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EU's suggested Carbon Border Adjustment Mechanisms (CBAM)

SECTORAL EFFECTS FOR A SMALL OPEN ECONOMY WITHIN THE COALITION

PRESENTATION IAEE, MILANO

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Overview:

- EU's and Norway's climate policies under the Paris agreement
- EU's FF55 policy suggests Carbon Border Adjustment Mechanism (CBAM) to curb carbon leakage and loss of competitiveness
- Small, open economy Norway: In a climate coalition with EU
- Effects of CBAM analysed in a numerical, global CGE model
- Results:
  - Positive output effects if no free quotas initially, larger effects for Norway than EU
  - Small leakage effects and negligible macro effects – competitiveness most important?

EU's Fit-For-55 policy and regulations

EU's FF55 goal: Reduce carbon emissions with 55% in 2030 from 1990 and prepare EU for its «net zero» commitment by 2050.

Three pillars in the EU policy with separate emission reduction targets:

1. Emissions covered by **EU's Emission trading system (EU ETS):** Energy Intensive and Trade Exposed (EITE) sectors. Trade in emission quotas
2. Non-ETS emissions: Effort-sharing regulations for non-ETS sectors
3. Net emissions from land use and forest changes (LULUCF)

EU are in negotiations for implementing the FF55 goals, strategies and regulations

EU's Fit-For 55 policy, carbon costs and CBAM

- ETS: Carbon price in the range of 70-100 Euro (2022-2023) and will increase
- CBAM: Import tariff system that levels the playing field between importers and domestic producers of ETS goods.
- Why? Still large differences in carbon regulations and carbon prices worldwide
  - Carbon leakage (competition effect & fossil fuel market effects)
- CBAM: Import tariff system suggested by EU, ETS sectors
  - Based on direct emissions. Region- and sector specific, emission coefficients based on EU sectors at start.
  - Free quotas will be phased out, fully from 2035.

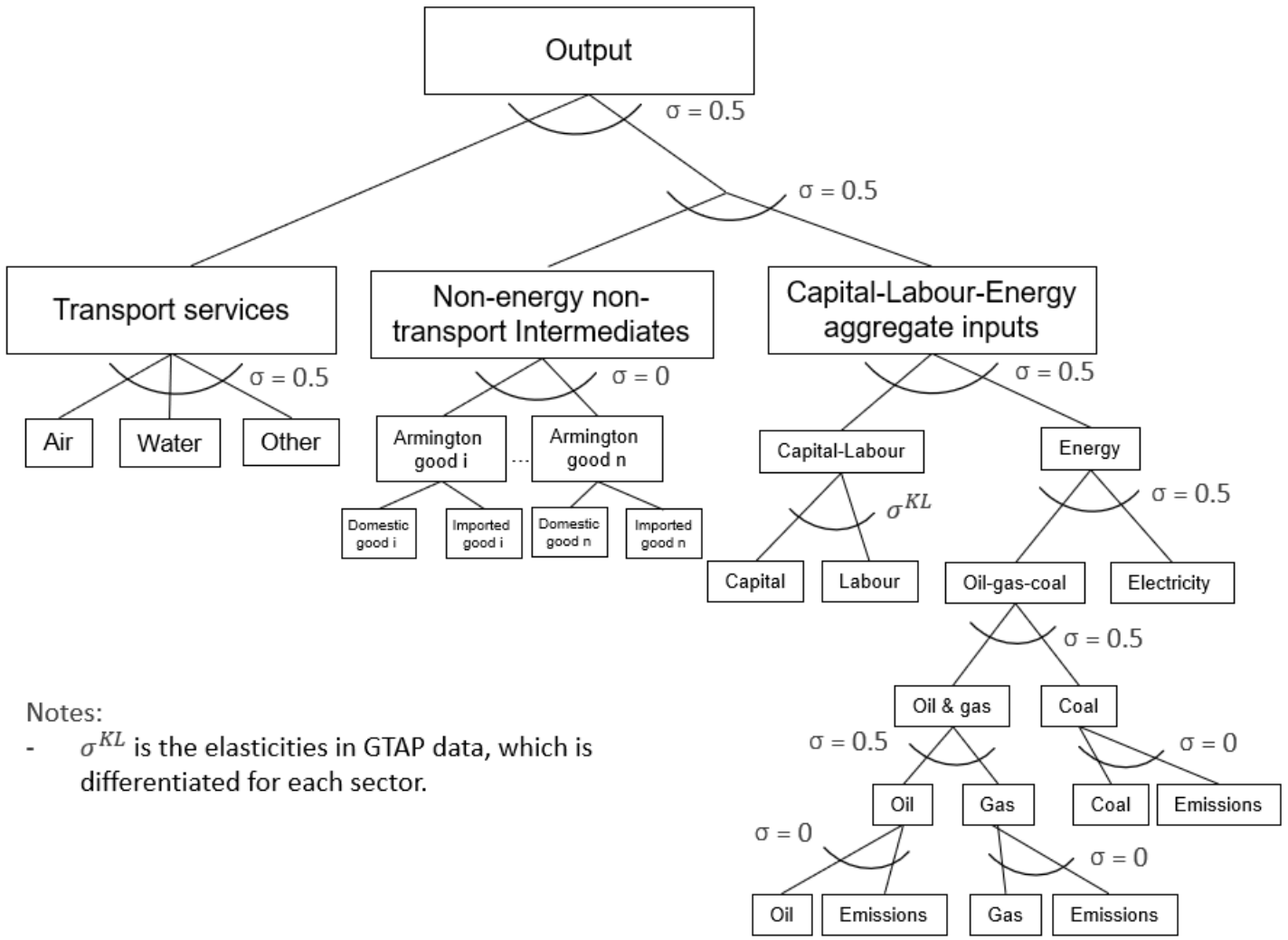
Climate coalition: EU and Norway

- Regulated by the Norwegian Climate act and the Paris agreement that Norway and EU can cooperate to reach climate commitments.
- Treaty with EU from 2019: Norway has to adopt EU rules and regulations
- Norway's updated emission reduction goal as EU: Reduce carbon emissions with 55% in 2030 from 1990
- This paper: Analyses the effects of introducing CBAM for Norway and EU given the existing climate policies for Norway and EU in 2030. Focuses on Norway.
- Use a global CGE model SNOW with Norway as a separate region

