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# Making 'green' and 'growth' work together

**Dr. Alex Bowen**

**Principal Research Fellow,  
Grantham Research Institute on Climate Change and the  
Environment, LSE**

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Munich RE



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## **‘Green’ growth: outline**

- Ultimate necessity
- Scope for boosting growth – ‘win-win’ possibilities
- Challenges



# What is meant by ‘green’ growth?

- *‘improving human well-being and social equity, while significantly reducing environmental risks and ecological scarcities’ (UNEP, 2011)*
- *‘fostering economic growth and development while ensuring that natural assets continue to provide the resource and environmental services on which our well-being relies’ (OECD, 2011)*
- *‘making growth processes resource efficient, cleaner and more resilient without necessarily slowing them’ (World Bank: Hallegatte et al, 2011)*
- Sustainable development: *‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Brundtland Report, 1987)*



# Erosion of natural capital

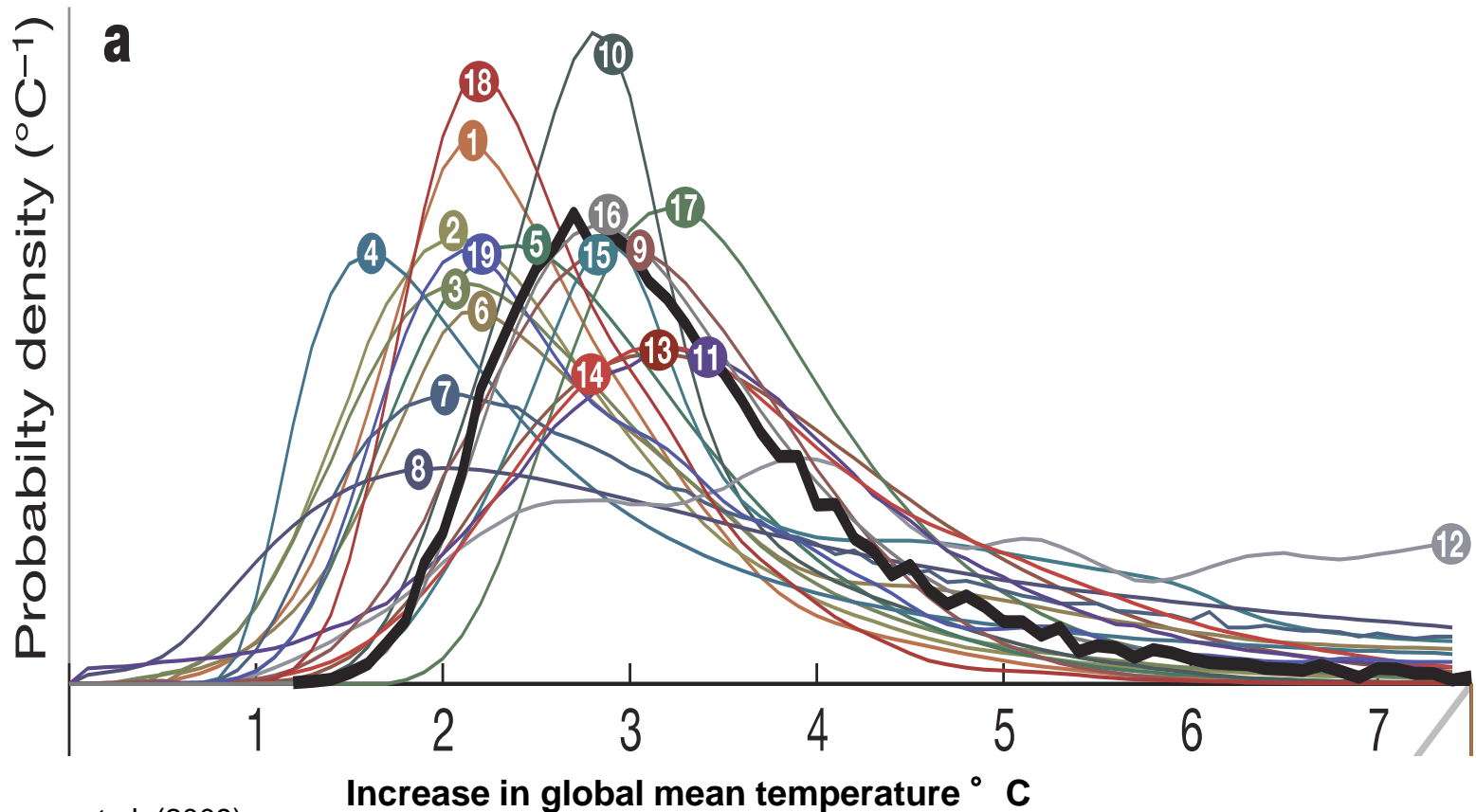
## Annual dissaving (% of GNI)

	Energy depletion	Mineral depletion	Net forest depletion	CO <sub>2</sub> damage	Particulate emissions damage	Total
East Asia/Pacific	4.3	1.7	0.0	0.9	1.1	8.0
Sub-Saharan Africa	10.4	2.2	0.5	0.5	0.4	14.0
World	2.8	0.6	0.0	0.4	0.3	4.1



# Guarding against the worst risks

25 estimates of the 'climate sensitivity'





## The urgency of early action

- Induces innovation sooner
- Avoids 'lock-in' of the wrong technologies
- Allows more gradual scrapping/retrofitting
- Allows policy-makers to establish credibility
- Preserves 'option value'
- Allows maximum benefit from correcting associated market failures
- Exploits current high world saving rates



## **‘Green’ growth: potential**

- Fiscal stimulus and jobs in the short run
- Correction of market failures in the short to medium run and co-benefits e.g. health
- Wave of innovation and competition in the medium to long run
- Loosening of the energy resource straightjacket in the long run



## **‘Green’ growth: fiscal stimulus**

- Is there Keynesian unemployment?
- Would other measures work better w.r.t. cause of downturn?
- Are projects ‘shovel-ready’?
- Are there problems with financing?
- Can the private sector provide the stimulus?
- Is there an appropriate exit strategy?





# Not all measures equally 'jobs-friendly'

## The Korean stimulus

Spending item	Total Employment Increase	Total Planned Spending (US\$ m)	Employment Increase/US\$ Bn Added Expenditure
Mass transit	138,000	7,005	19700
Energy conservation	170,000	5,840	29100
Vehicles and clean energy	14,300	1,490	9600
Env friendly living space	10,800	350	30900
River restoration	200,000	10,500	19000
Forest restoration	134,000	1,750	76600
Water resource management	16,000	685	23400
Resource recycling	16,000	675	23700
Green information	3,000	270	11100
Total	703,000	28,600	24600

Source: Barbier (2009).



