

# Reducing the decarbonisation cost burden for EU industries

Panagiotis Fragkos, February 24, 2022, NAVIGATE,  
RFF-CMCC Webinar



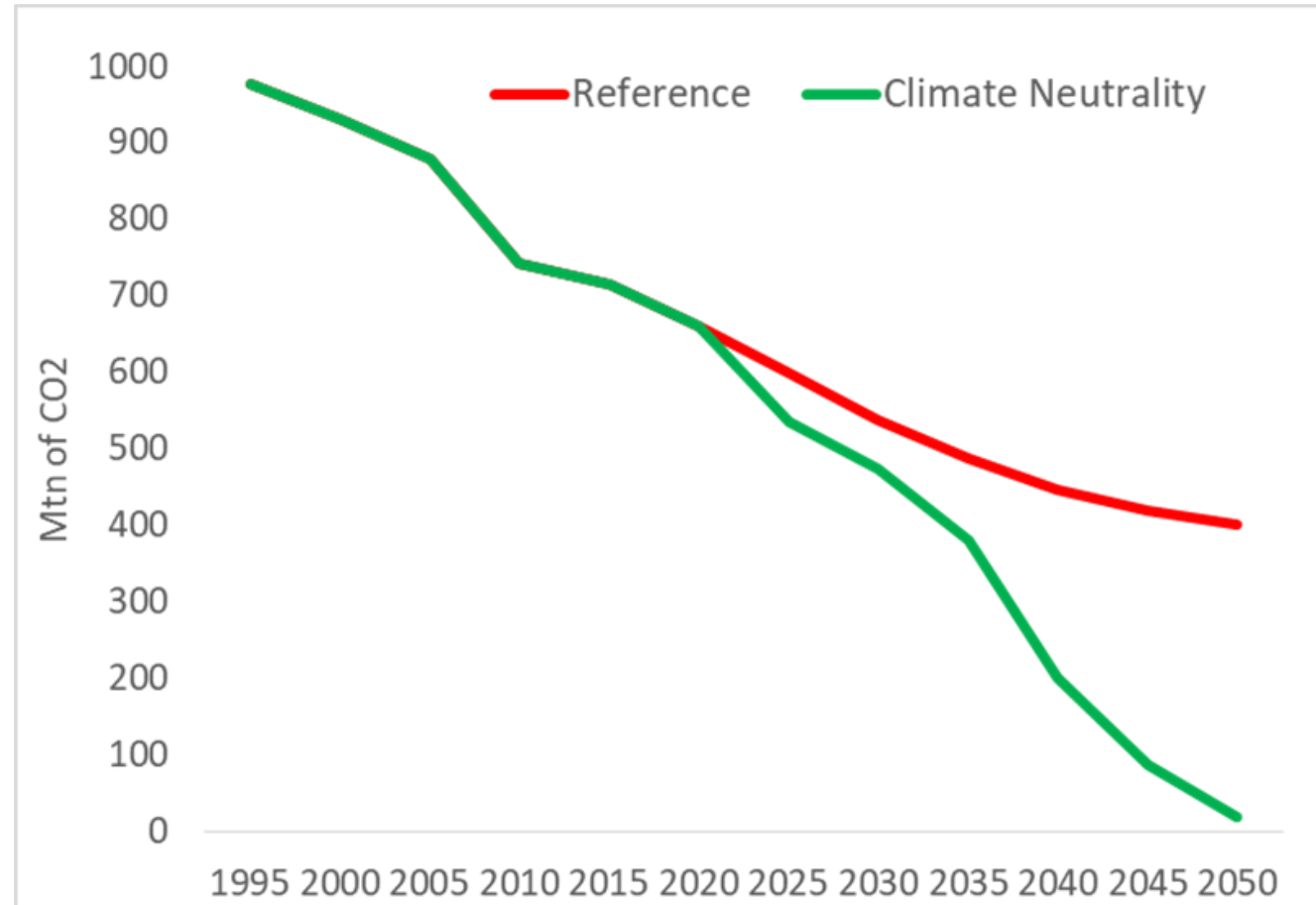
## Industry: A Hard to abate sector for the EU

EU industries have begun a steady decarbonisation progress from the 1990s

Main reasons: ETS pricing, energy efficiency, structural changes towards higher value-added products (declines in energy intensive sectors)

But current efforts need to accelerate to meet the EU Green Deal targets and bring EU Industries to carbon neutrality by 2050