The SNOW-Global CGE model

- GTAP - Global data base: Economic variables, trade, taxes, energy use and CO2-emissions data for 140 regions and 57 goods. Calibrated input-output data with regional trade in goods (GTAP9 dataset)
- SNOW **S**tatistics **NO**rway **W**orld model: Static Global Computable General Equlibrium (CGE) model with several sectors, CO2-emissions and regions, Norway is one region.
- Factor and commodity markets within each region are perfectly competitive
- Labour and capital mobile within the region, immobile between regions
- Representative agents maximizing profits and utility, nested CES technologies. Programmed in GAMS/MPSGE (Rutherford)
- Bilateral trade in goods specified as Armington's differentiated goods approach

Nesting in Non-Fossil-Fuel Production



Notes:

- σ^{KL} is the elasticities in GTAP data, which is differentiated for each sector.

15 Regions

- Africa (AFR)
- Australia and New Zealand (ANZ)
- Brazil (BRA)
- Canada (CAN)
- China (CHN)
- Europe (EUR)*
- India (IND)
- Japan (JPN)
- South Korea (KOR)
- Middle East (MEA)
- Norway (NOR)
- Other Americas (OAM)
- Other Asia (OAS)
- Russia (RUS)
- United Kingdom (GBR)
- United States (USA)

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Sectors and regulations

SNOW sector	ETS	OBA	CBAM
Coal (col)	X		
Crude oil (cru)	X		
Natural gas (gas)	X		
Refined petroleum products (oil)	X	X	X
Electricity (ele)	X		X
Non-ferrous metals (nfm)	X	X	X
Iron and steel (i_s)	X	X	X
Non-metallic mineral products (nmm)	X	X	X
Chemical products (crp)	X	X	X
Paper products – publishing (ppp)	X	X	X
Air transport (atp)	X		
Water transport (wtp)			
Other transport (otp)			
Agriculture (agr)			
All other manufacturing (mfr)			
Services (ser)			

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Reference solution for 2030 based on:

- International Energy Outlook for future GDP growth, energy demand, energy prices
- Existing climate policies in EU and Norway (approx. 50% emissions cut from 1990):
  - ETS sectors:

    - EU and Norway trade emission quotas in the ETS (ETS carbon price in EU and Norway)

    - EU 100% free allowances = 100% OBA (output-based-allocation) in the ETS sectors
  - Non-ETS sectors:

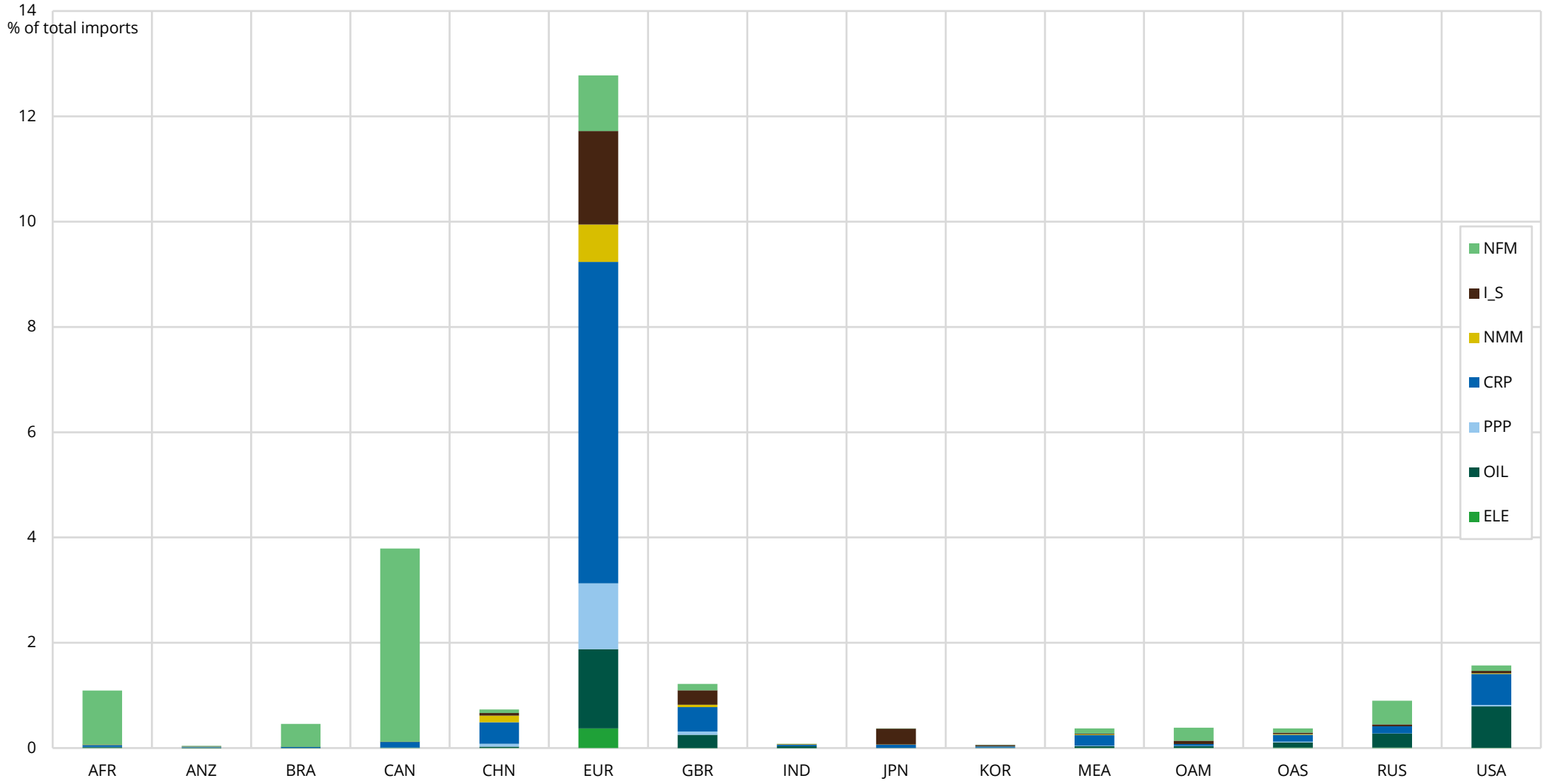
    - EU trades in Non-ETS emissions (Non-ETS carbon price in EU)

