



## A MACROECONOMIC PERSPECTIVE ON CIRCULAR ECONOMY MODELLING

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## INTRODUCTION

**“I am not a fan of economic models because they have all proven wrong.”**

David Davis MP, Secretary of State for Exiting the EU, December 2017.

## GOALS OF PRESENTATION

Identifying and discussing the role of macro-economic modelling in the transition to a circular economy.

Assessing the status quo and limitations of macroeconomic models in the field of circularity.

Evaluating the effectiveness of CGE models in modelling the circular economy.

Introducing the role of macro-economic models in the INITIATE project.

# MACROECONOMIC MODELS

## What are macroeconomic models?

Analytical tools designed to replicate the operation of the global or individual country's economy. They examine the dynamics of important economic indicators like output, inflation and unemployment.

Models aim to represent the societies and economies that we live in, all held within a computer system.

## How can macroeconomic models be used?

- To understand the past and present
- To predict (forecast) the future
- To test alternative futures

## Why are macroeconomic models important?

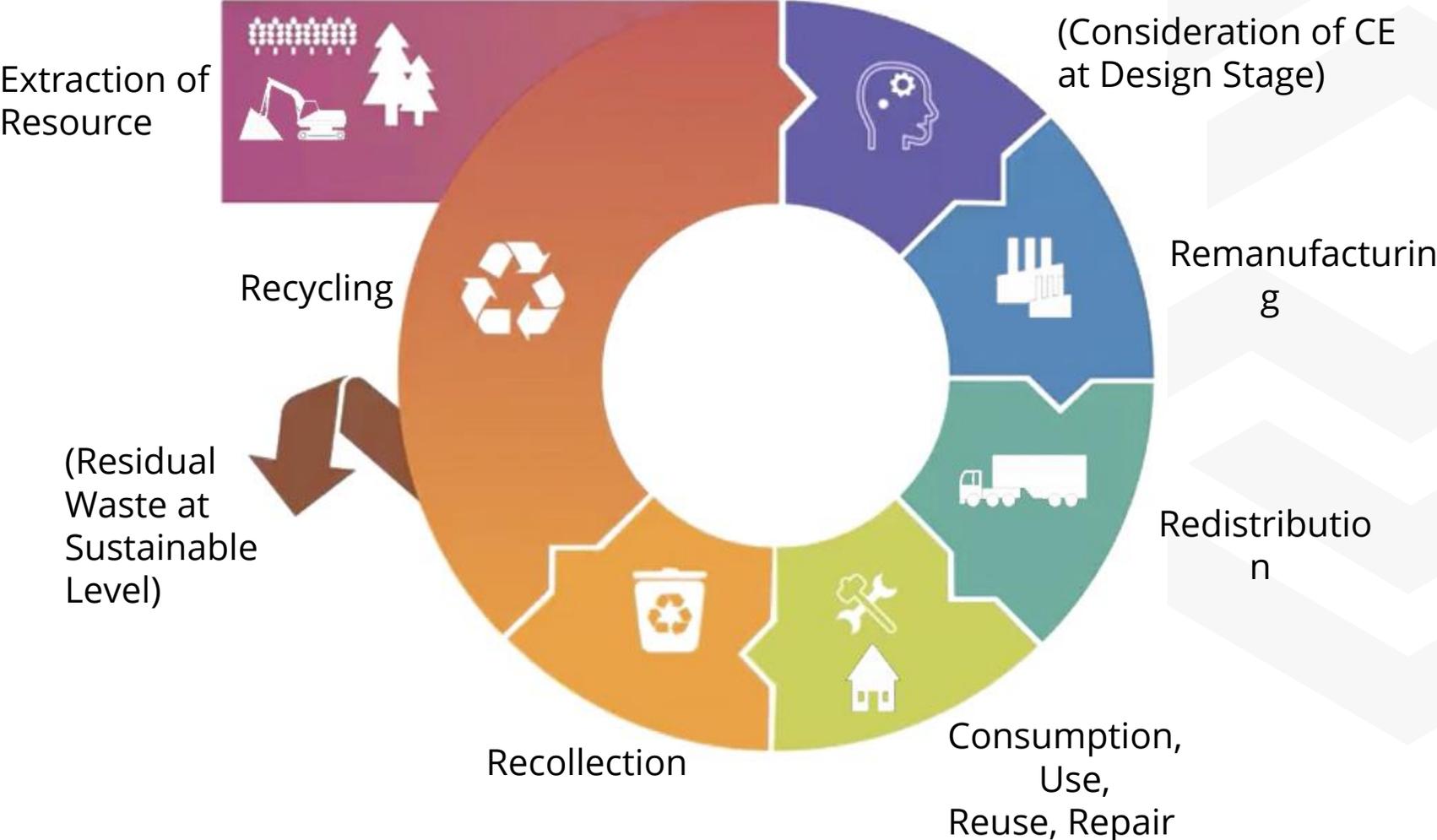
At European level, new policies may impact up to 500 million citizens hence it is only reasonable to ask what the effects might be in advance.

