

The potential of supporting developing countries by using carbon tax revenue

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Introduction



- IPCC presents future scenarios to align with the Paris Agreement goals¹.



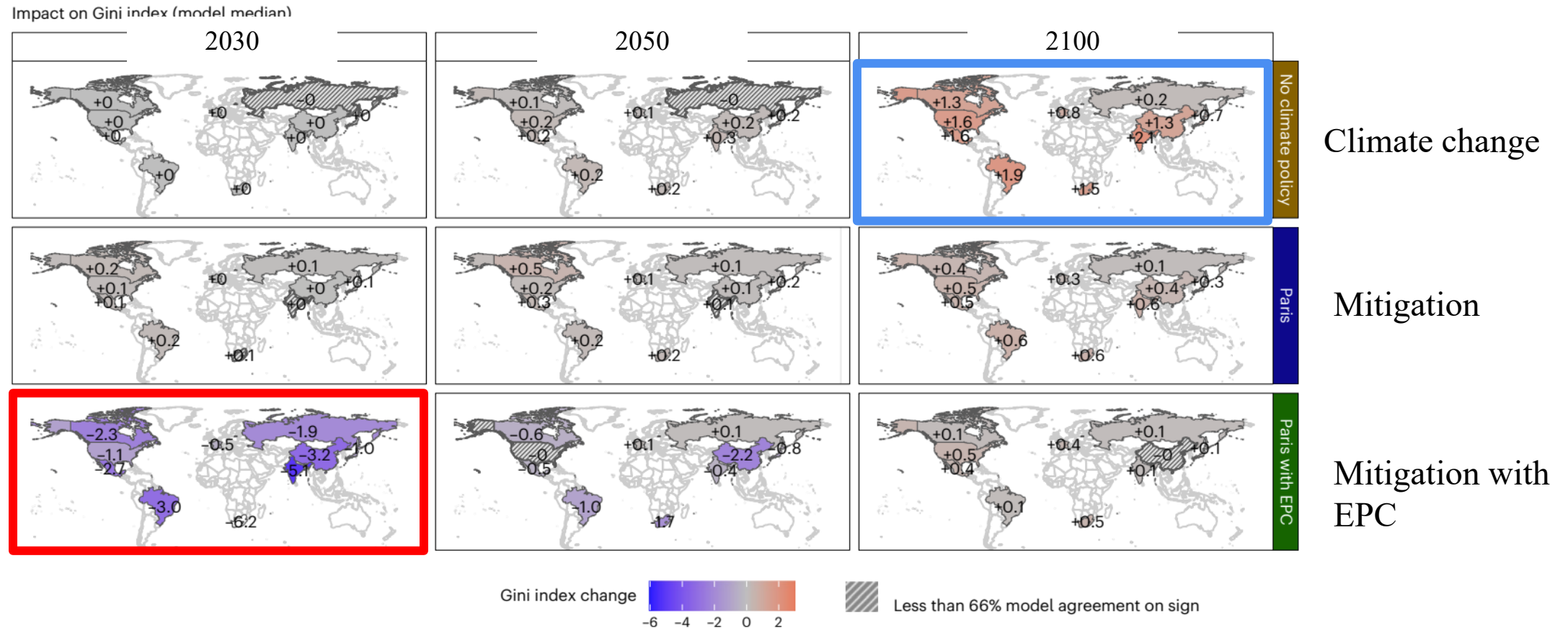
- Global uniform carbon price is often used in many scenario analysis including IPCC, because it minimize the total cost².



- Unequal consequence
Both regionally³ and domestically⁴

Carbon price is always discussed with its revenue distribution scheme.

Introduction

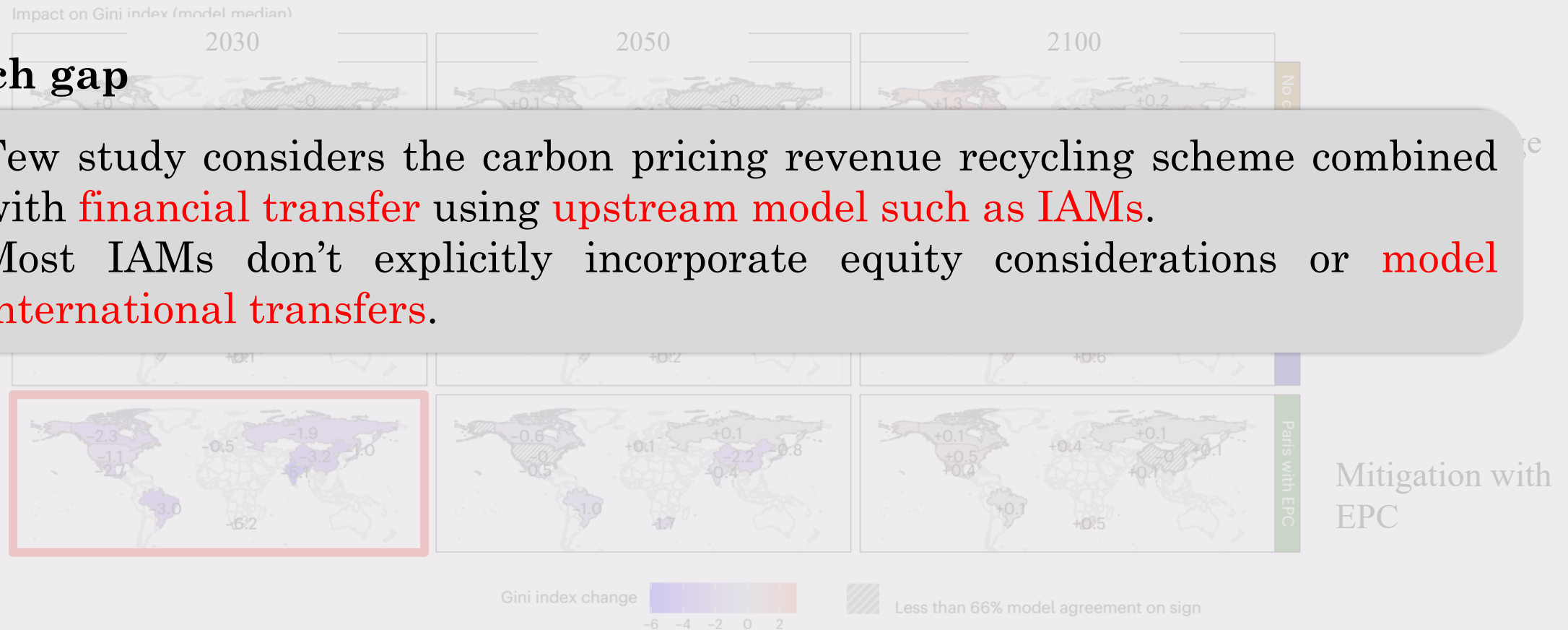


Uniform carbon pricing with equal per capita redistribution improved inequality (Emmerling et al., 2024).

Introduction

Research gap

- Few study considers the carbon pricing revenue recycling scheme combined with **financial transfer** using **upstream model such as IAMs**.
- Most IAMs don't explicitly incorporate equity considerations or **model international transfers**.