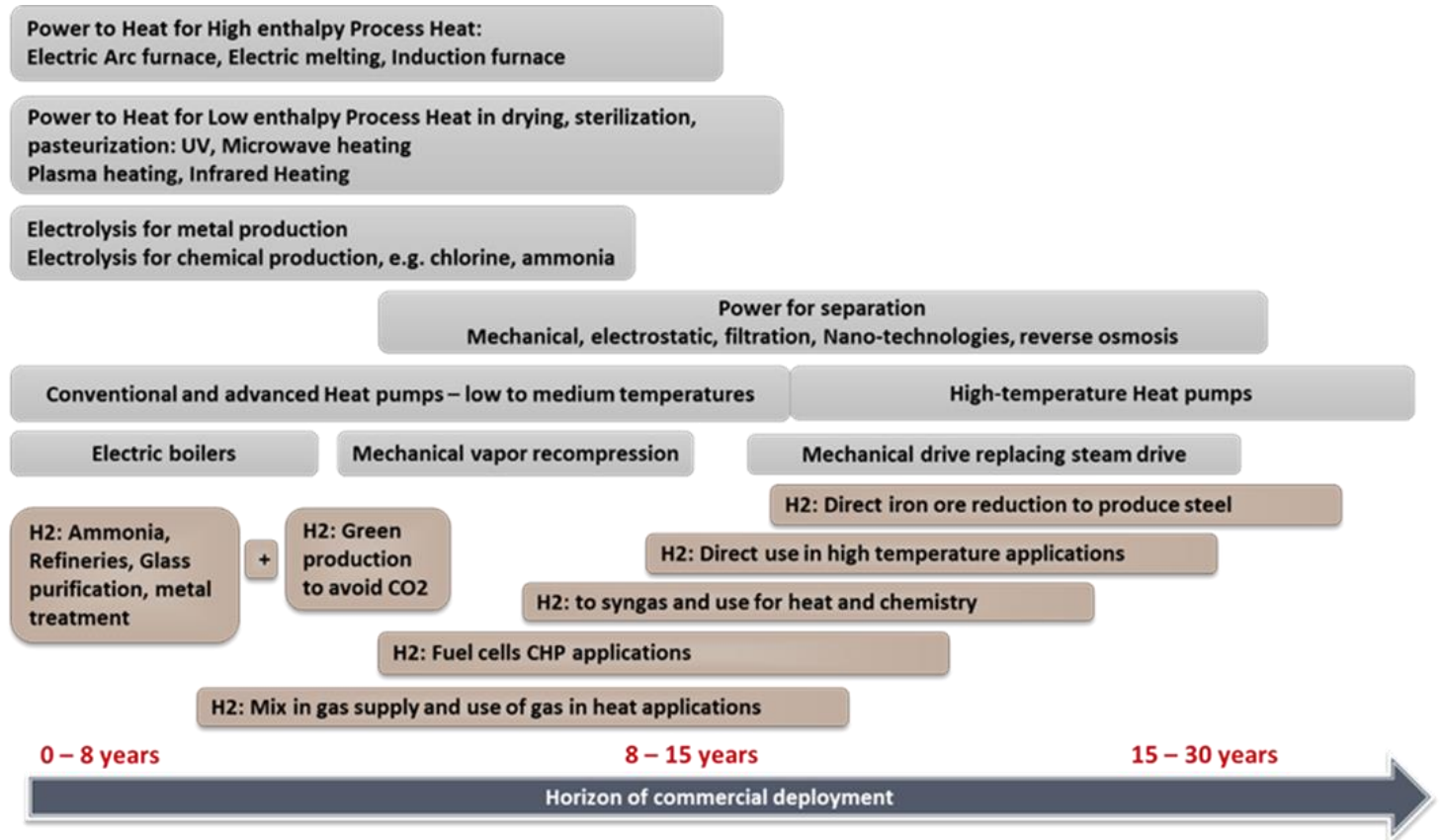
Large technological challenges and competitiveness issues are raised



# NAVIGATE The technology challenge

Low-carbon technology development and diffusion is critical to decarbonize the European industries, esp. deep electrification and hydrogen applications

