



The poverty and inequality outcomes of deep climate mitigation --soft-linking a household model to global IAMs

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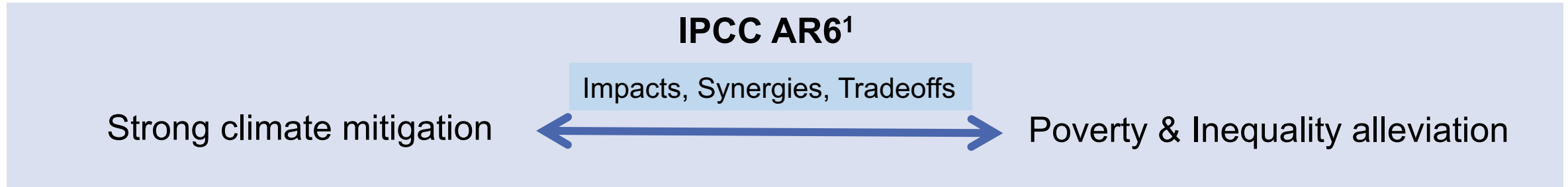
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Poverty and inequality



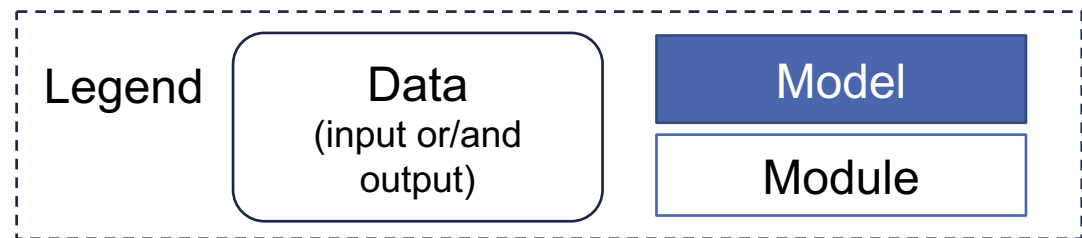
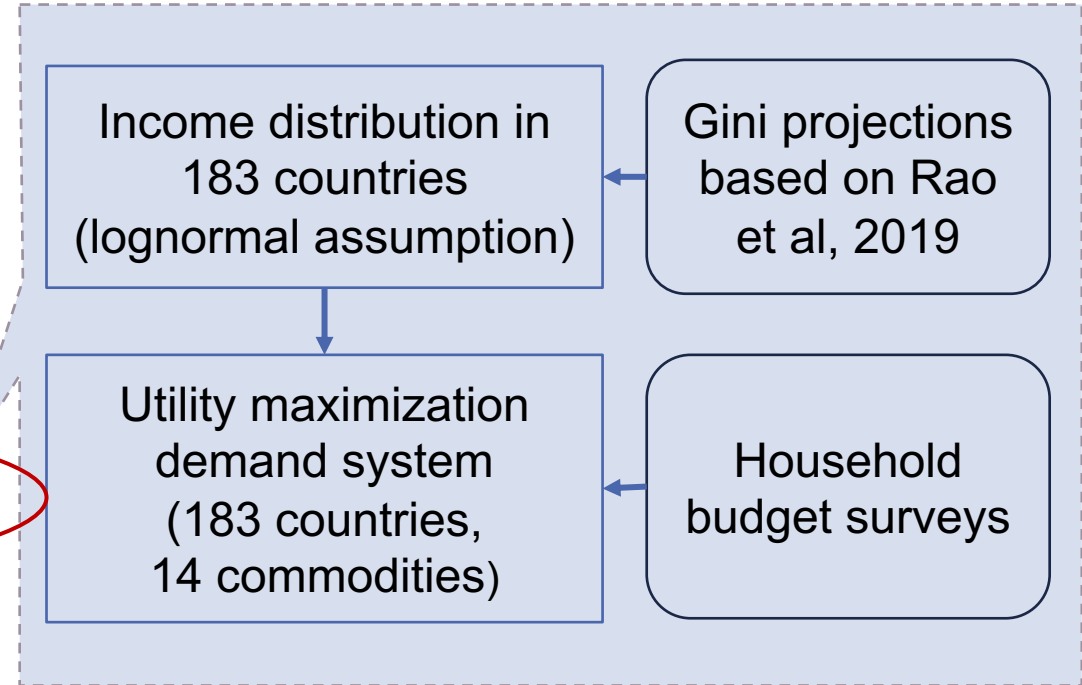
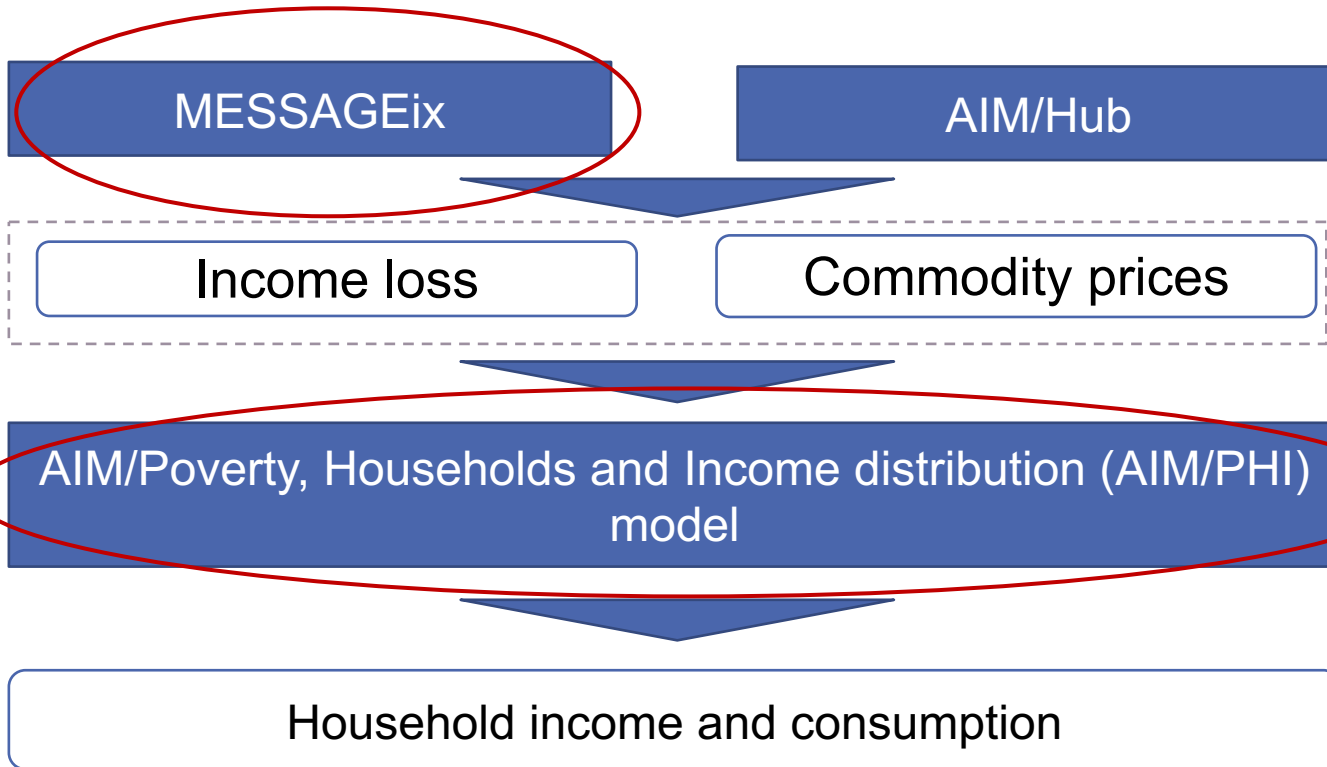
A risk of worsening inequality:

Between country^{2,3}, Within country⁴, Low-income households facing the most negative effects⁴

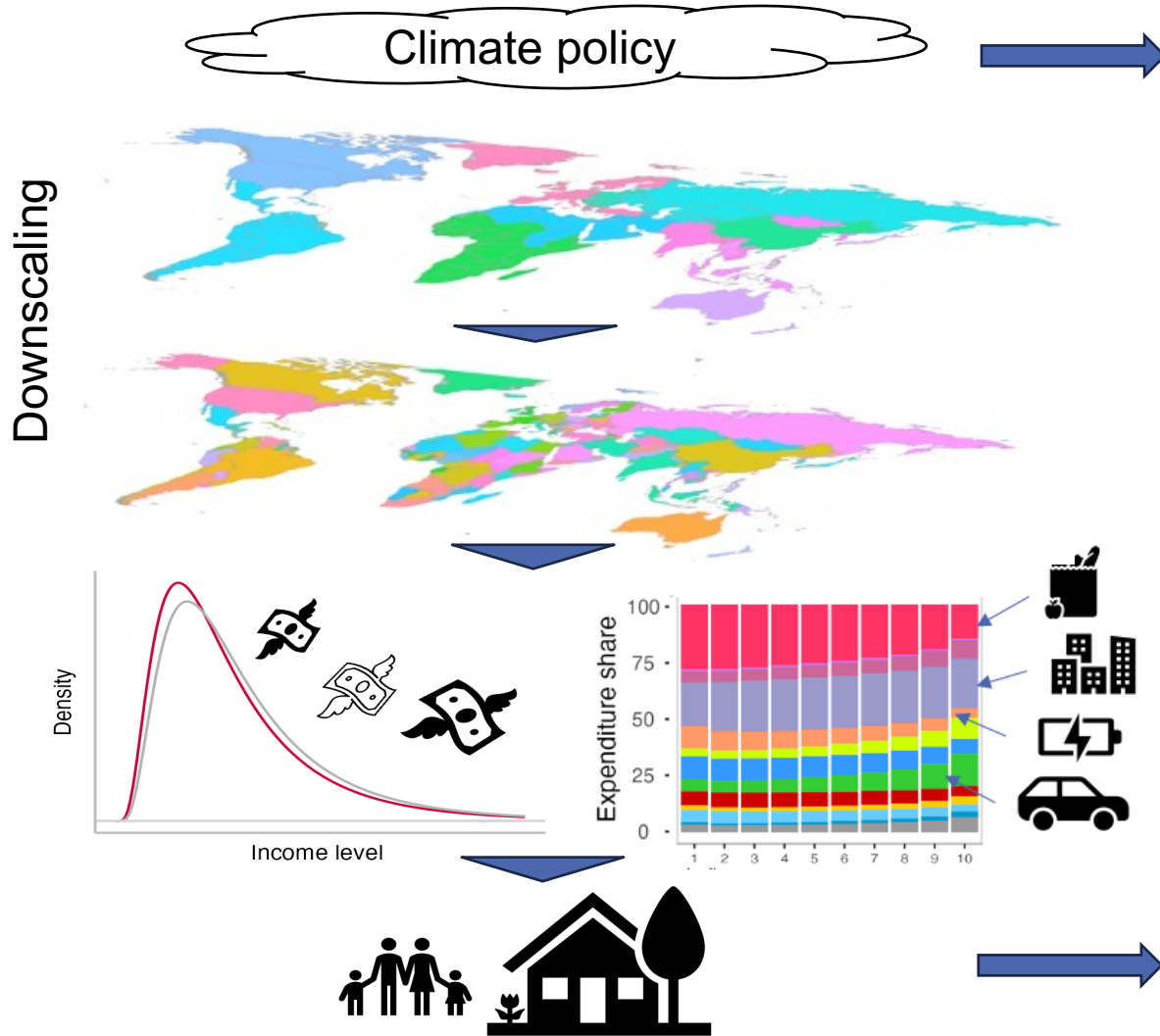
Increasing poverty headcount (without revenue redistribution) →
potential of using revenue redistribution for poverty^{5,6,7} and inequality⁸ abatement

