



Centre for  
Climate Change  
Economics and Policy



Grantham Research Institute on  
Climate Change and  
the Environment

# 'Green' growth and 'green' jobs: some challenges and opportunities

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**Delivering Green Growth: Seizing New Opportunities for Industries**  
**Korea/OECD workshop, Seoul**  
**4-5 March 2010**





# Opportunities and challenges for labour markets

- Policies to combat climate change must comprise three elements:
  - Making the polluter pay: pricing the greenhouse gas externality
  - Tackling the other market failures (and policy distortions) standing in the way
  - Making greenhouse gases an ethical issue
- Challenges for the labour market from the first
- Opportunities from the second and third



# Opportunities (and challenges) for labour markets

## EXHIBIT 2

### THE CLEAN ENERGY ECONOMY—A DEFINITION

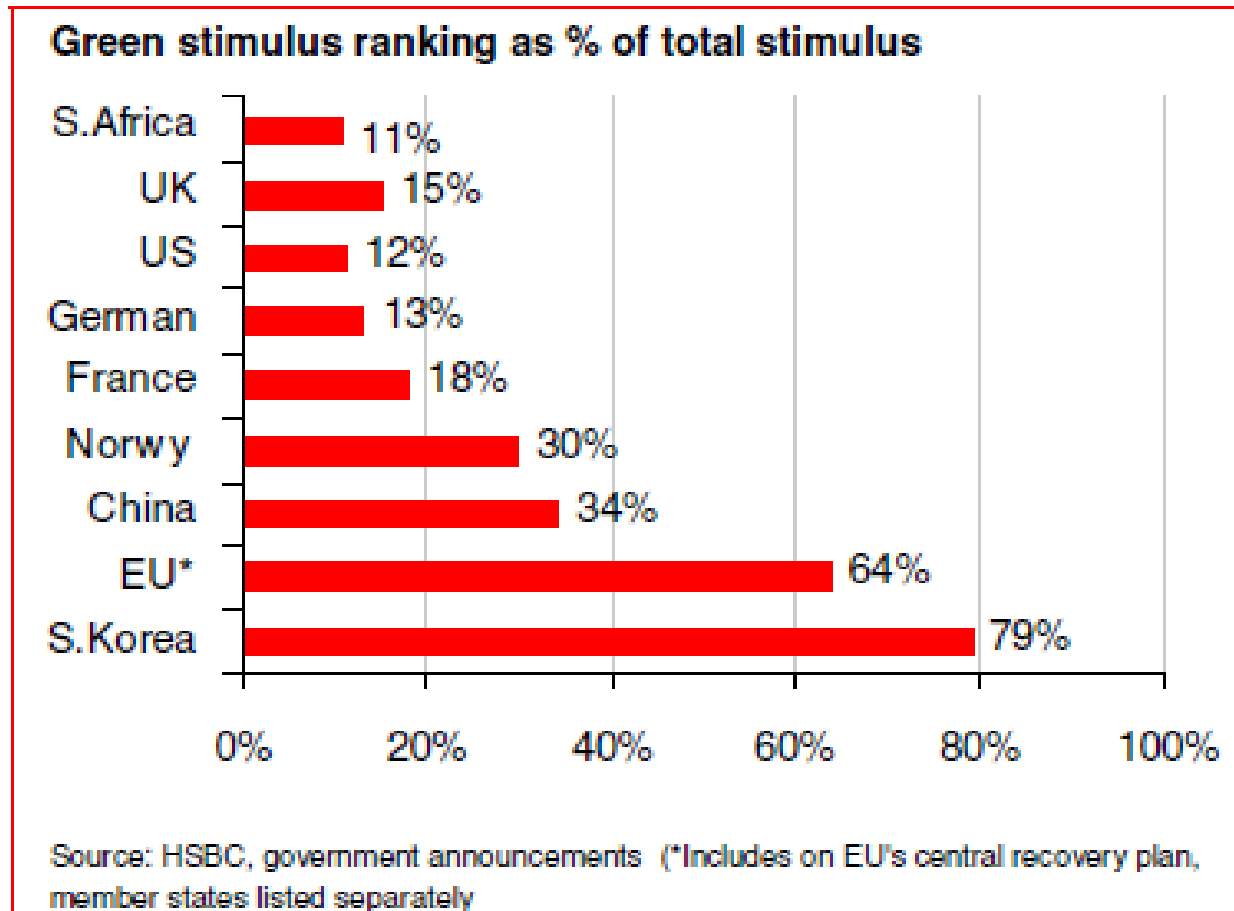
The clean energy economy generates jobs, businesses and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste and pollution, and conserving water and other natural resources.

The clean energy economy comprises five categories:





