

Carbon Leakage, Consumption and Trade

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Grubb, M., Jordan, N. D., Hertwich, E., Neuhoff, K., Das, K., Bandyopadhyay, K. R., van Asselt, H., Sato, M., Wang, R., Pizer, B., and Oh, H. (2022). *Annual Review of Environment and Resources*, 47(1):753–795.

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Consumption based responsibility is currently largely ignored

- The climate problem and its solutions conceived in terms of **territorial emissions**
- **Territorial emissions** basis of national carbon accounting, diplomacy and policies
 - Assumed this best reflects principles of state sovereignty over regulating emissions
 - But claiming emission reductions from 'outsourcing' questions **legitimacy**
- Yet **globalisation** and surge of **international trade** and extended **supply chains**
 - Driven **wedge** between territorial and consumption-based emissions
 - Share of CO₂ emissions associated with traded goods grown to 25% in 2011.

Production-based perspective increasingly problematic in a globalized world

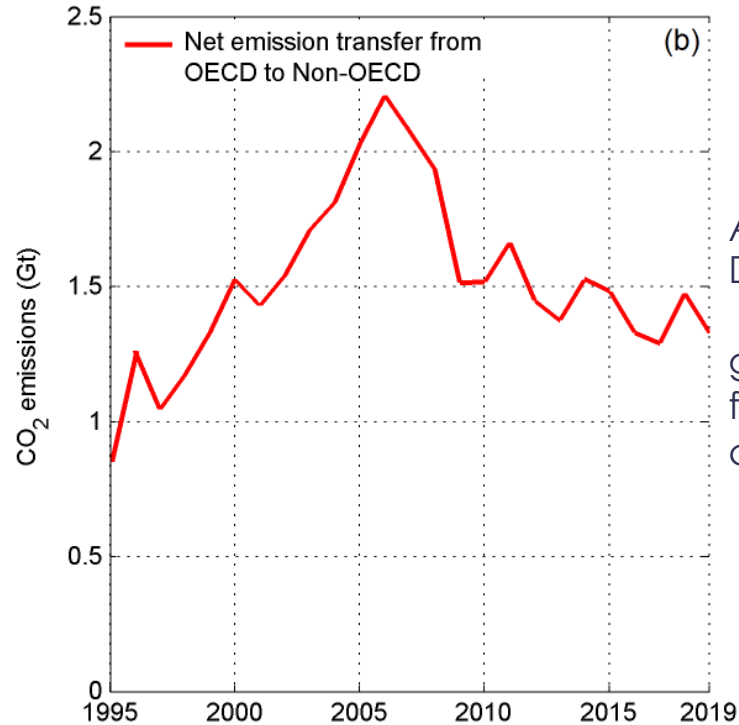
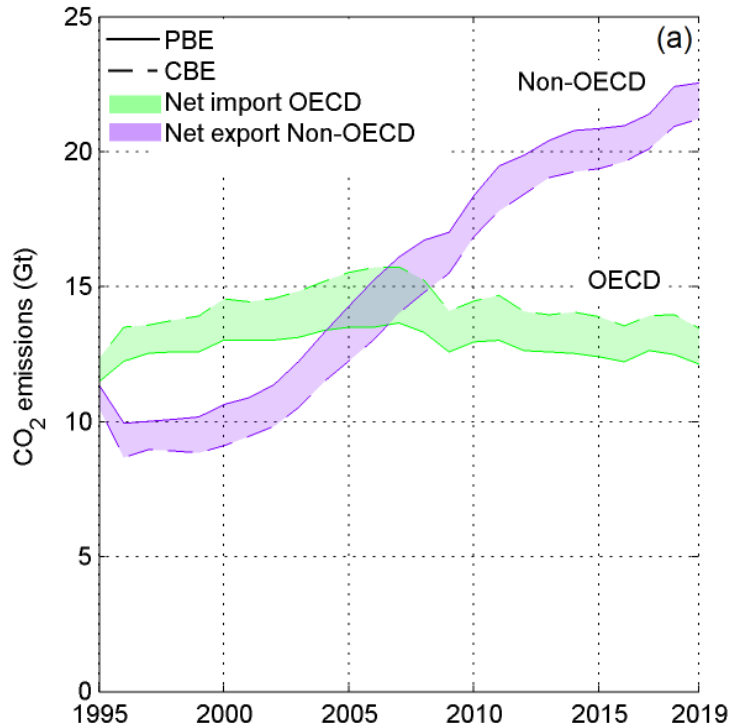
- Fear of **carbon leakage** potentially undermining effectiveness and legitimacy of claimed national emissions reductions
 - Most relevant emission- intensive sectors are largely shielded from significant carbon costs e.g. through free allocation in ETS
 - Incompatible with deep decarbonization and carbon neutrality
 - industrial production accounts for around 40% of global emissions).
- Companies and consumers increasingly concerned about the emissions throughout **supply chains**, implicated in **final product**.
 - Corporate net zero claims hollow if limited to direct emissions

