

Global convergence of incomes in a climate-constrained world

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Towards a Post-Growth Deal: Introducing the REAL EU-ERC Synergy project



Planet,
People,
Care: It
 Spells
Degrowth!



Zagreb, Sept 1 2023

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European Research Council
Established by the European Commission

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The REAL team

Major Questions

- 01.** How can **dramatic reductions in energy and resource use** be achieved while at the same time **ensuring decent lives for all?**

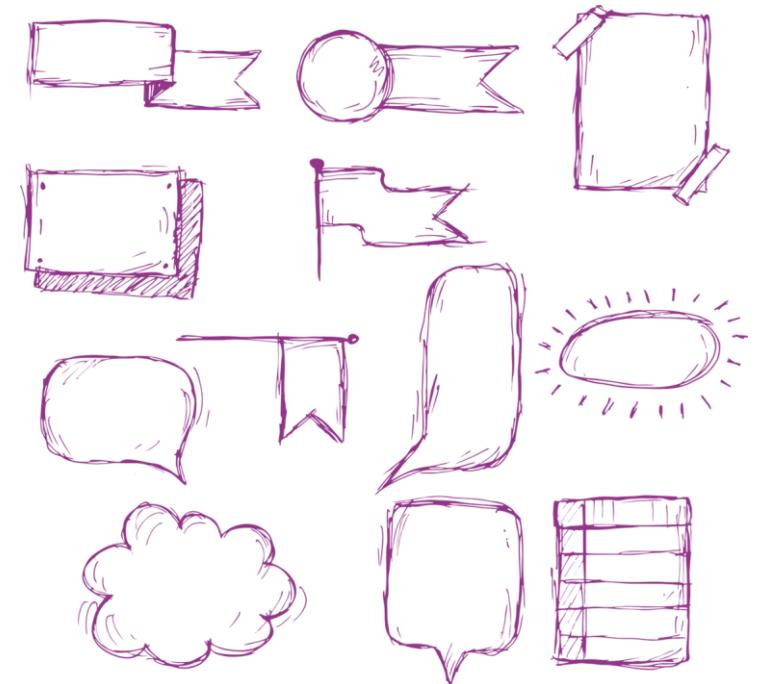
- 02.** What **policies** and **provisioning systems** are required? How can post-growth transitions be accomplished **politically**?

- 03.** How can **convergence** be achieved between North and South, to a level of throughput that is sufficient for high human development and compatible with planetary boundaries?



Plan for today

- Generic economic convergence discussion
- Introduce research idea
- Model walkthrough
- Results



More specific
and technical

Generic convergence discussion

What do I mean by convergence? And climate-constrained?

**Exactly same living
standard** across
countries and groups
within

With **as little global
warming as** possible

Convergence of what in my model?



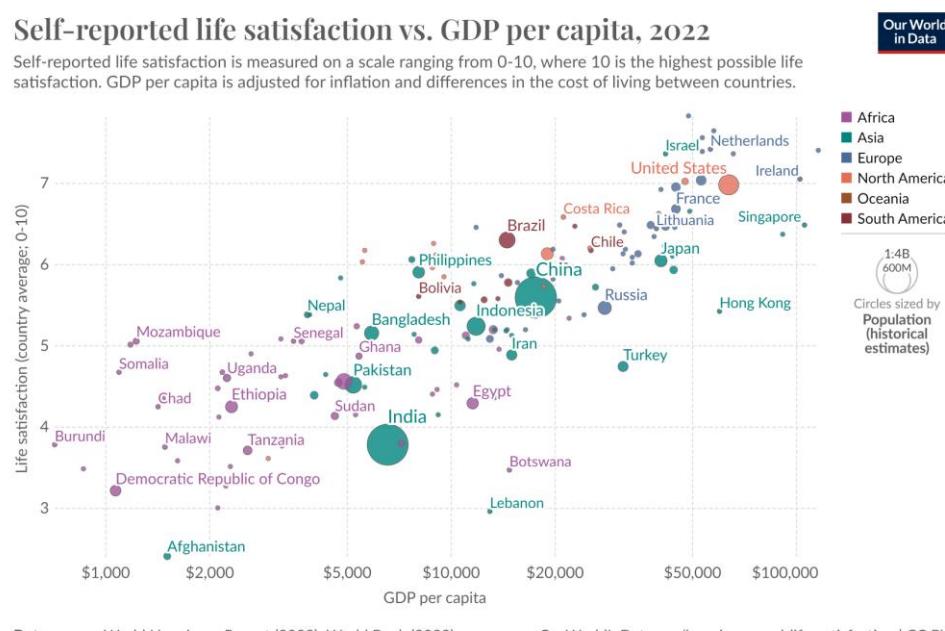
**Household
disposable
income /
consumption
expenditures**

Why economic convergence? Why incomes?

If you are an economist..

Self-reported life satisfaction vs. GDP per capita, 2022

Self-reported life satisfaction is measured on a scale ranging from 0-10, where 10 is the highest possible life satisfaction. GDP per capita is adjusted for inflation and differences in the cost of living between countries.

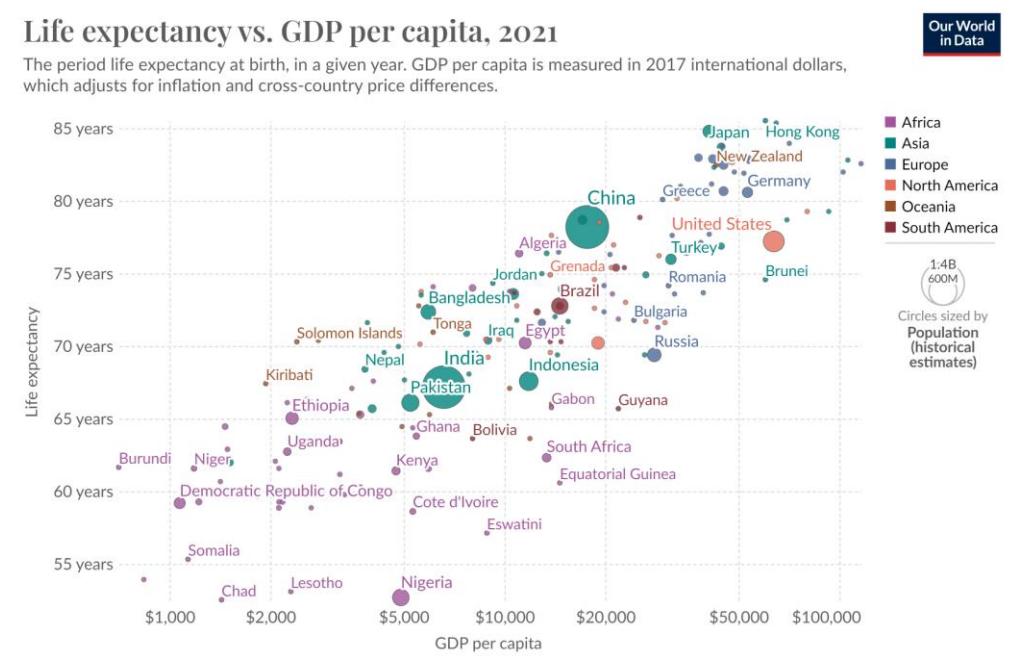


Data source: World Happiness Report (2023); World Bank (2023)
Note: GDP per capita is expressed in international-\$¹ at 2017 prices.

1. International dollars: International dollars are a hypothetical currency that is used to make meaningful comparisons of monetary indicators of living standards. Figures expressed in international dollars are adjusted for inflation within countries over time, and for differences in the cost of living between countries. The goal of such adjustments is to provide a unit whose purchasing power is held fixed over time and across countries, such that one international dollar can buy the same quantity and quality of goods and services no matter where or when it is spent. Read more in our article: What are Purchasing Power Parity adjustments and why do we need them?

Life expectancy vs. GDP per capita, 2021

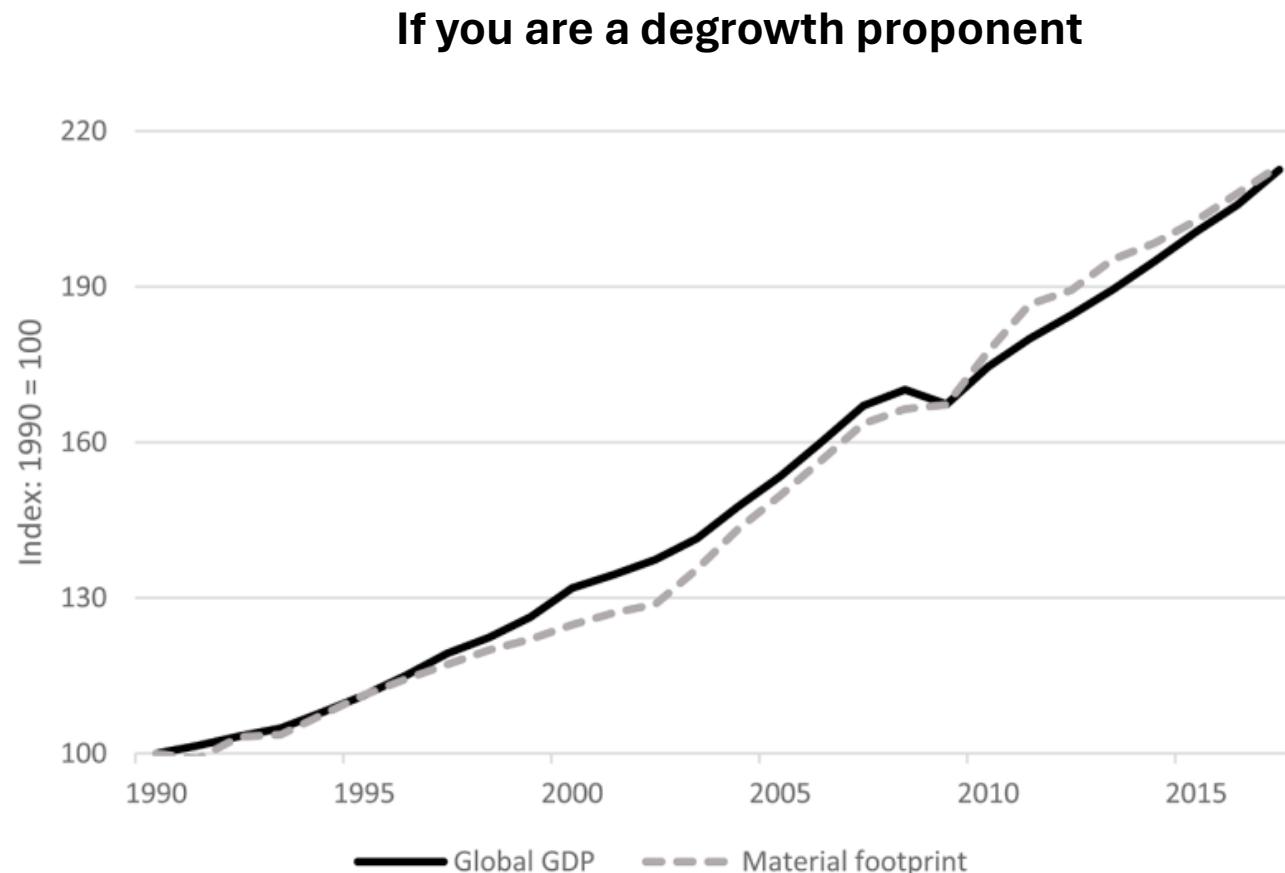
The period life expectancy at birth, in a given year. GDP per capita is measured in 2017 international dollars, which adjusts for inflation and cross-country price differences.