# **‘Green’ growth: correcting market failures**

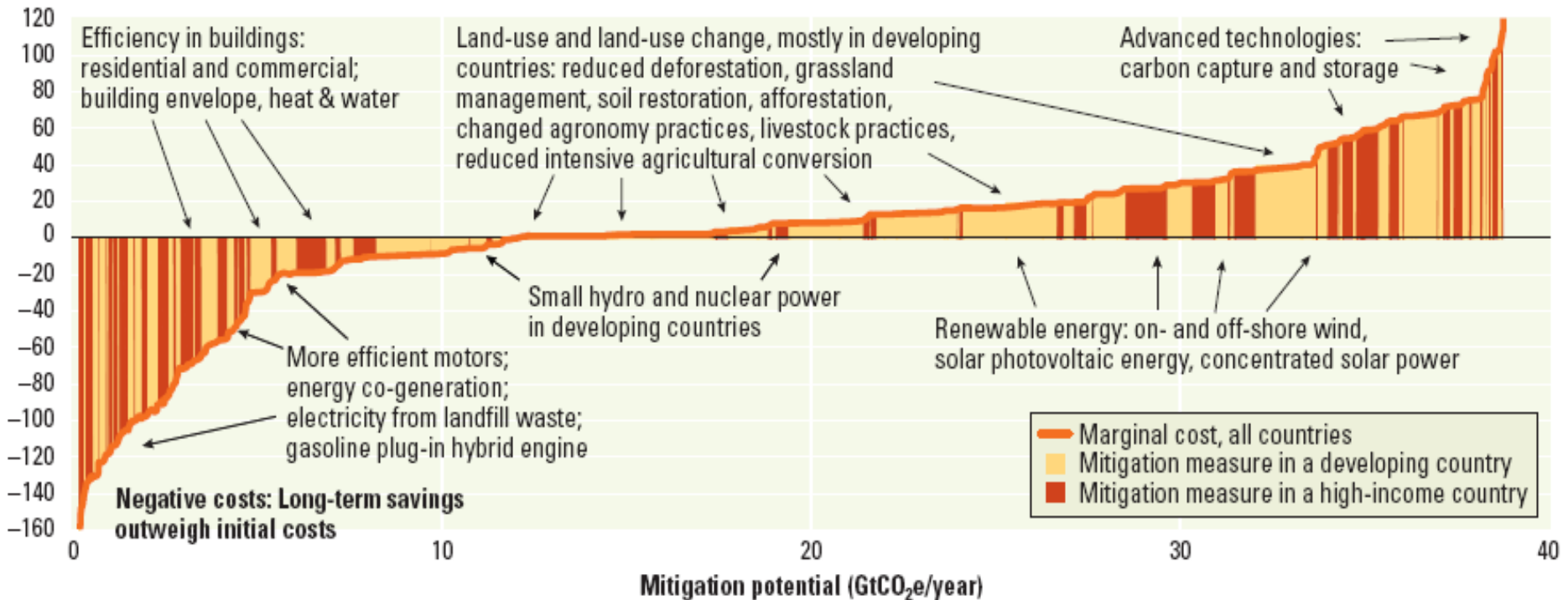
- The GHG externality
- Network externalities
- Financial system (need for a GIB)
- Innovation
- Competition
- Trade (energy security issue)



# Cost estimates

a. Global greenhouse gas mitigation marginal cost curve beyond 2030 business-as-usual

Marginal mitigation cost (\$/tCO<sub>2</sub>e)



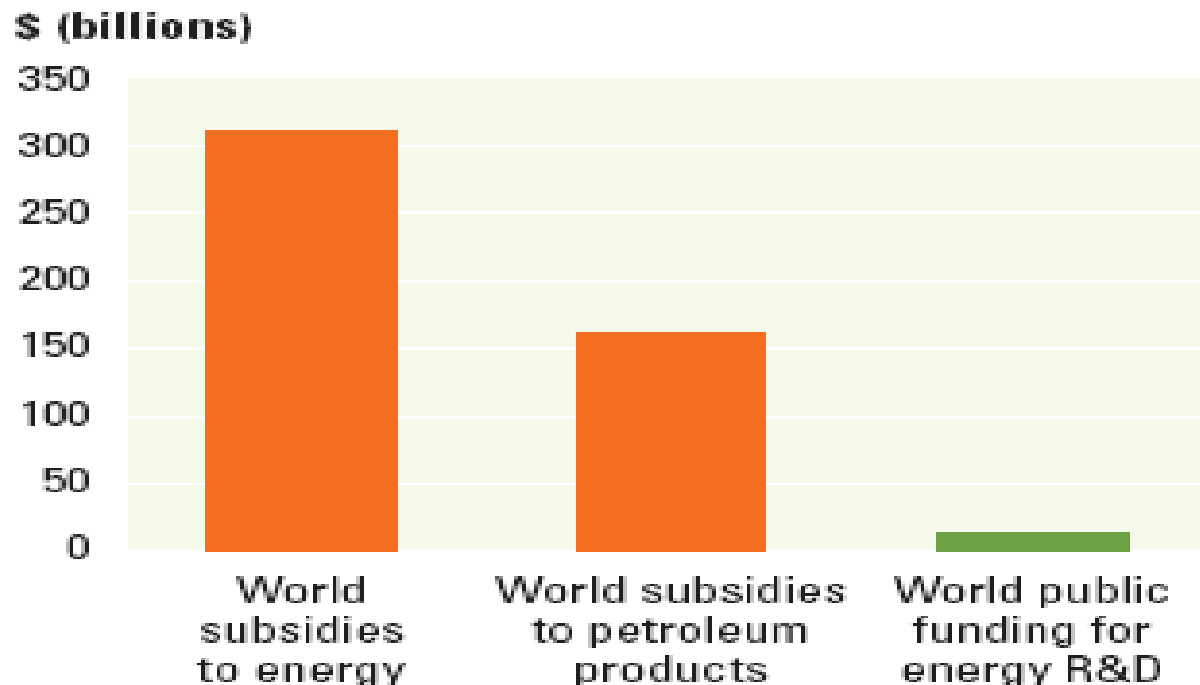


# **‘Green’ growth: innovation and structural change**

- Need to benefit from the usual spill-overs from innovatory activities
- Green innovations have more spill-overs than average
- Competition among entrepreneurs/countries drives adoption of green technologies and products – the ‘Green Race’
- Carbon pricing drives innovation and structural change



# Promoting technological innovation



*Sources:* IEA 2008a; IEA 2008b; IEA, <http://www.iea.org/Textbase/stats/rd.asp> (accessed April 2, 2009).

*Note:* Global subsidy estimates are based on subsidies shown for 20 highest-subsidizing non-OECD countries only (energy subsidies in OECD countries are minimal).



