能源经济与能源政策协同创新中心
Collaborative Innovation Center for Energy Economics and Energy Policy
CICEP

厦门大学能源学院
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Trade and Climate Change: The Case of China

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Dr. Xiying LIU

Content

Trade and Climate Change: The Case of China

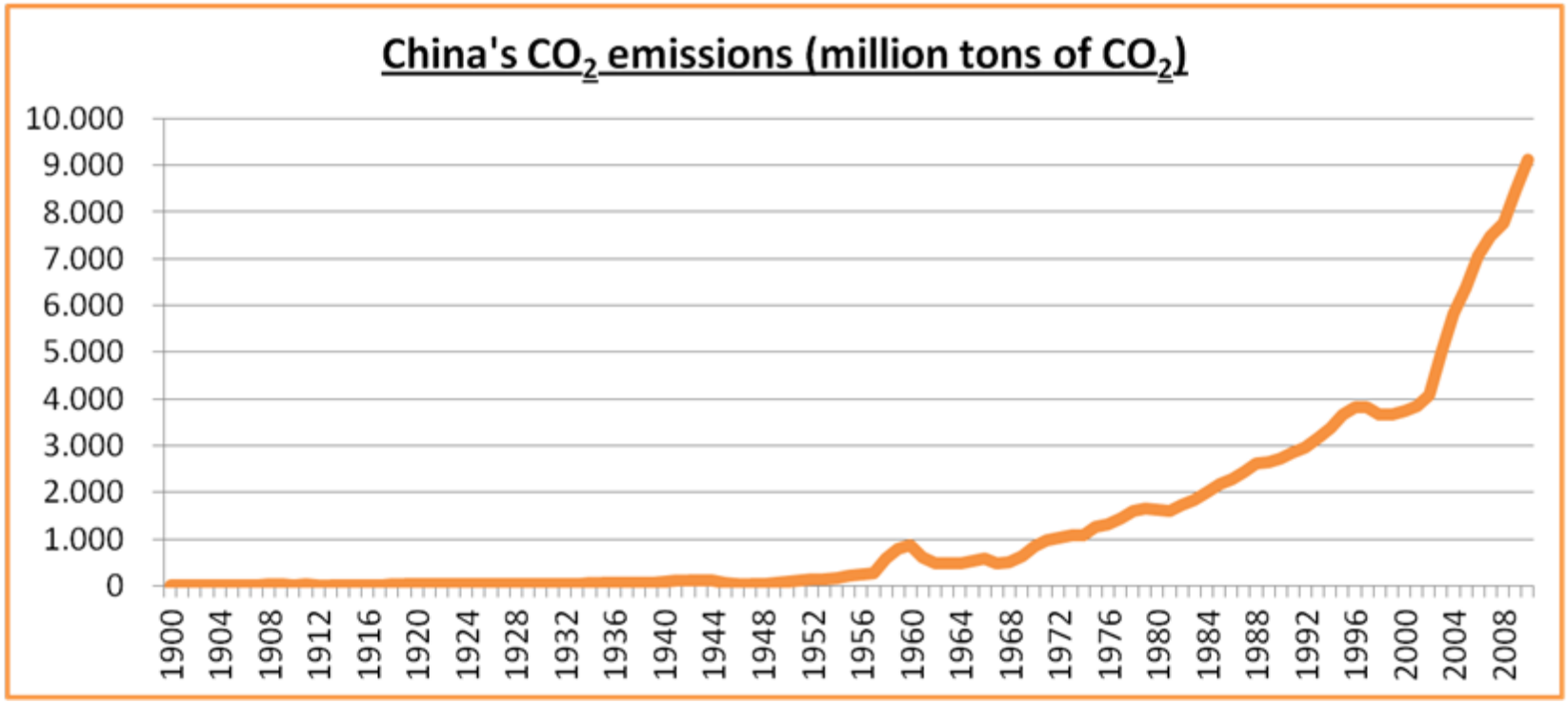
- Introduction: China's international trade and CO_2 emissions
- The impacts of international trade on China's CO_2 emissions
- Policies: border carbon adjustments and carbon tax

Introduction

- Globalization: *international trade* and *climate change*
- China plays a major role in both fields.

China: carbon dioxide emissions

- China overtook the United States as the world's largest carbon dioxide emitter in 2006.
- The share of China's carbon dioxide emissions is also growing very fast, from 20% in 2005 to 29% in 2011.



Source: CDIAC.

Why is China's CO_2 emissions growing?

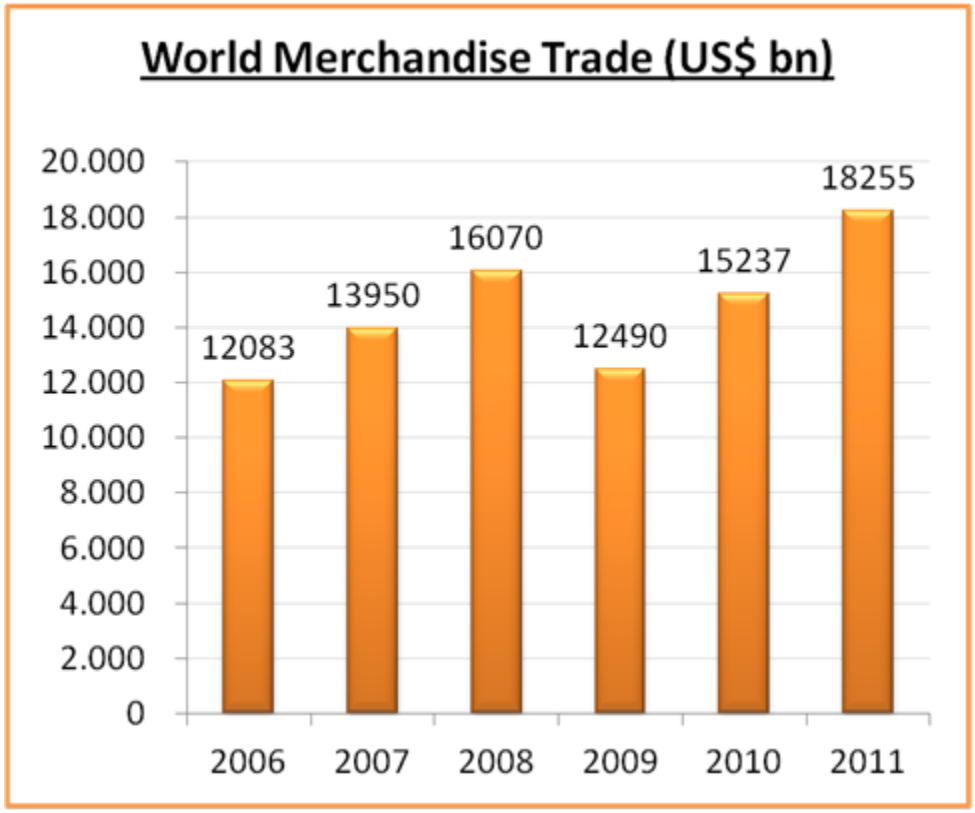
China's CO_2 emissions

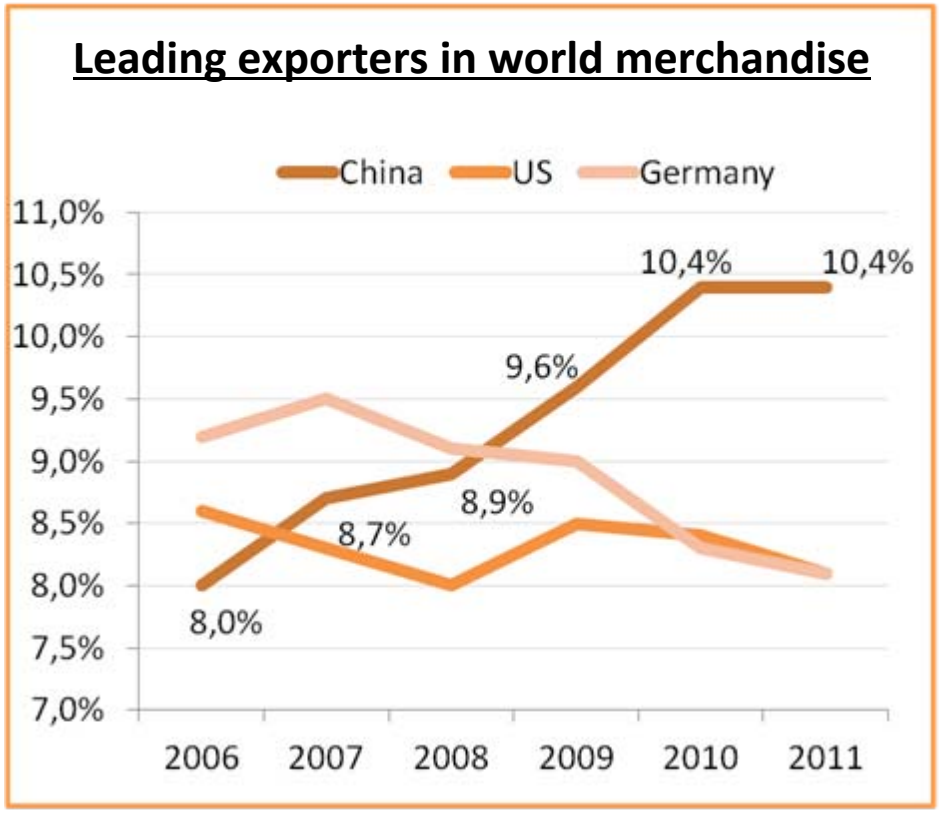
- **Economic Growth**
- **Population Growth**
- **Urbanization**
- **Industrialization**

What is the role of ***international trade***?

China: international trade

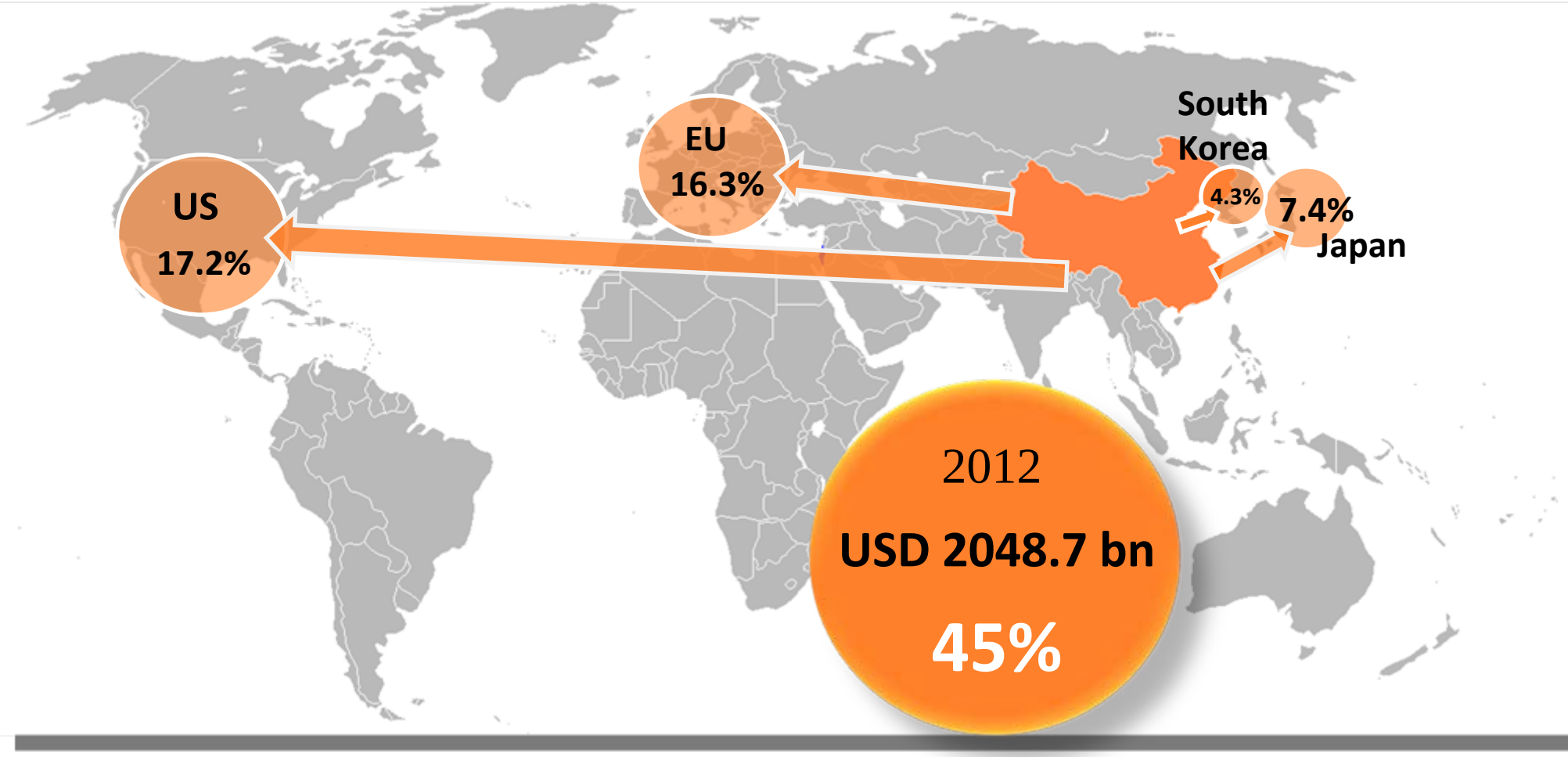
- China has become the largest merchandise exporter in the world since 2009.
- China's share of merchandise export in the world is growing much faster than other leading exporters, such as Germany and US.





Source: WTO.

China: international trade

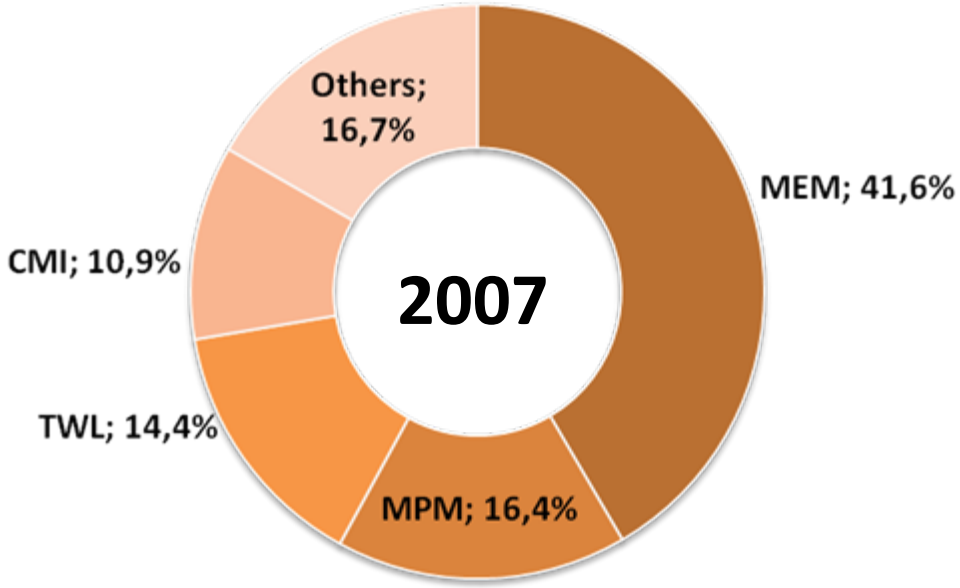


Source: WTO.

