

CO₂ emission transfers associated with trade

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Production vs Consumption accounting

- **Production/ territorial emissions – basis of national carbon accounting, diplomacy and policies**
 - Assumed this best reflects principles of state sovereignty over regulating emissions
- **Wedge driven between territorial and ‘carbon footprints’ or ‘consumption-based emissions’**
 - Globalisation and surge of international trade and extended supply chains
 - Share of CO₂ emissions associated with traded goods grown to 25% in 2011.

The challenge is persuasive

- **CO₂ emission transfers largely ignored by governments to date**
 - Particularly the issue of potentially shared responsibility
 - 'outsourcing' manufacturing could be claimed as emission reductions and presented as improving efficiency - questions legitimacy of claimed national emission reductions
- **Climate policy design has to navigate enduring difference in ambition and instruments between countries and the fear of carbon leakage – companies moving production abroad to escape regulation**
 - Most relevant emission- intensive sectors are largely exempt from significant policy costs e.g. though free allocation in emissions trading
 - Incompatible with deep decarbonization
 - Achieving net zero carbon imply potential costs exceeding €100/tCO₂



How to attribute responsibility over emissions associated with trade and how to measure it

$$CBE = PBE - CFE + CFI$$

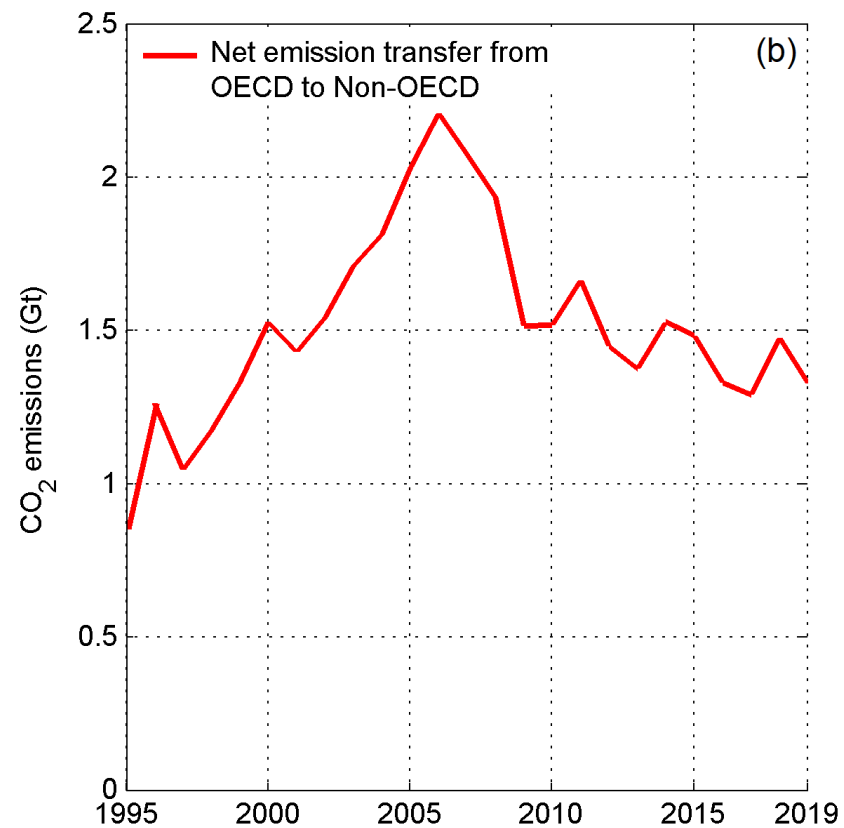
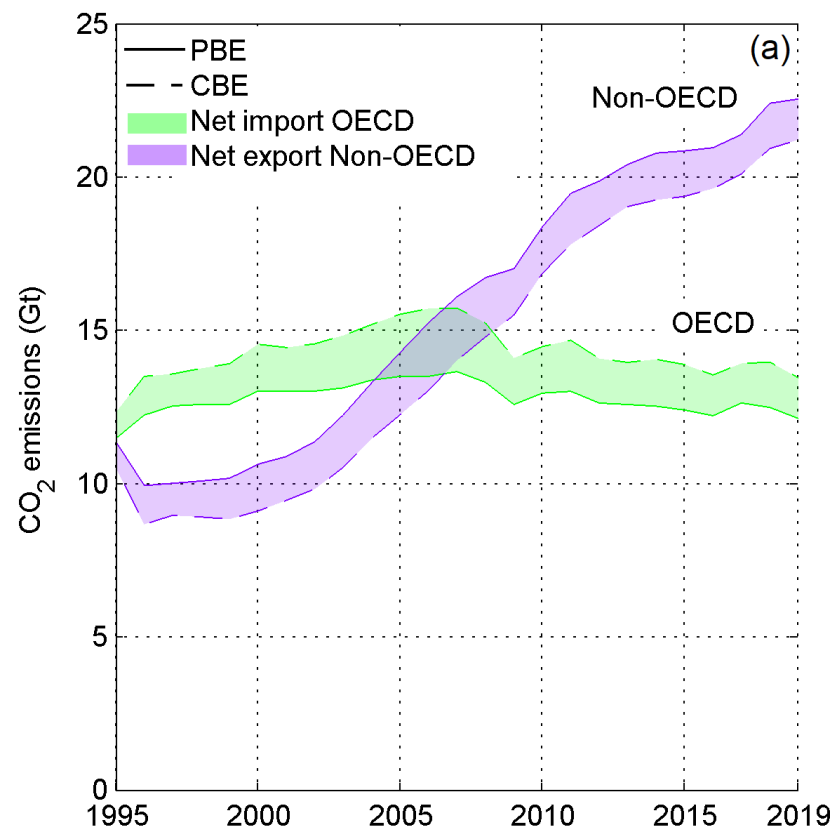
$$Net\ Transfers = CBE - PBE = CFI - CFE$$

