LOCOMOTION

Low-carbon society:
An enhanced modelling tool for the transition to sustainability

Feasible alternatives to green growth... *at the time of COVID-19*

LOCOMINAR 6.11

LOCOMINAR Series

Simone D'Alessandro

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821105.

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Low-carbon society: An enhanced modelling tool for the transition to sustainability

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"LOCOMOTION aims to enhance the existing MEDEAS IAMs to provide policy-makers and relevant other stakeholders with and open source, well-documented model to assess the feasibility, effectiveness, costs and impacts of different sustainability policy options"

The project

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- Coordinator: Universidad de Valladolid (Spain)
- Partners:

UNIPI, SDEWES, AEA, BC3

CESAR, UoI, CRES, FC.ID

UNU-EHS, EEB, CREAF, CARTIF, INN

Introduction

D'Alessandro, Cieplinski, Distefano, Dittmer (2020). **Feasible alternatives to green growth**, *Nature Sustainability, **3**, pp. 329-335*

- **Climate change** and **increasing inequality** have emerged as twin threats to contemporary standards of living, peace, and democracy
- These problems are usually **tackled separately** in the policy agenda (NECPs, SDGs, COPs)
- A new breed of radical policies (*post-growth*) has been advanced to manage a fair low-carbon transition, often deemed economically and politically unfeasible
- Three main narratives for policy actions:
  - **Green Growth**
  - **Green New Deal**
  - **Post-Growth**

Green Growth Strategy

The main response to the global challenges posed by climate change are currently based on **Green Growth** policy proposals, namely:

- mainstream and institutional paradigm focused on *technological optimism*;
- **market-oriented view**: *trickle-down effect* should improve welfare and job creation;
- **one-size-fits-all solution**: *GDP growth*

Critiques to the ability of market mechanisms and innovations to

- foster **material decoupling** (Wiedmann, 2015)
- meet **planetary boundaries** (Steffen, 2015, O'Neill, 2018)
- avoid **critical transitions** (Scheffer, 2012)
- ensure social justice: within-country **inequality** (Piketty, 2014)
- overcoming the rebound effect: **% RES and CO2 per capita**

Alternatives to Green Growth

GREEN DEAL

recognizes the need to address inequality and environmental issues in a unified perspective combining social policies with *green growth* measures

> ***Ursula von der Leyen*** *(11th Dec, 2019): "new growth strategy that transforms the Union into a modern [...] economy where there are no net emissions of greenhouse gases by 2050, where* ***economic growth*** *is* ***decoupled*** *from resource use and where* ***no one and no place is left behind****"*

POST-GROWTH

advocates that continuous economic growth and ecological sustainability are incompatible (Hickel and Kallis, 2019)

→ *down-shift* of economic scale

Social policies becomes essential to face inequality

What we do

We develop **EUROGREEN**, a macrosimulation model tailored to compare the long-run effects, synergies and trade-off of these three alternative narratives.

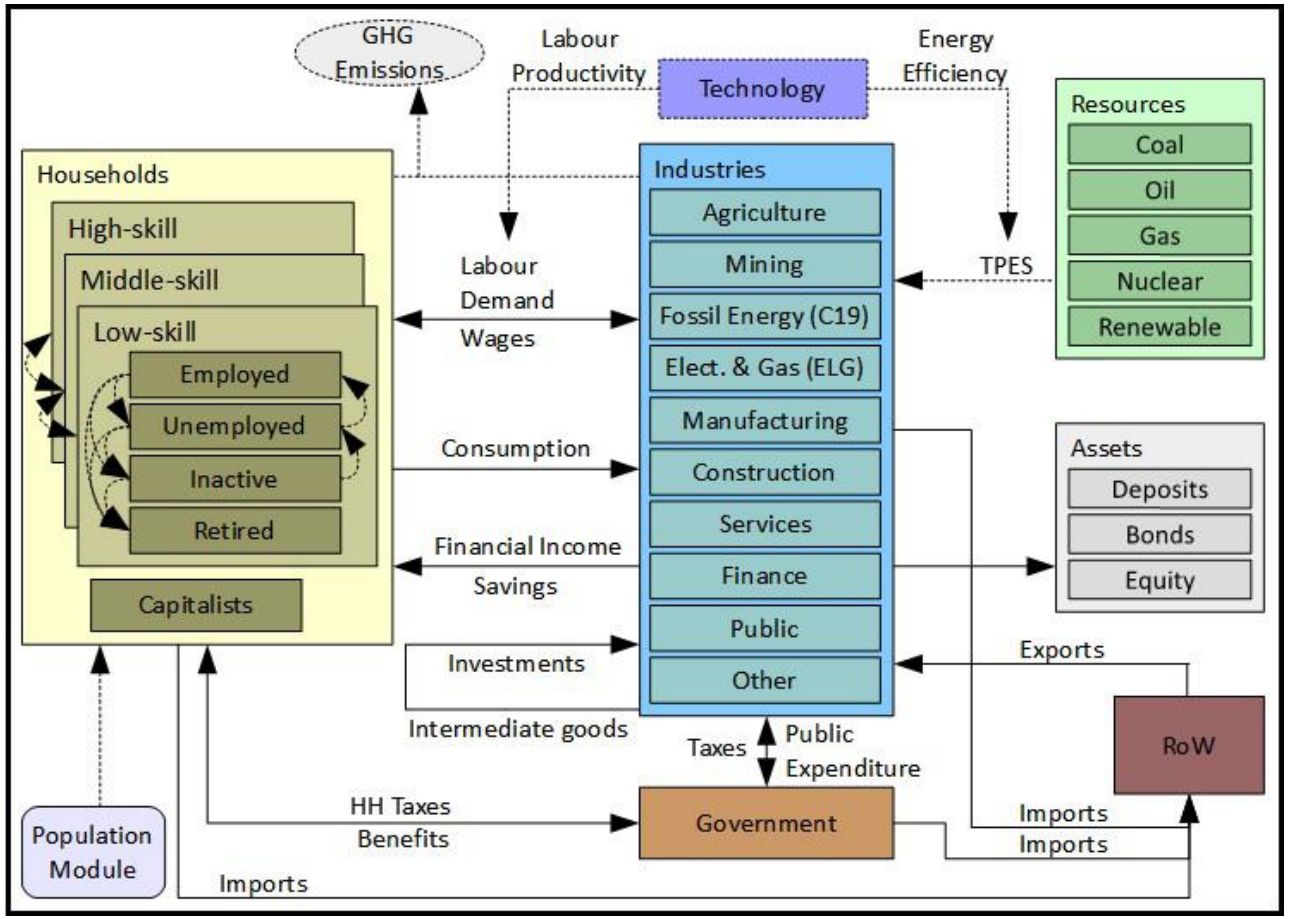
Research Questions

- Are the current measures advocated for green growth at **risk of fostering inequality** within countries?
- If so, is there any room for social policies to **offset** such **harmful outcome**?
- Is a **downscale in consumption** necessary to meet environmental targets?

Our contribution

- compare direct/indirect effect of different policy-mix scenarios
- clarify the reciprocal relationships between energy and social policies
- provide a detailed socio-economic and energy structure

Macro-view



EUROGREEN applied to France (2014-2050). Datasources: Eurostat,EU-Klems, WIOD, OECD, IEA, and INSEE. Softwares: Vensim, Matlab.

Scenarios setting

Each policy-mix is composed by several individual policies

GREEN GROWTH

energy efficiency, RES, electrification, change in the energy mix, carbon tax and labour productivity

HLP+HEEF+EnM+BCA

POLICY FOR SOCIAL EQUITY

adds to GG two social policies: **Job Guarantee** and **Working Time Reducition**

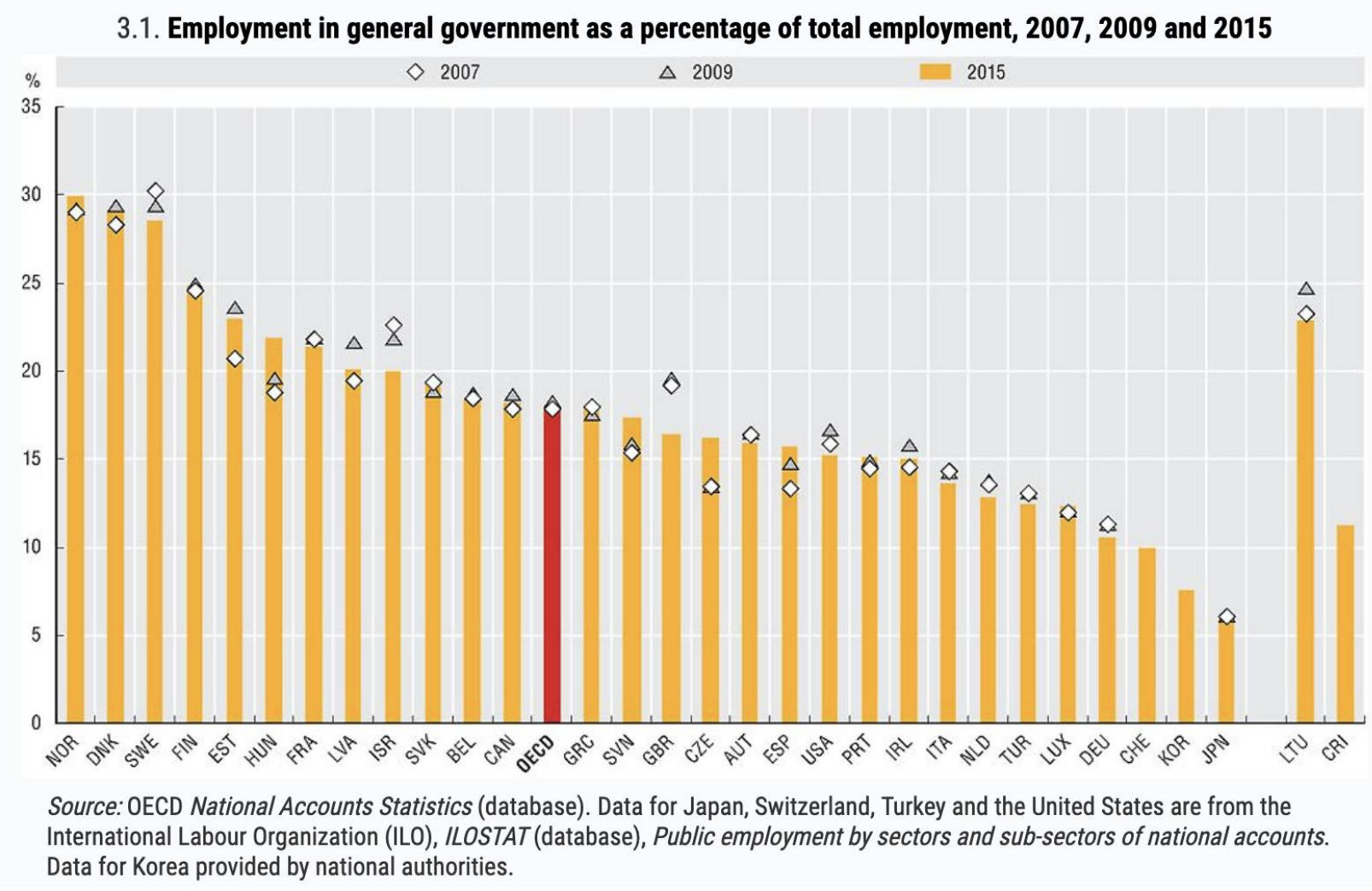
HEEF+EnM+BCA+WTR+JG

DEGROWTH

adds to PSE two social policies: **Consumption Reduction, Export Reduction** and **Wealth Tax**

