



# ECONOMIC AND SOCIAL EFFECTS OF REACHING FIT FOR 55 TARGETS – POLICY DESIGN MATTERS

## RESULTS FROM TWO SIMULATION STUDIES

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# OECD ECONOMIC SURVEY OF GERMANY

The Council of Economic Experts, Wiesbaden, 19 September 2023

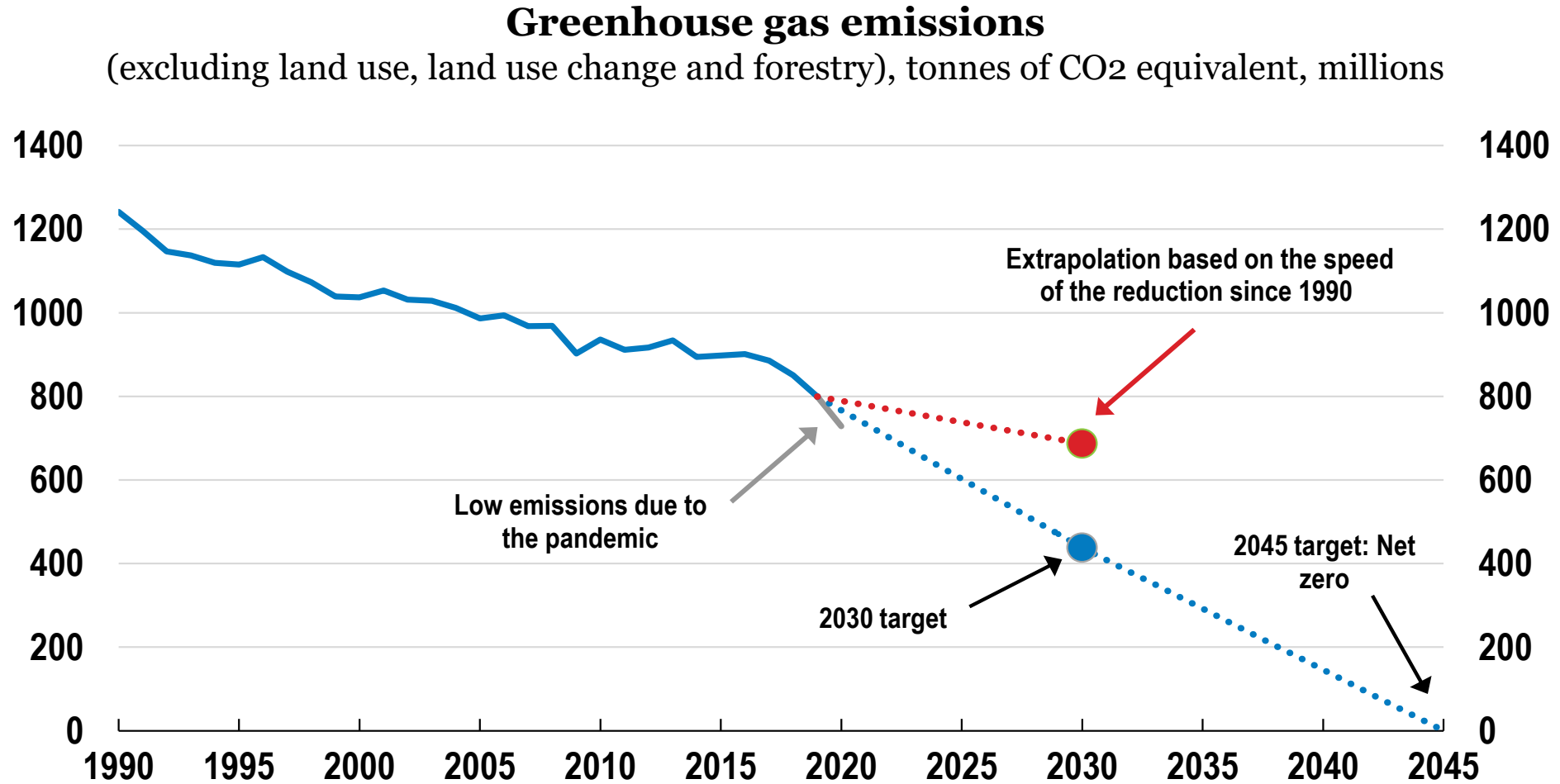
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# Germany has set ambitious emission reduction targets



Source: OECD calculations based on OECD Environment Statistics and Umweltbundesamt.



## We use a multi-country and multi-sector static computable general equilibrium model based on Böhringer et al. (2021)

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- Analyse **consequences of reaching the 2030 climate targets in the EU and Germany** on:
  - GDP and welfare (real consumption)
  - different economic sectors (trade offs of policy measures)
  - distributional effects across households (by expenditure deciles)
  - regional effects in Germany
- **CO<sub>2</sub> emissions can be reduced in principle through three channels:**
  - (i) fuel switching (substitution of fuels for each other)
  - (ii) fuel-non-fuel switching (substitution of fossil fuels for electricity and other production inputs)
  - (iii) direct energy savings (i.e. reducing production or consumption activities).



# In all scenarios the EU Fit For 55 target will be reached in 2030

Scenarios	Description
Main EU Fit for 55 scenario	<p>Separate CO2 pricing systems in sectors, which are covered by</p> <ul style="list-style-type: none"><li>• the EU-Emission Trading System (ETS) and</li><li>• the EU Effort Sharing Regulation (ESR).</li></ul> <p>Unilateral emission reduction in the EU.</p> <p>Output-based subsidies: Rebate of emission allowance payments to ETS industries (except for power producers).</p>
Measures to support industries and address carbon leakage	<ol style="list-style-type: none"><li>1) Introduction of a carbon tariff.</li><li>2) Extending output based subsidies to other sectors.</li><li>3) Multilateral emission abatement.</li></ol>
Institutional reform of the ETS	Full integration of ESR sectors into the ETS.
National measures to decarbonise the power sector	<ol style="list-style-type: none"><li>1.) Subsidies for renewable energies.</li><li>2.) Coal exit</li></ol>



## Benchmark 2030

- EU: Benchmark is based on climate mitigation policies **before** the Fit For 55 target.
- The former climate target (-40% vs. 1990) is reached in the benchmark.

	Benchmark
EU (vs. 1990)	-43.8%
Germany (vs. 1990)	-52.8%
USA (vs. 2005)	-27%
Rest of OECD (vs. 2005)	-18%
China (vs. 2005)	+108%

- Our analysis is restricted to CO<sub>2</sub> emissions.



