NAVIGATE

Next generation of advanced integrated assessment modelling to support climate policy making

E3Modelling
Energy Economy Environment

Assessing the socio-economic impacts of different ways to recycle carbon revenues

Panagiotis Fragkos, NAVIGATE Final Conference

October 2023

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Key research questions

- What are the impacts of ambitious decarbonization on:
  - Macro-indicators like GDP, investment, trade
  - Employment change by sector
  - Structural change of major economies

- How can we ensure double dividends from mitigation?
  - Explore different ways to recycle the carbon revenues, collected by the government.
  - Focus on how new job opportunities can be created and how regressive distributional impacts can be alleviated

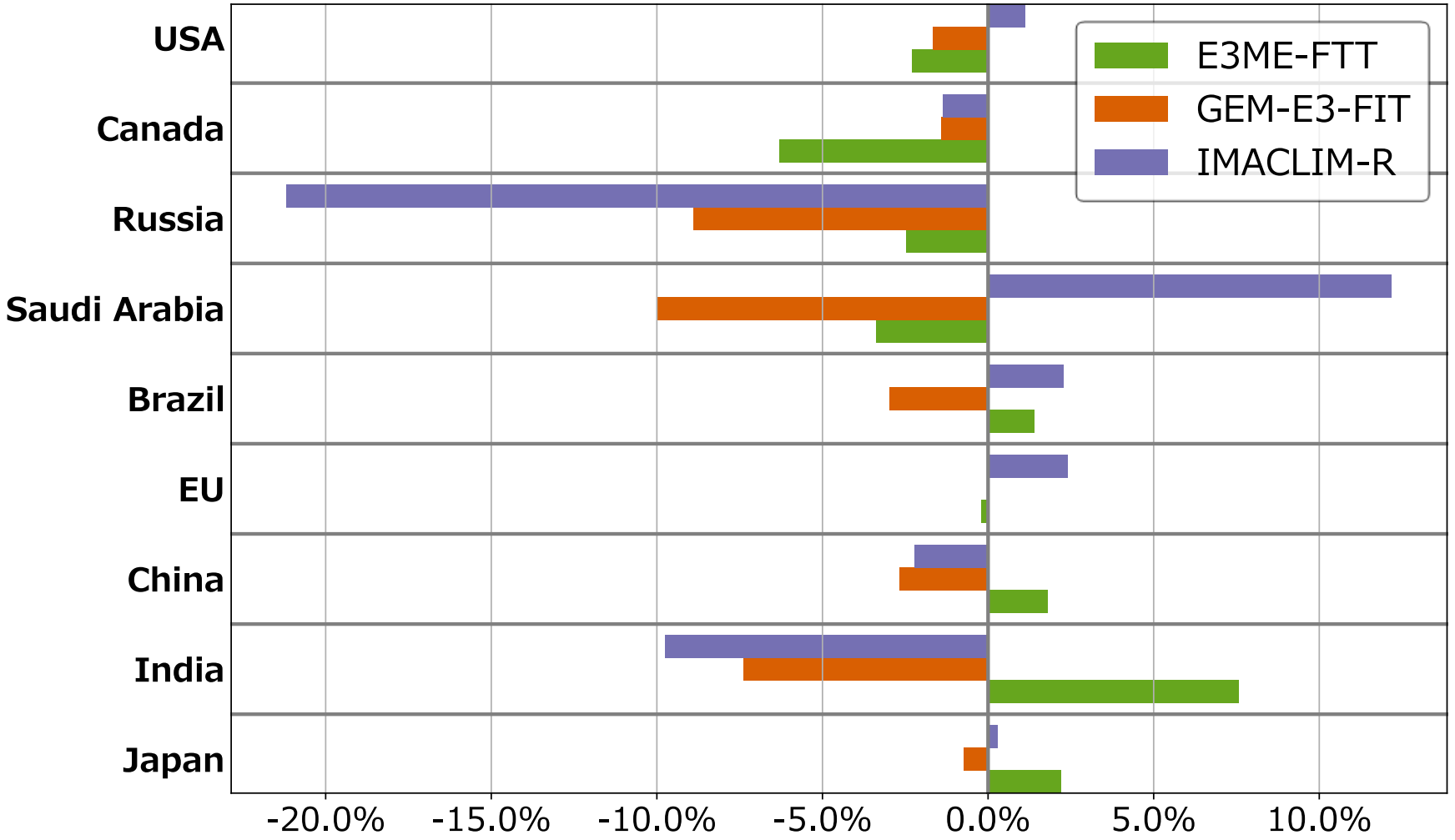
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Macro-economic models used