Trade and Carbon Dioxide Emissions

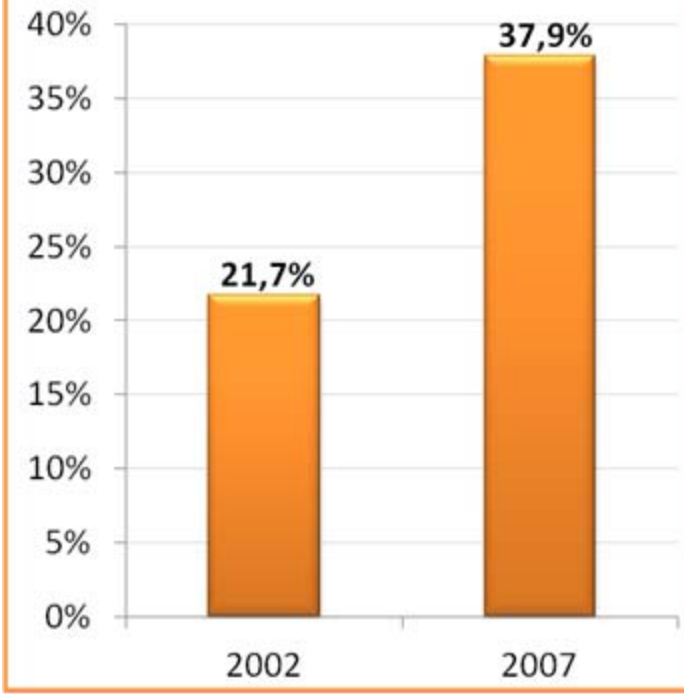
- EEX: carbon emissions embodied in export
- EEI: carbon emissions embodied in import
- BEET: balance of carbon emissions embodied in international trade
- BEET = EEX - EEI

The Structure of China's EEX



- MEM: *manufacture of* ***machinery and equipment***
- MPM: *manufacture and processing of* ***metals and metal products***
- TWL: *manufacture of textile, wearing apparel and leather products*
- CMI: *chemical industry*

The Share of China's BEET in Total CO_2 Emissions



Source: Y. Liu et al., (2013).

Policy: border carbon adjustment

- Comparing to carbon tax, border carbon adjustments (BCA) will have higher economic costs with the same amount of CO_2 emission reduction.

BCA	Carbon emission reduction (%) (USD 50/ton CO_2)	Carbon emission reduction costs (USD/ton CO_2)	Carbon leakage (%)	Competitiveness (%)	
				Industrial goods	Non-industrial goods
	-2.760	69.42	53.44	-0.024	0.003

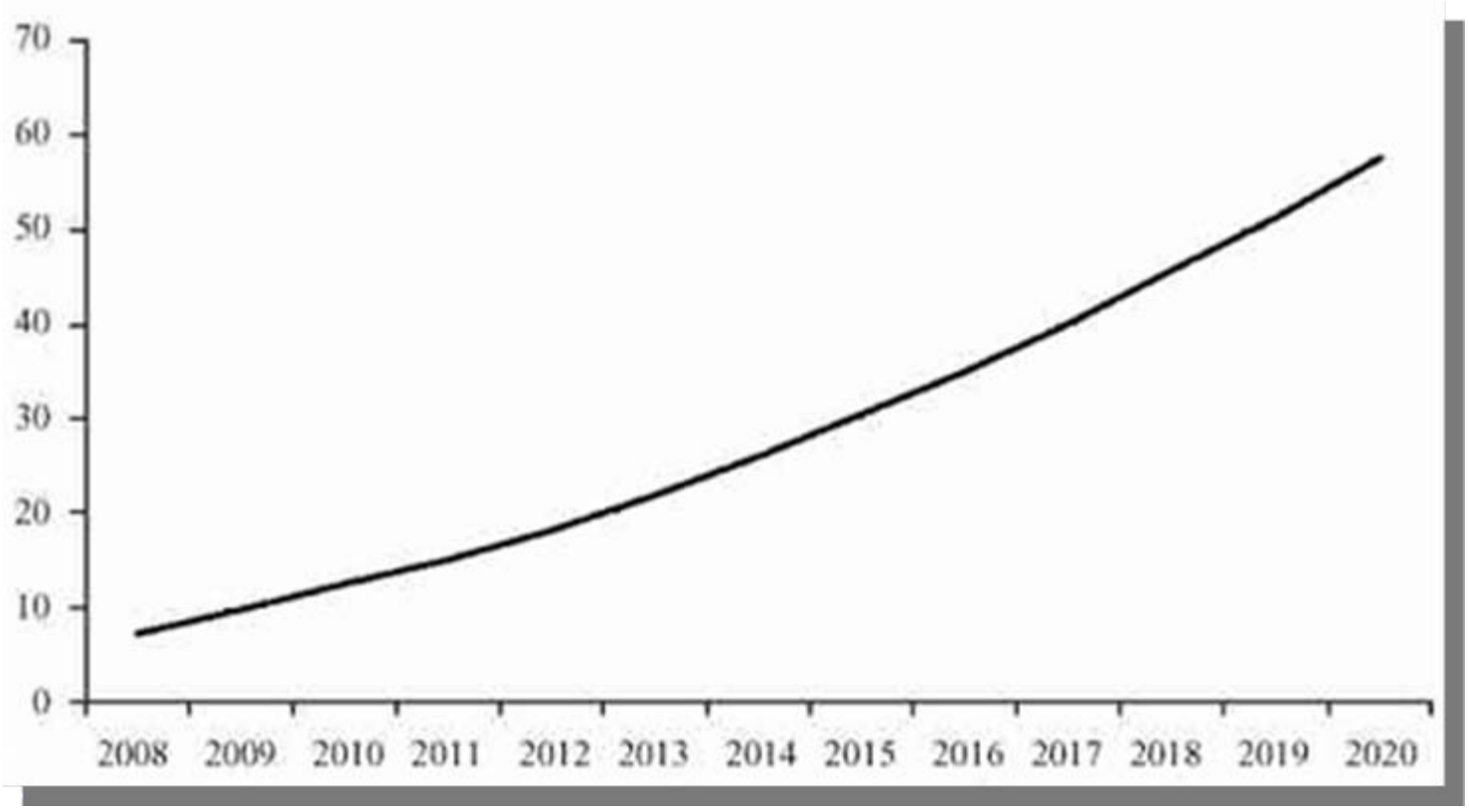
Carbon tax	Carbon emission reduction (%)	Carbon emission reduction costs (USD/ton CO_2)	Carbon leakage (%)	Competitiveness (%)	
				Industrial goods	Non-industrial goods
	-2.760	68.66	50.89	-0.003	0.003

Source: B.Q. Lin and A.J. Liu, 2013.

Optimal carbon tax

- Carbon tax needs to be considered as a dynamic optimization problem.
- Optimal carbon tax needs to be set based on the balance among economic growth, carbon emission reduction, and social development.

Optimal carbon tax for China during 2008 to 2020 (CNY/ton CO_2)



Source: X. Yao, X.Y. Liu, 2010.

Impacts of carbon tax in China

- Carbon tax will put extra costs on economic growth, but improve the energy efficiency and reduce the carbon dioxide.
- The impacts of carbon tax are non-linear.

Carbon Tax (CNY/ton CO_2)	10	20	205
GDP (%)	-0.008	-0.015	-0.517
Employment (%)	-0.002	-0.008	-1.455
Import (%)	-0.005	-0.012	-1.489
Export (%)	-0.202	-0.548	-2.904
CO_2 emissions (%)	-0.933	-2.908	-8.859
Energy Intensity (%)	-1.056	-2.013	-7.501

Note: ①Production-side carbon tax; ②Carbon tax on the fossil fuels combustion only; ③ The levels of carbon tax are set based on Ministry of Finance, Ministry of Environmental Protection, and Finland, respectively.

Source: X. Yao, X.Y. Liu, 2010.

Impacts of carbon tax in China

- The impacts of carbon tax in different industries are different.
- Carbon tax will adjust China's industrial structure.

Carbon Tax (CNY/ton CO_2)	10	20	205
Agriculture (%)	0.008	0.002	-0.157
Light industry (%)	0.022	0.018	-0.255
Heavy industry (%)	-0.101	-0.190	-0.589
Construction (%)	-0.202	-0.058	-2.904
Service industry(%)	0.003	0.001	-0.039
Coal-fired power generation(%)	-0.658	-0.859	-3.438
Other power plants (%)	0.023	0.017	-0.179

Note: ① Other power plants refer to nuclear and renewable power generation.

Source: X. Yao, X.Y. Liu, 2010.

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Thanks for your time!

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Trade and Climate Change

Country Study: Germany

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German Institute for International and Security Affairs – Stiftung Wissenschaft und Politik (SWP)

Conference: Trade and Climate Change

International Conference – Konrad-Adenauer-Stiftung/SUIBE, Shanghai
23.11.2013

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Agenda

- The pathway towards the German „Energiewende“
- „Ecological Industrial Policy“ as important part of the German foreign trade strategy
- New challenges: The case of the Photovoltaic industry

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Introduction I: The EU framework is important for national Policy-Makers

- **Limits for policy-makers due to European Integration:**
  - Trade Policy is a completely integrated policy field, the EU Commission is the main actor here
  - Climate Policy has mainly been integrated. The EU Emissions Trading Scheme (EU ETS) regulates emissions in the electricity supply and most industrial sector
  - Energy, Industry and Innovation Policies are still to a large extent under national control

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Introduction II: Major steps in German Energy and Environmental Policies

- **2000: „*Atomausstieg*“**
  - Decision to abandon nuclear power
  - Establishment of the German Renewable Energies Law (EEG)
- **2006: Ecological Industrial Policy**
  - Connecting „Green Economy“ with Employment, Innovation and Trade
- **2011: „*Energiewende*“**
  - Roadmap for low-carbon development in the energy sector without nuclear power
  - Constructed as „societal project“

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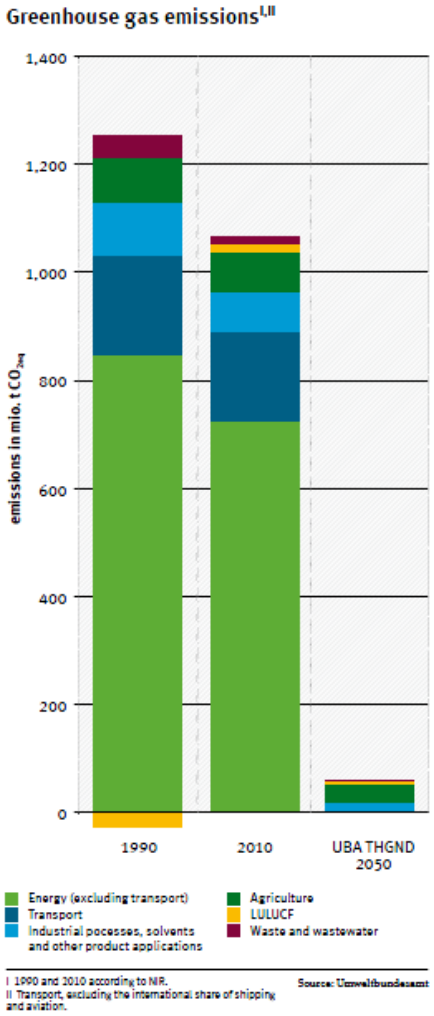
The „Energiewende“ in numbers

	2011	2020	2050		
GHG emissions					
Reduction (base year 1990)	-26%	-40%	2030 -55%	2040 -70%	2050 -80 to 95%
Efficiency					
Primary Energy (base 2008)	-6,0%	-20%	-50%		
Energy productivity	2.1% p.a. (2008-2050)				
Electricity consumption	-2,1%	-10%	-25%		
Buildings					
Heating	-	-20%	-		
Primary Energy consumption	-	-	around 80%		
Transport					
Final energy consumption (base year 2005)	ca. -0.5%	-10%	-40%		
Number of electric vehicles	Ca. 6.800	1 Mio.	2030 6 Mio.		
Renewable Energies					
Share in Net Electricity Consumption	20.3%	min. 35%	2030 min. 50%	2040 min. 65%	2050 min. 80%
Share in Net Overall Primary Energy Consumption	12.1%	18%	2030 30%	2040 45%	2050 60%

German GHG emissions have dropped significantly, however for different reasons…



→ Special Effect: German Reunification and close down of old heavy industries

→ Carbon leakage?

→ Increase of embedded carbon in consumption?

