Policies for a Green Economy: Making a Reality of Sustainable Development

Inaugural Goodwin Lecture on Sustainability

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Structure of presentation

1. Sustainability and sustainable development
2. Economic growth, ‘green growth’ and the Green Economy
3. How to move towards a Green Economy: the need for policy
   - Greening the Recovery: the report of the UCL Green Economy Policy Commission
4. Environmental fiscal reform
5. Climate change as a case study
6. Implications for economic growth

Sustainability and sustainable development

- Sustainability: capacity for continuance
- Sustainable development is development that possesses that capacity
- Three dimensions of sustainable development: economic, social and environmental
- Sustainable development entails maintenance of human welfare and therefore of the benefits which give rise to it and therefore of the capital stock which produces the benefits.
- Four kinds of capital: manufactured, natural, human, social/ organisational (last includes financial capital)
- Issues of substitutability between capitals: weak and strong sustainability
- Issues of cost and benefit valuation - and therefore valuation of the capital stocks
- Difference between economic, social and environmental sustainability

Principles of economic sustainability

- Borrow systematically only to invest, not to consume
- Keep money sound: control inflation, public borrowing, trade deficits, indebtedness
- Establish transparent accounting systems that give realistic asset values
- Maintain or increase stocks of capital (manufactured, human, social, natural, all of which contribute to economic activity)
- Major cause of the financial crisis was a failure to observe these principles in the financial sector and mainstream money economy
- Loss of natural capital may lead to economic unsustainability in the future
- Thresholds of economic (un)sustainability fairly well established

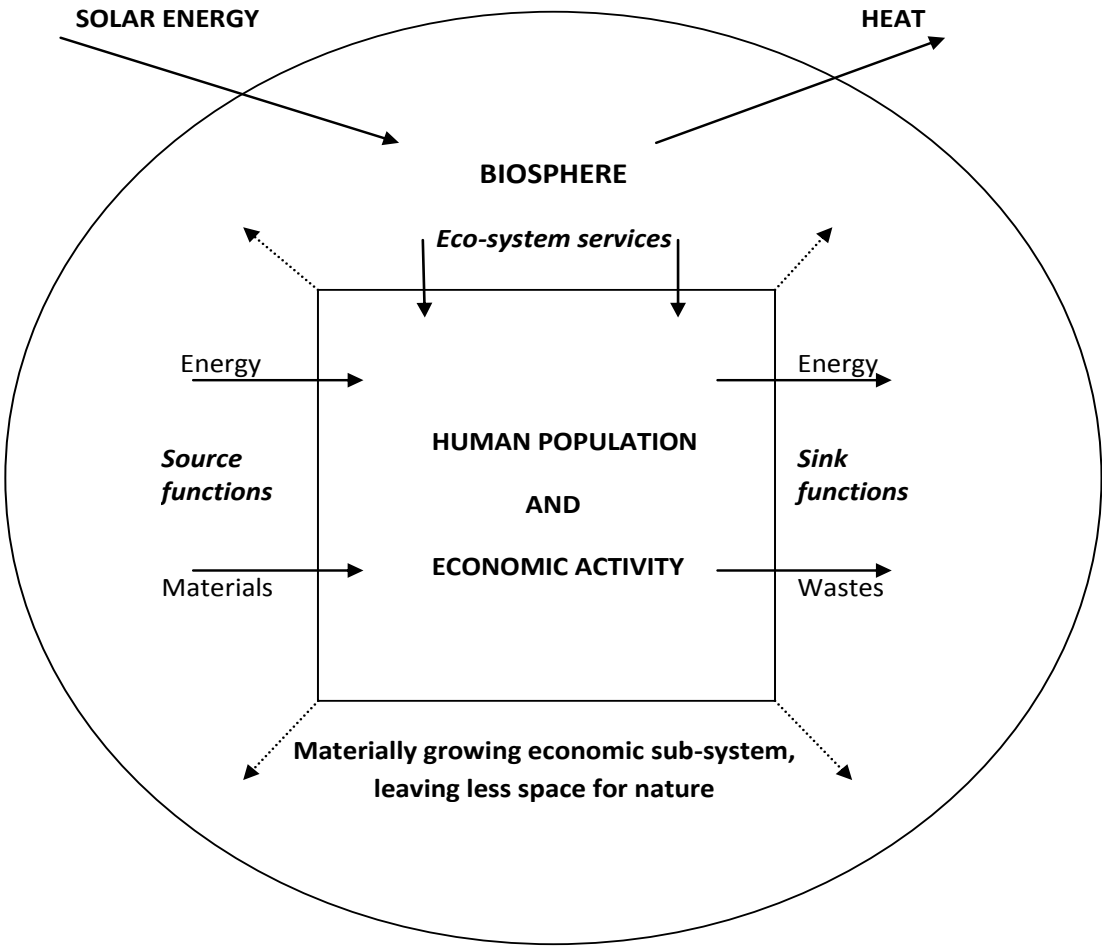
Principles of social sustainability

- Maintain social capital [OECD (2001): "networks together with shared norms, values and understandings that facilitate co-operation within or among groups". May be seen to include:
  - Organisational capital, which "reflects the shared knowledge, teamwork and norms of behaviour and interaction within organisations"
  - Cultural capital, "the habits or cultural practices based on knowledge and demeanours learned through exposure to role models in the family and other environments"
  - Political, institutional and legal arrangements.]
- Indicators of social capital: intensity of involvement in community and organisational life; public engagement (e.g. voting); community volunteering; informal sociability (e.g. visiting friends); reported levels of trust
- Social unsustainability may arise from high levels of unemployment, crime, inequality (Wilkinson and Pickett, 2009: inequality destroys social capital), family breakdown, loss of social cohesion – destructive of social capital
- Very difficult/impossible to establish thresholds of social (un)sustainability

Principles of environmental sustainability

- Environmental sustainability (anthropogenic): maintenance of important environmental functions and the natural capital which generates them.
- Important environmental functions:
  - Not substitutable, irreversible loss, 'immoderate' losses
  - Maintenance of health, avoidance of threat, economic sustainability
- Thresholds of environmental (un)sustainability quite well established: safe minimum standards
  - Global: planetary boundaries / safe operating space
  - Local: human health standards, critical loads, maintenance of environmental functions

The economy-environment relationship: the economy as a sub-system of the biosphere



How big can the economy get?

- **What kind of growth?:** a source of some confusion in the literature
- Physical growth (growth in the amount of matter/energy mobilised by the economy): indefinite growth of this kind is impossible in a finite physical system subject to the laws of thermodynamics
- Economic (GDP) growth (growth in money flows/incomes/value added/expenditure): there is no theoretical limit on this kind of growth
- Growth in human welfare:
  - Dependent on sustaining environmental functions
  - Complex relationship to economic growth (although hard to argue that, *ceteris paribus*, more money is not better than less)
  - Dependent on many other factors
- Complex, variable relationship between these different types of growth

Where does economic growth come from?