- CBE = consumption based emissions
- PBE = production based emissions
- CFE = carbon footprint of exported products
- CFI = carbon footprint of imported products

Carbon footprint measurement and uncertainty

	Approaches	Uncertainty	
 <p>Top down</p>	Country	Global environmentally extended MRIO, Leontief demand model	10% (Rodrigues et al 2018, Dietzenbacher et al 2020)
	Sector	Disaggregated MRIO e.g. EXIOBASE 3.3	?
 <p>Bottom up</p>	Firm/supply chain	<ul style="list-style-type: none"> - decomposition of the traditional Leontief model - multiplying the final demand matrix with an emission multiplier matrix and an index of sectoral presence of MNEs in each country 	?
	Product	<ul style="list-style-type: none"> - life-cycle assessment approaches - Material content 	?

Historical increase in emission transfers from developing to developed countries reversed in the last 15 years



Trends in production-based (solid line) and consumption-based (broken line) CO₂ emissions and (b) net transfers between OECD and non-OECD countries, 1995-2019. Update of figure in Wood et al. (2020), in Grubb et al (forthc ARER)

Factors behind the decline in net south-north transfers

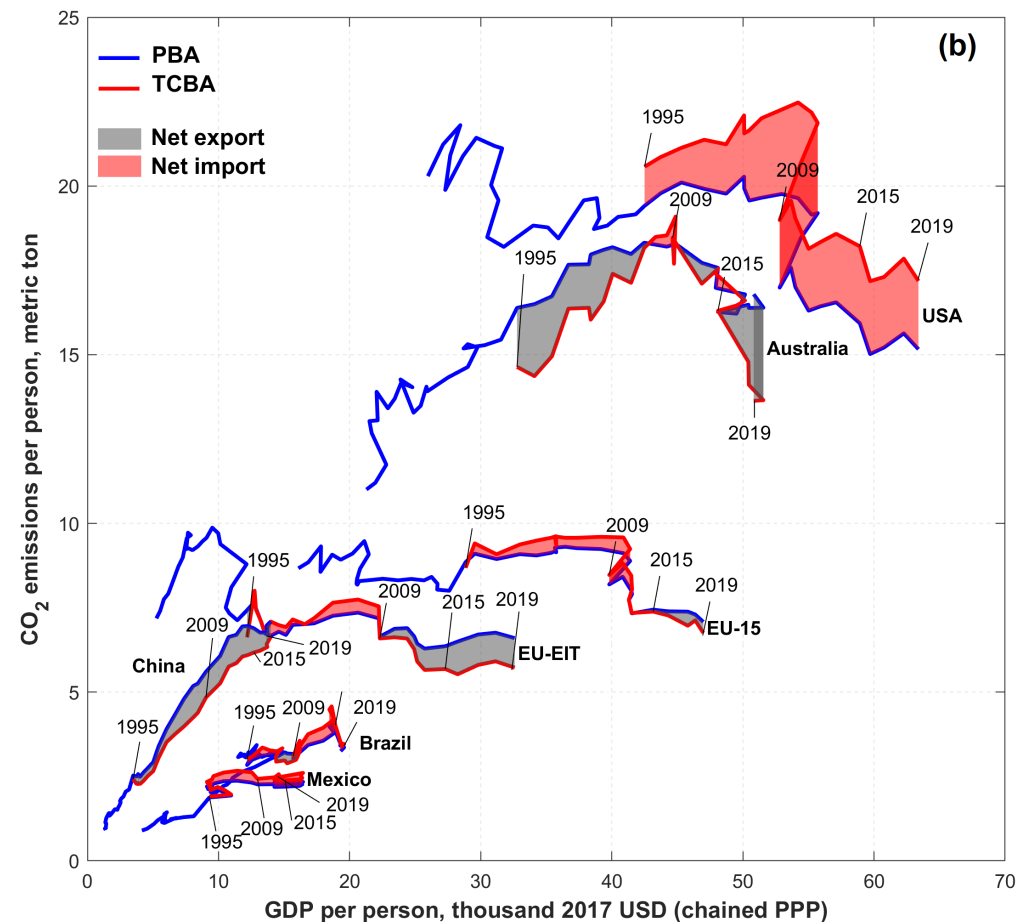
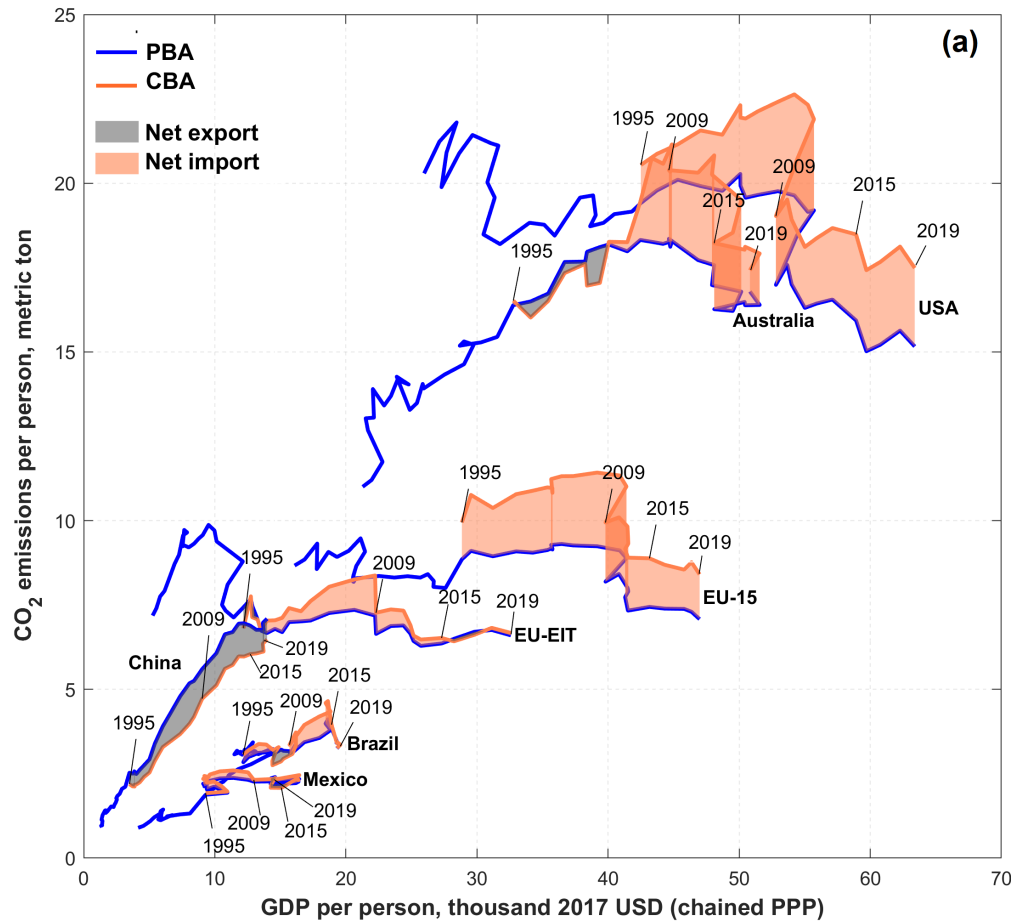
Structural:

- Slowdown in growth of global trade after financial crisis
- **Reduction in emissions intensity of traded goods since 2005**
 - China: since 2007, emissions decoupling effect due to declining emissions intensity of production processes and shifts to production structure towards higher value added products.
- Growth of exports to developing countries

Short term:

- recession hit OECD imports particularly hard – indeed, the reduction in consumption
- emissions exceeded that in production emissions in the US and Europe while Non-OECD consumption emissions growth was largely unaffected.
- Declining transfers also observed between developing countries

Evolution of PBE and CBE in terms of 'development pathways'

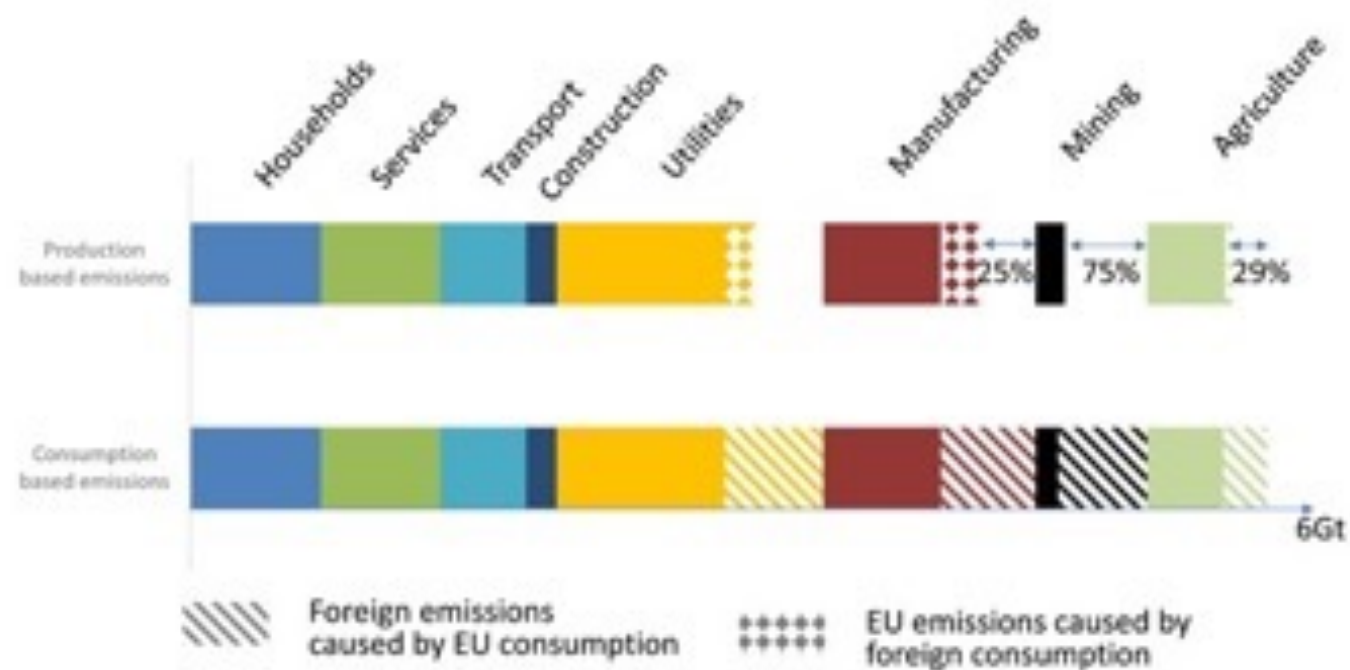


Production- and consumption-based CO₂ emissions per capita of selected countries as a function of GDP per capita (b) using technology-adjusted consumption-based accounting (TCBA) Source: Grubb et al (forthcoming, ARER)