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Introduction

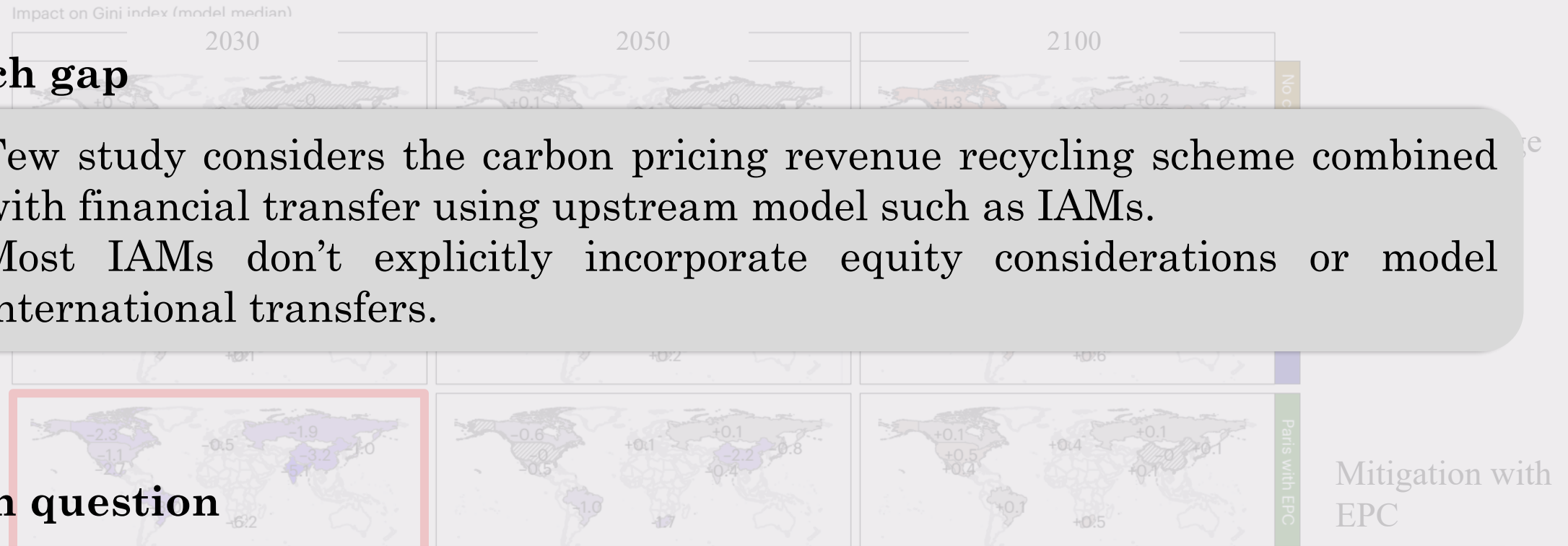
Research gap

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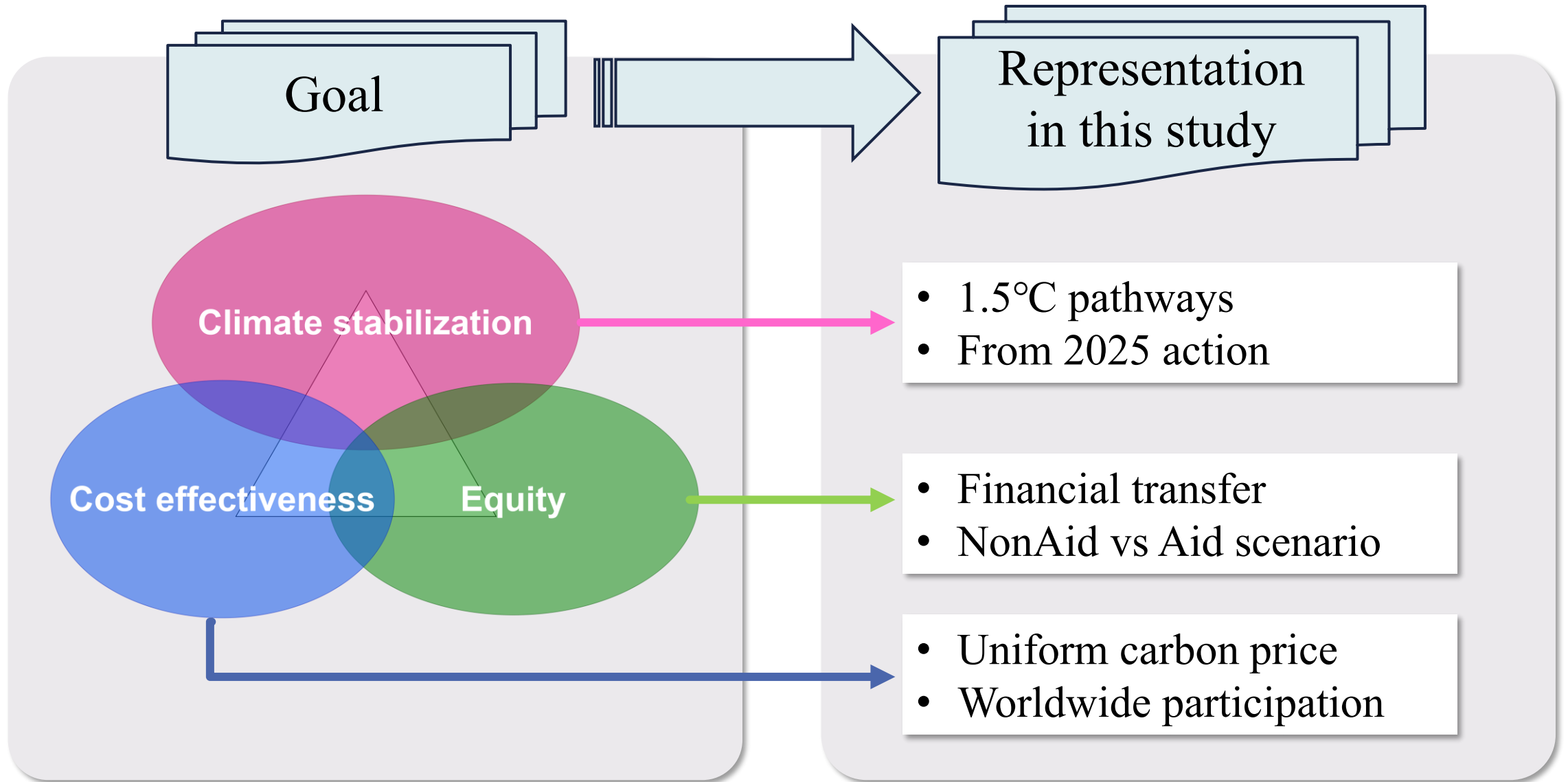
Research question

To what extent will the **regional distributional effects** be moderated if carbon tax revenue would be transferred to developing regions?

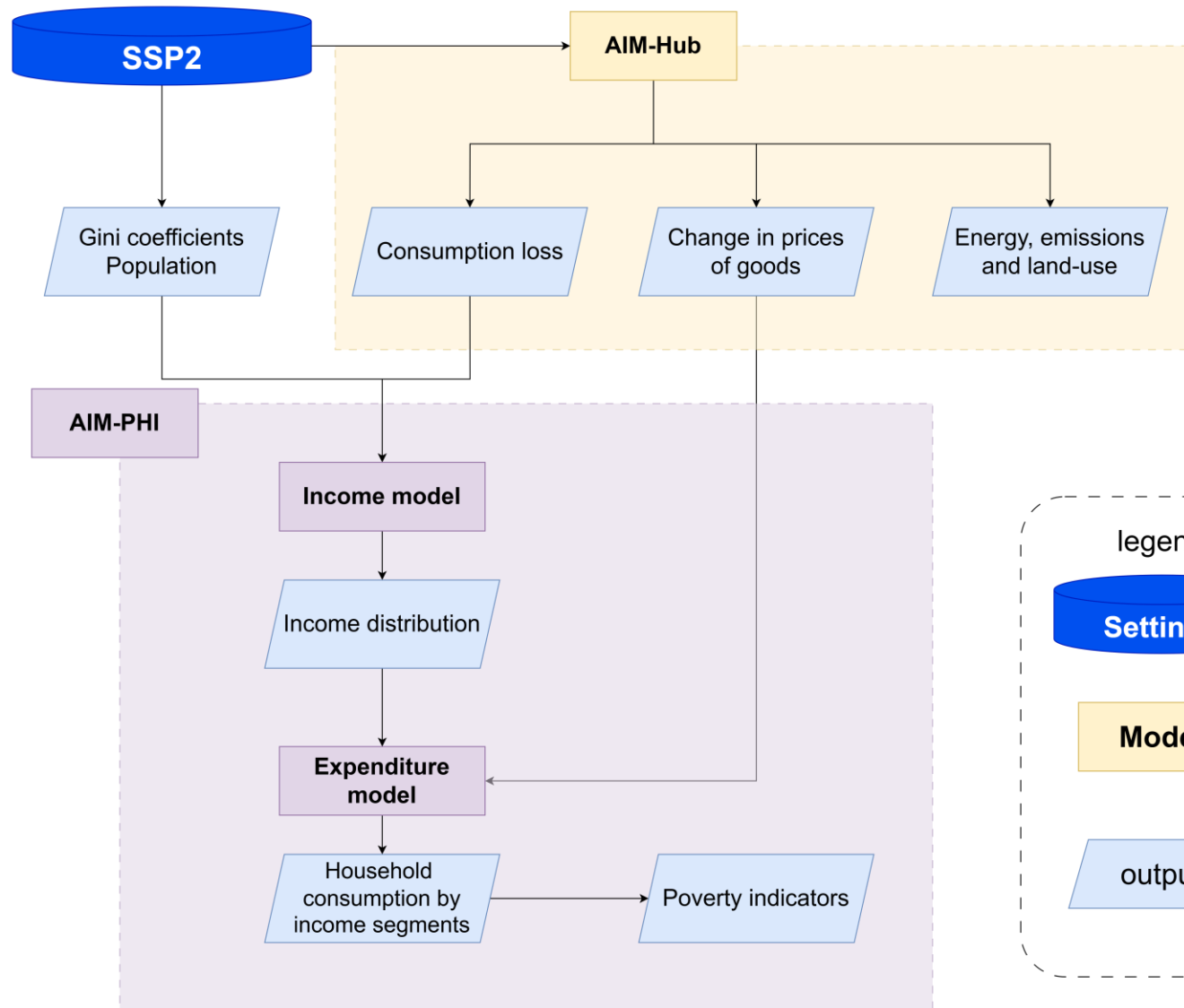
Uniform carbon pricing with equal per capita redistribution improved inequality (Emmerling et al., 2024).