Towards shared responsibility for emissions in traded goods

This paper:

- **Empirical foundations**
 - scale of emissions transferred through international trade
 - divergence between production and consumption emission accounts
 - **Growth of private sector initiatives**
 - **Main public policy options to address leakage**
 - Pricing approaches: 1) free allocation; 2) CBAM; 3) Consumption charge; 4) Climate excise contribution
 - Regulatory approaches: embodied carbon standards; GPP; subsidies
 - **Equity and distributional implications**
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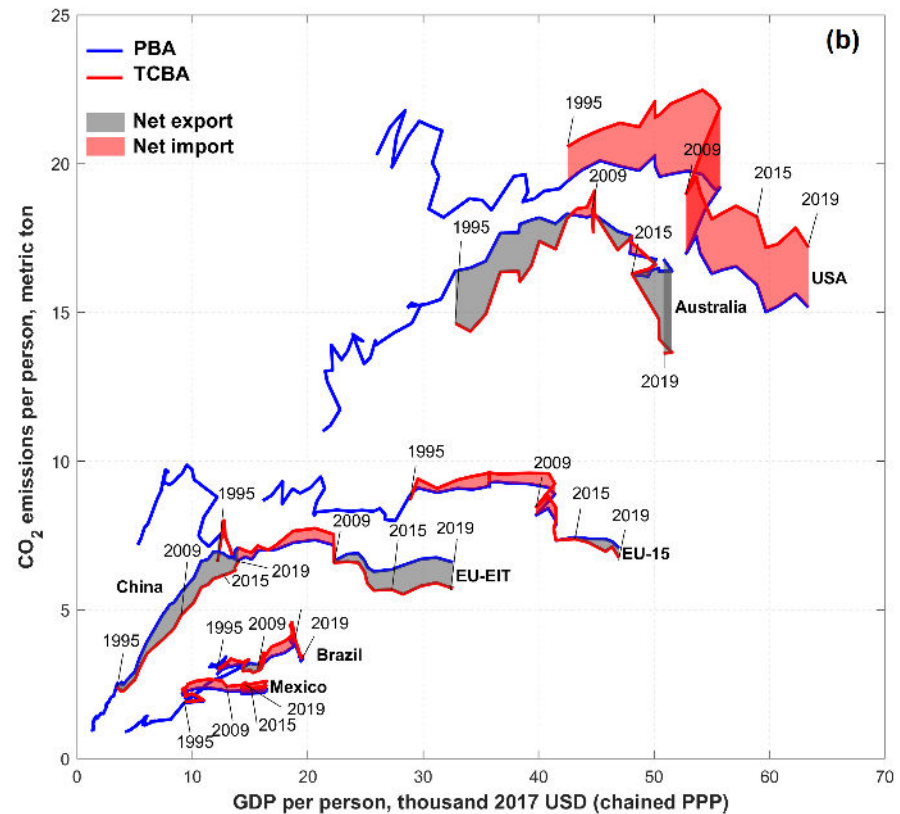
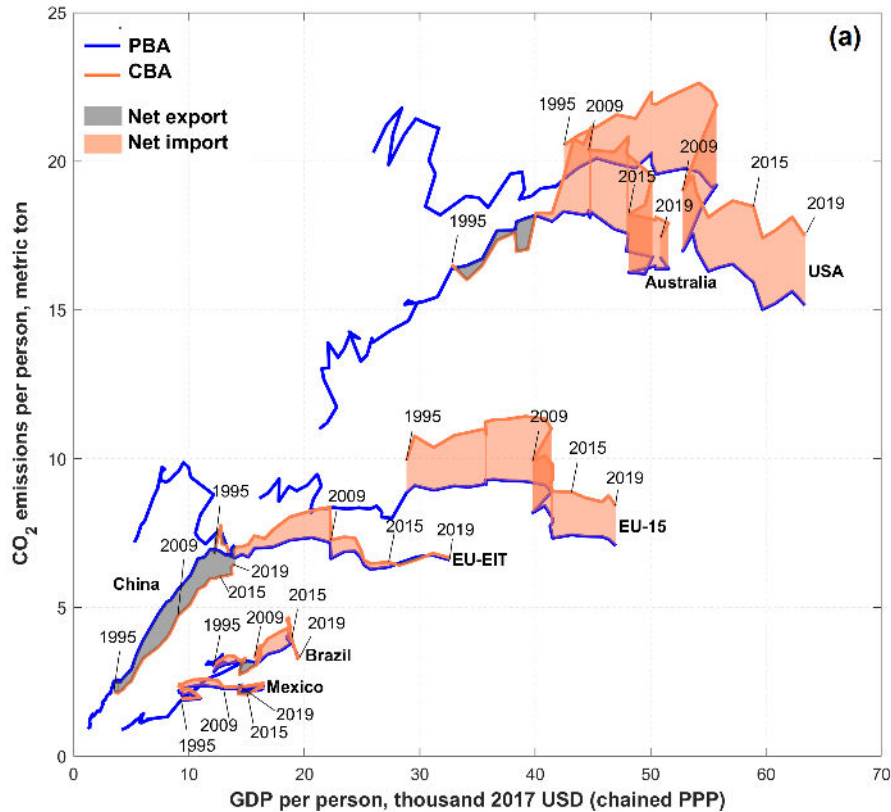
Historical increase in emission transfers from developing to developed countries reversed in the last 15 years