## Implementing the Fit For 55 targets (relative to 2030 benchmark)

- Imposing sectoral ETS/ESR targets (emission budgets) in the model:

ETS sectors	Climate target (vs. 2005)	Reduction in the model vs. 2030 Benchmark
EU	-61%	-22%

ESR sectors	Climate target (vs. 2005)	Reduction in the model vs. 2030 Benchmark
EU	-40%	-13%
Germany	-50%	-27%
Rest of EU	-38%	-10%

- Model outcomes are always in % change compared to the benchmark scenario



## Main EU Fit for 55 scenario: Macro results (relative to the benchmark scenario in 2030)

	Germany	Rest of European Union
Change in welfare	-0.86%	-0.29%
Change in GDP	<b>-1.22%</b>	<b>-0.34%</b>
EU ETS CO <sub>2</sub> price in \$/tCO <sub>2</sub>	74	74
ESR CO <sub>2</sub> price in \$/tCO <sub>2</sub>	<b>323</b>	<b>64</b>
Share of renewable energies in electricity generation (change in p.p. compared to benchmark)	77% (+15)	60% (+3)
Coal share in electricity generation (change in p.p. compared to benchmark)	5% (-15)	5% (-2)
Change in electricity generation	-9.9%	-2.4%
Change in electricity imports	+22.9%	+1.9%
Change in electricity supply	-7.8	-2.1%
Change in electricity price (consumer prices)	+4.7%	+2.8%
Total CO <sub>2</sub> emissions reduction vs 1990	<b>-67%</b>	<b>-46%</b>
CO <sub>2</sub> emissions reduction in the ETS sectors, compared to benchmark	<b>-36%</b>	<b>-17%</b>
CO <sub>2</sub> emissions reduction in the ESR sectors, compared to benchmark	<b>-27%</b>	<b>-10%</b>





## Main Fit for 55 scenario: Sectoral output changes for Germany

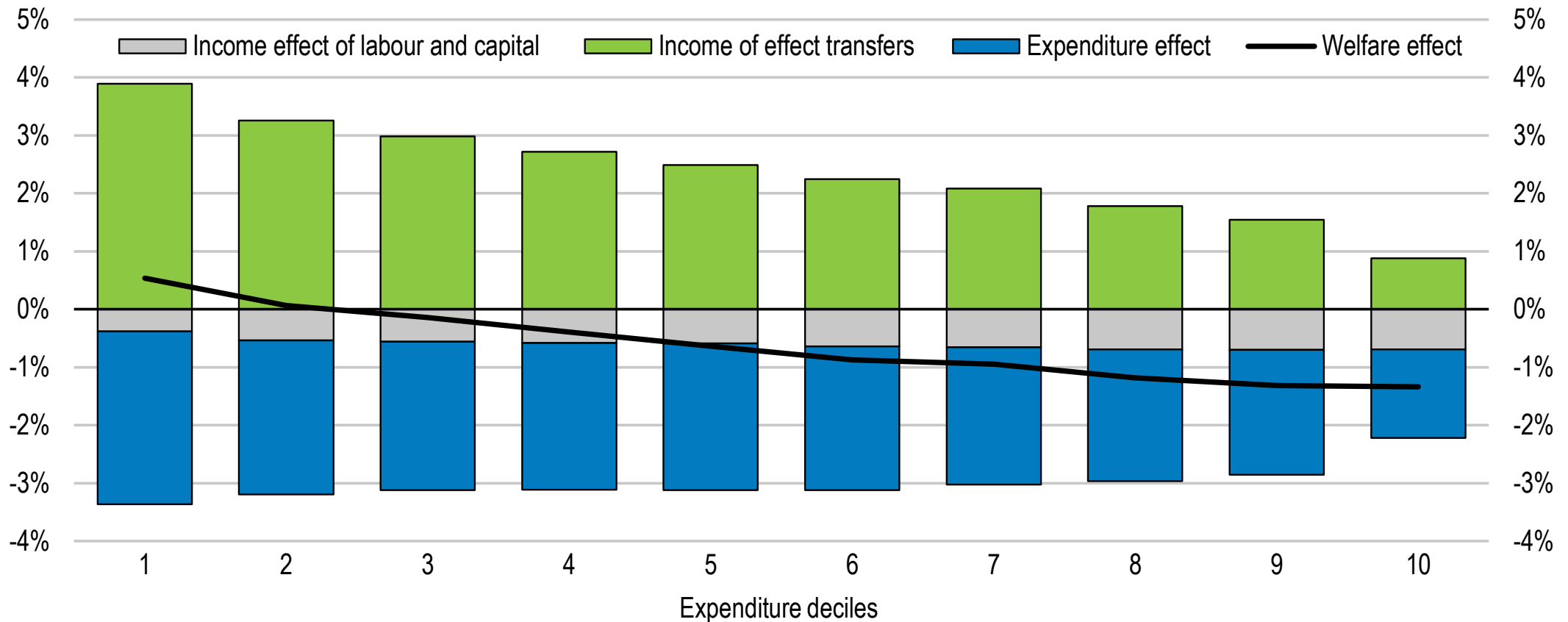
Sector	Main EU Fit for 55 scenario
<b>EITE industries Total</b>	<b>-1.7%</b>
Chemical products	0.4%
Paper products	0.1%
Non-metallic minerals	-0.5%
Ferrous metals	-1.4%
Non-ferrous metals	-1.0%
Oil refinery	-18.8%
<b>Other industries</b>	
Machinery and equipment	0.6%
Transport equipment goods	0.2%
Consumer good industries	-2.1%
<b>Services</b>	
Land transport	-9.4%
Air transport	1.4%
Water transport	-14.2%
Market services	-0.1%
Non-market Services	0.0%

Source: (Bickmann et al., forthcoming).