# Fiscal stimuli: 'green' content varies





# Fiscal stimuli: 'green' content varies

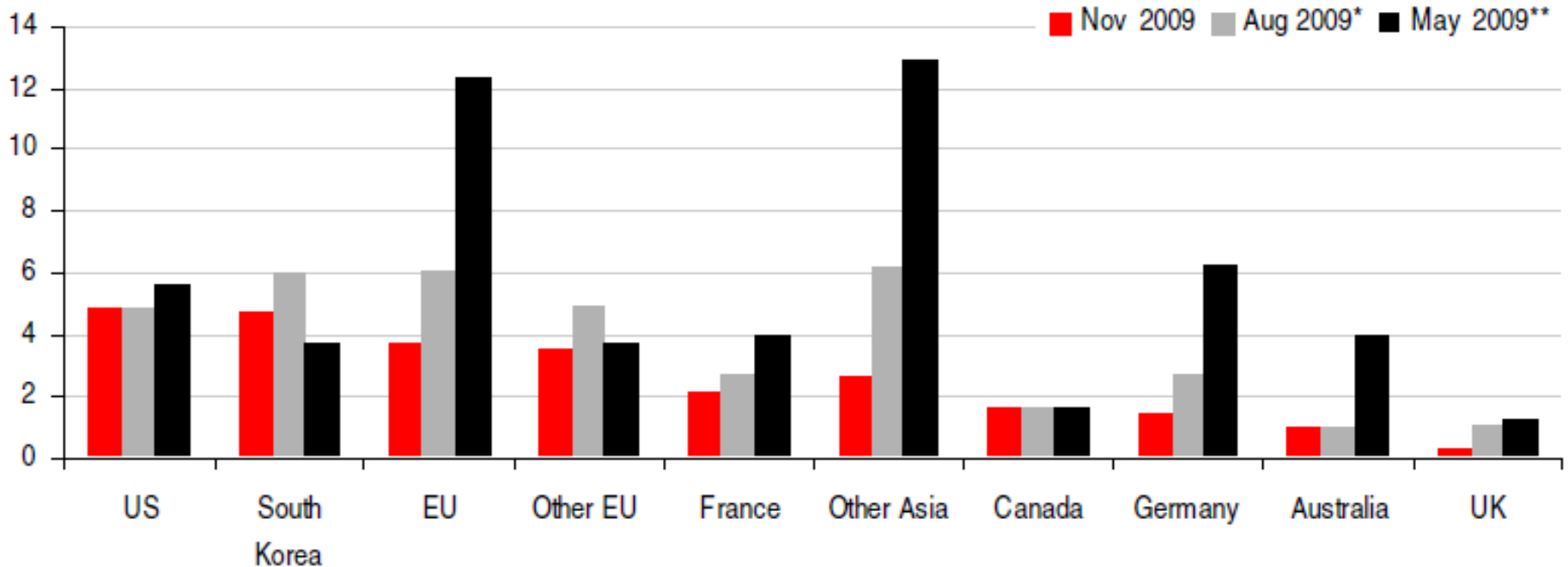
Country	Total stimulus (in \$US billion)	"Green" Stimulus(in \$US billion)	"Green Stimulus" (%)	Power		Energy Efficiency				Water/Waste
				Renewable	CCS/Other	Building Efficiency	Low carbon vehicle	Rail	Grid	
Australia	26.7	2.5	9.3	-	-	2.48	-	-	-	-
China	586.1	221.3	37.8	-	-	-	1.5	98.65	70	51.15
India	13.7	0	0	-	-	-	-	-	-	-
Japan	485.9	12.4	2.6	-	-	12.43	-	-	-	-
South Korea	38.1	30.7	80.5	-	-	6.19	-	7.01	-	13.89
Thailand	3.3	0	0	-	-	-	1.8	-	-	-
EU	38.8	22.8	58.7	0.65	12.49	2.85	1.94	-	4.86	-
Denmark	-	1.8	-	0.9	-	-	0.9	-	-	-
Germany	04.8	13.8	13.2	-	-	10.39	0.69	2.75	-	-
France	33.7	7.1	21.2	0.87	-	0.83	-	1.31	4.13	-
Italy	103.5	1.3	1.3	-	-	-	-	1.32	--	-
Spain	14.2	0.8	5.8	-	-	-	-	-	-	-
UK	30.4	2.1	6.9	-	-	0.29	1.38	0.41	-	0.83
Other EU states	308.7	6.2	2	1.9	-	0.4	3.9	-	-	0.03
Canada	31.8	2.6	8.3	-	1.08	0.24	-	0.39	0.79	0.13
Chile	4	0	0	-	-	-	-	-	-	-
US	972	112.3	11.6	32.78	6.55	30.74	4.76	9.92	11.92	15.58
<b>Total</b>	<b>2,796.00</b>	<b>436</b>	<b>15.6</b>	<b>38</b>	<b>20.1</b>	<b>66.8</b>	<b>15.9</b>	<b>121.8</b>	<b>91.7</b>	<b>81.6</b>

Source: Strand and Toman (2010): 'Green Stimulus,' Economic Recovery, and Long-Term Sustainable Development, WB PRWP 5163



# Slower-than-planned disbursement

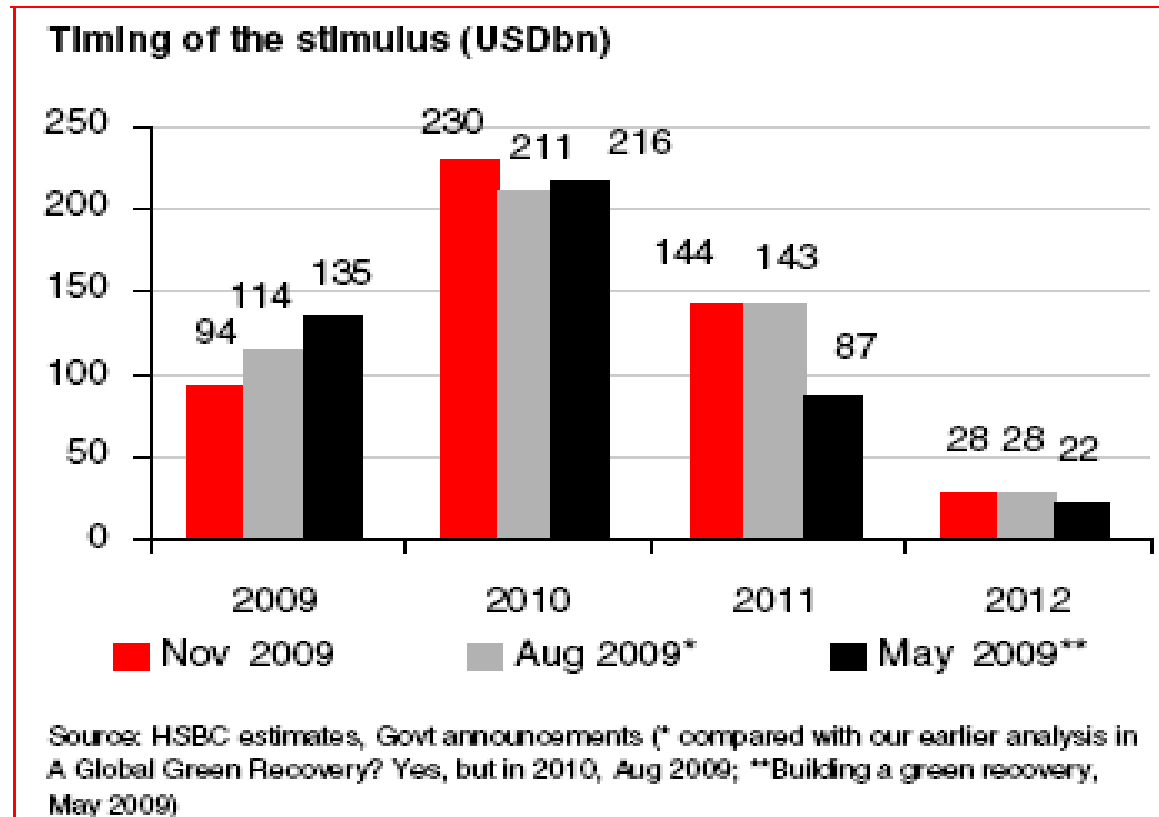
Heading down: projections of green stimulus spending for 2009 (USDbn)