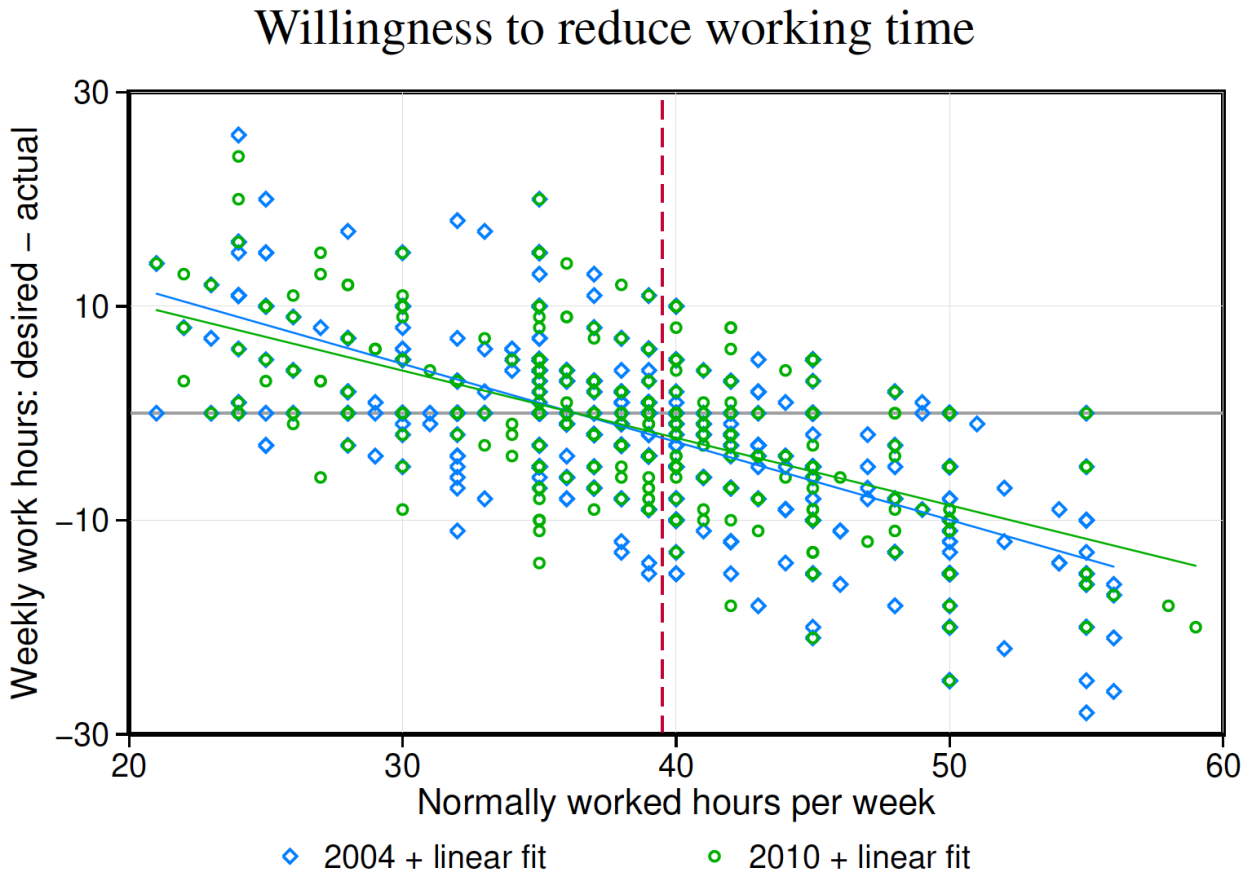
HEEF+EnM+BCA+ WTR+JG+CR+WT

Job Guarantee



Source: OECD *National Accounts Statistics* (database). Data for Japan, Switzerland, Turkey and the United States are from the International Labour Organization (ILO), *ILOSTAT* (database), *Public employment by sectors and sub-sectors of national accounts*. Data for Korea provided by national authorities.

Working Time Reduction

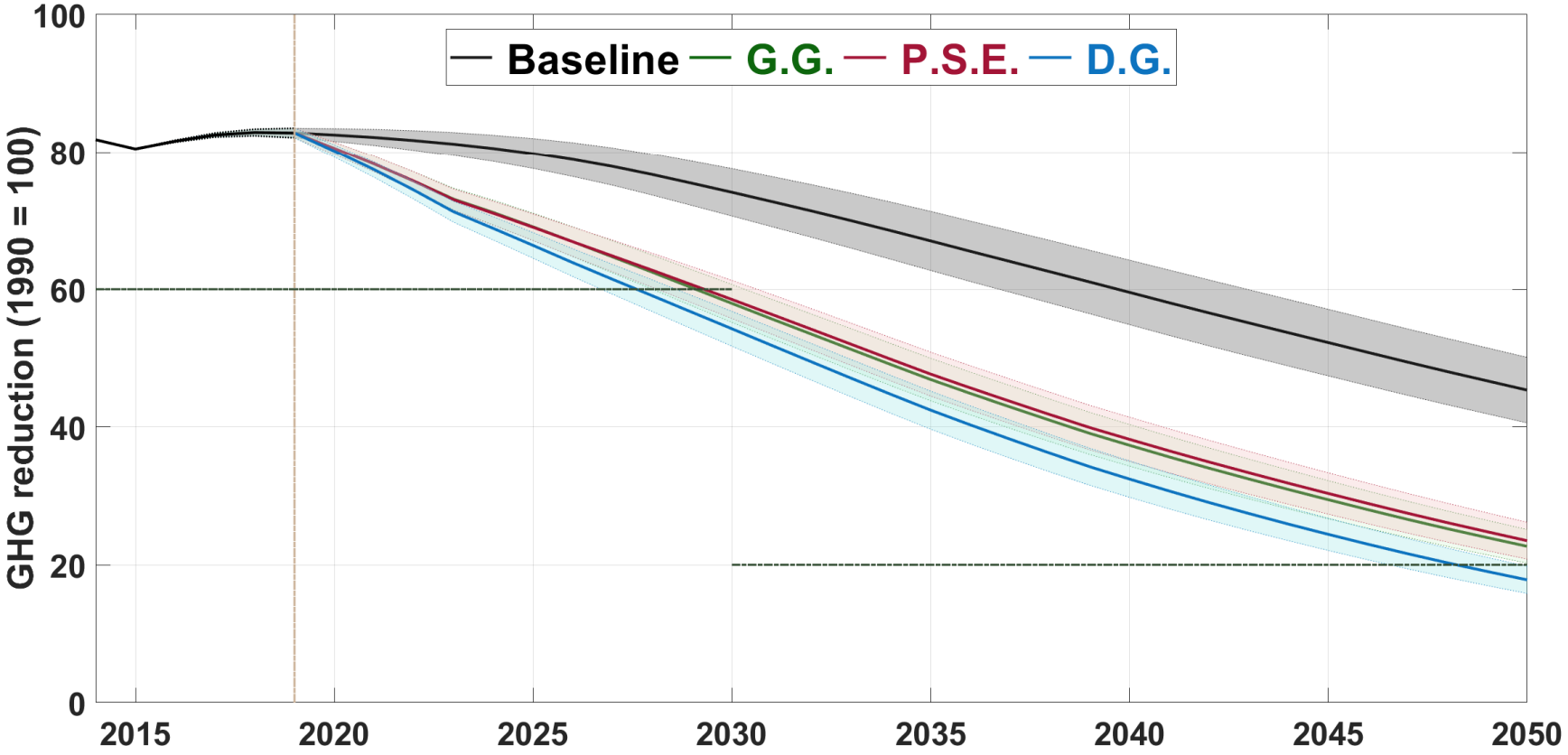


Source: French data from the European Social Survey (2004 and 2010)

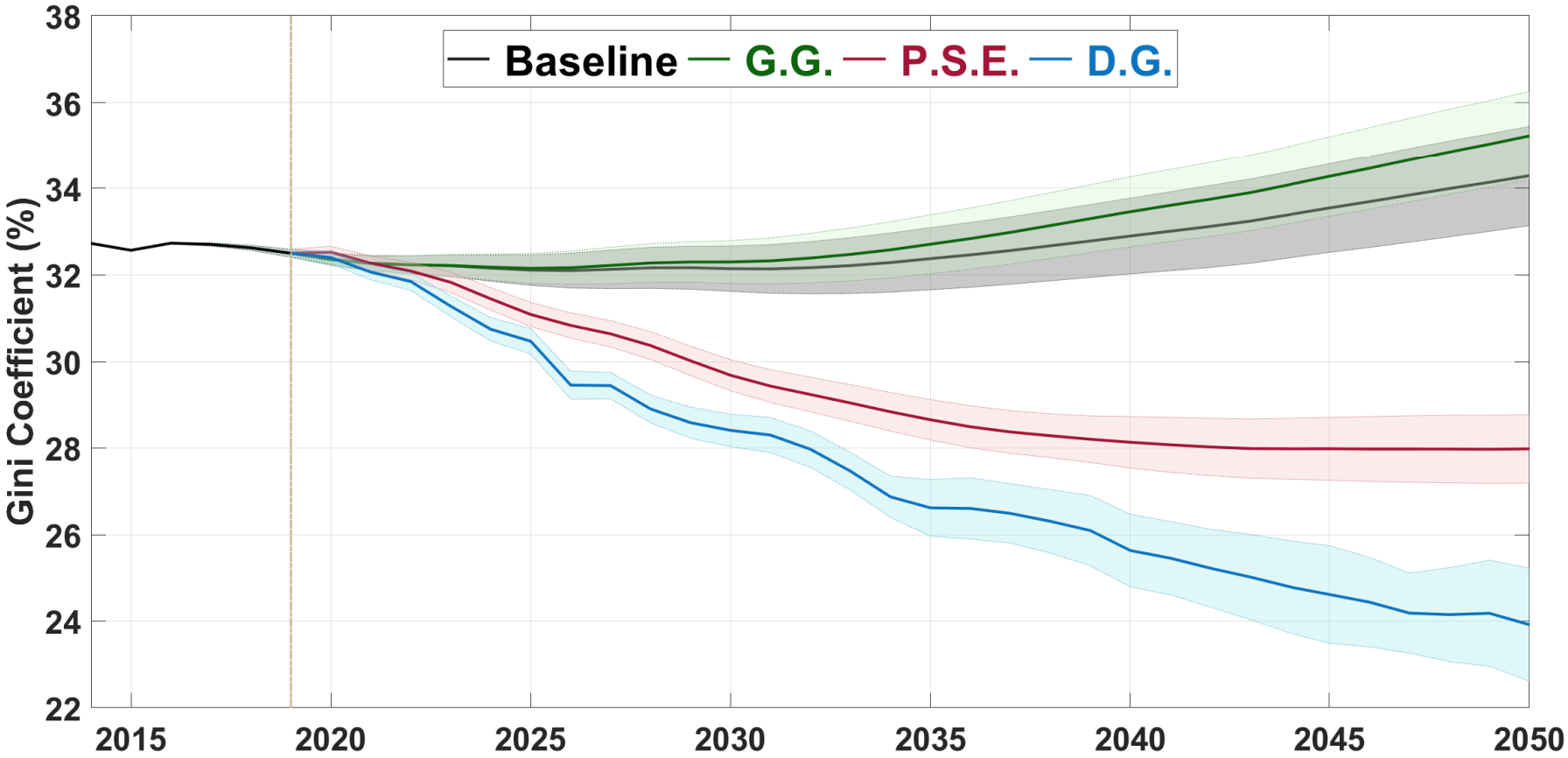
Main indicators

- **GHG emissions** with respect to 1990. Targets: −40% in 2030 and −80% in 2050
- **Gini coefficient** for income inequality: from 0% (no ineq.) to 100% (max ineq.). Computed over 13 groups (3 skill by 4 work status + capitalists) including incomes from labour, financial assets and wealth
- **Deficit/GDP**: fiscal sustainability
- **GDP growth**
- **Unemployment**: total and by skill
- **Energy Mix**: shift in source composition in electric power generation and TPES.