3 main drivers for net emission transfers

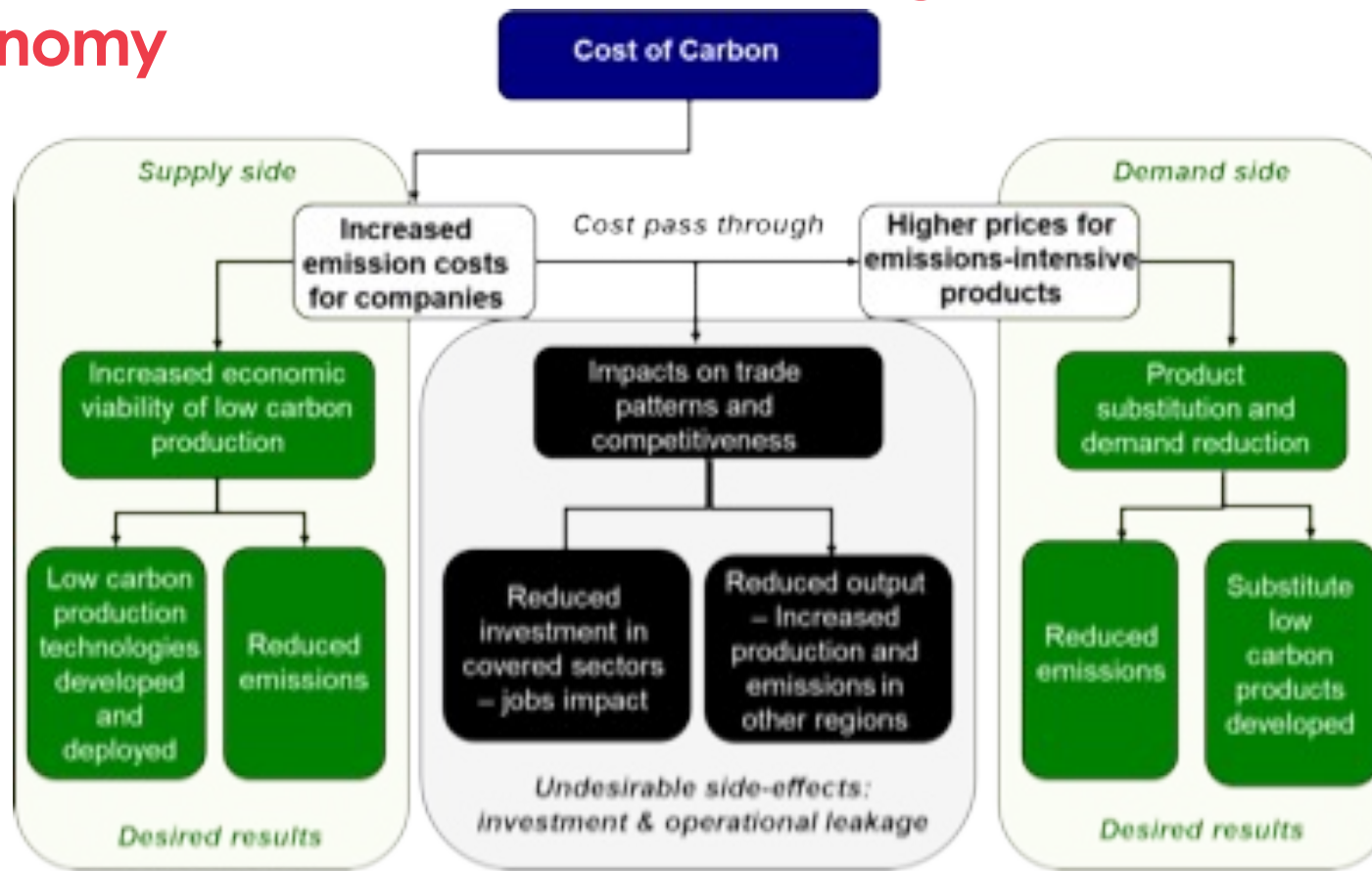
1. Trade balance
 - **US** trade deficit
2. Energy mix in a region compared to its trade partners
 - **EU** low carbon energy mix
 - **China** dirty energy mix
3. Position of the region in the global division of labour
 - **EU** specialising in services or light industries
 - **Russia** specialising in resource/ heavy industry

Utilities, manufacturing, mining and agriculture responsible for the bulk of emission transfers



Production vs Consumption emissions by sector for the EU: internal and external attribution, Source Wood et.al. 2020 in Grubb et al (forthcoming, ARER)

Leakage – undesirable side effect of mitigation policies in an open economy



Adapted from Grubb (2014, Planetary Economics)