    - Norway has a unilateral emission target, no trade with EU (Non-ETS carbon price in Norway)
- The Paris Agreement of emission reductions in 2030 are met
  - => Implemented as the Nationally Determined Contributions (NDCs) from 2021 for all regions and countries. Regional quota markets in rest of the world, one carbon price in each region.

Key determinants for CBAM effects

- Import shares within the coalition (Norway, EU) and outside
- Emission (CO_2)-intensities for sectors and regions/countries
- Factor input composition:
  - Import of CBAM/ETS-goods as material inputs from regions outside the coalition
  - Share of demand for «own» goods as input
  - Share of non-ETS goods (no CBAM)

Norwegian (NOR) import shares, CBAM sectors, Reference (REF), 2030



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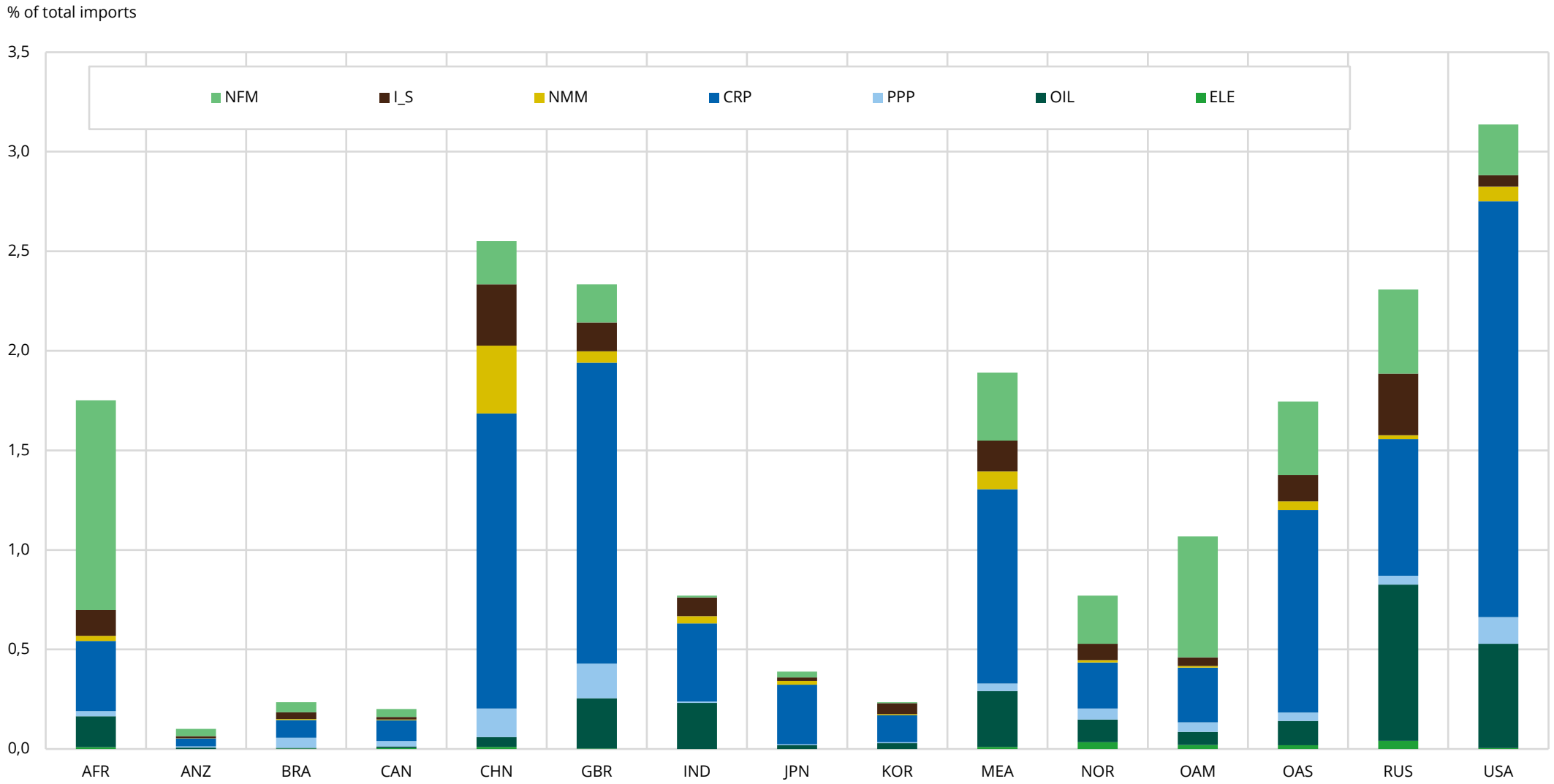
Europe (EUR) import shares, CBAM sectors, Reference (REF), 2030