- Economic (GDP) growth is the kind of growth of interest to economists and policy makers. It results from applied knowledge and innovation
  - Turning non-resources into resources (e.g. fossil fuels in 18th century)
  - Finding more productive ways of doing things (more outputs/inputs)
- Investment in knowledge and innovation is at an all-time high globally
  - There is no shortage of renewable energy if we knew how to harness it (cost-effectively)
  - There is no shortage of materials if we knew how to manipulate and use them
- Economic growth is likely to remain a top policy and social priority.
- Even if it didn't, it is not clear how policy makers could 'stop' economic growth even if they wanted to ('degrowth' is not a politically or practically realistic proposition)
- BUT in the long term, sustainable economic growth must be environmental sustainable (and currently is not so)
- 'Green growth': GDP growth that is economically and environmentally sustainable

Considerations for green growth

- Any aspiration for green growth must start from the recognition of the need for the sustainable use of resources and ecosystems, and be rooted in basic laws of physical science (especially thermodynamics):
  - Indefinite physical expansion of the human economy on a finite planet is impossible;
  - All use of non-solar forms of energy creates disorder, and potential disruption, in the natural world
  - Air, water and land have limited abilities to absorb human wastes while continuing to perform important environmental functions
- At a certain physical scale, further physical growth (resulting in resource depletion or degradation or pollution) becomes economically counter-productive.
- History has examples of this scale being exceeded at local levels (agricultural degradation, air pollution)
- Evidence is mounting of this scale being exceeded globally (especially climate change)
- Important question: what is the optimal physical scale of the human economy at different levels? The necessary knowledge base and model capability to answer this question is not yet available.

Why green growth (1)?

- The current human population is in excess of 6 billion. Barring catastrophe it will rise to 9 billion by 2050
- The vast majority of the relatively poor want to live like rich consumers in Europe, North America and other currently rich countries, while the relatively rich in those countries want to get still richer
- Large populations in relatively poor countries now have the human and technical capacity to get richer
- There will be a considerable increase in resource consumption, energy use, greenhouse gas emissions and destruction/degradation of ecosystems
- Science (IPCC, MEA) is suggesting that environmental degradation is already beyond safe limits

Why green growth (2)?

- Brown growth is unsustainable, i.e. it will not/cannot continue
- Thailand floods: “GDP declined 9% in the three months through December [2011] from a year earlier.” (Bloomberg Finance)
- “Sustained heat, above 38^{o}C – never before endured in 130 years of record keeping” caused fires in Russia which destroyed over a quarter of Russia’s crops, took 1% off GDP ($15 bn), destroyed 50 villages (with a rebuilding cost of $400m - £1 billion) and took 15,000 lives. (BBC, Daily Telegraph, Bloomberg, Aug.2010)
- “The worst drought in the US in at least half a century has destroyed one-sixth of the country’s expected corn crop in a month threatening a surge in global food price inflation.” (Financial Times, 10/8/12)
- This is with less that 1^{o}C average global warming. What about 6^{o}C ?
- Prof Sir John Beddington, CSA, 2009: ‘The perfect storm’ of crises in food, water and energy by 2030
- To prove Malthus wrong again in this context will require radical **decoupling** of GDP growth from resource use and environmental impact. This will require robust public policy.

UCL Green Economy Policy Commission

- Established in September 2012 to explore the intersection between policy for macro-economic recovery (from the recession) policy for environmentally sustainable economic activity
- Report *Greening the Recovery* published in February 2014
- Authors: Paul Ekins, Will McDowall, UCL ISR; Dimitri Zenghelis, LSE
- Commission consisted of senior academics from across UCL, plus visiting professors Tom Burke, Michael Jacobs, Jonathon Porritt
- Numerous external advisers from other universities and consultancies
- Stakeholder consultation and engagement with government departments, politicians, business-people and NGOs

Green Economy: definition and characteristics

A Green Economy is more easily characterised than defined. It:

- Has very low levels of carbon and other emissions to the atmosphere, and does not pollute the land, freshwater or seas.
- Has very high levels of resource productivity, which means that it delivers high levels of human value, measured in money or other terms, for low throughput of energy and material resources.
- Results in aggregate human activity remaining within local and planetary environmental limits, such that it does not damage human health, deplete renewable resources, or cause climate change or ecosystem degradation, because it takes due account of the values and human benefits which a stable climate, high environmental quality and resilient ecosystems provide.
- Is not just about ‘economics’, but also intersects with two other important debates and public policy agendas – those on growth and environment (‘limits to growth’) and growth and human welfare (‘GDP and Beyond’).

Foundations and pillars of a green economy

Headline messages (1)

- **Credible, consistent public policy is required in order to develop a green economy**
  - Externalities need to be internalised, markets need to be harnessed to drive eco-innovation
- **A green economy strategy to put European economies decisively on a trajectory towards low-carbon prosperity, resource security and environmental quality currently has low macroeconomic risk**
  - Interest rates are low and, with still under-utilised resources, the benefits of stimulating directed investment can be large.
- **A green economy strategy can strengthen European economies by addressing major long-term weaknesses, particularly under-investment in infrastructure and under-performance in innovation.**
  - A credible, long-term strategy, supported by environmental tax reform, can thus deliver a more soundly-based recovery, economically as well as environmentally.

Headline messages (2)

- **Government should take a more proactive, strategic approach to driving green innovation.**
  - A green industrial strategy can help to strengthen innovation systems and secure comparative advantage in key sectors and areas of technology that enhance resource productivity, but global competition in these areas is intensifying.
- **Government should adopt a clearer approach to prioritisation of key infrastructure projects, and ensure that infrastructure investments are compatible with long-term green economy objectives.**
  - Going beyond undifferentiated infrastructure lists, governments need to identify what green infrastructure investments are required and prioritise these accordingly in order to ensure policy clarity and credibility.
- **A new information infrastructure is required to facilitate the evolution of a greener economy.**
  - Current national accounting practices and corporate reporting rules were largely developed at a time when the economic and social importance of environment and resource issues was less well recognised than it is today. Governments should develop comprehensive natural capital and material flow accounts for their economies.

Core areas and recommendations (1)

- **Macro-economic strategy**:

  Headline conclusion: *core ingredients are environmental taxes, public investment and policy credibility*

  – Environmental taxation and fiscal reform, to reduce labour and capital taxes
  – Public borrowing over the business cycle for investment, not consumption (the Golden Rule)
  – Credibility and direction: index-linked carbon bonds

Core areas and recommendations (2)

- **Innovation**: direct innovation processes in the economy towards green innovation, or eco-innovation

  Headline conclusion: *government can and should play a more active role in driving eco-innovation through a new kind of industrial policy*

  – Greening the national innovation system ('horizontal'): embed incentives for green innovation across innovation system

  – Green industrial strategy ('vertical'), targeting core sectors and areas of green technology

Core areas and recommendations (3)

- **Infrastructure**:

  Headline conclusion: *appropriate infrastructure is crucially important in building green competitiveness and facilitating green consumption and behaviour change*

  - Prioritisation of infrastructure, need for choices (not all infrastructure is green, traffic light categorisation)
  - **Investment:** Establish new financial institutions: Green Investment Bank (specialist green investment); National Infrastructure Bank (wider infrastructure investment according to green criteria)

Core areas and recommendations (4)

- **Information**: make the physical/material and energetic basis of the economy as transparent as its monetary basis

  Headline conclusion: *a new knowledge infrastructure is required*

  – National accounts, natural capital and material flow accounting
  – Corporate reporting (for investors and consumers)
  – Consumer information and labelling, backed up by regulation

Core areas and recommendations (5)

- **Resource efficiency (RE):**

  Headline conclusion: *slow down/prevent the process whereby resources/materials become wastes that need to be managed*
- Negative cost opportunities for resource efficiency:
  - Globally USD 2.9 trillion in 2030 (70% at 10% internal rate of return) (McKinsey 2011)
  - EU net benefits of €603 billion (AMEC and BIO IS for European Commission 2013)
  - UK economy £23 billion (Oakdene Hollins 2011)
- European RE Roadmap: Recycling and efficiency targets
- European Resource Efficiency Platform

Policy approaches for increasing resource productivity (European Resource Efficiency Platform)

