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# E-MISSION POSSIBLE

## Low-emission investment and ETS reform

14 February 2018

# Keynote address

# Professor Geoffrey Heal

## “Managing GHG Emissions”

*Columbia Business School*

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# Managing GHG Emissions

Geoffrey Heal

Columbia Business School

## Five alternatives -

- Regulation
- Taxes
- Cap-&-Trade
- Legal liability
- Activism



# REGULATION

- The default
- The approach all econ texts love to hate
- Because it's inefficient – want to abate so that MCs are equal
- Goes back a long way – in 1492 “John Everard, Butcher, allowed his dunghill to drain into the common stream of this village, to the serious detriment of the tenants and residents; fined 4d; pain of 10s”
- But it does work – responsible for solving many pollution problems in the last 50 years

# Regulation

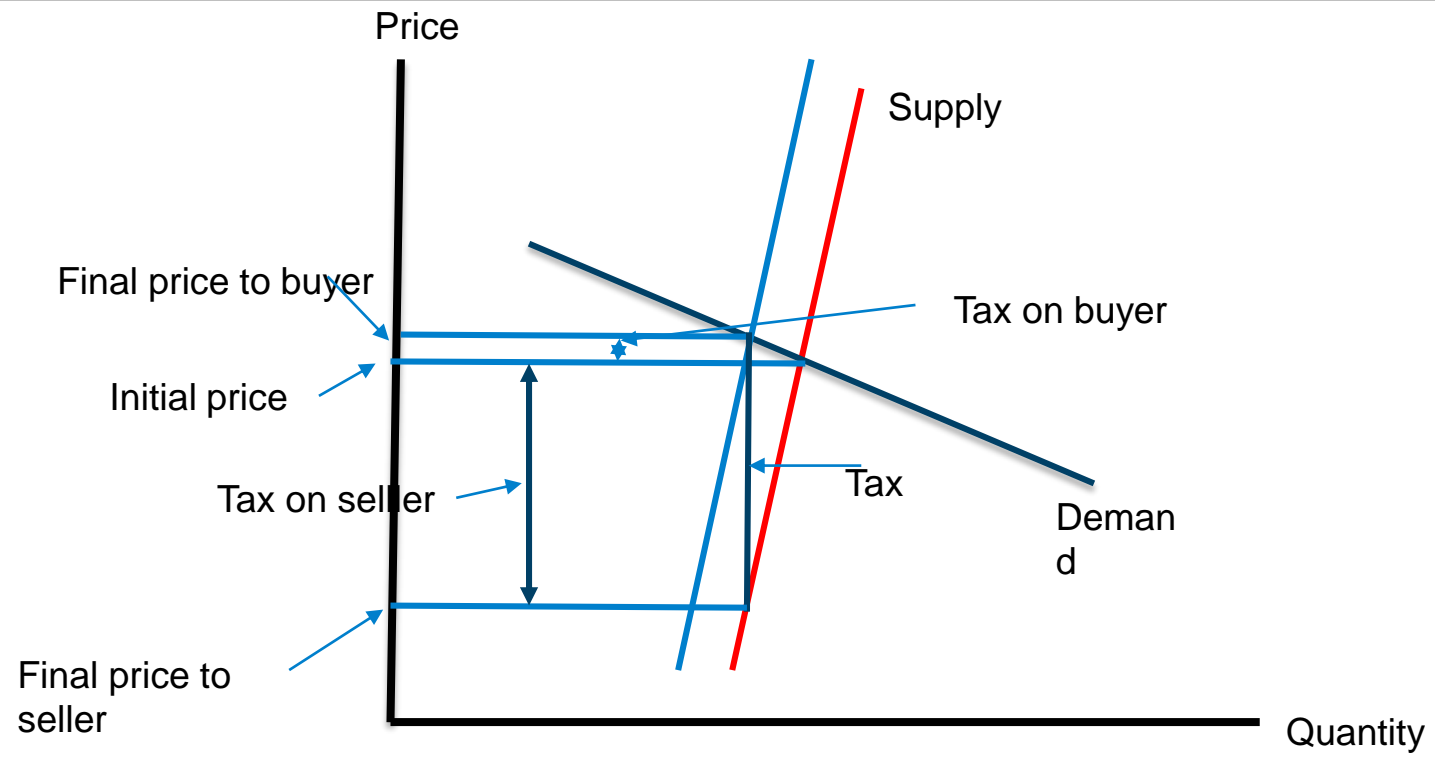
- Regulation can be tempered with elements of market-based approaches
- US CAFE regs govern vehicle emissions of GHGs. They set standards and fine non-compliers
- But firms that over-comply can sell their over-compliance to those who under-comply. So Toyota, Honda and Nissan regularly sell over-compliance credits to BMW, Mercedes and VW
- Provides an incentive not just to comply but to over-comply
- Obama's Clean Power Plan was also regulation-based, setting limits to CO2 emissions per MWH