Based on the underlying data of the model, the interlinkages provided by macro econometric models provides a representation of world outlook.

## Where do macroeconomic models go wrong?

- Oversimplification
- Assumptions
- Trading off theory and empirical content

# TOWARDS A CIRCULAR ECONOMIC MODEL

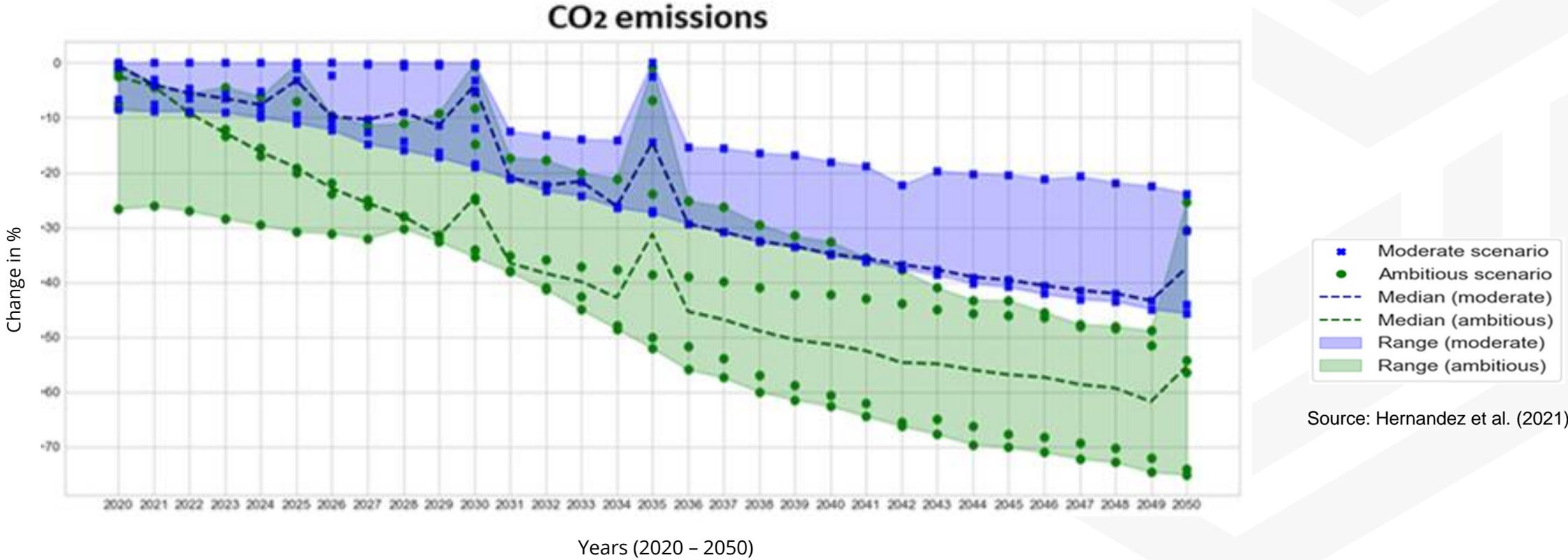


## CIRCULAR ECONOMY AS A VIABLE SOLUTION?

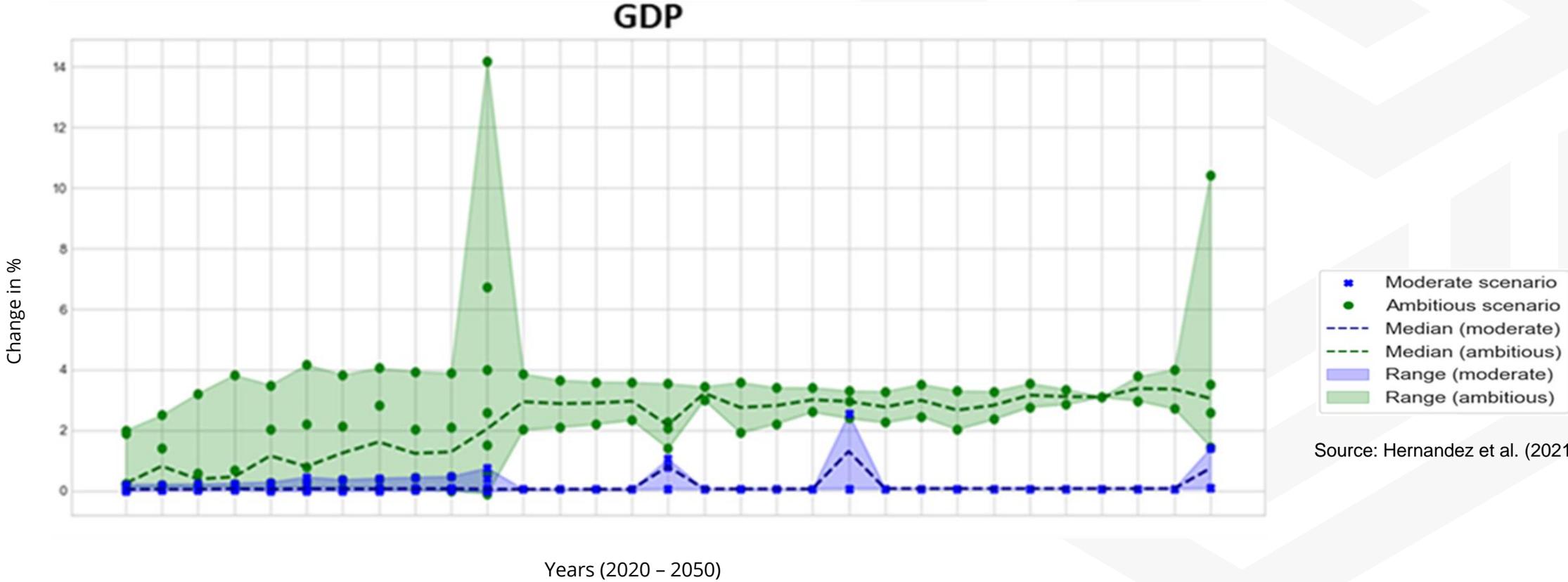
### Four specific sets of benefits for policymakers:

1. Efficient material management a useful tool for meeting national level climate commitments.
2. Domestic secondary material sector to reduce imports and supply risks.
3. Drivers of a circular economy transition to contribute towards re-industrialisation, employment and economic growth. New sectors to emerge such as repair, remanufacture and the sharing economy (subset of services).
4. Given the finite nature of natural resources, alleviate pressure of a drag on long run economic growth from the twin effect of global population pressure and resource scarcity.