Methodology – overview –



Methodology – modeling framework –



AIM-Hub



- CGE model⁵
- Global (17 regions)
- 2005-2050
- 56 sector
- 1 representative household

AIM-PHI



- Household consumption model⁶
- Global (186 regions)
- 2010-2050
- 14 items
- Lognormal distribution

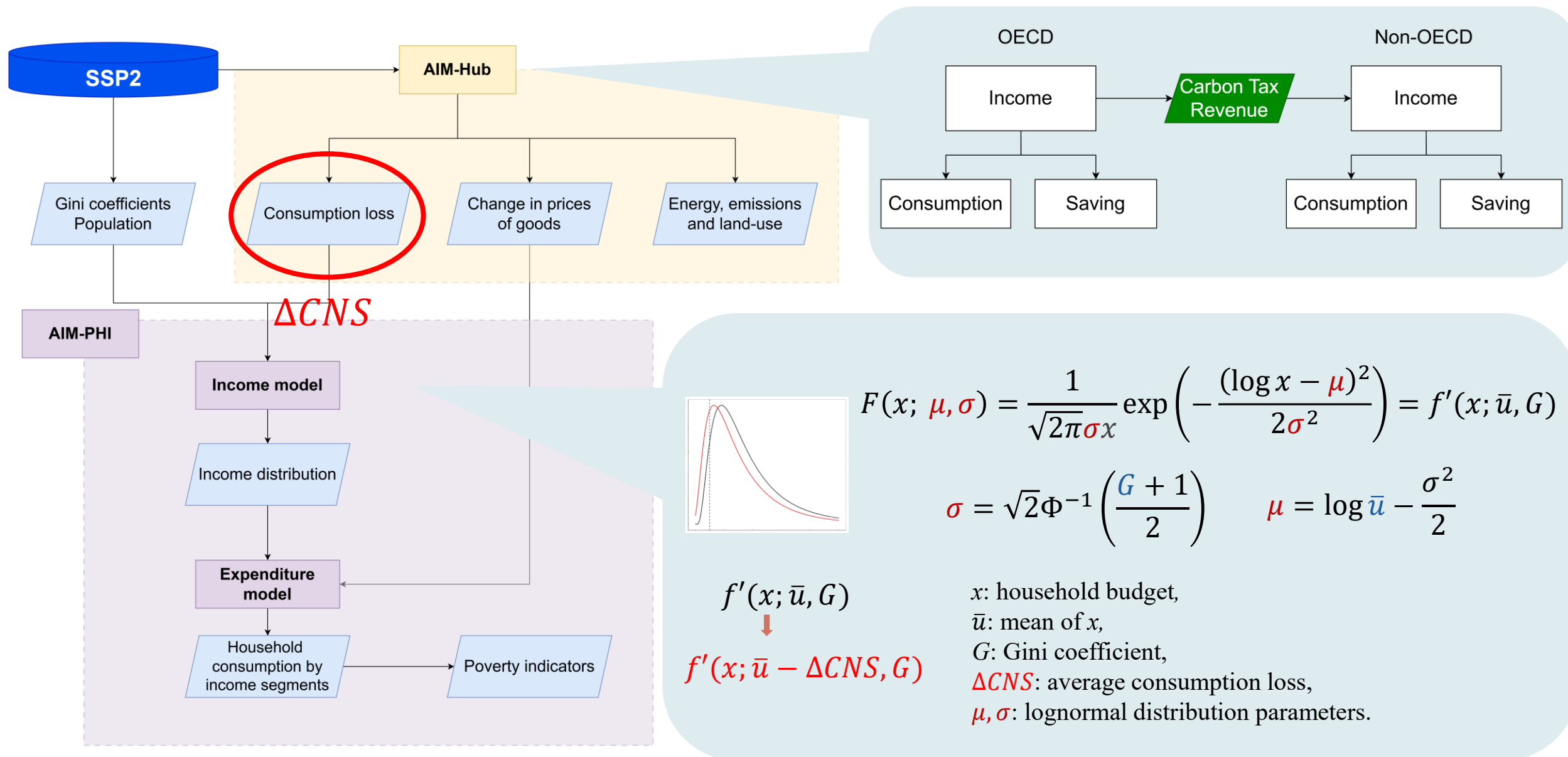
legend

Settings

Model

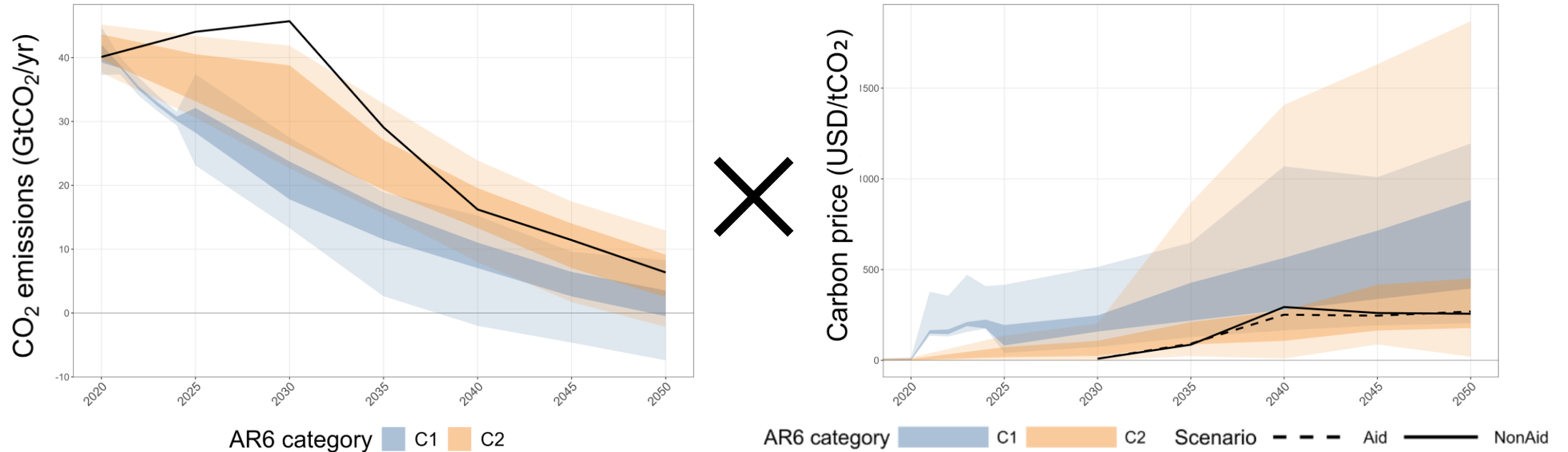
output

Methodology – modeling framework –



Results – emission pathway and carbon price–

1.2 trillion USD/year is transferred



- Carbon tax revenue in developed regions (= Transferred money):