	E3ME-FTT	GEM-E3-FIT	Imaclim-R	JRC-GEM-E3
Model type	Macro-econometric model	CGE model	CGE model	CGE model
Macro theory branch	Non-equilibrium (Demand driven)	Equilibrium (Supply driven)	Equilibrium (Supply driven)	Equilibrium (Supply driven)
Technological change	Endogenous	Endogenous	Endogenous with high inertia	Endogenous
Energy system representation	Bottom-up, explicit technologies	Bottom-up, explicit technologies	Bottom-up, explicit technologies	Bottom-up in electricity supply Top-down (CES) in other sectors
Labour market representation	Imperfect and flexible market	Imperfect and flexible market	Imperfect market limited flexibility	Imperfect and flexible market
Investment & Finance	Unlimited	Crowding-out of investment	Crowding-out of investment	Crowding-out of investment
Sector coverage	43	52	12	31
Regional coverage	71 countries regions	46 countries	12 regions	49 countries

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

NAVIGATE Regional disparities



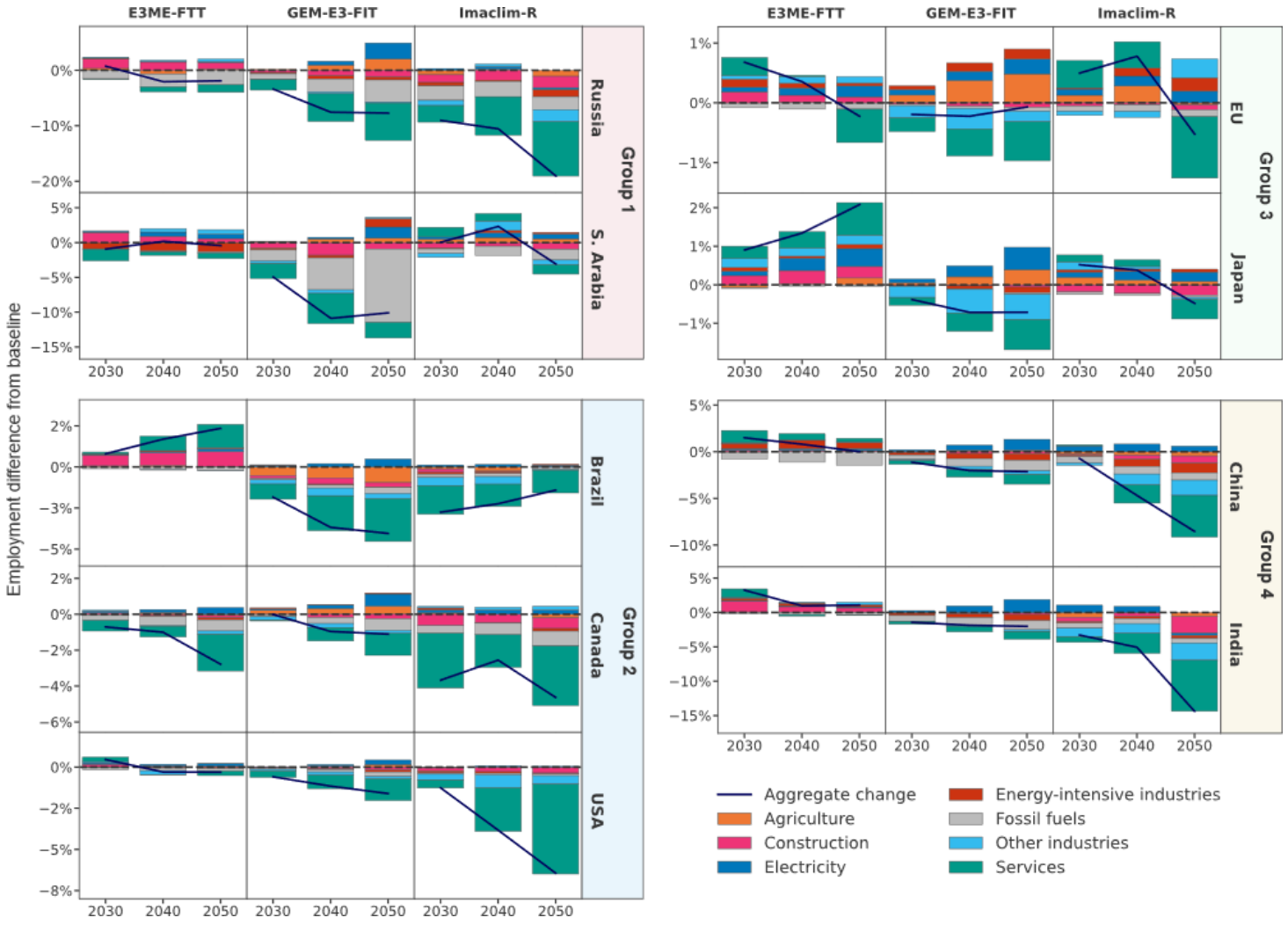
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Country classification of GDP impacts of decarbonization