Source: HSBC; Government websites; (\*compared with our earlier analysis in A Global Green Recovery? Yes, but in 2010, Aug 2009; \*\*Building a green recovery, May 2009)

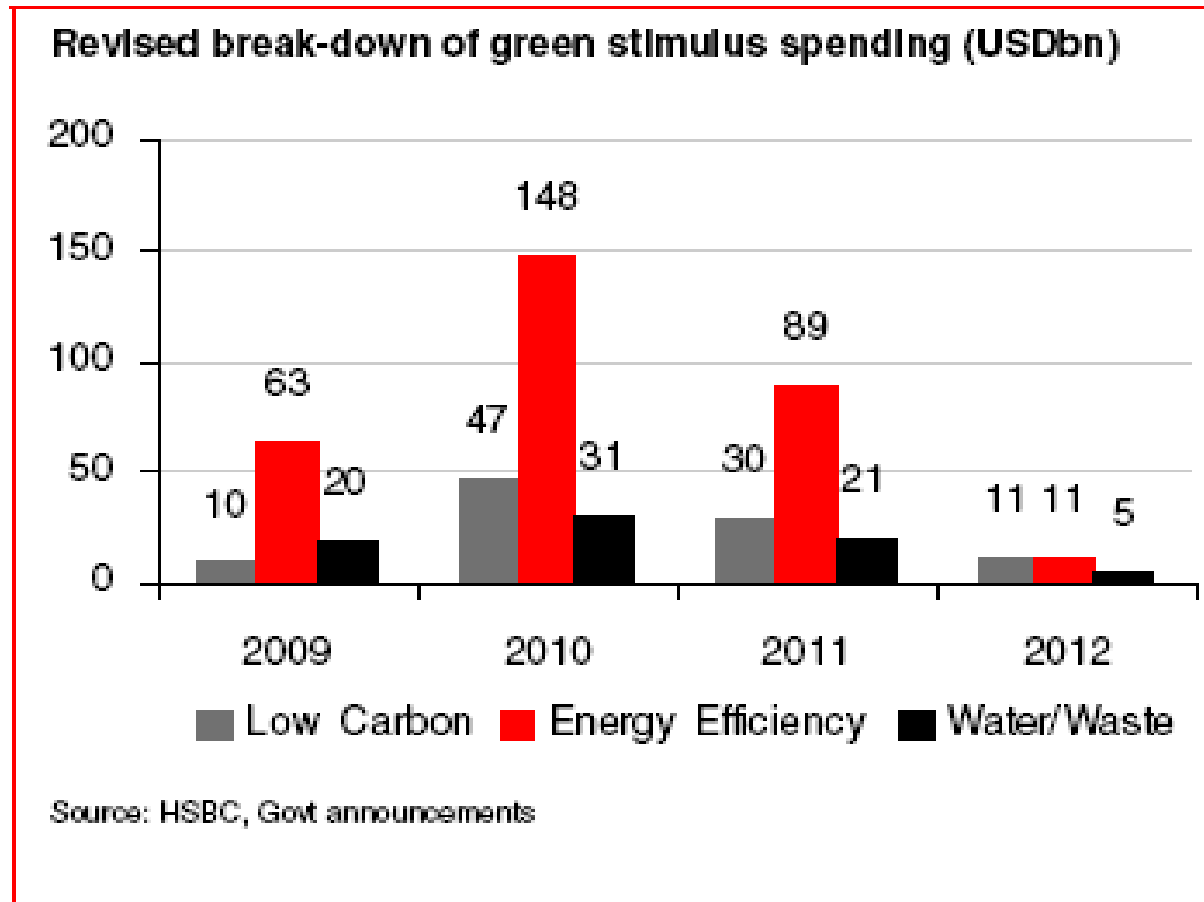


# Slower-than-planned disbursement





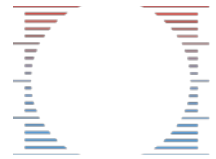
# Focus on energy efficiency





# Not all measures equally 'jobs-friendly'

A GREEN RECOVERY: Impacts per billion dollars of government spending						
Green Programs	Approximate impact	Speed	Employment	Energy Savings	Energy Security	Climate Change
		How quickly the money gets spent	Job-years created	Long-term energy cost reductions	Reduction in U.S. oil imports	Direct emission reductions
Household Weatherization	Weatherize 377,000 homes	●	●	●	●	●
Federal Building Retrofits	Reduce Federal energy consumption by 8 trillion BTU	●	●	●	●	●
Green School Construction	Improve efficiency of all new schools by 33 percent	●	●	●	●	●
Production Tax Credit Extension	Incentivize 1,500 megawatts of additional wind generation capacity	●	●	●	●	●
Investment Tax Credit Increase	Incentivize 300 megawatts of additional solar power	●	●	●	●	●
Carbon Capture and Storage Demo Projects	Fund the CCS component of a 500 MW demonstration project	●	●	●	●	●
Cash for Clunkers	500,000 vehicles traded in	●	●	●	●	●
Hybrid Tax Credit	Incentivize the purchase of 190,000 hybrids	●	●	●	●	●
Battery Research & Dev.	FreedomCAR objectives met	●	●	●	●	●
Mass Transit	Decrease vehicle-miles travelled by 18 million per year	●	●	●	●	●
Smart Grid	Install smart meters on 4.4 million homes	●	●	●	●	●
<b>Other Programs</b>						
Tax Cuts	Increase consumer spending by \$333 million	●	●	—	—	—
Road Investment	Increase vehicle-miles travelled by 11 million per year	●	●	●	●	●
		● High impact	● Low impact			
		● Moderate impact	● Negative impact			



# Not all measures equally ‘jobs-friendly’

“Green” program	Overall employment impact, job years, initial year	Energy cost saving, US\$ million annually, 2012-2020	CO <sub>2</sub> emissions reduction, 1000 tons annually 2012-2020	Private share, overall generated, average