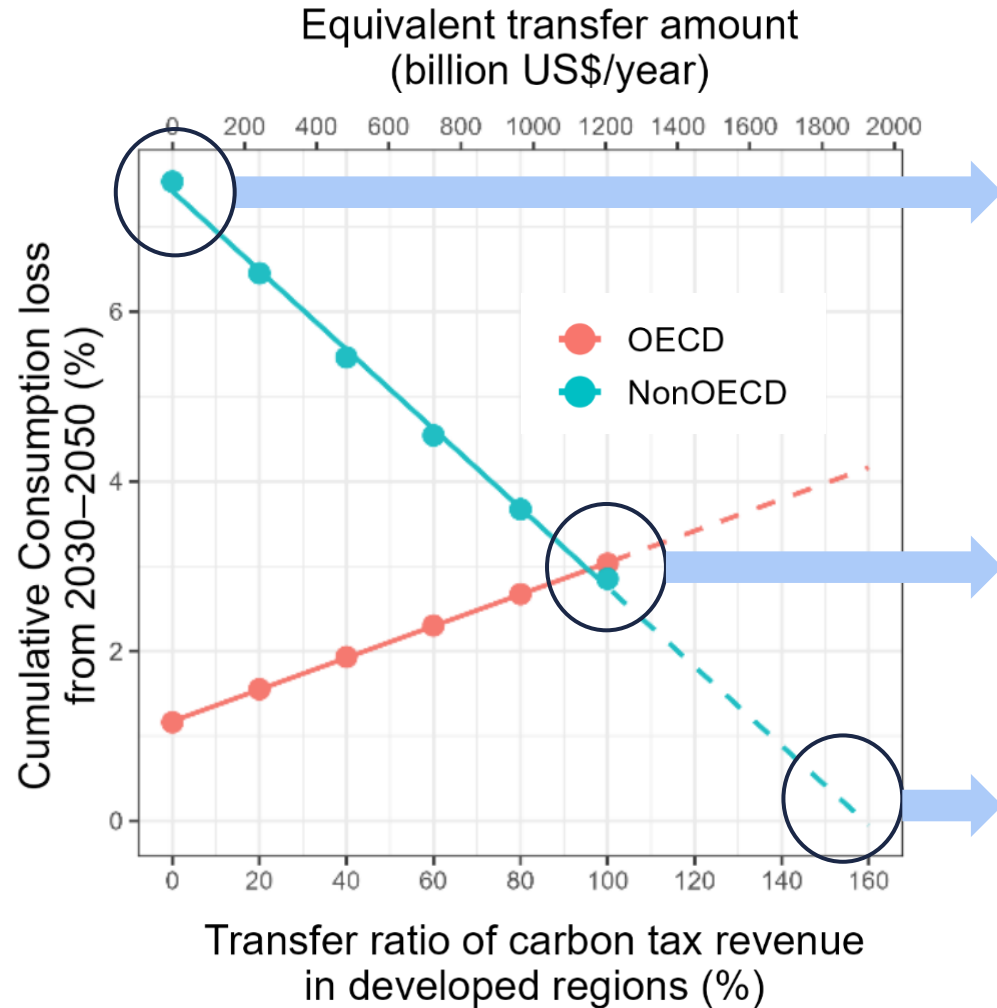
➤ 1.2 trillion USD/year

⇔ 1.4% of GDP in developed regions

⇔ 800 USD/year/cap in developed regions

Results – macro economic effects –

With 100% revenue aid, policy cost would be balanced in 3 %

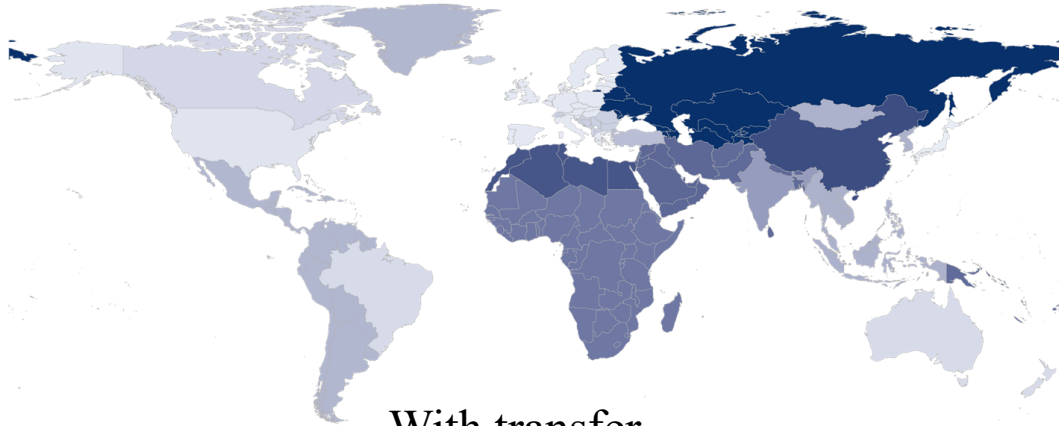


- Without any financial transfer, the cumulative cost of developing regions is **7.5 %**, which is **much higher than developed regions**.
- When developed regions transfer all of the carbon tax revenue, the cumulative consumption of both sides would be around **3 %**.
- To fully offset loss, **1.9 trillion USD/year** will be required.

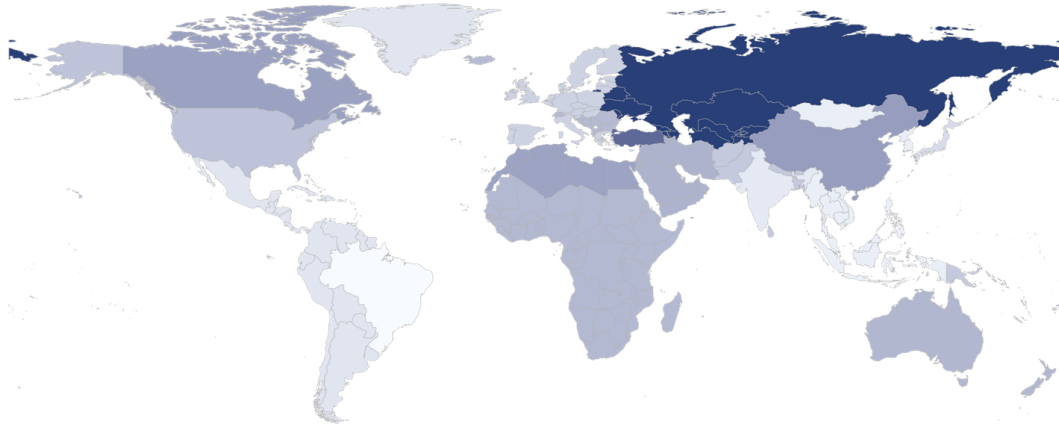
Results – regional insight –

Which region recover?

