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# The scope for 'green' growth and a new technological revolution

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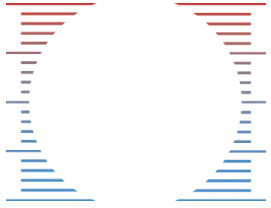


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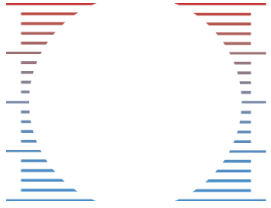
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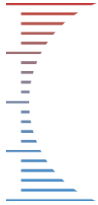
## **‘Green’ growth: outline**

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



# What is meant by 'green' growth?

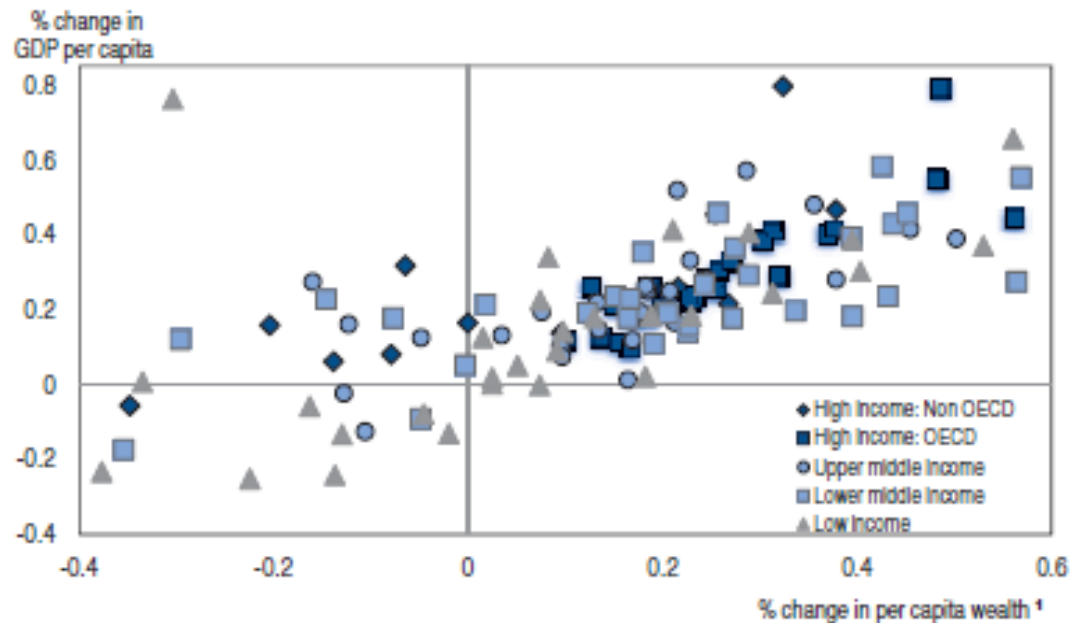
- *'improving human well-being and social equity, while significantly reducing environmental risks and ecological scarcities'* (UNEP, 2011)
- *'fostering economic growth and development while ensuring that natural assets continue to provide the resource and environmental services on which our well-being 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)<sup>3</sup>



# The challenge of sustainability

Figure 1.2. Rising GDP and declining wealth in some countries

1990-2005



1. The wealth estimates incorporate stocks of manufactured, human, social and natural capital. Measured natural capital in these data include agricultural land, protected areas, forests, minerals, and energy but exclude a range of assets which are difficult to measure and value including water resources.

Source: Based on data from World Bank (2010), *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*.



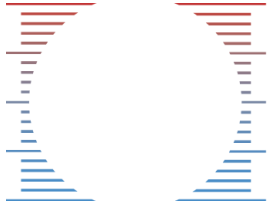
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## **‘Green’ growth: necessity**

- Business as usual
  - Costly
  - Risky
  - Unsustainable
- Growth still necessary
  - Poverty alleviation
  - Politics