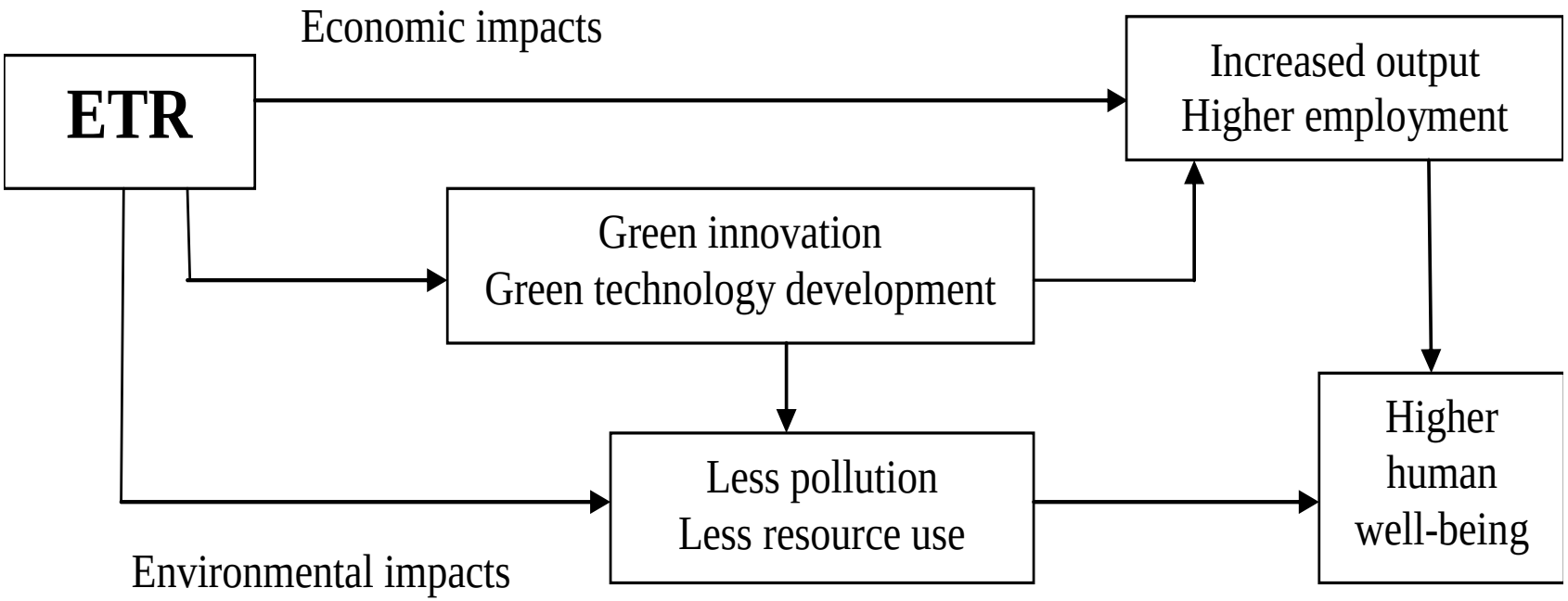
- Circular economy (reduce, re-use, recycle)
- Waste hierarchy
- Extended producer responsibility
- Industrial symbiosis
- Instruments (market-based, regulation, voluntary agreements, information, R&D/innovation):
  - Environmental tax reform
  - Targeted resource and environmental taxation (e.g. pay-as-you-throw for wastes)
  - Recycling and efficiency targets
  - Take-back/deposit requirements
  - Corporate reporting/transparency/risk management (stranded assets)
  - Consumer information / labelling / product passports

Recent projects on environmental tax reform (ETR) or green fiscal reform (GFR)

Definition: ETR is the shifting of taxation from 'goods' (like income, profits) to 'bads' (like resource use and pollution)

- COMETR: Competitiveness effects of environmental tax reforms, 2007. http://www2.dmu.dk/cometr/ (What is the experience to date of ETR in Europe?
  See Andersen, M.S. & Ekins, P. (Eds.) *Carbon Taxation: Lessons from Europe*, Oxford University Press, Oxford/New York, 2009
- petrE: 'Resource productivity, environmental tax reform (ETR) and sustainable growth in Europe'. One of four final projects of the Anglo-German Foundation under the collective title 'Creating Sustainable Growth in Europe'. Final report published October 29, Berlin, November 25, London. www.petre.org.uk
- UK Green Fiscal Commission. Final report published October 26, London. www.greenfiscalcommission.org.uk

The potential of ETR



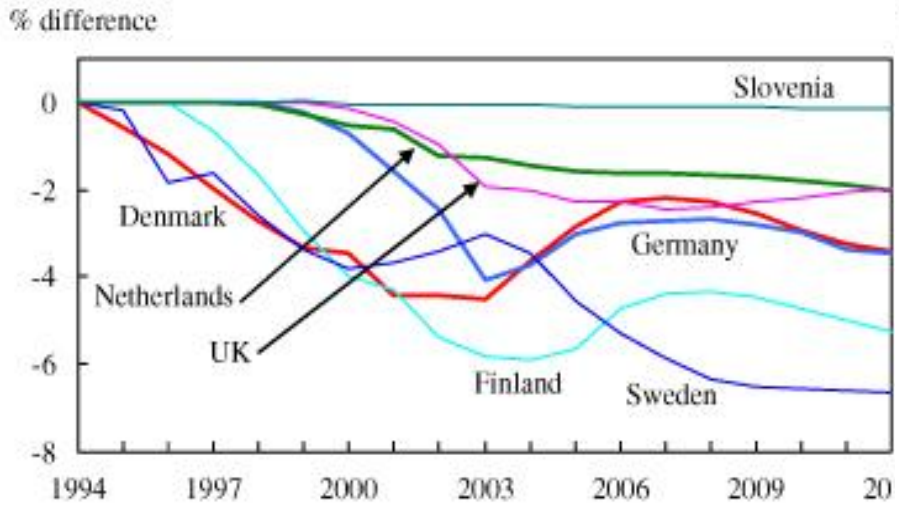
What is the experience to date of ETR in Europe?

- Six EU countries have implemented ETRs: Denmark, Finland, Germany, Netherlands, Sweden, UK
- The outcomes – environmental and economic – have been broadly positive: energy demand and emissions are reduced; employment is increased; effects on GDP are very small
- Effects on industrial competitiveness have been minimal, BUT
- ETRs so far have been very small

- See Andersen, M.S. & Ekins, P. (Eds.) *Carbon Taxation: Lessons from Europe*, Oxford University Press, Oxford/New York, 2009

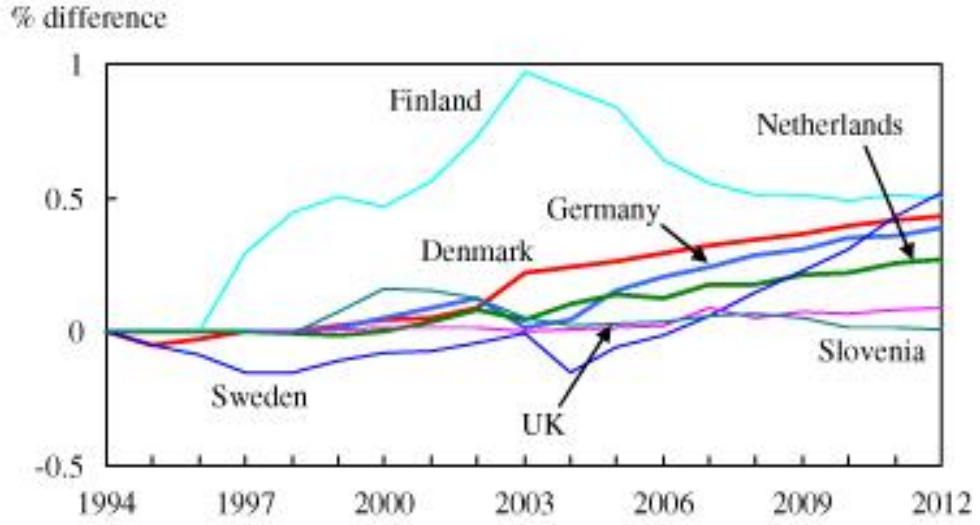
Environmental and economic impacts of ETR, from COMETR study, 2007