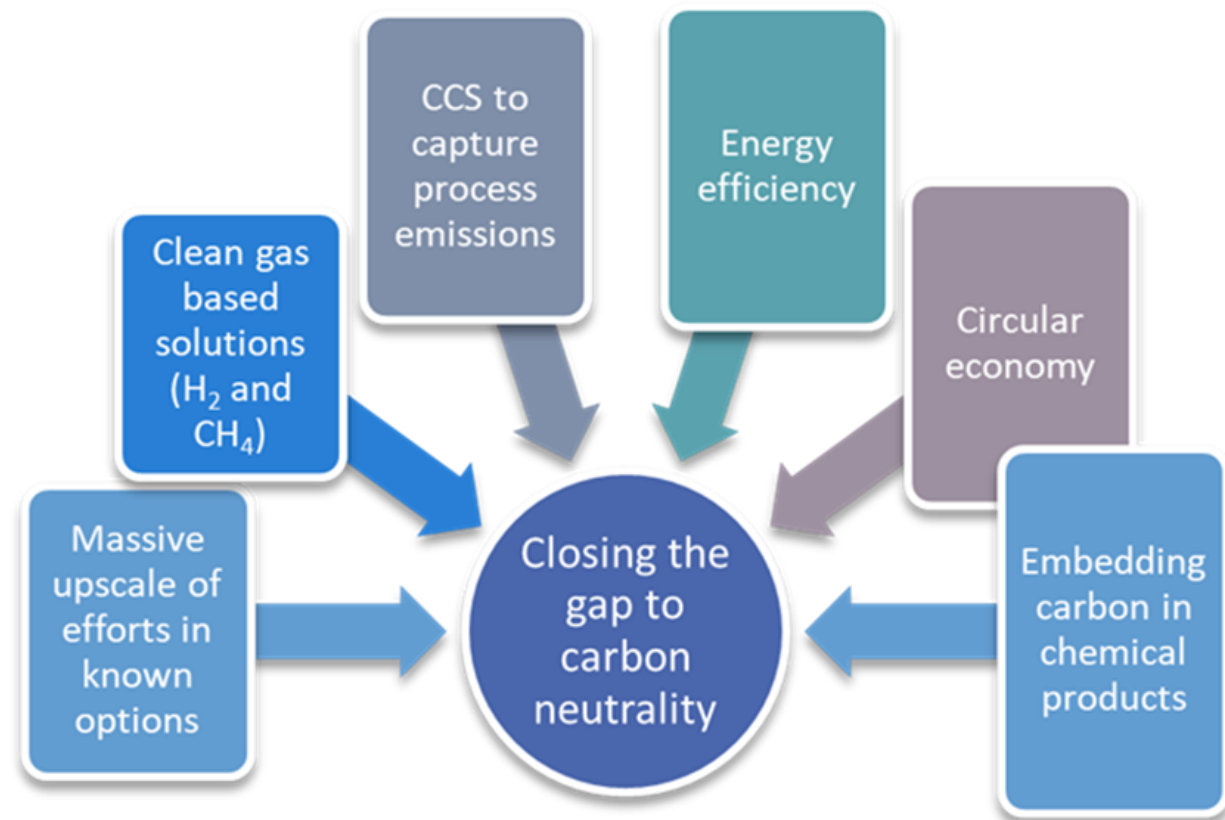
Ambitious policies in this decade are required to ensure market uptake and maturity of these options (due to long lead time for the technologies & infrastructure)



# NAVIGATE Decarbonisation routes and pathways

A rapid decarbonisation of EU industries is necessary to ensure a cost-efficient transition to zero-carbon thanks to the diffusion and deployment of carbon-neutral technologies

The gap to carbon neutrality can be closed by a combination of current and novel options, ranging from electrification and energy efficiency to Hydrogen, clean gas, CCUS and circular economy



# NAVIGATE The competitiveness problem

EU: Climate neutrality by 2050, to be enshrined in a 'European Climate Law', combined with ambitious policies for 2030 (Fit for 55 package), including transformation of industries

But globally, there is a continued asymmetry of climate efforts

In this context, the **competitiveness of Energy Intensive and Trade Exposed (EITE) industries may be impacted, increasing the risk of relocation-** due to increasing ETS prices,

As a response, the European Green Deal (and the recent fit for 55 package) suggested the Carbon Border Adjustment Mechanism (CBAM) to:

- Address carbon leakage and level the playing field between EU and foreign producers
- Help to create an EU market for low-carbon products
- Press non-EU industries to adopt low-carbon technologies
- Support trade-exposed EU industries towards their transformation



# NAVIGATE Main options and challenges for CBAM

## *Main options available*

- A tax applied on imports at the EU border
- An extension of the EU ETS to imports
- Carbon tax (e.g. excise or VAT type) at consumption level
- The obligation to purchase allowances from a specific pool outside the ETS