Empirical evidence on leakage so far limited

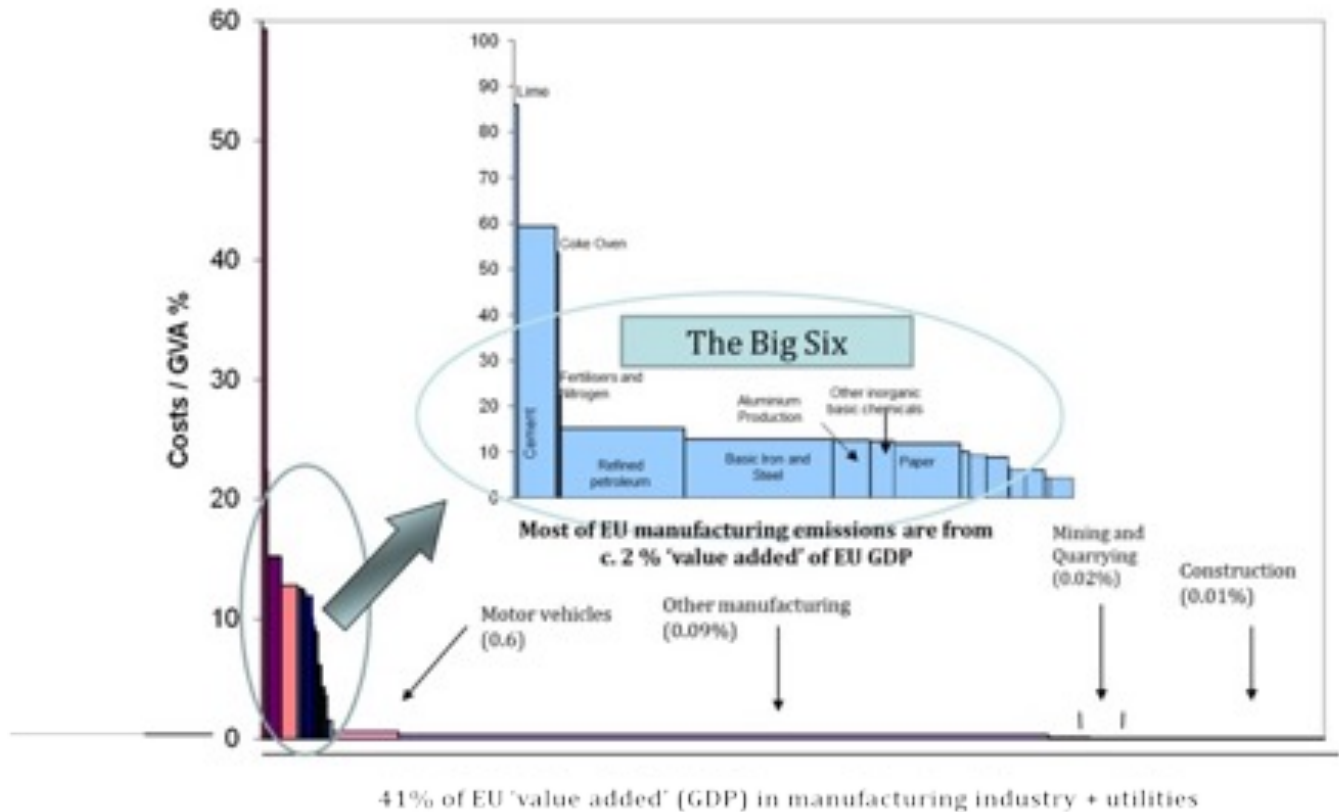
Basic materials sectors – mixed/ partial cost pass through ability

- **Limited empirical evidence of carbon leakage e.g. from the EU ETS**
 - presence of free allocation
 - historically low carbon prices
- **Investment leakage**
 - Relocation limited due to high fixed plant costs and immobile physical capital
 - higher domestic costs tend to deter new investment, but harder to detect.

Electricity

- Low leakage risk except in jurisdictions – high cost pass thorough ability with significant cross border interconnection capacity and trade e.g. California

Carbon leakage risk primarily concern energy/emissions intensive, trade-exposed (hence EITE) basic materials sectors



Basic materials account for 2/3 of industrial emissions or 1/4 of global emissions (including indirect emissions).

Potential impact of carbon cost on EU industry sectors, and their share of economy, 2011, Grubb (2014)

Looking ahead

- A consumption-led perspective gaining strong traction but made limited progress in public policy
- Key barriers
 - Carbon footprint measurement and data issues → significant progress made
 - International equity issues → largely unsolved
- Addressing carbon transfer via imports will become increasingly important for reducing national carbon footprints, for high climate ambition countries.
- **Complex minefield of conflicting perspectives and domestic & international interests**
→ **Solution likely to be inherently evolutionary, testing options and ‘feeling the stones’**
→ **Both pricing and non-pricing approaches needed**

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