# The conventional economic analysis

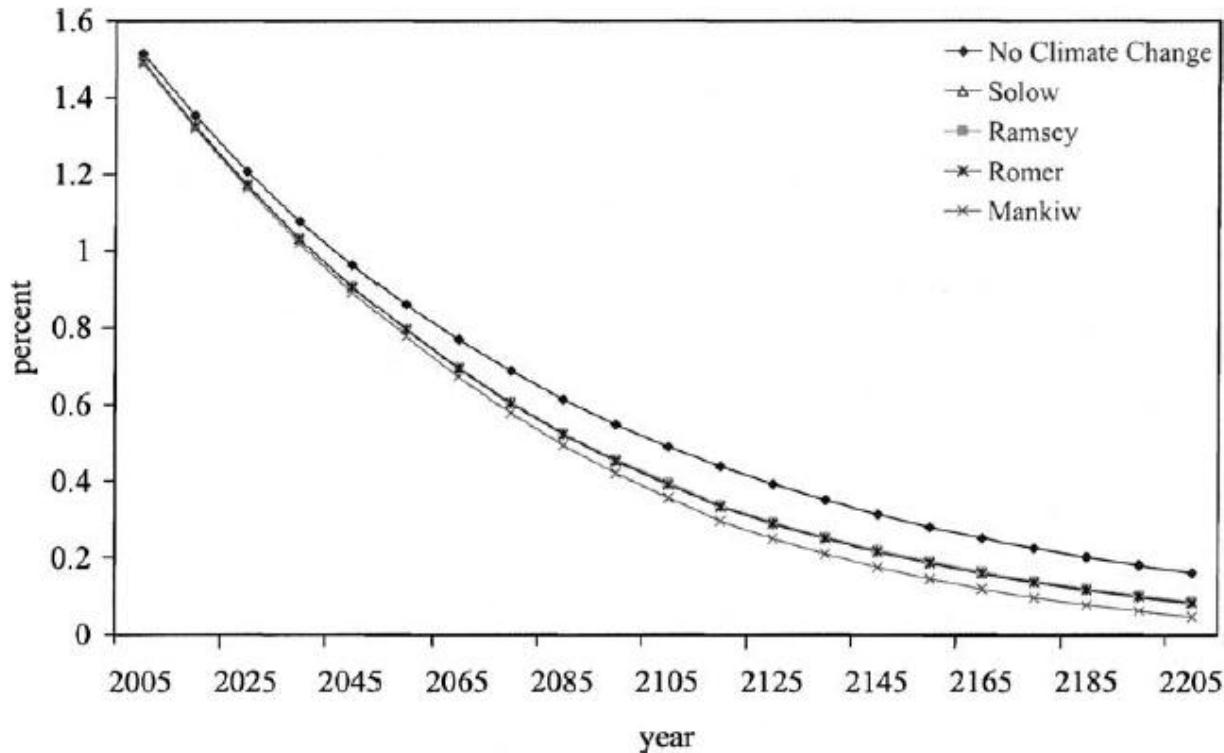
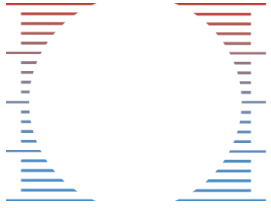
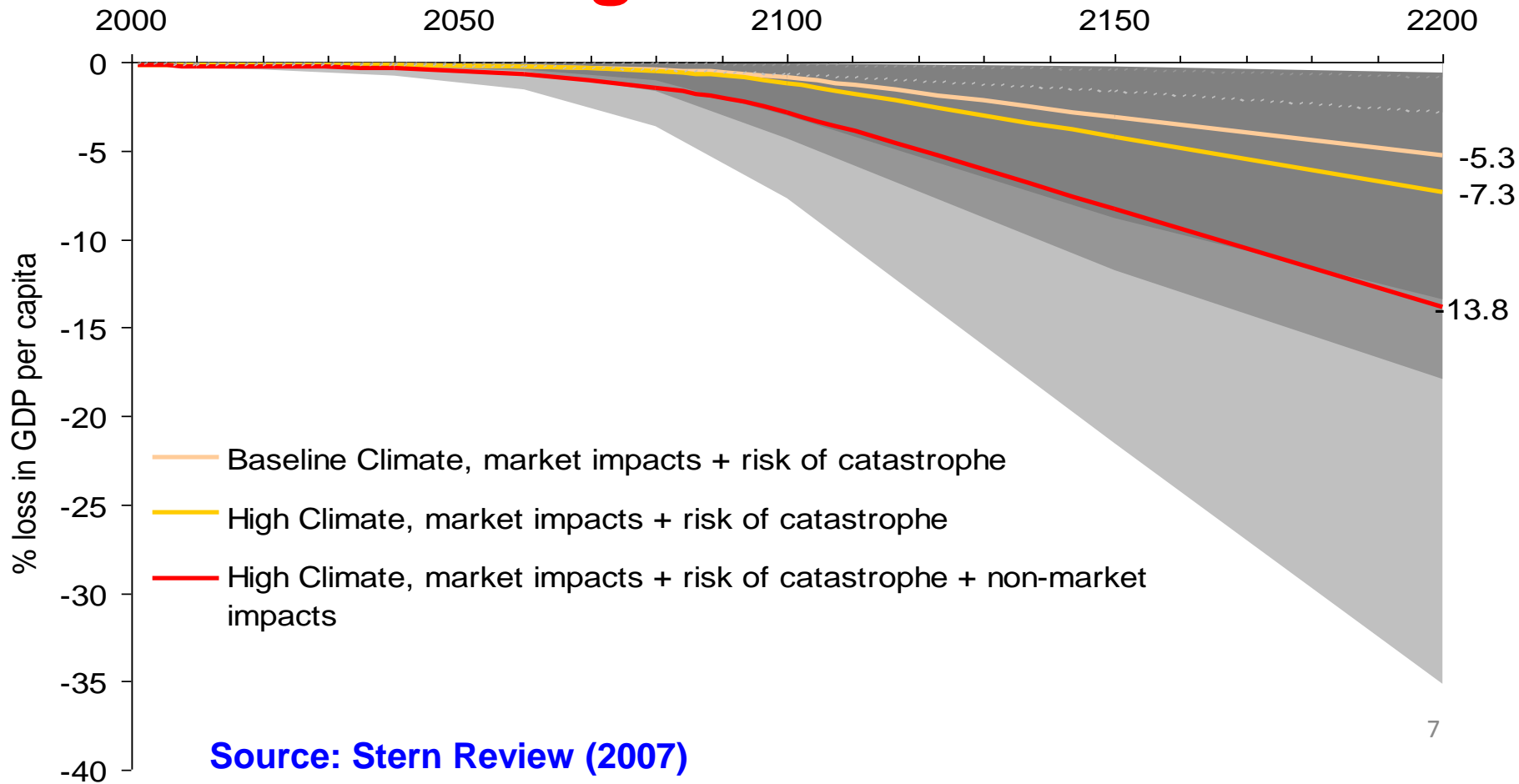
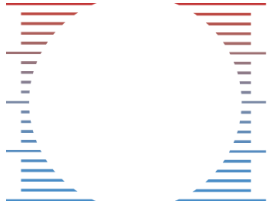