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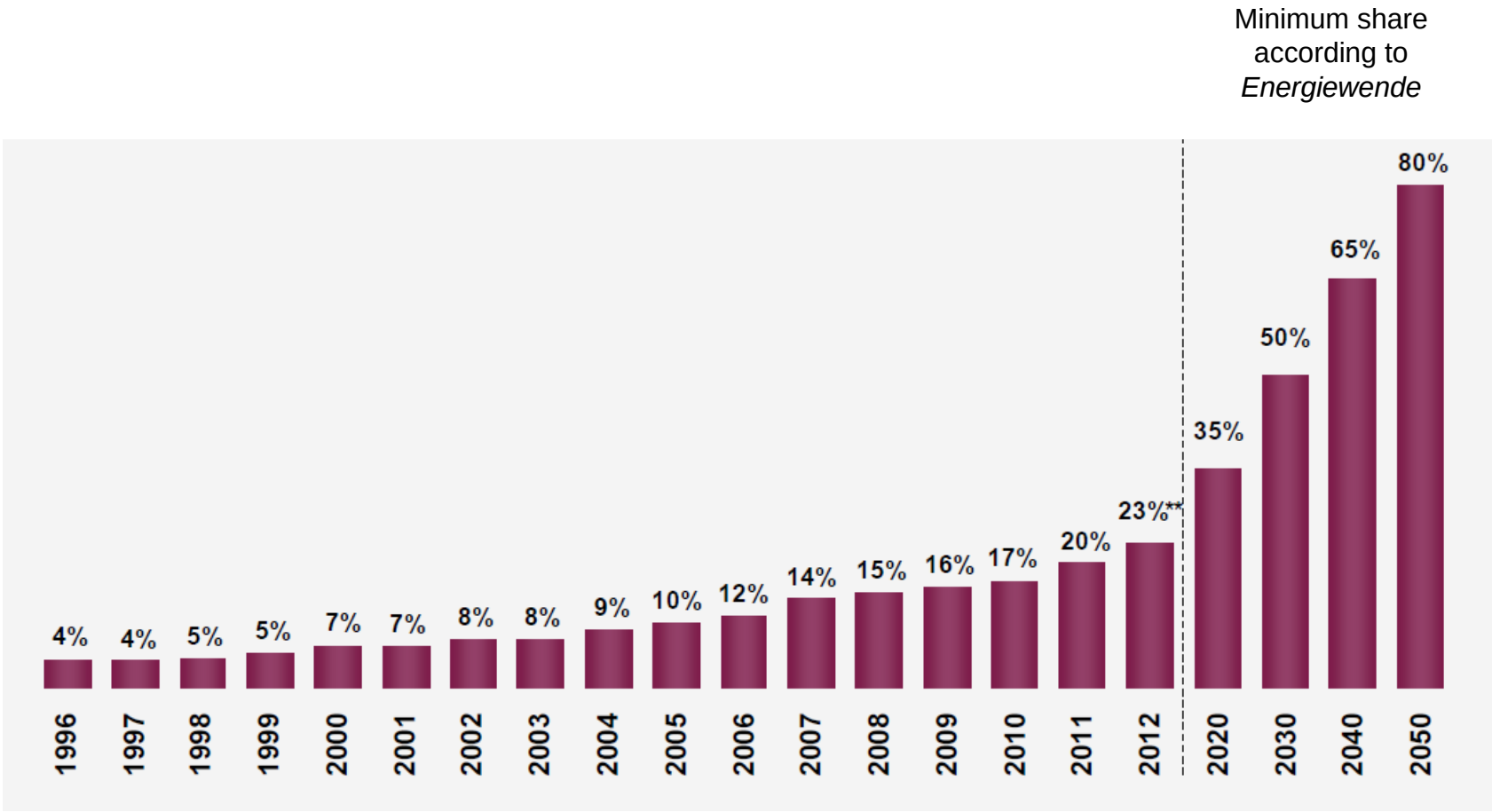
One result: The share of renewable energies in electricity consumption is rapidly rising



Source: BDEW 2013

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The Concept of an „Ecologial Industrial Policy“

- Initiated in 2006 by the Federal Ministry for the Environment
- Connection of Innovation, Industry and Employment
- Identifiying „lead-markets of the future“
- Four pillars:
  - Energy Technologies
  - Sustainable Mobility Structures
  - Efficiency Technologies
  - Life Science Technologies

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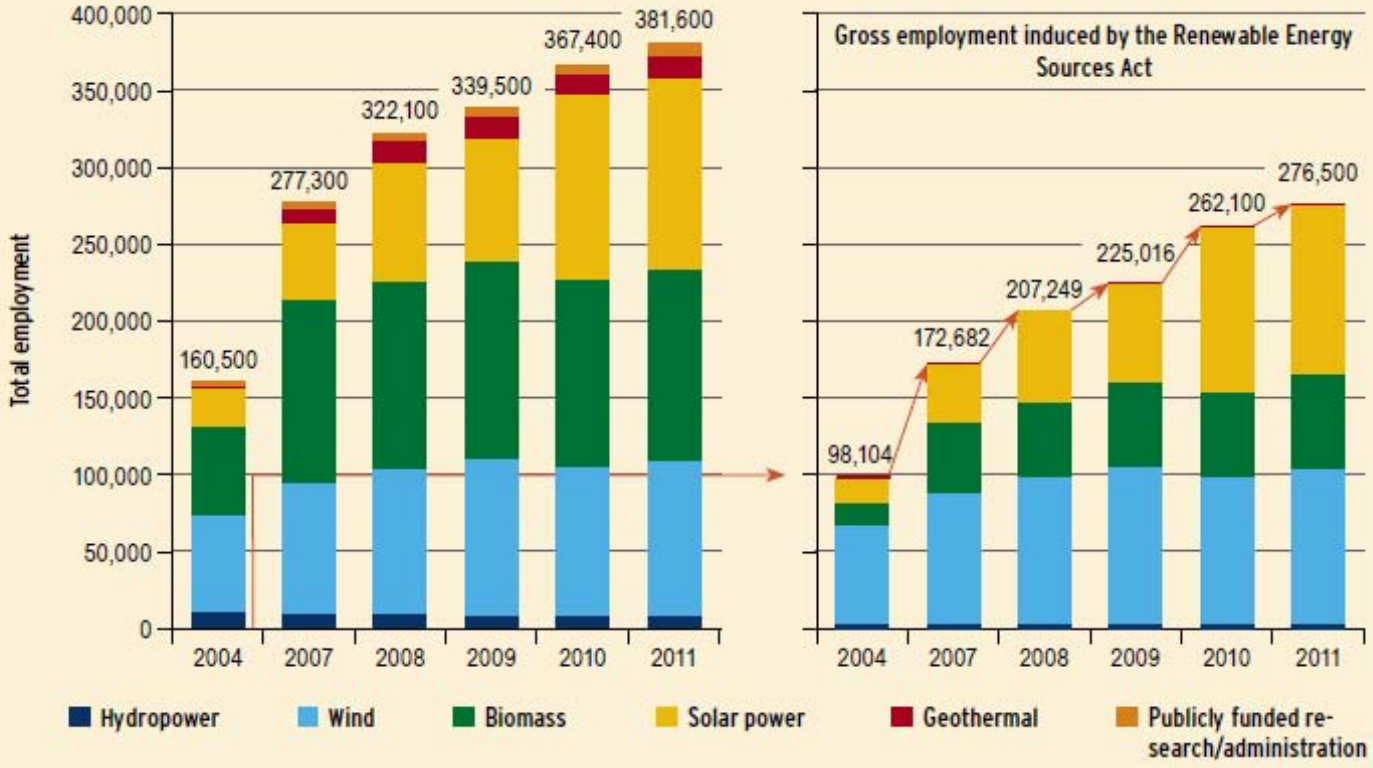
Employment effects are visible…

Figure 3: Employment trends in the renewable energy industry and employment induced by the Renewable Energy Sources Act between 2004 and 2011



276.500 jobs can be ascribed to the impact of the Renewable Energy Sources Act in 2011. This means that the Act's relevance for trends in levels of gross employment rose from about 61 percent in 2004 to 71 percent in 2011.

Source: Federal Ministry for the Environment 2012

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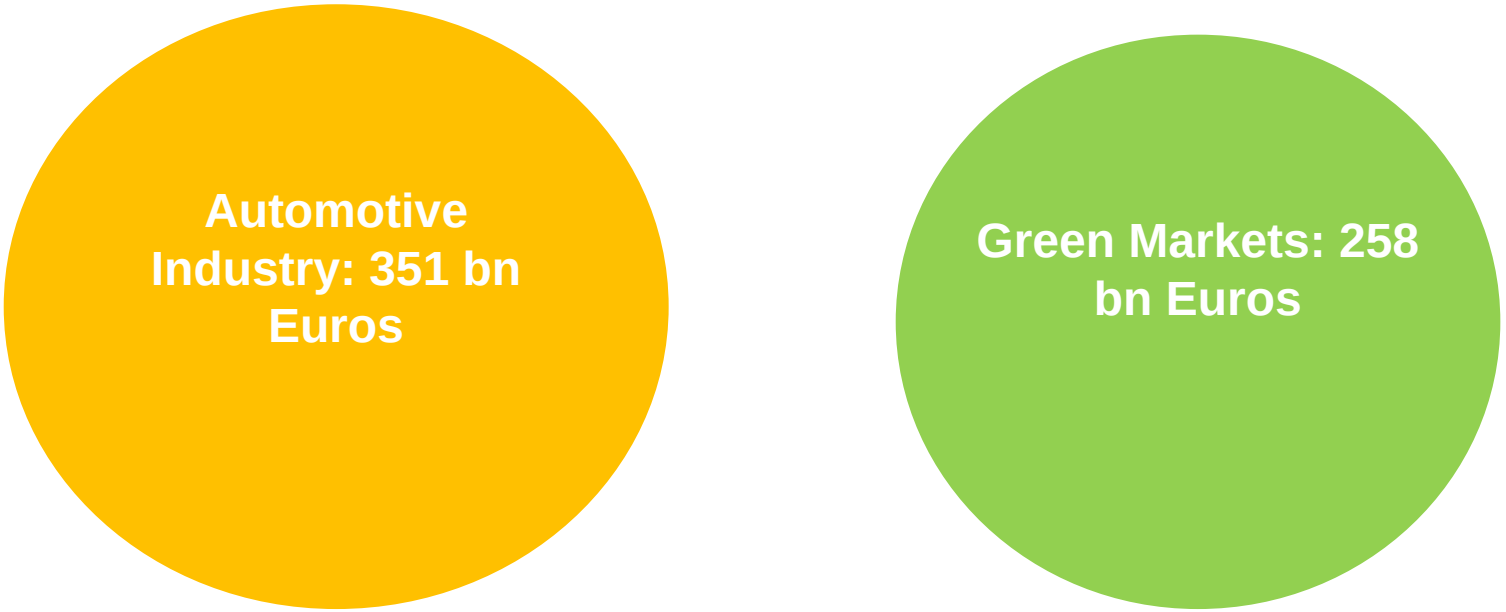
…and market volumes are rising (figure for 2011)



Green Markets: Energy Efficieny: 98 bn Euros, Environmentally sound energy and storage technologies: 73 bn Euro; Sustainable Mobility: 51 bn Euros; Sustainable Water Management: 41 bn Euros; Recycling: 16 bn Euros; Ecological Agriculture: 6.6 bn Euros
Source: BMU 2012; VDA 2010

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Push and Pull Factors in the Concept (Focus on Energy and Climate)

Push Factors

- National law on the deployment of renewable energies (feed-in-law/EEG)
- Incentives for restructuring conventional industry sectors
- Support for RD&D

Pull Factors

- International Climate Negotiations
- WTO rules
- EU level measures (EU ETS, EU regulations on renewables and energy efficiency)

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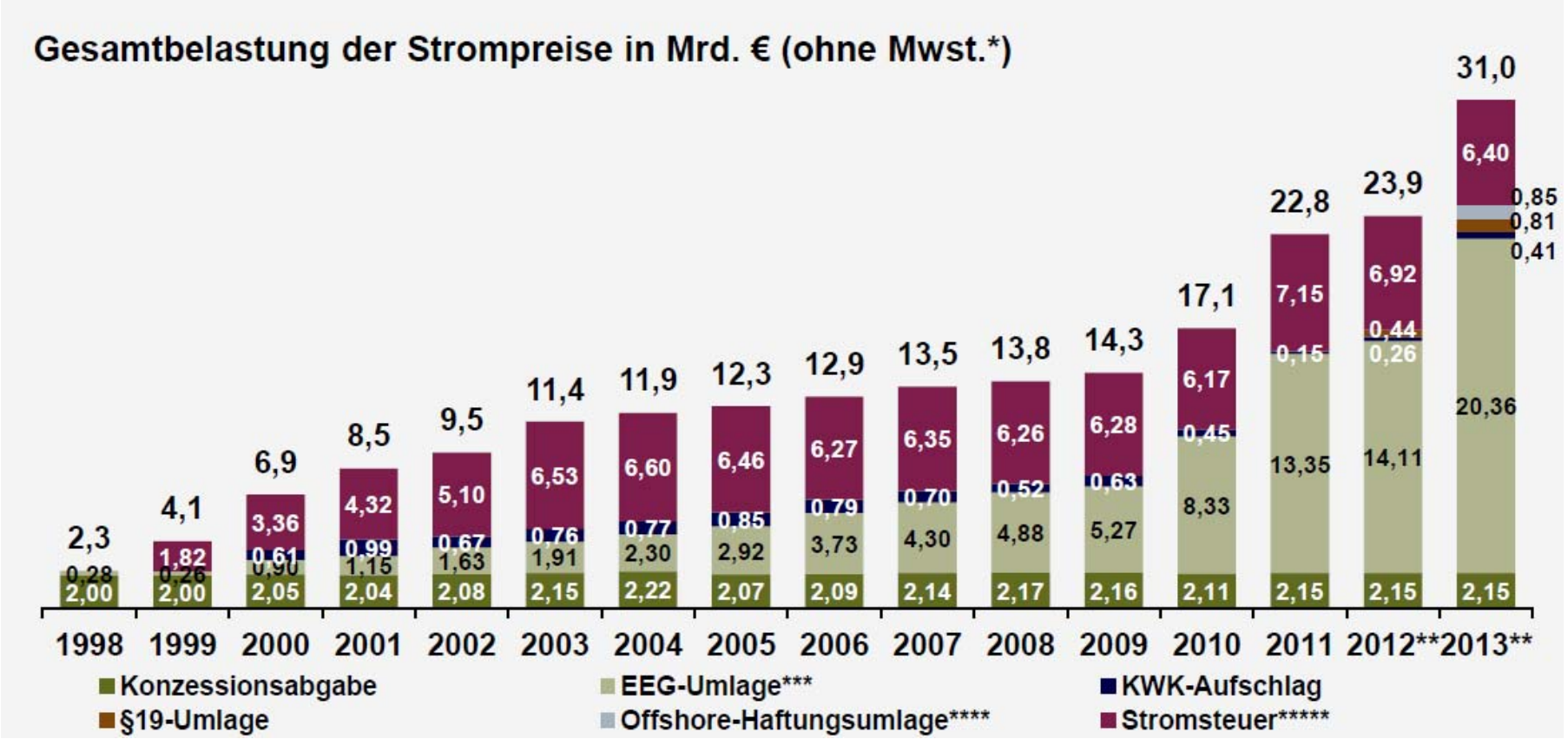
Total addition of public obligations to electricity prices in Billion Euro p.a. (excluding VAT)