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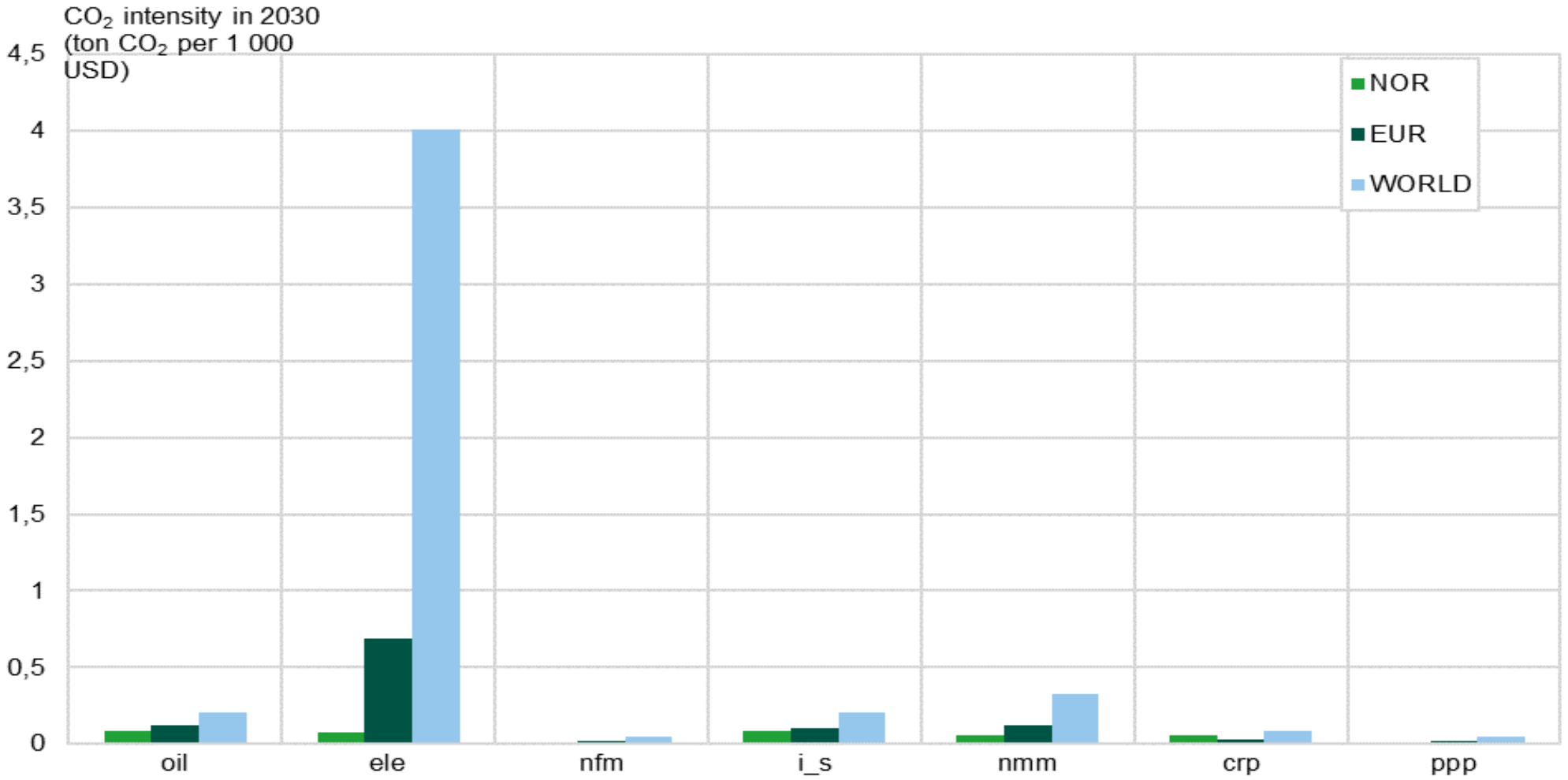
CO_2 intensity (metric ton CO_2 per $ 1 000) for Norway (NOR), EU (EUR) and world average (WRL), Reference (REF), 2030



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CBAM policy for the coalition Norway and EU

- Tariff on carbon content in import from all regions outside of Norway and EU
- Carbon content based on:
  - Direct emissions,
  - Region- and sector specific,
  - Emission coefficients based on EU sectors (suggested by EU as a starting point).
- CO2 prices outside the coalition given from Reference → potential for leakage
- Tariff rate: The difference between the EU ETS price and the CO2 price outside EU ETS, i.e. regions outside the coalition (Norway and EU)
- Free quotas (OBA) for EU ETS sectors are phased

CBAM Policy scenarios:

- **TARIFF**: A scenario with 100% CBAM and no OBA.
- **NOLEAK**: A scenario with no leakage policies, i.e. no OBA and no CBAM
- **HYBRID**: A scenario with 50% CBAM and 50% OBA, except for ELE which receives no OBA and 100% CBAM since they have no OBA in REF

- Effects of the CBAM policy scenarios are measured as % change from the Reference (REF) in 2030