Fig. 3. Growth in per capita income for different growth models, assuming a global mean temperature increase of  $3^{\circ}\text{C}$  causes 5% GDP damage; the Solow–Swan, Ramsey–Cass–Koopmans and Romer results are very similar.

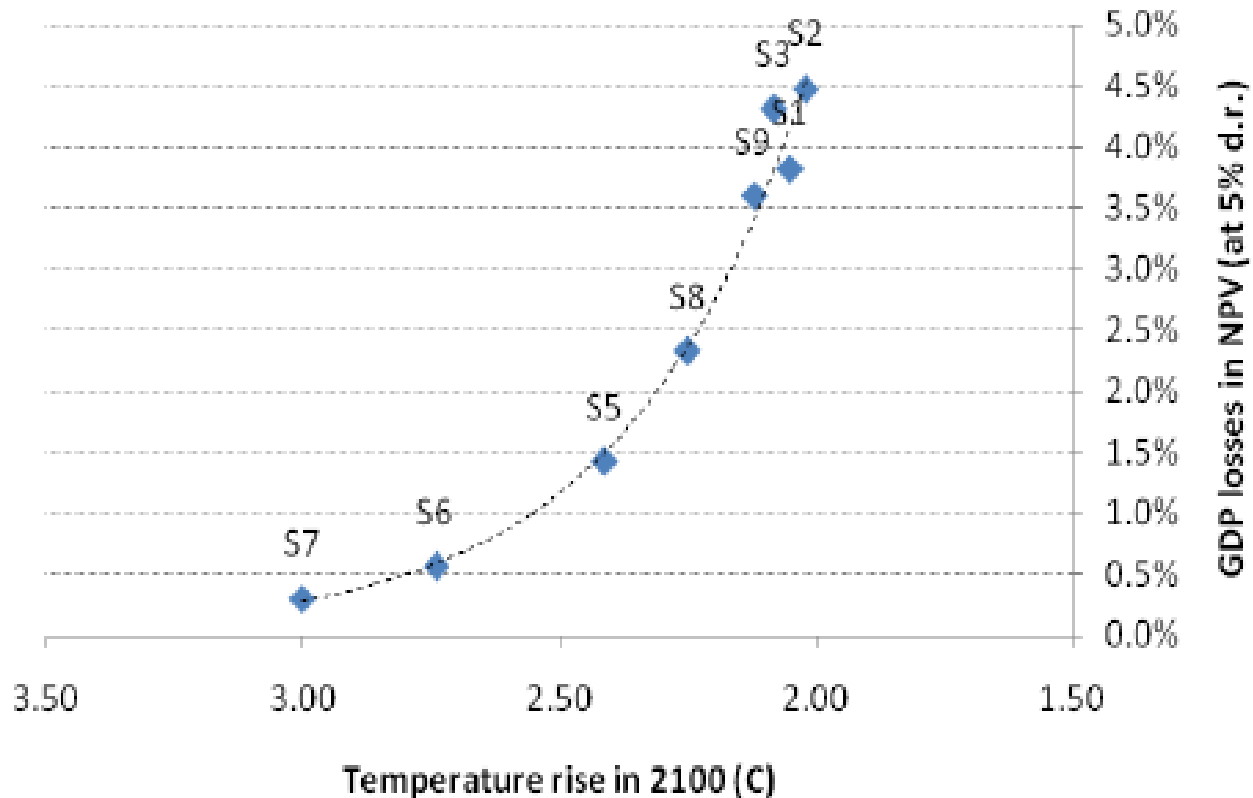


# The Stern Review – and UNFCCC negotiators?





# The temperature/costs trade-off in WITCH (scenarios for AVOID)

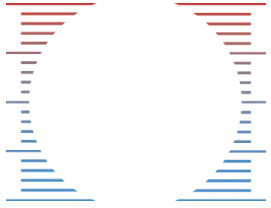






# 'Green' growth: challenges

- Costs