Data source: UN, World Population Prospects (2022); Multiple sources (via World Bank)

OurWorldInData.org/life-expectancy | CC BY

Why economic convergence? Why incomes?



Why economic convergence? Why incomes?

If you are a pragmatist..

Kinda good data available



Institutions
interested perhaps



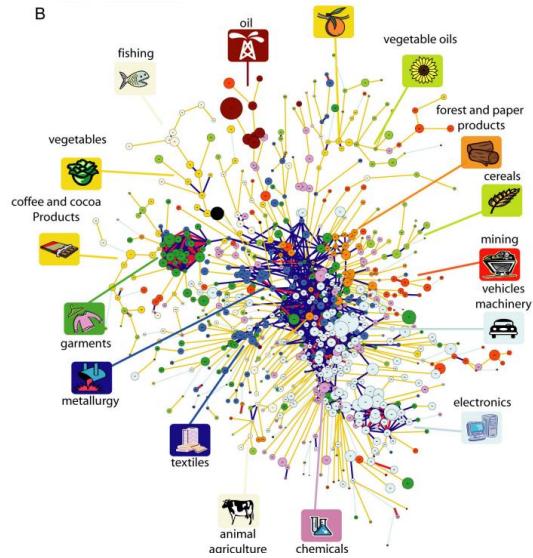
Global economic convergence is about many things not in the model



Geopolitical restructuring



New international and
national institutions



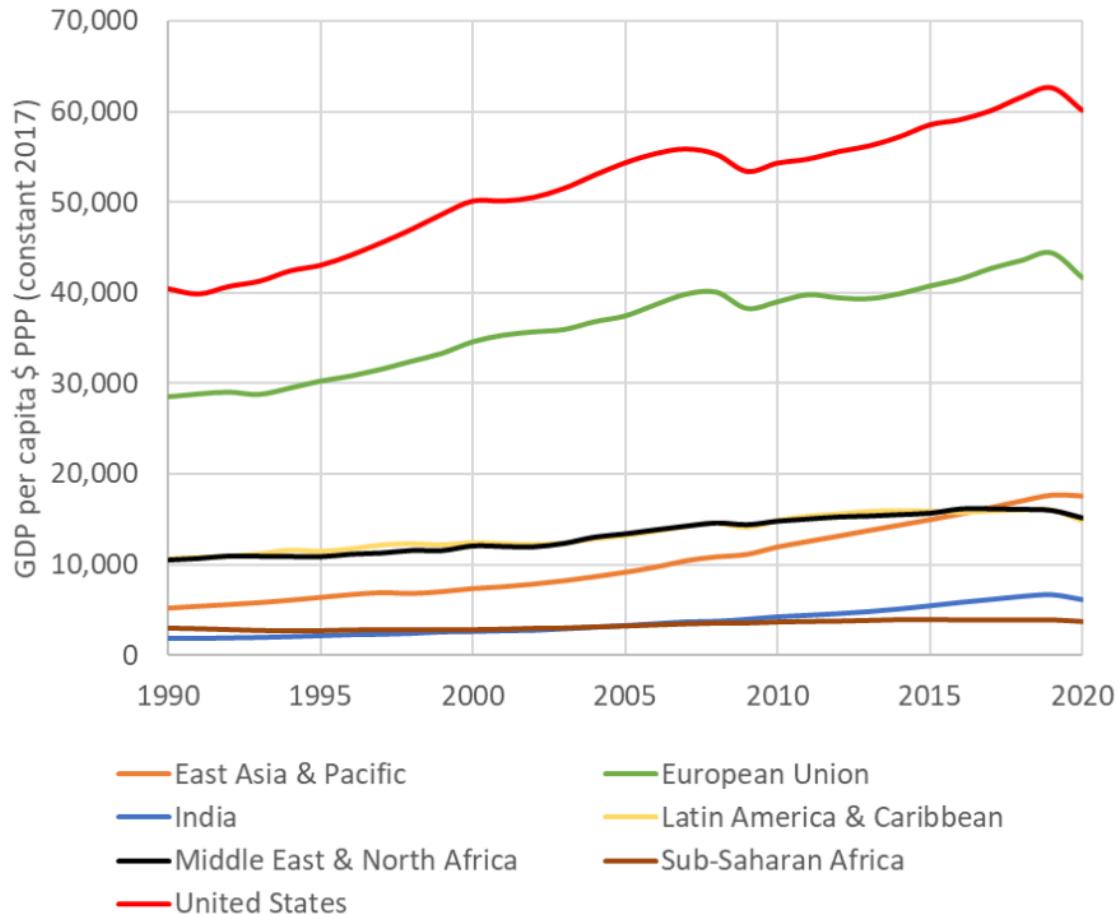
Production and consumption shape

Figure from 1: Hidalgo, C. A., Klinger, B., Barabási, A. L., & Hausmann, R. (2007). The product space conditions the development of nations. *Science*, 317(5837), 482-487.

Specific motivation

Motivation (i)

- Convergence should happen but is not.



Oswald, Y. L. (2022). *Inequality, (re) distribution and luxury-taxation of international household energy and carbon footprints* (Doctoral dissertation, University of Leeds).

Motivation (ii)

Studies focusing on poverty eradication and climate

Bruckner, B., Hubacek, K., Shan, Y. et al. Impacts of poverty alleviation on national and global carbon emissions. *Nat Sustain* 5, 311–320 (2022). <https://doi.org/10.1038/s41893-021-00842-z>

Wollburg, P., Hallegatte, S., & Mahler, D. G. (2023). Ending extreme poverty has a negligible impact on global greenhouse gas emissions. *Nature*, 623(7989), 982-986.

Motivation (iii)

- Even small achievements equal much emission under current techno-economic assumptions.

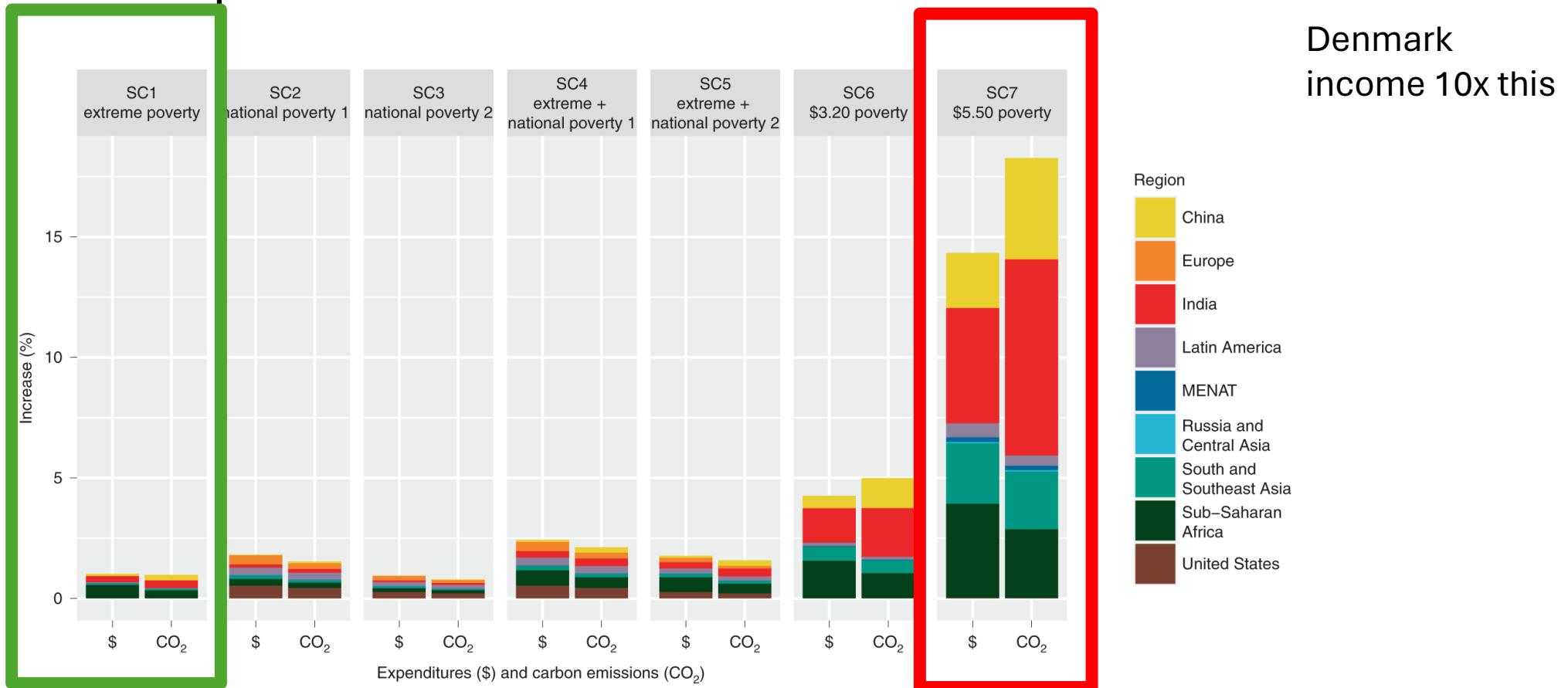


Figure from: Bruckner, B., Hubacek, K., Shan, Y. et al. Impacts of poverty alleviation on national and global carbon emissions. *Nat Sustain* 5, 311–320 (2022).
<https://doi.org/10.1038/s41893-021-00842-z>

What if *all* people lived like in...?