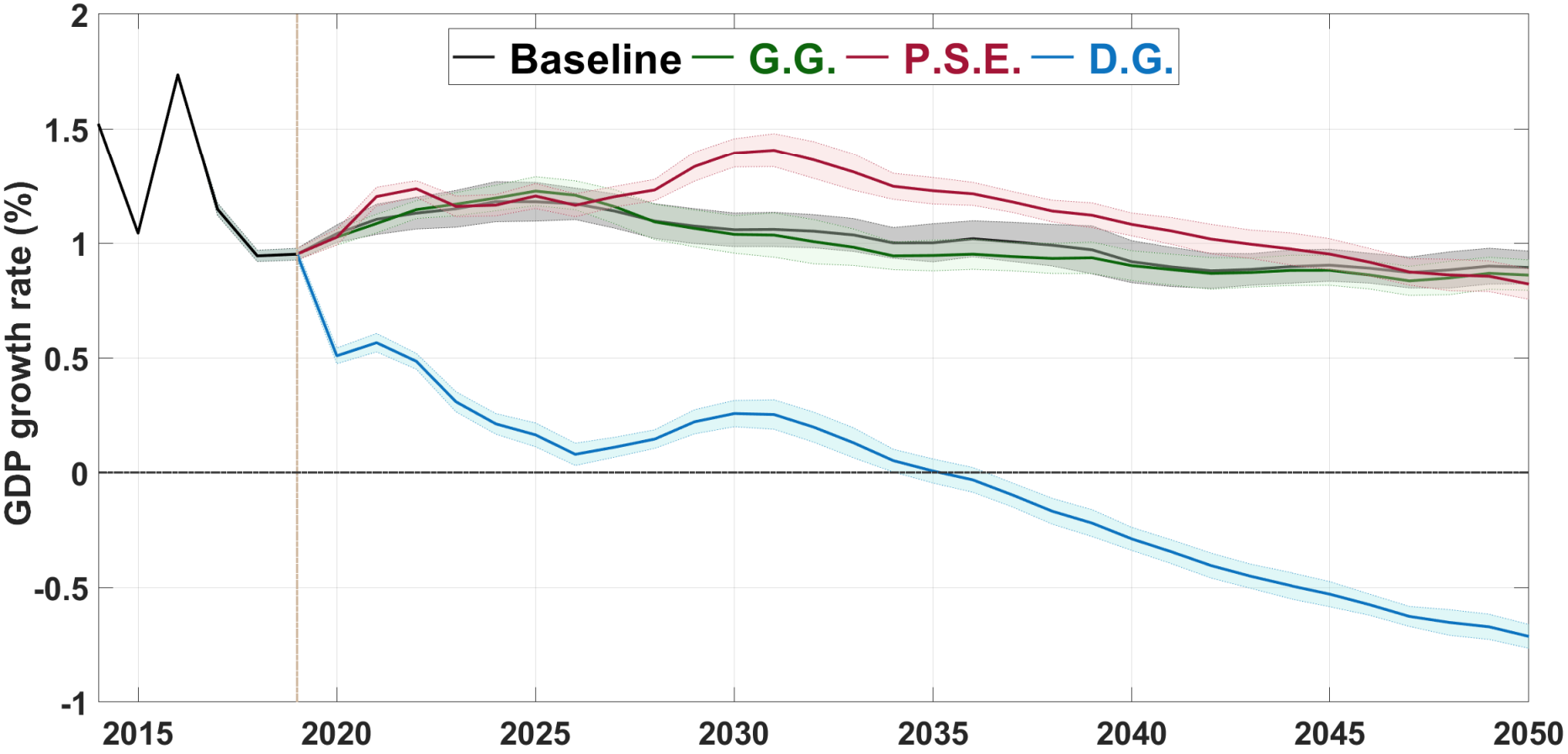
Results: GHG Emissions (1990=100)



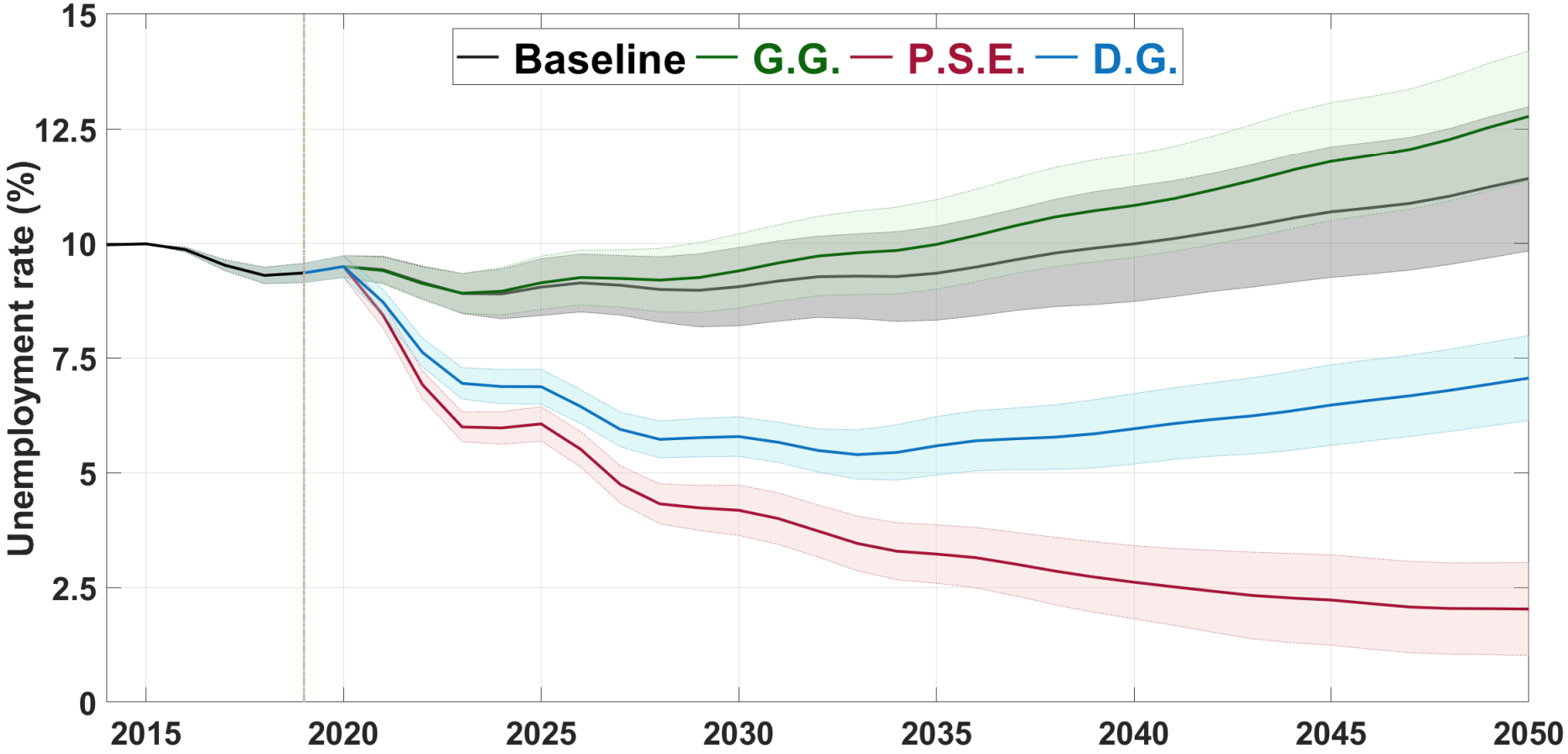
Results: Gini Coefficient (%)



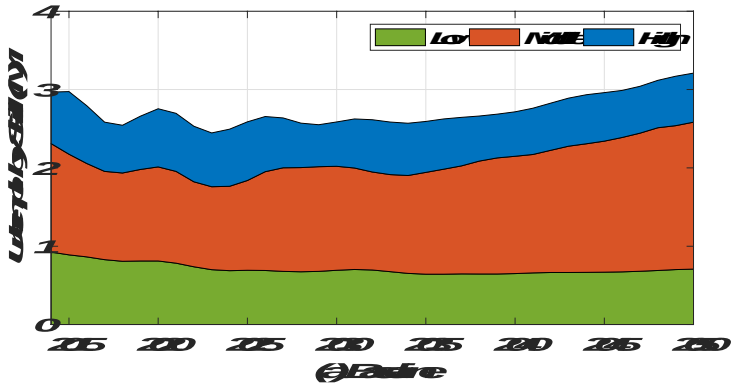
Results: GDP Growth (%)

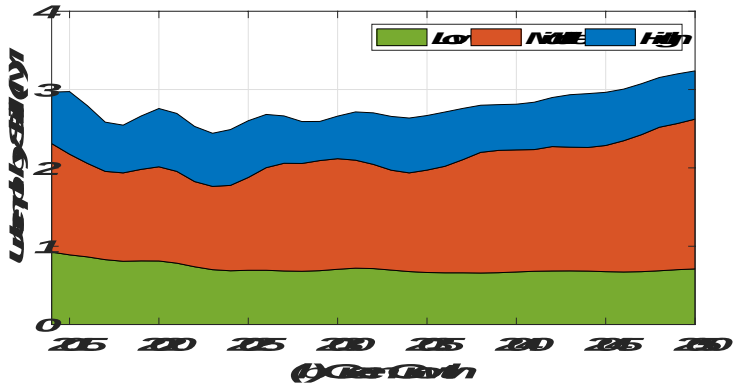


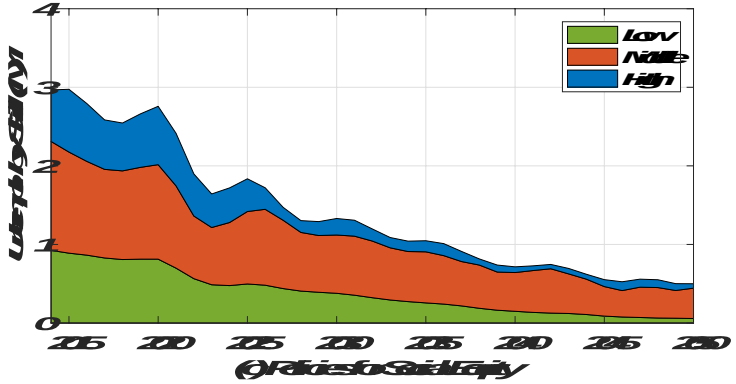
Results: Unemployment Rates (%)