Source: BDEW 2013

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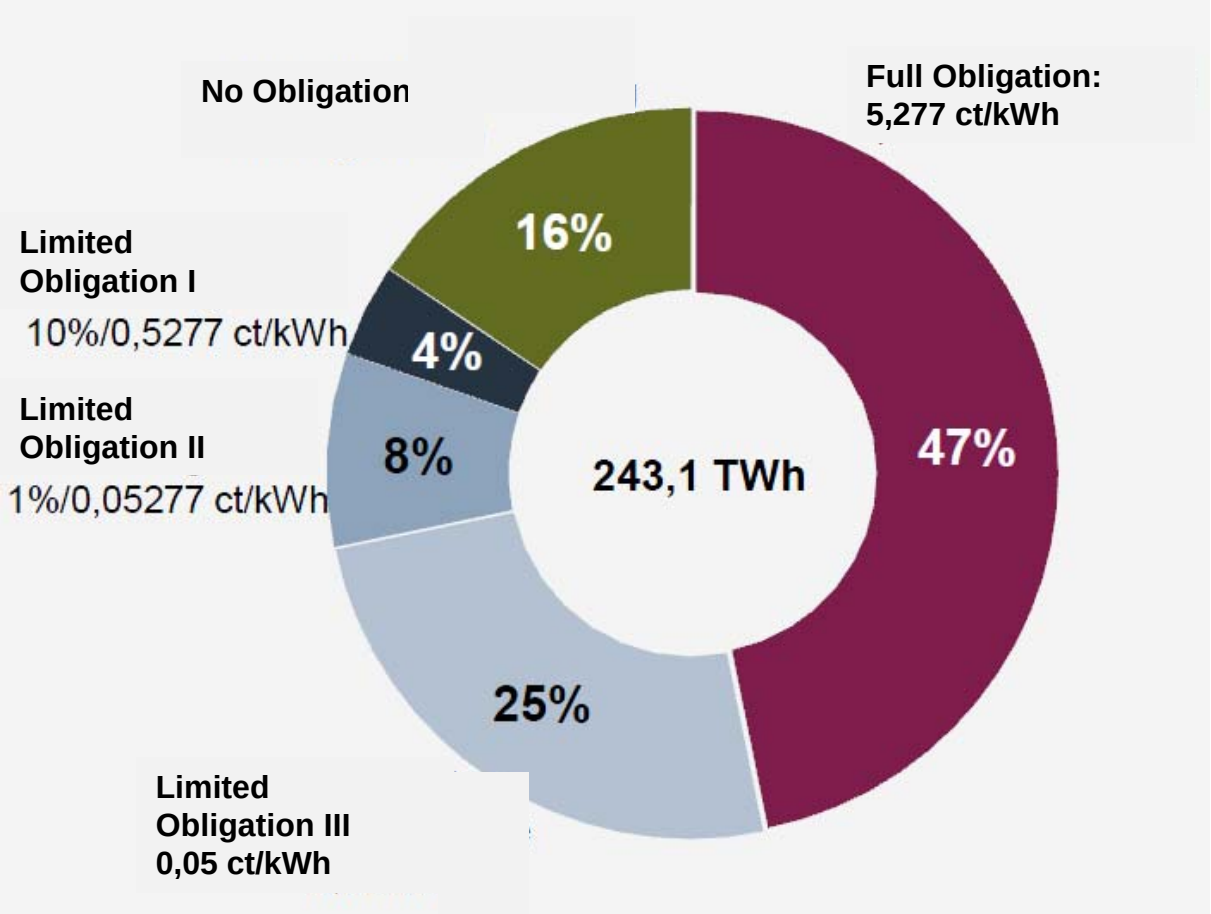
Protectionism behind the border is necessary: Differentiation in the public obligation for RES payements within the Industry due to competitiveness concerns



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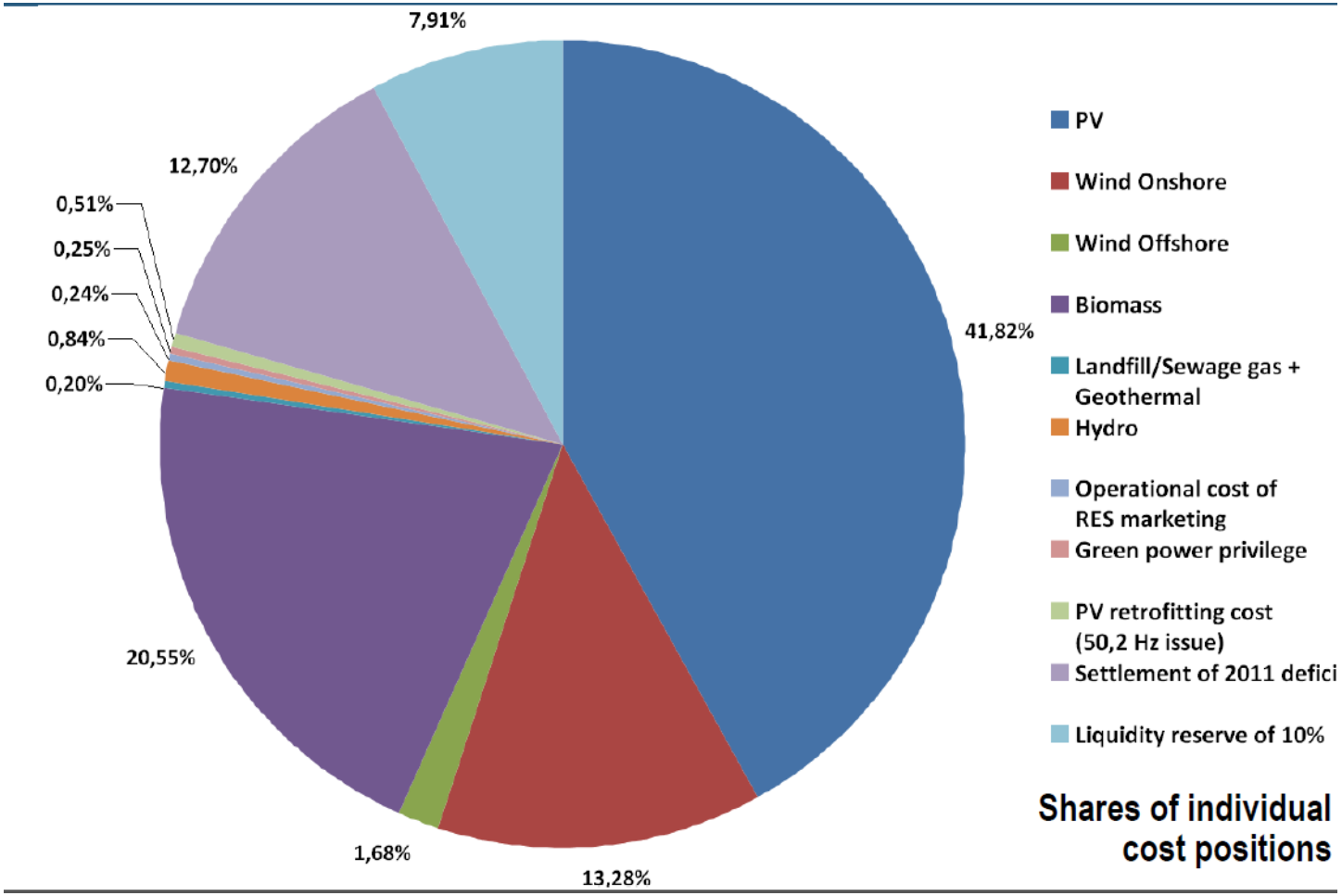
Share of different technologies in the overall costs of the renewables surcharge



Source: BDEW 2012

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New Challenges: The Case of the Photovoltaic Industry

- Solar/Photovoltaic Industries were an important pillar of the success story around German „Ecological Industrial Policy“
- German consumers paid the learning curve for a future technology, but also saw high employment rates in the sector

  → Global impact: Positive
- With prices for solar installations going down, by today, German Photovoltaic industry is largely uncompetitiveness

  →Are protection measures needed?

  →How to deal with another strucutural change?
- Lessons learned:
  - More focus on R&D necessary
  - Lead markets are dynamic, policy-makers have to adapt

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Conclusions

- Germany used both, push and pull factors, to develop its domestic industry and to create global demand for low-carbon-development
- Climate and trade policies have largely been Europeanized over the years, therefore options for national governance are limited
- The case of the German Photovoltaic Industry shows that policy-makers have to use flexible and dynamic instruments to force market players to become adapt to changing circumstances

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Thank you for your attention!

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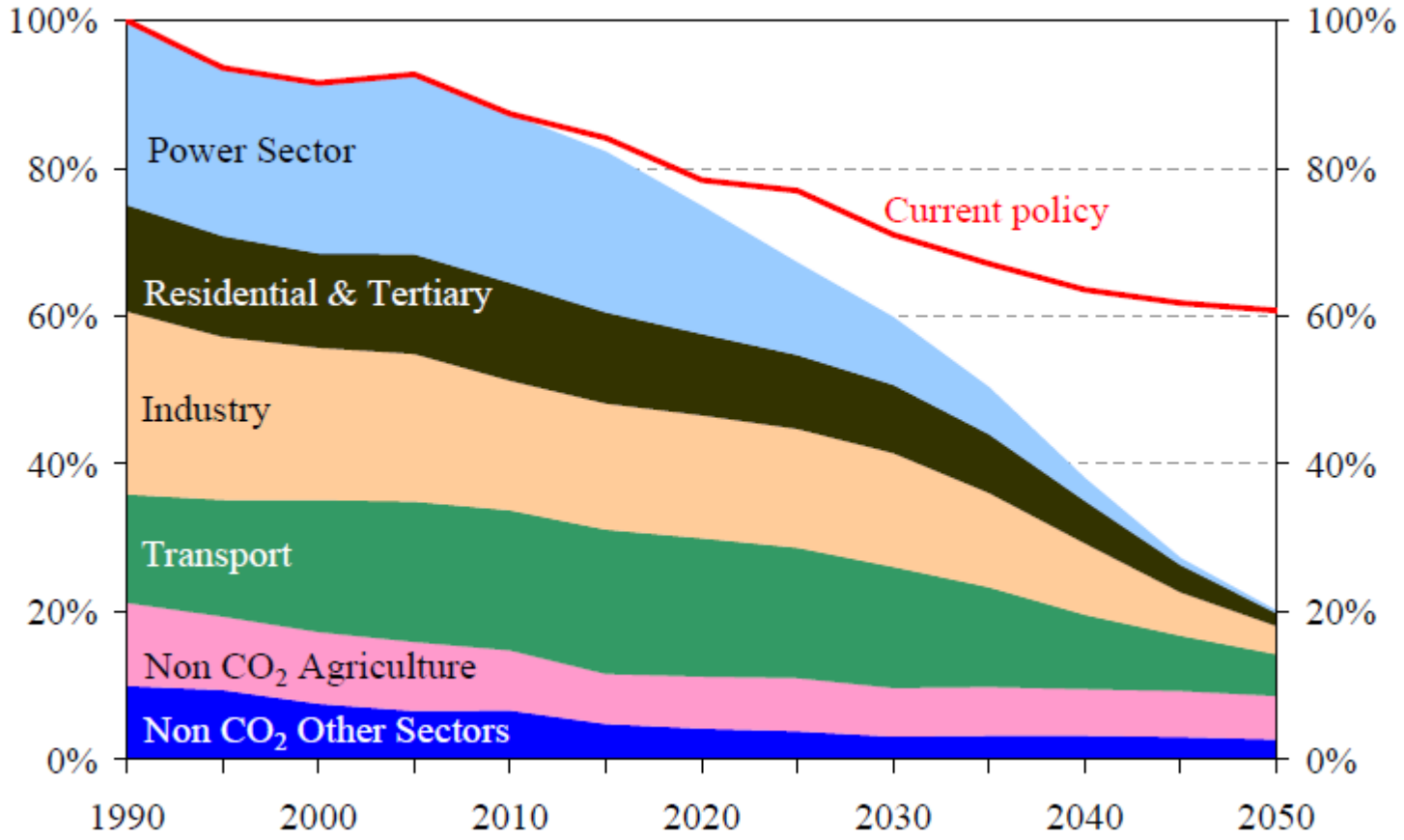
EU climate and energy policies towards 2030

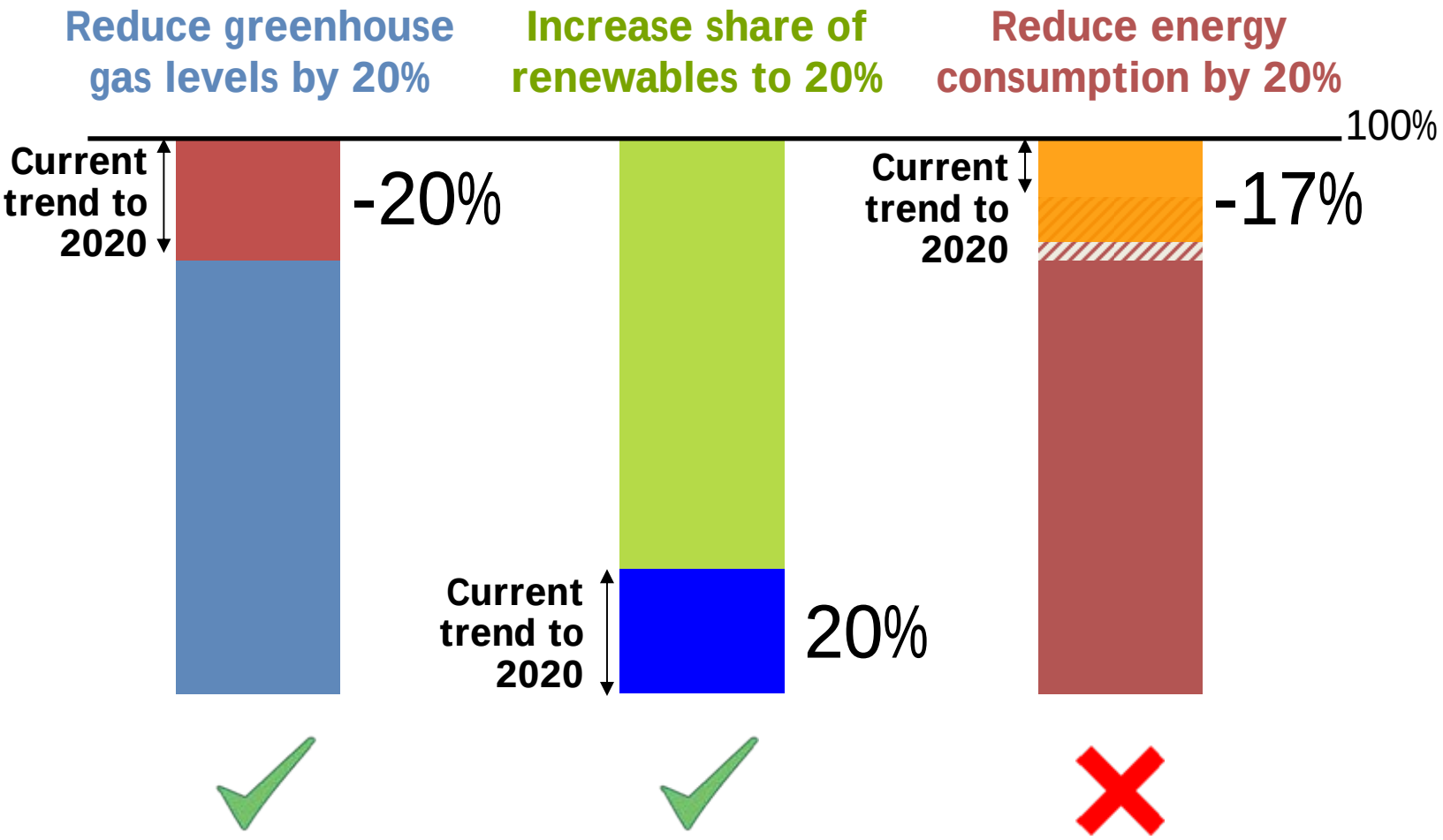
1. Current policies: The 20-20-20 targets
2. EU‘s main energy and climate challenges towards 2030
    - Import dependence
    - Clean energy investments
    - Competitiveness questions
3. Options for an EU 2030 climate and energy framework

EU‘s long-term objective:

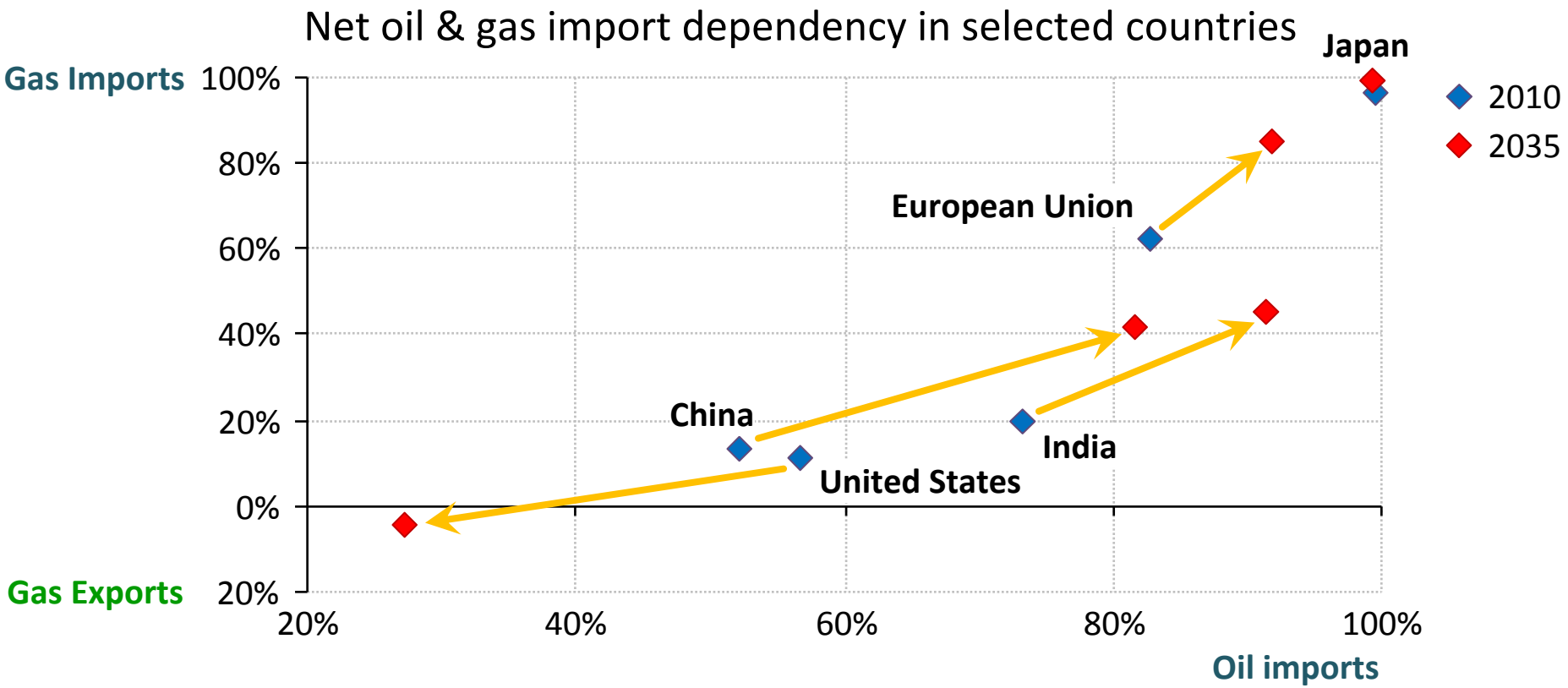
reducing the EU's greenhouse gas emissions by 80-95% in 2050 compared to 1990 levels



Current policies: The 20-20-20 targets



Challenges: energy import dependence



While dependence on imported oil & gas rises in many countries, the United States swims against the tide

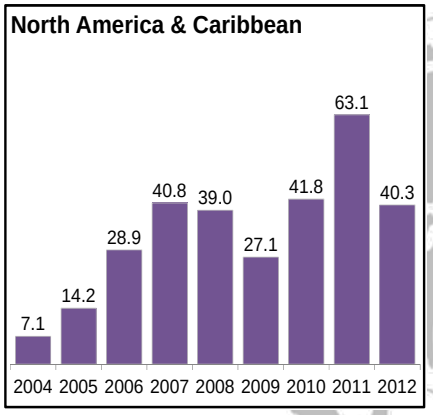
Source: World Energy Outlook

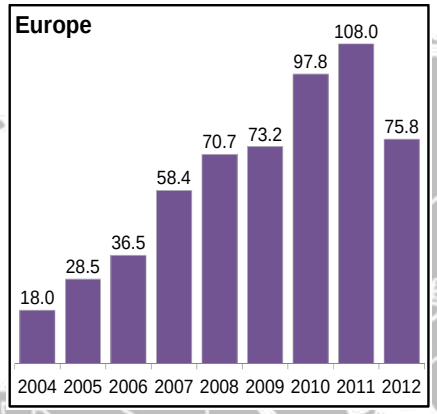
Challenges: Import dependence

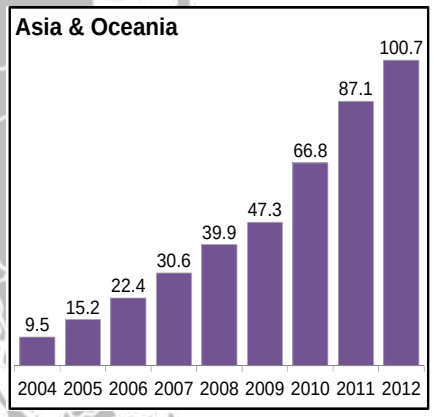
EU‘s fossile fuel imports

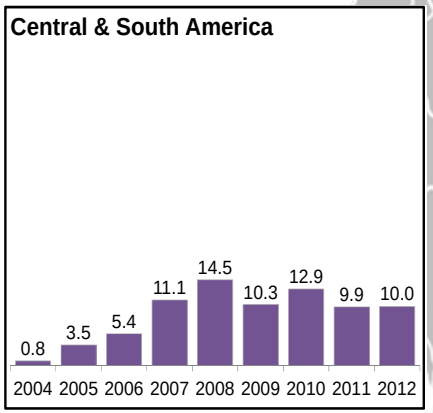
	Import value in bill €	net import value in bill € (trade balance)
2012	545	421
2011	492	391
2010	383	304
2009	298	240
2008	458	373

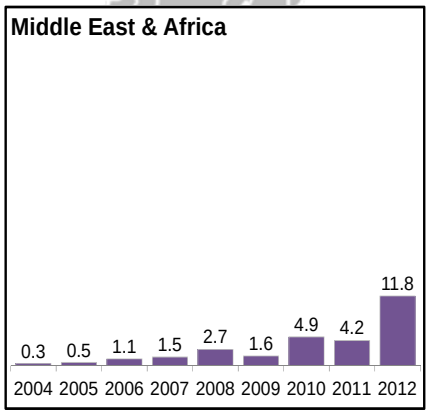
Challenge: New investment in clean energy by region, 2004-2012 ($BN)









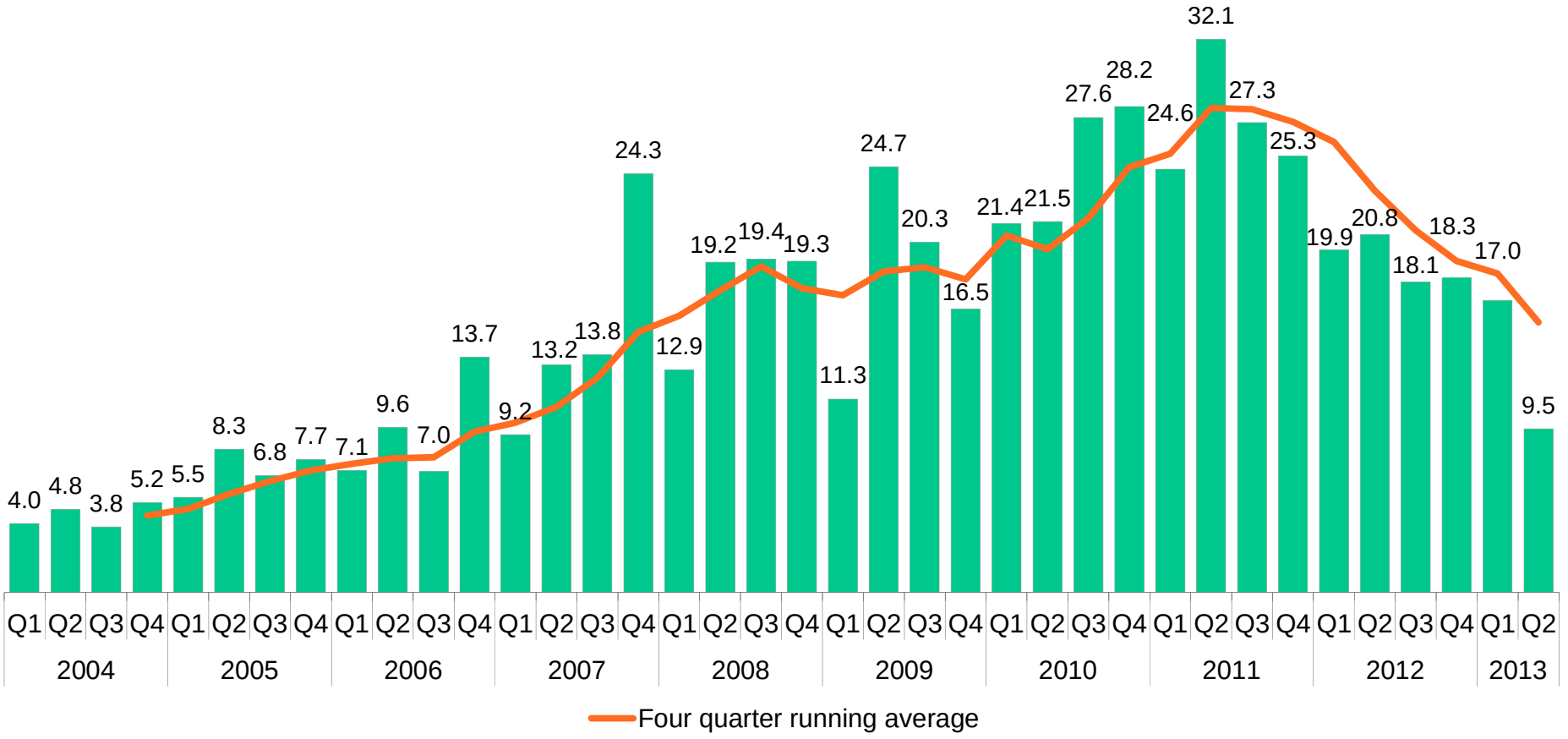


Note: Excludes corporate and government R&D

Source: Bloomberg New Energy Finance

NEW INVESTMENT IN CLEAN ENERGY IN EUROPE

Q1 2004–Q2 2013 ($BN)

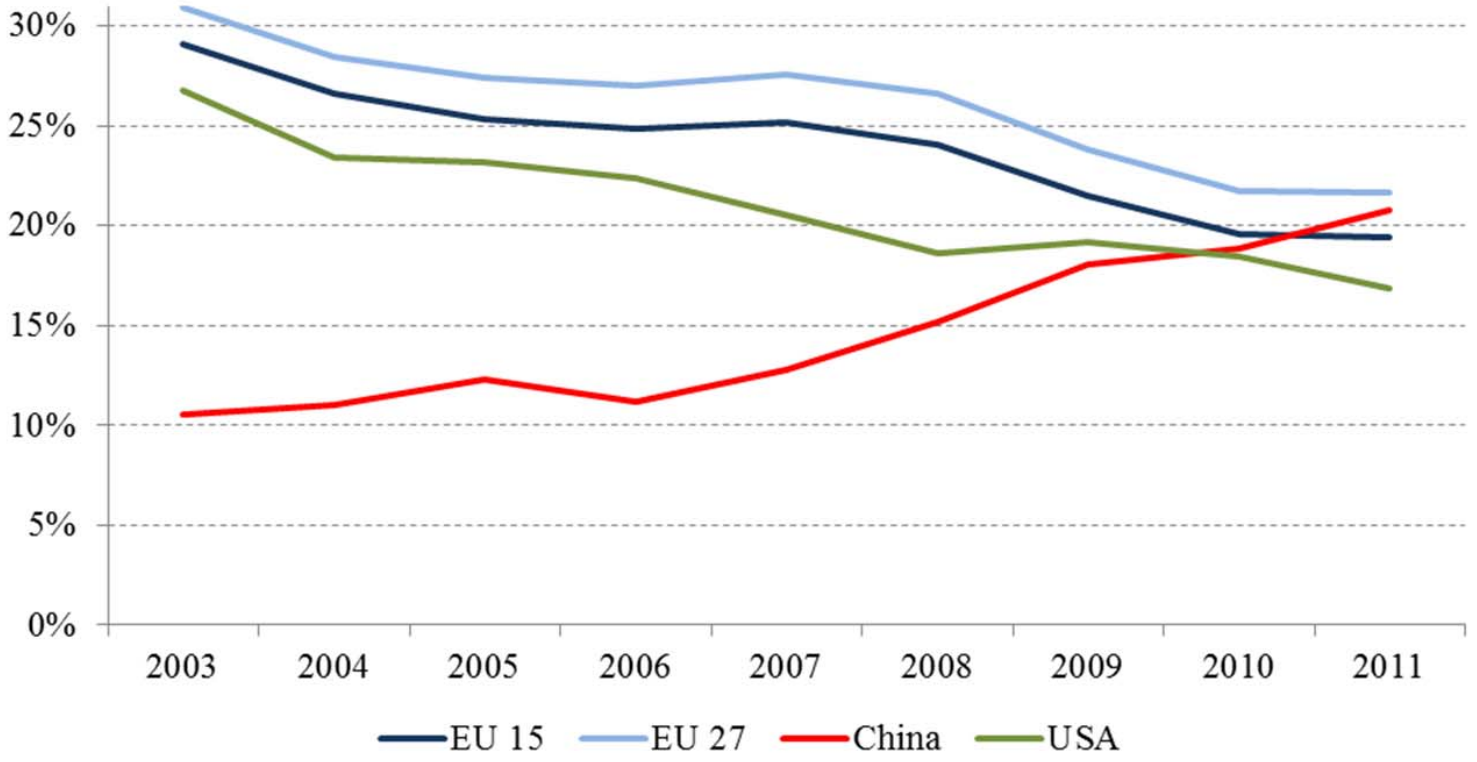


Note: Total values include estimates for undisclosed deals. Excludes corporate R&D, government R&D, digital energy asset investment and energy storage asset investment (only available annually)