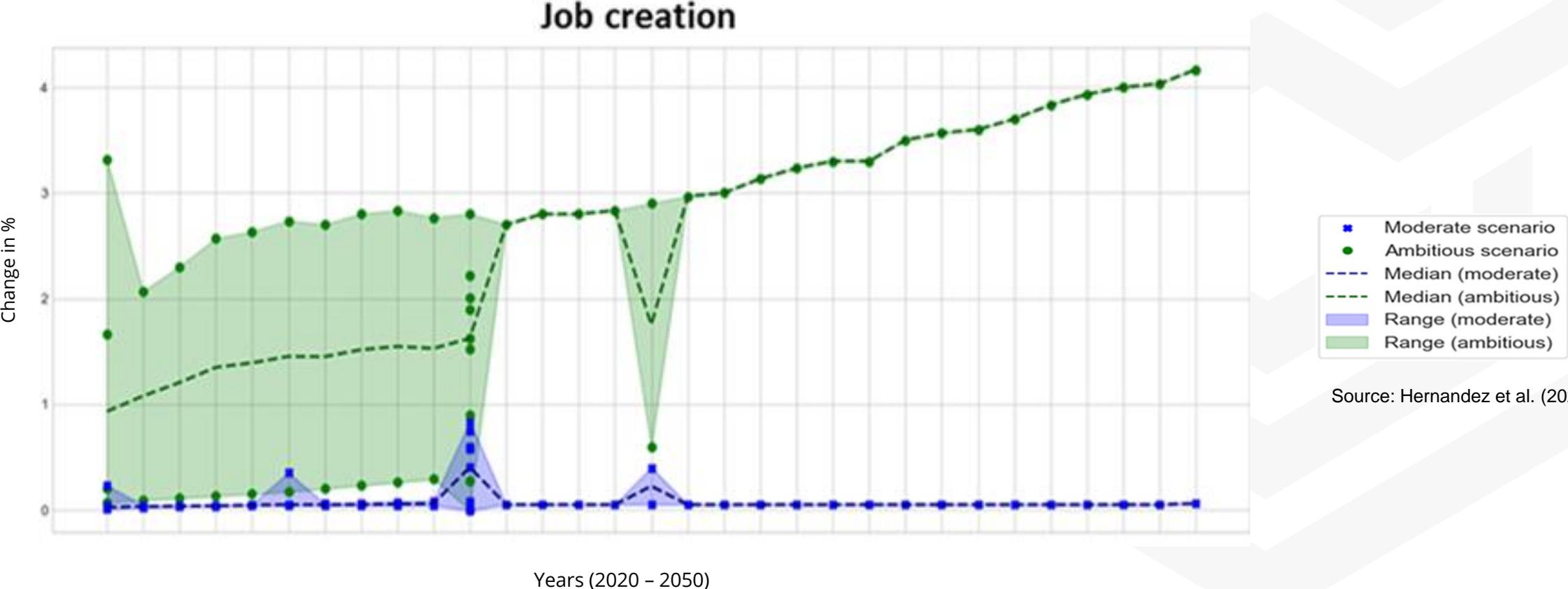
# PRELIMINARY RESULTS: W-W-W?



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Source: Hernandez et al. (2021)

## ROBUSTNESS OF PRELIMINARY RESULTS

### Main limitations in preliminary results

- Much of the existing modelling has tended to focus on improvements in resource or material productivity within a continued “linear” economy.
- Rebound and secondary order effects not explicitly provided. For example, what are the drivers of higher employment and to what extent have structural employment and inequality trends changed.