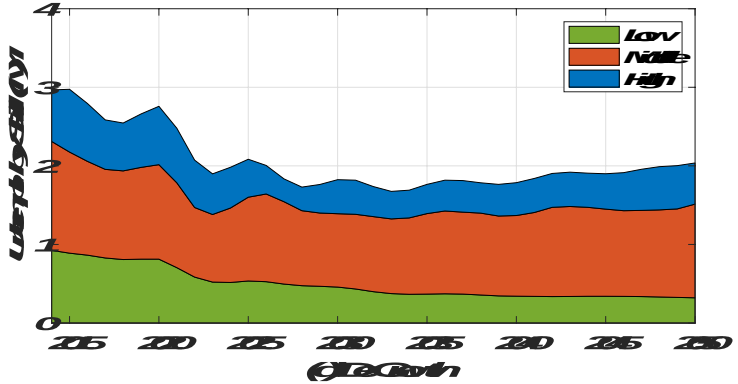


Results: Unemployed by skill (million)

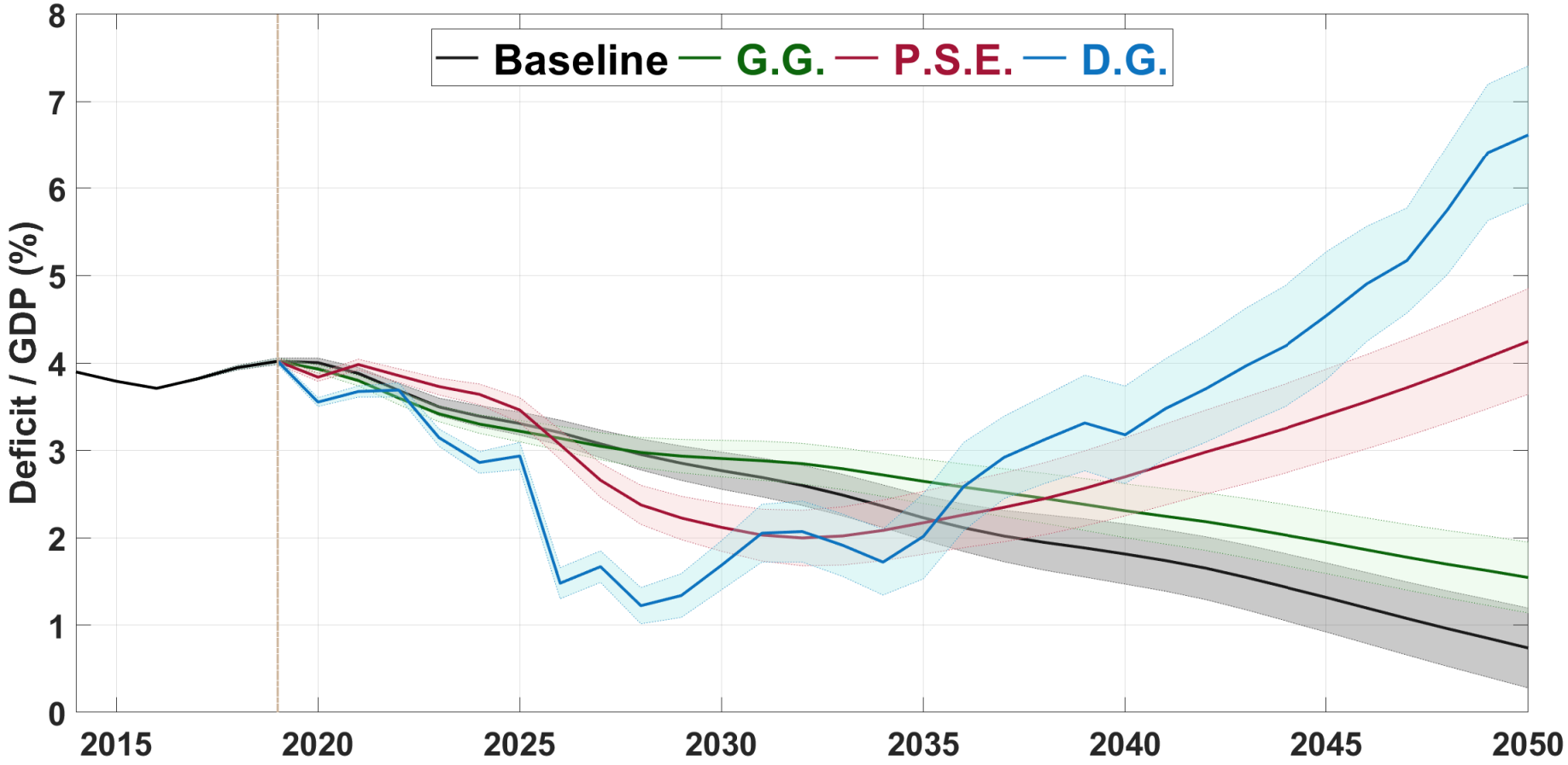








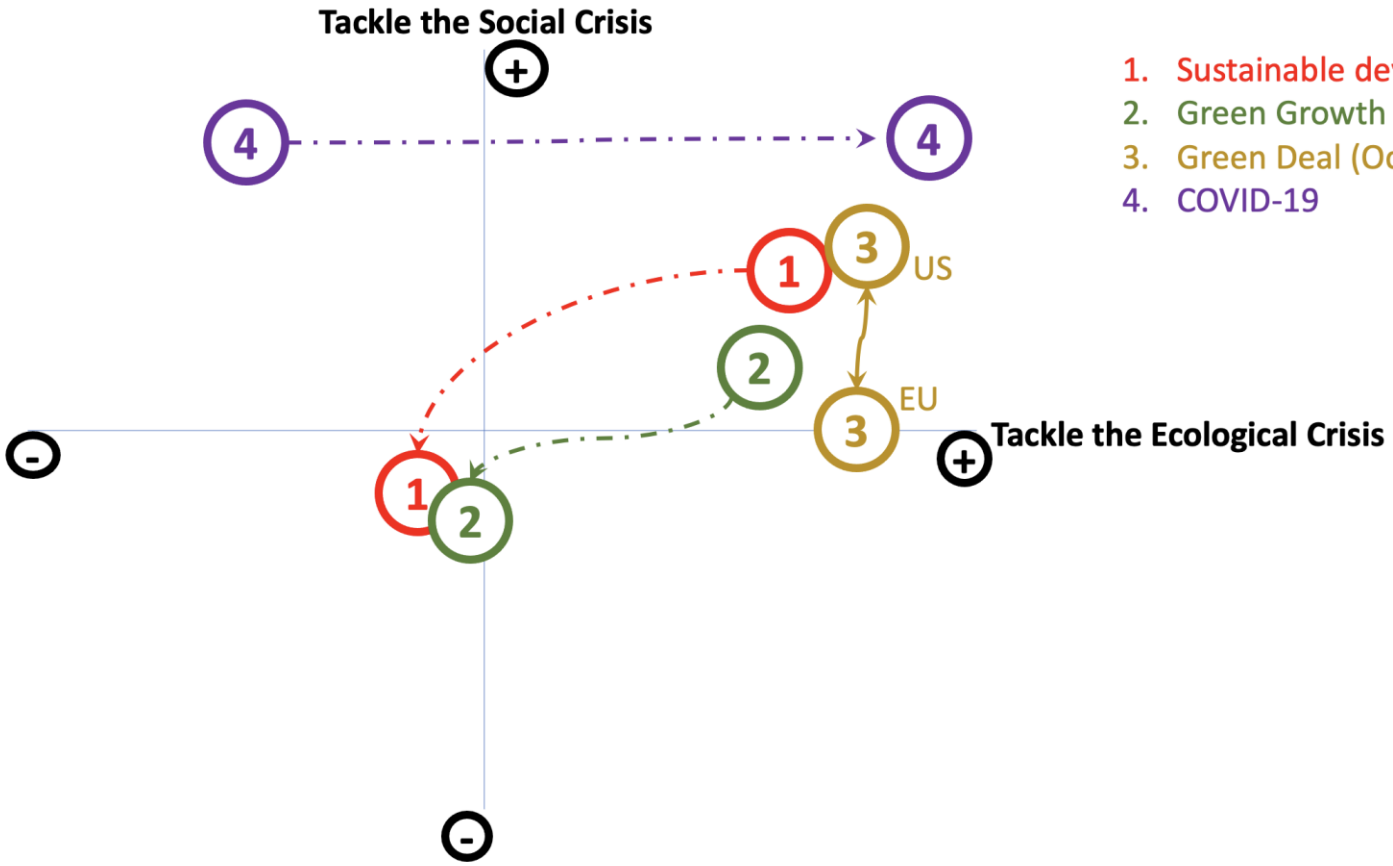
Deficit-to-GDP ratio(%)



Discussion

- Our results suggest that there are **no win-win solutions**
- Similar reductions in emissions can result in ***radically different social consequences*** in terms of income distribution, employment, and fiscal stability.
- **Green Growth Paradox** $\Longrightarrow$ The effectiveness of GHG reductions depends on the failure to promote GDP growth.
- ***Techno-scepticism***: Environmental policies alone fails to deliver the advocated improvements in employment and income distribution
- **Radical social policies** (JG and WTR) can combine social prosperity and low-carbon emissions
- Lower aggregate demand helps emission target achievement

COVID recovery and ecological transition



STRATEGIES:

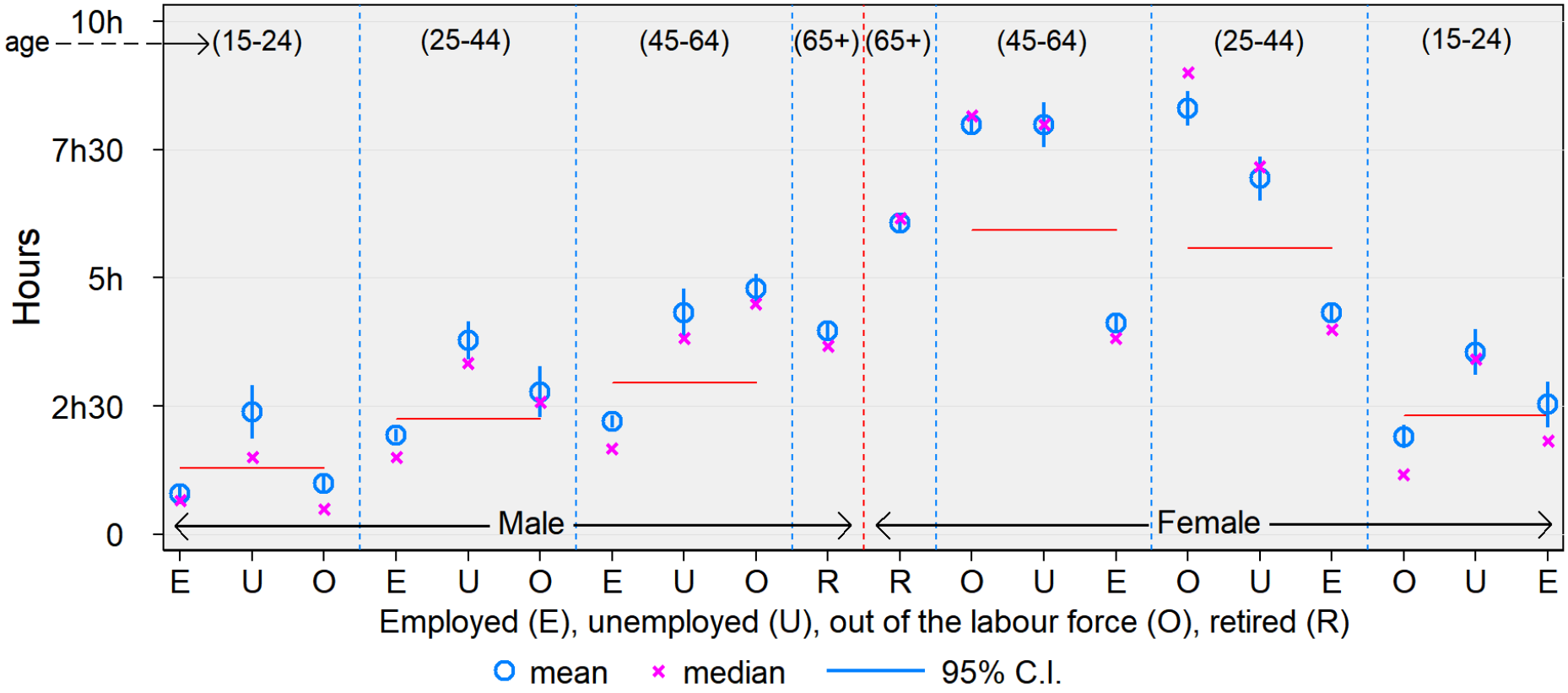
1. Sustainable development ('90s)
2. Green Growth
3. Green Deal (Ocasio-Cortes vs. von der Leyen)
4. COVID-19