Costa Rica $\approx 28 \text{ \$/day}$
 $\approx 10000 \text{ \$/yr}$

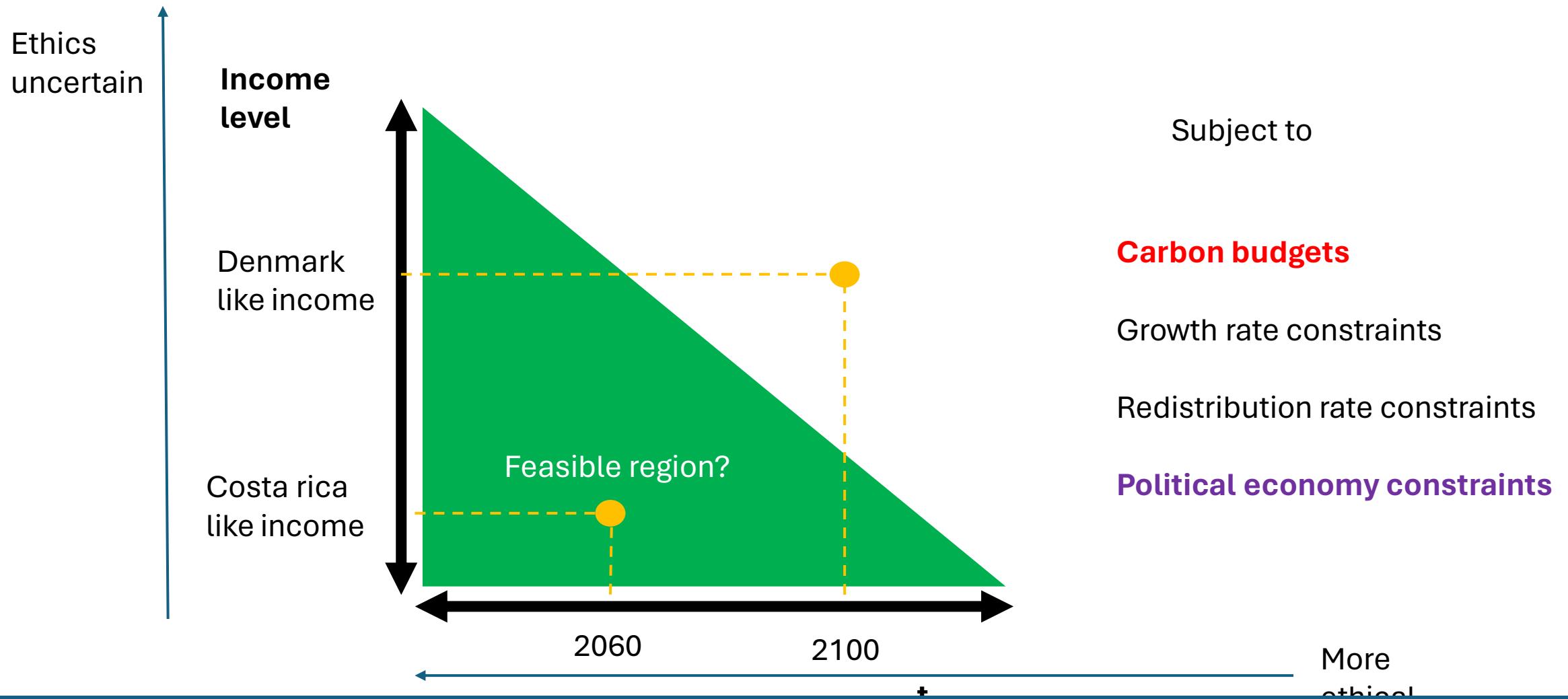


Denmark $\approx 55 \text{ \$/day}$
 $\approx 20000 \text{ \$/yr}$



Model introduction

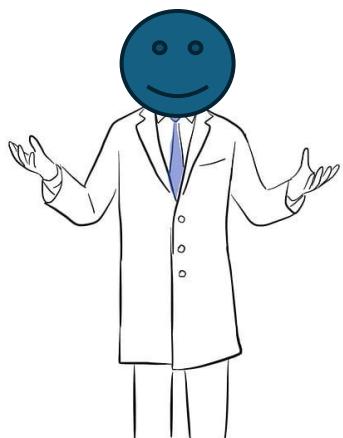
What kind convergence is possible?



In order to approach this question I..

Study a
data-driven
determinist
ic model

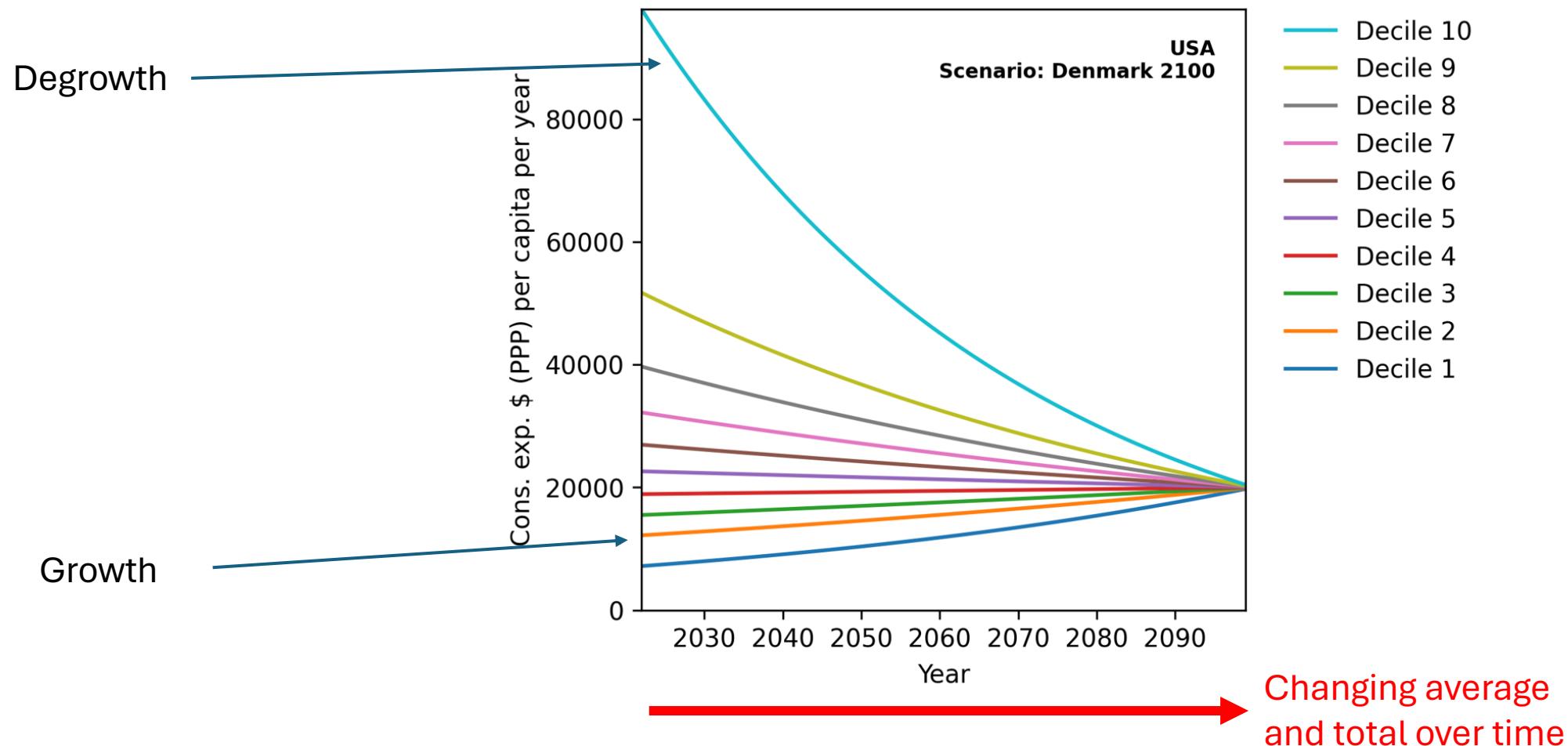
Employ data from
Poverty and Inequality
Lab (World Bank)



On the underlying data from <https://pip.worldbank.org/>

- Deciles over 150 countries
- Consumption expenditure / disposable income of households \$ PPP (2017 dollars)
- Initial year of model = 2023
- All other data e.g. on carbon emission from World Bank

How does the model work what does it do?