Group	Degree of model similarity	GDP impacts	Countries	Fossil fuel Importer or exporter	Economic Carbon intensity
1	High	Largest negative impacts	Russia, Saudi Arabia	Exporter	High
2	High/medium	Small - moderate positive or negative impacts	Brazil, Canada, US	Exporter	Medium
3	Medium	Smallest positive or negative impacts	EU, Japan	Importer	Low
4	Low	Largest positive or negative impacts	China, India	Importer	High

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

NAVIGATE Sectoral disparities



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

NAVIGATE Sectoral classification on job impacts

Winners	Losers	Not clear
• Electricity supply • Renewables • Construction • Manufacturing for renewable goods	• Coal • Oil and gas extraction • Gas distribution • Refineries • Land transport • Air transport • Energy intensive industries	• Services (depend on outcomes of revenue recycling) • Agriculture (biofuels) • Other industries

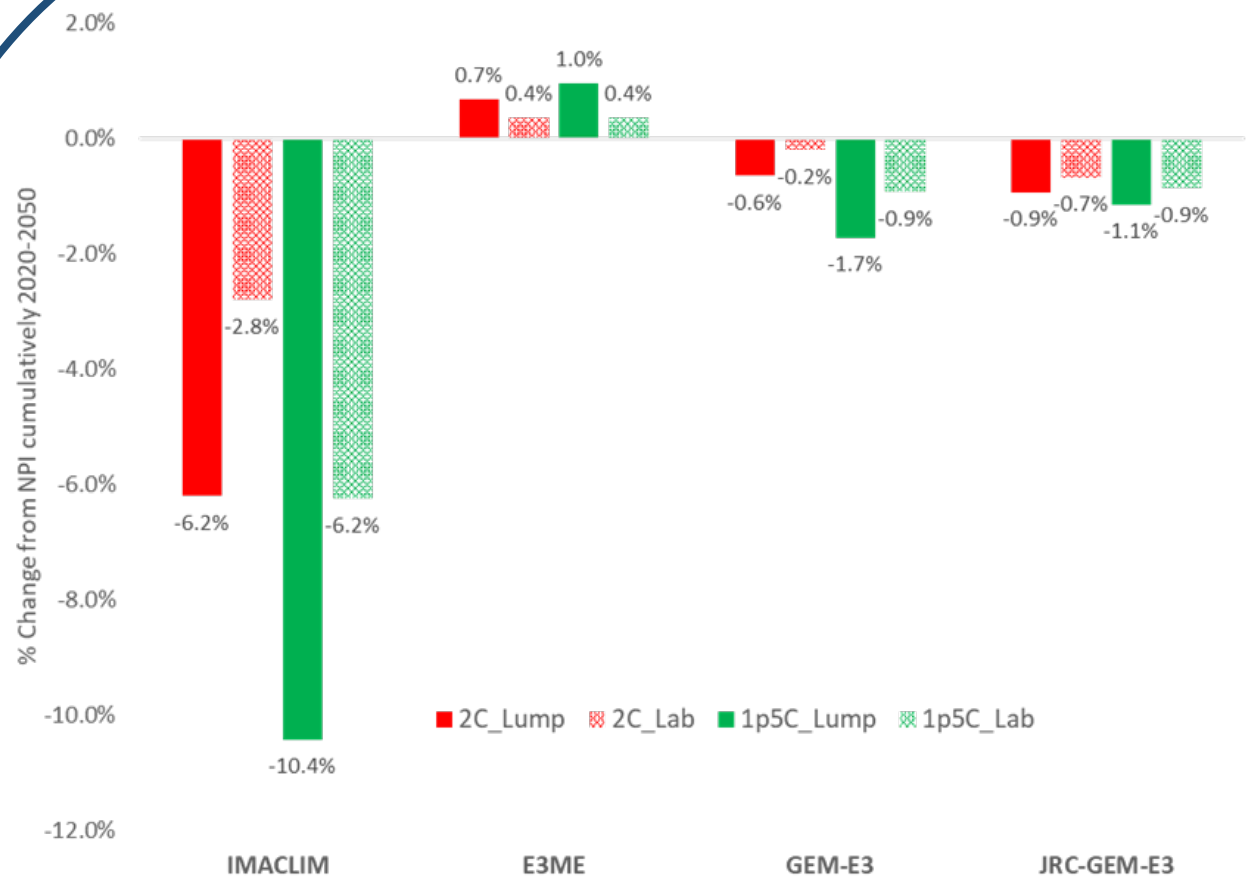
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Carbon revenue recycling