Source: Bloomberg New Energy Finance

Challenge: Competitiveness questions

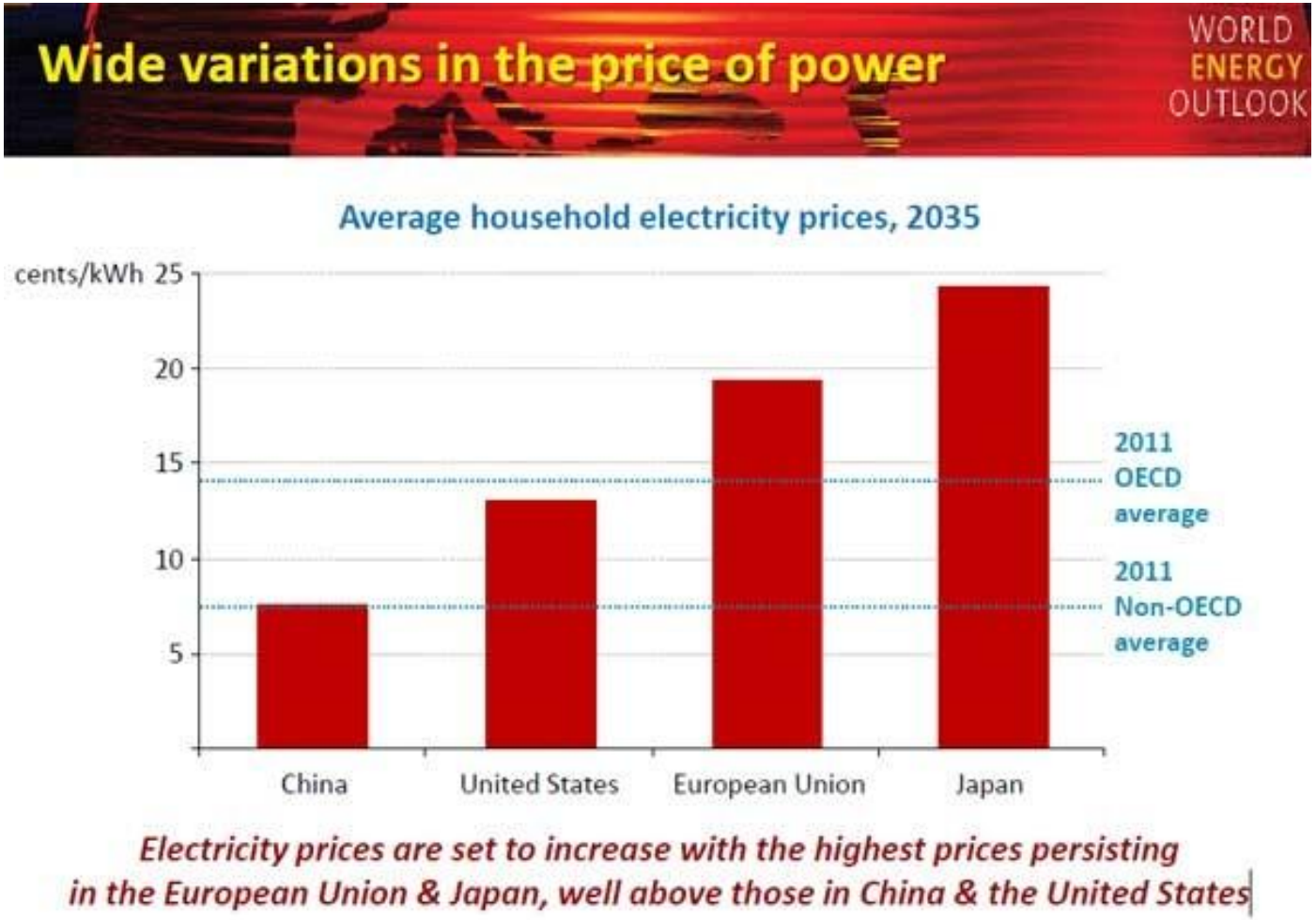
EU manufacturing output on a global scale



The share of manufacturing in Europe has been consistently decreasing, while manufacturing in China has been on the rise.

Source: UN National Accounts Main Aggregates Database

Challenge: Competitiveness questions



3. Options for an EU 2030 climate and energy framework

Trade and Climate Change

Issues for India

Nitya Nanda

The Energy & Resources Institute (TERI)

Shanghai Conference on

Climate Change and Trade

Shanghai, November 23, 2013

Trade and climate change –emerging issues

- Developed countries' apprehension: Emission intensive production units in developed countries may relocate to developing countries (**carbon leakage**) => undermine global objective of climate change mitigation in post Kyoto regime.
- Growing concerns of the industries in developed countries in the changing **competitive environment** due to various domestic CC policies – R&D Inv./Higher compliance cost -> ^Price
- **Elimination of price advantage** and induce developing countries to adopt more rigorous climate policies

Measures

- Proposals for various BTA measures to offset any adverse impacts arising from domestic policies in developed countries
- Use of other voluntary trade restrictive measures that are sensitive and controversial (labelling)

Legality etc.

- Compatibility of carbon barriers under UNFCCC and WTO is questionable
- Voluntary measures taken by some sectors are already acting as carbon barriers – for e.g. food chains; action needed to address these barriers

Select literature review

Impact in developed countries (carbon leakage)	Impact on developing countries (BTA)	Suggested policies
Pew Climate paper : Not likely to impact US competitiveness under CAP and trade system **World Bank (2010):** No evidence the energy intensive industries' competitiveness is affected in the presence of carbon taxes. **Manders et.al. (2008):** Modest carbon leakage **Aldy & and Pizer (2008):** leakage found **Adkins et.al (2011):** moderate to high leakage **Babiker et.al. (2005):** substantial leakage **Fischer and Fox (2009):** Substantial leakage	**Manders and Veenendaal (2008):** may entail a welfare loss for the rest of the world (developing countries) **Hubler (2009):** Exports decline in the range of 8-20% (china+middle+low inc countries) **ICTSD (2010):** India export decline in EU 24%, China 7%, Indonesia 17%. **Richard D. Morgenstern (2007):** Potential impact on developing countries **Goldar and Bhalla (2011),;** Observed impacts, **Matoo et. al (2009):** developing vs. developed carbon intensity and differential impact	**Cosbey (2007): A**reas and policies where action could enhance the contributions of international trade and investment to climate change mitigation options **Brewer (2008):** improved international institutional arrangements **Vicente Paolo Yu (2009) :** developed countries refrain from adopting border adjustment measures, pushing for trade liberalization of climate-friendly products **Webel and Peters (2009)**: tech sharing, agreements

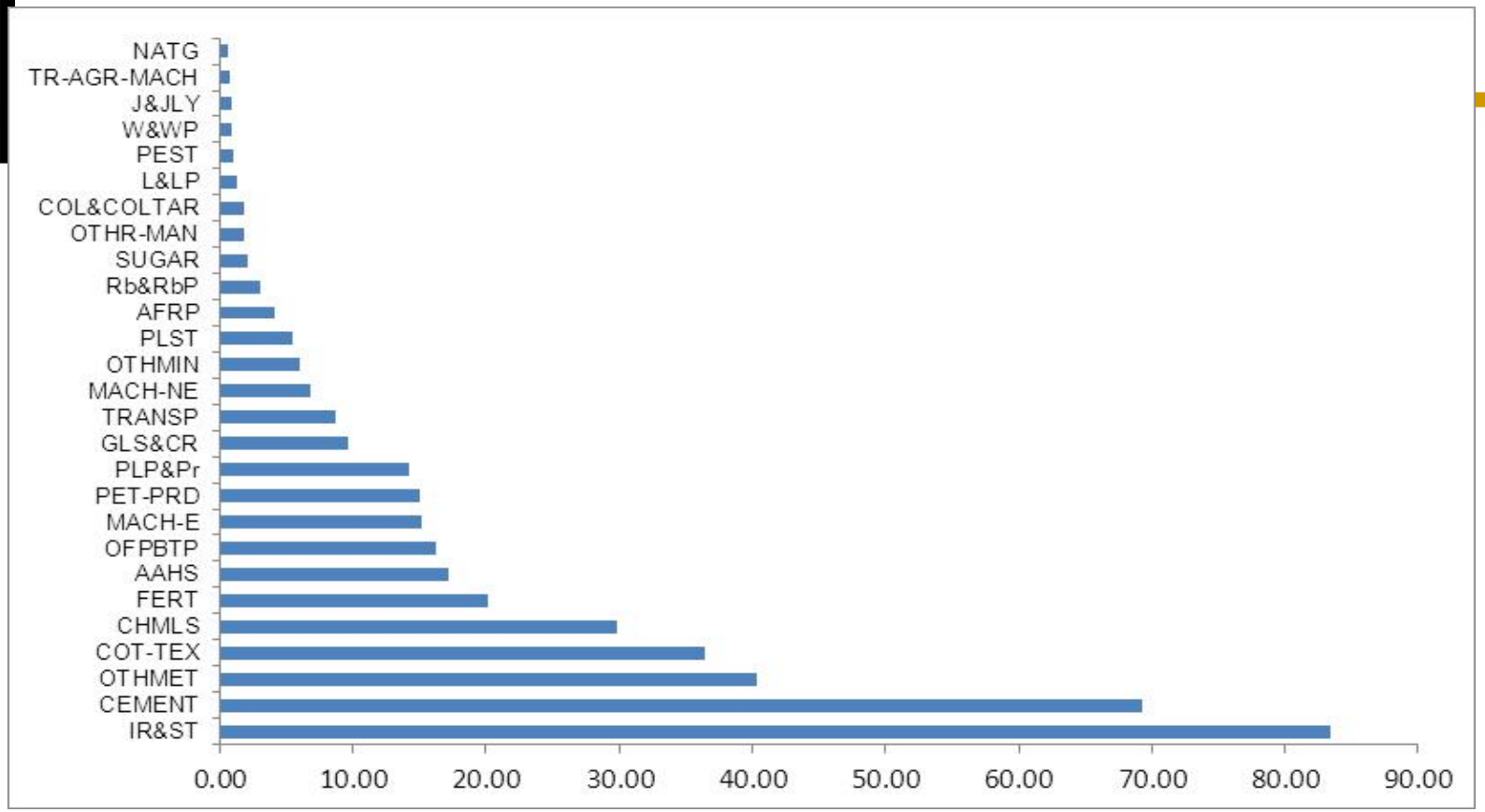
Climate Change and India

- Vulnerable due to geographical and socio-economic conditions
- Likely to impact macroeconomic and trade performance as well as livelihood and living standards of people
- Studies show even a marginal increase in temperature can have substantial impact on production of major crops
- Increased precipitation may further aggravate the problem
- Even in Himalayan regions there may be landslide and related loss of life property and deterioration of land quality
- Agricultural goods or products based on agricultural goods are substantial in export basket

Impact of BTA

A Case Study of Indian Exports to US and Germany

Estimated sectoral emission (million tonnes)



- Total CO2 emission due to economic activities 2006–07 = 1210 million tonnes.
- MoEF emissions inventory with the reference year 2007 estimated in 2010 total CO2 emission as 1221.76 Mt or 1.22 Gt (GoI, 2010)
- Electricity is the largest emitter = 591 million tonnes, followed by IR&ST, cement, metallic prd..

India's key (top 10) exports to the USA and Germany (2006-2007)

USA

SECTOR	EXPORTS (Rs. Lakhs)	SHARE IN TOTAL EXPORTS (%)
J&JLY	2161741	25.46
COT-TEX	2158155	25.42
MACH-E&MACH-NE	811423	9.56
CHMLS	810819	9.55
IR&ST	674668	7.95
OTHR-MAN	297981	3.51
AAHS	286654	3.38
TRANSP	251449	2.96
OTHMET	176056	2.07
OTHMIN	171153	2.02

Germany

SECTOR	EXPORTS (Rs. Lakhs)	SHARE IN TOTAL EXPORTS (%)
COT-TEX	658945	34.50
CHMLS	331043	17.33
IR&ST	177532	9.29
MACH-E	125717	6.58
L&LP	102775	5.38
TRANSP	84027	4.40
J&JLY	73460	3.85
OTHR-MAN	64711	3.39
AAHS	49299	2.58
OTHMET	46492	2.43

Main Findings

USA

- **Scenario1 = 2.34%, Scenario 2 = 3.5%**
- **Largest % decline** in cement and related products of 53% and 68% for scenario 1 and 2.
- Maximum decline in export revenue for **IR&ST** Rs. 7292 million and Rs. 10939 million for scenario 1 and 2.
- FERT (39% and 59%), PLP&Pr (12% and 19%) and glass and ceramic (10% and 15%).
- Second highest decline in revenue for **COT-TEX** Rs. 6210 million and Rs. 9315 million
- Other potentially impacted sectors are chemicals, metallic products rubber and plastic.

Germany

- **Scenario1 = 2.7%, Scenario 2 = 3.9%**
- **Largest % decline** in cement 32% and 47% for scenario 1 and 2.
- Maximum decline in export revenue for **COT-TEX** Rs. 1684 million and Rs. 2526 million for scenario 1 and 2.
- FERT (19% and 29%) and glass and ceramic (18% and 29%).
- Second highest decline in revenue for **IR&ST** Rs. 1417 million and Rs. 2125 million
- Other potentially impacted sectors are chemicals, metallic products rubber and sugar.

Impact on Exports – US as case study

	Total Exports (Rs Lakhs)	Share of exports in total	Percent decline under scenario € 20/ton	Percent decline under scenario € 30/ton
CEMENT	1540.73	0.02%	53.38	68.03
FERT	126.89	0.00%	39.48	59.23
PLP&Pr	29147.26	0.34%	12.69	19.04
IR&ST	674667.68	7.95%	10.81	16.21
GLS&CR	24792.31	0.29%	10.16	15.24
PLST	77888.89	0.92%	4.75	7.12
SUGAR	1013.33	0.01%	3.73	5.60
Rb&RbP	105032.69	1.24%	3.39	5.08
COT-TEX	2158154.98	25.42%	2.88	4.32
W&WP	11789.02	0.14%	2.86	4.29
OTHMET	176056.02	2.07%	2.62	3.92
OTHMIN	171153.35	2.02%	2.55	3.83
TRANSP	251448.9	2.96%	1.94	2.91
MACH-E	811423.19	9.56%	1.70	2.54
OFPBTP	70252.98	0.83%	1.53	2.29
CHMLS	810818.64	9.55%	1.48	2.23
OTHR-MAN	297980.78	3.51%	1.01	1.51
AAHS	286654.08	3.38%	0.74	1.11
L&LP	97939.03	1.15%	0.68	1.02
AFRP	136079.59	1.60%	0.20	0.29
J&JLY	2161740.57	25.46%	0.08	0.12
Others	134724.02	1.59%	0.00	0.00
TOTAL	8490424.9	100%	2.34	3.50

* Based on 2006-2007

Impact on Exports – Germany as case study

	Total Exports (Rs Lakhs)	Share of exports in total	Percent decline scenario € 20/ton	Percent decline scenario 2 € 30/ton
CEMENT	20743	1.09%	31.06	46.59
FERT	10	0.00%	19.78	29.68
GLS&CR	6869	0.36%	18.84	28.26
IR&ST	177532	9.29%	7.98	11.97
SUGAR	1445	0.08%	5.42	8.13
OFPBTP	44472	2.33%	3.31	4.96
Rb&RbP	29587	1.55%	2.97	4.46
COT-TEX	658945	34.50%	2.56	3.83
OTHMET	46492	2.43%	1.63	2.44
CHMLS	331043	17.33%	1.57	2.35
W&WP	4005	0.21%	1.45	2.17
TRANSP	84027	4.40%	0.70	1.05
MACH-E	125717	6.58%	0.65	0.97
AFRP	24601	1.29%	0.44	0.66
AAHS	49299	2.58%	0.38	0.58
J&JLY	73460	3.85%	0.26	0.39
PLST	25541	1.34%	0.25	0.38
L&LP	102775	5.38%	0.21	0.32
OTHR-MAN	64711	3.39%	0.13	0.19
PLP&Pr	2624	0.14%	0.13	0.19
OTHMIN	8860	0.46%	0.08	0.12

Trade reduces emissions?