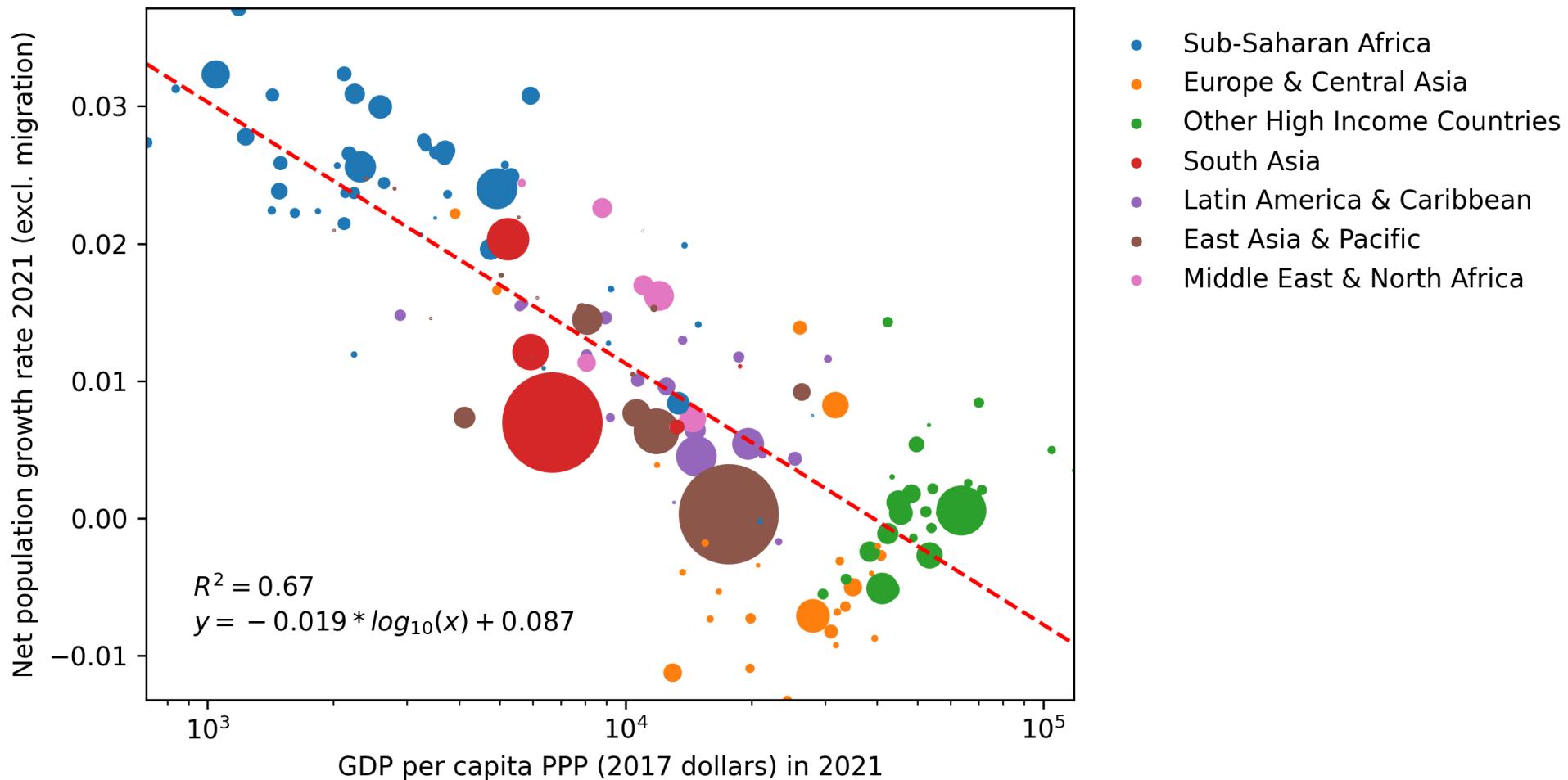
How does the model work what does it do?

$$C = \frac{\text{Household expenditure}}{GDP}$$

$$\text{Emissions} = GDP \times \text{Carbon intensity}$$

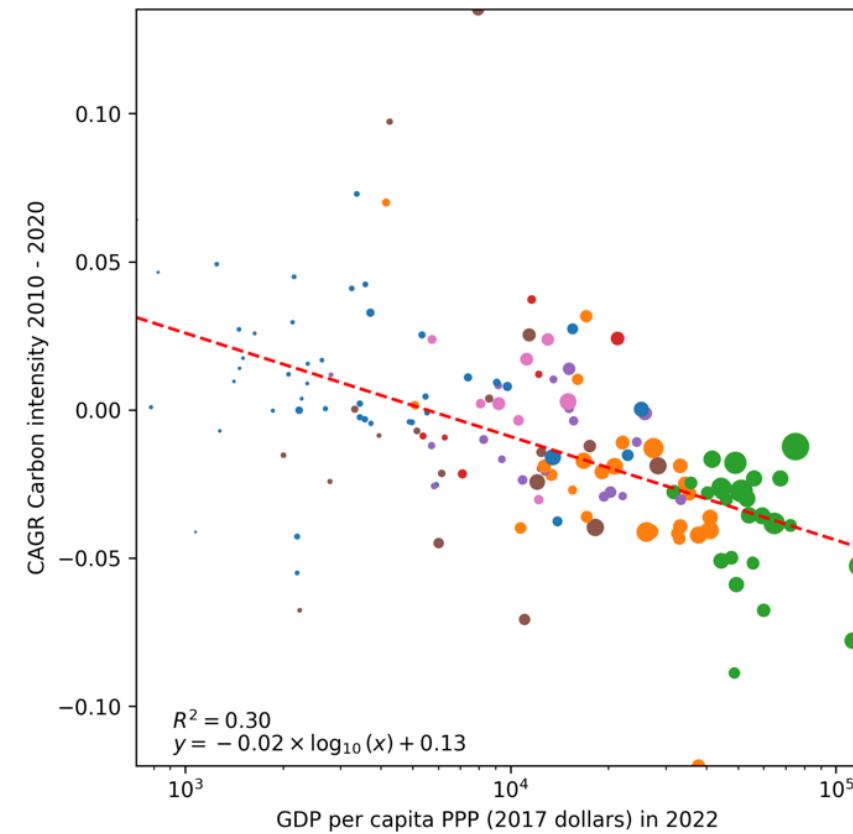
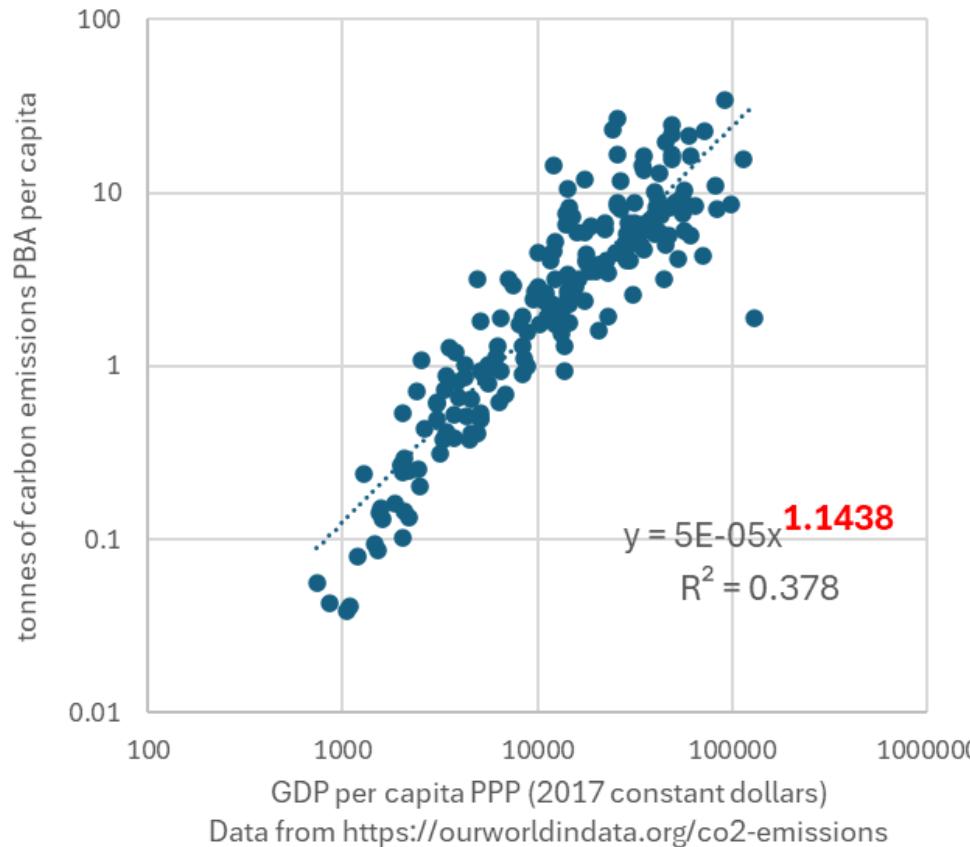
Model mechanics and assumptions

On population..

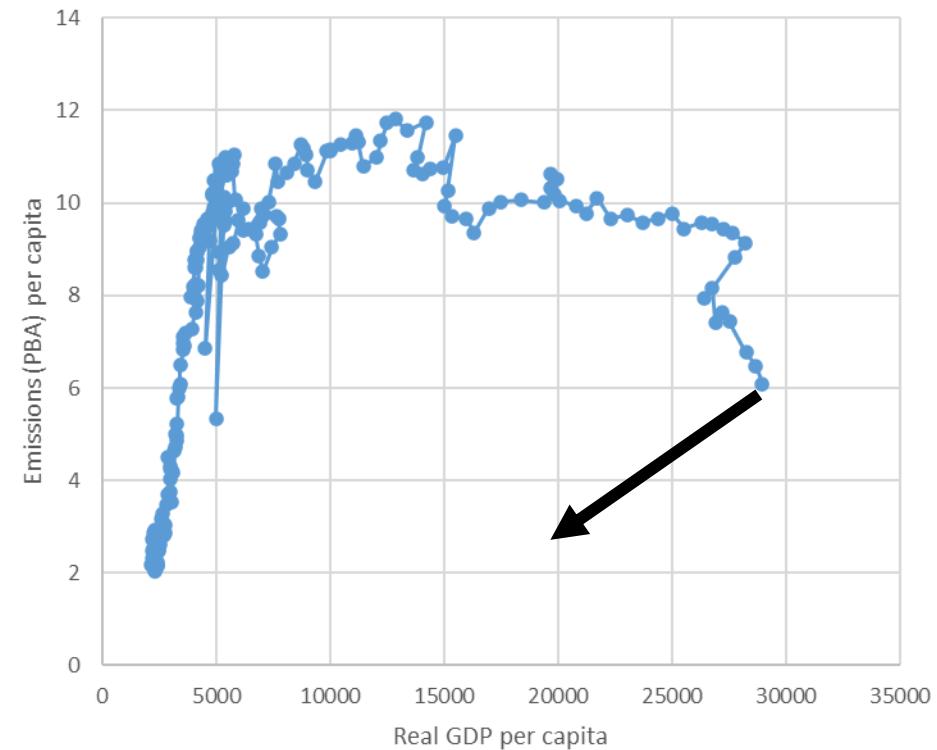
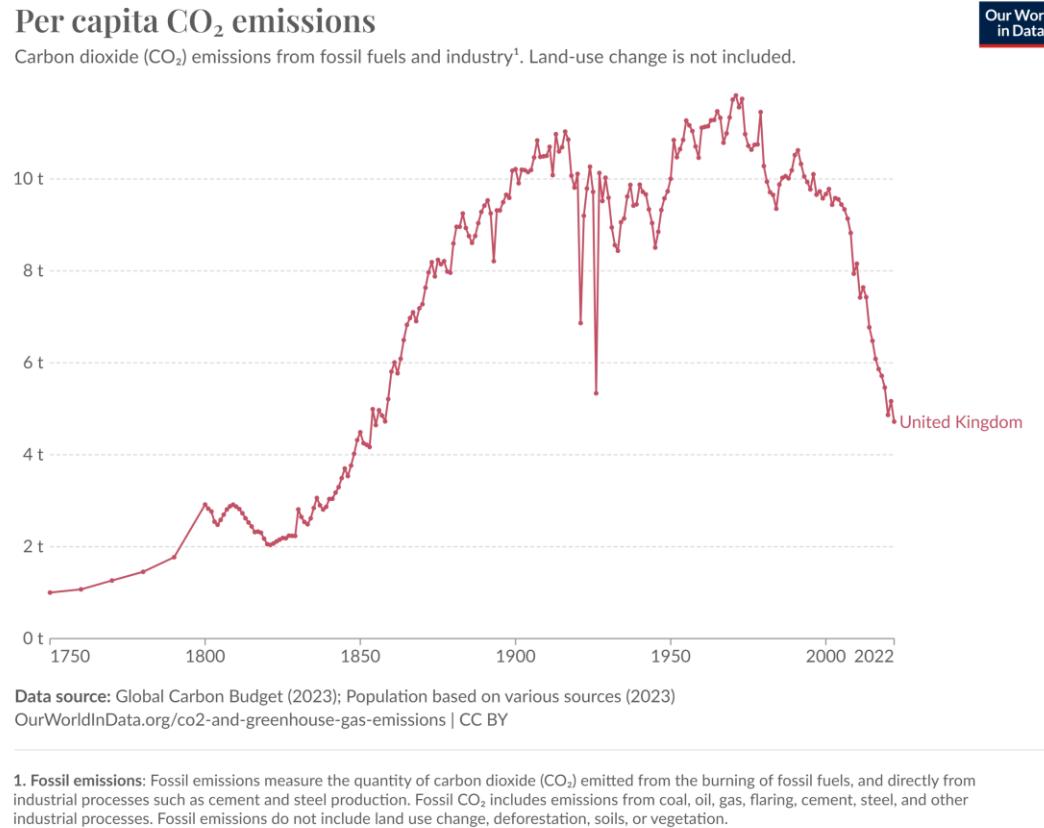