After peak in 2006:
Declining emissions
intensity of traded
goods, especially
from developing
countries

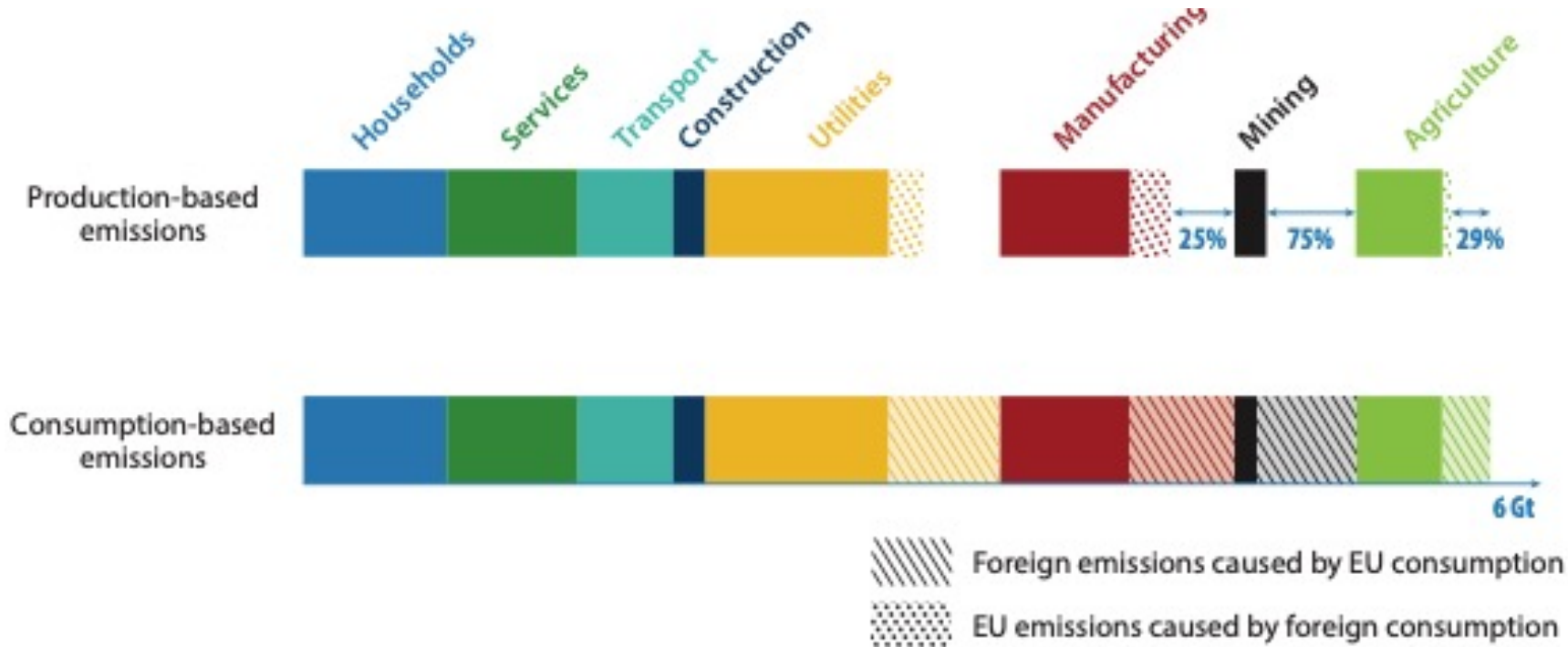
Trends in production-based (solid line) and consumption-based (broken line) CO₂ emissions and (b) net transfers between OECD and non-OECD countries, 1995-2019. Update of figure in Wood et al. (2020), in Grubb et al (2022 ARER)

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 (a) using consumption-based accounting (CBA) (b) using technology-adjusted consumption-based accounting (TCBA) Source: Grubb et al (forthcoming, ARER)

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 (2022, ARER)