- Various ways are proposed in the literature to recycle carbon revenues that are an important revenue source for the government
- WorldBank focuses on two main schemes:
  - ➢Reduce distortive taxes on labour
  - ➢Lump-sum transfers to households (equal-per-capita basis)
- We assess these two key options using a set of 4 well-established, multi-sectoral macro-economic models
  - First multi-model, multi-country study on the issue
  - Explore the socio-economic impacts of different revenue recycling schemes in the context of Paris aligned scenarios (WB2C and 1.5C)
  - Focus on the cost-efficiency and equity impacts of recycling schemes

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

GDP impacts from CurPol in 2050



Using carbon revenues to reduce labour taxes reduces GDP losses by 30%-70% in CGE models

Two main channels:

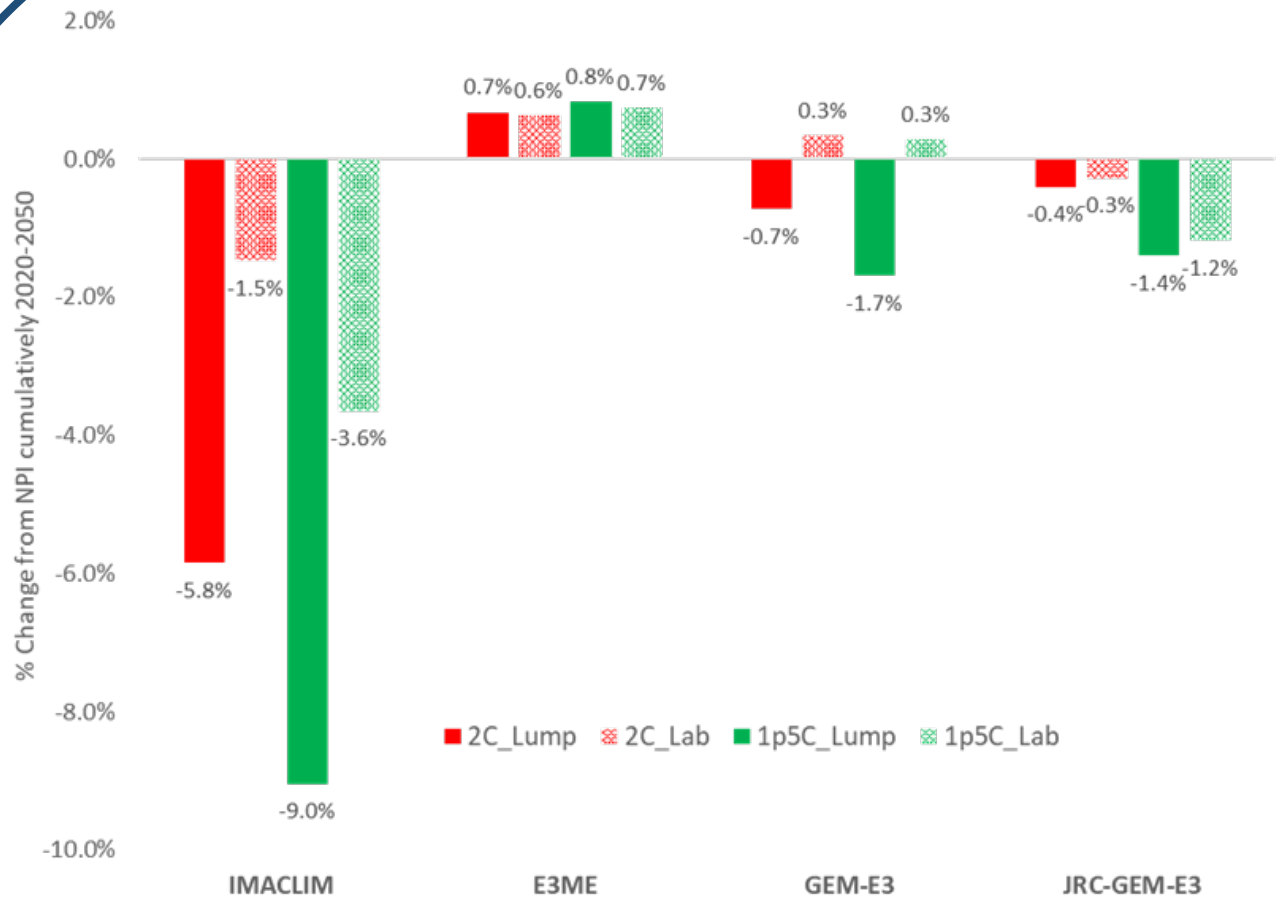
- reduced labour costs lower the production cost for firms and distortions are gradually removed
- additional labour demand increases household income and consumption.