Timely social innovation

- **Ideally, WTR should:**
  i. maintain **high levels of employment** without increasing emissions
  ii. improve the distribution of **paid working time**
  iii. improve **hourly wage distribution**
  iv. address **gender income inequality** and the gender time gap

- Fortunately, we don't need to rely exclusively on WTR to deliver all of the above
- Better results can be achieved **combining WTR with universal income policies**

Time use: unpaid work



Daily hours of unpaid word by gender, age group and occupational status.
Data from reported weekdays in the 2013 *Italian Time Use Survey*.

Time use and macroeconomics

The following results are from the Italian version of the model with some modifications:

1. Labour demand and supply by skill and gender

2. Five time uses for 60 population groups: age-group, gender, skill, occupational status

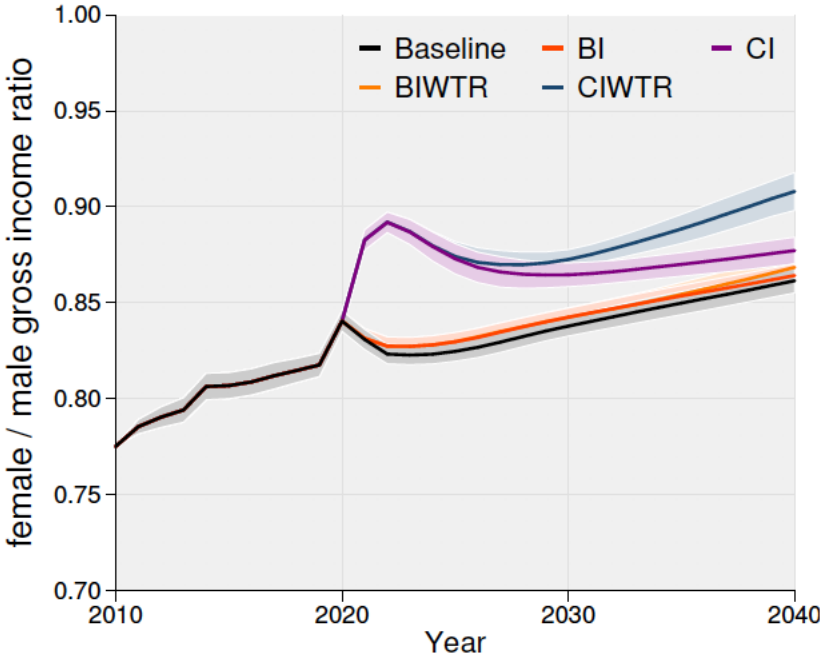
3. LFPR are a function of the difference between expected labour income and out-of-labour-force income.

4. Reduction in paid working hours redistributed to unpaid work and leisure according to coefficients estimated from ITUS.

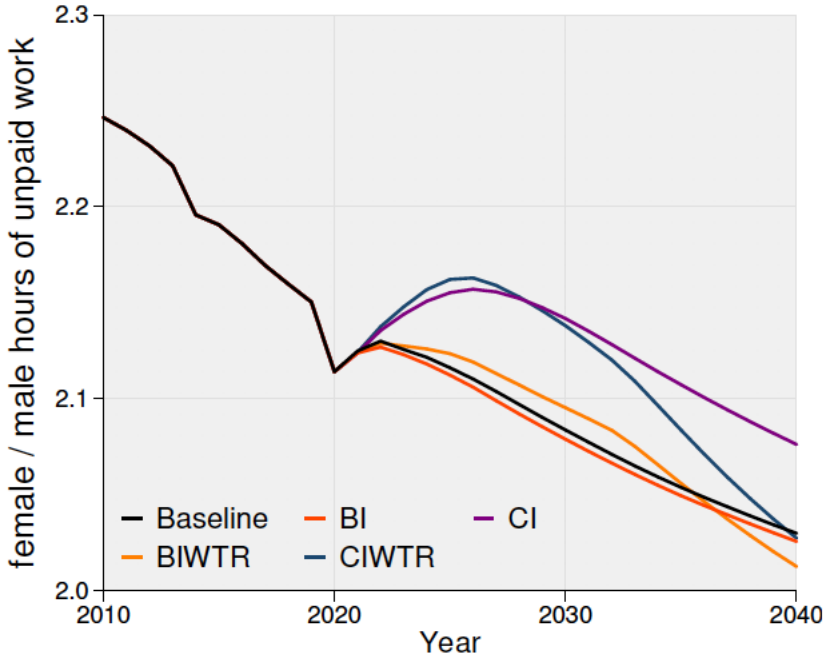
Policies & Scenarios

- **WTR:** from 40 to 30 weekly hours between 2020 and 2040
- **Universal Basic Income:** 3; 500 euros year for all 15+ population.
- **Universal Care Income:** 5 euros/hour of unpaid work (6; 500 euros year for 45–64 out of labour force, low–skill female)
- **Income tax rates:** lowest bracket increased from 0.23 to 0.35. Others increased proportionally to maintain current progressiveness.

Preliminary Results

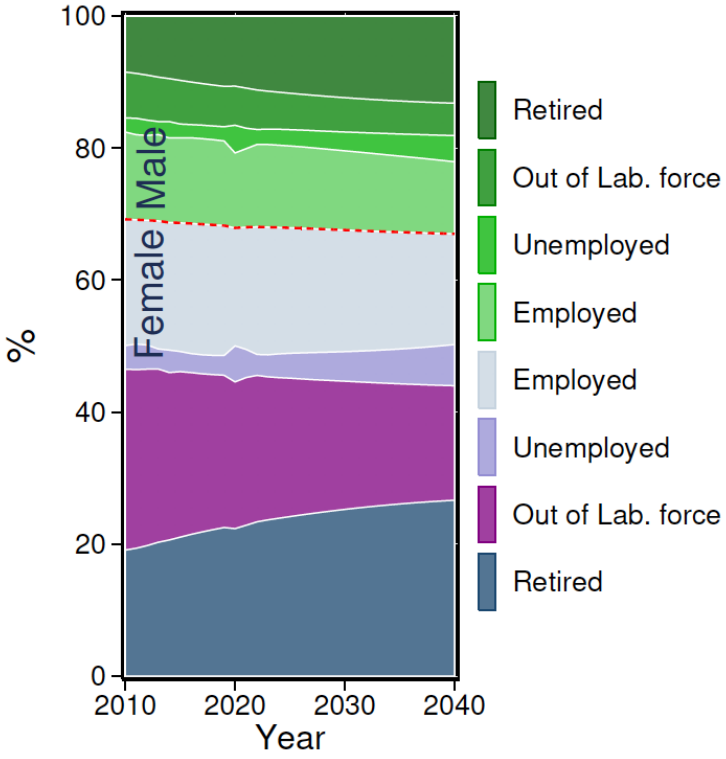


(a) Gross non–financial income ratio

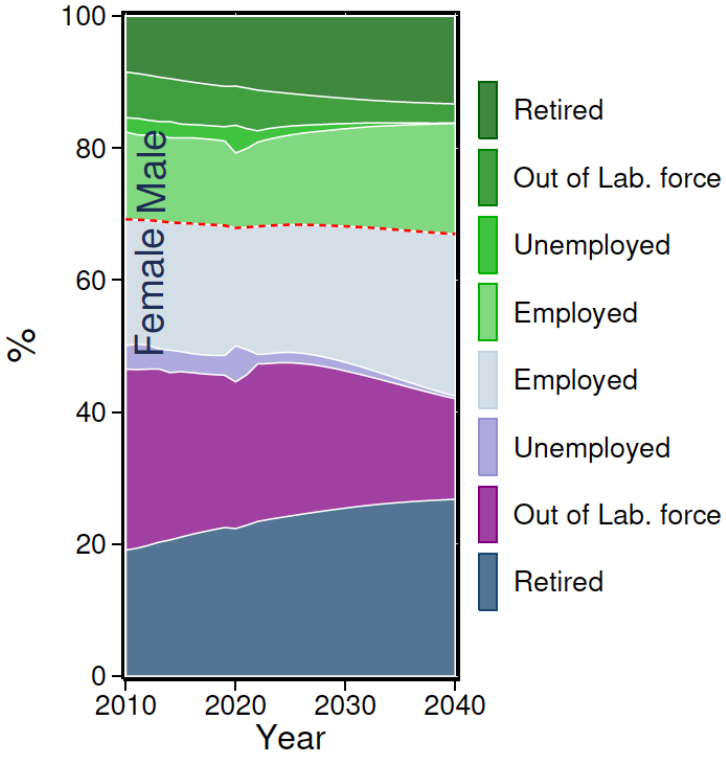


(b) Hours of unpaid work ratio

Preliminary Results



(a) Baseline



(b) CI + WTR

Final Remarks

- **Radical social policies** are necessary to reduce inequality and make the ecological transition possible.
- **Such policies,** such as WTR, JG, CI, BI gain momentum and can promote social innovation in the post-COVID phase.
- A better **distribution of time** (and income) is a precondition for adapting to planetary boundaries.
- Decoupling seems unfeasable in the short and middle run. Thus, economic growth is an impediment to the transition.
- We need to concentrate our effort on social innovation to guarantee **prosperity for all** in absence of growth.

UNIPI TEAM

André Cieplinski – Tiziano Distefano – Pietro Guarnieri – Simone D'Alessandro

Publication and Working Papers

- Cieplinski, D'Alessandro and Guarnieri (2021). Environmental impacts of productivity-led working time reduction, *Ecological Economics*, vol. 179.
- D'Alessandro, Cieplinski, Distefano, Dittmer (2020). Feasible alternatives to green growth, *Nature Sustainability,* 3, pp. 329–335
- Cieplinski, D'Alessandro, Distefano, Guarnieri (2020). Coupling environmental transition and social prosperity: a scenario-analysis of the Italian case, *DEM Discussion paper.*

Work in progress

- Cieplinski, D'Alessandro, Marghella (2020). Assessing the renewable energy policy paradox: a scenario analysis for the Italian electricity market.
- *Distefano, D'Alessandro (2020).* Environmental effectiveness and societal impacts of the Carbon Tax: The Italian case.
- Cieplinski, D'Alessandro, D'Alisa, Guarnieri, (2021). Who Cares? Universal care income and working time reduction effects on gender income and time gaps.