# Promoting technological innovation

## Comparative performance on green innovation

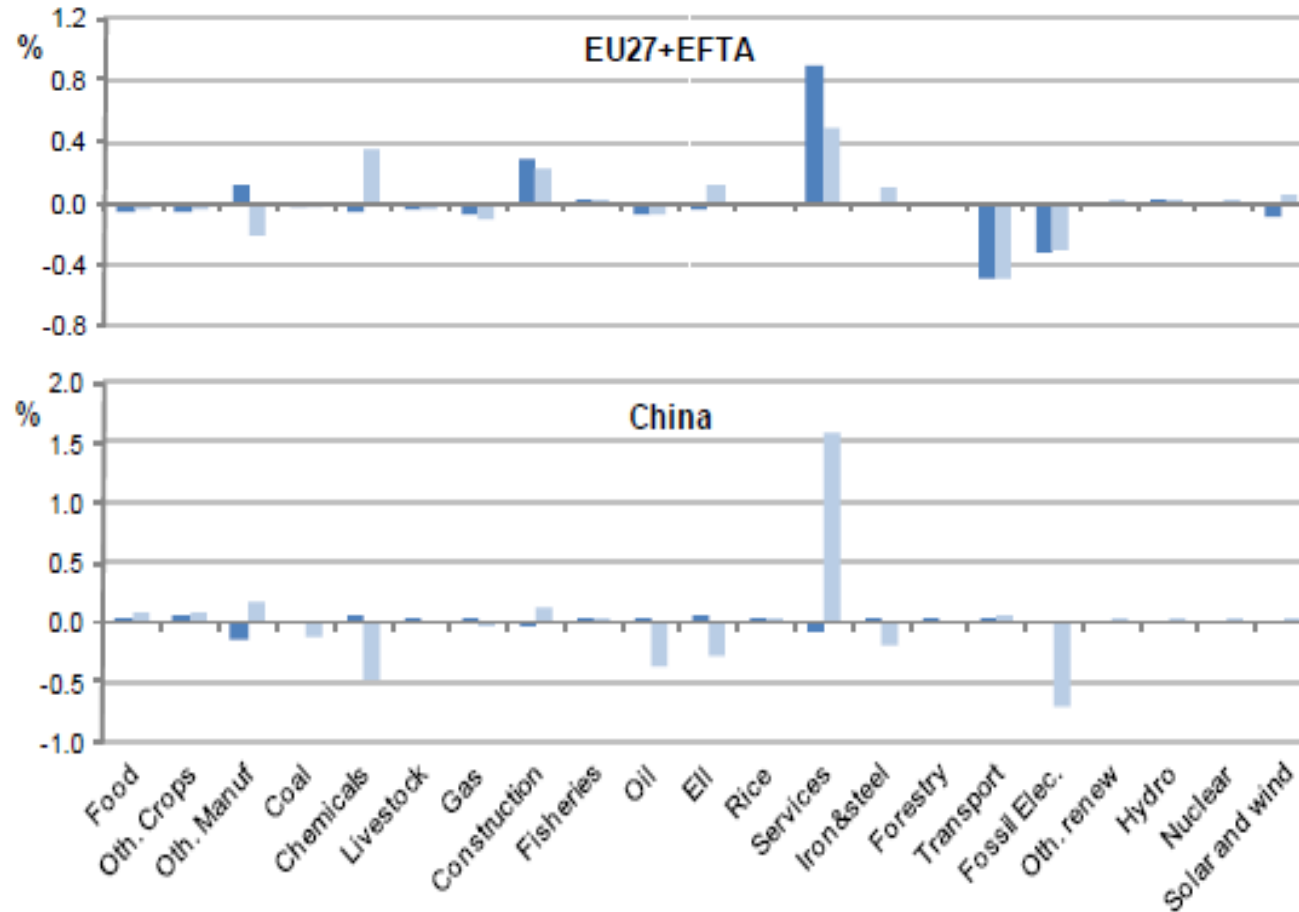
Top 15 inventors, with average % of total climate related inventions (1980-2007 and 2002-2007)

Country Rank	1980-2007		2002-2007	
	Average % of world's inventions	Rank	Average % of world's inventions	Rank
Japan	20.2%	1	20.8%	1
Germany	19.8%	2	17.8%	2
USA	15.4%	3	14.1%	3
France	5.1%	4	4.4%	5
<b>UK</b>	<b>4.5%</b>	<b>5</b>	<b>4.3%</b>	<b>6</b>
Australia	3.8%	6	2.9%	9
Sweden	3.3%	7	1.7%	14
South Korea	3.1%	8	5.6%	4
Canada	2.2%	9	3.0%	8
Netherlands	2.1%	10	1.8%	13
Austria	2.0%	11	2.1%	11
Italy	1.9%	12	2.3%	10
Switzerland	1.9%	13	1.3%	16
China	1.9%	14	3.9%	7
Denmark	1.4%	15	1.4%	15
<b>Total</b>	<b>88.6%</b>		<b>87.4%</b>	

Source: Dechezleprêtre and Martin (2010)