# If revenues are recycled as a lump sum, low-income households will benefit from the increase in carbon prices

Percentage changes compared to the benchmark scenario (in %)



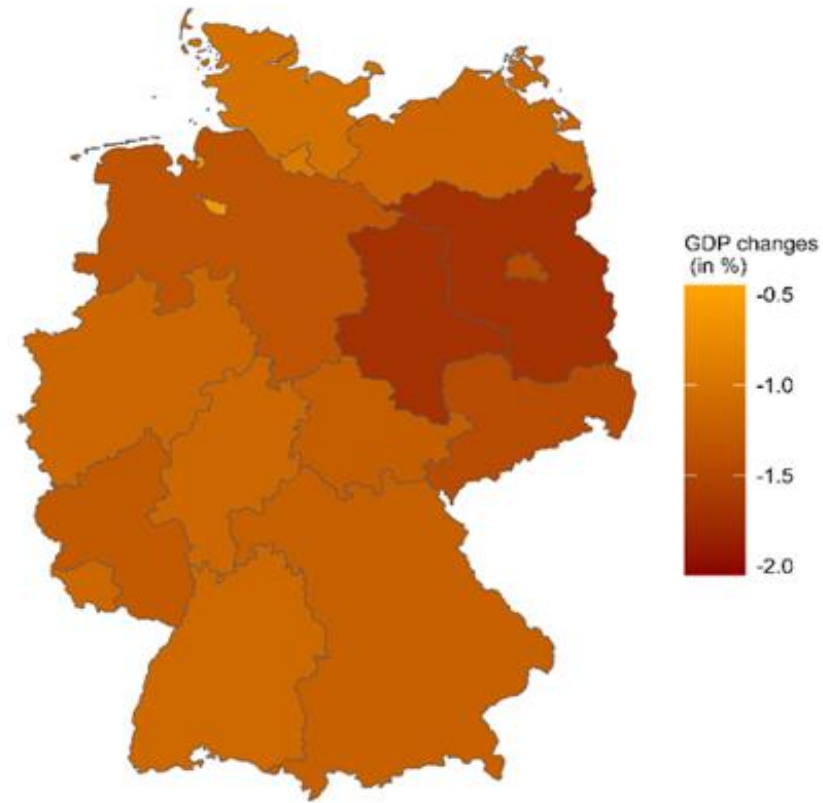
Note: Welfare is defined as real purchasing power. Results refer to the main Fit for 55 scenario. With transfers: Carbon price-related revenues are recycled transferring the same amount of each household..

Source: (Bickmann et al., forthcoming).



## Regional Effects - Fit for 55 Reference scenario

### Changes in real GDP (in %)



Note: Conducted using a Computable General Equilibrium Model (CGE) for Germany. See Box 2.5 in the *2023 Economic Survey* for a detailed description of the methodology and scenarios. The charts show changes for the Main Fit for 55 scenario compared to the benchmark scenario.

Source: (Bickmann et al., forthcoming).



## Carbon tariff: Sectoral output changes for Germany

Sector	Main EU Fit for 55 scenario	Carbon tariffs
<b>EITE industries Total</b>	-1.7%	<b>-2.9%</b>
Chemical products	0.4%	0.6%
Paper products	0.1%	0.3%
Non-metallic minerals	-0.5%	0.4%
Ferrous metals	-1.4%	<b>-11.0%</b>
Non-ferrous metals	-1.0%	<b>-2.0%</b>
Oil refinery	-18.8%	-18.5%
<b>Other industries</b>		
Machinery and equipment	0.6%	<b>0.2%</b>
Transport equipment goods	0.2%	<b>-0.3%</b>
Consumer good industries	-2.1%	-1.8%
<b>Services</b>		
Land transport	-9.4%	-9.3%
Air transport	1.4%	-4.4%
Water transport	-14.2%	-13.9%
Market services	-0.1%	-0.1%
Non-market Services	0.0%	0.0%



## Renewable subsidies: Sectoral output changes for Germany

Sector	Main EU Fit for 55 scenario	Renewable subsidies
<b>EITE industries Total</b>	-1.7%	-0.6%
Chemical products	0.4%	0.7%
Paper products	0.1%	0.6%
Non-metallic minerals	-0.5%	-0.3%
Ferrous metals	-1.4%	1.8%
Non-ferrous metals	-1.0%	2.0%
Oil refinery	-18.8%	-15.0%
<b>Other industries</b>		
Machinery and equipment	0.6%	-0.2%
Transport equipment goods	0.2%	-0.8%
Consumer good industries	-2.1%	-2.8%
<b>Services</b>		
Land transport	-9.4%	-10.2%
Air transport	1.4%	1.0%
Water transport	-14.2%	-16.2%
Market services	-0.1%	-1.2%
Non-market Services	0.0%	-0.3%



## Merging ETS and NON-ETS: Sectoral output changes for Germany

Sector	Main EU Fit for 55 scenario	Merging ETS + Non ETS
<b>EITE industries Total</b>	-1.7%	-1.7%
<b>Chemical products</b>	0.4%	-0.8%
<b>Paper products</b>	0.1%	-0.7%
<b>Non-metallic minerals</b>	-0.5%	-0.9%
<b>Ferrous metals</b>	-1.4%	-2.1%
<b>Non-ferrous metals</b>	-1.0%	-1.6%
<b>Oil refinery</b>	-18.8%	-8.9%
<b>Other industries</b>		
<b>Machinery and equipment</b>	0.6%	0%
<b>Transport equipment goods</b>	0.2%	-0.1%
<b>Consumer good industries</b>	-2.1%	-0.8%
<b>Services</b>		
<b>Land transport</b>	-9.4%	-2%
<b>Air transport</b>	1.4%	-0.2%
<b>Water transport</b>	-14.2%	0.5%
<b>Market services</b>	-0.1%	-0.2%
<b>Non-market Services</b>	0%	0%



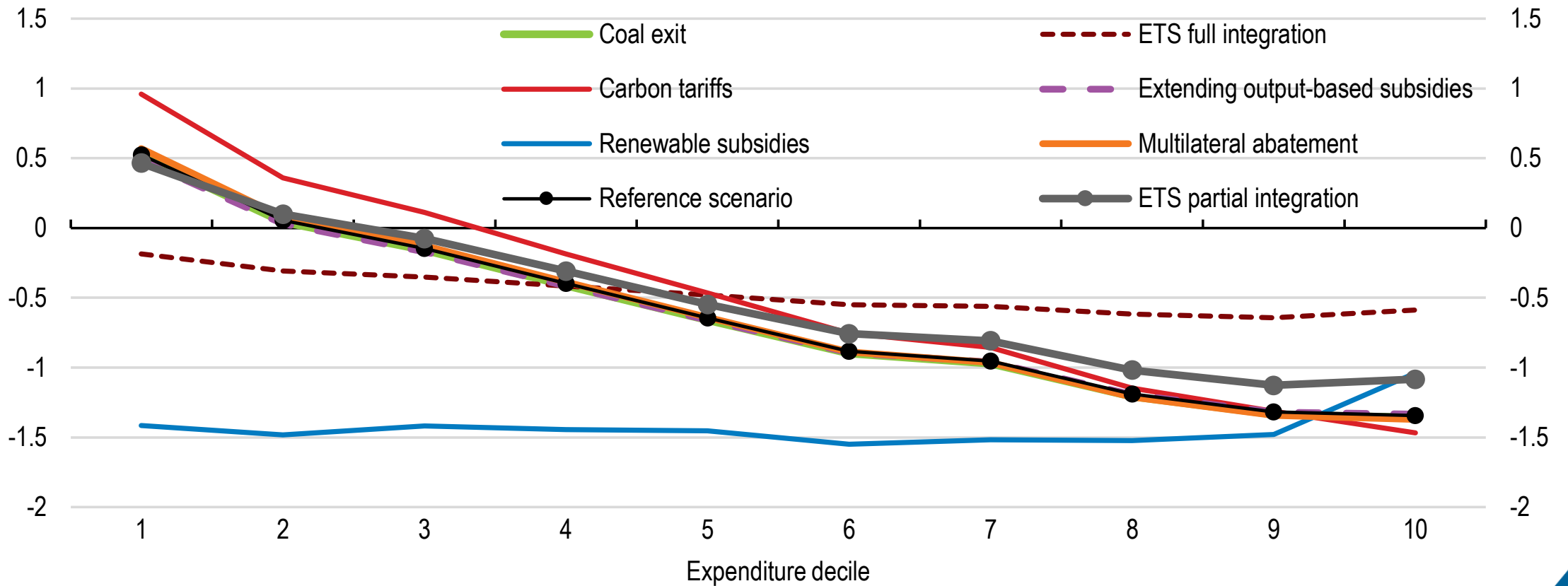
## Multilateral Abatement: Sectoral output changes for Germany

