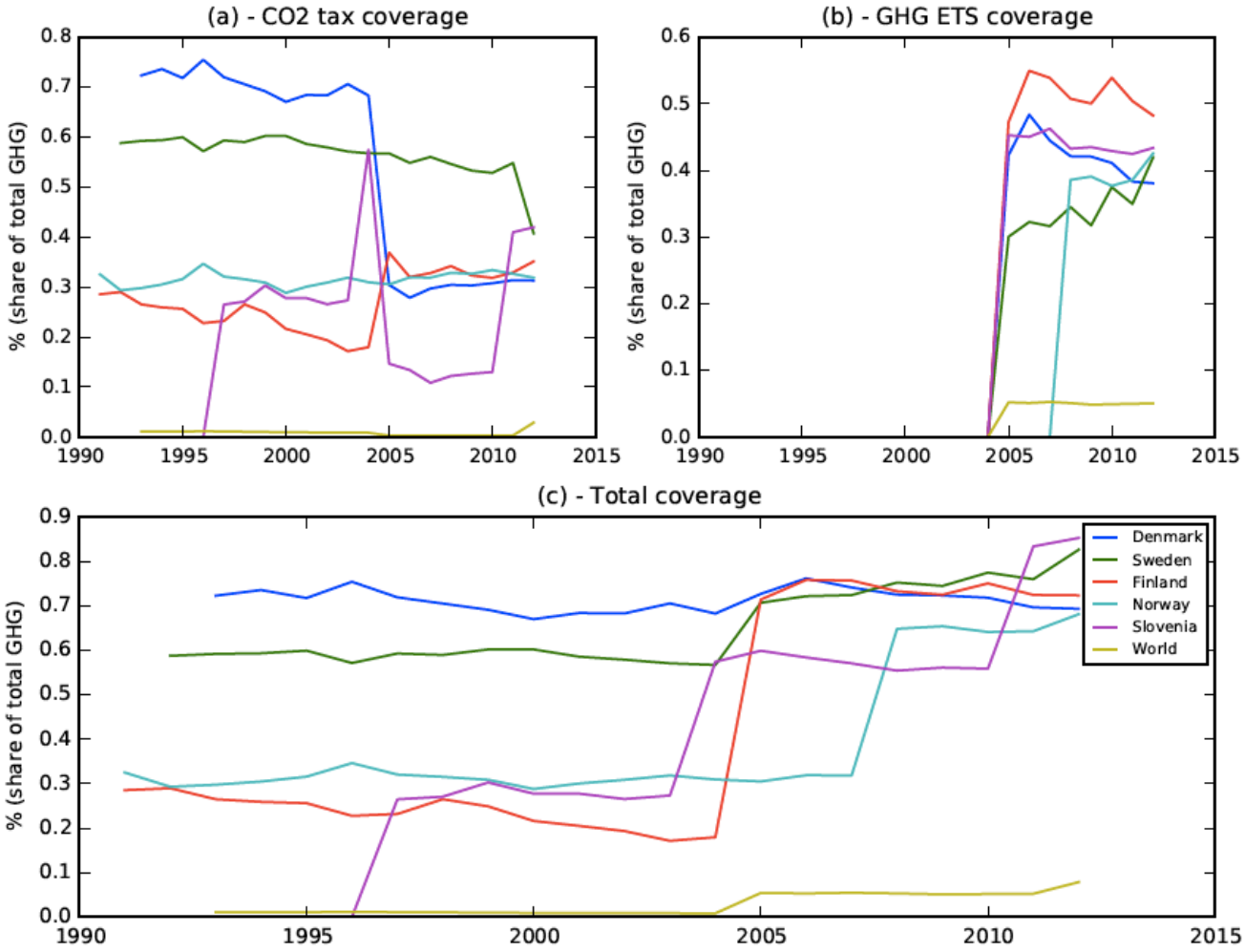
Issues with carbon markets…

- Does the extension of carbon markets need some external motivation as part of more general free trade agreements?
- Are carbon markets going to be just about residual fossil fuel switching?
- Are carbon markets adequately designed to cope with fluctuations in the price of fossil fuels?
- As costs of alternatives to comprehensive carbon pricing become clear maybe there will be increased interest in role of carbon markets?