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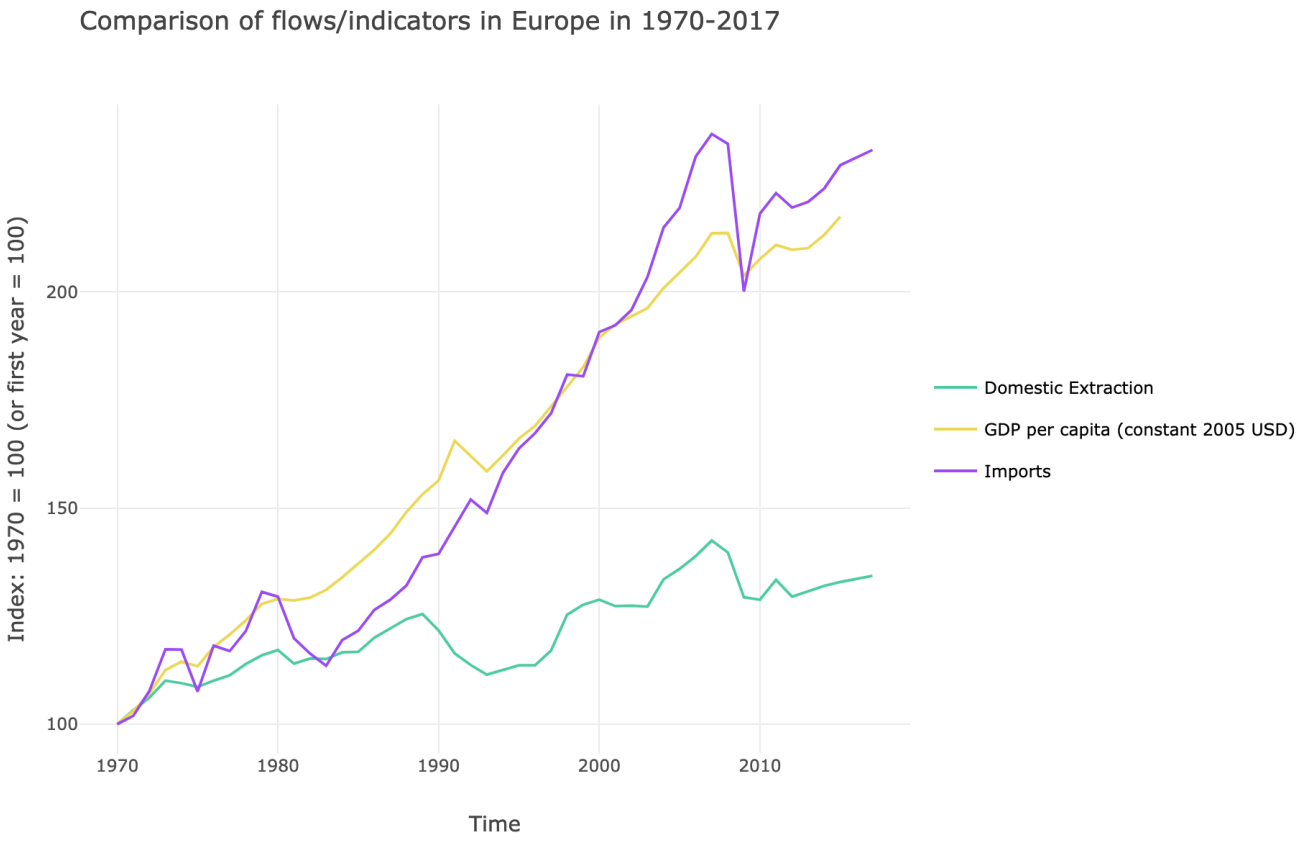
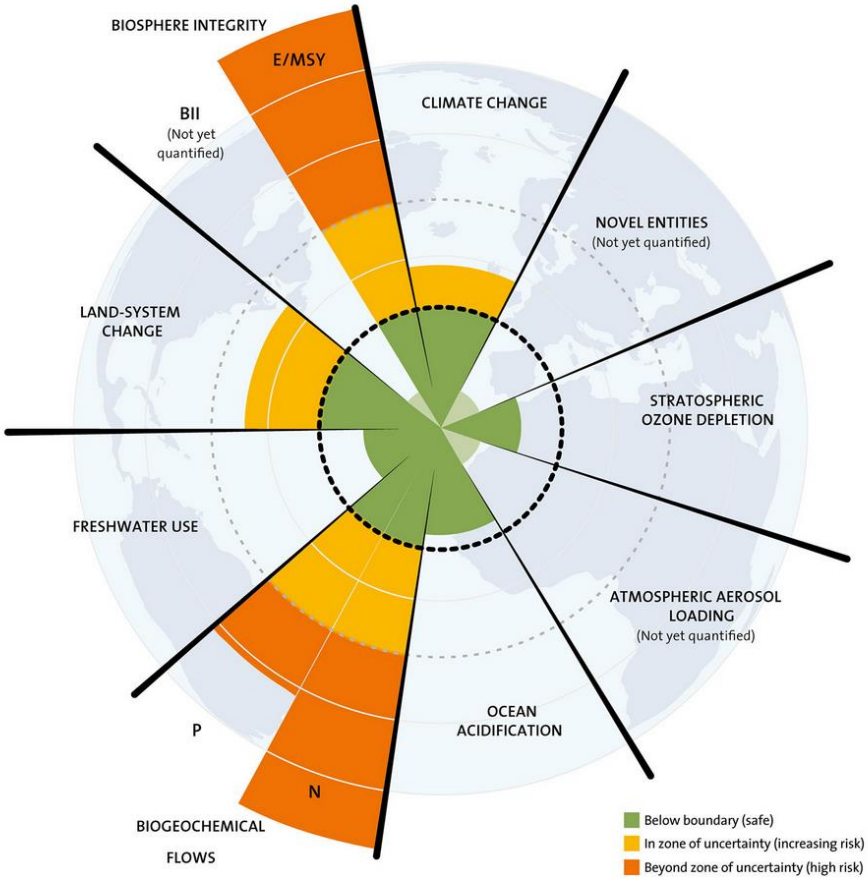
Follow us

MATERIAL FLOWS



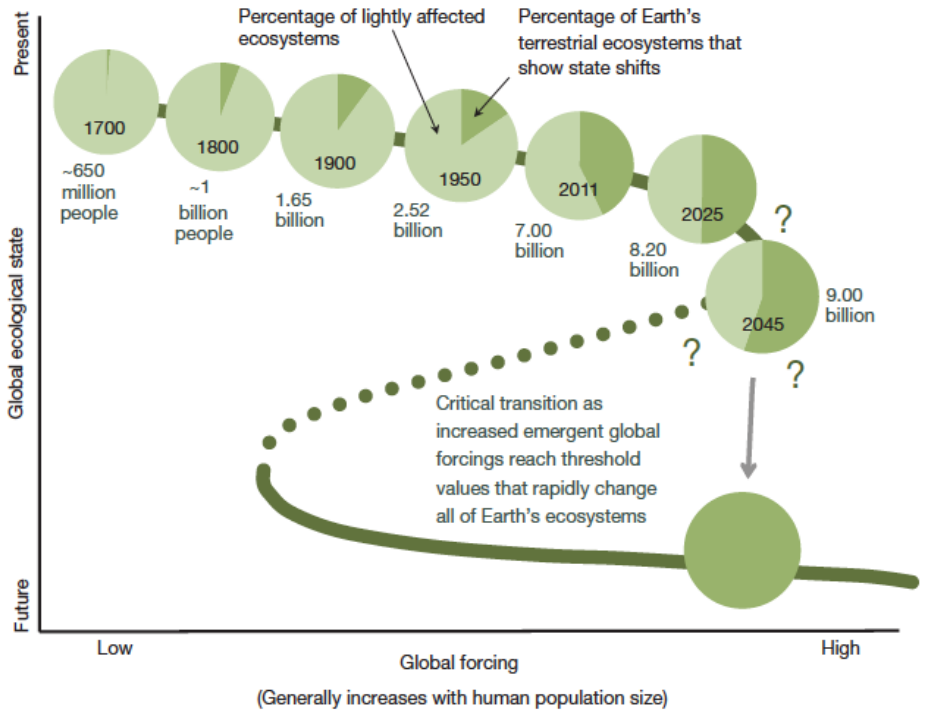
Wiedmann et al. (2015),"The material footprint of Nations", *PNAS*

Planetary Boundaries



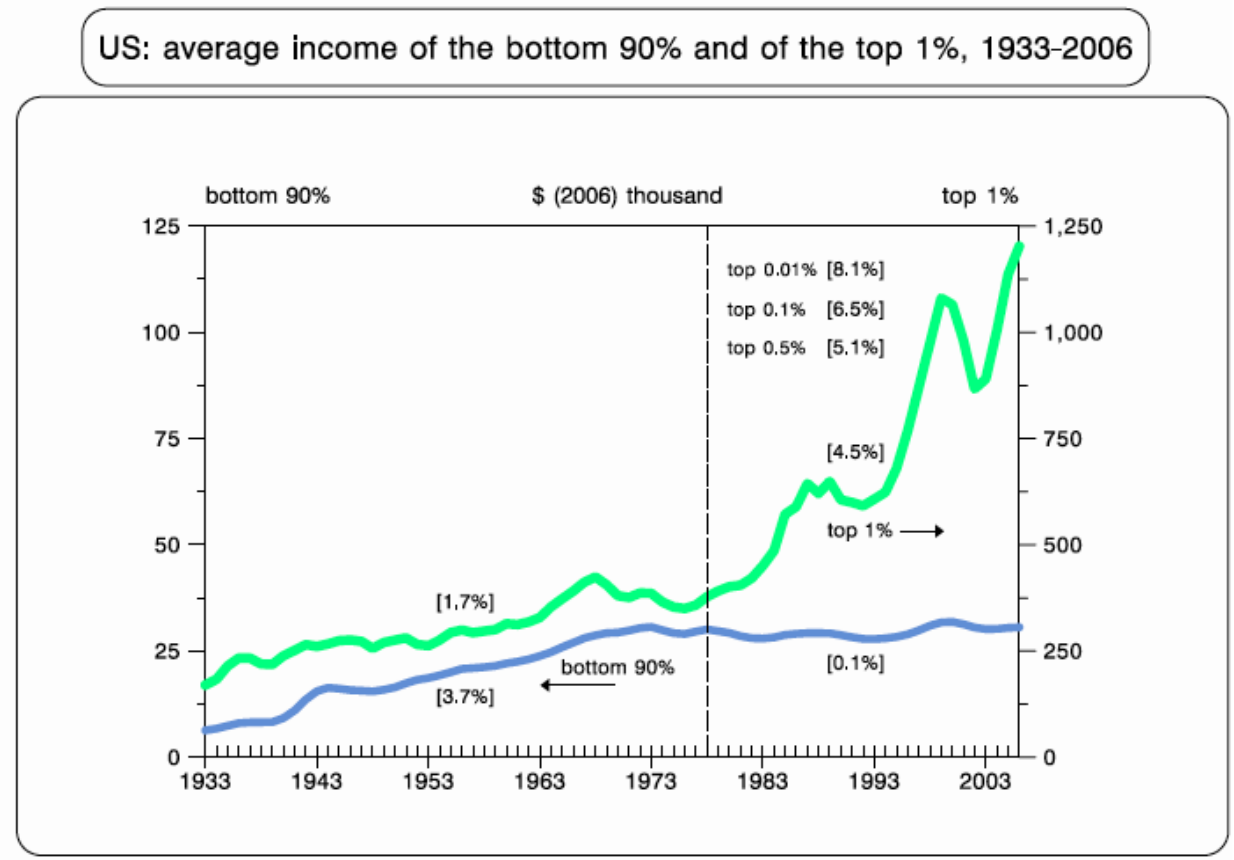
Rockstrom et al. (2009), "A safe operating space for humanity", *Nature*