Household weatherization	25100	207.8	440.7	0
Federal building retrofits	25300	386.7	546.9	0
Green school construction	25200	609.2	905.8	0
PTC extension	39100	562.5	727.7	76.1
ITC increase	33300	208.7	213.4	47.0
CCS demo projects	28500	225.3	341.6	68.8
“Cash for clunkers”	46900	433.0	1112.5	86.8
Hybrid tax credit	11100	-	-	0
Battery R&D	22500	1278.8	1332.8	0
Mass transit	34500	23.6	87.3	27.4
Smart metering	40000	918.0	207.4	50.0
Average for green stimulus	30100	450	593	-
Road investment	25200	-32.8	-35.4	0

Source: Houser, Nohan and Heilmayr (2009).



# 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).



# Renewable energy more labour-intensive (but expensive)

Energy Technology	Source of Estimate	Average Employment Over Life of Facility (jobs/MWa)		
		Construction, Manufacturing, Installation	O&M and fuel processing	Total Employment
PV 1	REPP, 2001	6.21	1.20	7.41
PV 2	Greenpeace, 2001	5.76	4.80	10.56
Wind 1	REPP, 2001	0.43	0.27	0.71
Wind 2	EWEA/Greenpeace, 2003	2.51	0.27	2.79
Biomass Ğ high estimate	REPP, 2001	0.40	2.44	2.84
Biomass Ğ low estimate	REPP, 2001	0.40	0.38	0.78
Coal	REPP, 2001	0.27	0.74	1.01
Gas	Kammen, from REPP, 2001; CALPIRG, 2003; BLS, 2004	0.25	0.70	0.95

**Table 1: Average employment for different energy technologies. “MWa” refers to average installed megawatts de-rated by the capacity factor of the technology; thus, for a 1 MW solar facility operating on average 21% of the time, the power output would be 0.21 MWa. References in parentheses and sources refer to the studies reviewed in the text. The biomass energy studies are a proxy for jobs that could derive from an expansion of biofuels (e.g. ethanol use) in regional or the national energy mix.**



# Where are the new jobs going to be?

## Economic activity by energy-related sector

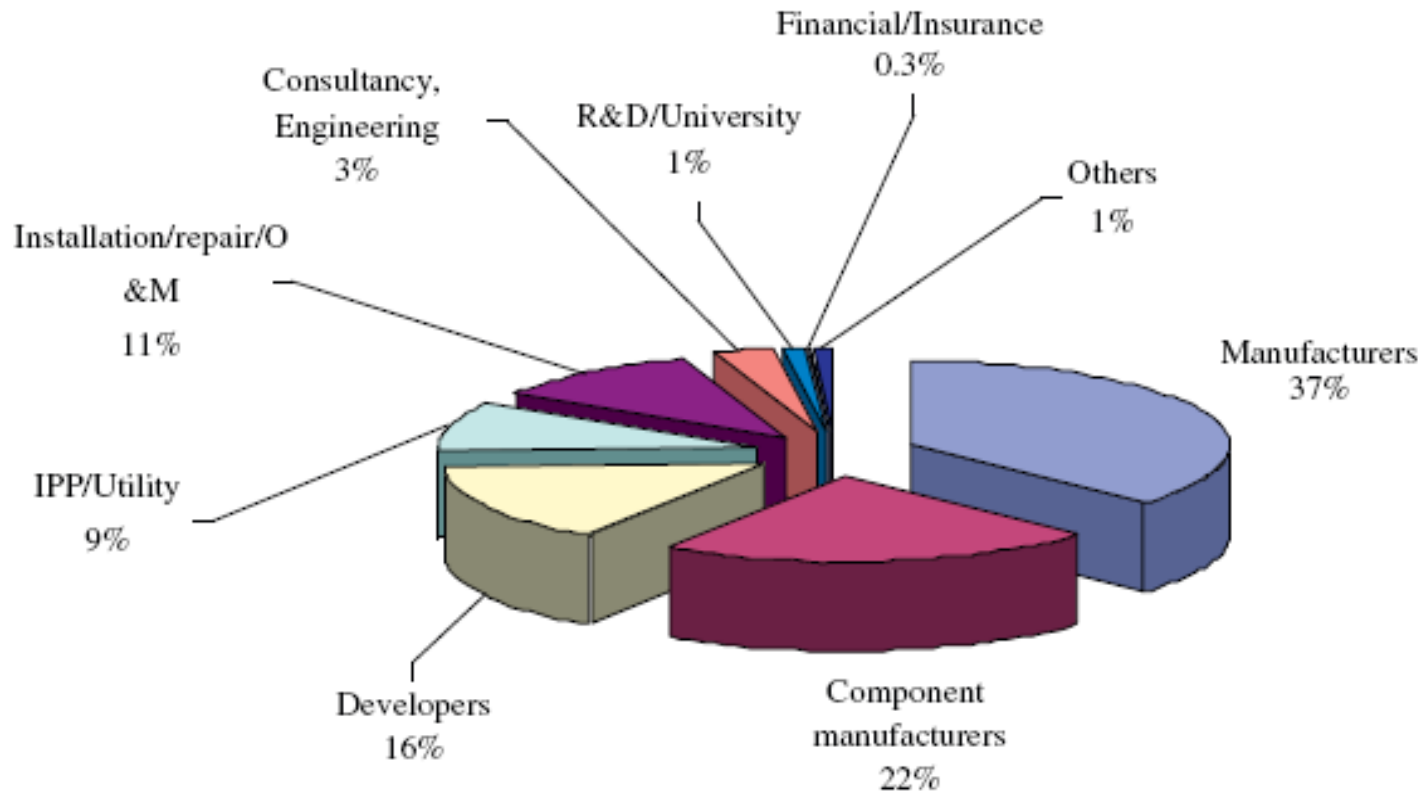
Figures are percentages of total jobs for each sector