No existing literature tried to **explain or to connect the global poverty and inequality outcomes of climate mitigation from the perspective of changes in household consumption basket.**

Overview



SSP2 based Scenarios



BaU scenario (SSP2 business-as-usual)

2D scenario, proportional redistribution

1.5D scenario, proportional redistribution

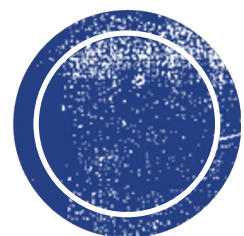
- Simulation: 2020-2100
 - Global uniform carbon price
 - MESSAGEix: 12 regions, AIM/Hub: 17 regions
- Downscaled to national levels (183 countries) and households levels in AIM/PHI

Poverty projections

Welfare change

Inequality index

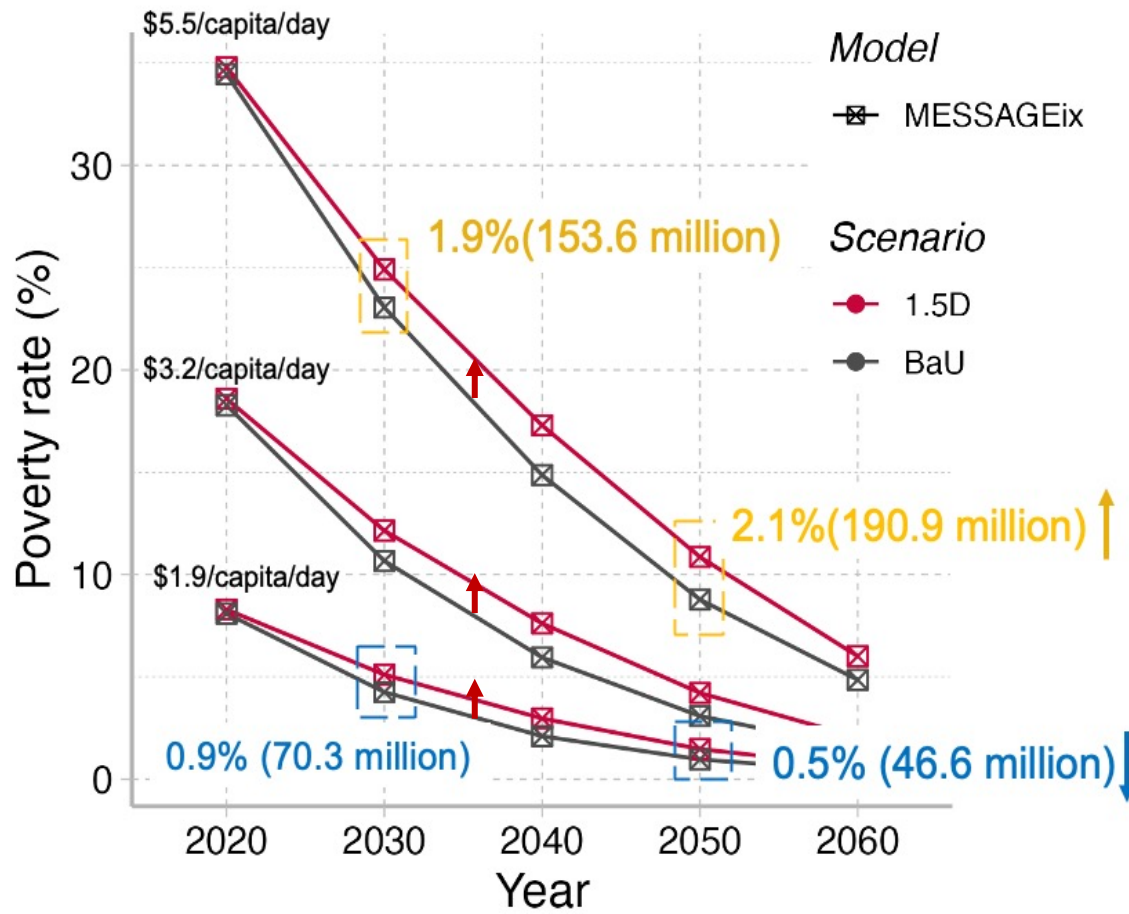
Household income and expenditure



Poverty projection

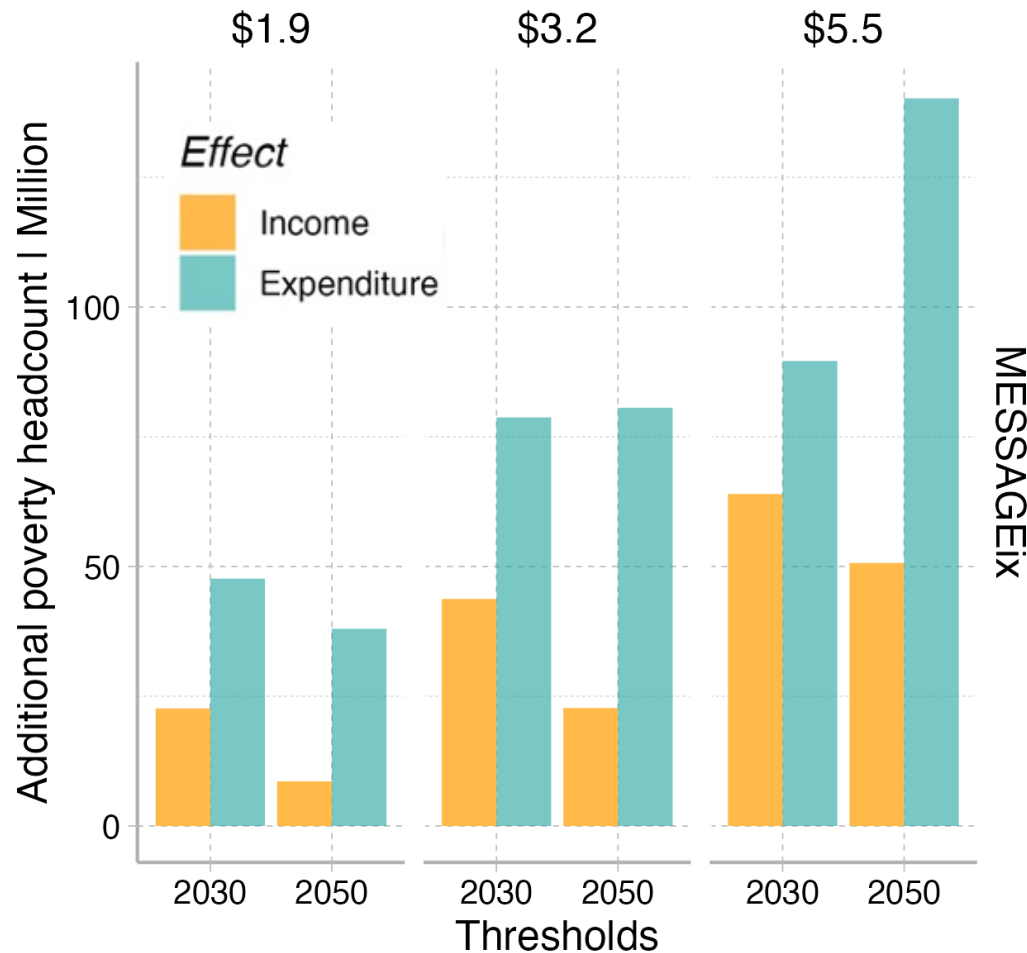
Additional poverty rate at global level