Carbon leakage – Achilles heel of production-based emissions control

- Subset of trade embodied emissions specifically driven by international **differences in climate policies**
- **Leakage risk** limited to a **few key material sectors**
- **Limited empirical evidence** for basic materials sectors with mixed/ partial cost pass through ability (e.g. Verde 2020, Caron 2022)
 - presence of free allocation
 - historically low carbon prices
- **Yet politically, cannot be ignored**
 - Sectors will always fight government efforts to extract revenue
 - Politicians can't ignore threat by firms to cut jobs, relocate or demand policy compensation

Growing attention to **Consumption-based instruments** to circumvent problems from differences in production-based climate policies & stimulate demand shifts toward cleaner intermediate/ final consumption

- >30 consumption based instruments identified (Grubb 2020, IPCC WG3 AR6 2022)
- Recognising importance of **full carbon cost internalisation** throughout the value chain.



Key obstacles

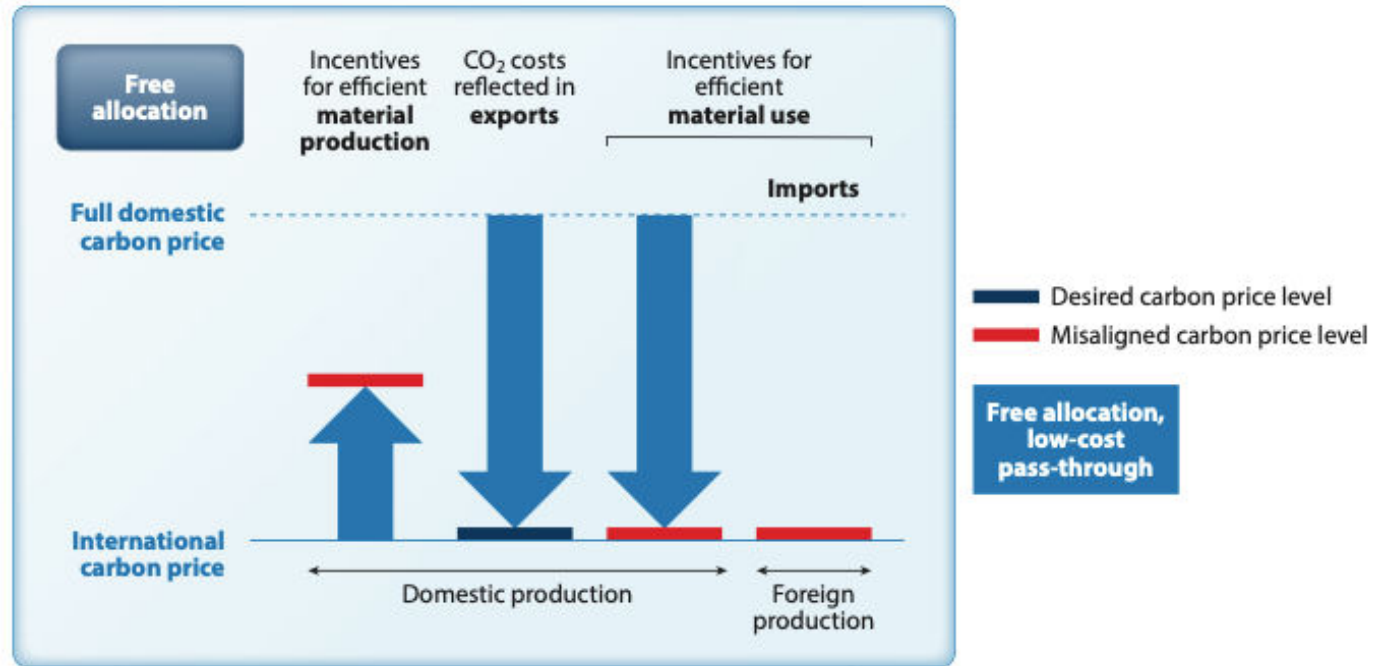
- **Information** on carbon emissions
- **Governance**
- **Ethical** considerations

Private sector initiatives – widespread, moving fast

- **Product foot prints (PCFs) / Environmental Product Declarations (EPDs)**
 - Efforts to improve methodology and comparability, make higher quality environmental labels e.g. sustainable building certification
 - Internationally agreed standards for PCFs [International Organization for Standardization (ISO) 14067:2018] and EPDs (ISO 14025:2005)
 - But lack of coordination in specifying **Product Category Rules** (PCRs) specify key parameters for the LCAs underlying PCFs or EPDs
- **Corporate foot-printing**
 - GHG Protocol, an industry standard.
 - Scope 1 and 2. Supply chain emission disclosure voluntary and unverified
 - Relates to climate-related financial risk disclosure

Carbon pricing approaches to tackling leakage 1

Exemptions and free allocation



3 alternative approaches – incidence in the supply chain

Border carbon adjustment (CBAM)

Primary production
(e.g., steel, cement)