  - Lower productivity (for how long?)
  - Crowding out consumption and/or other investment
  - Managing structural change
  - Timing with respect to macroeconomic conditions



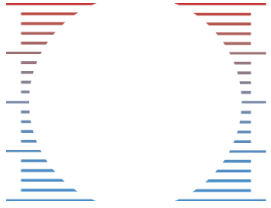
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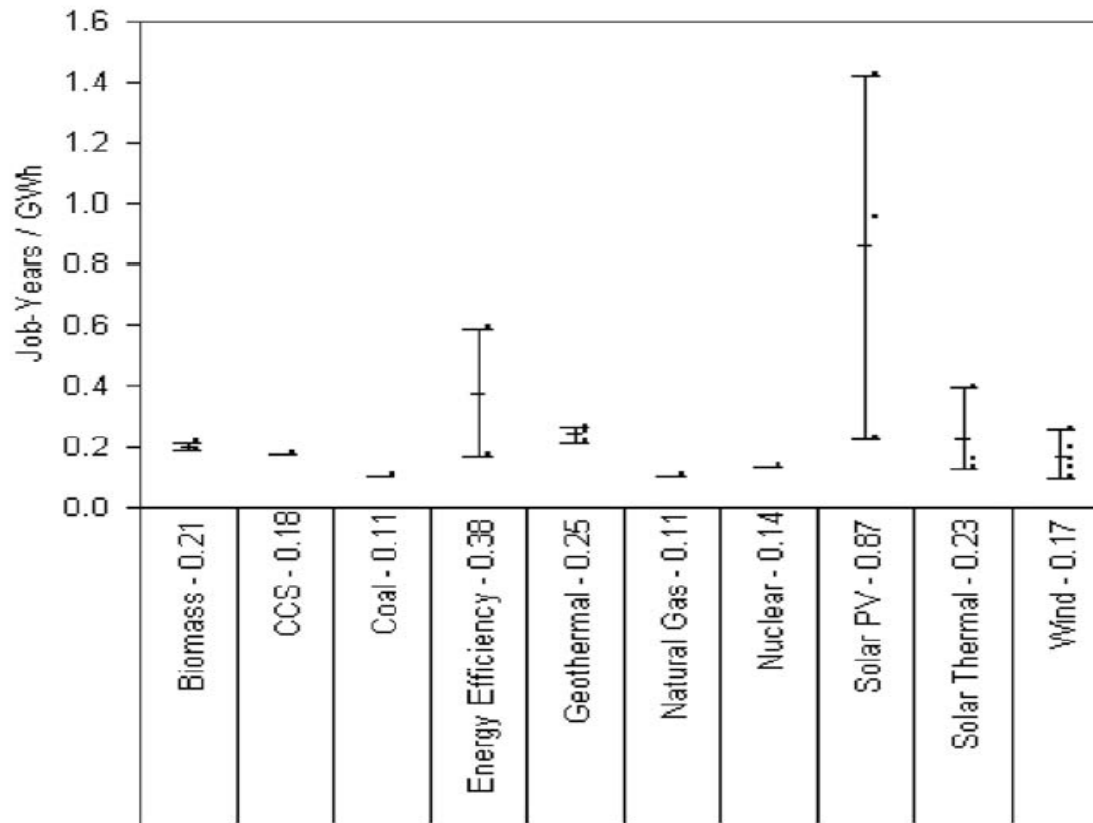
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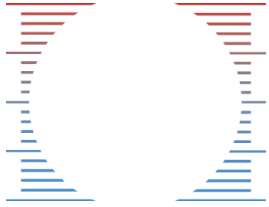
## **‘Green’ growth: potential**