Sector	Main EU Fit for 55 scenario	Multilateral Abatement
<b>EITE industries Total</b>	-1.7%	-0.1%
<b>Chemical products</b>	0.4%	0.8%
<b>Paper products</b>	0.1%	0.4%
<b>Non-metallic minerals</b>	-0.5%	0.3%
<b>Ferrous metals</b>	-1.4%	0.7%
<b>Non-ferrous metals</b>	-1.0%	1.2%
<b>Oil refinery</b>	-18.8%	-16.9%
<b>Other industries</b>		
<b>Machinery and equipment</b>	0.6%	0.1%
<b>Transport equipment goods</b>	0.2%	-0.6%
<b>Consumer good industries</b>	-2.1%	-2.5%
<b>Services</b>		
<b>Land transport</b>	-9.4%	-7.8%
<b>Air transport</b>	1.4%	13.1%
<b>Water transport</b>	-14.2%	-11.4%
<b>Market services</b>	-0.1%	-0.4%
<b>Non-market Services</b>	0.0%	0.1%



# Distributional effects of emission abatement differ across policy options

## Distributional effects of emission abatement differ across policy options



Source: (Bickmann et al., forthcoming).





## For more information

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# 2023 ECONOMIC SURVEY OF THE EUROPEAN UNION AND THE EURO AREA



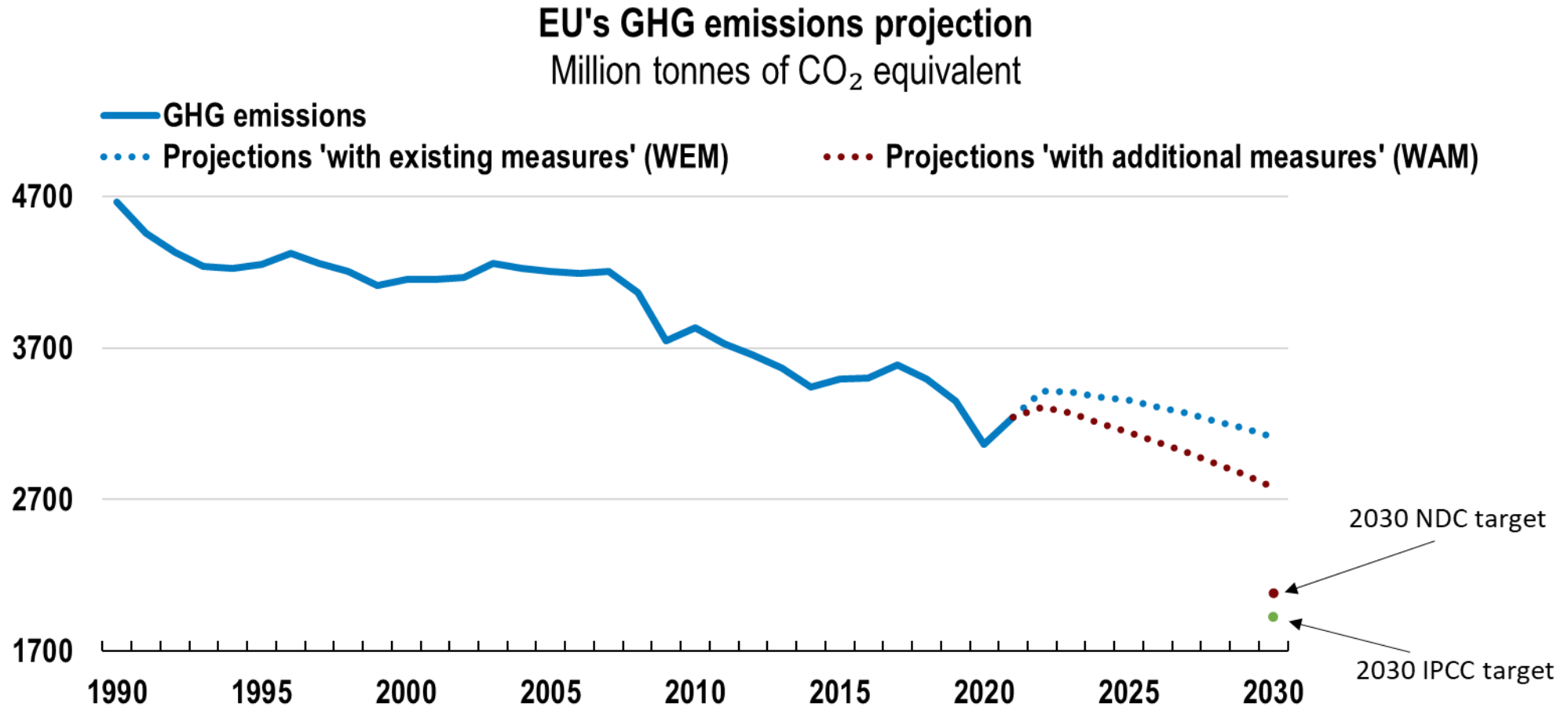
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# Emission reductions need to accelerate to meet targets