Reading

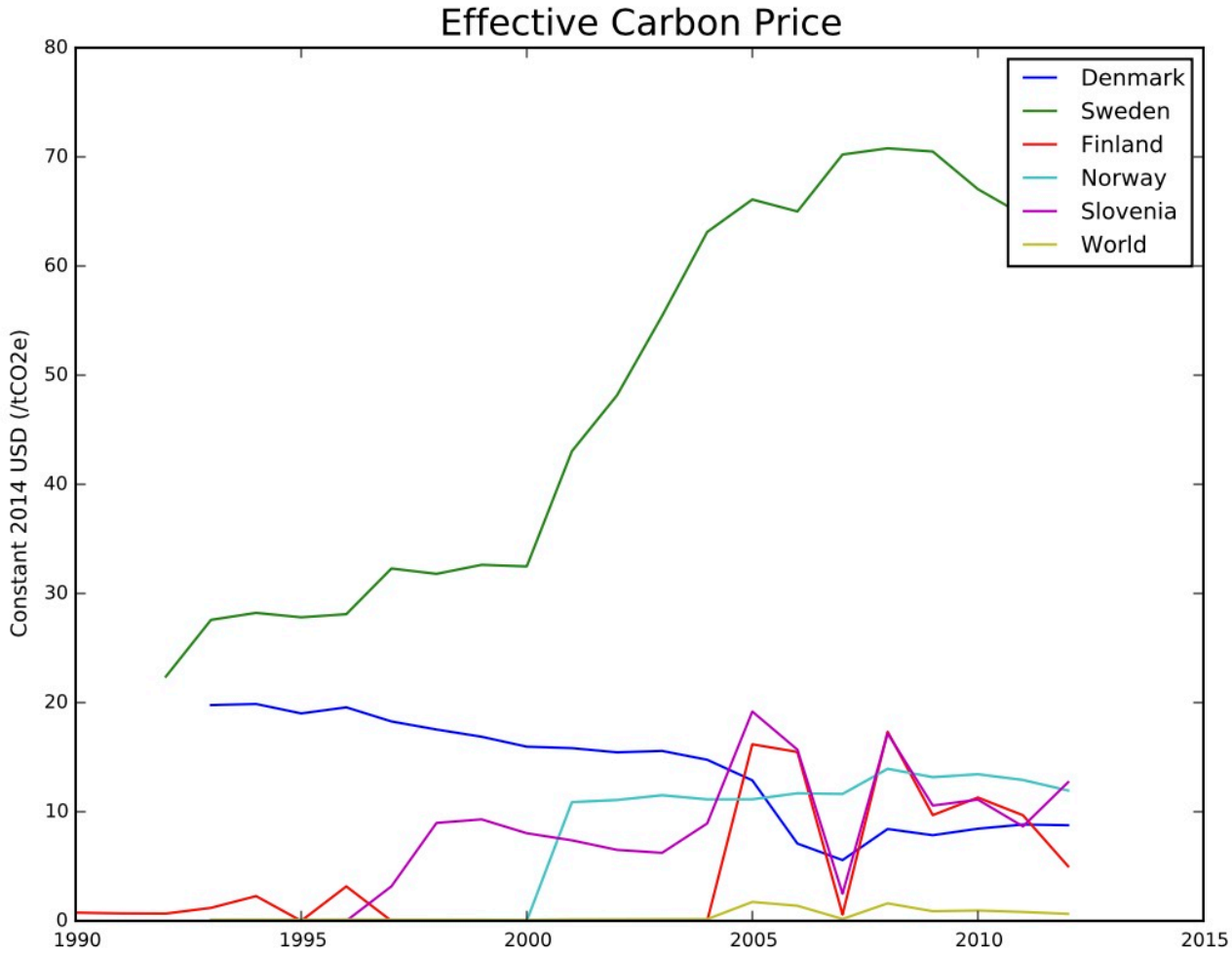
- Allen, M., D. Frame, C. Huntingford, C.D. Jones, J.A. Lowe, M.Meinshausen & N.Meinshausen, (2009) 'Greenhouse-gas emission targets for limiting global warming to 2^{o}C', *Nature* 458, 1163-1166. doi:10.1038/nature08019
- Grubb, M., Jamasb, T. and Pollitt, M. (2008) (eds), *Delivering a low carbon electricity system*, Cambridge: Cambridge University Press.
- Pollitt, M.G. (2015) "A global carbon market?" *MIT Center for Energy & Environmental Policy Research (CEEPR) Working Papers*, No.2015-016. Cambridge, MA: MIT.
- Robson, A. (2014), 'Australia's Carbon Tax: An Economic Evaluation', *Journal of Economic Affairs*, Vol.34, No.1, pp.35-45.
- UN Environment Programme and Bloomberg New Energy Finance (2015), *Global Trends in Renewable Energy Investment 2015*, UNEP and BNEF.
- Weitzman, M. (1974), 'Prices vs.Quantities', *Review of Economic Studies,* 41 (4): 477-491.
- World Bank (2014), *State and Trends of Carbon Pricing*, Washington DC: Ecofys, World Bank.
- World Bank (2015), *State and Trends of Carbon Pricing*, Washington DC: Ecofys, World Bank.
- World Resources Institute data at: http://www.wri.org/resources/data-sets/cait-historical-emissions-data-countries-us-states-unfccc

Carbon pricing coverage – example countries



Source: Dolphin et al., 2016.

Effective carbon price – example countries



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