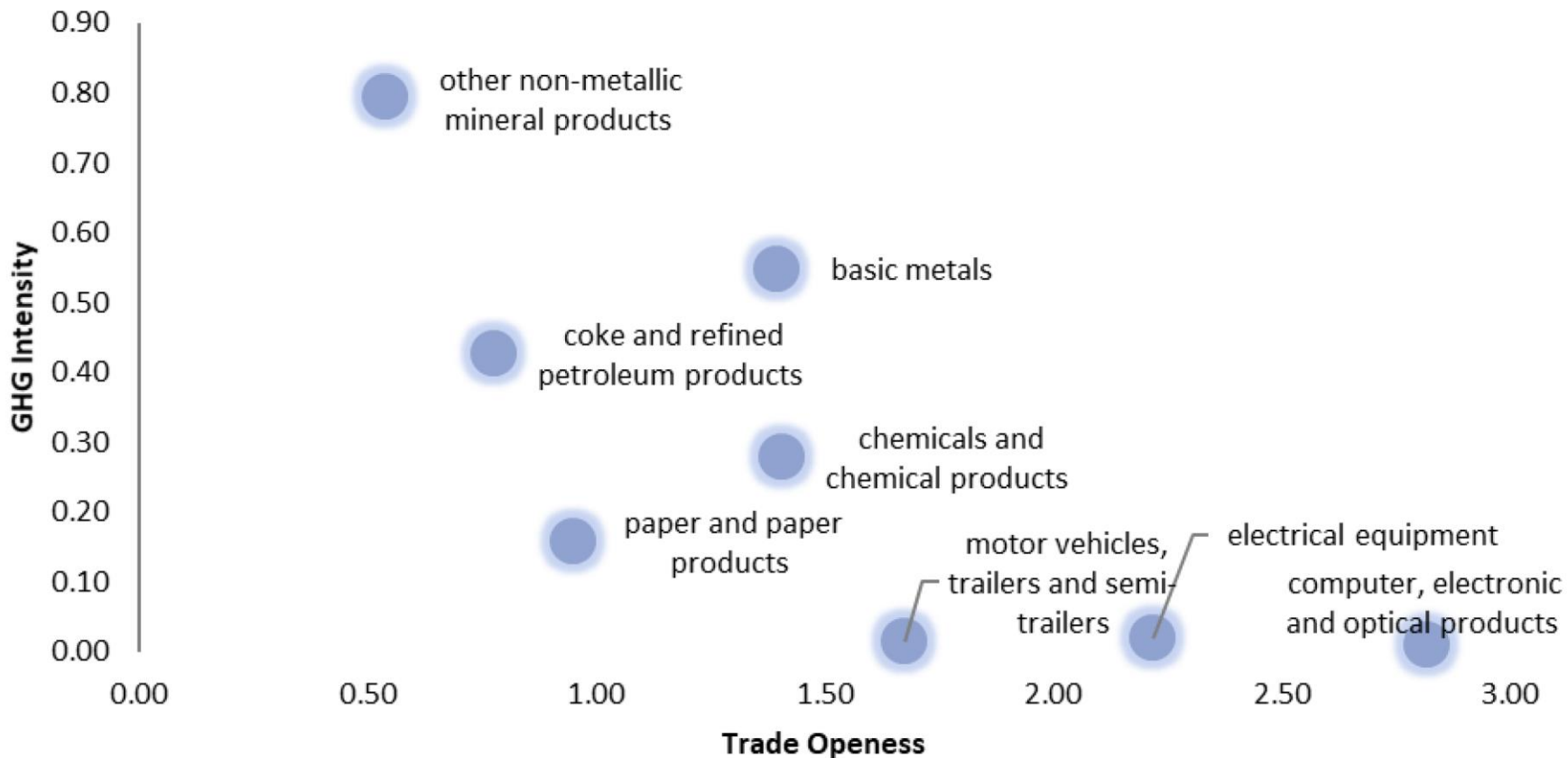
## *Key challenges*

- *Trade flow coverage*: Consider role of EU exports and their competitiveness in foreign markets
- *Replacing free allocation* will face large pushback in the EU, making a phased approach more likely
- *Sectoral scope*: Basic goods with relatively low trade-intensity – such as cement – may offer a good piloting opportunity; also possible: steel, aluminum, and electricity
- *Emission scope*: Determination of embedded emissions
- Avoiding **resource shuffling** and **potential retaliation** will be challenging
- *Revenue use*: International revenue transfers face political obstacles
- Crediting for foreign policies: complex but likely necessary
- Ensure compliance with WTO rules



# NAVIGATE Vulnerability of EU industrial sectors

Carbon leakage exposure as a function of trade openness and GHG intensity.  
Basic metals, non-metallic minerals, chemicals face the highest leakage exposure