--temporal trend



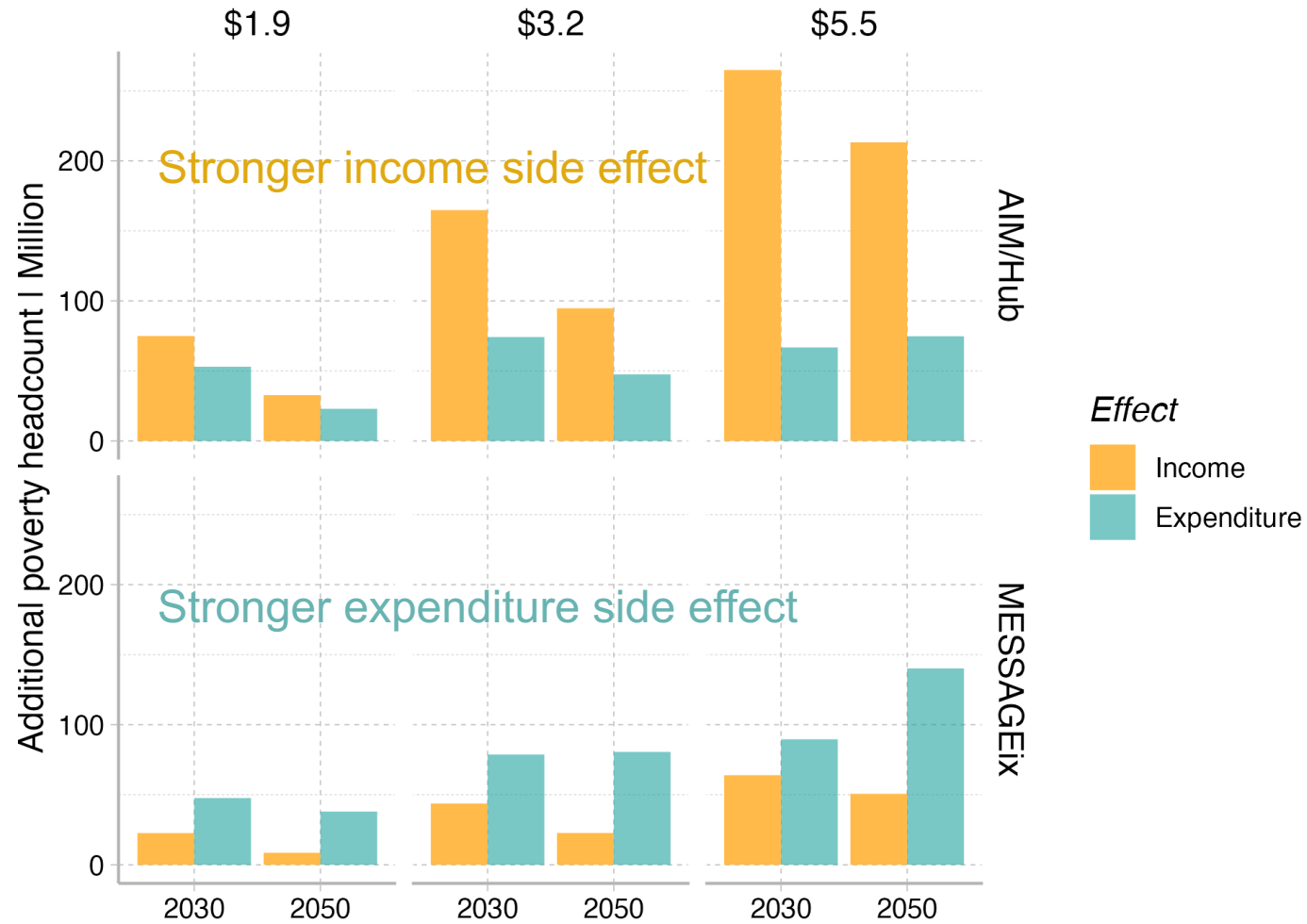
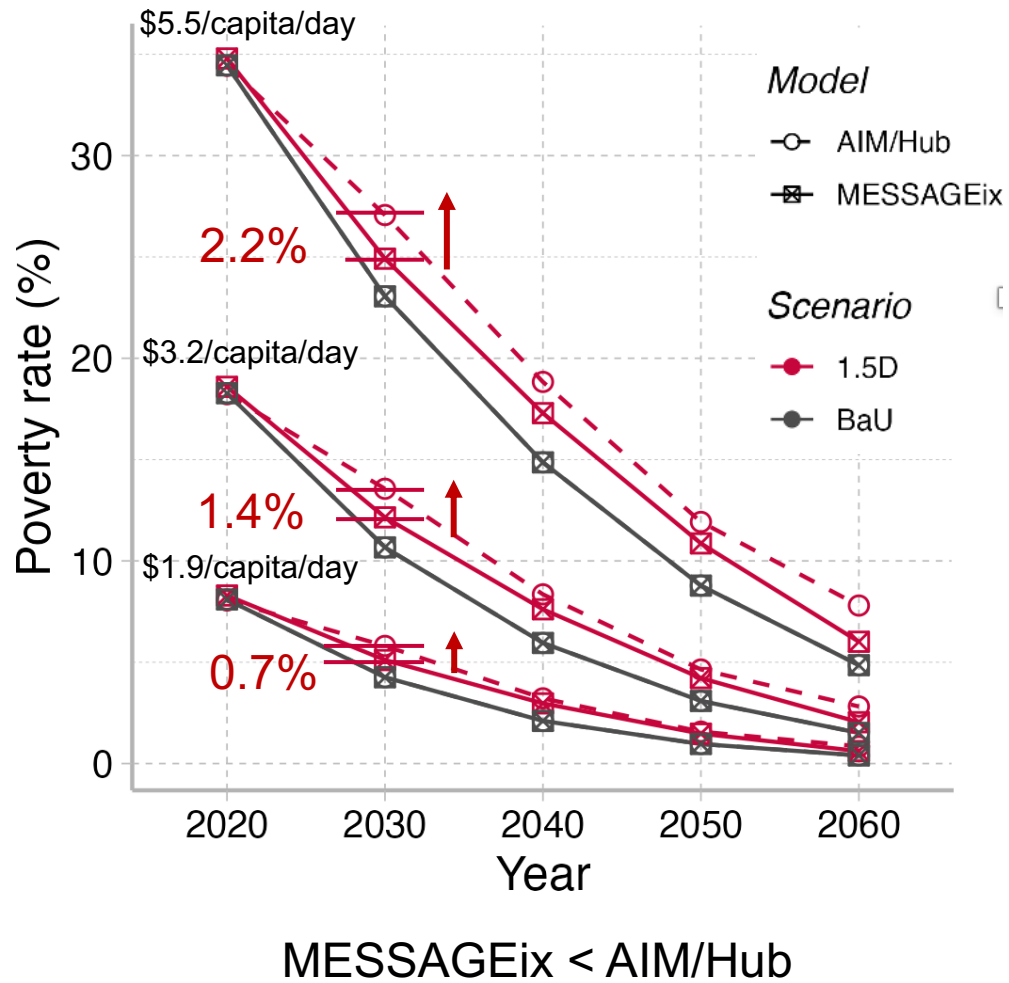
- 2030: Global poverty rate **increases** by 0.9~1.9 percentage points depending on the poverty threshold
 - 2050: The impact diminished for extreme poverty but **enlarged for a higher poverty line**
- Stronger policy impacts on a higher-income (than the extreme poverty line) population.