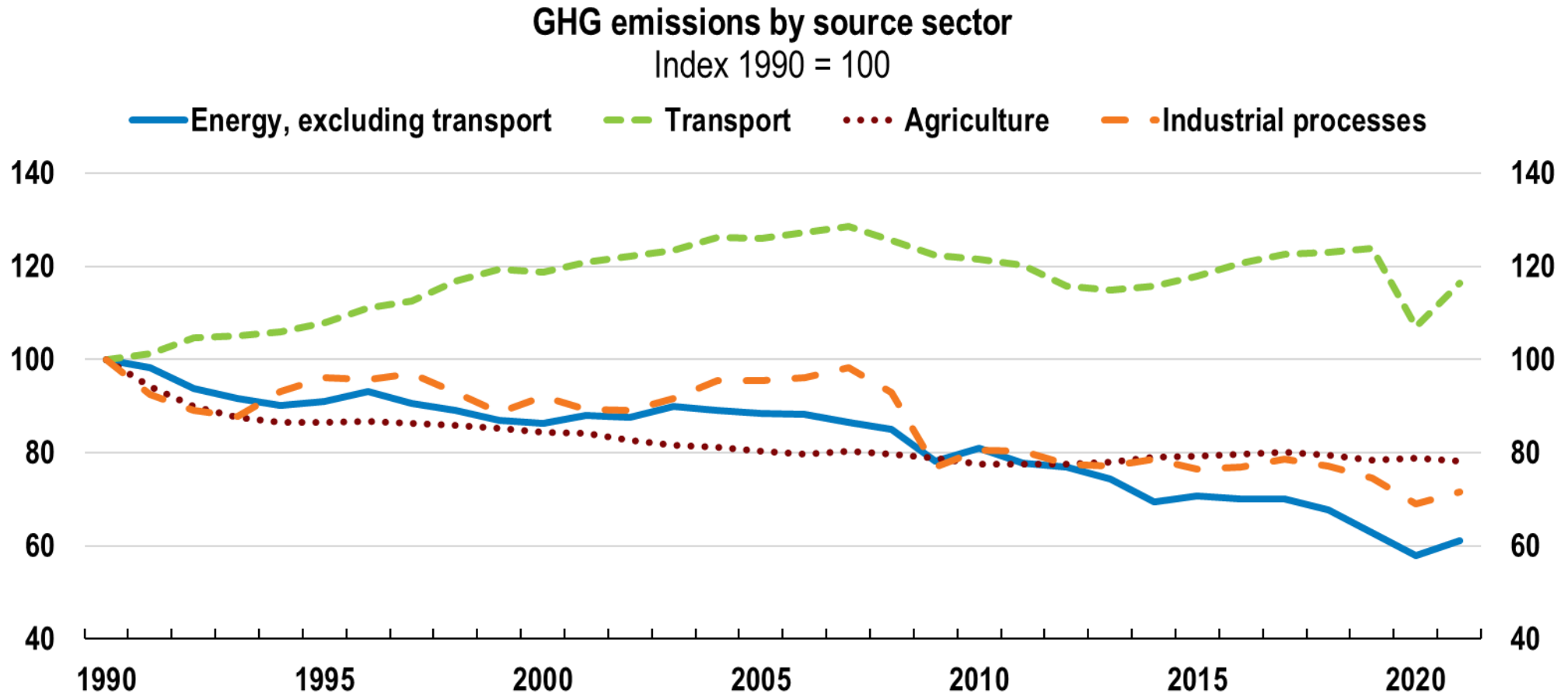


Note: Greenhouse gas (GHG) emissions include those from the land use/land use change and forestry sector (LULUCF). Projections “with existing measures” (WEM) refer to 2019 EU policies and “with additional measures” (WAM) to new policies under more the ambitious FIT for 55 package. GHG emissions as projected by the respective country. NDC stands for Nationally Determined Contributions under the 2015 Paris Agreement. IPCC stands for Intergovernmental Panel on Climate Change. The IPCC target is equivalent to a 43% reduction compared to 2019 emissions, which is needed to limit global warming to around 1.5°C according to the IPCC (2022).

Source: IPCC (2022), United Nations (2022).



# Agriculture and transport need to contribute more to emission reductions



Note: Excluding land-use, land-use change and forestry (LULUCF).

Source: OECD Environment Statistics database.



## Economic effects of the EU's 'Fit for 55' policies

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- CGE model assesses the economic effects of the **EU's 'Fit for 55' mitigation policies**
- Comparison of two scenarios:
  - **Business as usual** (EU reference) **scenario** based on 2021 policies, where gross GHG emissions are reduced by 40% (compared to 1990 levels)
  - A more ambitious **'Fit for 55' scenario**, where gross GHG emissions are reduced by at least 55% in 2030 (compared to 1990 levels)
- The model projects macroeconomic, sectoral, energy and emission trends up to 2035
  - for the **EU as a whole**
  - and for the **five largest EU economies** separately (France, Germany, Italy, Poland and Spain)
- Economic effects from limiting climate change on the economy are not considered



## Main policy scenarios

Scenarios	Description
Reference Scenario	<p>Based on 2021 EU and national policies:</p> <ul style="list-style-type: none"><li>• the EU-Emission Trading System (ETS)</li><li>• the EU Effort Sharing Regulation (ESR) and National Energy and Climate Plans</li></ul> <p>Emissions and energy trends include COVID-19 and Russia's war of aggression against Ukraine</p>
Fit for 55 scenario	<ul style="list-style-type: none"><li>• More ambitious emission reduction target for 2030</li><li>• A new ETS 2 on transport and heating fuels</li><li>• Carbon border adjustment mechanism (CBAM)</li><li>• Increased share of renewables in the energy mix</li><li>• More stringent minimum emission standards for vehicles</li></ul> <p>National policies: more ambitious reduction targets for ESR sectors, coal phase-outs in Germany, France, Italy, and Spain</p>



## Key results

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- The ‘Fit for 55’ policies are projected to lead to a **moderate loss in GDP per capita of 1% in 2030**
- **Countries with a larger emission intensity of production are projected to see higher income losses**, due to specialisation in industry (e.g. Germany), or a higher reliance on coal power (e.g. Poland)
- **Russia’s war against Ukraine** did not substantially increase the GDP costs of ‘Fit for 55’ policies