Upstream carbon pricing

with



Carbon tax at the border

or



Emission certificates at the border

Intermediate consumption
(e.g., car manufacturing, building construction)

Final consumption
(e.g., purchase and use of cars, buildings)



Consumption charge (or personal allowances)

Accumulation of emissions incurred



Monitoring throughout supply chain



Climate excise contribution



Upstream carbon pricing



Free allocation

and



Excise duty for domestic products and imports

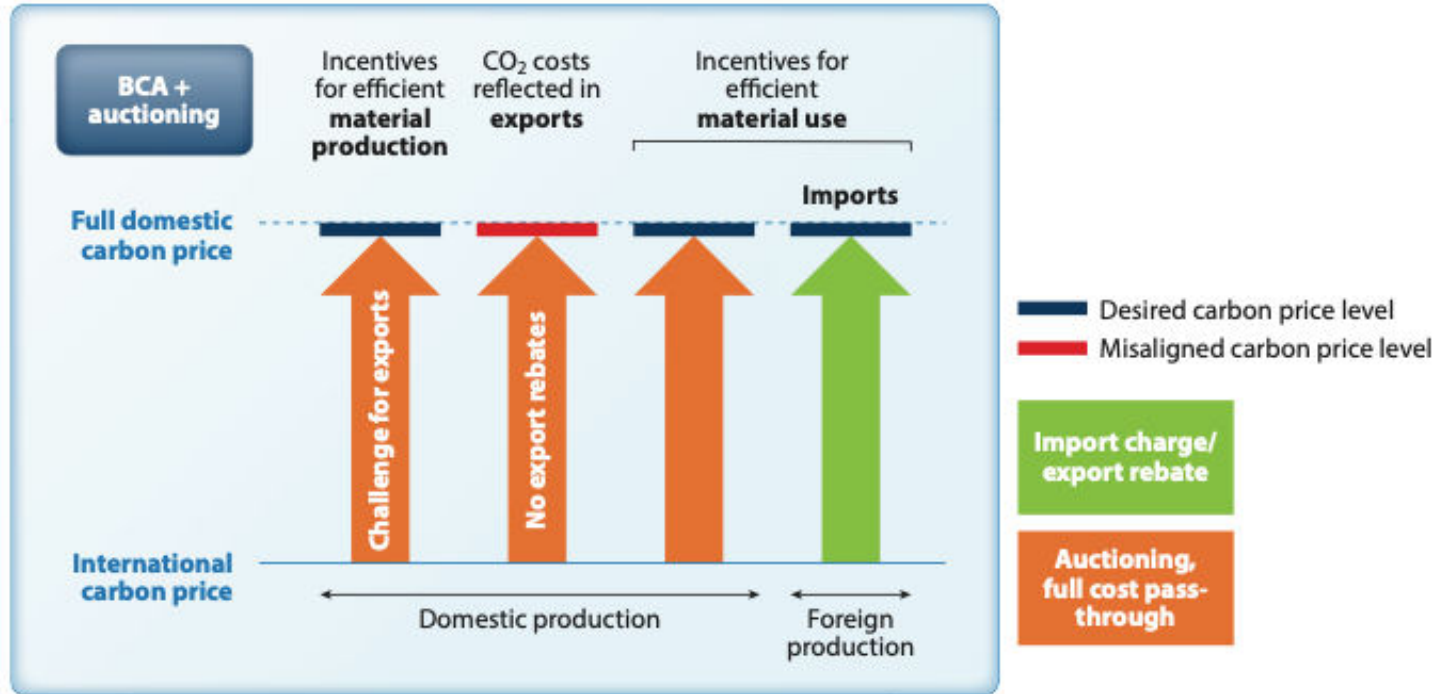


Waived on exports



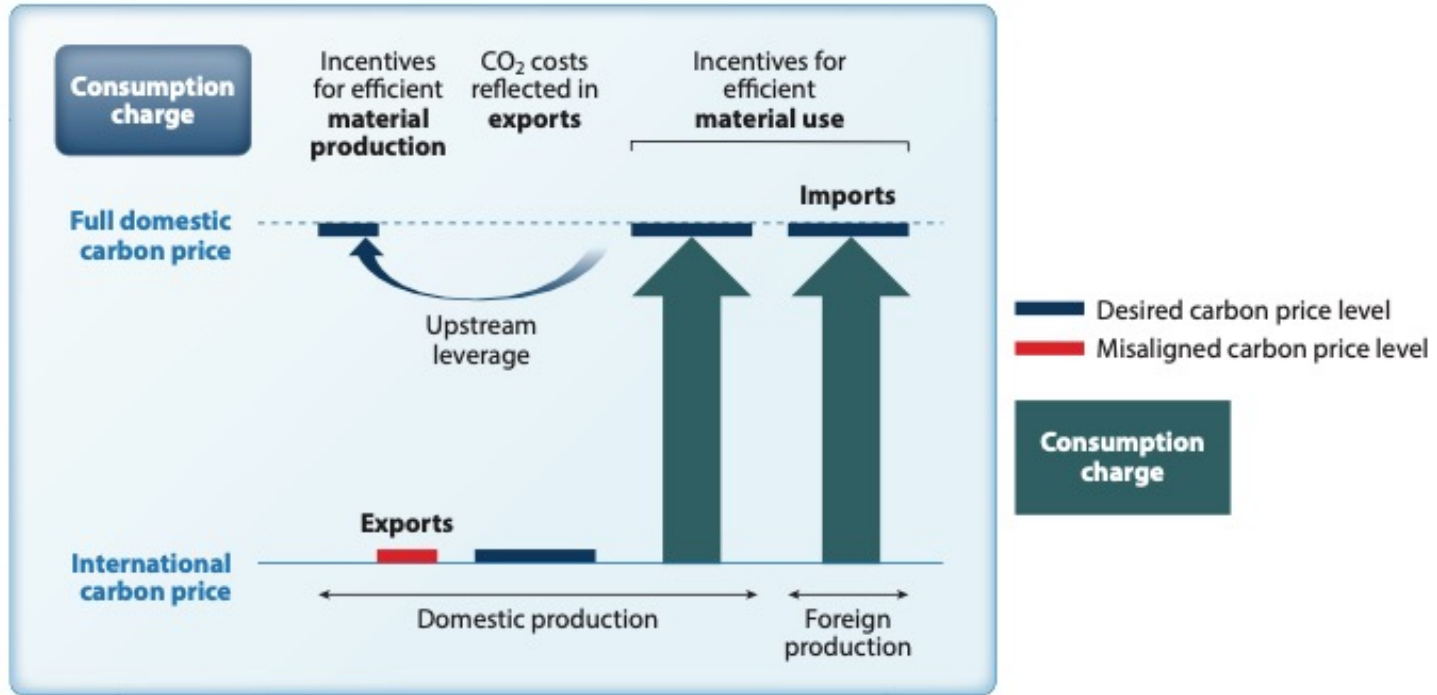
Carbon pricing approaches to tackling leakage 2

BCA + Full auctioning



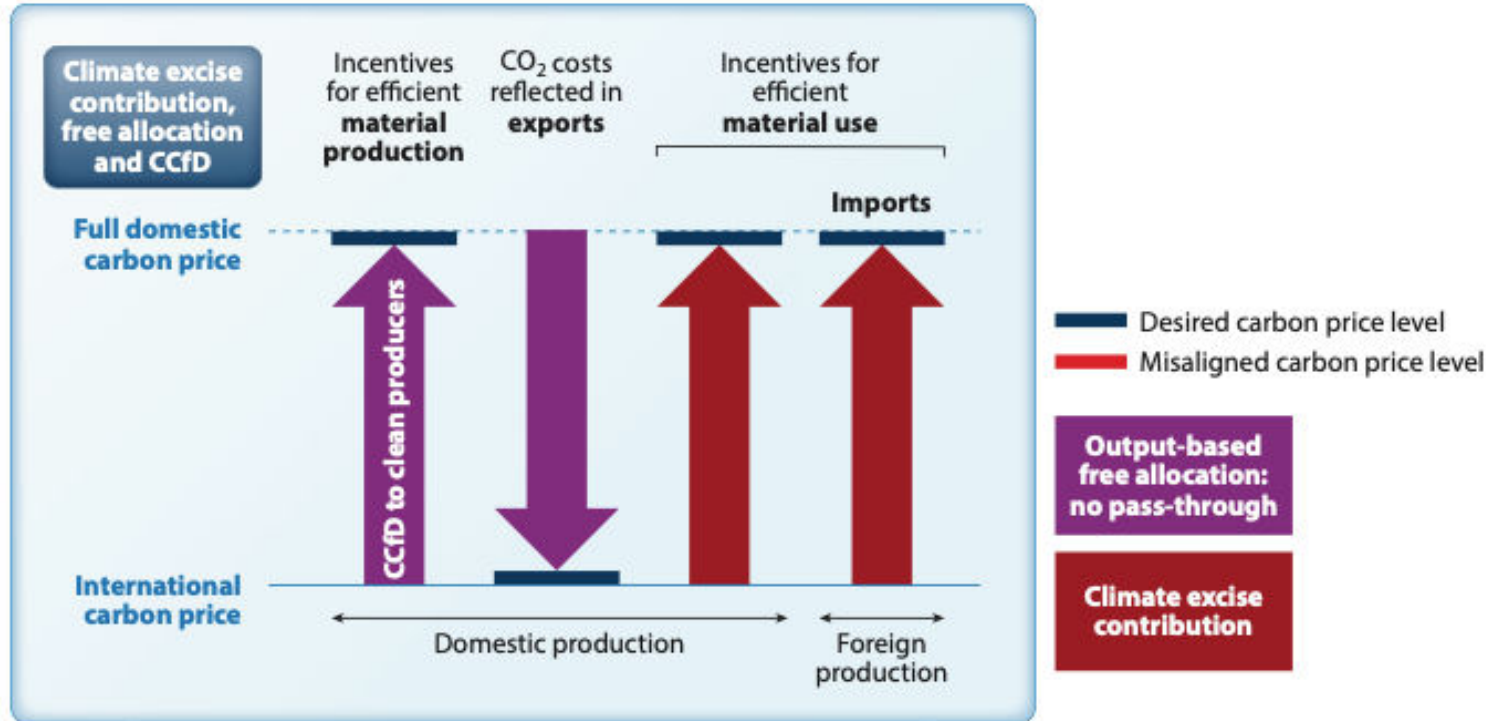
Carbon pricing approaches to tackling leakage 3