Lump-sum transfers on an equal per capita basis can reduce inequality, but this misses opportunities for enhanced productivity and for the creation of new jobs especially in resource-constrained CGE models.

Lump-sum transfers have stronger positive impacts in E3ME as they further increase private demand in the non-equilibrium demand-led model

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Employment impacts in 2050



Two major trends influencing jobs:

- declining economic activity tends to reduce employment (in CGE models)
- more labor-intensive structure based on renewables and energy efficiency

Trade-offs between jobs lost in some sectors and jobs creation in others

The LAB scenarios lead to more positive job effects as they directly reduce labor cost thus increasing labor demand

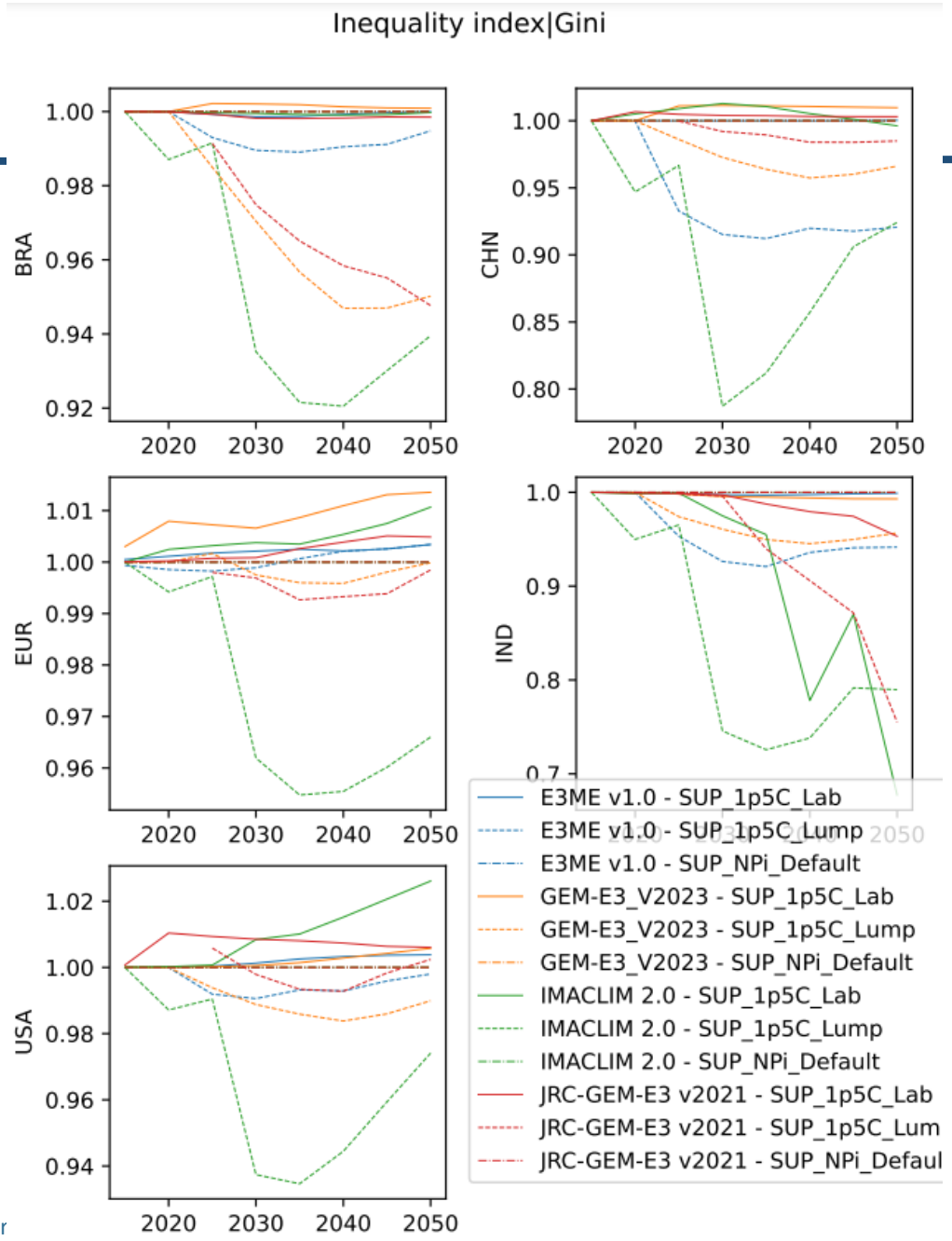
This is pronounced in GEM-E3 showing even net creation of jobs by 2050.