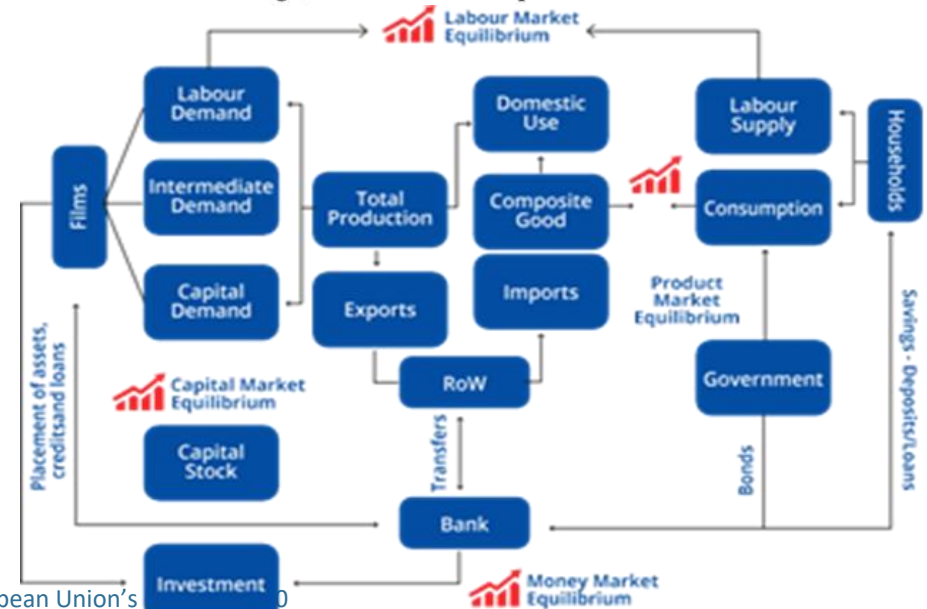
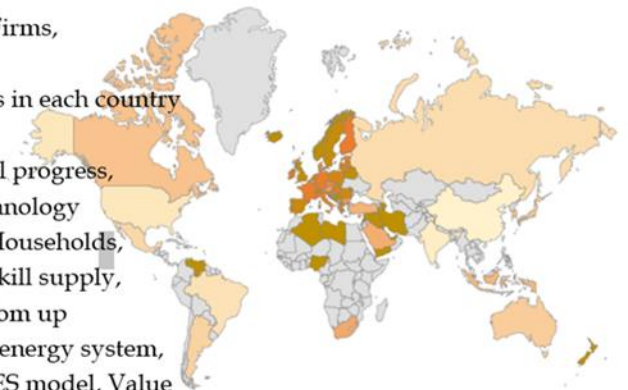


# The GEM-E3-FIT model

- Market equilibrium is reached in all markets (including markets for capital, labour, products, money)
- Representation of multiple industrial sectors, and endogenous bilateral trade flows (Armington)
- Technology progress is modelled depending on public and private R&D and learning-by-doing
- Multiple households are included to analyse the distributional implications of policies
- Representation of a detailed financial sector and labour markets differentiated by skills
- Detailed representation of electricity system and energy use in transport and buildings sectors

## Model ID

Name: GEM-E3  
 Type: Macroeconomic, Structuralist, CGE  
 Countries: 46 countries/regions covering the whole world  
 Sectors: Households, Banks, Firms, Government, RoW  
 Firms: 67 economic branches in each country  
 Time: 2015-2100  
 Distinctive: Endogenous technical progress,  
 Features: Financial Sector, Technology diffusion, Multiple Households, Endogenous labour skill supply, Unemployment, Bottom up representation of the energy system, Soft Link with PRIMES model, Value Chains  
 Domain of Applications: Economic and employment assessment of climate and energy policies, Energy taxation, Carbon leakage, Evaluation of R&I portfolios







# NAVIGATE Scenario Assumptions

	Scenario Description	EU Climate Target	Non-EU Climate Targets
REF	Reference scenario	Meets the EU NDC	All countries meet NDCs in 2030, no increase in policy ambition after 2030
2DEG	Decarbonisation to 2 °C with all options available	All countries adopt ambitious climate policies/universal carbon pricing to meet the 2 °C temperature target	
EUGD_Alone	EU meets the EU Green Deal Targets by 2030 and 2050	EU achieves 55/90% reduction in 2030/2050 from 1990	Non-EU countries meet their NDCs in 2030, policy ambition does not increase beyond 2030
EUGD_BCA	Green Deal Targets are met, BCA is implemented on EU imports	EU achieves 55/90% reduction in 2030/2050 from 1990	Non-EU countries meet their NDCs in 2030, policy ambition does not increase beyond 2030
EUGD_BCA_REC	As EUGD_BCA but BCA revenues are used to reduce social security contributions	EU achieves 55/90% reduction in 2030/2050 from 1990	Non-EU countries meet their NDCs in 2030, policy ambition does not increase beyond 2030

BCA is aligned with the EU ETS pricing and applies to products of energy-intensive industries Imported goods from non-EU are taxed according to their carbon content, which is calculated accounting for the direct GHG emissions.

Tariff rates are differentiated by country, based on their carbon content

Export rebates and retaliation measures from non-EU countries are not considered



# NAVIGATE What if the EU acts alone on climate?

Carbon Leakage occurs (25% by 2050), especially in EITE industries

- Negative GDP and employment outcomes (about 1% lower than REF)
- Major trade partners and countries close to EU benefit (e.g. Russia)
- CO2 increases in non-EU, esp. in EITE sectors and power generation