Consumption charge



Carbon pricing approaches to tackling leakage 4

Climate excise contribution, free allocation and CCfD



Key characteristics of 3 pricing approaches addressing carbon consumption and leakage concerns

	Border carbon adjustment	Carbon consumption charge	Climate excise contribution
Point of application	Direct emissions and point of import	Final consumption	Production and import
Relation to upstream carbon pricing	Complement (to a carbon tax, or ETS with auctioning)	Alternative	Complement (e.g., to carbon tax or ETS with free allocation)
Requires phasing out of free allocation	Yes	Yes	No
Carbon leakage risks	Remains if coverage of value chain limited, and export leakage not covered	No	No
Incentives for exporters to mitigate carbon emissions	Yes, if export rebate not possible	No	Yes, if complementary to an upstream cleaner production incentive (e.g., ETS with free allocation)
Resource shuffling concerns	Yes, as use of default values would be limited	Yes, as long as not entirely reliant on default values (which would not seem desirable)	Not as long as limited to the use of default values

Complementary regulatory approaches

- **Embodied carbon standards**

- E.g. minimum carbon intensity standards in basic materials or intermediate products ; maximum life cycle emissions for buildings/cars
- Objectives: improve material efficiency, recyclability, life cycle emissions, eliminate most inefficient products
- Help prepare industry to have data for BCA/ alternative to BCA

- **Green public procurement**

- E.g. Buy Clean Californian Act
- Create early lead markets

- **Subsidies**

- E.g. CCfD to guarantee value for industrial carbon savings

Equity concerns

BCA

- Historical emissions responsibility/ intergenerational equity
- Reduce trade-related income to energy-intensive exporters e.g. Russia, China
- Who receives the revenue?
- Green protectionism

Consumption charge and Climate Excise Contribution

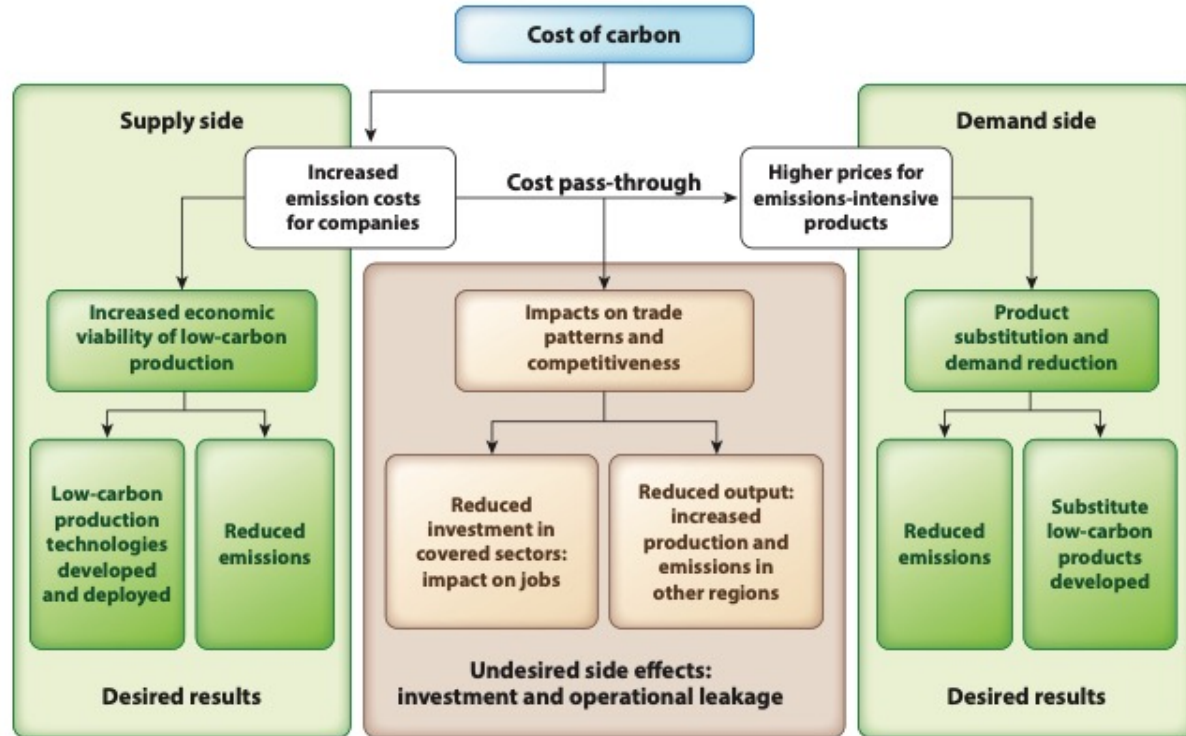
- Non-discriminatory between domestically produced vis-à-vis imported goods, as the same duty would apply on a particular material
- Distributional impact depends on how much it affects imports from third countries