# TAXES

- Pigouvian approach – internalize the external costs, make agents aware of the external costs of actions
- For GHGs involves a carbon tax – tax on energy
- Efficient – but generally seen as regressive as poor spend proportionally more on energy
- But distributional impacts depend on tax incidence, involving elasticities
- If S is inelastic and D is elastic then most of the tax is paid by the supplier and it's not borne by the consumer. Tax can always be rebated to consumers, as in British Columbia





# Social Cost of Carbon

- For GHGs ideal tax is the SCC, PDV of marginal impact 1 extra ton CO<sub>2</sub> has on welfare

- $W(K, L, GHG): SCC = \frac{\partial W}{\partial GHG} = \frac{\partial}{\partial GHG} \int_t^{\infty} U e^{-\delta t}$

- Complex to evaluate:
  - Quantify all impacts of GHGs
  - Value impacts
  - Choose discount rate – or sequence of discount rates
- In Obama administration done using Integrated Assessment Models

- Damage functions of IAMs are weak in the extreme, omitting many impacts of climate change
  - Pindyck: IAMs “have crucial flaws that make them close to useless as tools for policy analysis...[they] create a perception of knowledge and precision, but that perception is illusory and misleading.”
  - Researchers are working to improve this but we are still far short of a comprehensive model of GHG impacts – and so of SCC
  - Best study to date is Bloomberg Paulson and Steyer’s “Risky Business” – but just for the US

# Social Cost of Carbon

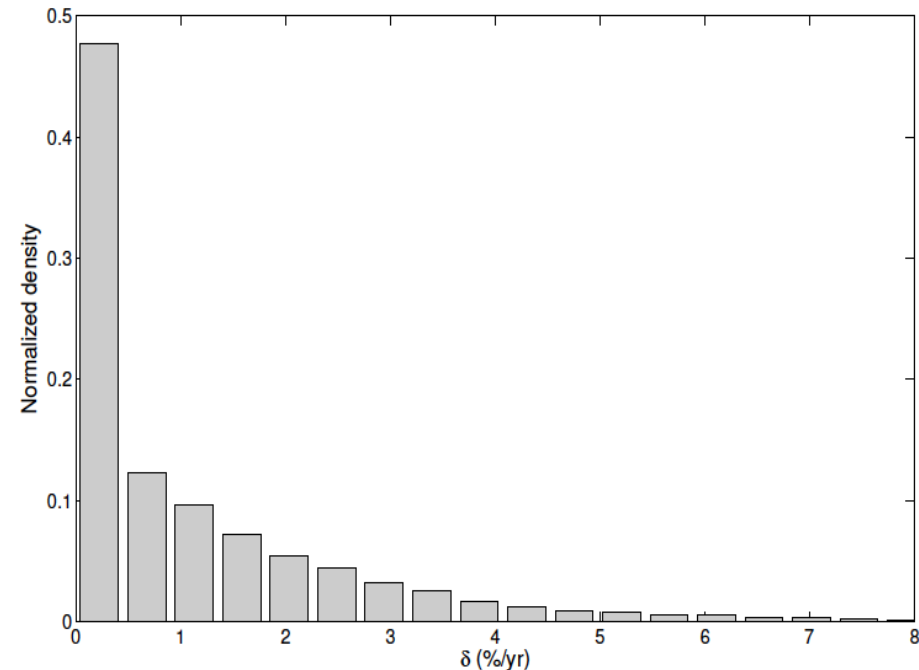
- Discount rate also a key and difficult choice. Obama number in 2007\$/metric ton CO2

Year	5% average	3% average	2.5% average	95Pct@3%
2020	12	42	62	123
2030	16	50	73	152
2040	21	60	84	183
2050	26	69	95	212

- Answer sensitive to discount rate and to uncertainty

# Social Cost of Carbon

- What is the right discount rate?
  - Antony Millner and I have argued for 0.5%. Nordhaus suggests 1.5%, Stern zero, etc.
  - 0.5% based on recognizing that different people have different discount rates and treating the amalgamation of these as a social choice problem
  - Can also argue for non-constant discount rate, falling to zero



From Drupp et al.: distribution of pure rates of time preference over climate change experts

# Social Cost of Carbon

- Bottom line – hard to implement a Pigouvian tax. But not an argument for no tax!
- Alternative approach – what tax would tip the economy away from fossil fuels? Easier to calculate than the SCC and tipping away from FF is what we really need to do
- Questions here are – What tax on CO<sub>2</sub> would suffice to transfer power generators to non-fossil energy? What tax will shift people from ICEs to EVs?
- Answer will vary from country to country and with the prices of oil and gas

# Social Cost of Carbon

- A more tractable calculation. For the US
  - For electric power generation, a tax of \$25/ton CO<sub>2</sub> would end the use of FFs – which in fact is already ending
  - For cars, very sensitive to the price of oil. At \$60/bbl close to \$100/ton

## Co-Benefits

- Note that reducing use of fossil fuels brings many benefits in addition to GHG reductions –
- Reduced emissions of NO<sub>x</sub>, PM<sub>x</sub>, SO<sub>2</sub>, ozone,
- Substantial positive impact on health in particular in urban areas – examples Beijing, Dehli
- In fact some of world's most aggressive carbon policies motivated more by these co-benefits than by the GHG implications of fossil fuels
- IMF estimates \$57/ton CO<sub>2</sub> justified by co-benefits in top 20 emitting countries