CHART 2: THE EFFECT OF ETR ON GHG EMISSIONS



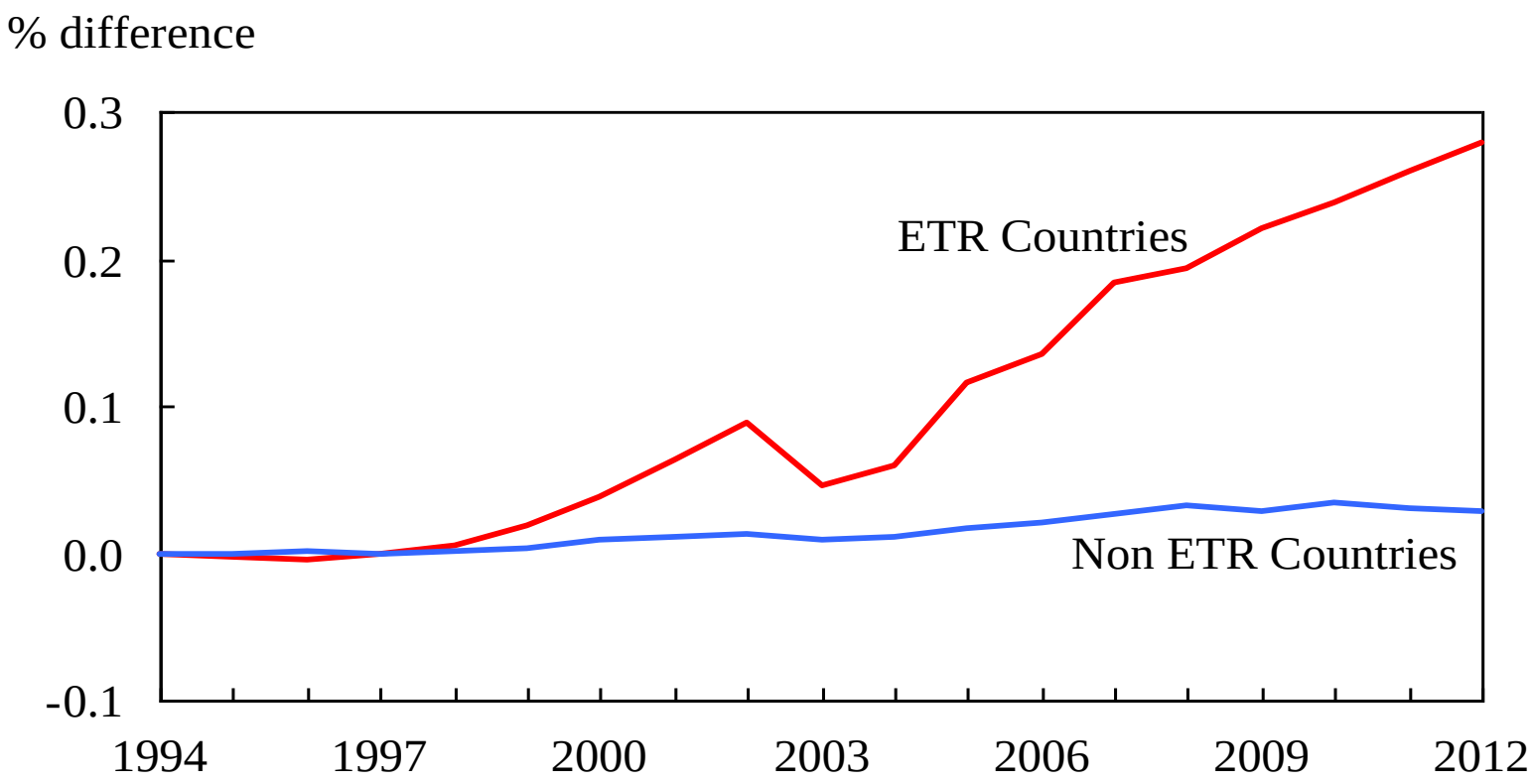
Note(s) : % difference is the difference between the base case and the counterfactual reference case.
Source(s) : CE.

CHART 3: THE EFFECT OF ETR ON GDP



Note(s) : % difference is the difference between the base case and the counterfactual reference case.
Source(s) : CE.

CHART 7.28: THE EFFECTS OF ETR: GDP IN ETR AND NON ETR COUNTRIES



Note(s) : % difference is the difference between the base case and the counterfactual reference case.

Source(s) : CE.

What might a large-scale ETR in Europe look like.....? (1)

- Two European macro-econometric models: E3ME, GINFORS
- Models deliver insights, not forecasts or 'truth'
- Six scenarios that meet EU carbon reduction targets in 2020 (20%/30% reductions)

- Ekins, P. & Speck S. Eds. 2011 *Environmental Tax Reform: A Policy for Green Growth*, Oxford University Press, Oxford

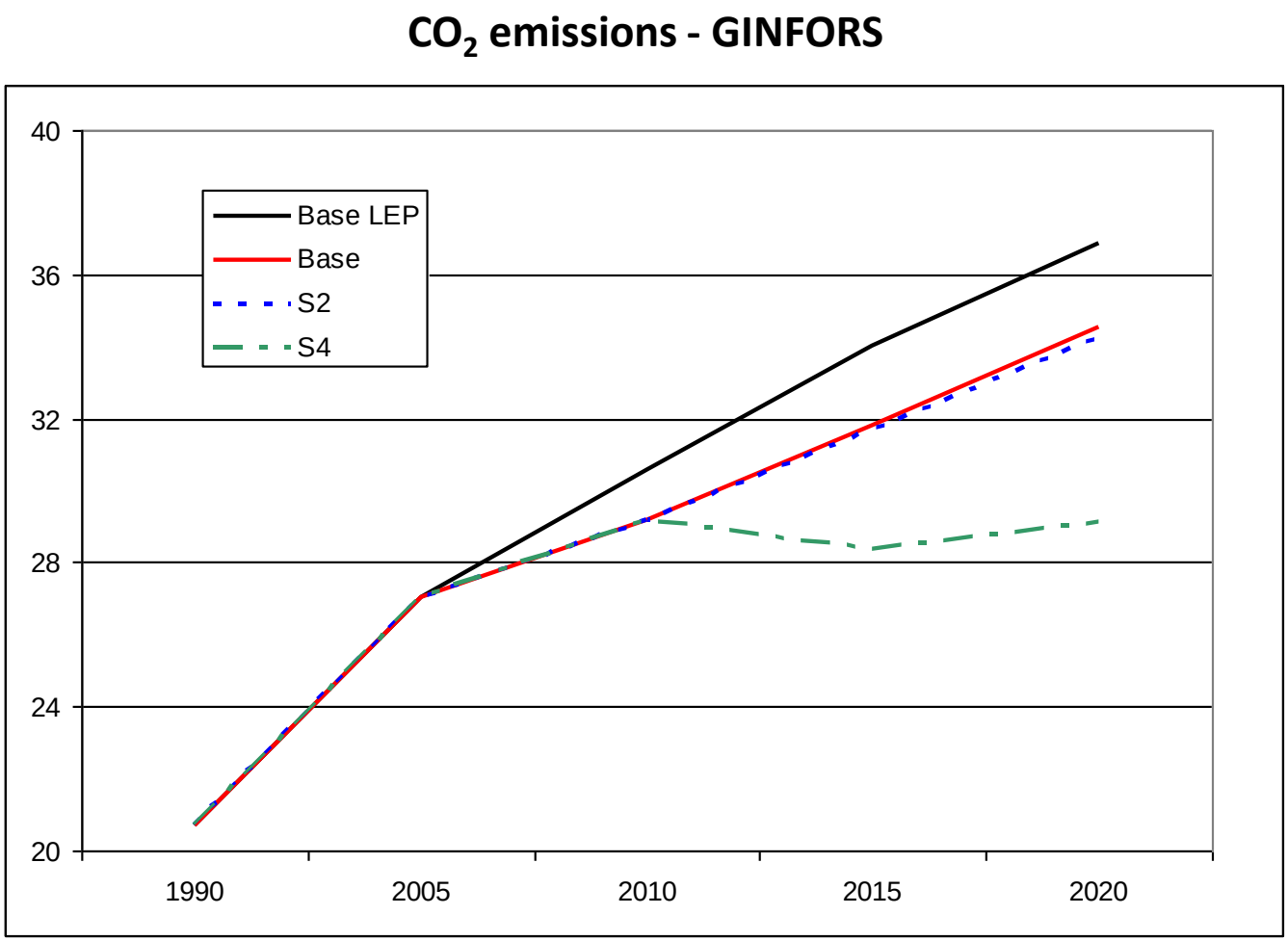
What might a large-scale ETR in Europe look like.....? (2)