- Fiscal stimulus in the short run: Keynes
- Correction of market failures in the short to medium run: Pigou
- Wave of innovation in the medium to long run (Schumpeter)
- Loosening of the energy resource straightjacket in the long run (Henry George)



# Job creation or low productivity?

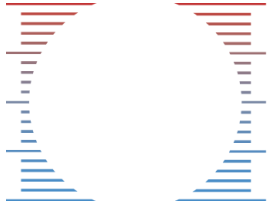




# Not all measures equally 'jobs-friendly': the Korean stimulus

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).



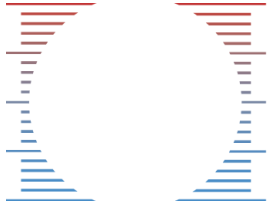
# Where are the new jobs going to be?

## Economic activity by energy-related sector

Figures are percentages of total jobs for each sector

Energy source	Extraction	Agriculture	Manufacturing	Construction	Utilities	Trade	Transport	Independent admin/ professional
<b>Fossil fuels</b>								
Oil and natural gas	14.6	0.4	13.9	2.4	11.3	6.6	13.1	37.5
Coal	41.6	0.3	13.1	0.9	7.8	5.9	6.8	23.6
<b>Energy efficiency</b>								
Building retrofits	0.5	1.4	13.6	61.5	0.1	7.9	2.5	12.4
Mass transit/freight rail	0.3	0.6	7.8	21.7	0.1	4.4	54.4	10.7
Smart grid	0.4	0.6	38.1	15.7	0.2	6.3	2.8	35.9
<b>Renewables</b>								
Wind	0.6	0.9	47.4	20.3	0.2	7.1	3.7	19.8
Solar	0.5	0.9	37.4	23.7	0.2	6.9	3.2	27.4
Biomass	1.3	60.4	20.6	0.4	0.2	3.8	2.8	10.5

Source: Pollin, Heintz and Garrett-Peltier (2009): 'The economic benefits of investing in clean energy' CAP/PERI, June