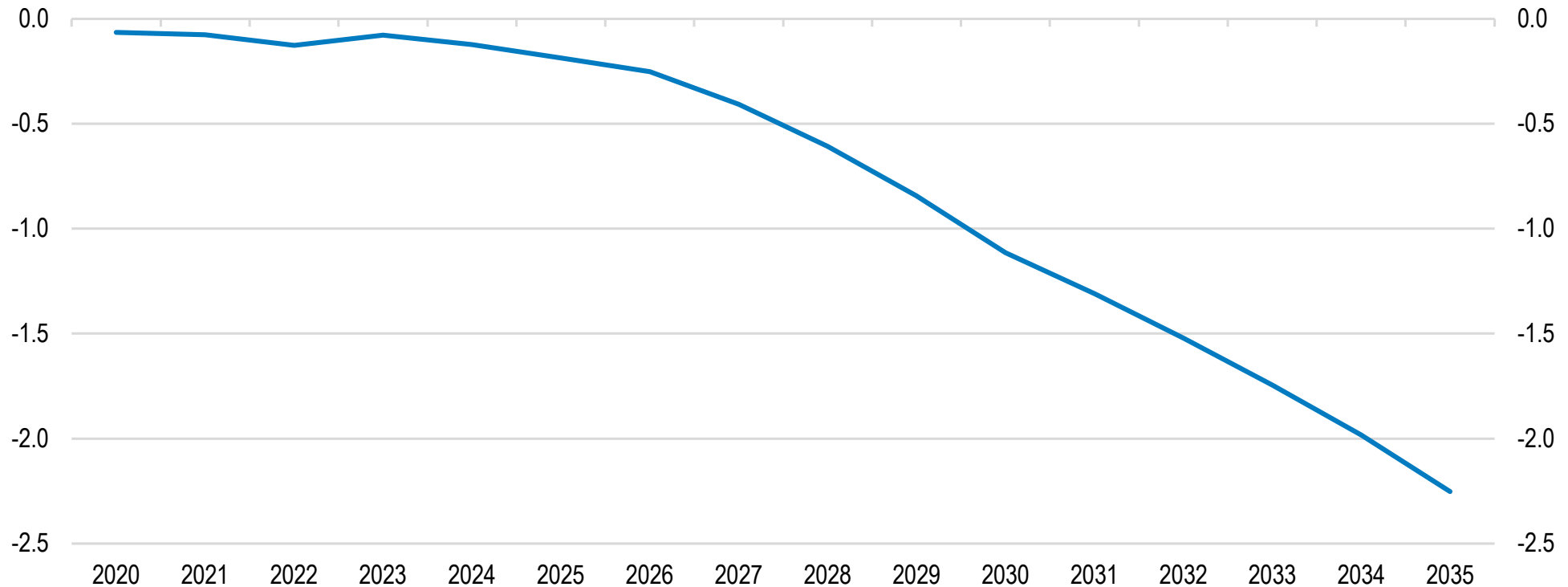
### **Climate policy design can contribute to making the transition cost-effective:**

- **Harmonising carbon pricing** across sectors would reduce income losses
- Using **carbon pricing revenues** to lower the labour tax burden would encourage employment
- **CBAM** may partly mitigate the loss of competitiveness of energy-intensive industries



# Economic effects of 'Fit for 55' policies increase over time

Changes in real GDP per capita, 'Fit for 55' scenario relative to reference scenario, %



Note: The chart shows results from a scenario introducing the EU 'Fit for 55' targets, which means that the EU reduces net GHG emissions by 55% in 2030 (relative to 1990). Results are shown relative to a reference scenario, which is based on 2019 policies, meaning that the EU reduces its net GHG emissions by at least 42.5% in 2030 (relative to 1990).

Source: OECD ENV-Linkages model.





# Economic effects of the EU's 'Fit for 55' policies in 2030, by country

Percentage changes compared to the reference scenario (in %)

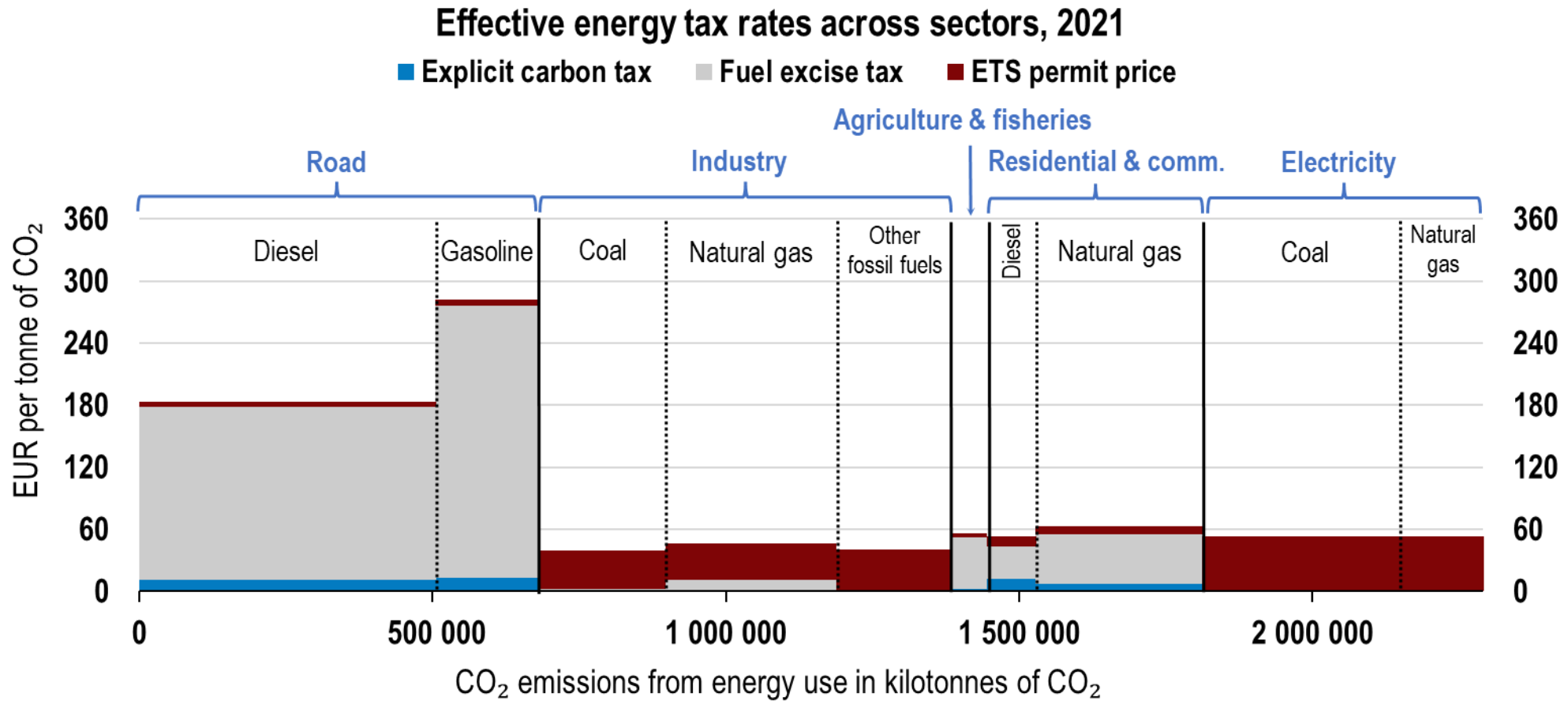
	EU	DEU	ESP	FRA	ITA	POL
<b><i>Emissions and energy mix</i></b>						
Total GHG emissions reduction vs 1990 (excluding LULUCF)	-11.2*	-10.5*	-14.2*	-4.9*	-10.0*	-21.5*
Total GHG emissions reduction vs 1990 (including LULUCF)	-11.7*	-10.3*	-16.3*	-5.2*	-10.1*	-22.8*
Total final energy consumption	-5.5	-5.6	-8.0	-2.0	-5.0	-11.0
Share of renewables in electricity generation	70.3	87.2	87.4	44.2	73.9	73.0
Share of fossil fuels in electricity generation	10.2	12.8	3.5	2.3	26.1	27.0
<b><i>Macroeconomic indicators</i></b>						
Real GDP per capita	-1.0	-1.1	-1.1	-0.6	-1.0	-3.0
Employment	-0.2	-0.2	-0.2	-0.1	-0.2	-0.8