Without transfer



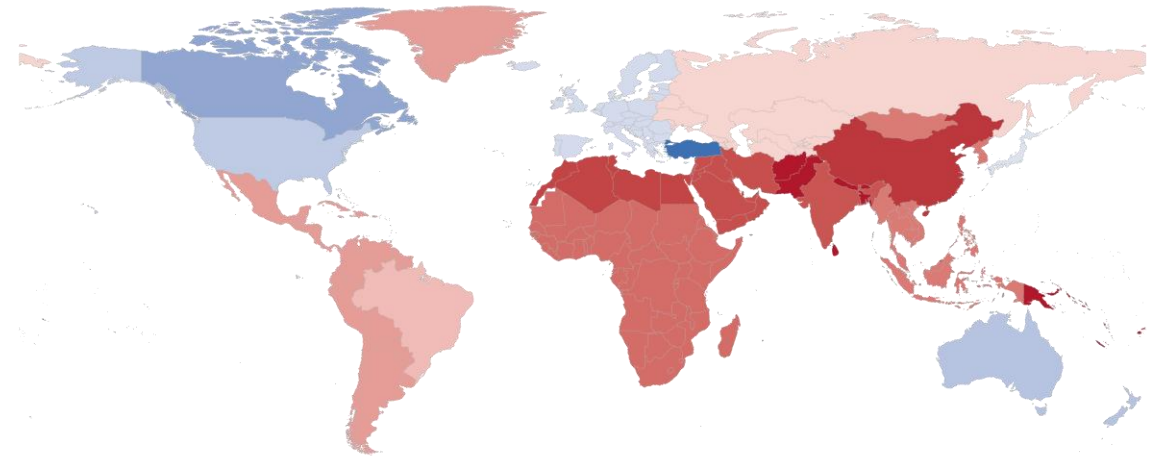
With transfer



Cumulative consumption loss rate



Asia and Africa get recovered
their consumption by carbon tax
revenue aid.

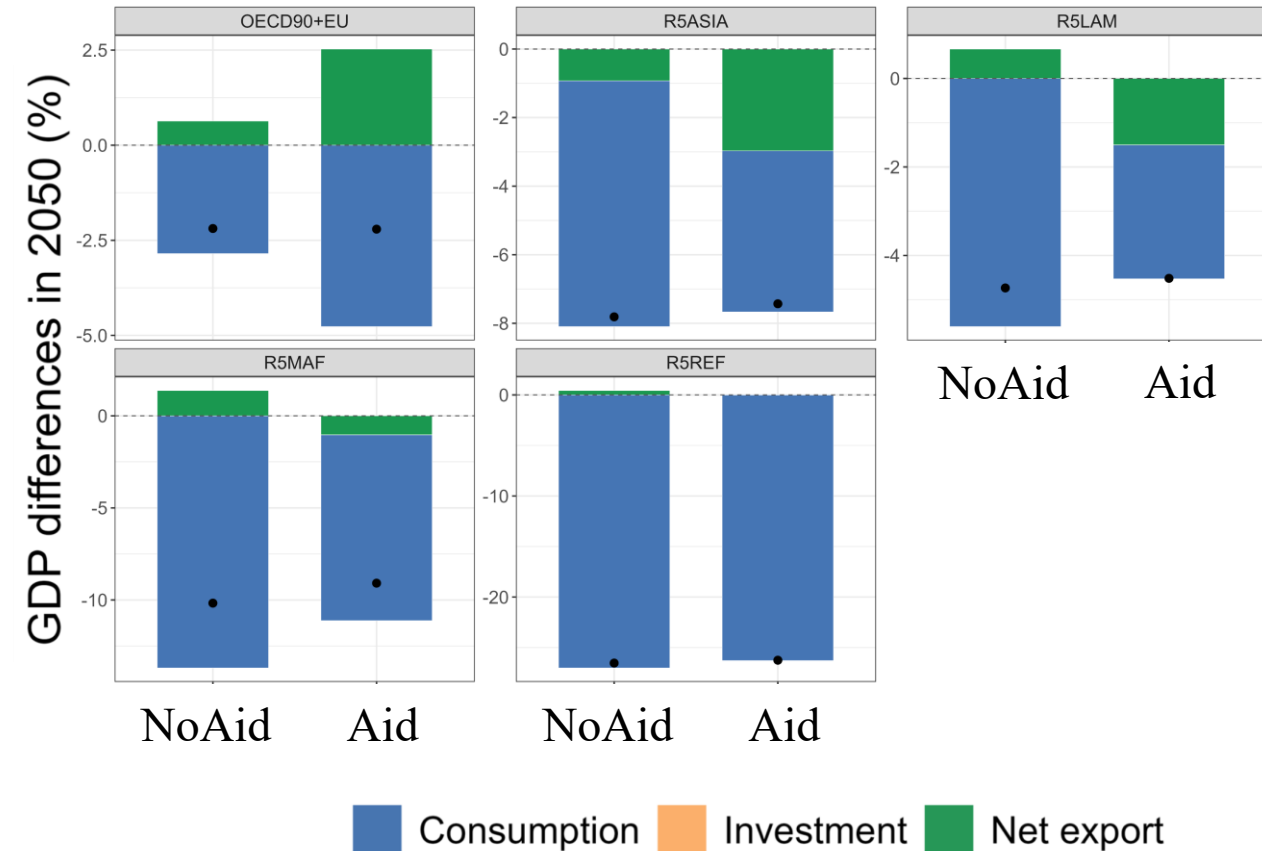


Recovery rate from NonAid (%)

A horizontal color scale bar ranging from -6 to 6. The color transitions from dark blue at -6, through white at 0, to dark red at 6, with intermediate labels at -3 and 3.

Results – regional insight –

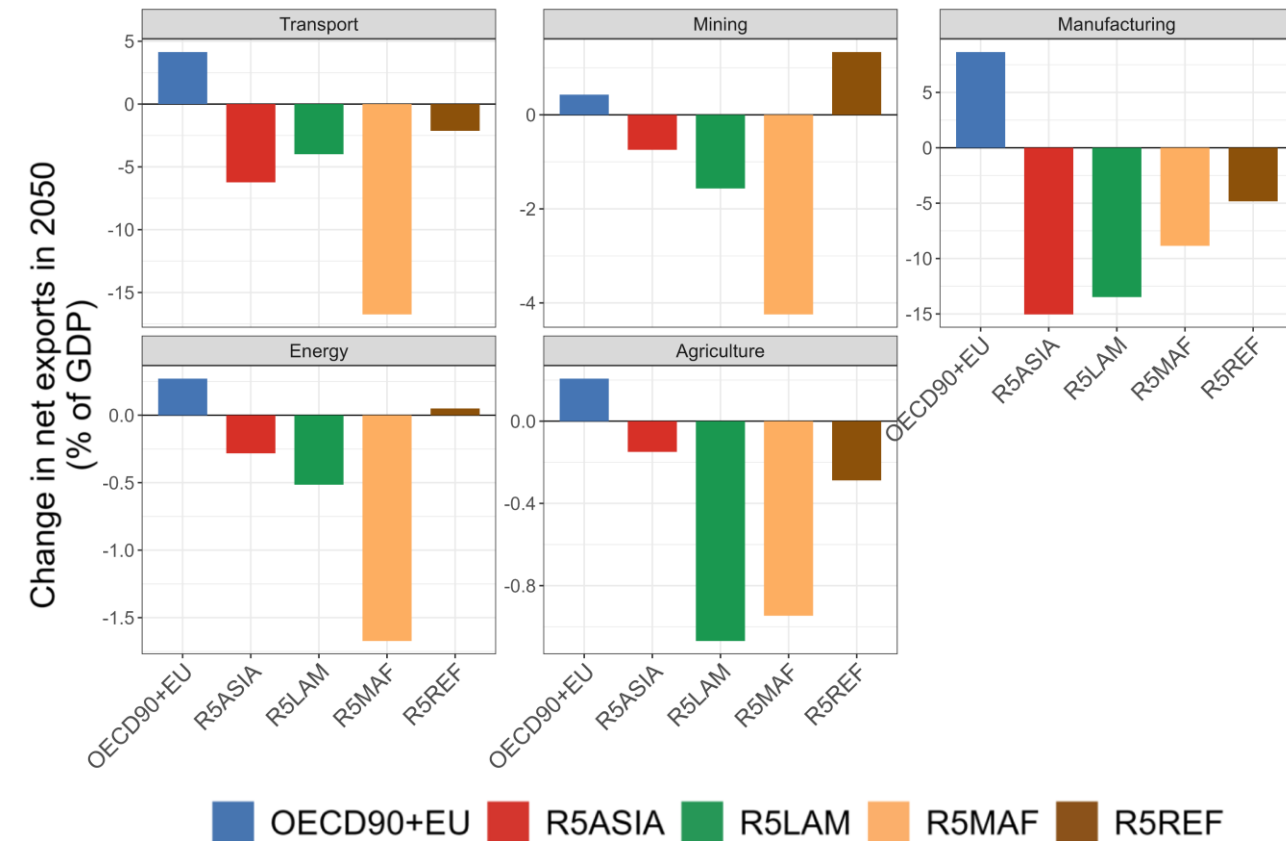
GDP also change, but trade mitigates its impact



- In terms of GDP, all regions have **GDP loss from no-climate policy scenario**.
- With financial aid from developed to developing regions, **consumption in developing regions increased**.
- At the same time, their **net-export decrease**. This mitigates the gain of their GDP.

