

Next generation of advanced integrated

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

> "Assessing the distributional impacts of ambitious EU climate policies and measures to enhance equality"

### Panagiotis Fragkos , June 2022, NAVIGATE-CHIPS Workshop Presenting work by Fragkos, Fragkiadakis, Sovacool, Paroussos etc



### **NAVIGATE** Distributional impacts of mitigation

- Decarbonisation may have adverse distributional impacts, posing high cost burden to those living in low-incomes
- Impacts both on the income and consumption side, as low-income groups spend relatively more for energy and transport services
- This reduces the social and political acceptance of climate policies
- Conventional CGEs and IAMs do not adequately capture heterogeneity
- Integrated modelling approaches are needed to assess social impacts





### **NAVIGATE** Modelling social impacts in GEM-E3

Soft-link of GEM-E3 with a bottom-up model that <u>separates 10 income deciles</u> differentiating their income by source, consumption by product & saving patterns

• Limited benefits from a hard-link approach while computational time increases considerably





## **INAVIGATE** Enhanced GEM-E3 modelling

- Extend GEM-E3 to capture key factors to inequality:
- <u>Detailed representation of ten income classes</u> through multiple households (different incomes, consumption & saving patterns)
- <u>Representation of involuntary unemployment</u> in labour markets for 5 different occupation and skill types;
- Endogenous technological change;
- Endogenous bilateral trade of goods and services;
- Inclusion of direct and indirect taxes, subsidies and benefits;
- But <u>always maintaining budget neutrality</u>



### Study Design and Indicators

Scenario	Scenario description	Climate target
REF	Reference scenario	All countries meet their NDCs in 2030, policy
		ambition does not increase after 2030
2DEG	Decarbonisation to 2°C	Countries adopt ambitious climate policies/
	with all available options	universal carbon pricing to meet the 2oC target
2DEG-	As 2DEG with revenue	As 2DEG
REC	recycling to households	

Indicator	Description
Gini coefficient	Based on Lorenz curve that compares income with uniform distribution that represents equality. It estimates the extent to which income distribution differs between an equal distribution and perfect inequality
Decile dispersion ratio, S80/S20	It presents the ratio of average income of the richest 20% of population divided by the average income of poorest 20% (e.g. S80/S20 income ratio)
Energy poverty	Share of energy expenditure in disposable income by decile



### **NAVIGATE** Decarbonisation affects economic structure

- Mitigation affects employment and labour income
- Structural changes in the economy with some sectors losing and others gaining
- Reduction of low-skilled labour (e.g. coal miners)
- Increase in higher-skills like technicians and managers required for the transition

### Changes in composition of value added by skill in 2DEG compared to Reference





### **NAVIGATE** Decarbonisation reduces available income



- Under strict CGE closure, income declines for all deciles, but impacts are larger for low-income ones
- Increased production costs depress demand and production and reduce GDP and labour income for EU households
- ETS revenues are recycled through public budget to increase savings and investment



### Decarbonisation increases energy costs for EU households

Decarbonisation increases energy expenditure, esp. for low-income classes, due to increases in prices of energy products & services

But impacts are limited and may be mitigated with appropriate measures targeted to low-incomes



Change of Energy Expenditure indicator in



# Double dividends with effective use of ETS revenues

Recycling ETS revenues as lump-sum to households leads to higher incomes mostly for low-income households, thus improving income equity and Gini index



### This idea is now proposed In the Social Climate Fund (part of Fit for 55)



research and innovation programme under grant agreement No 821124.

### **NAVIGATE** Conclusions

- The EU pathway to net zero may lead to regressive impacts, putting additional cost burden to low-income classes
- Decarbonisation would reduce the incomes of low deciles, due to a shift away from low-skilled occupations, and increase societal inequalities
- However, <u>transferring ETS revenues to households can support their incomes</u> (and jobs) and even reduce inequality, as low-income classes benefit more from government transfers
- Decarbonisation should be accompanied with fiscal policies to redistribute income across classes & ensure a just transition



# Thank you.

# For more information <u>fragkos@e3modelling.com</u>





### Inequality in the Reference scenario

#### Composition of EU labour value added by skill over 2020-2050 in REF Slight transition to higher skills

#### Evolution of Gini index over 2020-2050 in EU Member States



3.5