- Six scenarios:
  - Baseline with low energy price (LEP)
  - Baseline sensitivity with high energy price (HEP, reference case)
  - Scenario 1 (S1): ETR with revenue recycling designed to meet 20% EU 2020 GHG target (S1(L) – compared with LEP Baseline)
  - Scenario 2 (S2): as S1 but with high energy price (S1(H) – compared with HEP Baseline)
  - Scenario 3 (S3): as S2 but with 10% of revenues spent on eco-innovation measures (S2(H) – compared with HEP Baseline)
  - Scenario 4 (S4): ETR with revenue recycling designed to meet 30% 'international cooperation' EU 2020 GHG target (S3(H) – compared with HEP Baseline)

What might a large-scale ETR in Europe look like.....? (3)

Scenario	CO_2 price Euro2008/t	GDP % change from baseline	Employment % change from baseline	Labour productivity % change from baseline
S1(L)				
E3ME	142	0.6	2.2	-1.6
GINFORS	120	-3.0	0.0	-3.0
S1(H)				
E3ME	59	0.2	1.1	-0.9
GINFORS	68	-0.6	0.4	-1.0
S2(H)				
E3ME	53	0.8	1.1	-0.3
GINFORS	61	-0.3	0.4	-0.7
S3(H)				
E3ME	204	0.5	2.7	-2.1
GINFORS	184	-1.9	0.8	-2.6

... and would it deliver green growth?

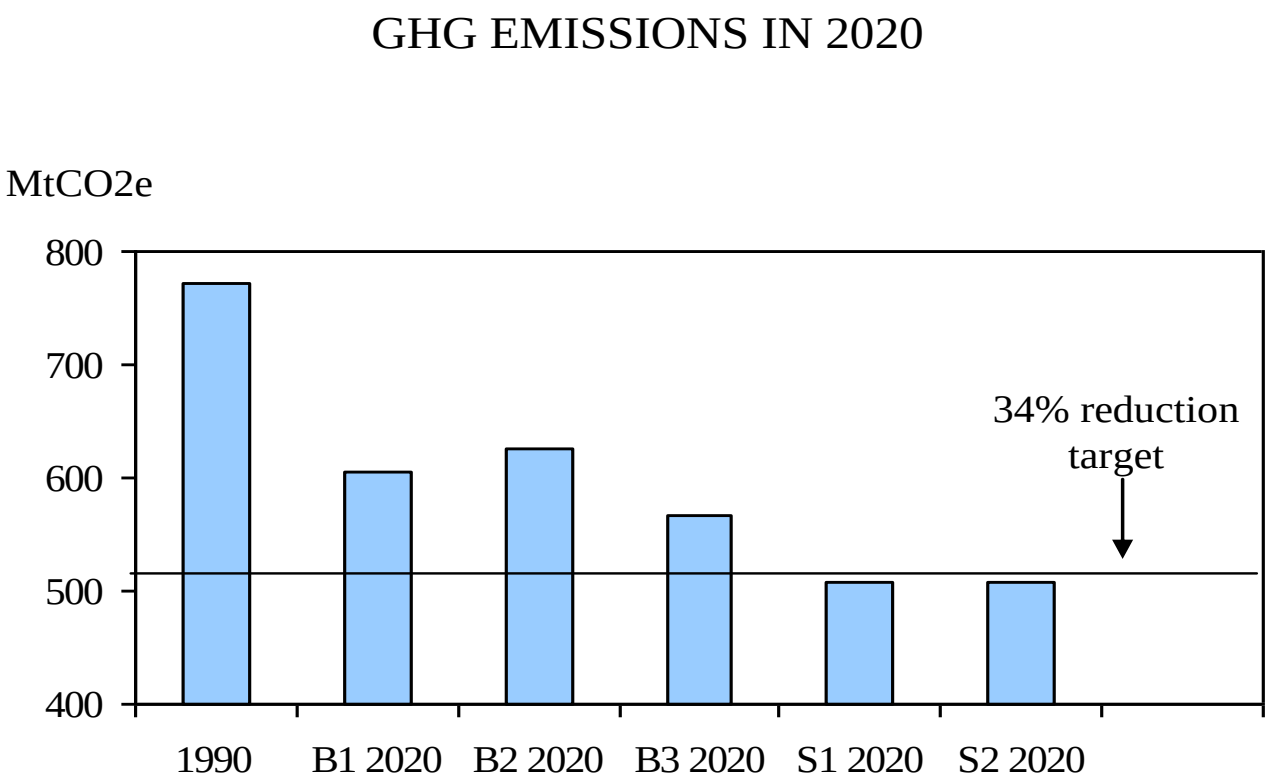


UK Green Fiscal Commission

- Investigation of
  - Enonomic, social and environmental implications of major green fiscal reform (GFR) (share of environmental taxes in total revenues from 5% to 15-20% by 2020)
  - Public attitudes to GFR