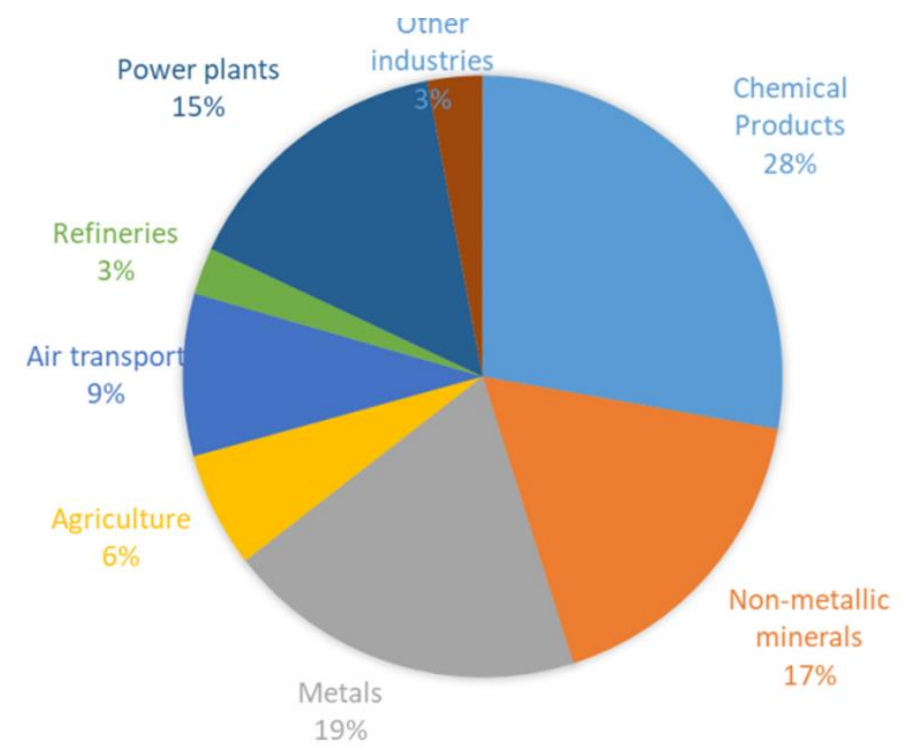
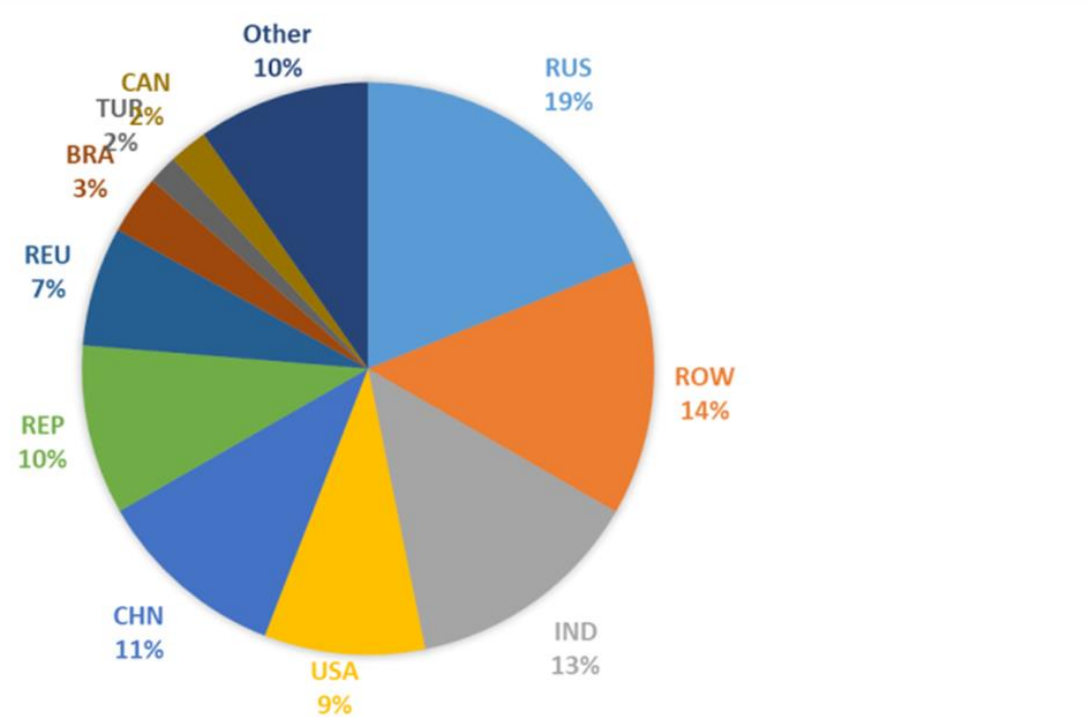