# Opportunities from sectoral change





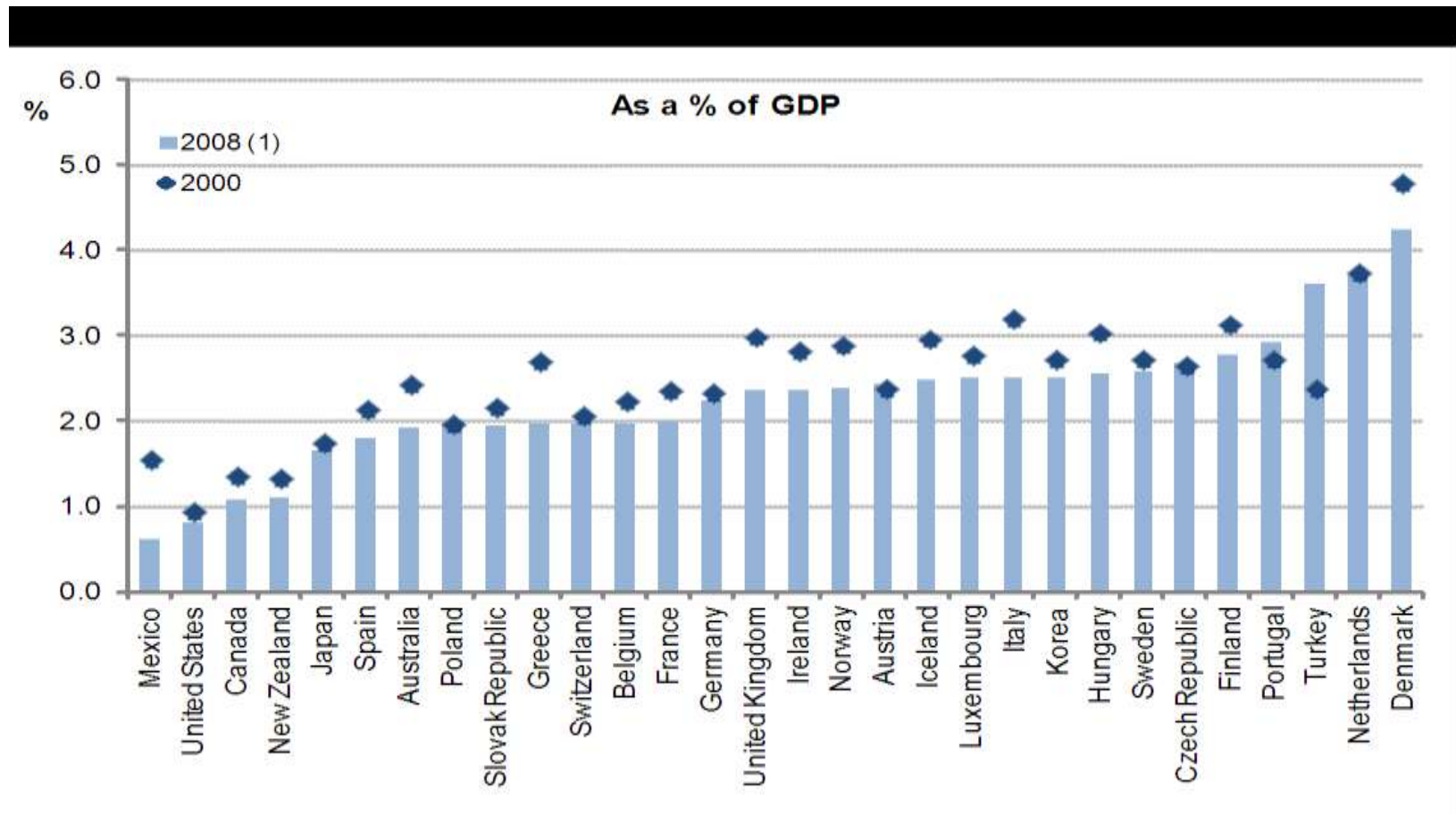
# ‘Green’ growth: challenges

- Measurement
- Costs
  - Lower productivity (for how long?)
  - Crowding out consumption and/or other investment
  - Managing structural change
  - Timing w.r.t. macroeconomic conditions
  - Cost effectiveness – carbon pricing





# Switch to environmental taxes?





# ‘Green’ growth: challenges

- Dependence on policies
  - Credibility
  - Time inconsistency
  - Rent seeking
  - Free riders
  - Lags in implementation

“rather than green policies stifling economic growth, it’s clear that the converse is true... this is our direction of travel: encouraging green growth and environmental protection through international cooperation, long-term targets and effective market mechanisms” - George Osborne, UK Chancellor



# Key policy actions required

## Low-Carbon Green Growth in Asia

Area of policy	Actions required	Reasons for these actions
Energy sector	Unwinding of energy subsidies; introduction of pervasive and broadly uniform carbon pricing.	To send a clear signal about the direction of energy policy; to improve energy efficiency and generate tax revenues to fund other national objectives.
Innovation	Stimulation of locally appropriate innovation in production technologies, products, and management. That needs sector-specific initiatives, including time-limited public support for low-carbon research, development, deployment, and diffusion; and more regional cooperation.	Innovation is a key driver, along with capital accumulation and skills acquisition, of economic growth. Asia will be able to rely less in future on very rapid capital widening, movement of workers from low-productivity to high-productivity sectors and “catch-up” with today’s technological leaders.
Resource use	Improvement of incentives for efficiency, particularly in the use of natural resources and the services provided by the natural environment. The focus must be on what is appropriate for nations in the longer term, given the long lives of many investments, particularly in the energy sector.	Policy makers need to discourage private investors from locking in inefficient technologies when they invest, by offering clear signals about the potentially high returns from the transition to green growth.
Labor markets	The promotion of labor market mobility and the acquisition of new skills.	Active labor market policies are needed to facilitate rapid structural change, including the transition to a low-carbon economy; that also helps to share the benefits of green growth more equitably.
Social inclusivity	Integration of the social dimension of growth with the macroeconomic dimension; mitigating the adverse impacts on the poor of taking the low-emissions path; using local knowledge to stimulate appropriate innovation.	Green growth should be pro-poor and pro-job but will not be so automatically; enhancing communities’ capacities for collective action should improve economic, social, and environmental outcomes across the board.



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# Thank you!

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The GRI research programme on 'Green growth and a new Industrial Revolution' is supported by the Global Green Growth Institute and comprises four research themes:

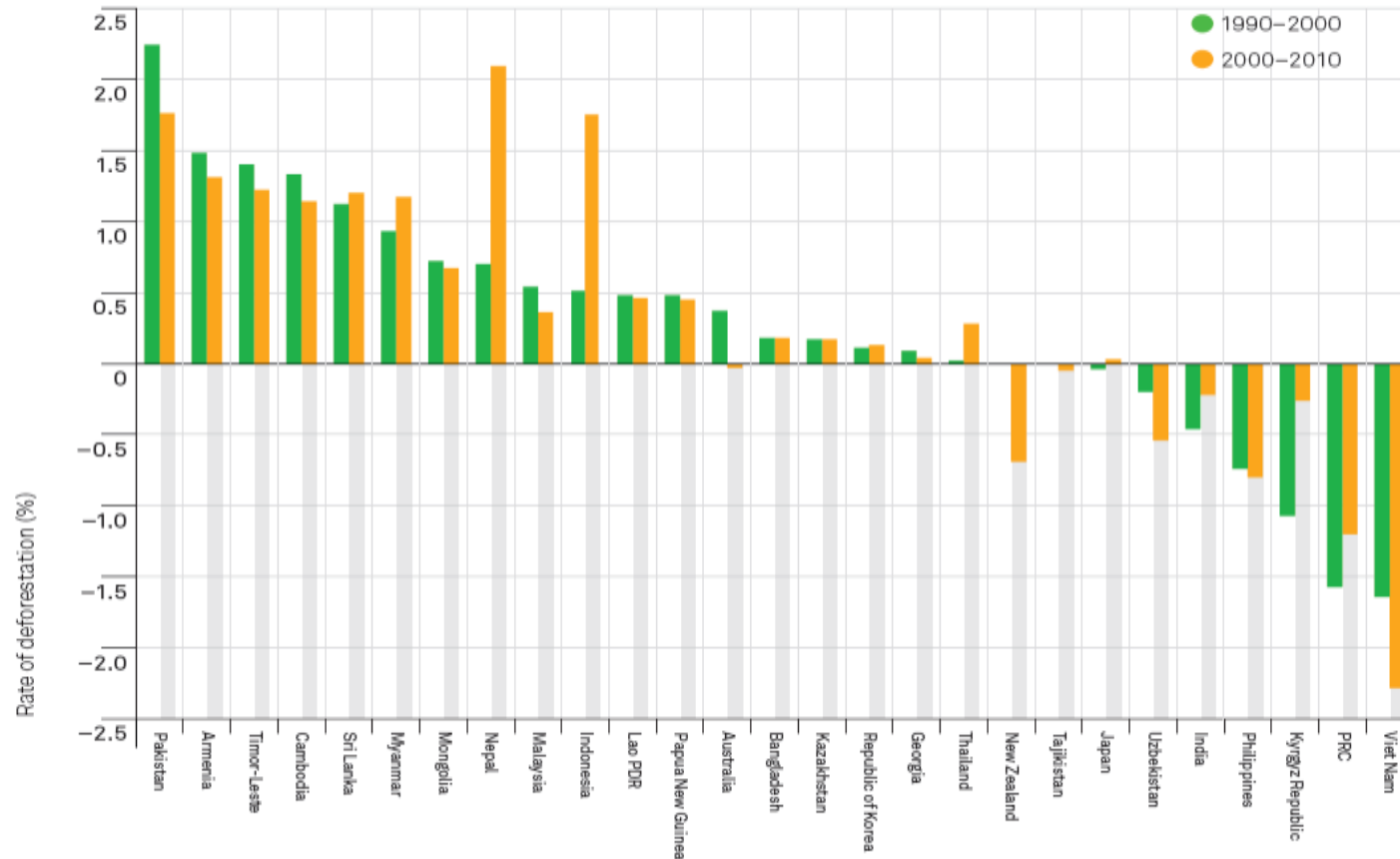
- Macroeconomic issues: jobs, poverty and green growth
- Studies of the impact of innovation and other climate-change policies
- Evidence from economic history about the sources of growth and the role of policy
- Growth and adaptation to climate change



# **ANNEXES**



# Average annual deforestation rates 1990-2000 and 2000-2010



Source:  
ADB (2011)



# Job creation from green policies

## Low-Carbon Green Growth in Asia

		Green potential	Green job progress to date	Long-term green job potential
Energy	Renewables	Excellent	Good	Excellent
	Carbon capture and storage	Fair	None	Unknown
Industry	Steel	Good	Fair	Fair
	Aluminum	Good	Fair	Fair
	Cement	Fair	Fair	Fair
	Pulp and paper	Good	Fair	Good
	Recycling	Excellent	Good	Excellent
Transportation	Fuel-efficient cars	Fair to Good	Limited	Good
	Mass transit	Excellent	Limited	Excellent
	Rail	Excellent	Negative	Excellent
	Aviation	Limited	Limited	Limited
Buildings	Green buildings	Excellent	Limited	Excellent
	Retrofitting	Excellent	Limited	Excellent
	Lighting	Excellent	Good	Excellent
	Efficient equipment and appliances	Excellent	Fair	Excellent
Agriculture	Small-scale sustainable farming	Excellent	Negative	Excellent
	Organic farming	Excellent	Limited	Good to Excellent
	Environmental services	Good	Limited	Unknown
Forestry	Reforestation/Afforestation	Good	Limited	Good
	Agroforestry	Good to Excellent	Limited	Good to Excellent
	Sustainable forestry management	Excellent	Good	Excellent

Source: ADB-ADBI study team based on UNDP (2008)



# Working with uncertainty

'Probabilities' of exceeding a global temperature increase at equilibrium (%)

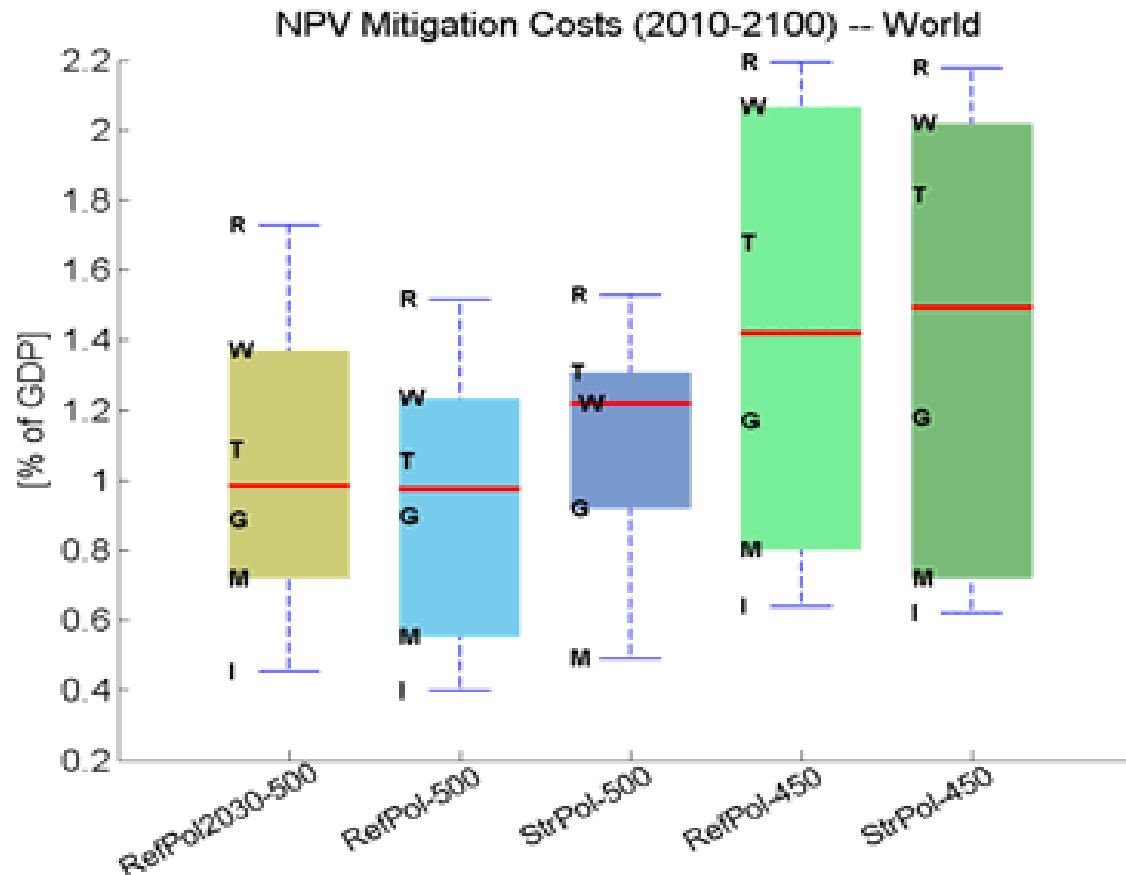
**Stabilisation level  
(in ppm CO<sub>2</sub>e)**