In E3ME-FTT, the additional demand created through lump sum transfers has a stronger job creation effect

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Inequality impacts

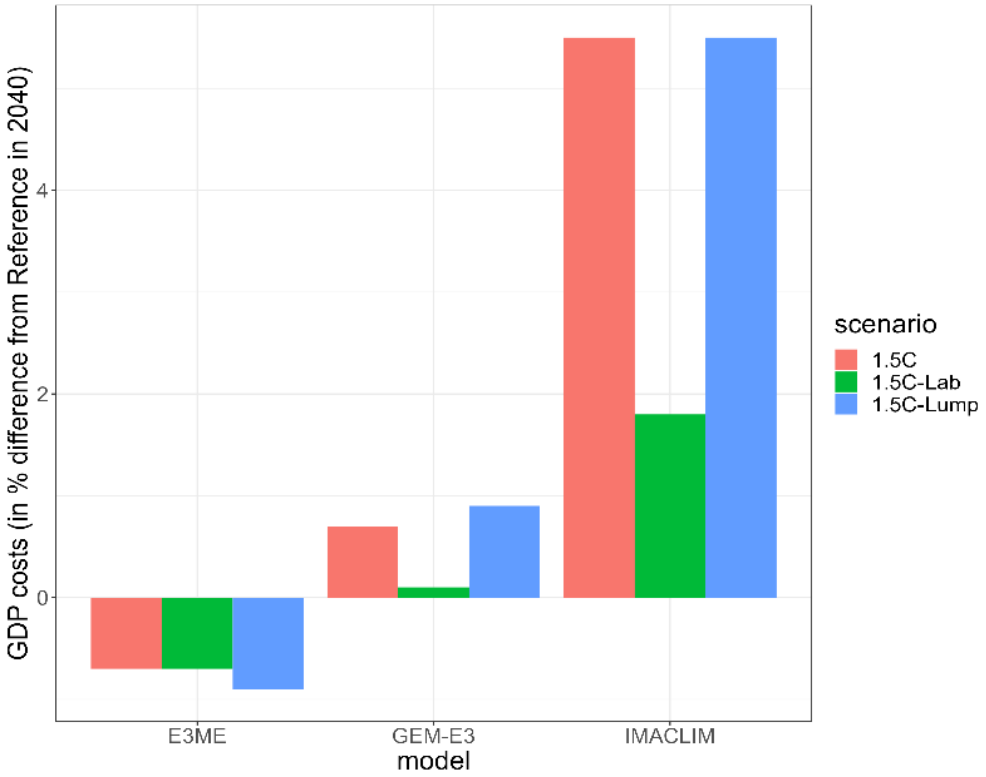
- Progressive outcomes from the lump-sum transfer policy with large Gini index improvements
- Lab tax scenarios have smaller equity impacts in countries
- Strongest results in IMACLIM, due to higher carbon revenues
- Trade-offs between equity and efficiency that need to be balanced for well-designed climate strategies