Note: \* denotes percentage point change. \*\* Energy-intensive industries are iron and steel, chemicals, pulp and paper, non-metallic minerals and non-ferrous metals. The table shows results from a scenario introducing the EU 'Fit for 55' targets, which means that the EU reduces net GHG emissions by 55% in 2030 (relative to 1990). Results are shown relative to a reference scenario, which is based on 2019 policies, meaning that the EU reduces its net GHG emissions by at least 42.5% in 2030 (relative to 1990).

Source: OECD ENV-Linkages model.



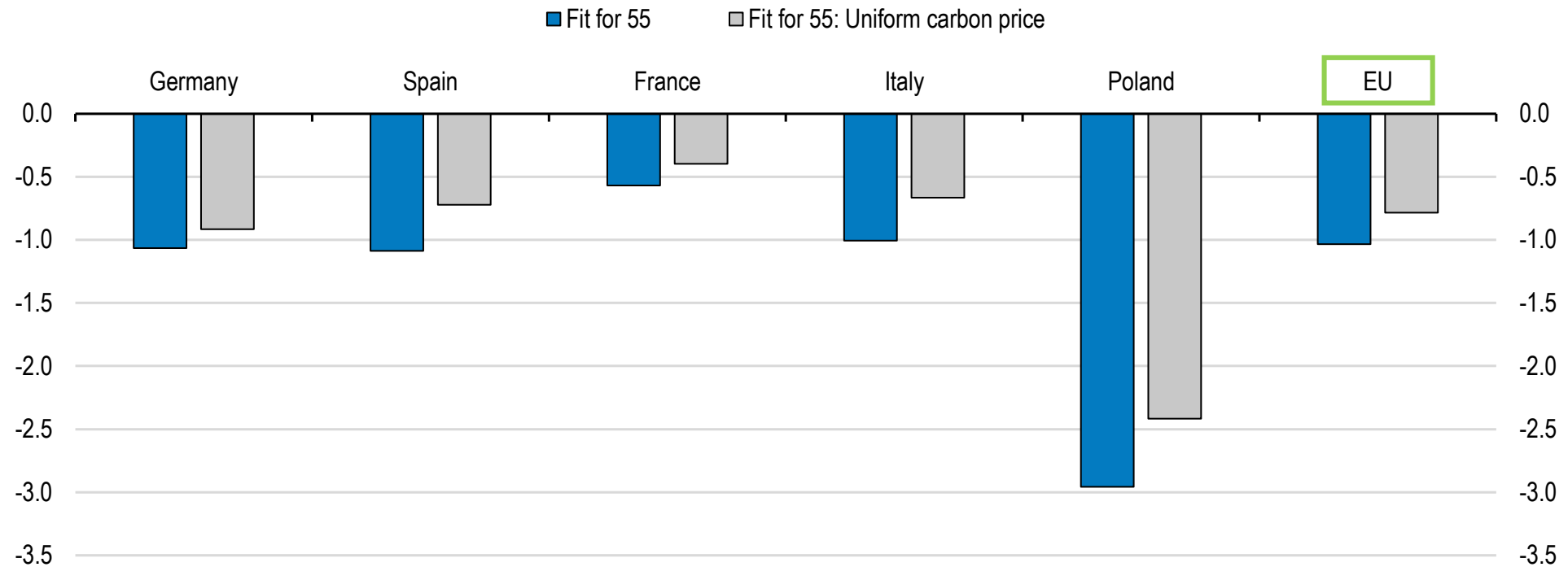
# Carbon prices differ across sectors and need to be more aligned





# Uniform carbon pricing can lower the economic costs of mitigation policies

Changes in real GDP per capita in 2030, 'Fit for 55' scenario relative to reference scenario, %