	2°C	3°C	4°C	5°C	6°C	7°C
450	78	18	3	1	0	0
500	96	44	11	3	1	0
550	99	69	24	7	2	1
650	100	94	58	24	9	4
750	100	99	82	47	22	9



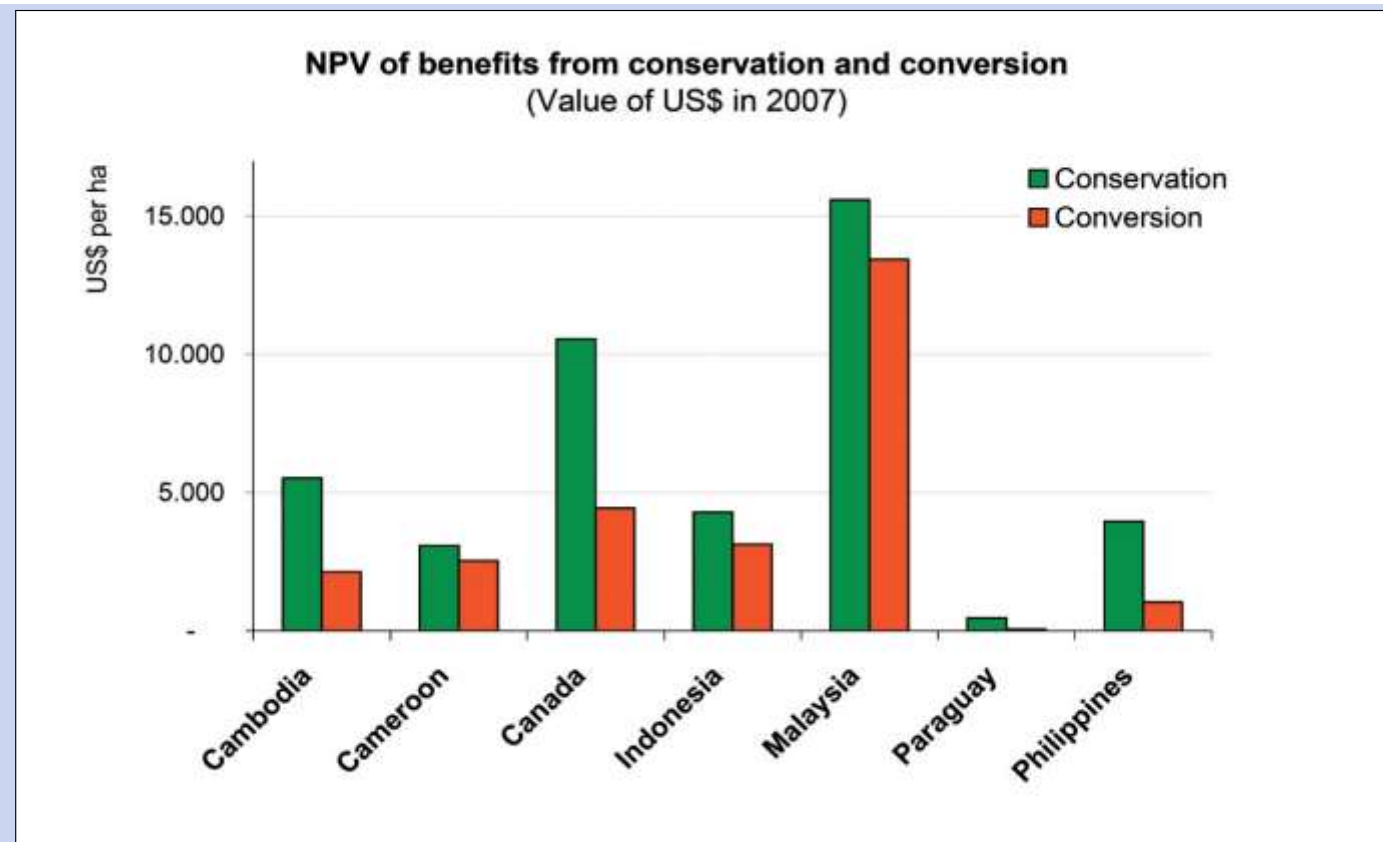


# How costly are climate-change targets?





# Making better economic choices

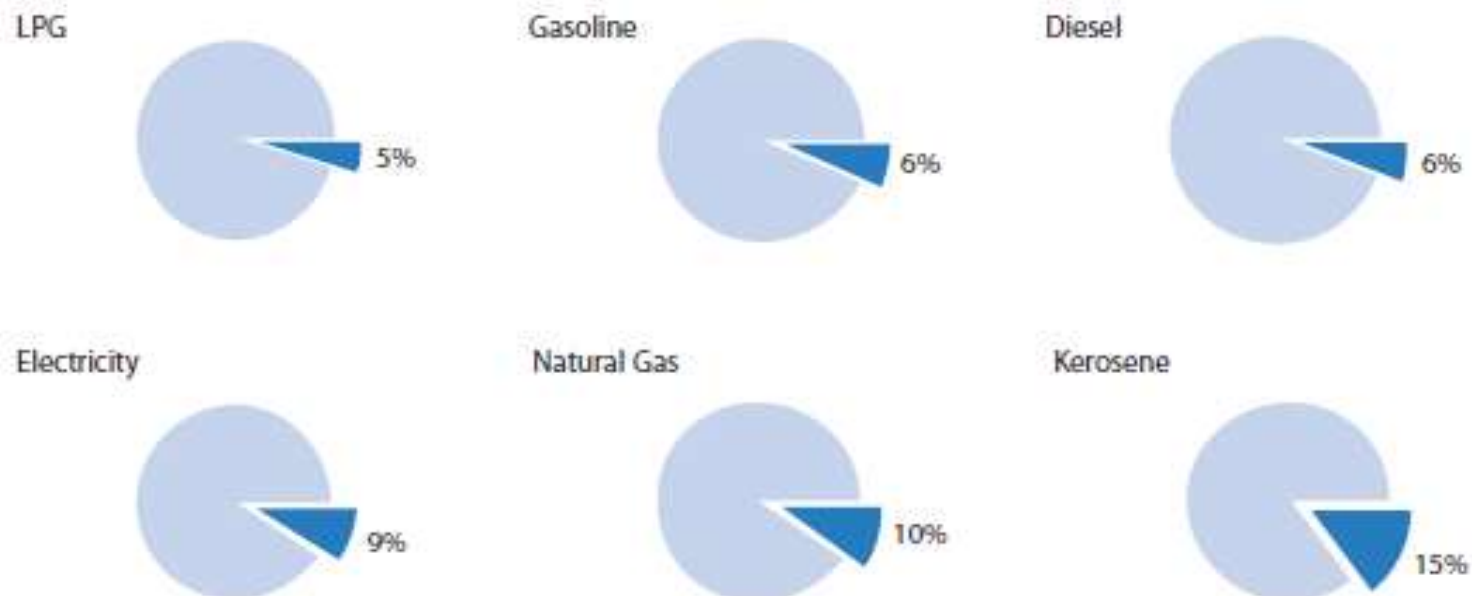


Sources: Bann (1997), Yaron (2001), van Vuuren and Roy (1993), van Beukering et al. (2003), Kumari (1994), Naidoo and Ricketts (2006), and White et al. (2000), as reviewed by Balmford et al. (2002), Papageorgiou (2008) and Trivedi et al. (2008). 'Conservation' includes sustainable production of market goods and services including timber, fish, non-timber forest products, and tourism. 'Conversion' refers to replacement of the natural ecosystem with a system dedicated to agriculture, aquaculture, or timber production.



# Removing inefficient subsidies

Figure 3.2. Share of fossil-fuel subsidies received by the lowest 20% income group, 2010  
Eleven surveyed developing economies



*Note:* Countries surveyed were Angola, Bangladesh, China, India, Indonesia, Pakistan, Philippines, South Africa, Sri Lanka, Thailand and Vietnam. LPG: liquid petroleum gas.