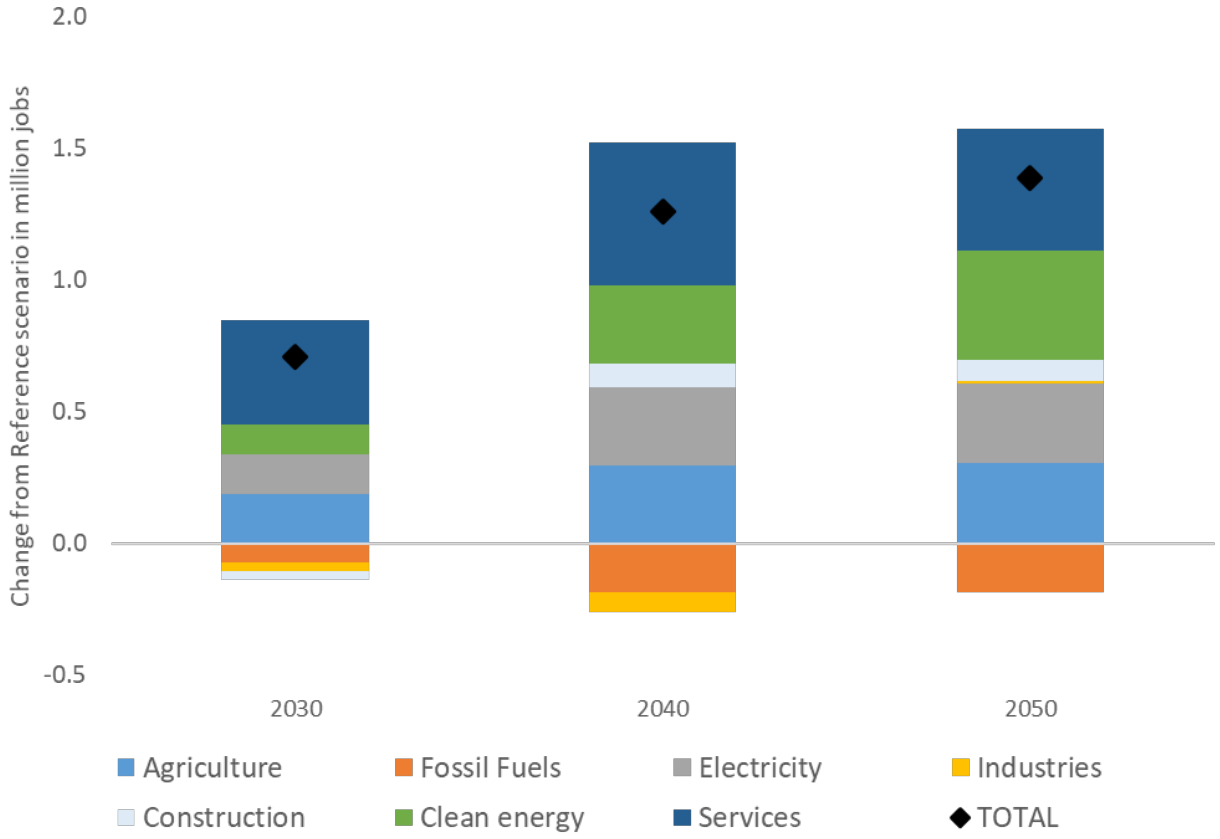
This project has received funding from the Eur
research and innovation programme under gra