- Technology transfer through energy efficient goods and services?
  - WTO agenda on liberalisation of environmental goods and services
- Potential is quite low as the products seem to be inelastic
- Long lists of environmental goods and services
  - Only a few have implications for climate change and problem of multiple use
  - No agreed definition
- Domestic policy more important than trade liberalisation

Border Tax Adjustment

- WTO is not clear but may not be too encouraging
- PPP (Process and production method) may be difficult - may not be fair as it may be producer specific – can you have different rates for different producers?
- UNFCCC also not in favour
- Legitimacy of BTA due to stalemate at UNFCCC?
- American Clean Energy Security Act (Waxman-Markey Bill)
- Only India China?
- Non energy-intensive but trade intensive goods also
- Can there be trade war? Developing countries operate at far below their bound tariff rates!!

Non-tariff Climate Barriers

- EU talks about mandatory labelling – may not be WTO compatible
- Voluntary/private standards/labelling proliferating – consumers giving importance
- Some eco-labels already include emission factor
- Labour standards – de jure no ban, but de facto…
- Governments and NGOs have been supporting various eco labelling programs, which cover thousands of products in more than 20 countries
- Efforts to standardize environmental labelling schemes at the international levels
- Exports from developing countries to developed countries get considerably affected by the eco-labelling in the EU and the US

Proliferation of Carbon Standards

- In 2007, the Carbon Trust and DEFRA commissioned the BSI to develop a comprehensive carbon footprint methodology - Publicly Available Specification (PAS 2050), was launched in October 2008
- The Carbon Trust introduced a carbon reduction label, based on PAS 2050 in partnership with several companies.
- There is no internationally agreed methodology for calculating the carbon footprint
- France - voluntary carbon labels have been introduced in supermarket chains, Casino for its several own-brand products - supported by the French Environment and Energy Agency,
- Switzerland - supermarket chain, Migros has introduced the Climatop carbon label on several own-brand products - product is 20 per cent more carbon efficient
- US - Carbon Fund, an independent non-profit carbon offset provider - Certified Carbon Free label; Climate Conservancy (Stanford University) - Climate Conscious label (gold, silver and bronze)
- Similar initiatives in Japan, Canada, Sweden, Germany, EU

Food Miles

- A range of environmental and community groups (eg. WWF, Soil Association) support the food miles concept
- Two major UK retailers (Tesco, and Marks and Spencer) now place plane stickers on fresh produce
- A group in San Francisco ('locavores') - encourage people to eat food grown or harvested within a 100 mile radius of their home
- Role of trade in poverty eradication / ethical issues - workers and their dependants
- Cranfield University study - cut roses grown in Kenya for UK (500 inputs) are 5.8 times (6.4 times excluding air freight) more carbon efficient compared to Dutch greenhouse flowers. Similar for green beans and strawberries grown in Kenya compared to grown in UK
- Study of emissions in the UK and NZ food supply chains for four food products — lamb, dairy, apples and onions - substantially more energy efficient, and less carbon intensive except onion
- Countries like Australia, NZ oppose food miles but support carbon labelling

Labelling Difficulties

- A complex methodology - cost of data collection and calculation of the carbon footprint and cost of the verification process
- Simpler methodology - less reliable and may contain loopholes and relatively more emission-intensive products can pass as low carbon products
- Can be done only up to factory/farm gate
- Carbon standards will require estimation of carbon footprint of all suppliers - many small producers - no fixed suppliers - source supplies from the market without any knowledge of the original suppliers
- A matter of concern is the administrative costs - It is very likely that for most products coming from developing countries will have lower emissions. Yet they will have difficulties as the costs of compliance would be very high particularly for the small producers

Carbon Standards – Legal Issues

- Standard setting and labeling activities come under the TBT agreement irrespective of whether they are mandatory and voluntary, though the applicable provisions are different.
- TBT agreement covers standards by central government bodies, local government bodies as well as non-governmental bodies
- No consensus on non-product related processes and production methods and private labeling schemes
- If the PPM is detectable and embodied in the product itself then it may come under the agreement
- In the US Shrimp Turtle case, the import ban was examined under Articles XI and XX of GATT - No TBT experience
- How to distinguish between private and NGO standards?

Implications for South Asia

- **Share of energy-intensive goods in total exports is not very high in India, particularly in case of exports to OECD countries**
- **Non-tariff barriers can be the real concern – certification costs to be high, even if emissions could be low**
- **Pre-emptive move? Can they have carbon tax? There is substantial tax burden on some energy commodities!! Can they be considered as equivalence of efforts?**

Thank You

Trade and Climate Change: A US Perspective

12th SUIBE-KAS WTO Conference

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Shanghai, China

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International Trade

- In the absence of externalities and political distortions, trade will assist the achievement of sustainable development goals
- Comparative advantage: International trade allows nations to obtain a given consumption bundle at lower cost than sourcing all goods and services domestically
  - Costs include physical resources and environmental damage
- Externalities: When environmental costs are regulated in some regions and not others, trade can increase pollution (e.g., leakage)
- Political distortions: The problem of collective action can result in policies driven by interest groups

Border carbon adjustments

- Leakage occurs when controls on greenhouse gas (GHG) emissions in one region increase emissions in other regions
  - Occurs via trade and fossil-fuel price channels
- Competitiveness concerns arise when a climate policy raises production costs in some regions and not others
  - Of particular concern in energy-intensive, trade-exposed industries
- Border carbon adjustment: A tariff on a good imported from a country that has not 'comparably offset' greenhouse gas emissions associated with production of the good
- Border carbon adjustments have been proposed to address leakage and competiveness concerns

Border carbon adjustments in US 'policy'

- The Waxman-Markey bill (H.R. 2454), which died in the Senate in 2009, contained a 'carbon tax adjustment' provision that would allow the president to place tariffs on goods manufactured in countries that fail to regulate GHGs
- Title IV, Subtitle A seeks to 'prevent an increase in greenhouse gas emissions in countries other than the US' (p.1087-8)
- March 31 discussion draft, Title IV, Subtitle A, 'Ensuring Domestic Competiveness' aimed 'to compensate domestic industrial sectors for carbon emission costs.' (p. 537)
- Border carbon adjustments have been included in other US policy proposals

Border carbon adjustments internationally

- Provisions for border carbon adjustments are included in EU legislation
- Carbon tariffs have sparked heated discussions in climate change negotiations
  - Bonn, 2009: Indian and Chinese officials proposed that "developed countries shall not resort to any form of countervailing border measures against imports from developing countries."
  - March, 2010: Indian Environment Minister Jairam Ramesh announced that, if BCAs are imposed, India will dispute such tariffs at the WTO.
- Including international aviation in the EU Emissions Trading Scheme has been met with staunch resistance
- The legality of carbon tariffs is yet to be determined by the WTO

Border carbon adjustment impacts

- Winchester *et al.* (2011)* consider the impact of border carbon adjustments using the MIT Emissions Prediction and Policy Analysis model
- Border carbon adjustments imposed by a coalition of countries that implement climate policies (the US, the EU, Japan, Australia & New Zealand) on imports from the non-coalition (all other countries)
- Border carbon adjustments based on life-cycle GHG emissions embodied in each product

* Winchester, N., S. Paltsev and J.M. Reilly (2011). Will border carbon adjustments work? *The B.E. Journal of Economic Analysis & Policy,* 11(1) (Topics), Article 7.

Border carbon adjustment impacts

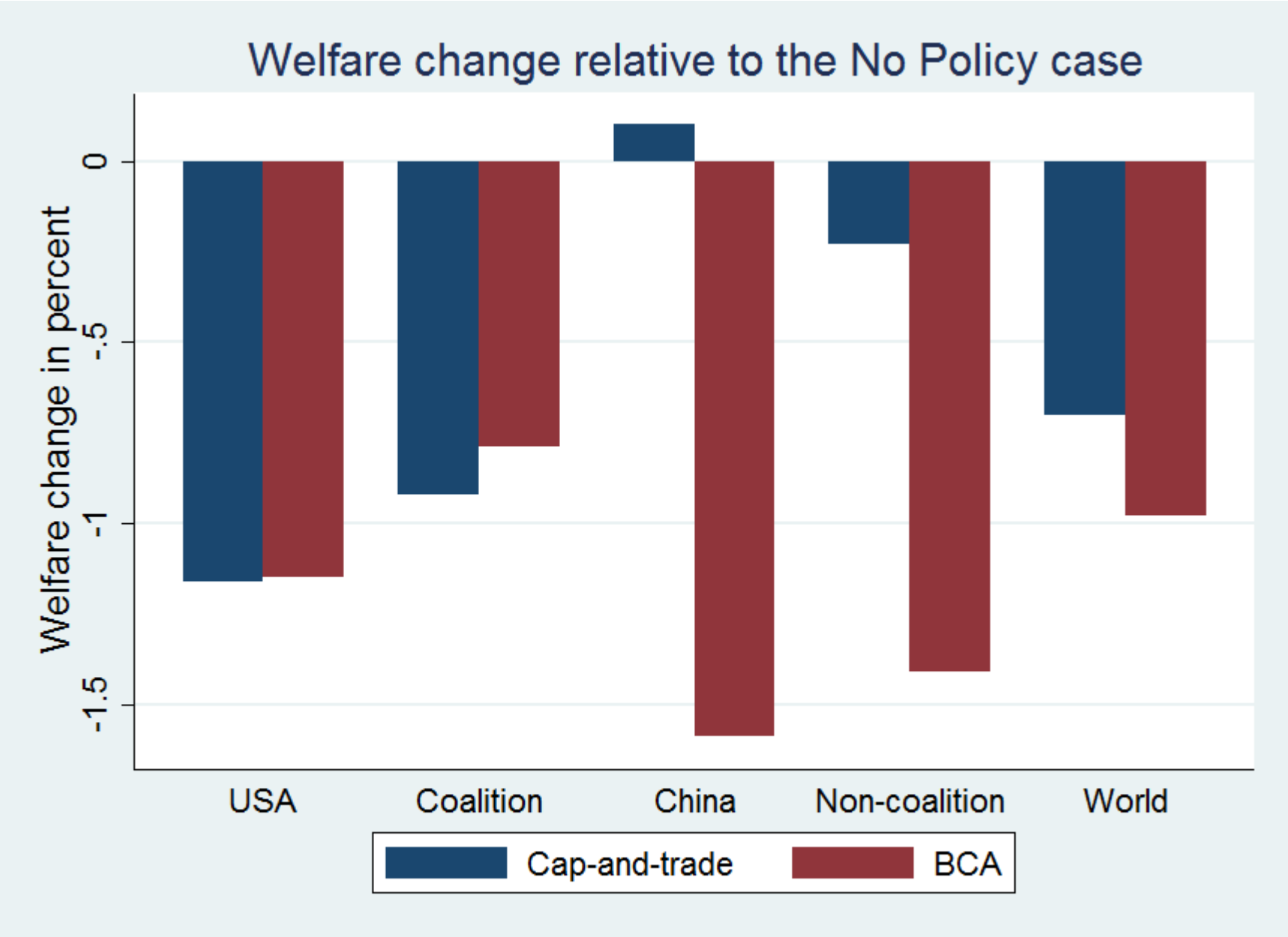
CO_2e GHG emissions and leakage rates, 2025

Abbreviation	No Policy	Cap-and-trade	BCA
Coalition	164.8	113.0	113.0
Non-coalition	393.5	398.7	395.5
Leakage (%)	-	10.1	3.8

$$Leakage\ rate = 100\ \frac{(Increase\ in\ noncoalition\ emissoins)}{(Decrease\ in\ coalition\ emissoins)}$$

- Significant changes in the leakage rates but small changes in global emissions
  - 60% leakage reduction but only a 0.6% fall in global emissions (and a 0.8% fall in non-coalition emissions)

Border carbon adjustment impacts



Border carbon adjustment impacts

- Border carbon adjustments induce small changes in global emissions but induce relatively large changes in non-coalition and world welfare

- In comparison, carbon tariff-equivalent emissions reductions can be induced by very small carbon prices in the non-coalition or minor efficiency improvements that have trivial welfare effects

China's trade-embodied carbon emissions

- Qi *et al.* (2012)* calculate emissions embodied in China's exports and imports using a life-cycle approach

$$Ay_{i,r} \times y_{i,r} = Ed_{i,r} + \sum_{j} Ay_{j,r} \times y_{j,i,r} + \sum_{j,s} (Ay_{j,s} \times y_{j,i,s,r} + At_{j,s} \times y_{j,i,s,r})$$

Direct emissions

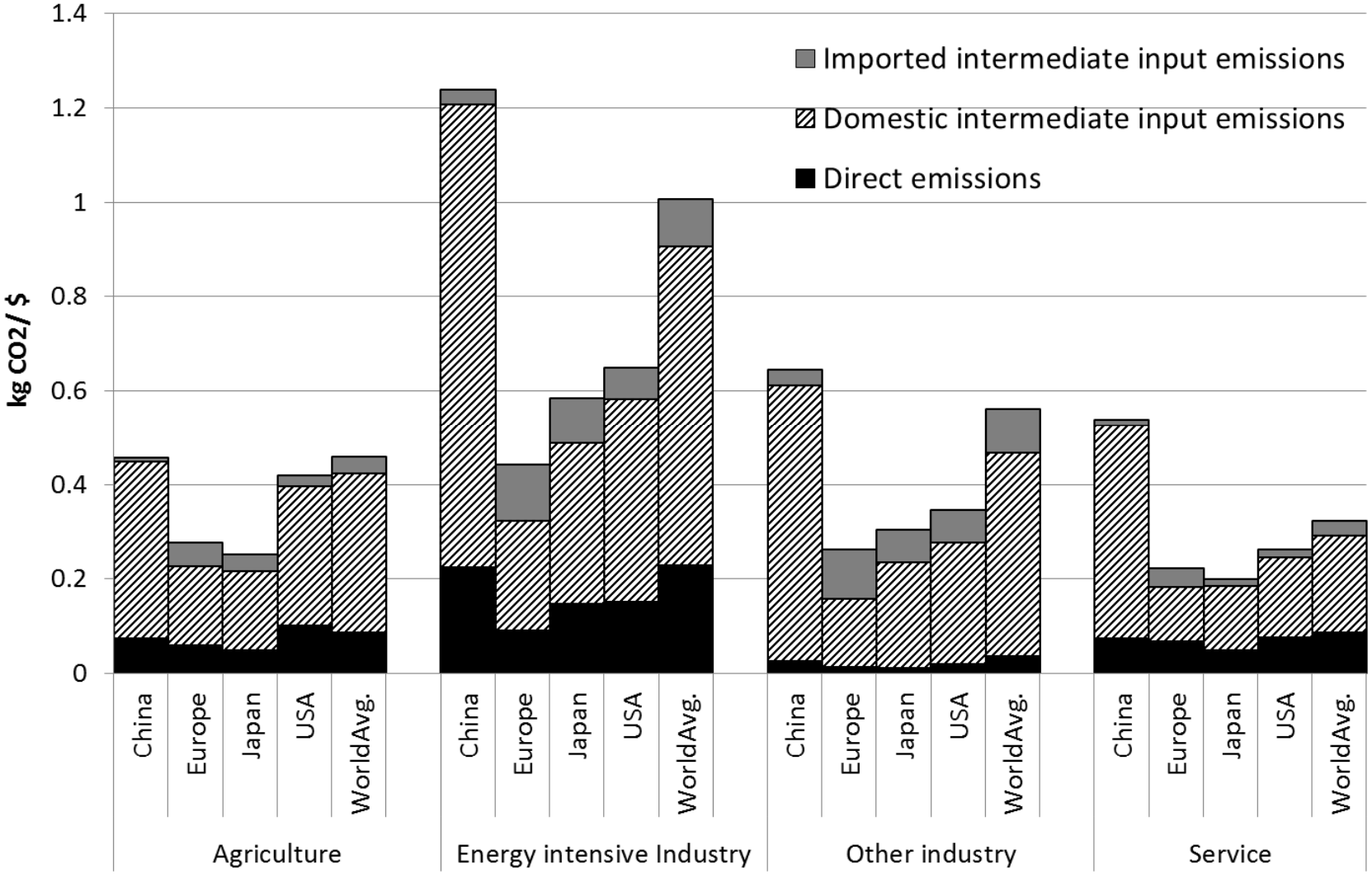
Emissions from domestic intermediate inputs