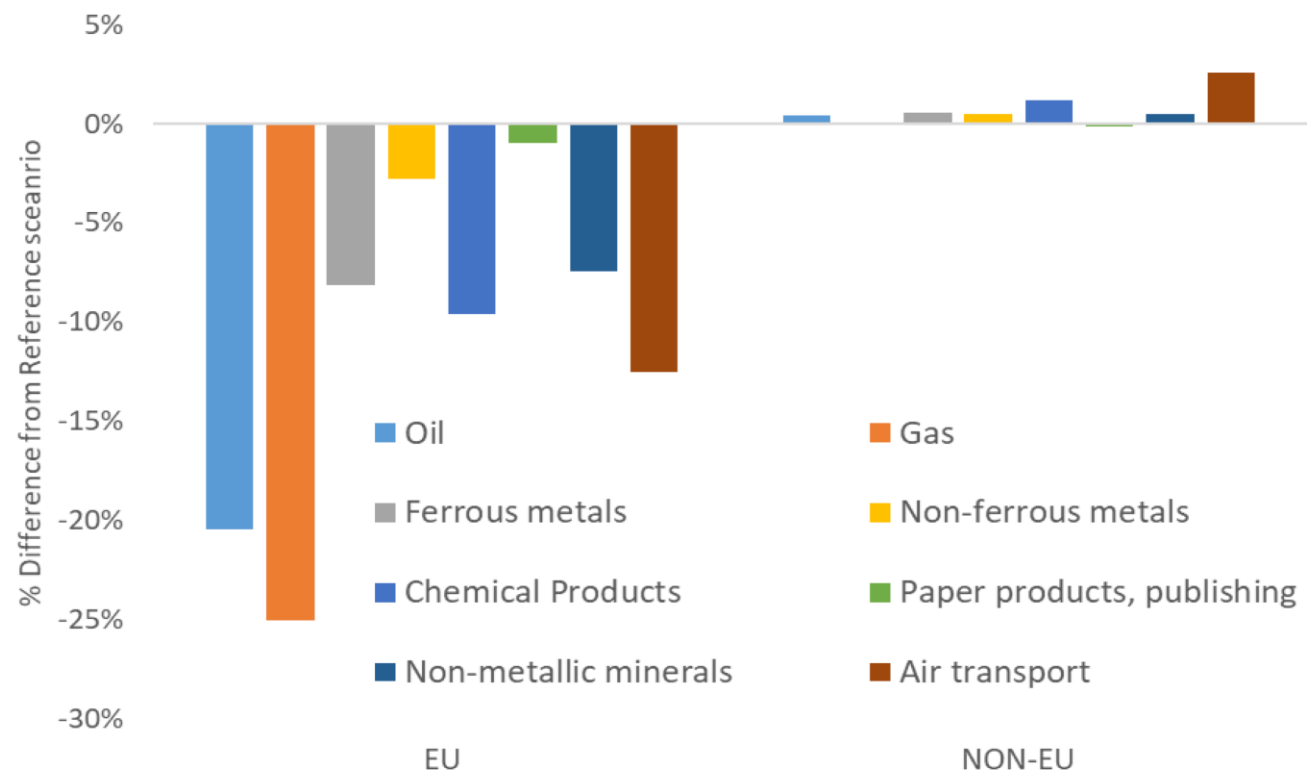
Figure 4. Regional decomposition of carbon leakage in EUGD-Along over 2020-2050. Figure 5. Sectoral decomposition of carbon leakage in EUGD-Along over 2020-2050.

# NAVIGATE What if the EU acts alone on climate?

EU: Larger impacts in fossil fuel industries, but also in chemicals and metals (lower in cement)

Non-EU: Relocation of EU manufacturing leads to increased non-EU industrial production

Global Demand of energy-intensive products declines as production costs increase, replaced by less emission-intensive goods