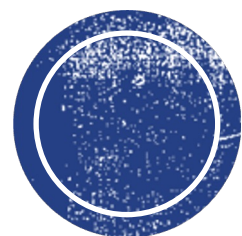
Decomposing the additional poverty headcounts...



- **Expenditure-side effects**, which is due to the welfare change resulting from a change in the consumption basket, takes over the income side effects in MESSAGEix scenario
- The expenditure-side effects become more **prominent in 2050** compared to 2030 level.

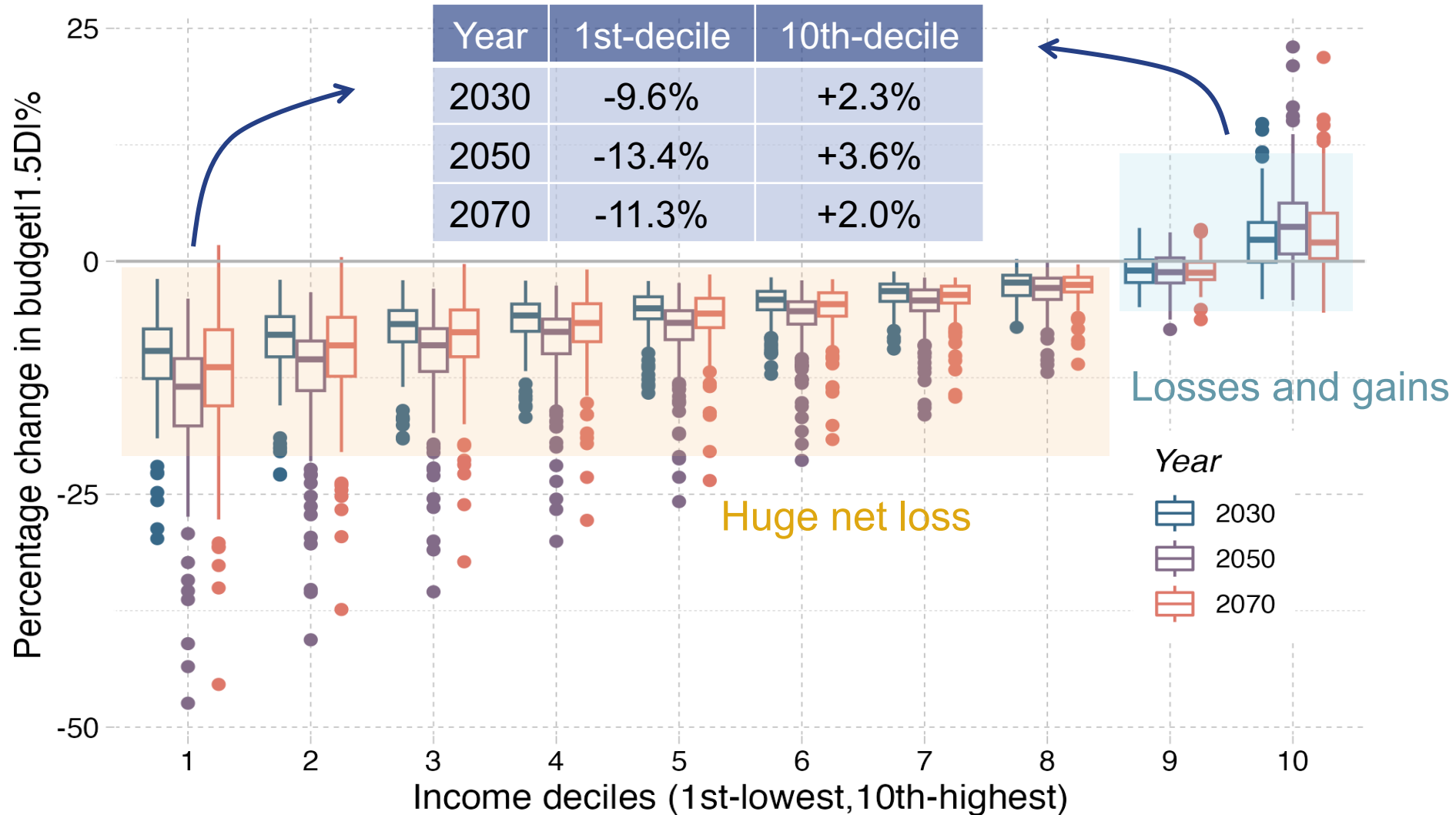
Comparison with AIM/Hub





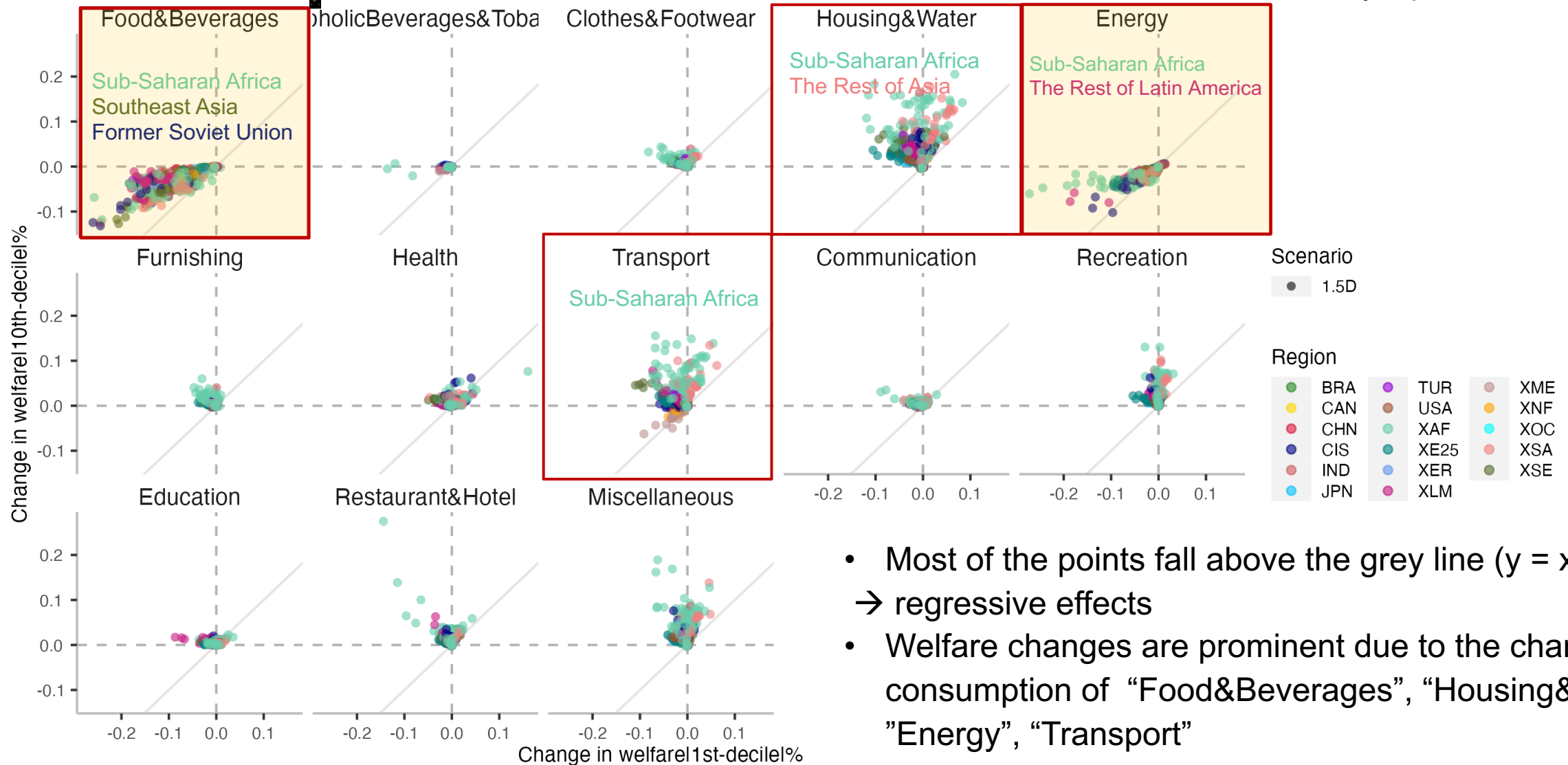
Inequality projection

Impacts on household expenditure (1.5D)