State Shift



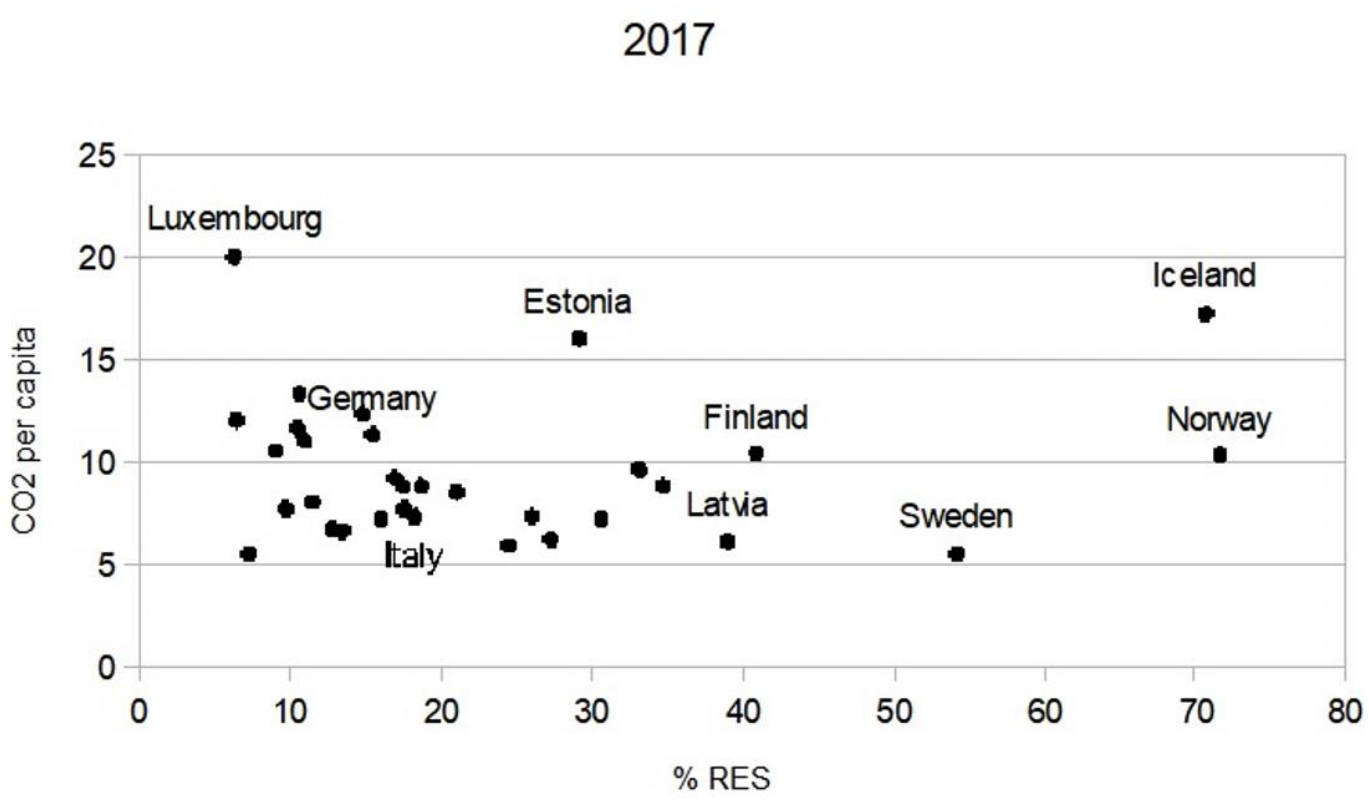
Scheffer et al. "Anticipating Critical Transitions" (2012), *Science*

Failure of trikkle-down hypothesis



• Percentages are average annual real rates of growth between 1933-78 and 1978-06. Includes capital gains. 3-year moving averages. ***Source***: Piketty and Sáez (2003).

RES vs CO2 per capita



RES ↑ ⇏ *CO2 per capita* ↓

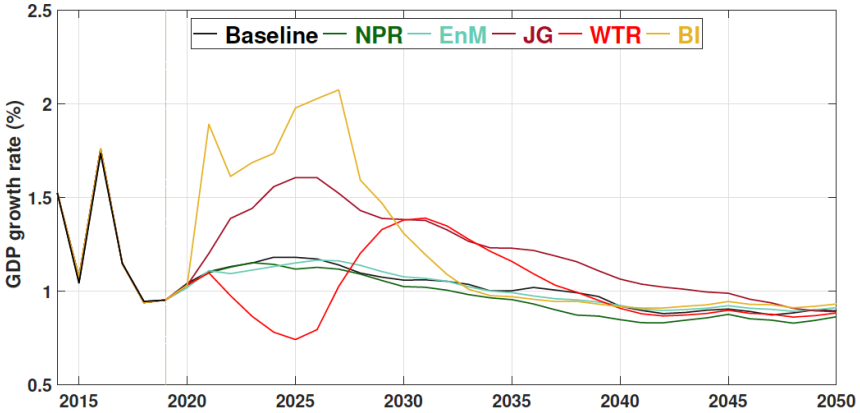
Individual Policies (1)

Policy	Summary	Comment	Real per capita GDP	GHG emissions	Unemployment	Income inequality	Deficif GDP
HLP	Reduces the labour saving innovation threshold parameter from 0.75 to 0.6 and the joint labour and energy saving threshold from 0.8 to 0.65	Average labour productivity increases about 25% more than in the baseline scenario	~ 0	$-$	$+$	$+$	~ 0
HEEF	Reduces the energy saving innovation threshold parameter from 0.5 to 0.3	Average energy efficiency increases about 16% more than in the baseline scenario	~ 0	$-$	~ 0	~ 0	~ 0
BI	Introduces a 5,580 yearly benefit to all working age adults that substitutes or reduces other social transfers	A high initial impact on growth a income distribution dissipates in time while deficit remains relatively high.	$+$	$+$	$-$	$-$	$+++$
JG	Government hires a maximum of 300,000 unemployed workers per year that perform either services or environmental work and are paid the minimum wages	Due to gradual hiring **JG** has a continued impact on employment and income distribution.	$+$	~ 0	$--$	$--$	$++$

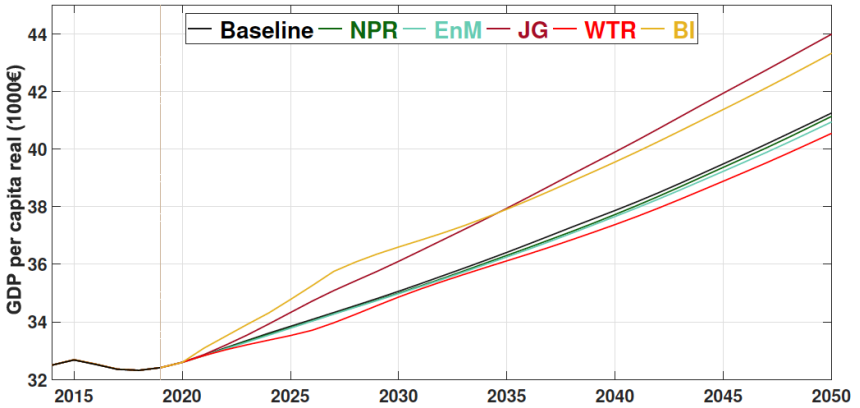
Individual Policies (2)

Policy	Summary	Comment	Real per capita GDP	GHG emissions	Unemployment	Income inequality	Deficif GDP
WTR	Weekly working hours are reduced from 35 to 30	Reduction leads industries to increase hiring, particularly in the five years in which the policy is introduced.	–	–	–	–	–
EnM	Gradually substitutes fossil fuels and nuclear power for renewables in electricity production while increasing the share of electricity in total energy consumption	Despite being by far the most effective environmental policy, it only has a mild impact on the other main indicators	~ 0	– – –	–	–	~ 0
BCA	Additional yearly increases of 4.4% in carbon tax rates after 2030 and application of similar taxes on imports CO2 content	Overall carbon taxes have a small impact on the simulations, mostly due to the limited amount of emissions that are subject to the taxes	~ 0	~ 0	–	–	~ 0

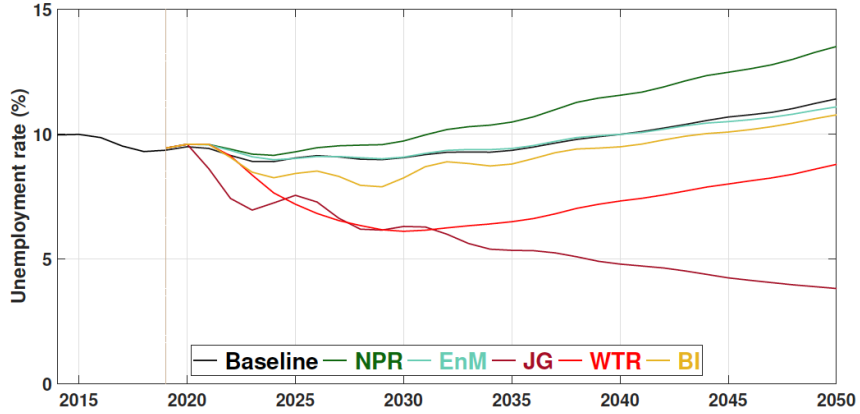
Individual Policies (3)