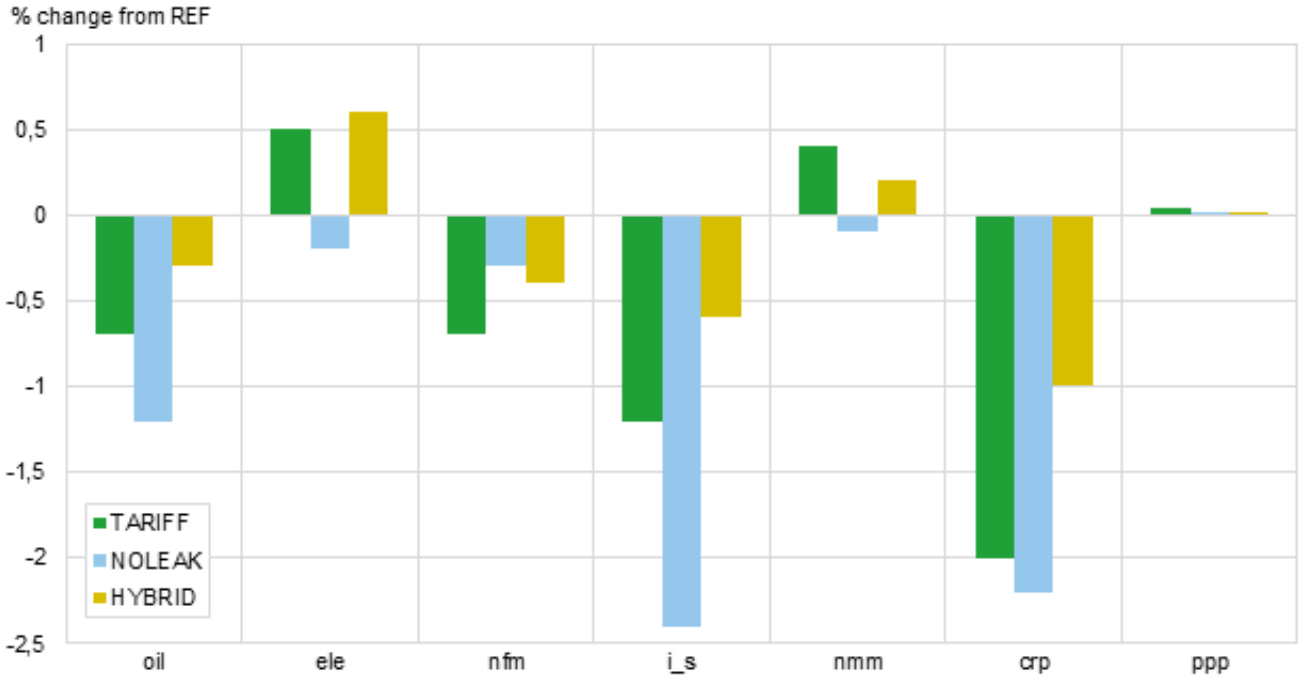
	REF	NOLEAK	HYBRID	TARIFF
Free Quotas (OBA)	100%	0%	50%	0%
CBAM	0%	0%	50%	100%

CBAM sectors - part of ETS

Sectors	OBA	CBAM
Refined oil products	X	X
Electricity		X
Non-ferrous metals	X	X
Iron and steel	X	X
Non-metallic mineral products	X	X
Chemical products	X	X
Paper products – publishing	X	X

- Energy Intensive Trade Exposed
- Substituting OBA with CBAM have cost effects:
  - Paying for all emissions (carbon quotas)
  - Industries with no or low share of free quotas (OBA) in REF benefit more from CBAM
-

Output, CBAM industries, Norway, %-change from REF



- Demand for labour and capital fall, wage and capital price fall
- Non-ETS industries: Costs of labour and capital are reduced, but overall effects are negligible
- Small macro economic effects in Norway

- **NOLEAK: Removing OBA**
  - All CBAM industries lower production
  - Costs of emissions increase – supply curve shifts upwards in domestic- and export markets
  - Effect depends of:
    - Emission intensity
    - Input costs
  - Iron & steel and chemical products large effects
    - High emission intensities
    - Larger share of inputs from other CBAM industries, incl self demand