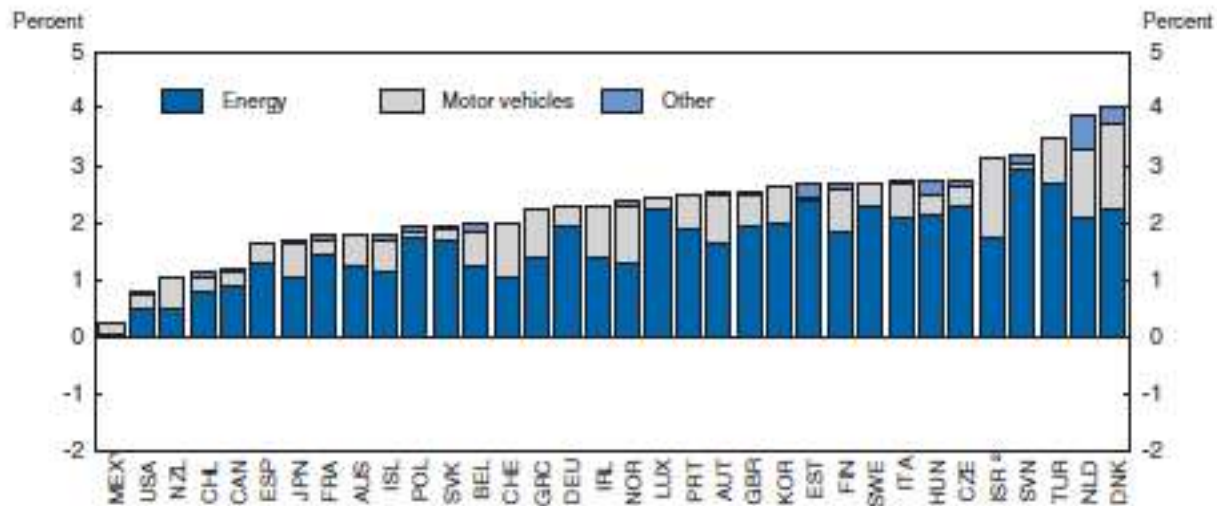
*Source:* IEA (International Energy Agency) (2011), *World Energy Outlook 2011*, IEA, Paris.



# Reducing deadweight losses from taxes

Figure 2.1. Composition of environmentally related tax revenues by country

As a percentage of GDP in 2009



1. In Mexico, fluctuations of consumer prices on motor vehicle fuels are smoothed out. Since 2009, the Government is implementing a phase-out policy of inefficient fossil fuel subsidies. For Greece, a 2008 figure is used for motor vehicle taxes.
2. Information on data for Israel: see endnote 2.

Source: OECD/EEA database on instruments for environmental policy and natural resources management



# 'Green' growth: challenges

- Are the conditions for a new long wave of development present?
  - Size of sector
  - Competition from old technologies
    - Energy density
    - Sailing ship effect
    - Fossil fuel rents
  - Difficulties in differentiating the product
  - Role of regulated utilities