Where it gets difficult: On income and technology

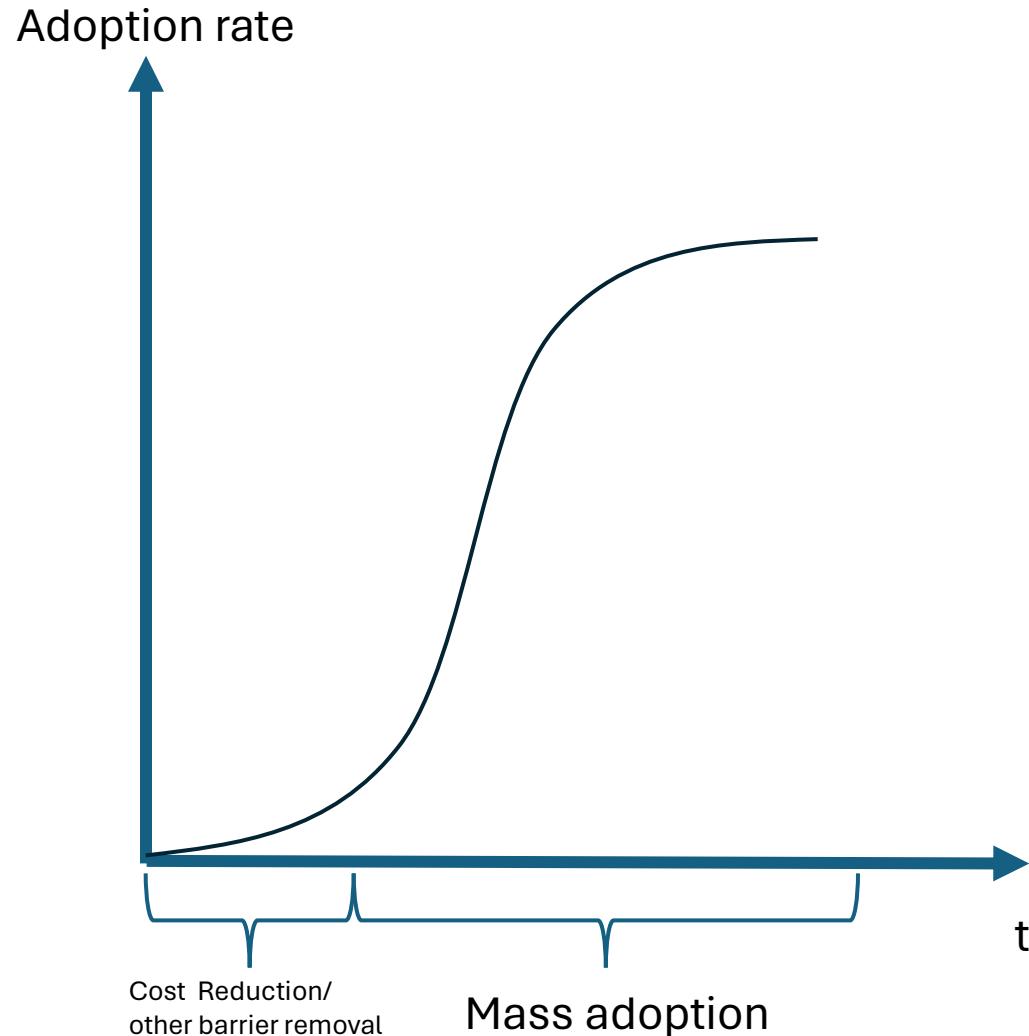
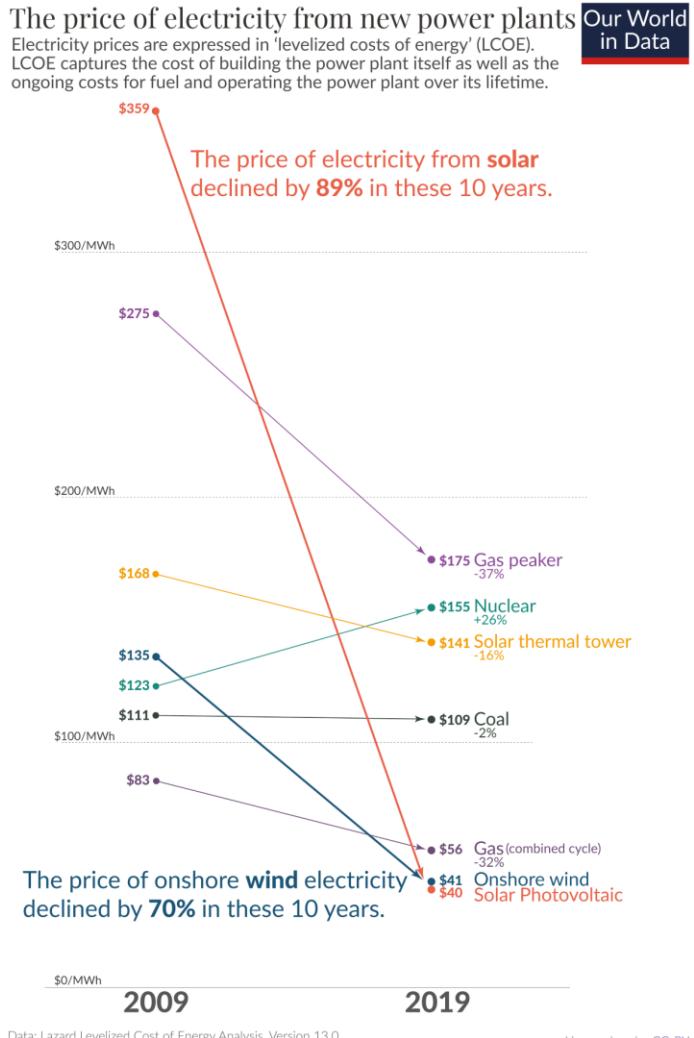
Income and carbon emissions



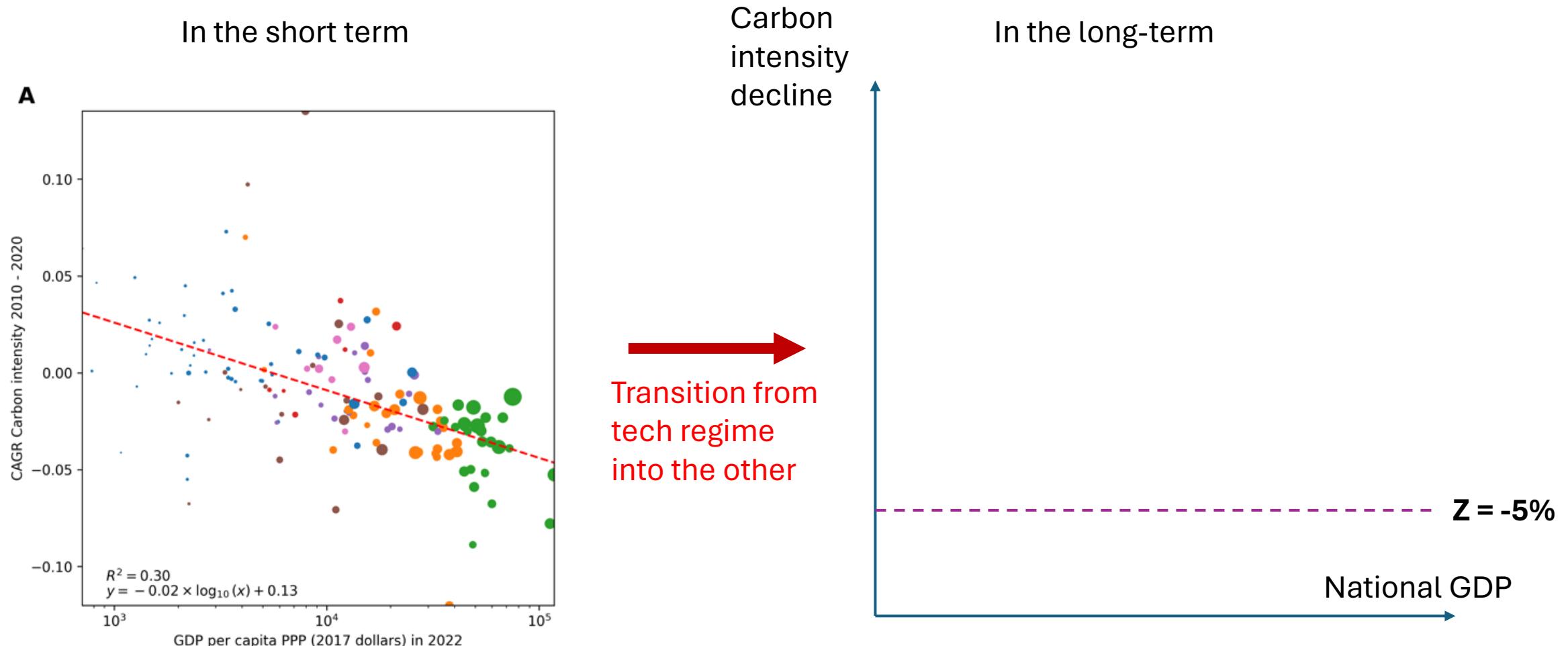
Planned degrowth plus fast decarbonization technology development and diffusion?...Probably, yes



Technology becomes more accessible over time



Transferred to my logic of using carbon intensity only..