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



# Where are the new jobs going to be?





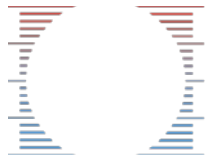
# More unskilled jobs?

## Breakdown of job creation through green investments versus fossil fuels by formal credential levels

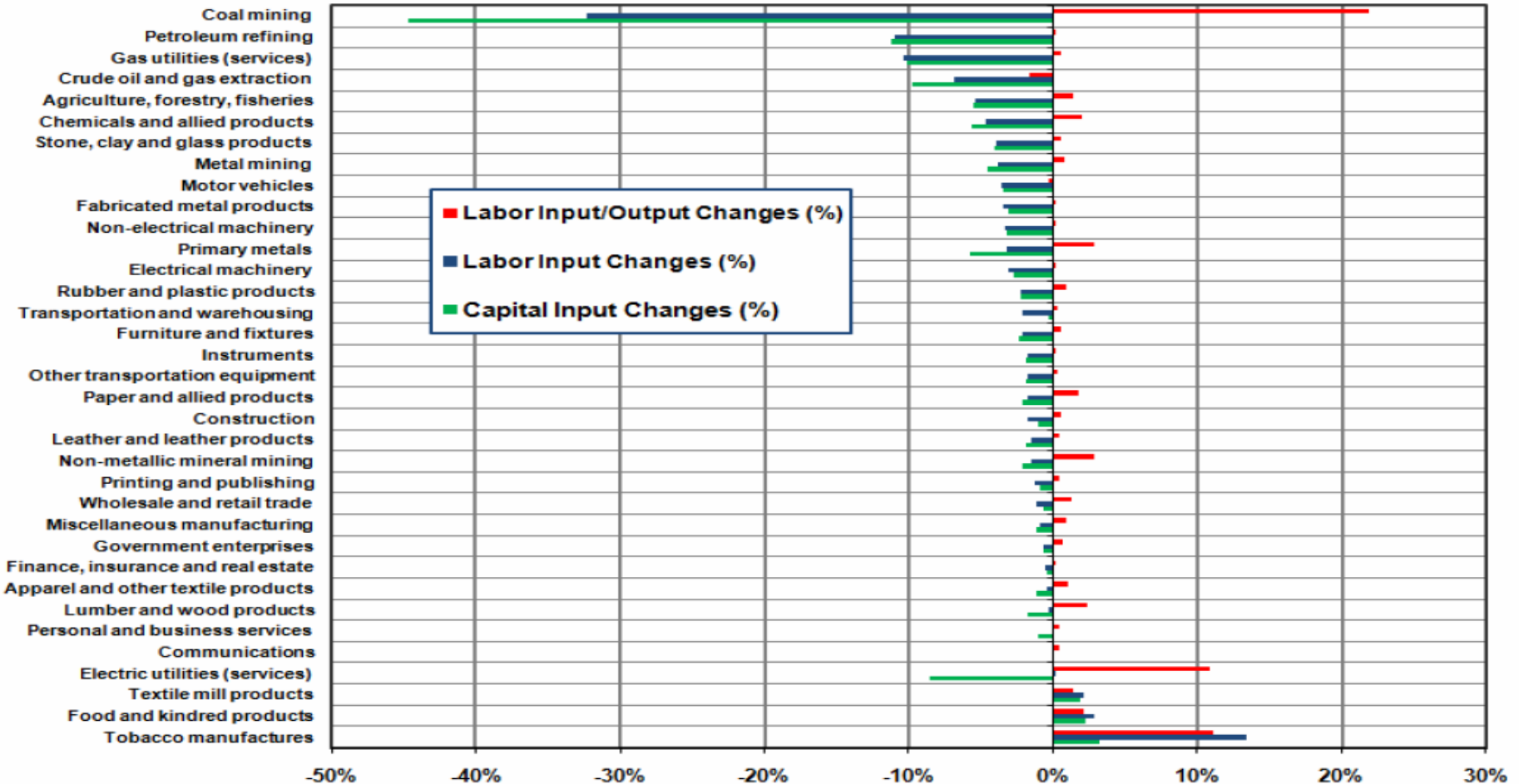
Based on \$1 million of spending

	1) Green investments	2) Fossil fuels	3) Difference in job creation (= column 1-2)
Total job creation	16.7	5.3	11.4
High-credentialed jobs	3.9	1.5	2.4
• B.A. or above	(23.3% of green investment jobs)	(28.3% of fossil fuel jobs)	
• \$24.50 average wage			
Mid-credentialed jobs	4.8	1.6	3.2
• Some college but not B.A.	(28.7% of green investment jobs)	(30.2% of fossil fuel jobs)	
• \$14.60 average wage			
Low-credentialed jobs	8.0	2.2	5.8
• High school degree or less	(47.9% of green investment jobs)	(41.5% of fossil fuel jobs)	
• \$12.00 average wage			
Note: Low-credentialed jobs with decent earnings potential	4.8	0.7	4.1
• \$15.00 average wage	(28.7% of green investment jobs)	(13.2% of fossil fuel jobs)	

Note: Average wage is the median wage for all workers across all industries within each of the credential categories listed above.