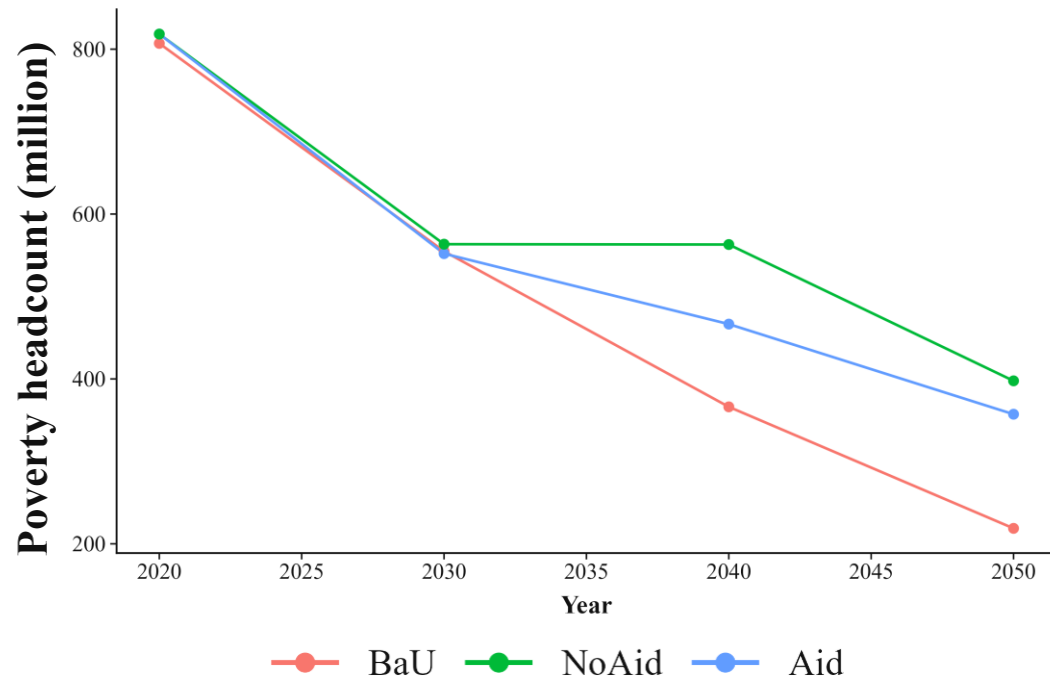
Results – regional insight –

Transport sector in Africa and Manufacturing in Asia

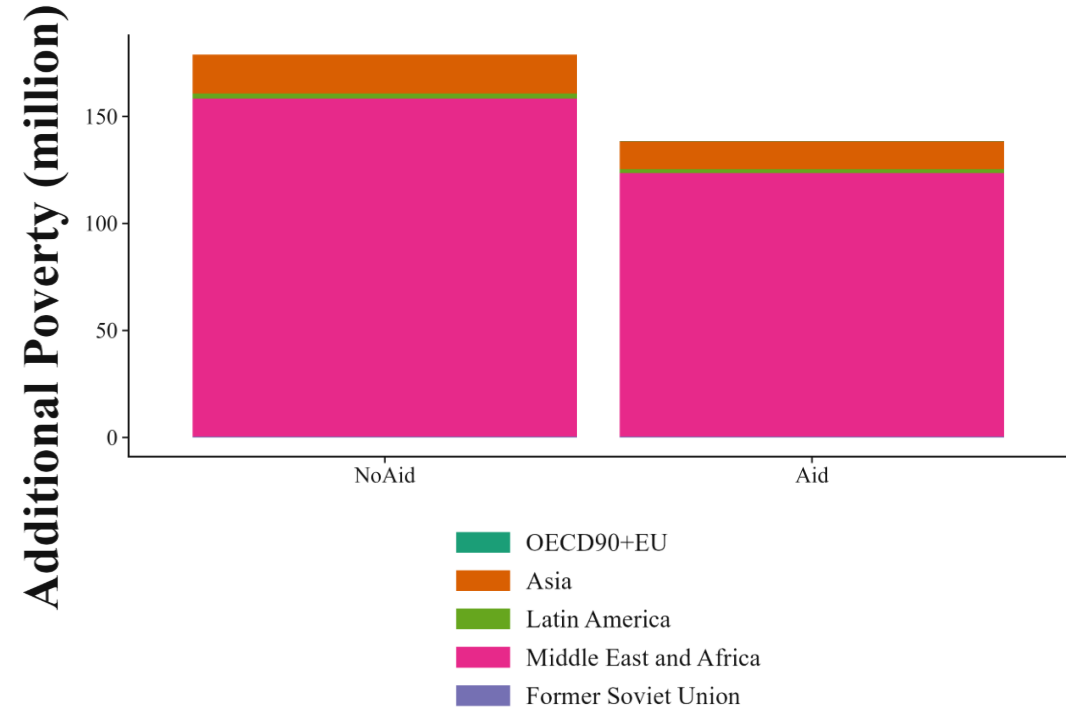


- All sectors in developed regions see increase of net export.
- Transport sector in Africa and Manufacturing in Asia see decrease of net export.
- These changes are due to inflow of funds and increased consumption.

Poverty projection is decreasing but mitigation policy hindered



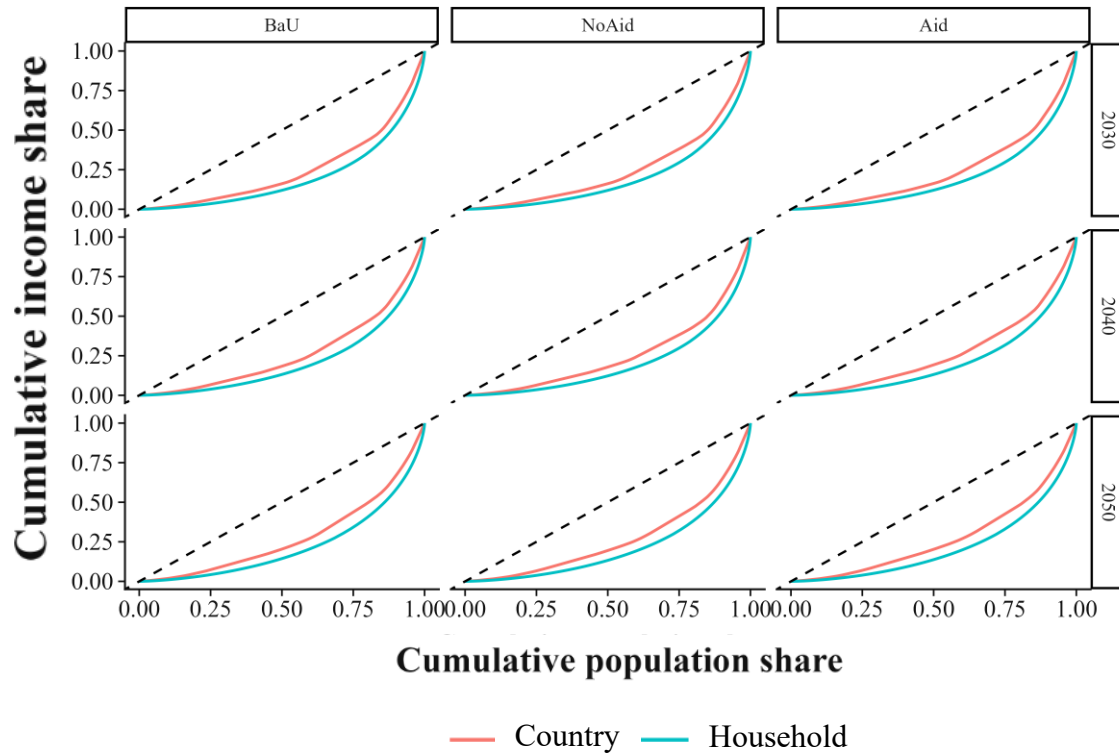
- ◆ The number of people under poverty line (2.15USD/cap) decreases over the year by economic growth assumption of SSP2.