IMF: How much carbon pricing is in countries' own interests? The critical roles of co-benefits. Ian Parry et al 2014





# CAP AND TRADE

## Cap-&-Trade

- We choose the emissions level, and the market chooses the implicit tax rate – the permit price
- Like a tax, efficient but could be regressive.
- Choice of allocations of permits and revenues from permit sales gives regulators some control over distributional impact. Can mitigate political objections
- Increasingly widespread at national and subnational levels and potential for linking internationally (California, NE States, China, NZ, EU,...)

## Cap-&-Trade

- Biggest success has been with reducing SO<sub>2</sub> emissions under the acid rain program in the US
- Introduced by Bush I in 1990, estimated to have reduced cost of phasing out SO<sub>2</sub> by well over 50% relative to standard regulatory approach
- Volatility of prices may be an issue (see EU) – California has caps and floors to the market price of an emission right



# LEGAL LIABILITY

## Legal Liability

- Give people affected by externalities the right to sue for compensation
- This and Cap-&-Trade emerge from Coase's ideas about property rights and externalities
- High profile cases – Exxon Valdez oil spill (1989) in Alaska, BP oil spill in Mexican gulf (2010)
- Very slow – Valdez case still before the courts, Deepwater Horizon took eight years to settle
- Transaction costs – legal fees run to \$ hundreds of millions



# ACTIVISM

- Shoppers & Investors are increasingly willing to base their choices on their values as these relate to the activities of alternative vendors
- Boycott products of companies of whose actions they disapprove (buyers) or avoid their shares (investors)
- In some cases this has produced clear results – Hong and Kasperczyk on impacts of SRI on stock prices
  - Prices of “sin stocks” low relative to model predictions
  - Prices of bonds not affected, leading to excessive leverage

- ABC Homes and Carpet experiment in Manhattan
  - Towels all organic and fair trade
  - Some labelled to indicate this and some not
  - Labelled sales rose, even if prices increased
- Nike boycott over child labor in supply chain
- Fisman et al. on tie-in sales on eBay
- Need a measure of climate impacts to trigger activism – not simple. GHG emissions of scopes 1, 2 and 3
- Overall activism can be effective, but possibly not for global problems

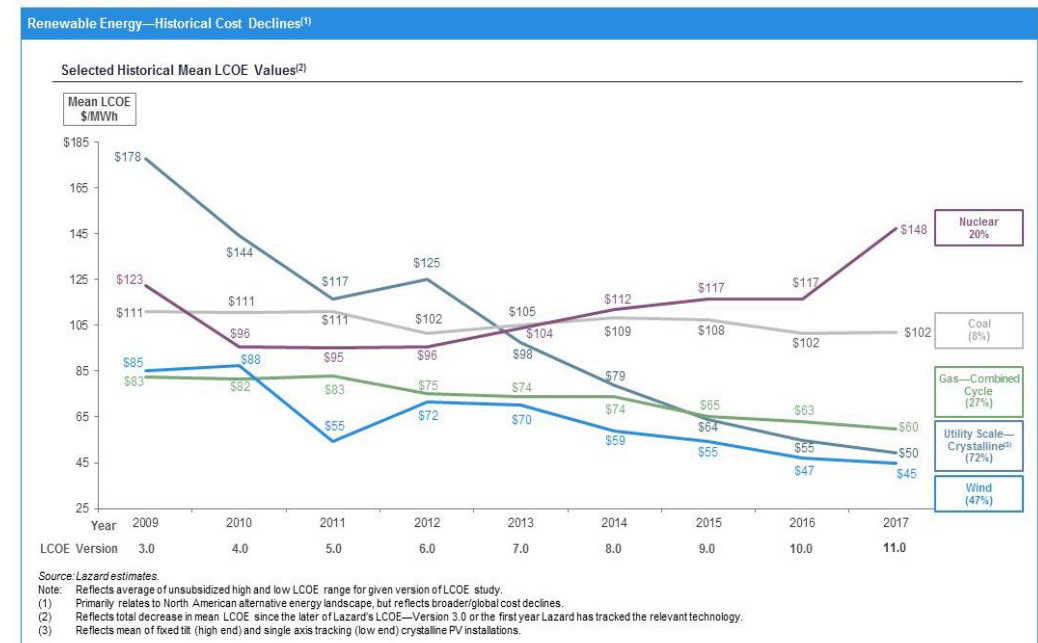




# CONCLUSIONS

# Conclusions

- Many options for reducing emissions
- Reducing electricity emissions easier now because of drop in renewable energy costs
- Cap-&-trade most popular approach
- This & carbon taxes equally effective from economic perspective
- Scale of problem means that tackling it at least cost matters:
  - 30+ billion tons of reductions required: if each costs \$50 more than needed, \$1.5 trillion in excess





**THANK YOU!**