# Where are the new jobs going to be?



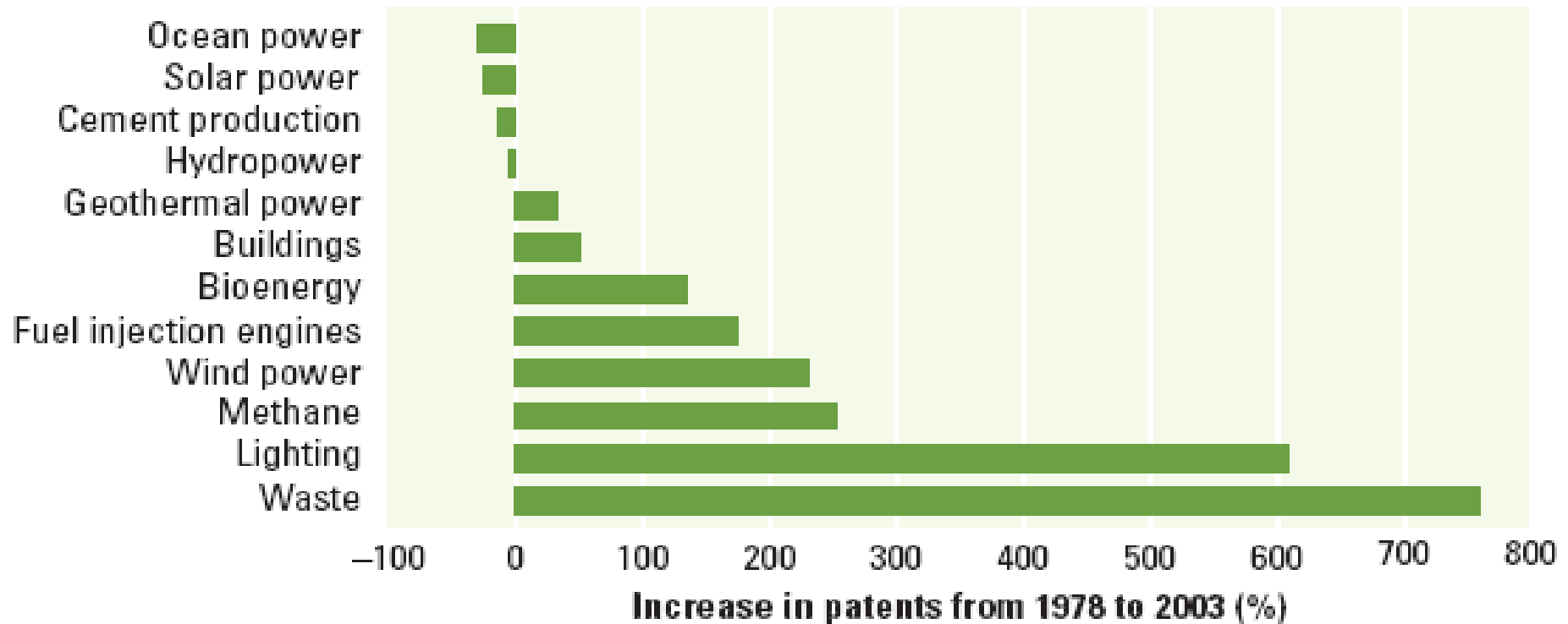


# 'Green' jobs: some caution required

- What is a 'green' job?
- Are related market failures being tackled?
  - Skill shortages
  - Finance, information, infrastructure, innovation
- More jobs in the short run than long run?
  - Bringing in a new policy framework
  - Exit strategy for fiscal stimulus packages
- Labour productivity reduced?
- Crowding out other jobs?
  - Structural change
  - Low employment multiplier per \$