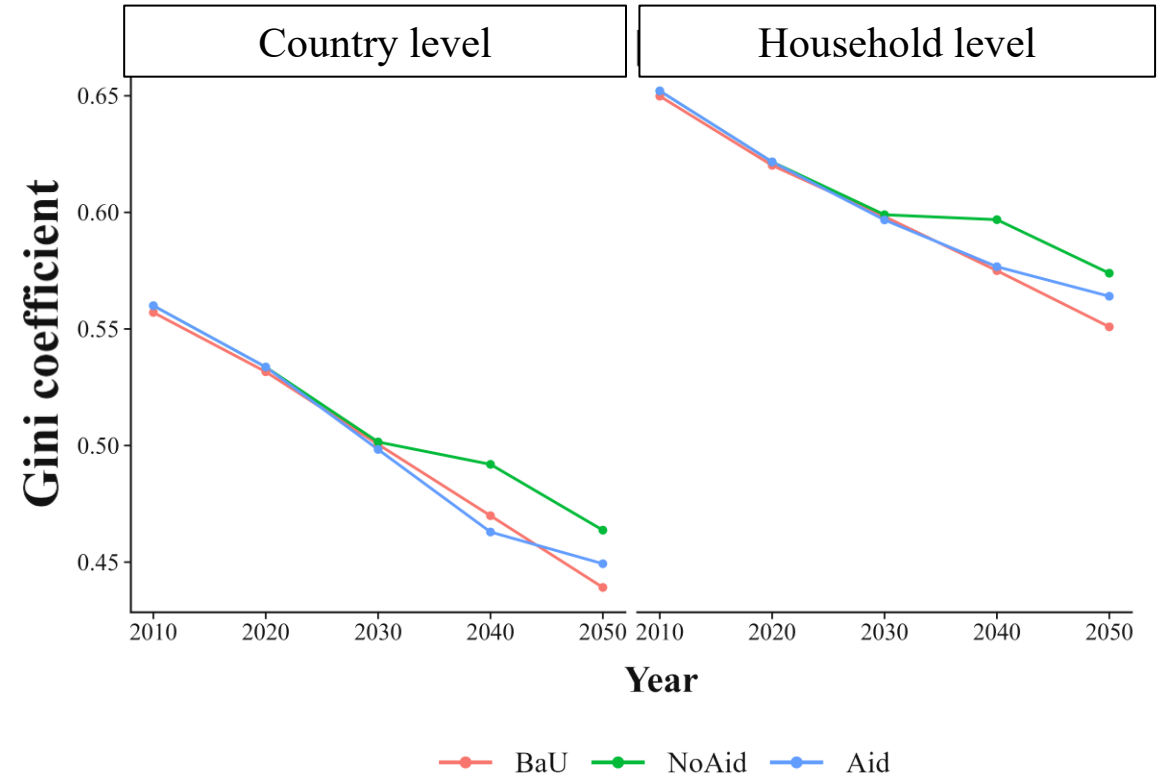
- ◆ Climate mitigation increases the number of poverty by both income and price effects.
- ◆ Carbon tax revenue reduced additional poverty of 23% (= 10% of global poverty).

Results – Poverty outcome and World Gini –

Gini changes across scenarios are small



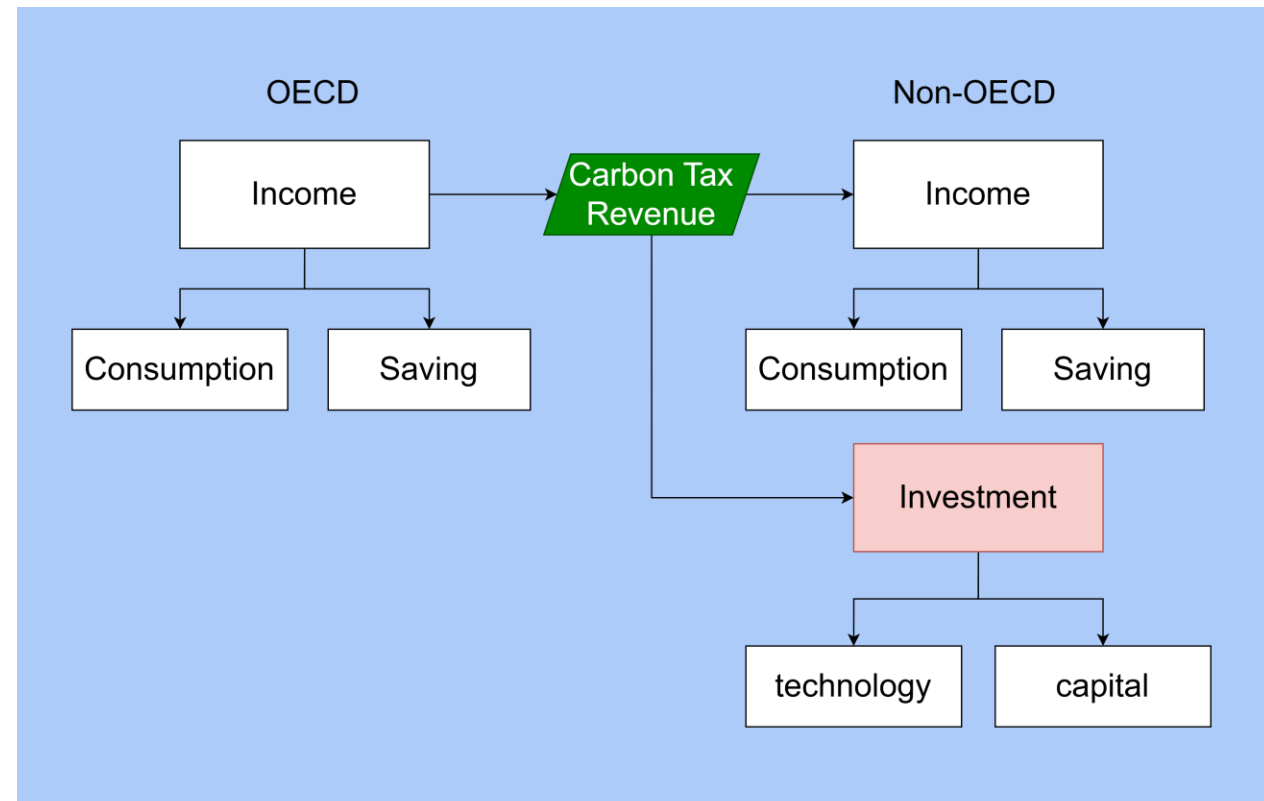
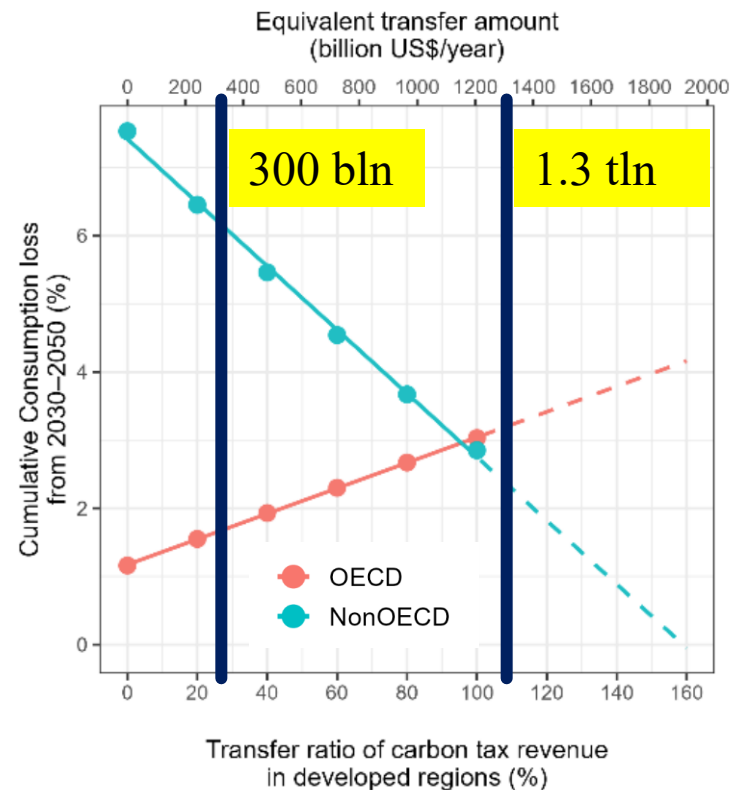
- ◆ Country...assume that one national average income in each country.
- ◆ Household...consider several income segment and each population within each country.