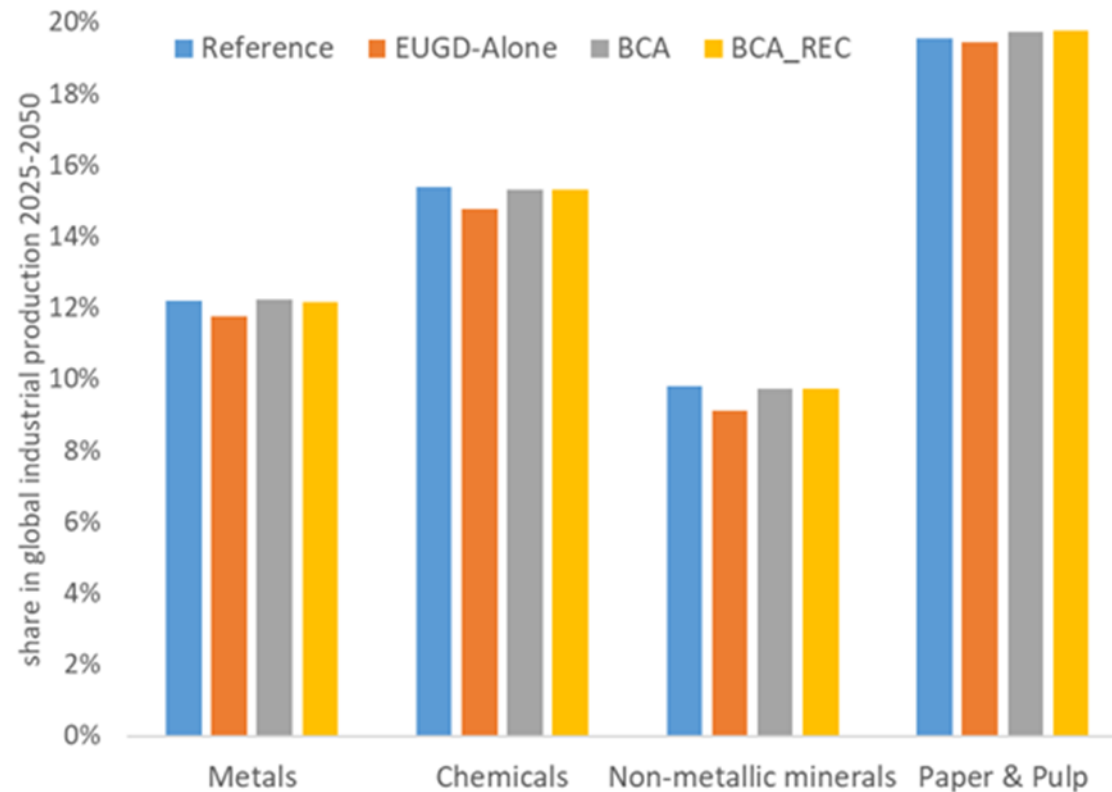


# NAVIGATE The role of CBA Mechanism

CBA can minimise EITE relocation & leakage, but implementation challenges remain

EU shares in energy-intensive production are increased to their Reference levels

CBA only included in imports and covers only the sectors of the EU ETS



No assessment of administrative & legal feasibility of policy options



# NAVIGATE Macroeconomic impacts of CBAM

GDP & Employment impacts are small & Depend on revenue recycling scheme  
Impacts for upstream & downstream sectors  
High climate benefits in terms of emission reductions, both in EU & non-EU



Using ETS and CBA revenues to reduce social security contributions leads to even higher employment in EU

The aggregate decarbonisation costs are low, but **industrial competitiveness for EITE sectors may be impacted**- risk of relocation- due to increasing ETS prices, if EU acts alone on climate

Policy measures, such as Border Carbon Adjustment proposed in the EU Green Deal, can protect the domestic manufacturing activity, but impacting GDP

The way ETS and CBA revenues are recycled is very important for socio-economic outcomes

Ambitious policies in the next decade are key for the cost-effective achievement of long-term goals to avoid carbon lock-in and pave the way towards maturity of innovative zero-carbon technologies

Decarbonisation also entails opportunities for European industries, esp. if anti-leakage measures arise:

1. Industrial products are indispensable for low-carbon solutions, i.e. RES, EVs, batteries, energy efficient buildings – so industrial growth and exports can accelerate driven by low-carbon innovation
2. Establish a comparative advantage in case of a global climate policy regime, as EU industries can deliver industrial products with lower carbon intensity compared to major economies (China, India, US)



Thank you very much for your attention

Comments?

For further information:

- [fragkos@e3modelling.com](mailto:fragkos@e3modelling.com)



## General Economy

No	Description
01	Agriculture
02	Wheat, Cereal Grains, Sugar cane, sugar beet
03	Oil Seeds
04	Forestry
05	Mining
06	Ferrous metals
07	Non-ferrous metals
08	Metal products
09	Chemical Products
10	Basic pharmaceutical products
11	Rubber and plastic products
12	Paper products, publishing
13	Non-metallic minerals
14	Computer, electronic and optical products
15	Electrical equipment
16	Machinery and equipment
17	Transport equipment
18	Other Equipment Goods
19	Consumer Goods Industries
20	Warehousing and support activities
21	Construction
22	Trade
23	Accommodation, Food and service activities
24	Financial services
25	Insurance
26	Recreational and other services
27	Education
28	Other Market Services
29	Other Non-Market Services
30	R&D

# Sectoral Coverage

## RES equipment

No	Description
31	EV Transport Equipment
32	Advanced Electric Appliances
33	Advanced Heating and Cooking Appliances
34	Equipment for wind power technology
35	Equipment for PV panels
36	Equipment for CCS power technology
37	CO2 Capture
38	Batteries

## Transport

No	Description
39	Air transport
40	Road -Passenger transport
41	Water - Freight transport
42	Road-Freight transport
43	Rail -Freight transport
44	Rail -Passenger transport
45	Water - Passenger transport

## Energy (Fuels)

No	Description
46	Coal
47	Crude Oil
48	Oil
49	Gas Extraction
50	Gas
51	Power Supply (T&D)
52	Biomass Solid
53	Ethanol
54	Bio-diesel
55	Hydrogen
56	Clean Gas

## Power Generation

No	Description
57	Coal fired
58	Oil fired
59	Gas fired
60	Nuclear
61	Biomass
62	Hydro electric
63	Wind
64	PV
65	Geothermal
66	CCS Coal
67	CCS Gas
68	CCS Bio