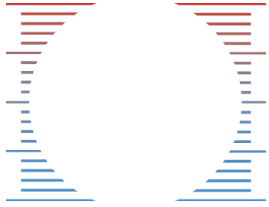
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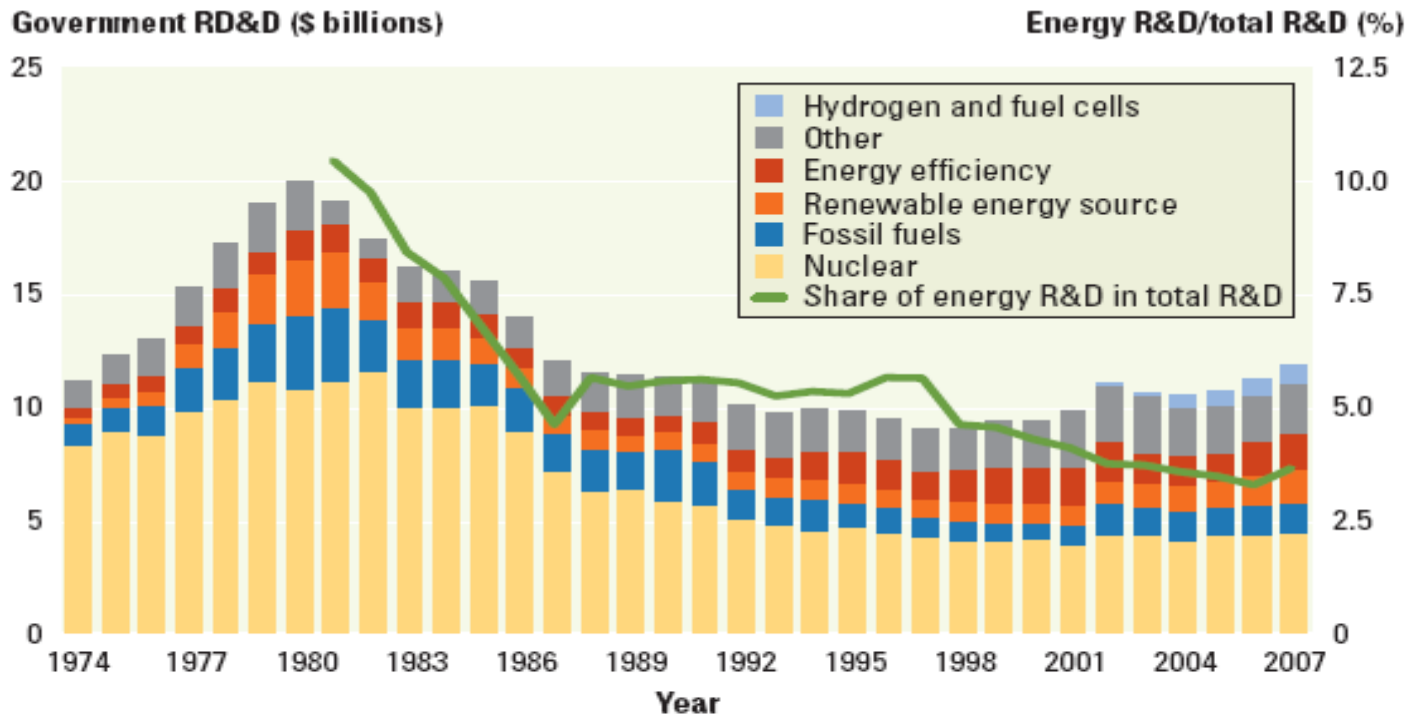
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# **‘Green’ growth: correcting market failures**

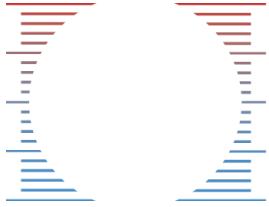
- The GHG externality
- Network externalities
- Financial system (need for a GIB)
- Innovation
- Competition
- Trade (energy security issue)
- Scrutiny of policies and learning – meta-rules