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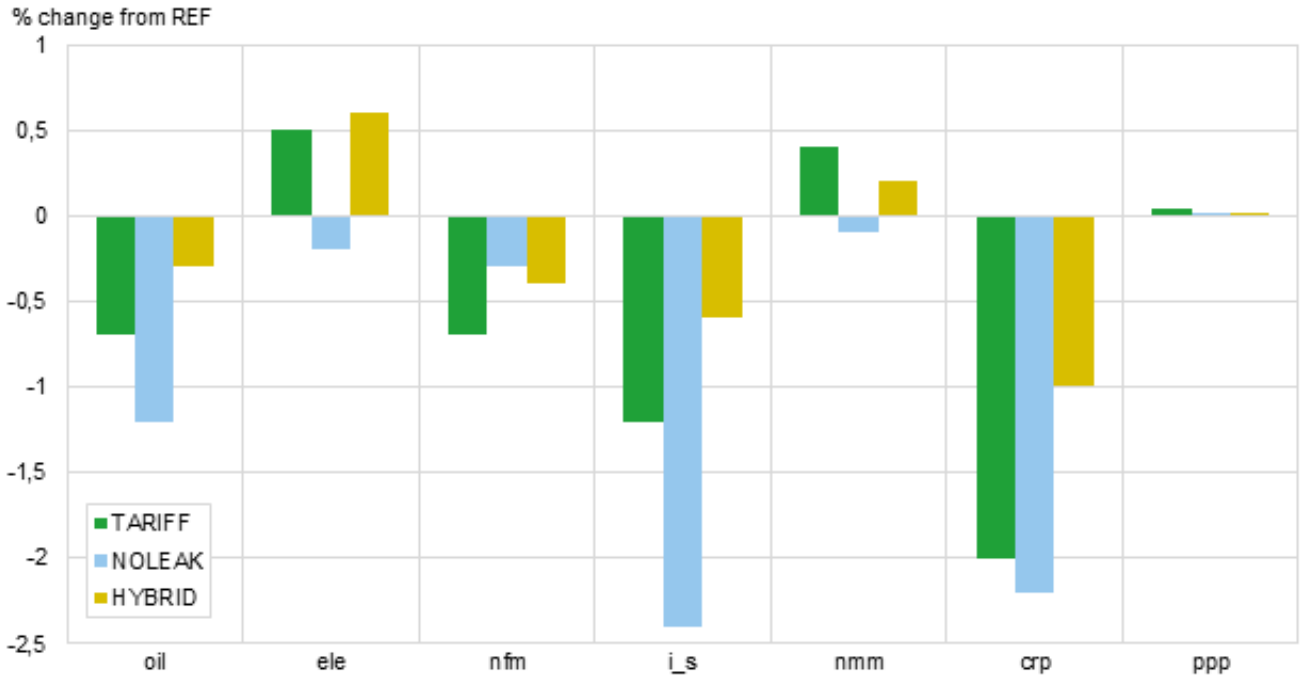
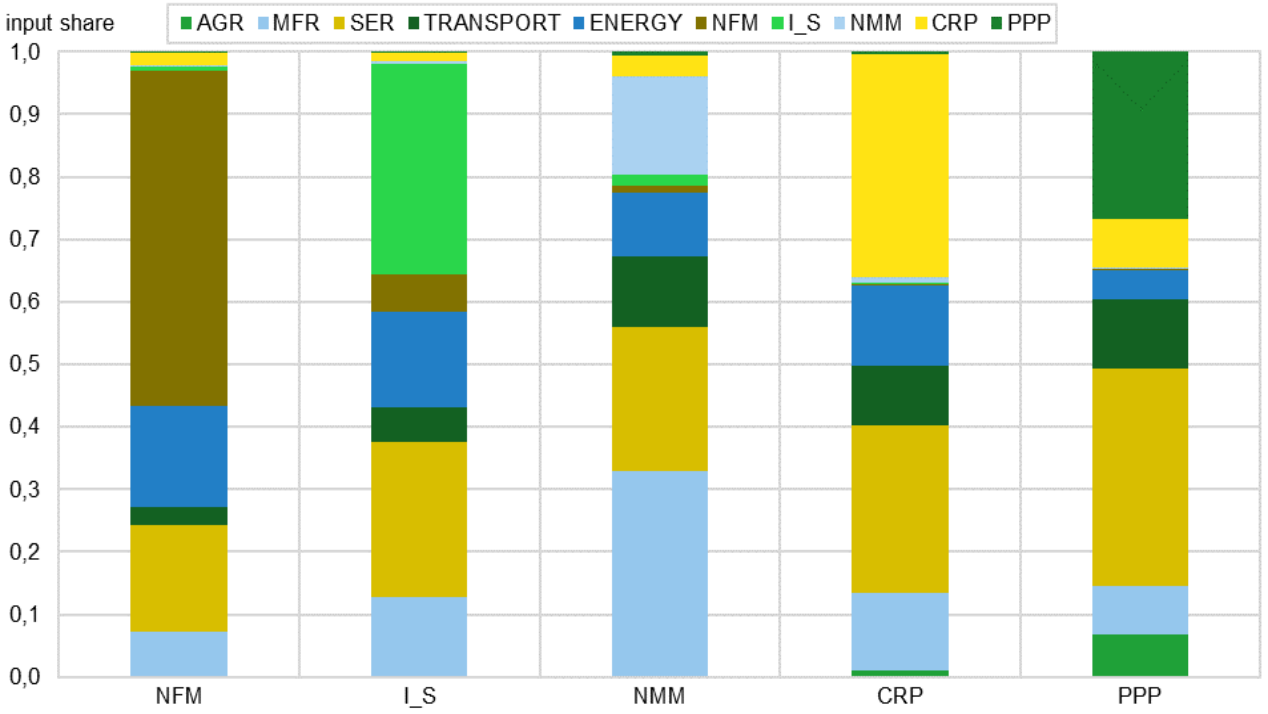
Output, CBAM industries, Norway, %-change from REF



- **TARIFF:** CBAM (import tariff but no OBA)
  - Counteract the negative output effect of no OBA, but does not outweigh for all industries
  - Largest fall for Iron & steel, chemical products, oil, non ferrous metals
    - Output increase: Non-metallic minerals, PPP, Electricity↑. Low/no OBA in REF, low emission intensity, less input of CBAM goods
  - Import price of CBAM goods increases
    - Demand substitutes towards domestic produced goods
    - Import price of CBAM input goods increases (NFM)
  - Export price increases. Disadvantage outside EU/NOR when no export rebate

Distribution of input goods in CBAM industries, NORWAY, Reference (REF), 2030



Factors important for cost effects:

- Import of CBAM-goods as material inputs from regions outside EUR
- Share of demand for own input (self-demand)
- Share of non-ETS goods (no CBAM)
  - AGR, MFR, SER, TRANSPORT

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ETS price, global emissions %-change from REF

	REF	TARIFF	NOLEAK	HYBRID
EU ETS price	$138	$137	$135	$138
Global CO_2 emissions excl. EUR and NOR		-0.06	0.02	-0.05

- Minor changes in ETS price between the scenarios
- Global emission reduction: 0.06% approximately 1% of EUR emissions
- Regions outside the coalition fulfill NDC-targets in REF and keep these CO2-prices in the policy scenarios.
- Sensitivity: Double the trade elasticity for ETS sectors in Norway → goods are easier substituteable and traded more → Increased potentional for carbon leakage, but the anti-leakage mechanism to CBAM is strengthen

Summing up

- CBAM has positive output effects if not 100% free quotas (OBA) initially
- CBAM does not outweigh the negative output effects of removing free quotas (OBA) for Iron & steel, Chemicals, Non-ferrous metals, Refined oil products
- Larger effects of CBAM between the CBAM industries, negligible macro effects
- Minor effects for global emissions: Competition effect most important for EU?
- Omissions that may be important:
  - Including indirect emissions from electricity production in countries outside Norway/EU. 10-times higher emission intensity
  - Export rebate: Compensate for CO2-price with export to regions outside the coalition (Norway/EU)

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Thank you!