- ◆ About 10% Gini difference between two different methods. (Country vs Household)
- ◆ About 1% Gini difference between scenarios. (BaU vs NoAid vs Aid)

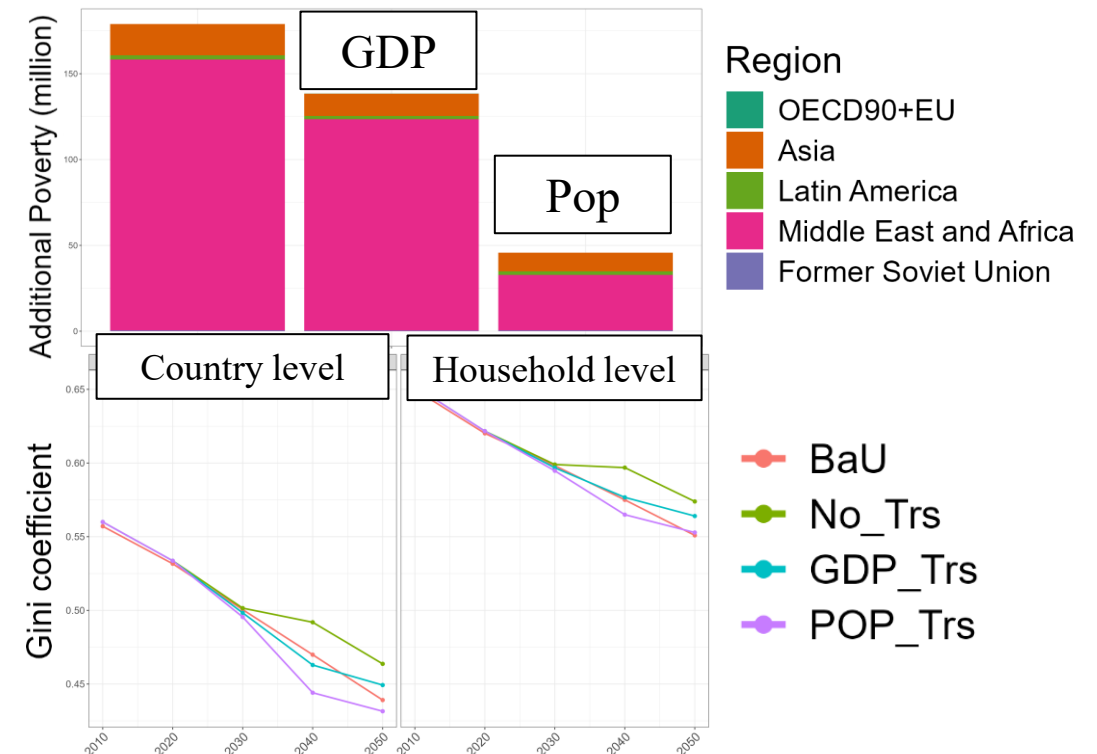
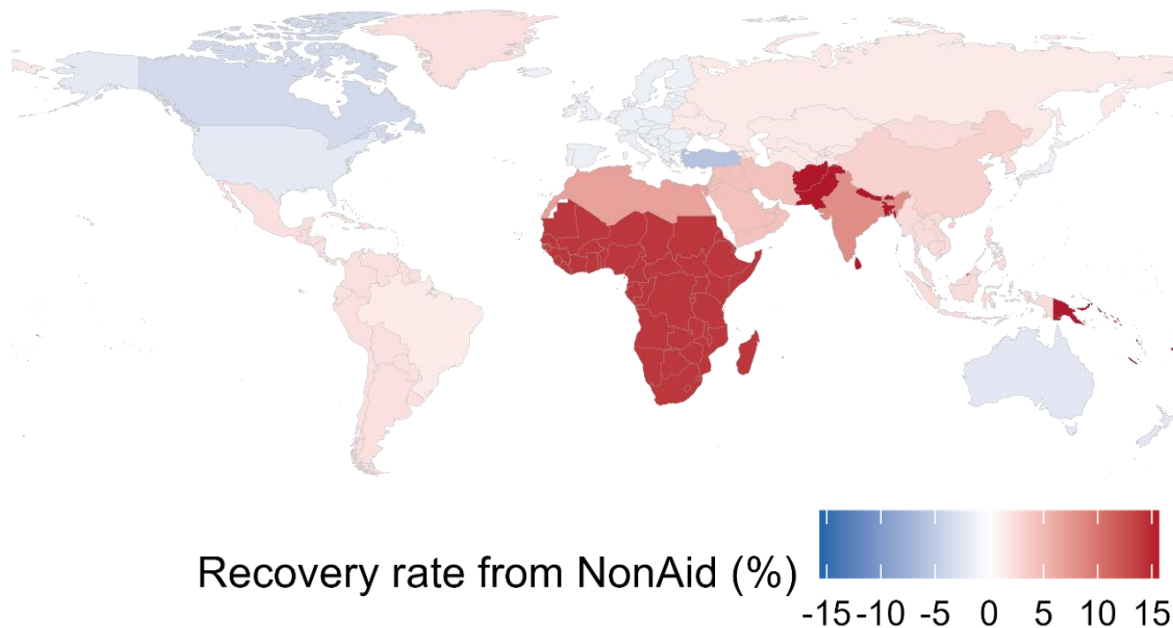
Discussion –the amount of money and its way of use –

- Insight of COP pledge - 300 billion or 1.3 trillion roadmap -
 - 300 billion USD annually are pledged, but its effect might be small for entire developing region's economy.
 - We have to carefully design how to use the money.



Discussion –Policy design –

- Regional clarification and distributional method
 - There is no clear division between developed and developing, but need to think more comprehensive classification.
 - For example, if we take population ratio transfer, African region gains more; hence we'll see more reduction in poverty headcount.



Conclusion

- The potential of carbon tax revenue
 - We found that carbon tax revenue in developed regions would be about 1.2 trillion USD/year between 2030 and 2050, which implies huge room for growth in the future.
- Global equity
 - When we transfer all of the revenue to developing regions, macro-economic loss would be almost balanced.
 - To fully offset, 1.9 trillion USD/year would be required.
- Regional insights
 - In 2050, 10% of global poverty(= 23% of additional poverty) would be eliminated by such additional income aid.
 - The overall effects on global gini is small (0.01).

Limitations and future study

- Domestic redistribution scheme
 - In this study, carbon revenue recycling scheme is distributionally neutral.
 - Its corresponding results would be underestimated compared to other method such as equal per capita or progressive scheme.
 - Future study could be the combination of international transfer and progressive redistribution of carbon revenue.
- Energy perspective
 - The overall results of this study don't see huge change in energy system.
 - This is due to the modeling assumption of direct transfer to the demand side.
 - Future study could be the additional investment by using carbon pricing revenue.
- Non-financial solution such as emission effort-sharing or CDR allocation.

Reference

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Thank you for your
attention!

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