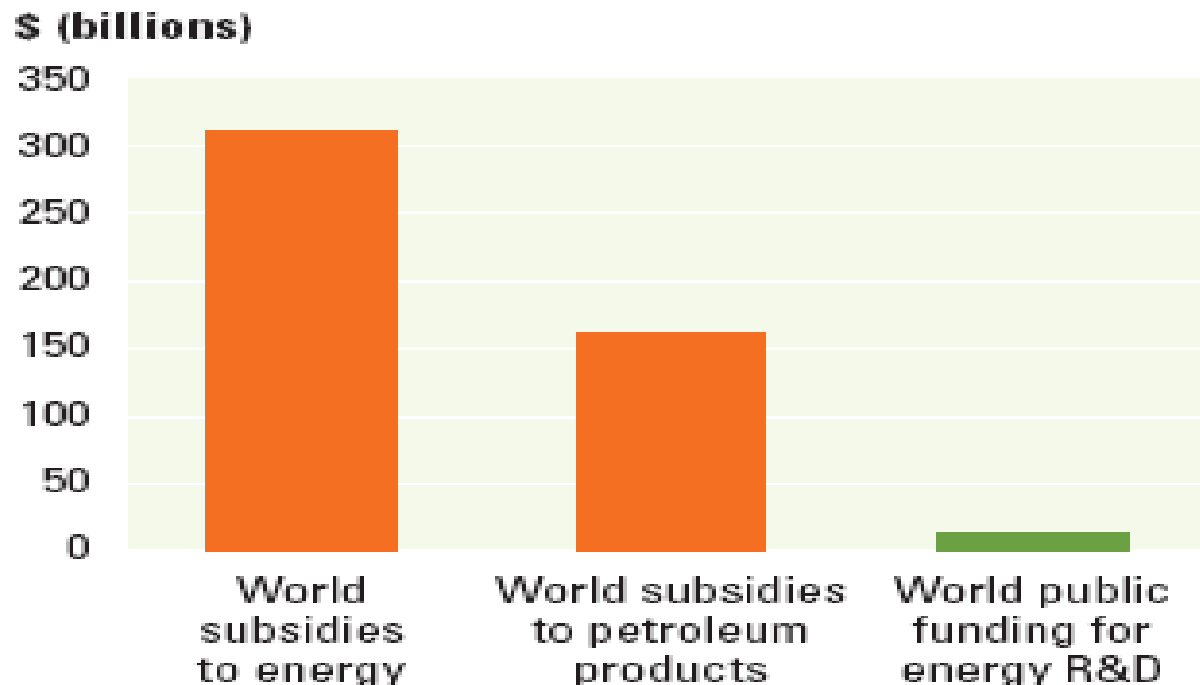
# Promoting technological innovation



Sources: IEA 2008a; IEA, <http://www.iea.org/Textbase/stats/rd.asp> (accessed April 2, 2009); Organisation for Economic Co-operation and Development (OECD), <http://www.oecd.org/statsportal> (accessed April 2, 2009).  
Note: RD&D calculated at 2007 prices and exchange rates. Values on left axis are for RD&D (that is, including demonstration in addition to research and development), as is typical in the energy sector. However because totals of cross-sectoral R&D alone are available, the right axis only includes R&D.



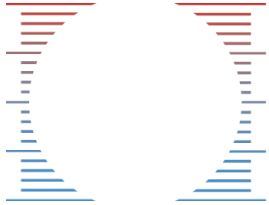
# Promoting technological innovation



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

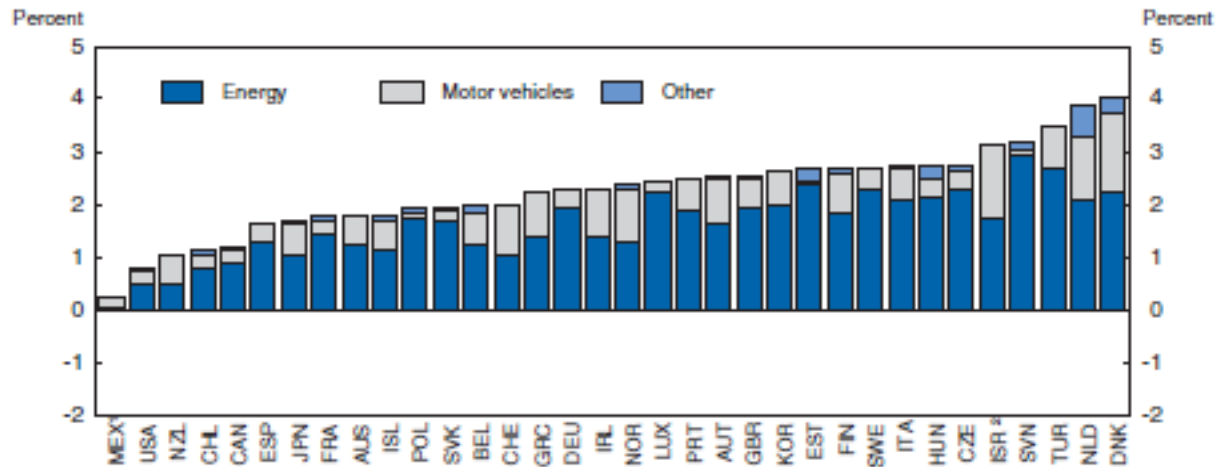
*Note:* Global subsidy estimates are based on subsidies shown for 20 highest-subsidizing non-OECD countries only (energy subsidies in OECD countries are minimal).





# Reducing deadweight losses from taxation

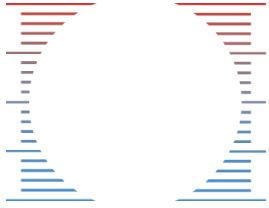
Figure 2.1. Composition of environmentally related tax revenues by country  
As a percentage of GDP in 2009



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.