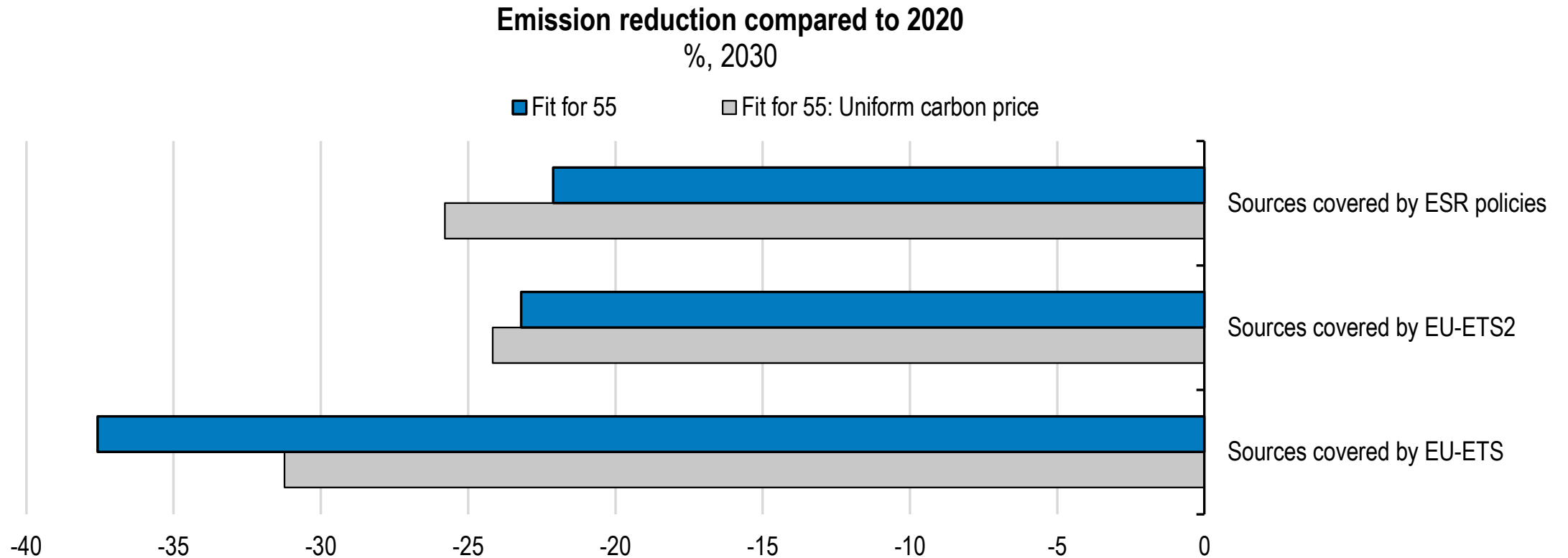


Note: The figure shows results from a scenario introducing the EU 'Fit for 55' targets, with and without uniform carbon price across sectors and countries. In both scenarios the EU reduces net GHG emissions by 55% in 2030 (relative to 1990). Results are shown relative to a reference scenario, which is based on 2019 policies, meaning that the EU reduces its net GHG emissions by at least 42.5% in 2030 (relative to 1990).

Source: OECD ENV-Linkages model.



# Uniform carbon pricing encourages a more efficient allocation of abatement activities



Note: The figure shows results from a scenario introducing the EU 'Fit for 55' targets, with and without uniform carbon price across sectors and countries. In both scenarios the EU reduces net GHG emissions by 55% in 2030 (relative to 1990). Results are shown relative to a reference scenario, which is based on 2019 policies, meaning that the EU reduces its net GHG emissions by at least 42.5% in 2030 (relative to 1990).

Source: OECD ENV-Linkages model.



## Economic effects of using carbon pricing revenues to lower the labour tax burden

	'Fit for 55' scenario	'Fit for 55' scenario with all revenues used to lower the labour tax burden	Percentage change compared to 'Fit for 55' scenario (in %)
Real GDP per capita (EUR at 2014 prices)	32157	32152	0.0
Real household consumption per capita (EUR at 2014 prices)	20411	20423	0.1
Employment (million)	211.7	212.5	0.4

Note: The 'Fit for 55' scenario assumes that one third of revenues from carbon pricing are used to finance investment in electricity grids, with the remaining two thirds used to finance subsidies for the take-up of electric cars and home insulations, and lump sum payments to households.  
Source: OECD ENV-Linkages model.



## **Selected recommendations to accelerate the EU's green transition**

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- Expand the coverage of the Emission Trading System, including in agriculture
- Broaden the energy tax base by phasing-out exemptions and reduced rates for fossil fuels
- Concentrate future funding for alleviating the socio-economic impacts of the green transition on mobility support and training. Make it conditional on labour market outcomes



## For more information



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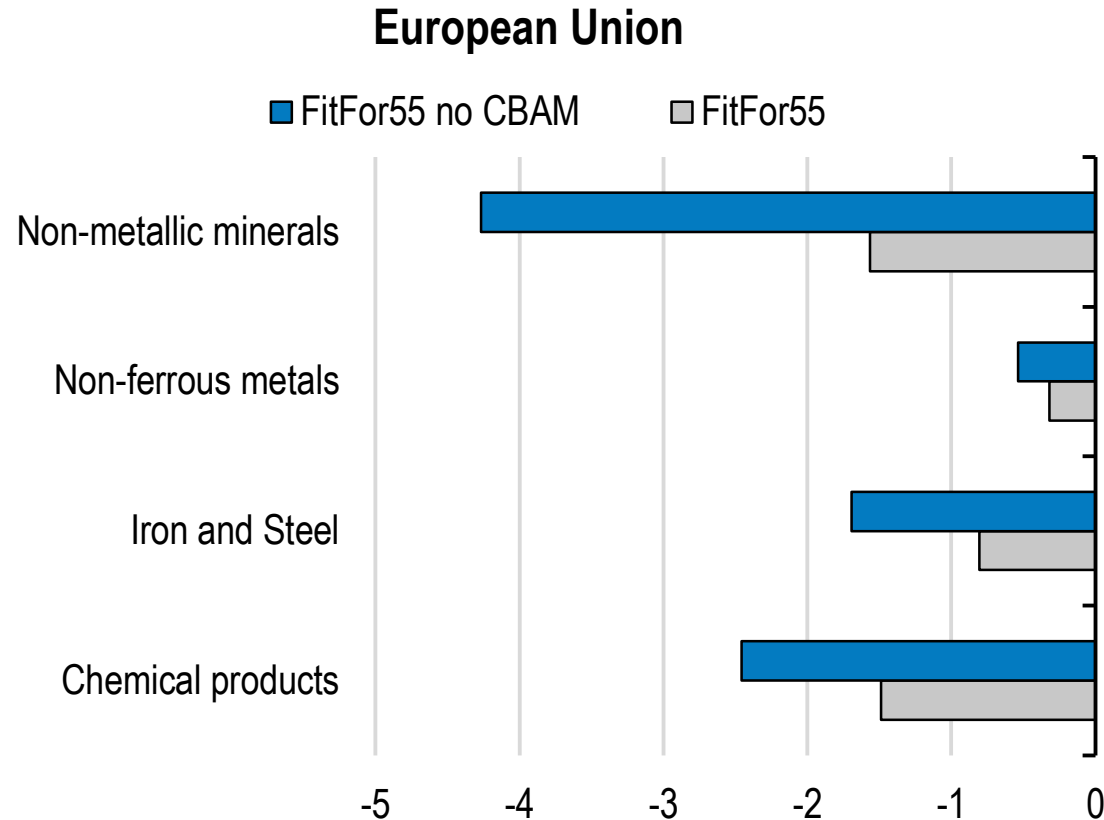
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# The Carbon Border Adjustment Mechanism only partly reduces losses to competitiveness



Note: The figure shows results from a scenario introducing the EU 'Fit for 55' targets, with and without the Carbon Border Adjustment Mechanism. In both scenarios, the EU reduces net GHG emissions by 55% in 2030 (relative to 1990). Results are shown relative to a reference scenario, which is based on 2019 policies, meaning that the EU reduces its net GHG emissions by at least 42.5% in 2030 (relative to 1990). The market share of a country for a given commodity is defined as its share of exports in world total exports.

Source: OECD ENV-Linkages model.