How to transition from tech regime into the other?

- Say $f(t)$ is technology or carbon intensity reduction over time

$$f(t) = (1 - w(t)) * \textcolor{brown}{r} + w(t) * \textcolor{green}{z}$$


Current regime
Wealth matters for
decarb.

Future regime
uniform decarb.

How to transition from tech regime into the other?

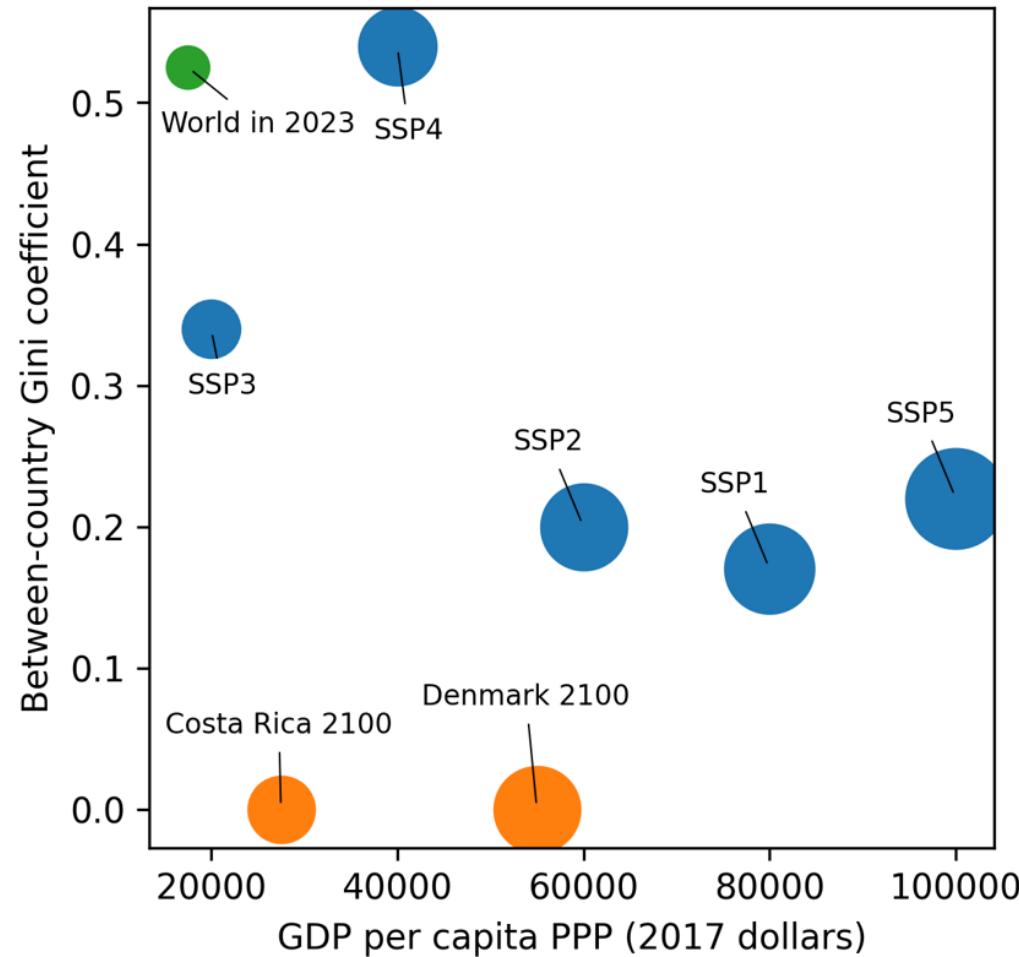
- Say $f(t)$ is technology or carbon intensity reduction over time