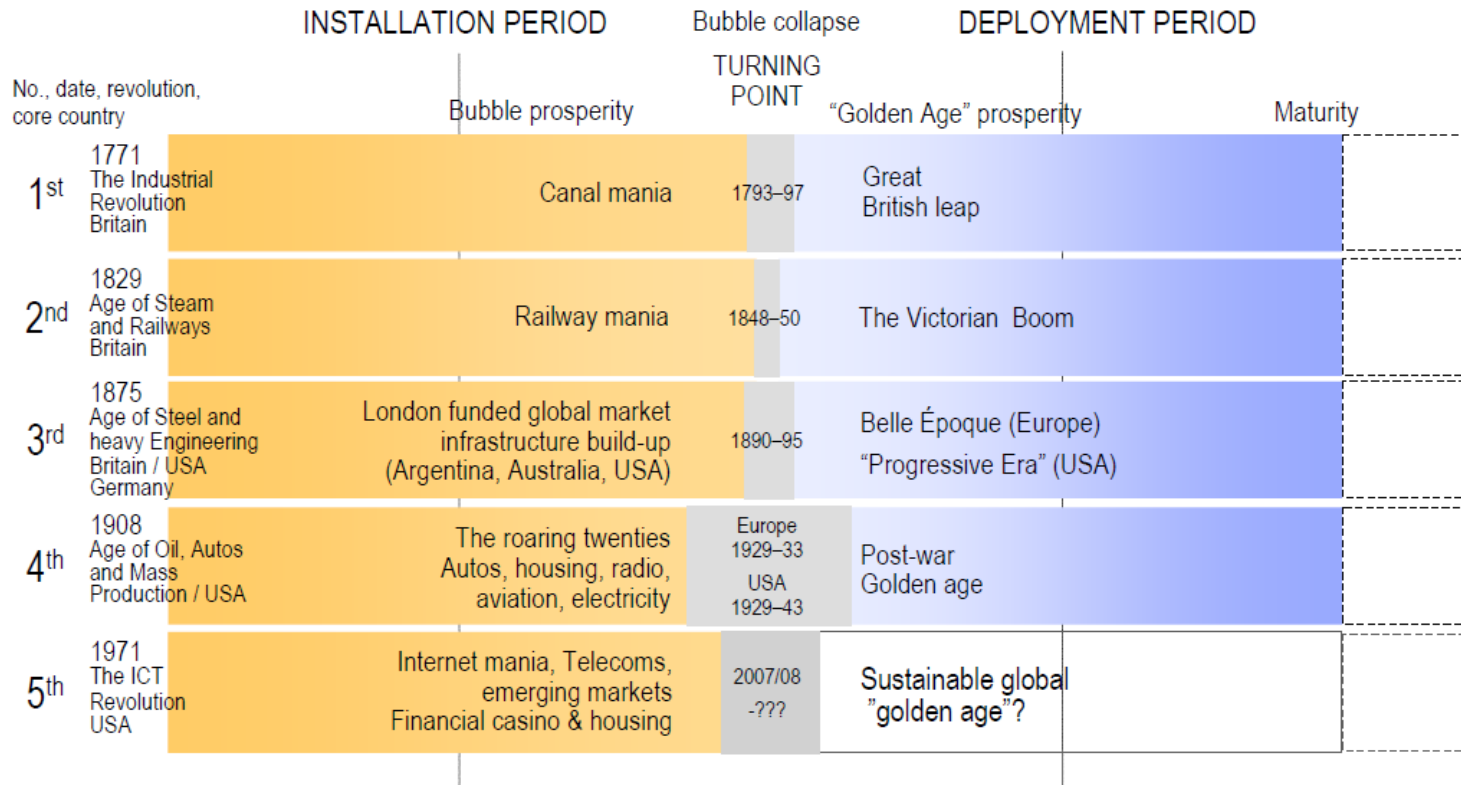
2. Information on data for Israel: see endnote 2.

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

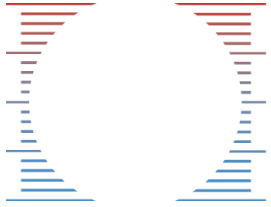


# Perez: techno-economic paradigm shifts

The historical record: bubble prosperities, recessions and golden ages



6<sup>th</sup> industrial revolution: new energy technologies? Biotech?



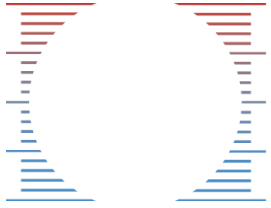
## **‘Green’ growth: challenges**

- 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



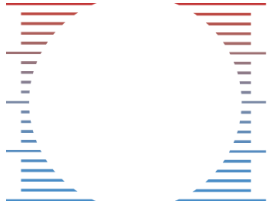
# ‘Green’ growth: challenges

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



## Lessons from monetary policy?

- No long-run trade-off between policy objectives
  - Temporary increase in aggregate demand can lead to permanent increase in inflation
  - Temporary increase in annual emissions can lead to permanent increase in stock of GHGs
- Analogue of the conservative central banker?
- Analogue of inflation targetry?
- Let the CCC set the carbon price and FIT rates s.t. government emissions target?



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**Thank you for your attention!**

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