Bye, B, Kaushal, K. R., Storrøsten, H. B. (2022): EU's suggested carbon border adjustment Mechanism: Impact on Norwegian industries, Reports 2022/48.
https://www.ssb.no/en/natur-og-miljo/miljoregnskap/artikler/eus-suggested-carbon-border-adjustment-mechanism

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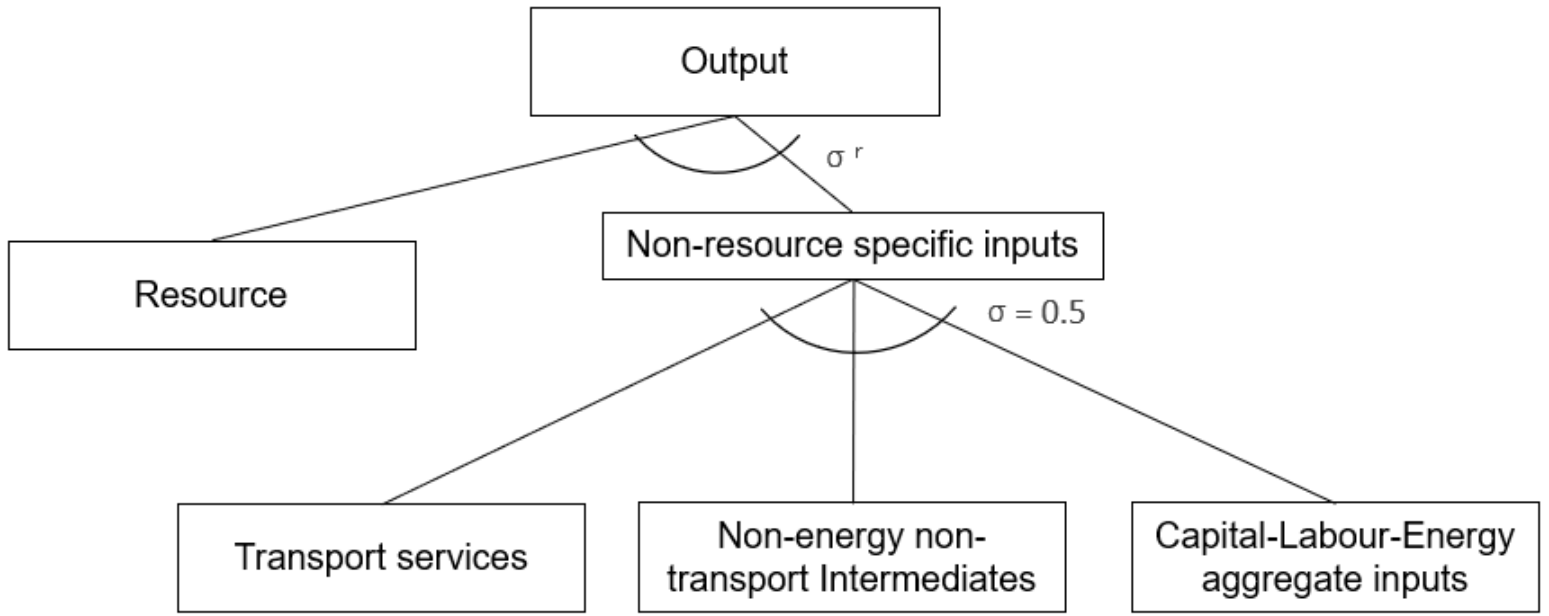
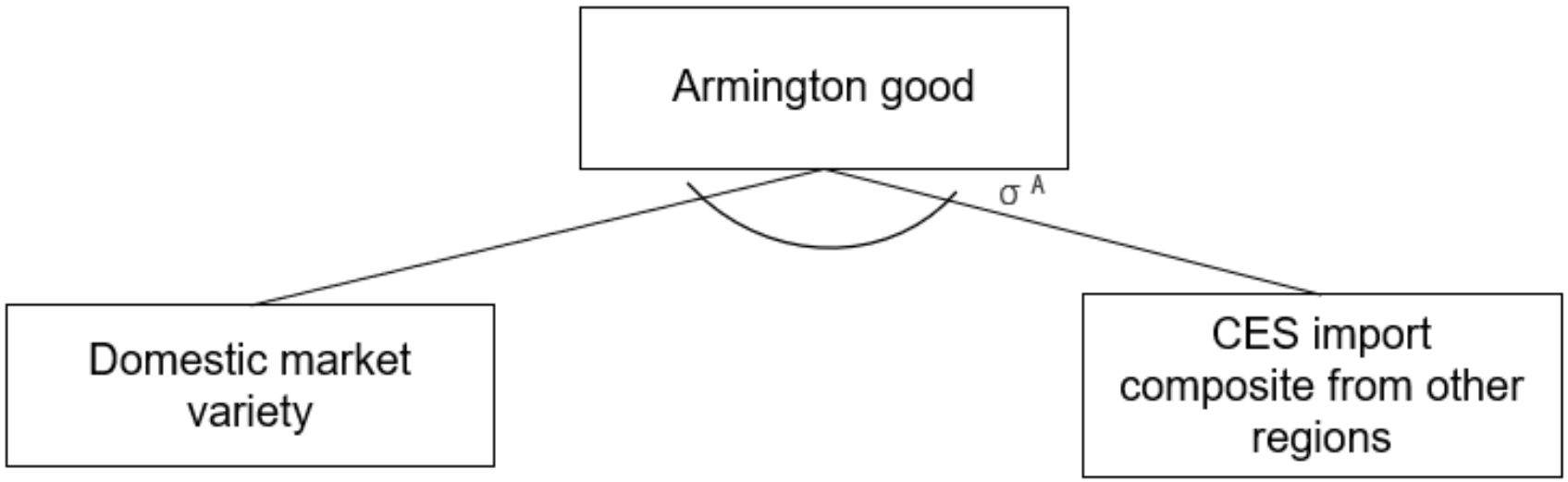