### Meta analysis correlations in 2030

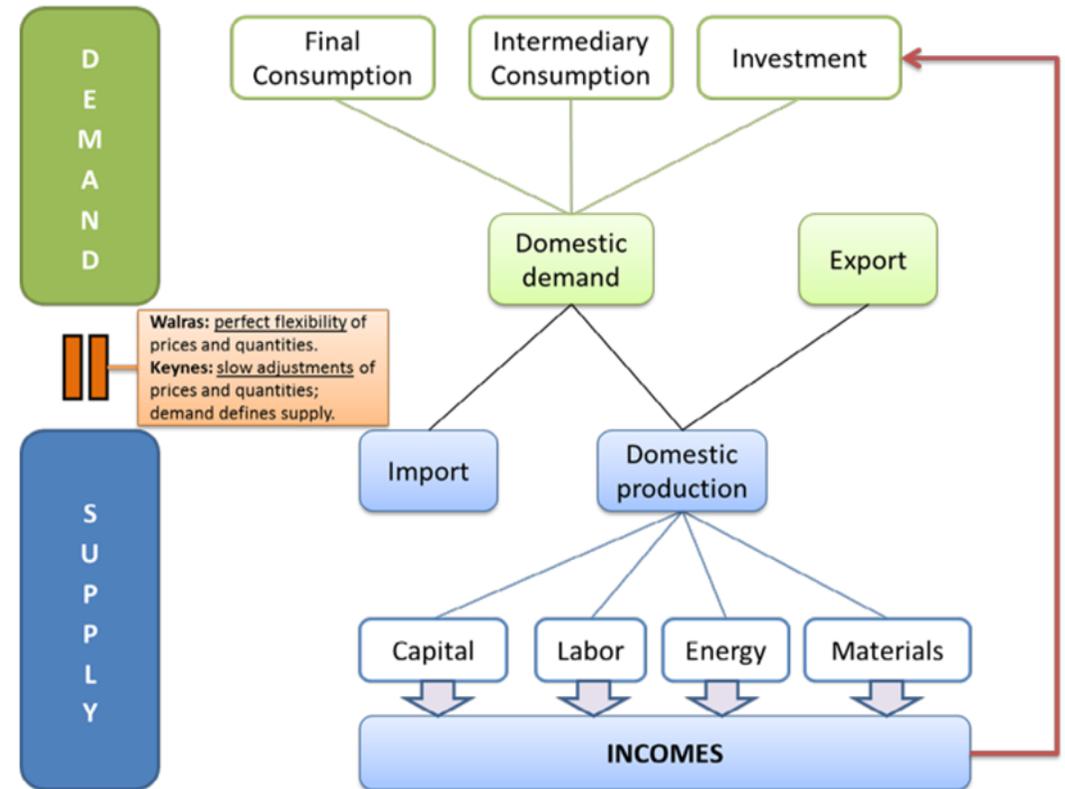
Correlated variables	Pearson correlation coefficient ( $r$ )	Outcome
GDP & Job	0.65	Win
GDP & CO <sub>2</sub>	-0.60	Win
Job & CO <sub>2</sub>	-0.58	Win

Source: Hernandez et al. (2021)