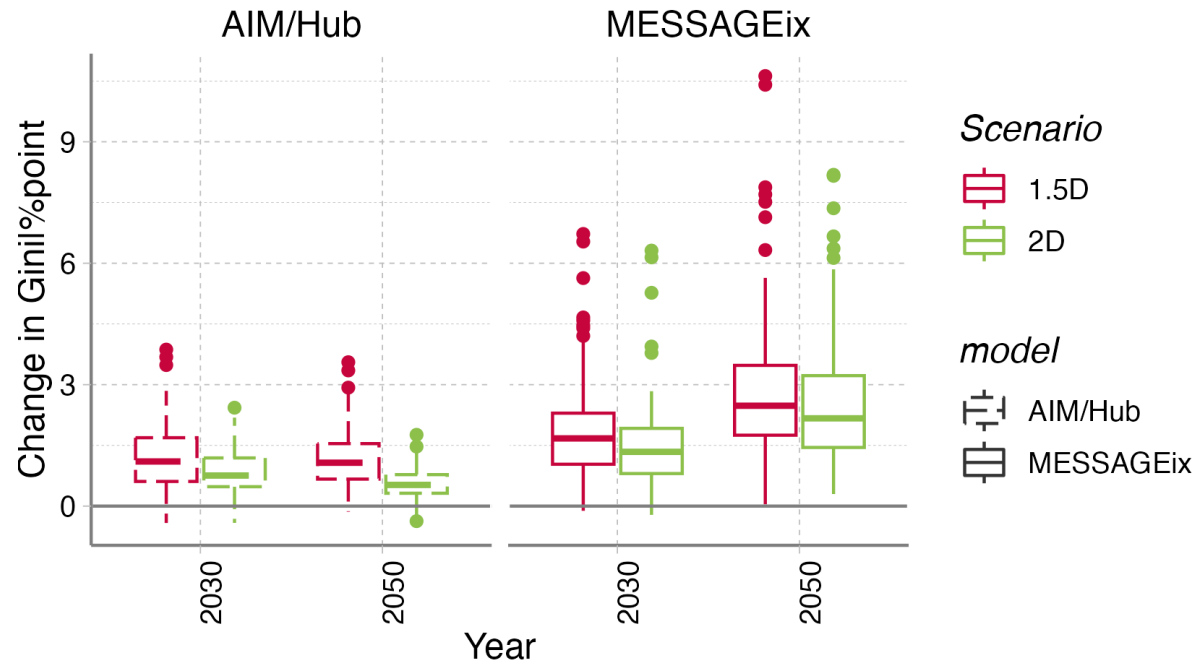
Consumption basket and welfare*

* Measured by equivalent variation ratio

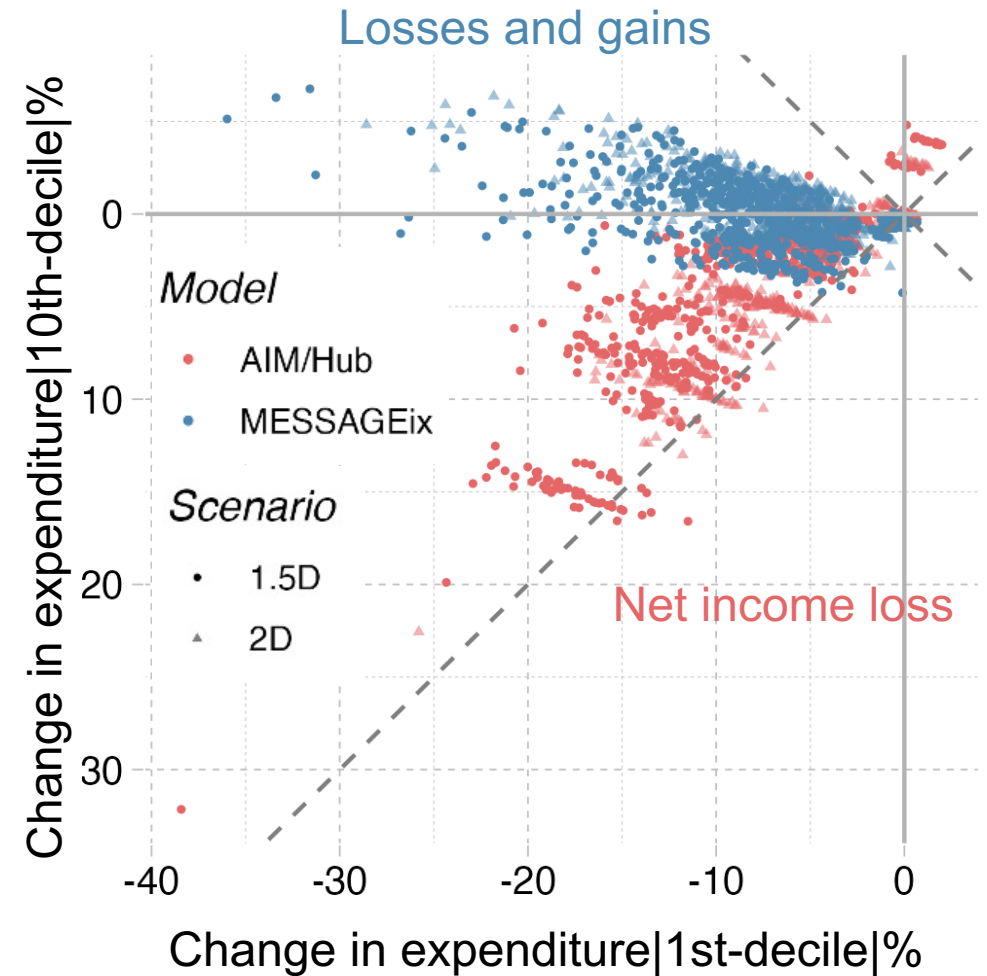


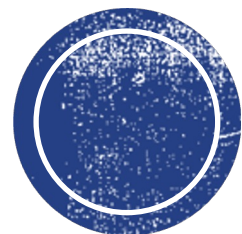
- Most of the points fall above the grey line ($y = x$)
→ regressive effects
- Welfare changes are prominent due to the changing consumption of “Food&Beverages”, “Housing&Water”, “Energy”, “Transport”

Comparison with AIM/Hub



- Stronger policy impacts on inequality in MESSAGEix scenarios
- Both models showed **no significant difference** in Gini between the 1.5D and 2D scenario





Key takeaways

- Deep climate change mitigation adds to poverty rate globally → uncertainty in terms of the magnitude

AIM/Hub projected huge macroeconomic losses but MESSAGEix scenarios implied more distributional effects due to the drastic price change.

→ Income losses are more influential to the poverty projection itself, though strong regressive effects add to some extent to the global poverty headcount

- Deep climate change mitigation adds to domestic income inequality, with ~10% loss in the lowest decile

The enhanced ambition to achieve the 1.5 degree target **does not add much to the Gini** than to achieve the 2-degree target -> robust between the two models

Food is the main channel in the consumption basket where the policy impacts are conveyed to households and results in net welfare loss -> robust between the two models

→ The impacts prevail if there is no strong interventions because of the **large share** of food expenditure in the household expenditure and **drastic increases of food prices** in mitigation scenarios.

Reference

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Thank you for your attention!

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