$$f(t) = (1 - w(t)) * r + w(t) * z$$

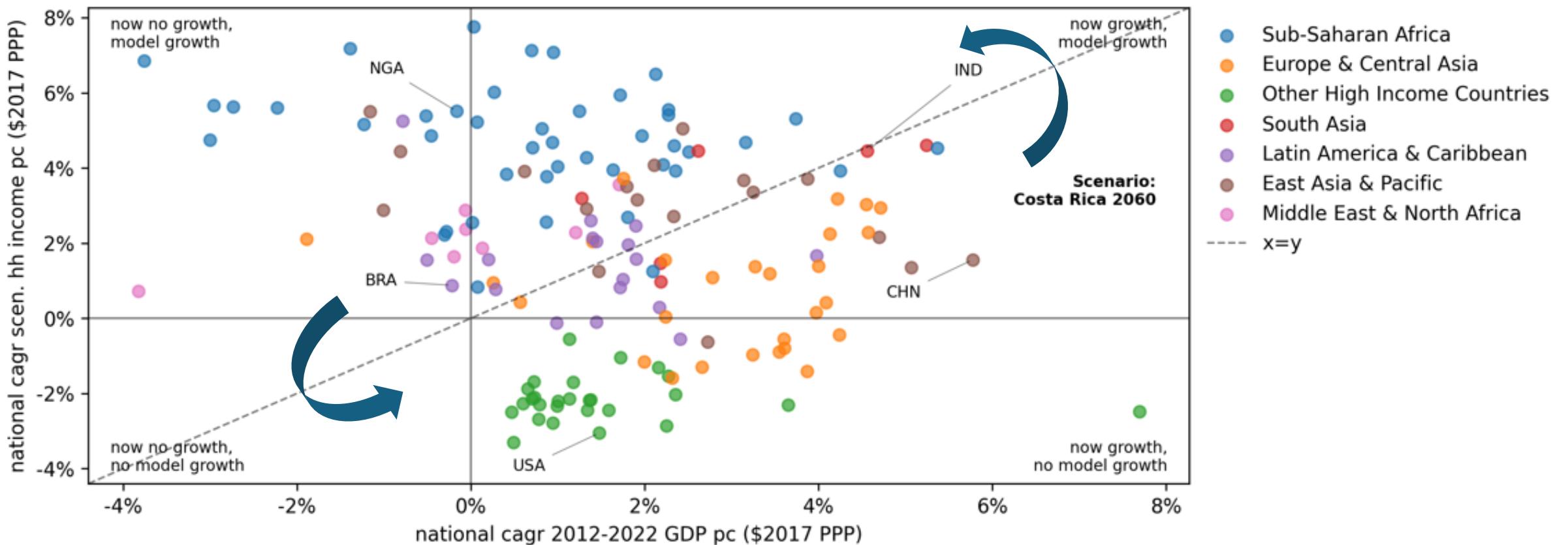
$$w(t) = \frac{1}{1 + e^{-k(t-t_0)}}$$

Preliminary results

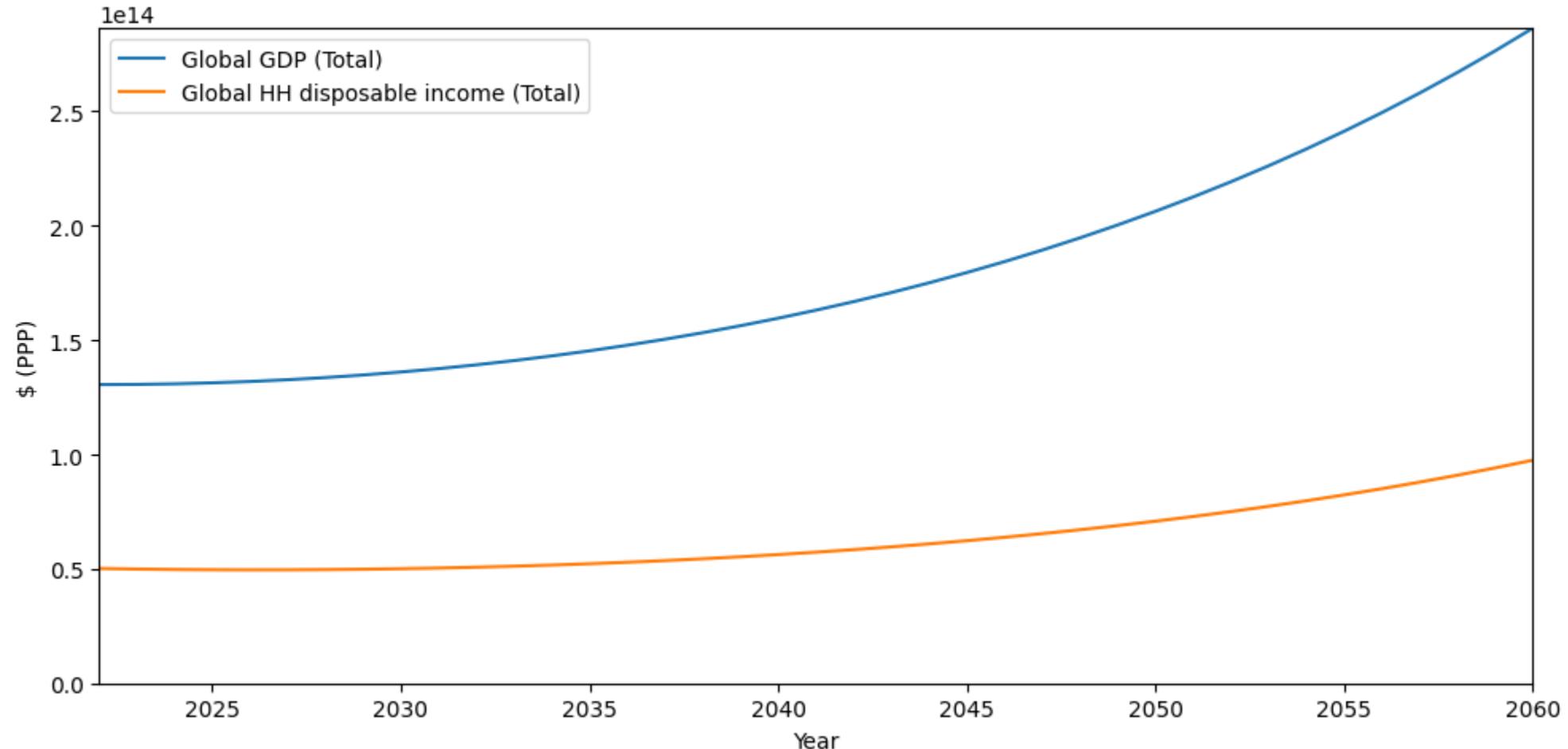
Stylized convergence scenarios



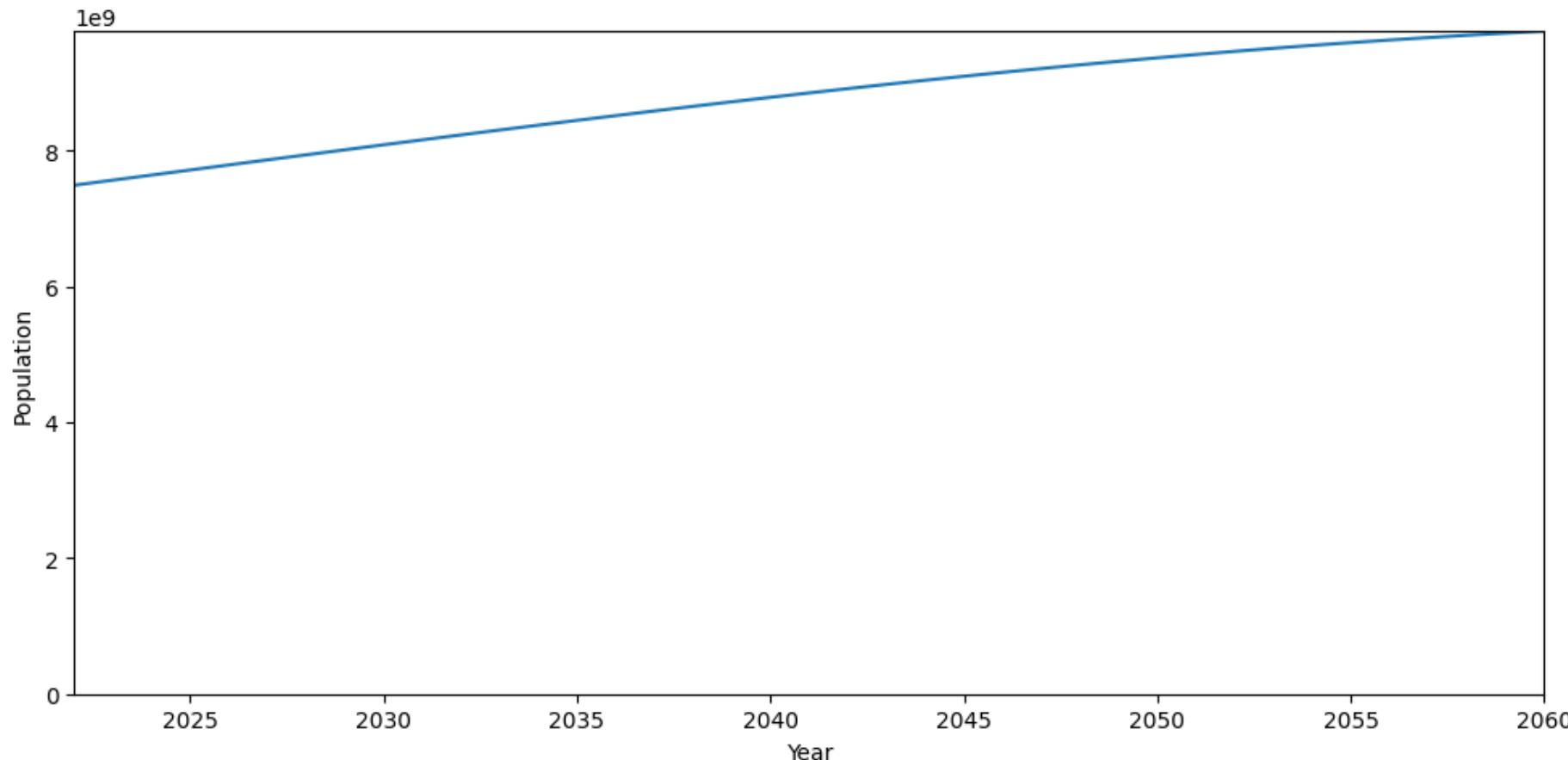
In a convergence scenario, rich countries degrow on average, poor ones grow



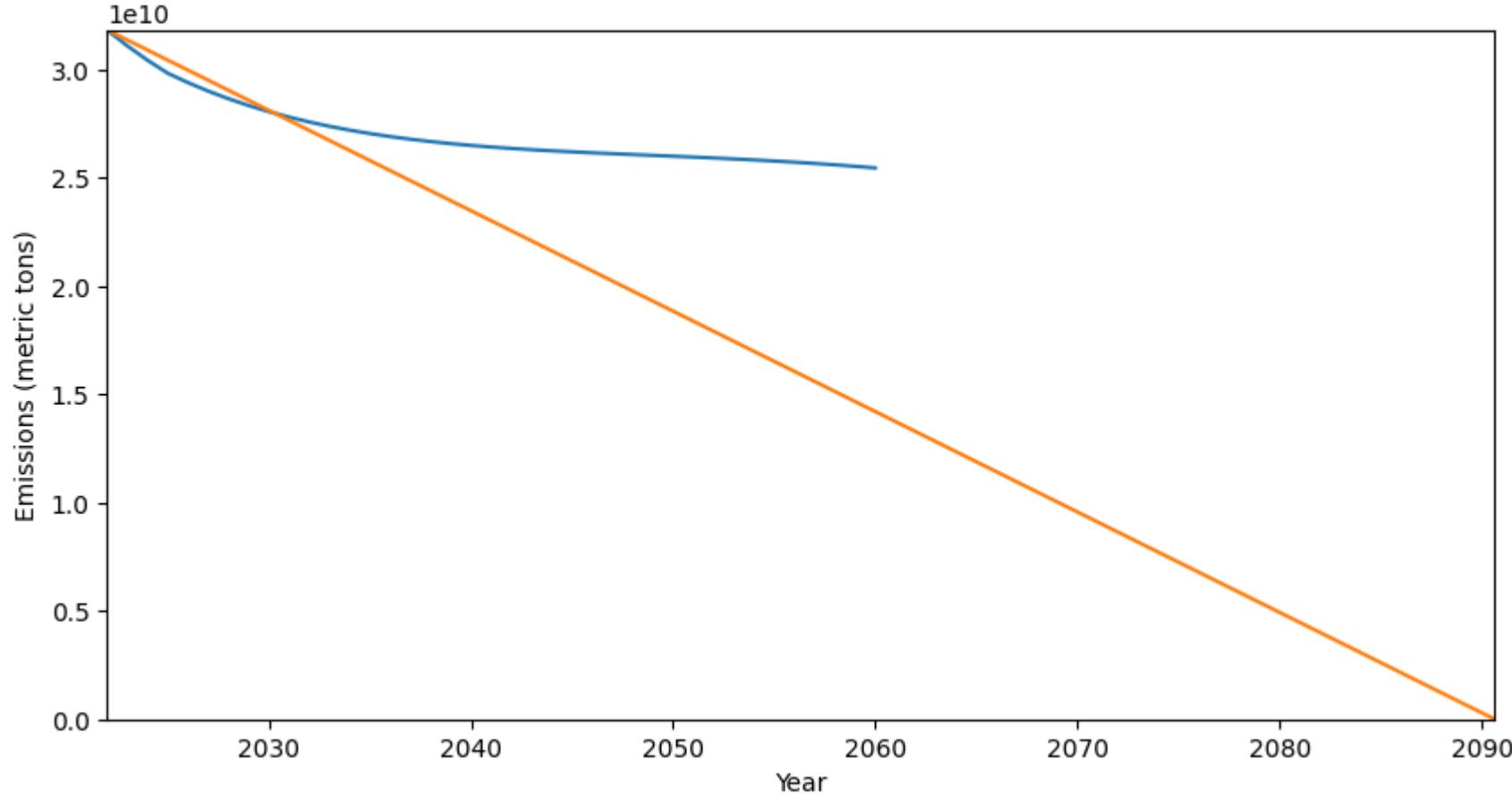
All countries converge to Costa Rica level income till 2060 (i)