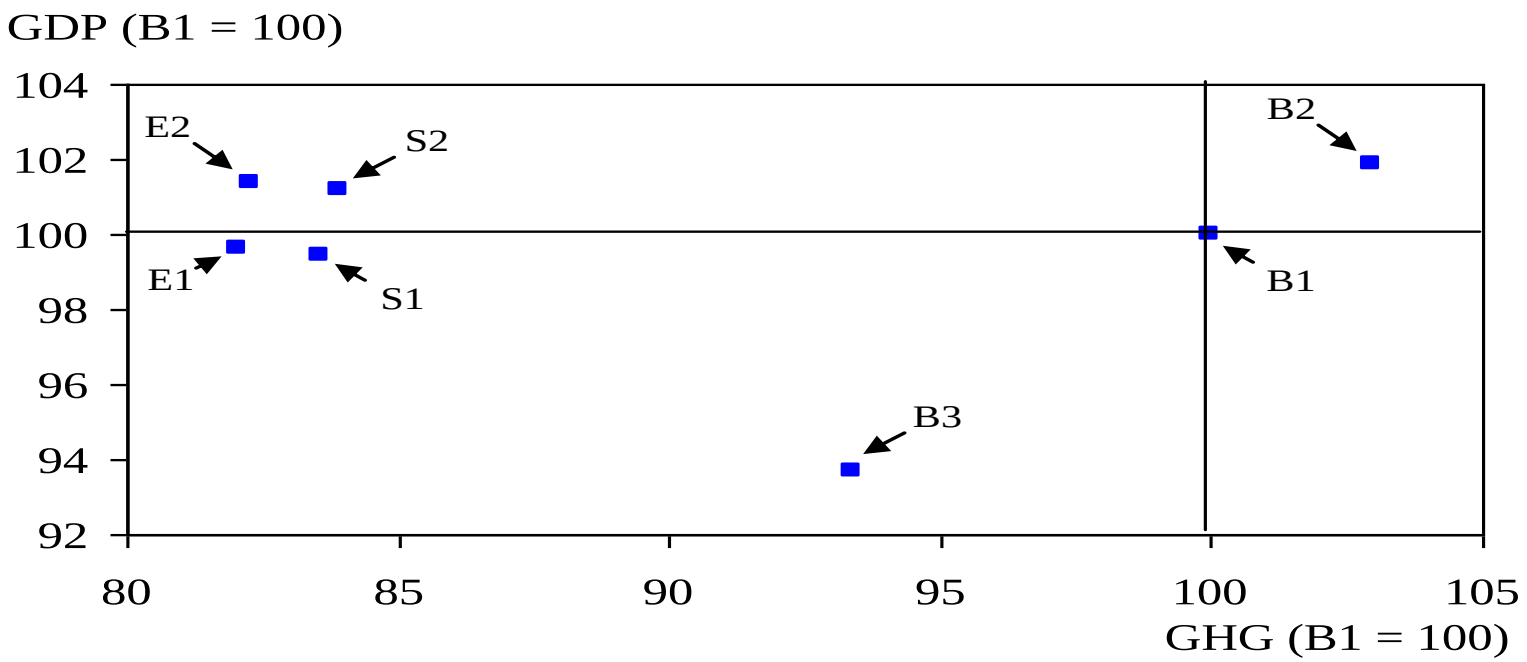
- Modelling of scenarios
  - Three baselines (B1, B2, B3) – low, medium, high world market fossil fuel prices
  - Two GFR scenarios (S1, S2) – increase in transport, household and industrial energy taxes, and taxes on water and materials, reductions in income taxes (households) and social security contributions (business)
  - Two 'eco-innovation' scenarios (E1, E2) – spending 10% of green tax revnues on energy-efficient buildings, renewable energy and hybrid vehicles

Green Fiscal Commission – GHGs



Source(s) : NAEI, Cambridge Econometrics.

Results: GDP and carbon emissions



Note(s) : GHG figures have been calculated on a net carbon account basis in MtCO2e.

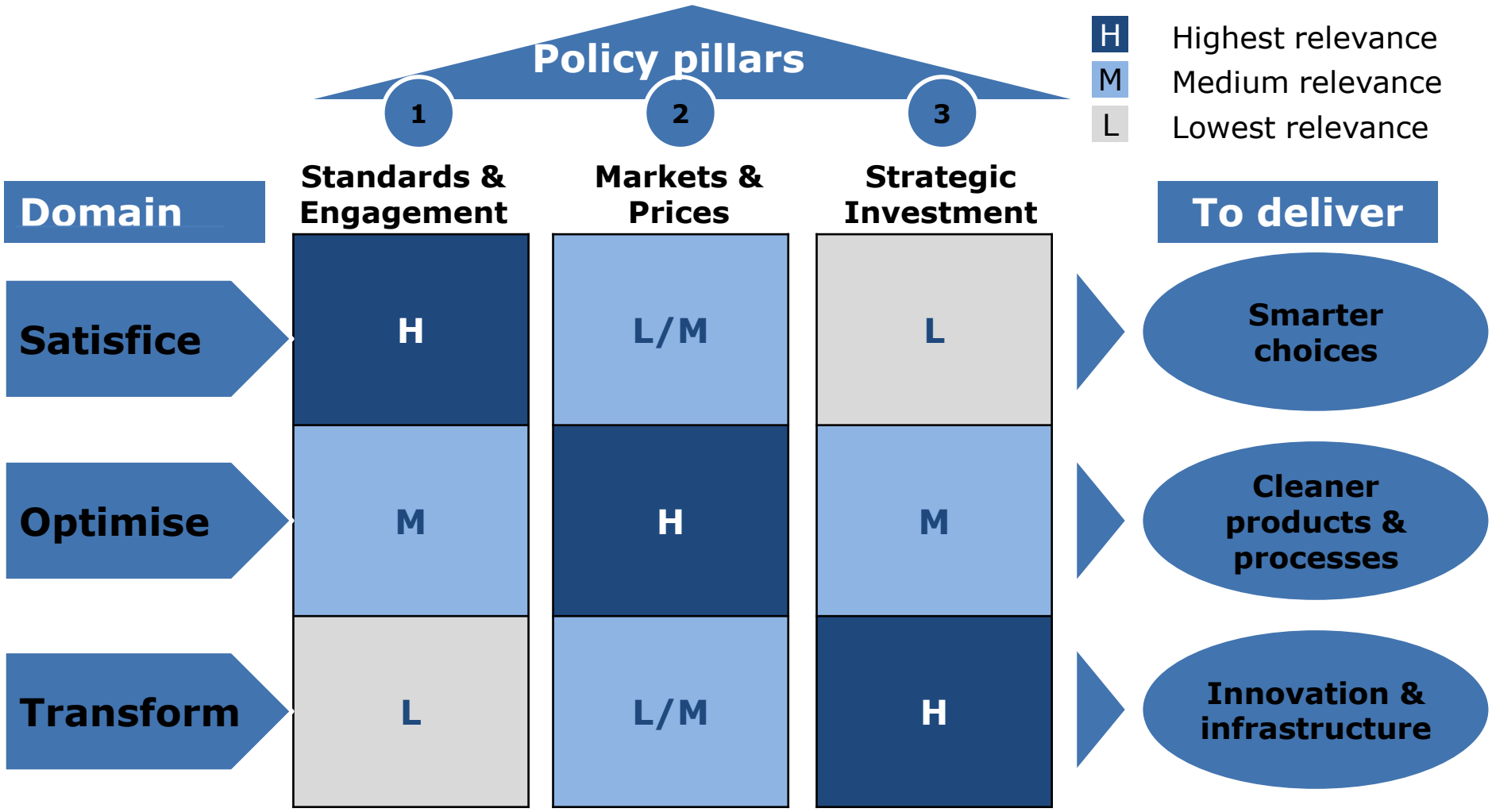
Source(s) : ONS, NAEI, Cambridge Econometrics.

How would the economy develop with ETR?