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’
 - Complementary roles of **pricing and non-pricing** approaches, **private and public** measures, **mix** to combine technology push and demand pull
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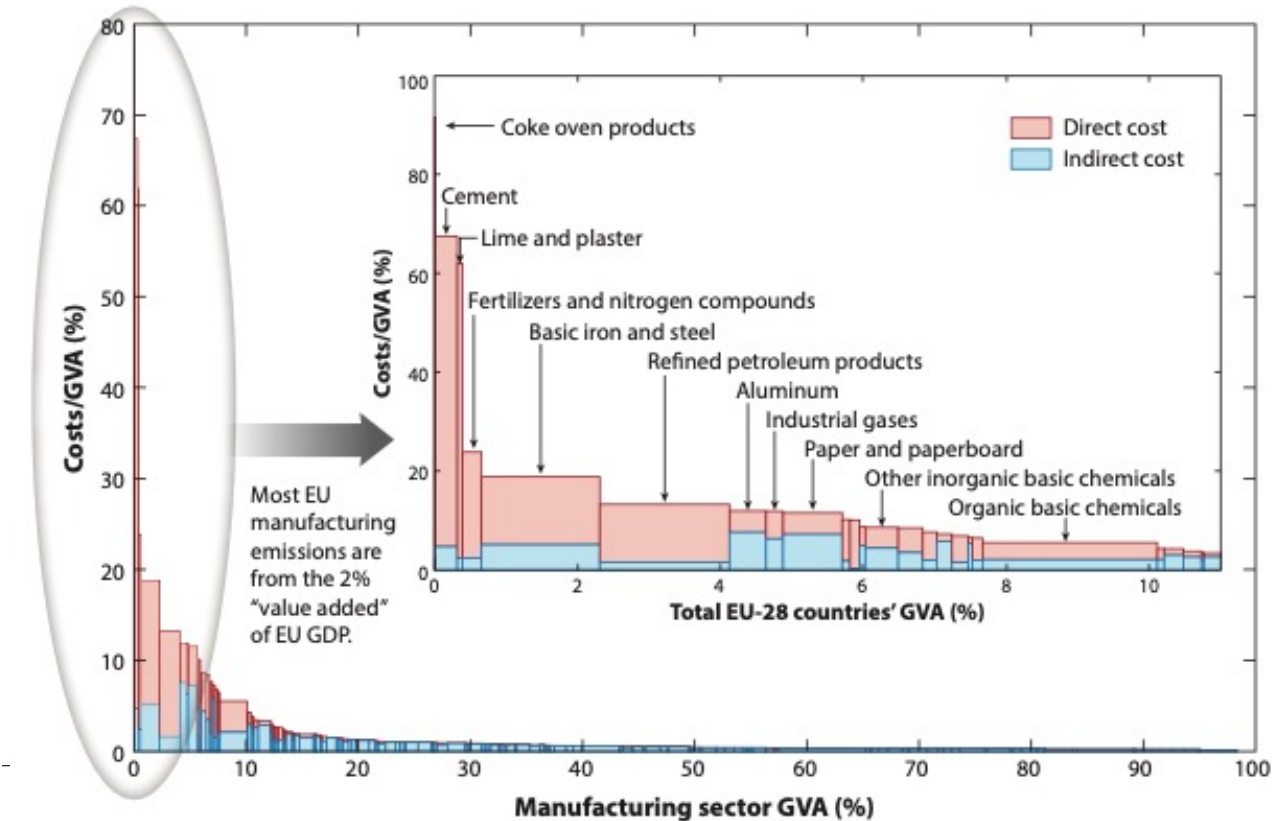
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Leakage – undesirable side effect of mitigation policies in an open economy



Adapted from Grubb (2014, Planetary Economics)

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).