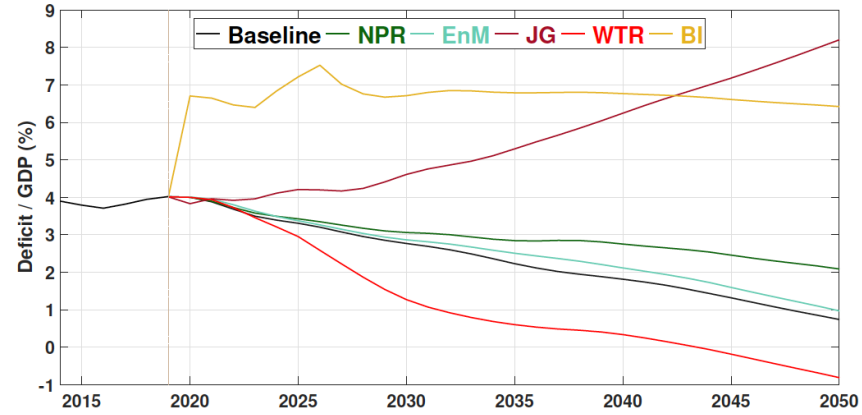
(a) Economic growth



(b) Income per capita

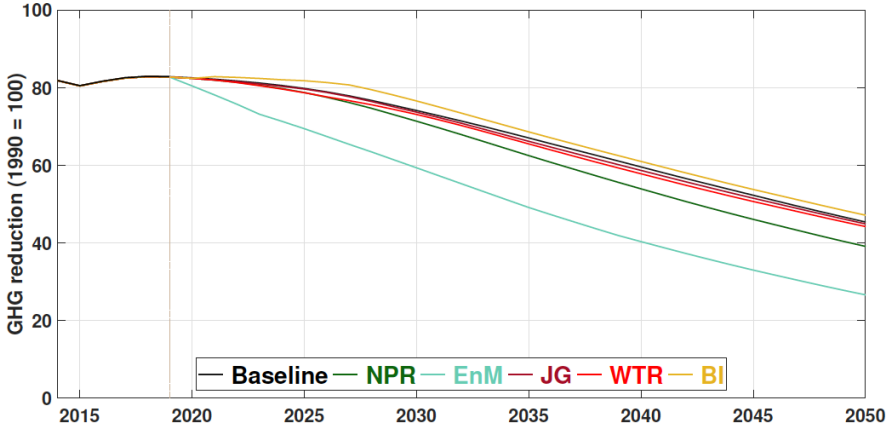


(c) Labor market

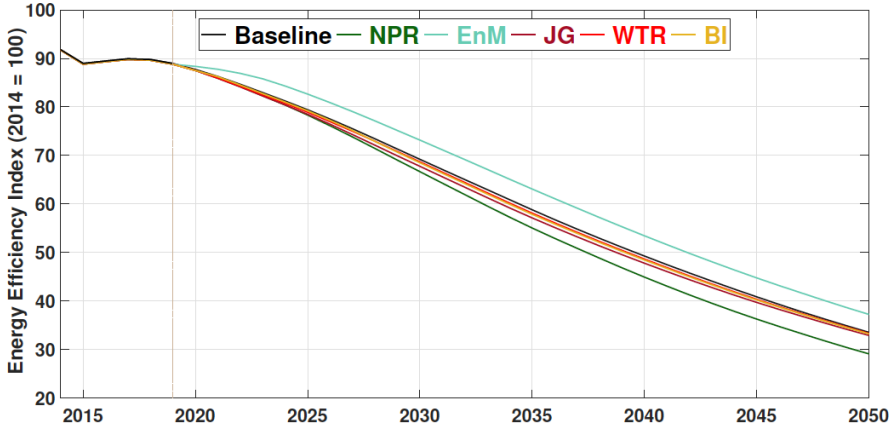


(d) Public deficit

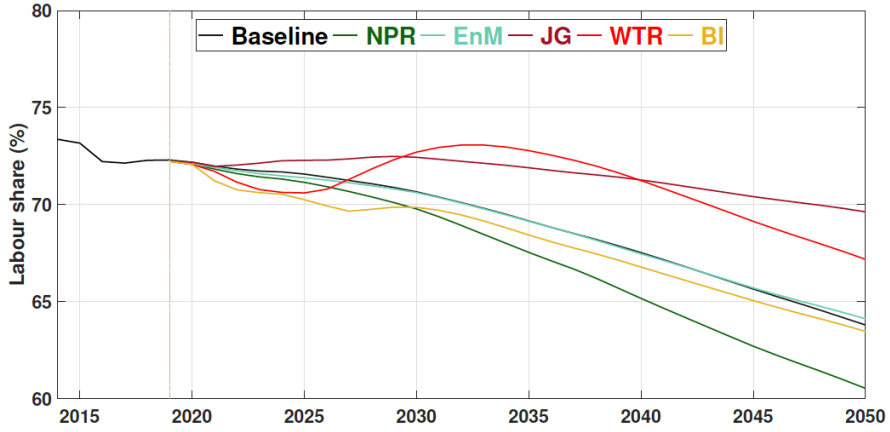
Individual Policies (4)



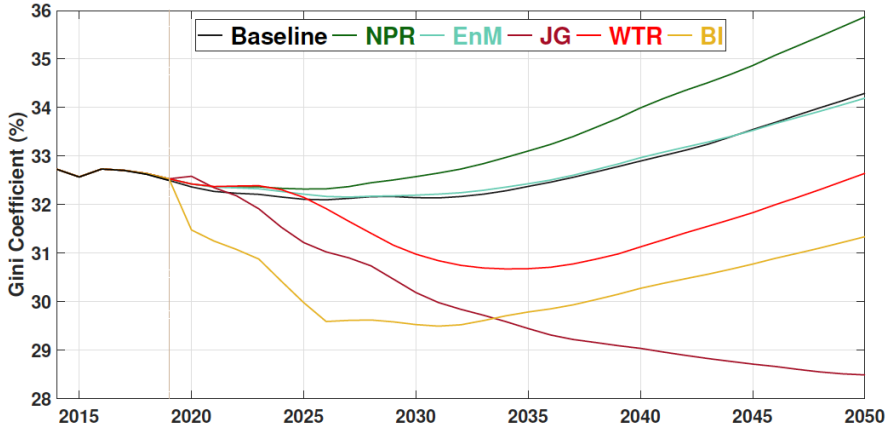
(a) GHG emissions



(b) Energy efficiency (TPES/GDP)

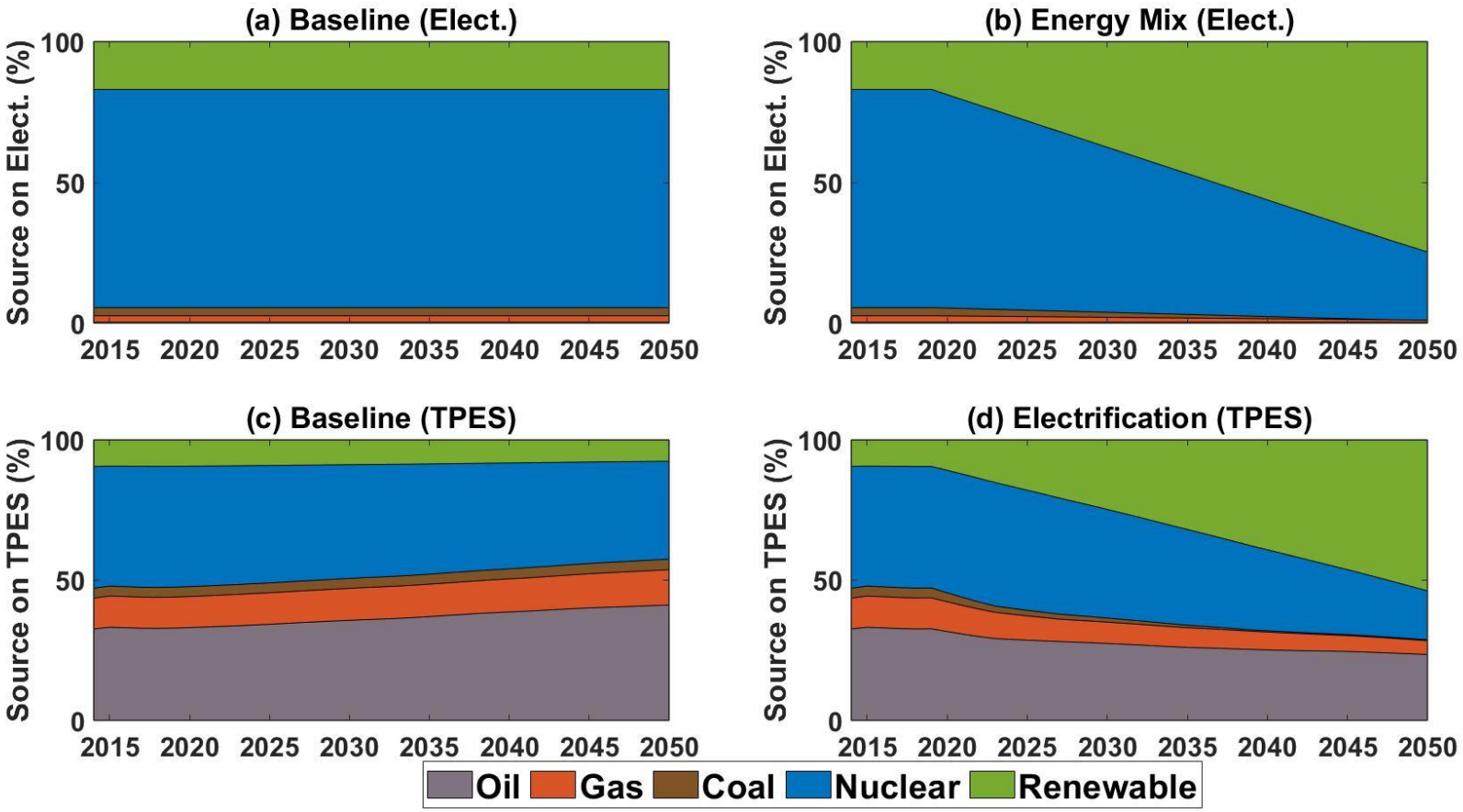


(c) Wages on value added

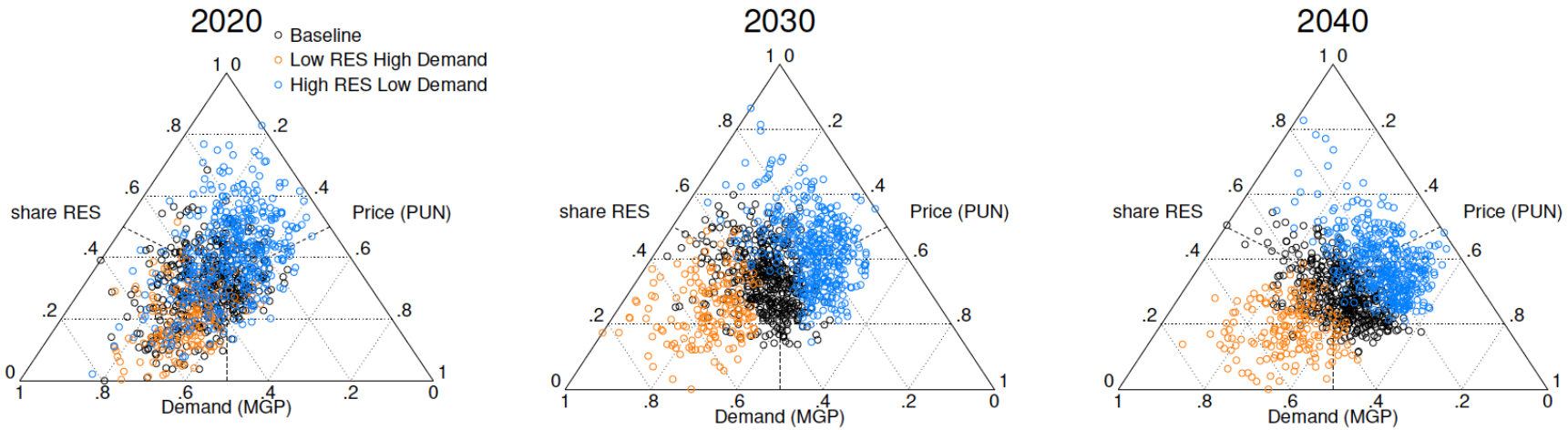


(d) Income inequality

Results: Electricity and Energy Mix (%)



Demand Effect on RES share



Clusters defined with respect to final (2040) values of national prices (PUN), electricity demand (MGP) and the share of RES in supply 1000 simulations to incorporate uncertainty over: minimum price; cost of gas, coal and CO2; investment cost of solar, wind and storage techs.; % excess supply exported; storage; electricity demand price elasticity; coal phase-out; and exports growth rate.