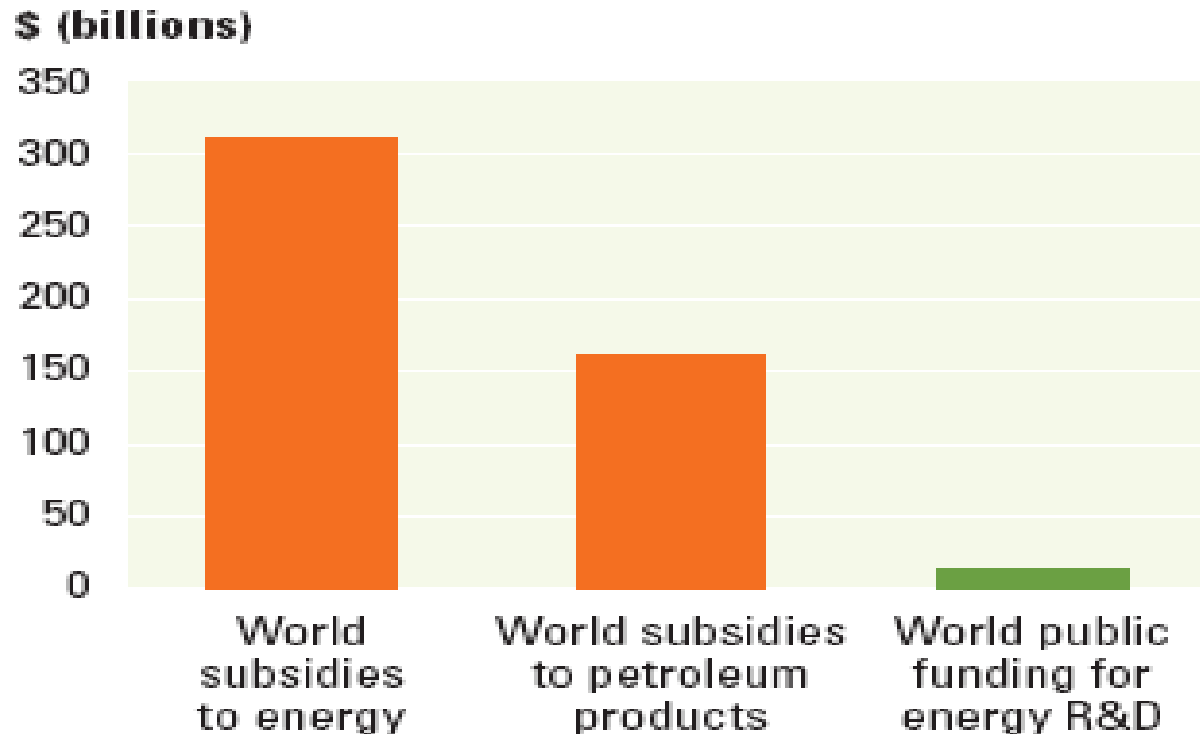
# Promoting technological innovation



Source: Dechezleprêtre and others 2008.



# Promoting technological innovation



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

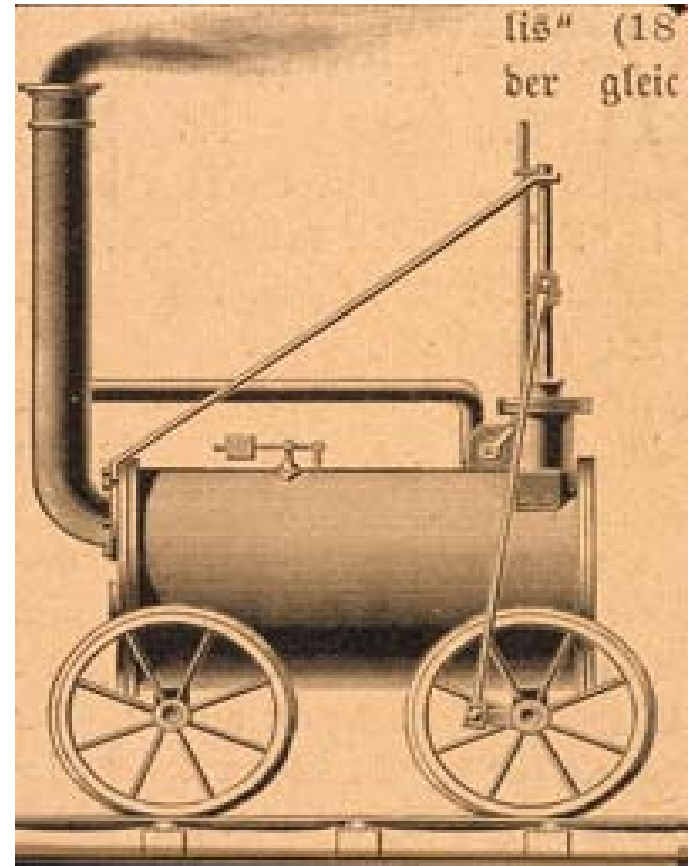
*Note:* Global subsidy estimates are based on subsidies shown for 20 highest-subsidizing non-OECD countries only (energy subsidies in OECD countries are minimal).