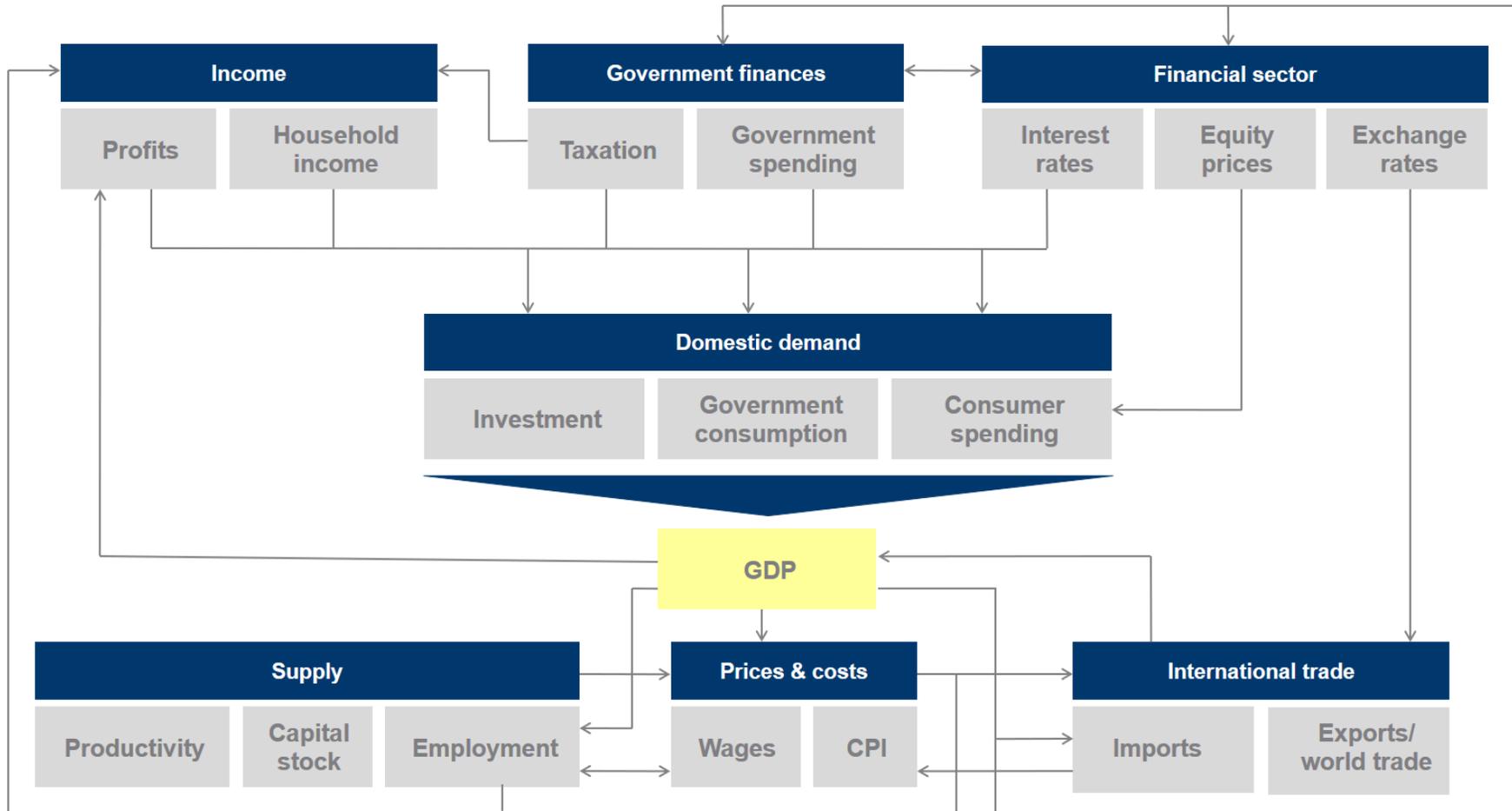
# COMPUTABLE GENERAL EQUILIBRIUM MODELS

Computable General Equilibrium (CGE) models use mathematical equations to represent the optimization of economic agents.

- Non-linear structure
- CGE can incorporate input and import substitutions and can handle supply constraints.
- Given many aspects of a circular economy transition are out of sample, Ex-ante capabilities of CGE models are particularly desirable.



# CGE FRAMEWORK



## INITIATE EUROPE: MACROECONOMIC IMPLEMENTATION

The implementation focusses on the potential generation of environmental, economic and social shared benefits generated from integrating a CGE model to represent the shifting towards the INITIATE symbiotic system from 2020 to 2050 on a European level.

Macro-economic modelling methods are used to introduce indicators like market sizes, sector CO2 emissions and jobs creation estimated in different scenarios.

A business as usual (or baseline) scenario is set and compared with a scenario where INITIATE is introduced, assessing the impact for industries, governments and consumers.

Additional scenarios are run to assess benefits sensitivity towards variations in regulations and worldwide market dynamics (e.g. environmental trading schemes or CO2 taxes, different energy mix or ownership schemes).

## FUTURE OUTLOOK ON MACROECONOMIC MODELLING

- Testing findings from literature on toy model
- Scaling model to depict global level
- Mapping physical and nominal flows