- ETR would rule out a resource-intensive growth path
- This would constrain short-term growth unless it reduced the cost of labour in a context of unemployment and/or it led to innovation in low-resource technologies
- ETR would stimulate such innovation, but this would need to be supported with complementary policies, policies for a green economy and ‘green growth’

Real world policy to address climate change: going beyond carbon pricing

- The Stern Review Policy Prescription for climate change policy
  - Carbon pricing: carbon taxes; emission trading
  - Technology policy: low-carbon energy sources; high-efficiency end-use appliances/buildings; incentivisation of a huge investment programme
  - Remove other barriers and promote behaviour change: take-up of new technologies and high-efficiency end-use options; low-energy (carbon) behaviours



Solutions need to harness corresponding policy pillars based on the three domains, to transform energy systems

Source: Grubb, M. 2014 *Planetary Economics,* Routledge, London/New York

Application of the framework

Need for credible, stable, consistent, predictable energy and climate policy, employing some mix of:

- Carbon pricing: taxes and trading, mixed systems (ETR, BTAs) (Domain 2)
- Technology deployment support for low-carbon supply (FiTs/obligations) (Domain 3)
- R&D for breakthrough technologies (CCS, storage) (Domain 3)
- Regulation for efficiency in demand (Domain 1)
- Information for sustainable consumption (Domain 1)

- **What would be the implications for economic growth?**

The costs of reducing GHG emissions

- Optimists:
  - 'Costs' are really investments, can contribute to GDP growth
  - Considerable opportunity for zero-cost mitigation
  - A number of resource-efficient technologies are (nearly) available at low incremental cost over the huge investments in the economic system that need to be made anyway
  - 'Learning curve' experience suggests that the costs of new technologies will fall dramatically
  - Resource efficiency policies can spur innovation, new industries, exports and growth
- Pessimists:
  - Constraining resource use is bound to constrain growth
  - Cheap, abundant energy and other resources are fundamental to industrial development

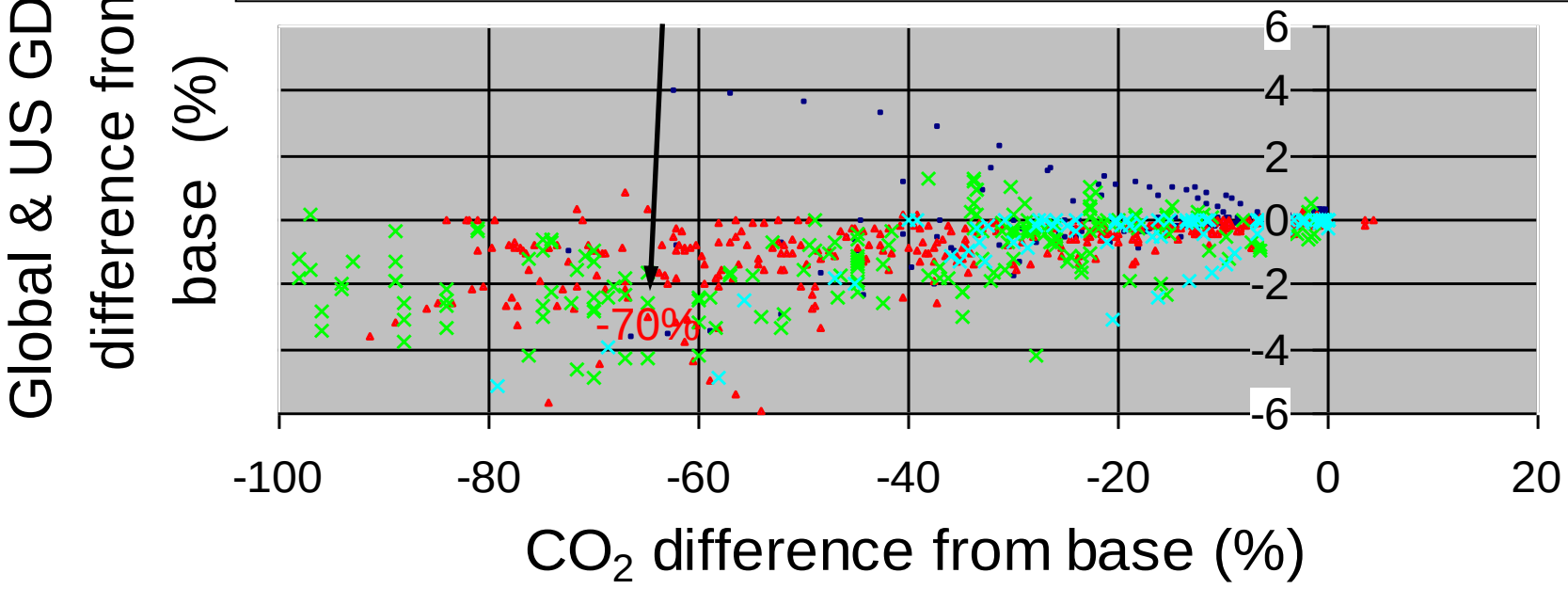
Estimating the macro-economic cost of carbon reduction

- Models are essential to integrate cost data in a representation of
  - The energy system (MARKAL): energy system cost, welfare cost, GDP cost
  - The economy: macro-econometric/general equilibrium models

- Stern's conclusion (p.267)
  - "Overall, the expected annual cost of achieving emissions reductions, consistent with an emissions trajectory leading to stabilisation at around 500-550 ppm CO_2e, is likely to be around 1% GDP by 2050, with a range of +/-3%, reflecting uncertainties over the scale of mitigation required, the pace of technological innovation and the degree of policy flexibility."

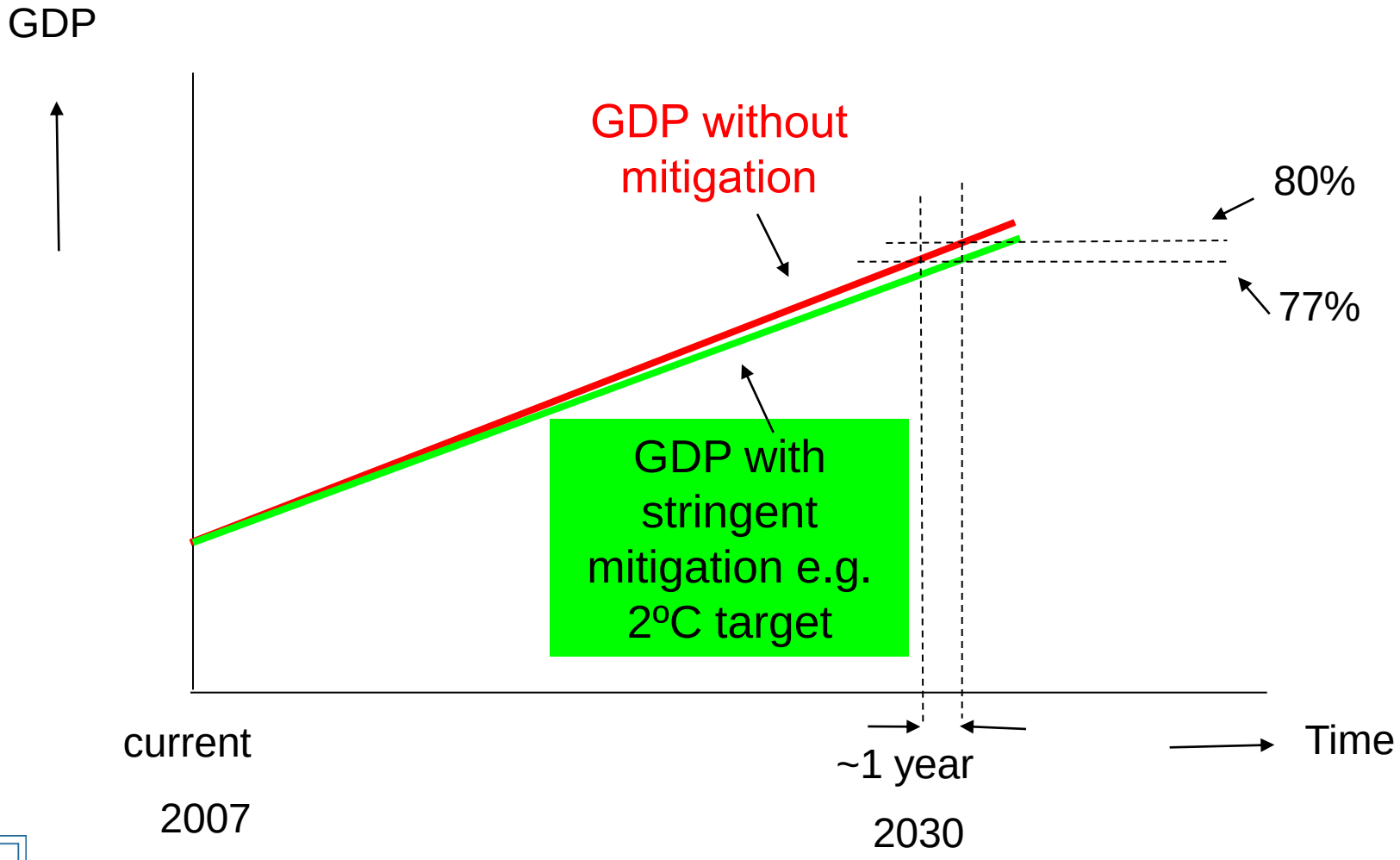
Scatter plot of model cost projections, 2000-2050