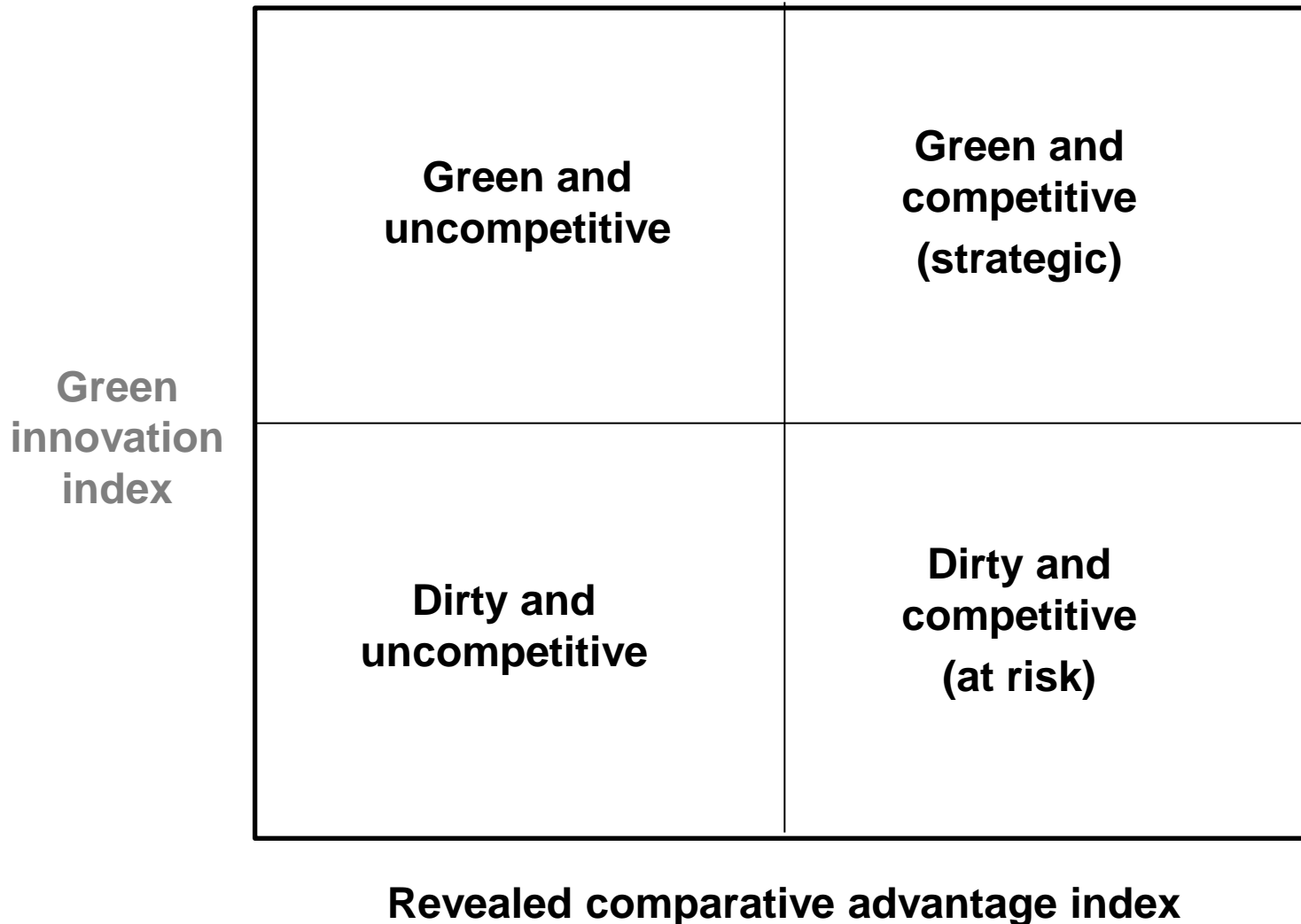


# The 'Green Race'

- LSE paper – Fankhauser, S, et al (2013): “The ‘green race’: in search of environmental competitiveness and innovation”  
*Global Environmental Change* 23, pp 902–913
  - Countries and sectors beginning to position themselves for the emerging green economy.
  - Combine patent data with international trade and output data to investigate who the winners of this ‘green race’ might be.
  - 110 manufacturing sectors in eight countries (China, Germany, France, Italy, Japan, South Korea, UK and the USA), 2005-2007.
  - Many incumbent country-sectors with strong comparative advantages today lag behind in terms of green conversion, so they could lose their competitive edge.

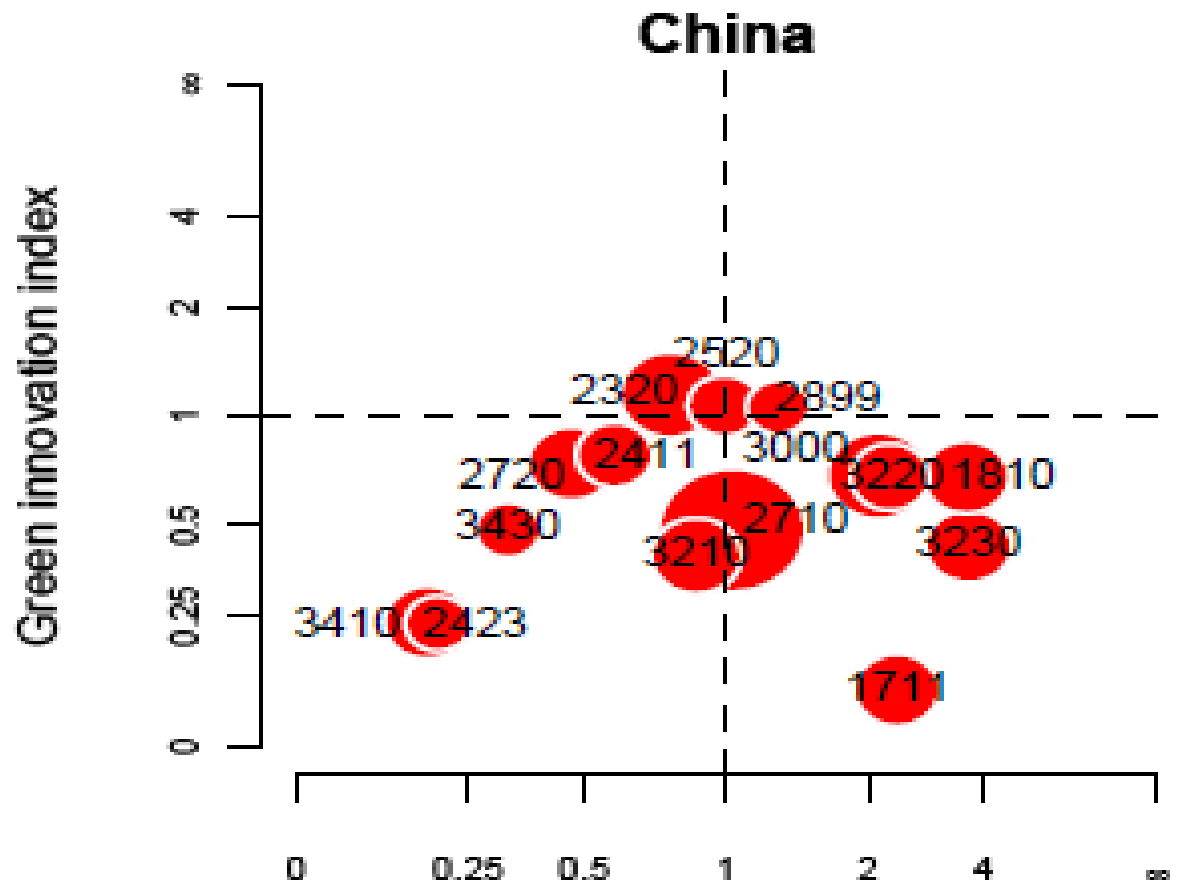


# Bubble charts





# Bubble charts







# Opportunities in the 'green race'

- **Innovation and comparative advantage**
  - Countries:
    - The manufacturing sectors of Japan and to a lesser extent Germany seem best positioned to take advantage of the green shake-up
    - Italy's manufacturing sector has the worst statistics and could fall behind in the green race
    - There are also question marks (based on our 2005–07 snapshot) about China
    - In the UK, green innovation is concentrated, perhaps strategically, in the energy-intensive industries



# Opportunities in the 'green race'

- **Innovation and comparative advantage**
  - **Sectors:**
    - The green economy is much broader than the few flagship sectors (e.g. clean energy and clean cars) on which the debate tends to focus
    - There are areas of green entrepreneurship and innovation across the manufacturing sector, for example:
      - areas such as machinery and consumer goods
      - issues such as resource efficiency and waste management



# Bubble charts