EU impacts of 1.5C scenarios in 2040

GDP impacts



Job impacts by sector in GEM-E3 in the Lab scenario



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

Thank you. Q&A session

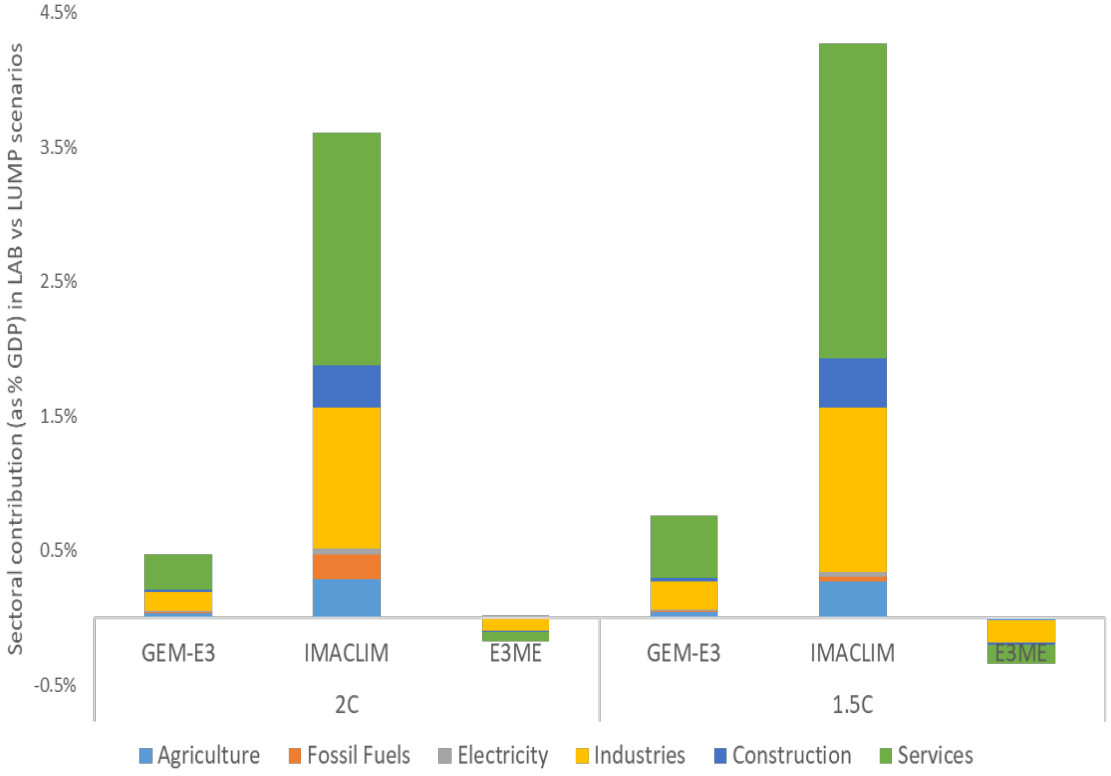
For more information

fragkos@e3modelling.com

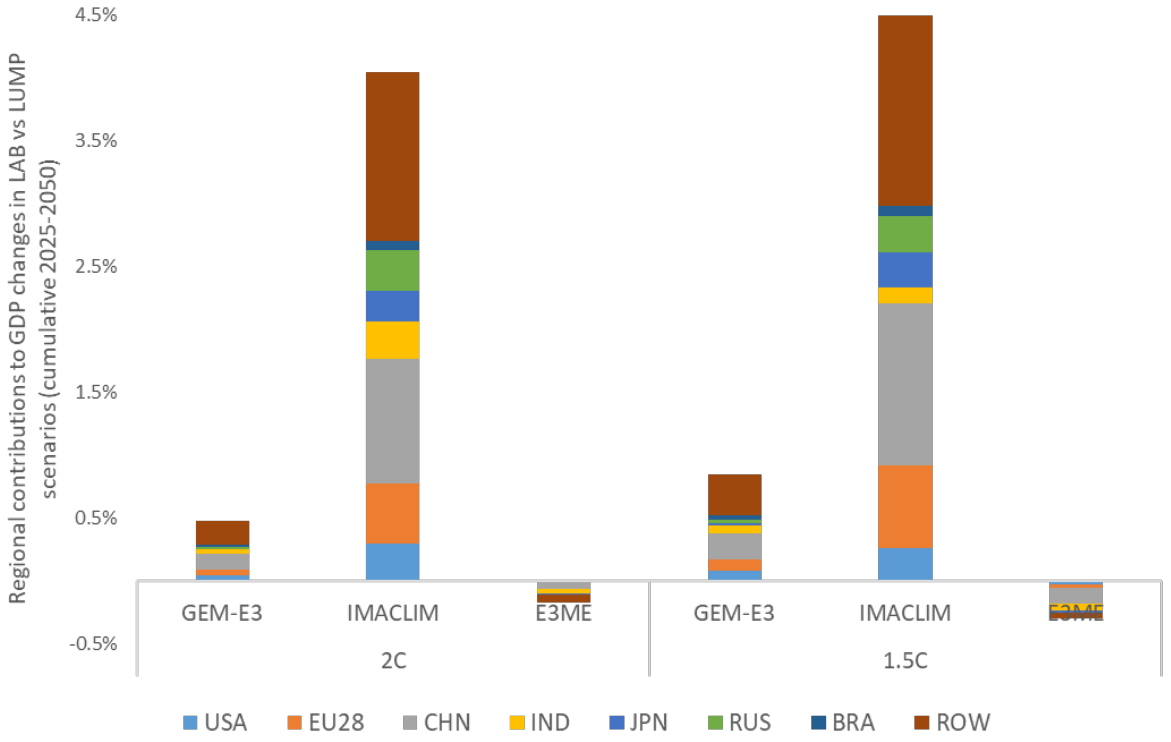
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.

NAVIGATE

Sectoral contribution to GDP increase



Regional contribution to GDP increase



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821124.