Notes:

- σ^r is differentiated for each sector

Nesting in Armington production



Notes:

- σ^A is differentiated for each sector according to GTAP data

Sectors included in CBAM

- **Assessment criteria for the sectoral scope of a CBAM:**
- Relevance in terms of GHG:
    - Regarding direct emissions
    - Regarding indirect emissions
- Exposure to a significant risk of carbon leakage.
- Practical feasibility aspects

The European Parliament resolution of 10 March 2021 towards a WTO-compatible EU carbon border adjustment mechanism (2020/2043(INI)) states:

- "12. Considers that in order to prevent possible distortions in the internal market and along the value chain, a CBAM should cover all imports of products and commodities covered by the EU ETS, including when embedded in intermediate or final products; stresses that as a starting point (already by 2023) and following an impact assessment, the CBAM should cover the power sector and energy-intensive industrial sectors like cement, steel, aluminium, oil refinery, paper, glass, chemicals and fertilisers, which continue to receive substantial free allocations, and still represent 94 % of EU industrial emissions."

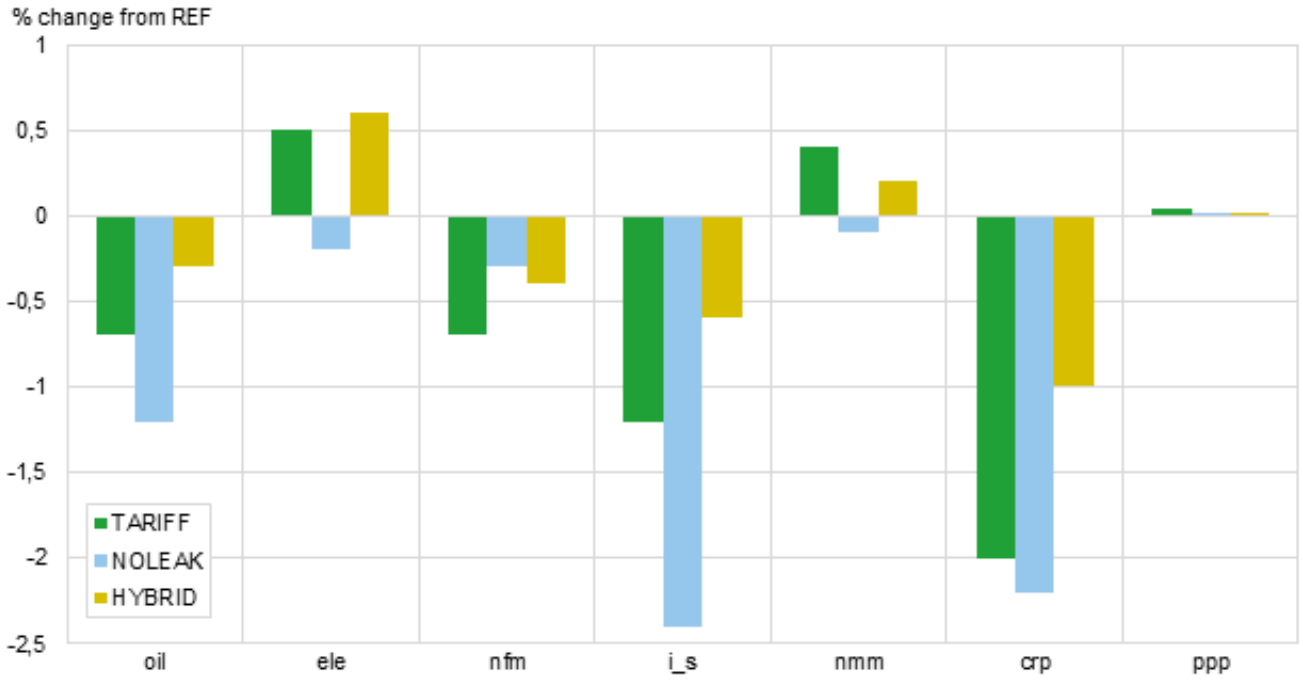
Reference solution: Several CO2-prices

- EU and Norway: Three CO2-prices are calculated
  - One price in ETS for Norway and EU
  - One price in Non-ETS for EU
  - One price in Non-ETS for Norway
- All other regions and countries outside EU and Norway (incl. UK):
  - Within region or domestic quota markets with the NDC targets that give one CO2-price in each region or country

TARIFF scenario: Decomposing effects

1. NOLEAK: Removing OBA
2. TARIFF: Implementing CBAM (the import tariff) and no OBA

Output, CBAM industries, Norway, %-change from REF



- **HYBRID:** 50% CBAM and 50% OBA
  - In between NOLEAK and TARIFF
  - In particular Iron & steel and Chemical products have positive effects of OBA
  - Output falls for Iron & steel, chemical products, oil, non ferrous metals
  - Output increases for Non-metallic minerals, Paper & pulp, Electricity↑.
    - Minor/no OBA in REF, low emission intensity, non-ETS material inputs

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