# Promoting technological innovation

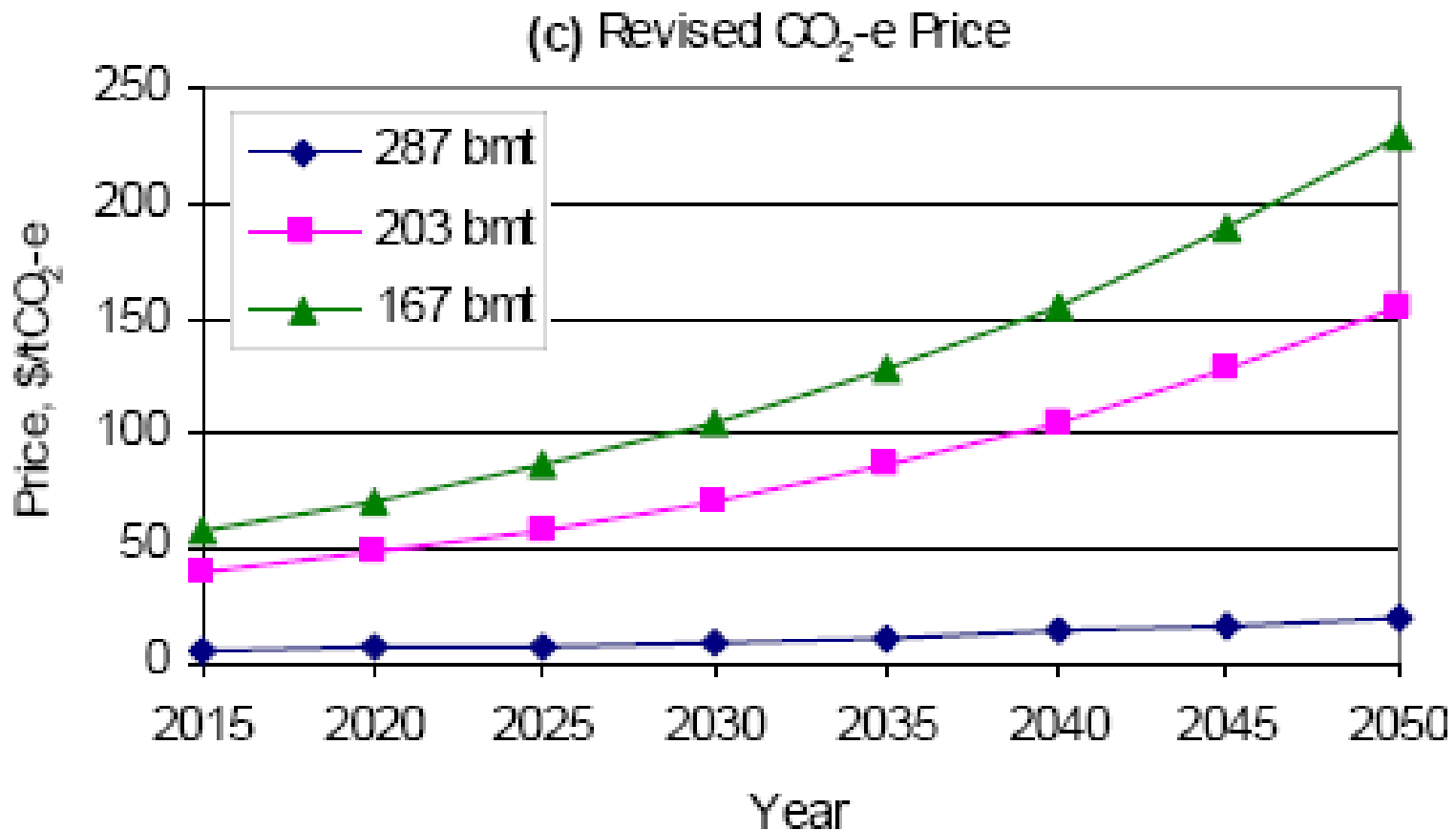


versus



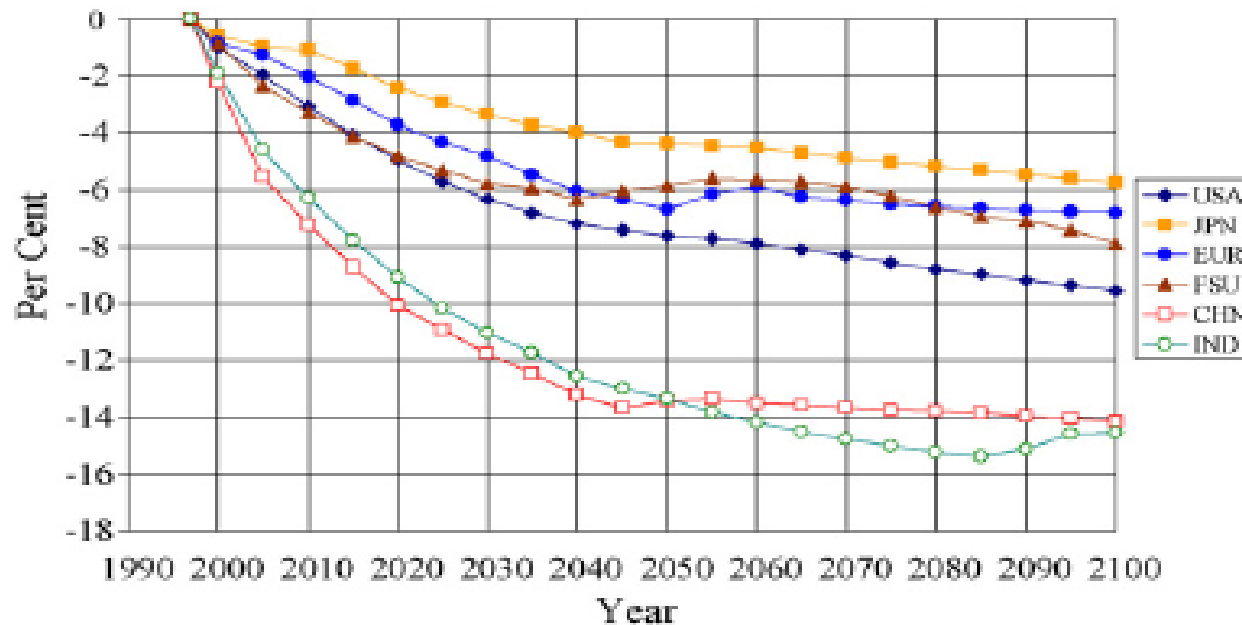


# (Opportunities and) challenges for labour markets





# (Opportunities and) challenges for labour markets



**Fig. 7 – Differences in GNP with emissions restrictions policy in solutions with sector-specific labor and rigid wages compared to solutions with flexible labor and flexible wages.**



## But don't forget the bottom line....

- “Climate change is the greatest collective challenge that we have ever faced. It is destroying our only planet at an accelerating pace.”

*(Angel Gurría, OECD Secretary-General,  
18 September 2009)*

- “The transition to low-carbon growth would create the most dynamic and innovative period in economic history. There is no real alternative. High-carbon growth is doomed.”

*(Nicholas Stern, LSE, Winter 2009)*



# Some questions

- Current fiscal stimulus packages
  - Do they have enough employment ‘bang for the buck’?
  - Are they building the foundations for ‘green’ jobs sustainable in the long run?
- Labour market policies
  - How to reduce skill shortages, especially in (energy) R&D, project management, energy capital goods manufacturing?
  - How to prepare for structural changes across industries and promote flexibility?
  - How to ‘manage down’ fossil fuel production?
  - Can emissions quota auctions be used to reduce taxes on workers and promote acquisition of skills?
- Social policies
  - The impact of carbon pricing on low-income families



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## THE END

**Dr Alex Bowen**

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<http://www2.lse.ac.uk/GranthamInstitute/Home.aspx>