Emissions from imported intermediate inputs

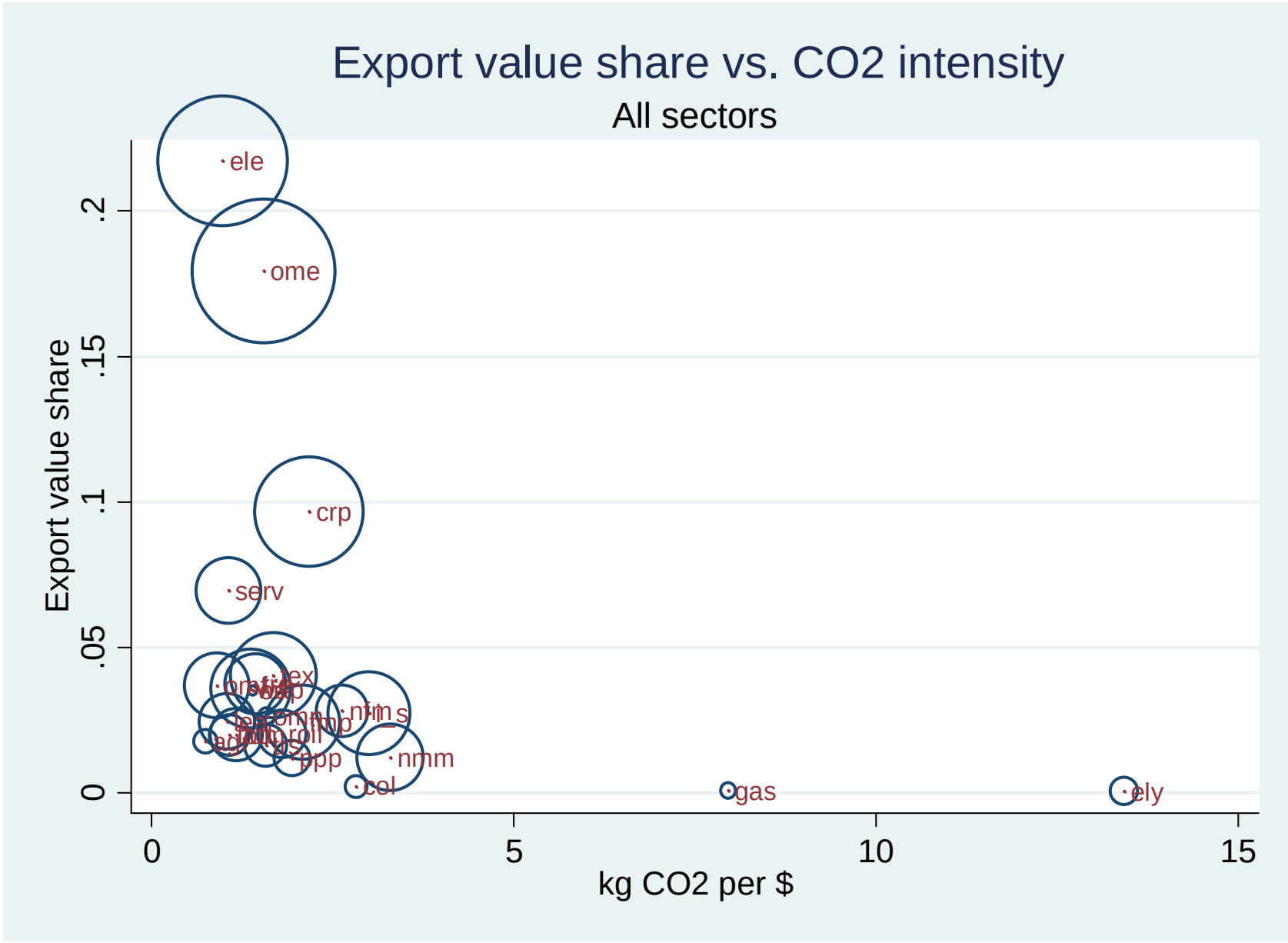
* Qi, T., N. Winchester, V.J. Karplus and X. Zhang (2012), Will economic restructuring in China reduce trade-embodied CO2 emissions?, Joint Program on the Science and Policy of Global Change, Report 232, Massachusetts Institute of Technology, Cambridge, MA.

China's trade-embodied carbon emissions

CO_2 intensity by source and region, 2025

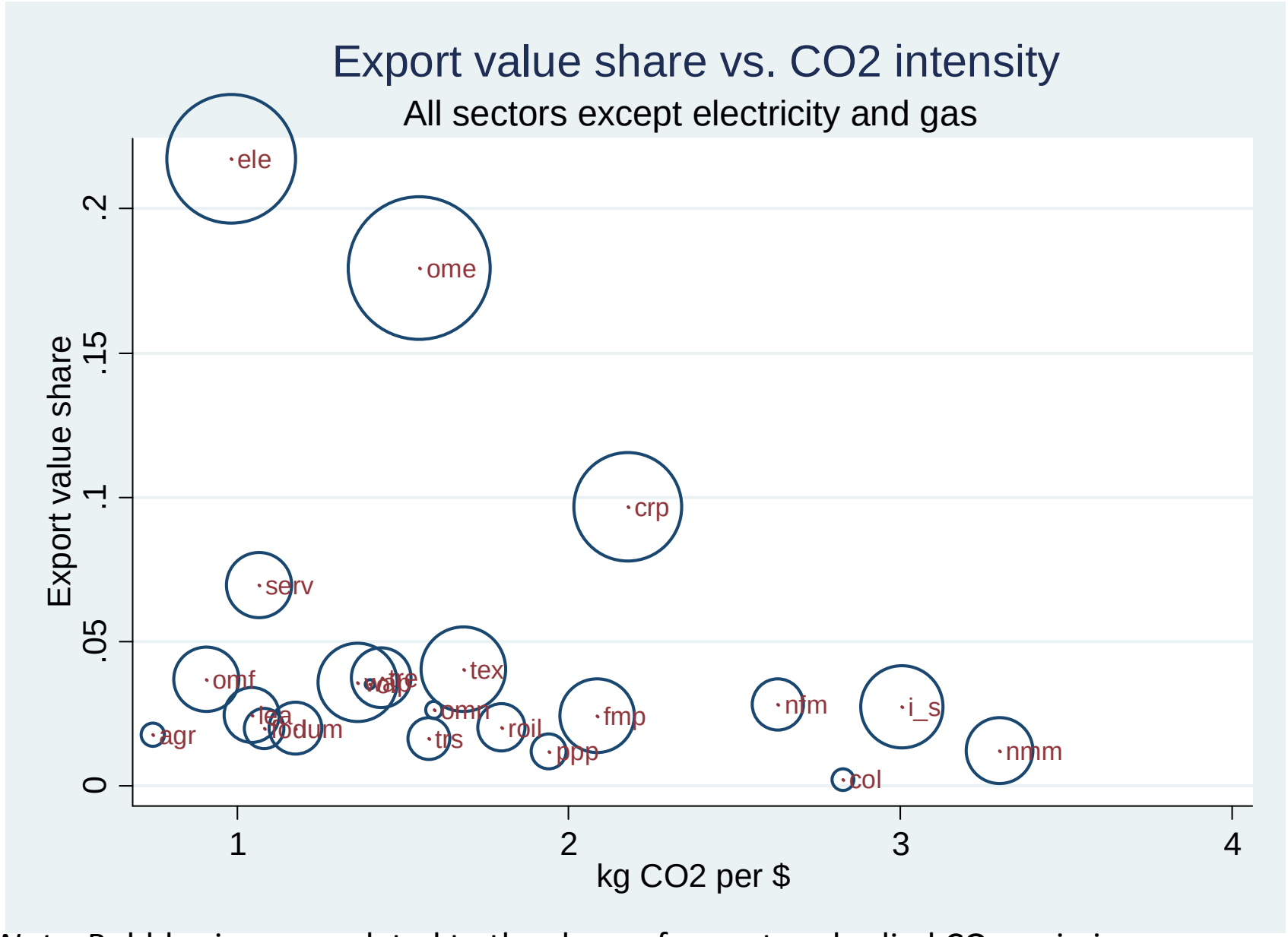


China's trade-embodied carbon emissions



Note: Bubble sizes are related to the share of export-embodied CO_2 emissions.

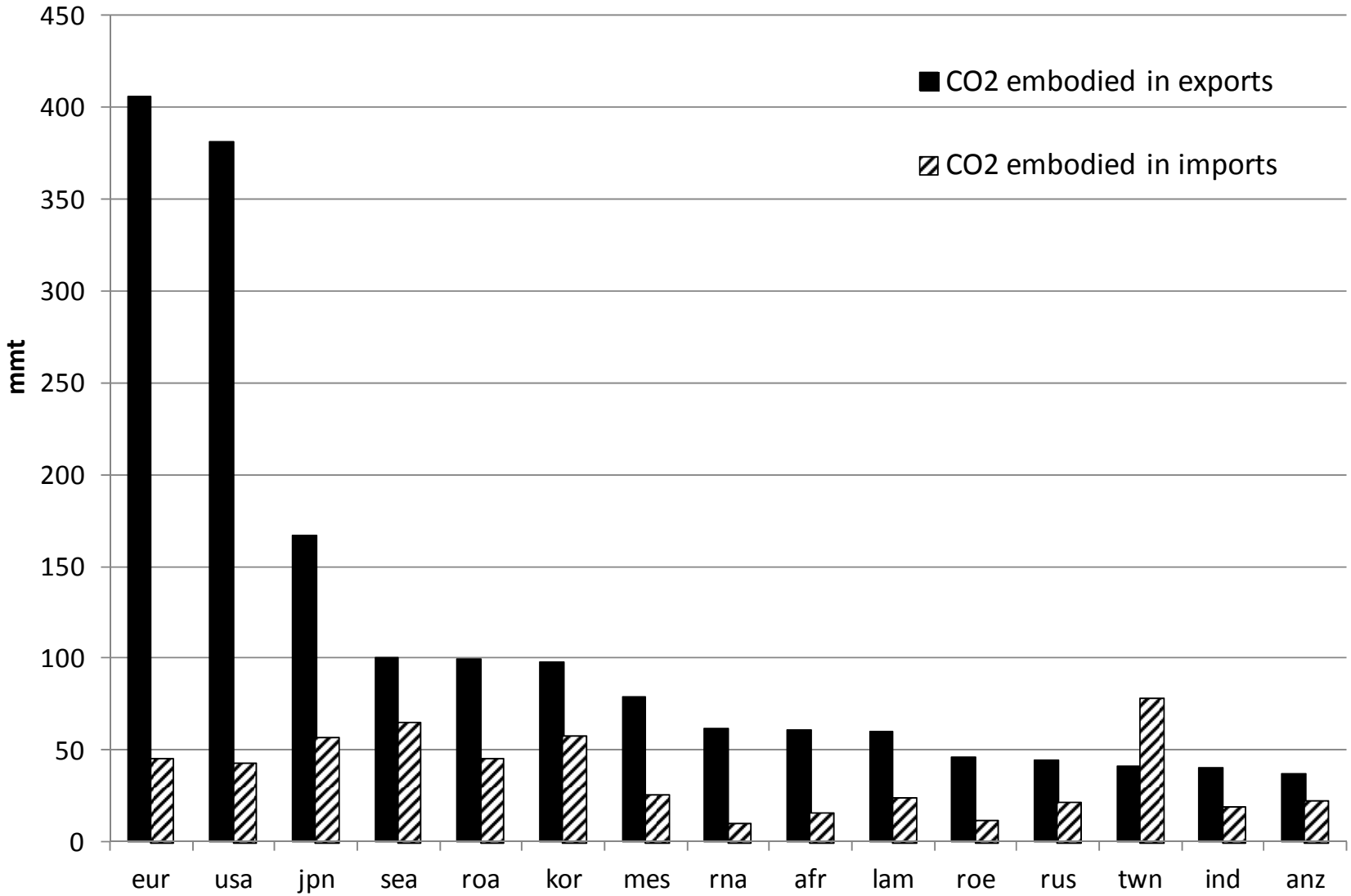
China's trade-embodied carbon emissions



Note: Bubble sizes are related to the share of export-embodied CO_2 emissions.

China's trade-embodied carbon emissions

CO2 emissions embodied in China's exports and imports by region, 2007



Trade and political issues

'Food Miles' campaigns

Dr Spock's ears

BCAs imposed by the US	BCAs imposed against the US
"… we cannot sacrifice another job to competitors overseas... There is no reason we should surrender our marketplace to countries that do not accept environmental standards." Kerry J. and L. Graham (2009)	"If the EU can tax the emissions over the entirety of a flight merely because it touches down in Europe, what is to keep the EU from imposing GHG import taxes on U.S. autos, pharmaceuticals, chemicals and other goods? And on what basis will the United States stand up against other countries that seek to do the same?" N. Young, Airlines for America (2012)

Conclusions

- Border carbon adjustments reduce leakage but cause a large amount of collateral damage
- Direct approaches to reduce emissions (e.g., a price on carbon) are more efficient ways to reduce emissions than border carbon adjustments
- Border carbon adjustments may be used to leverage a global climate policy
  - Requires global policies to address externalities and international organizations to oversee regulations
- Benevolent trade will assist the achievement of global climate goals
- Trade policies influenced by interest groups may frustrate the achievement of global climate goals