Each point refers to one year's observation from a particular model for changes from reference case for CO2 and the associated change in GDP (from four sources, for periods over 2000-2050)



- IMCP with ITC dataset
- post-SRES dataset
- WRI dataset (USA only)
- EMF-21 with multigas

Illustration of a 3% GDP cost number with 3% GDP growth per annum



Projections from the 2011 UNEP Green Economy Report

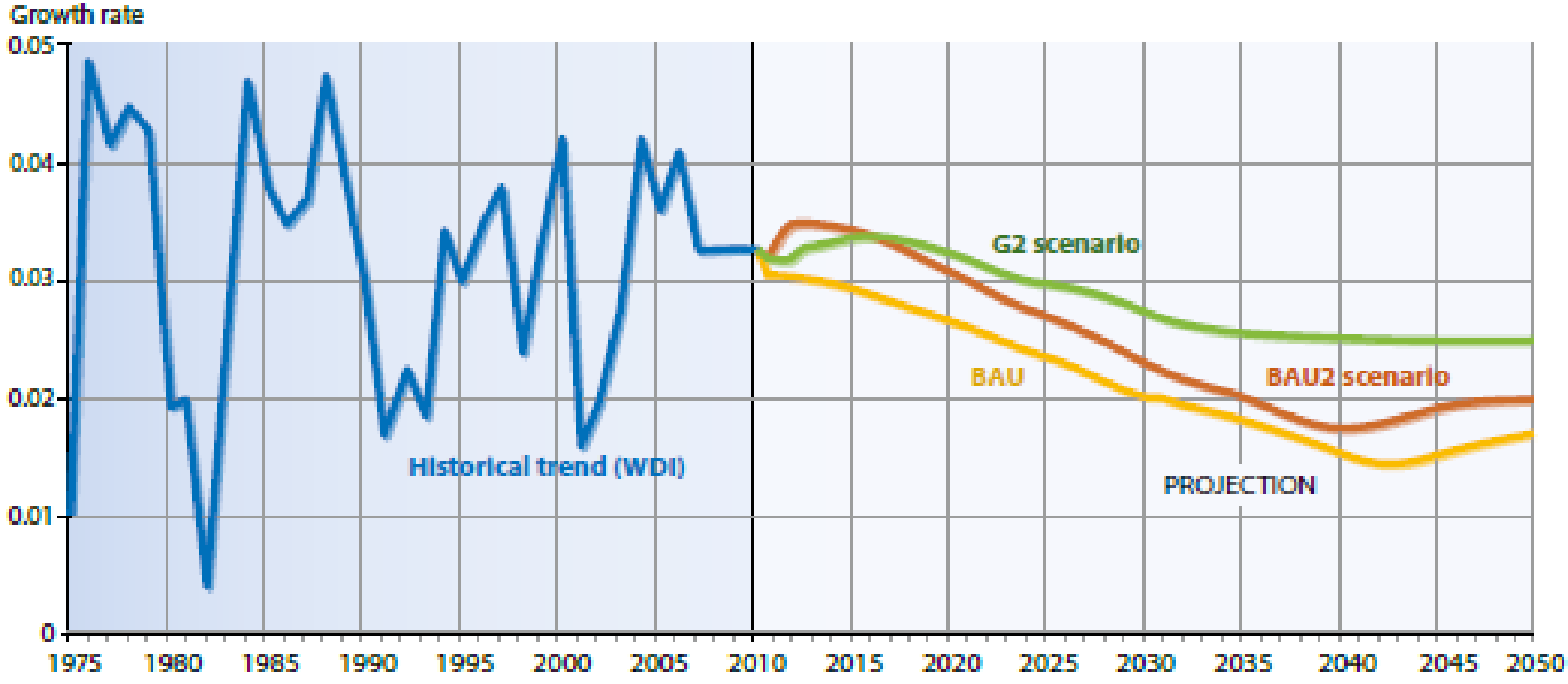


Figure 13: Trends in annual GDP growth rate, historical data (WDI, 2009) and projections in BAU, BAU2 and G2 scenarios

Going low-carbon: summary of the arguments

- **Two unpalatable facts:**
  - Low-carbon supply technologies are currently more expensive than high-carbon incumbents
  - Low-carbon efficiency technologies can have negative net costs but are not easy to implement through policy
- **However, going low-carbon can have net short-term benefits if:**
  - Implementation of efficiency technologies can balance out the higher costs of supply
  - Carbon pricing allows more distorting taxes to be reduced
- **Going low-carbon will have net long-term benefits if:**
  - It stimulates innovation that reduces low-carbon costs below those of high-carbon incumbents *or* results in the development of new, or more efficient, technologies, products and processes
  - Other countries also go low-carbon, providing export markets for the technologies, products and processes
  - There are further price increases and volatility in fossil fuel prices
  - It yields substantial secondary benefits in terms of reduced air pollution
- **Above all, if it helps to persuade other countries to go low-carbon, thereby reducing their emissions and limiting damages from climate change**

Conclusions on the economics of GHG abatement

- GDP costs of mitigation are likely to be relatively low (≈3% GDP)
- These costs are low compared to expenditures on health and insurance against risk
- With health co-benefits, there are net benefits from mitigation
- Fossil fuel importing countries with abundant renewables could experience net GDP and employment benefits by 2030
- Fossil fuel importing countries experience energy security benefits
- Decline in fossil fuel asset values needs to be carefully managed
- The development of renewables technologies promises essentially limitless zero marginal cost electricity for the future
- Investment in clean energy could be a major driver of development
- Many of these arguments can be applied to green economic policy more generally

More widely, successful policy for a green economy could deliver many aspects of sustainable development:

- Strengthen an economy by renewing infrastructure, stimulating innovation and investment, yielding new technology, economic activity, increased resource productivity, exports;
- Build comparative advantage, capability and exports in growing global markets;
- Deliver as much economic growth as the planet's resources and environment could support over the long term;
- Increase resource security (reduced vulnerability): food, water, energy, rare materials (expect high, rising and volatile commodity prices);
- Reduce GHG emissions, waste to landfill, extraction of virgin materials and improve the daily environmental experience and quality of life of citizens;
- Give a country a leading voice in global political discourse on increasingly important resource and environment issues.

BUT …

Successful policy requires more consistency across government than democracies find it easy to deliver

- There will be losers as well as winners
- Many losers are powerful, well-established vested interests (e.g. fossil fuel producers) which will resist change
- There will be short to medium-term costs which will be politically unpopular
- Some of the distributional implications could be regressive without compensating policy which may be difficult to design and deliver
- Democratic governments are more responsive to short-term pressures than long-term imperatives
- **SO**, despite its net long-term benefits, the Green Economy will not be easy to achieve

Thank you

www.bartlett.ucl.ac.uk/sustainable