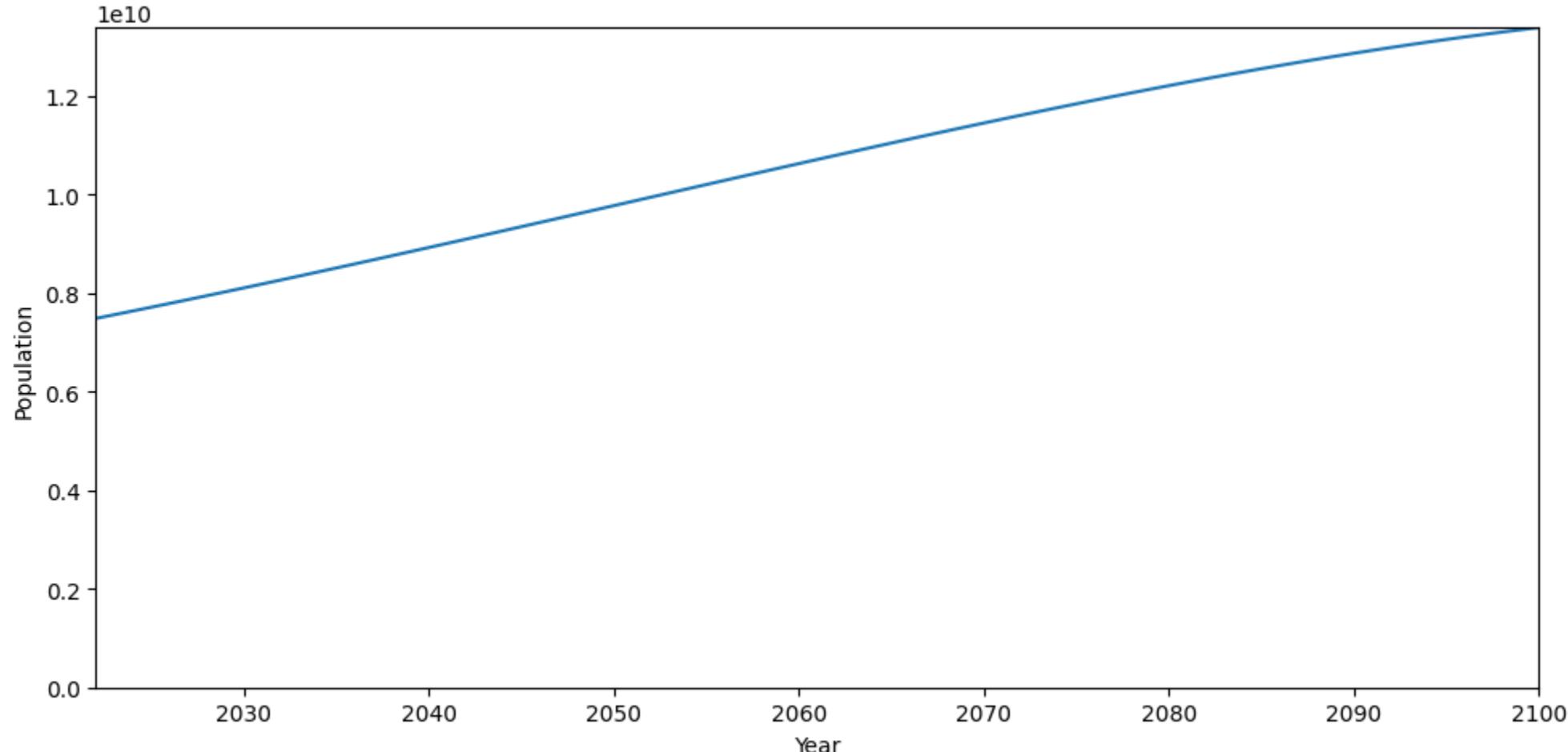
All countries converge to Costa Rica level income till 2060 (ii)



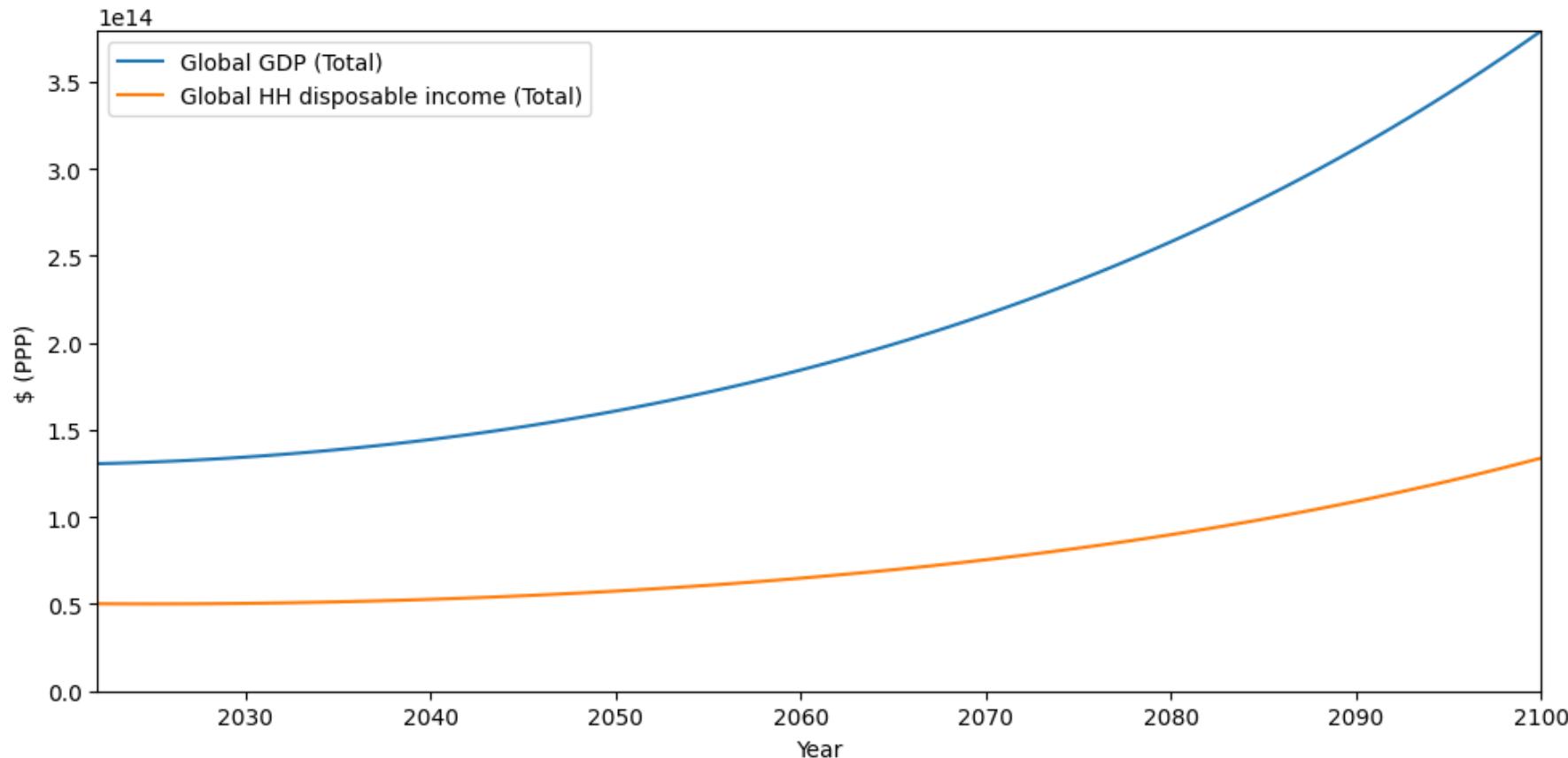
All countries converge to Costa Rica level
income till **2060**(iii)



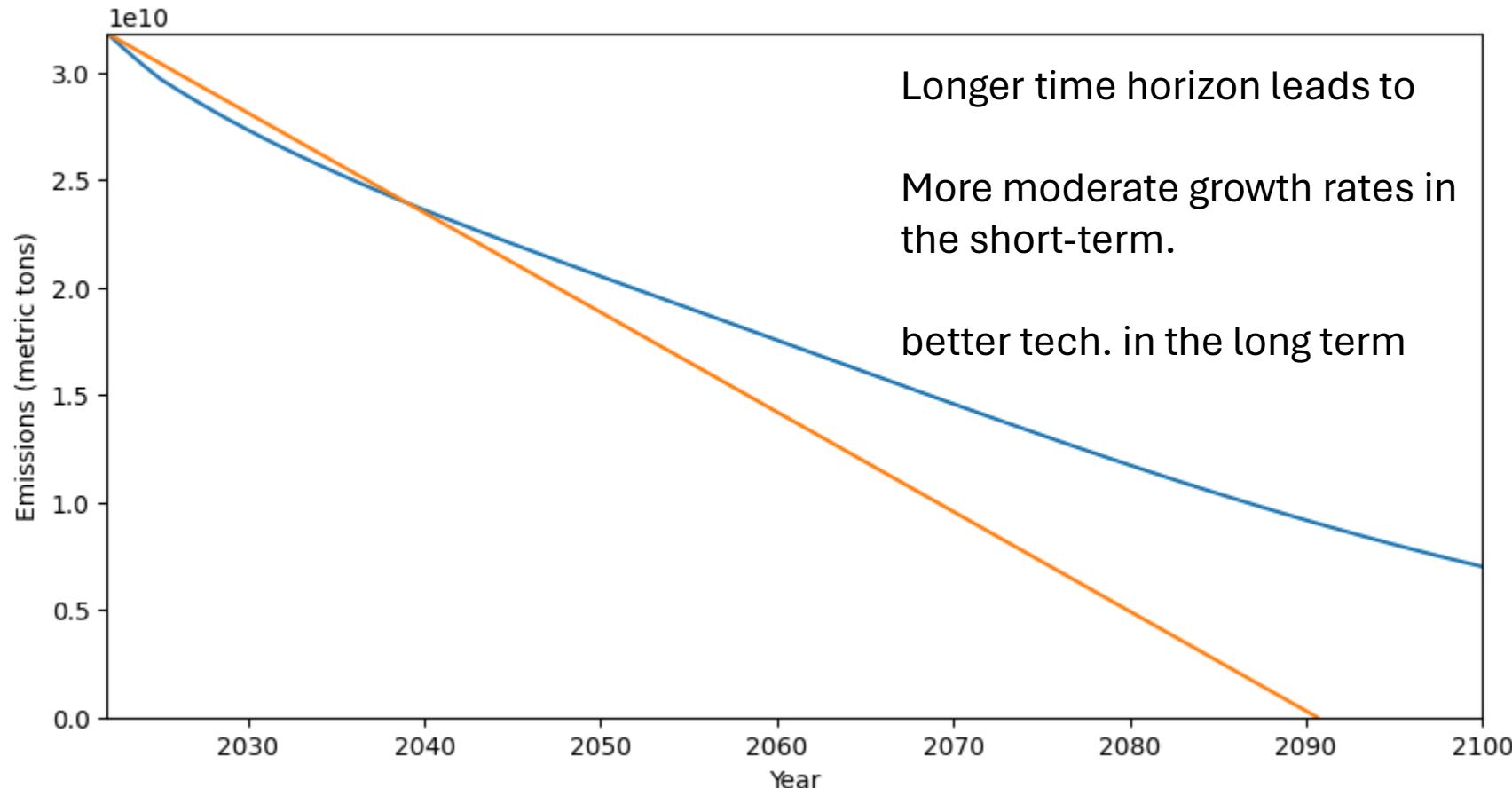
All countries converge to Costa Rica level
income till **2100** (i)



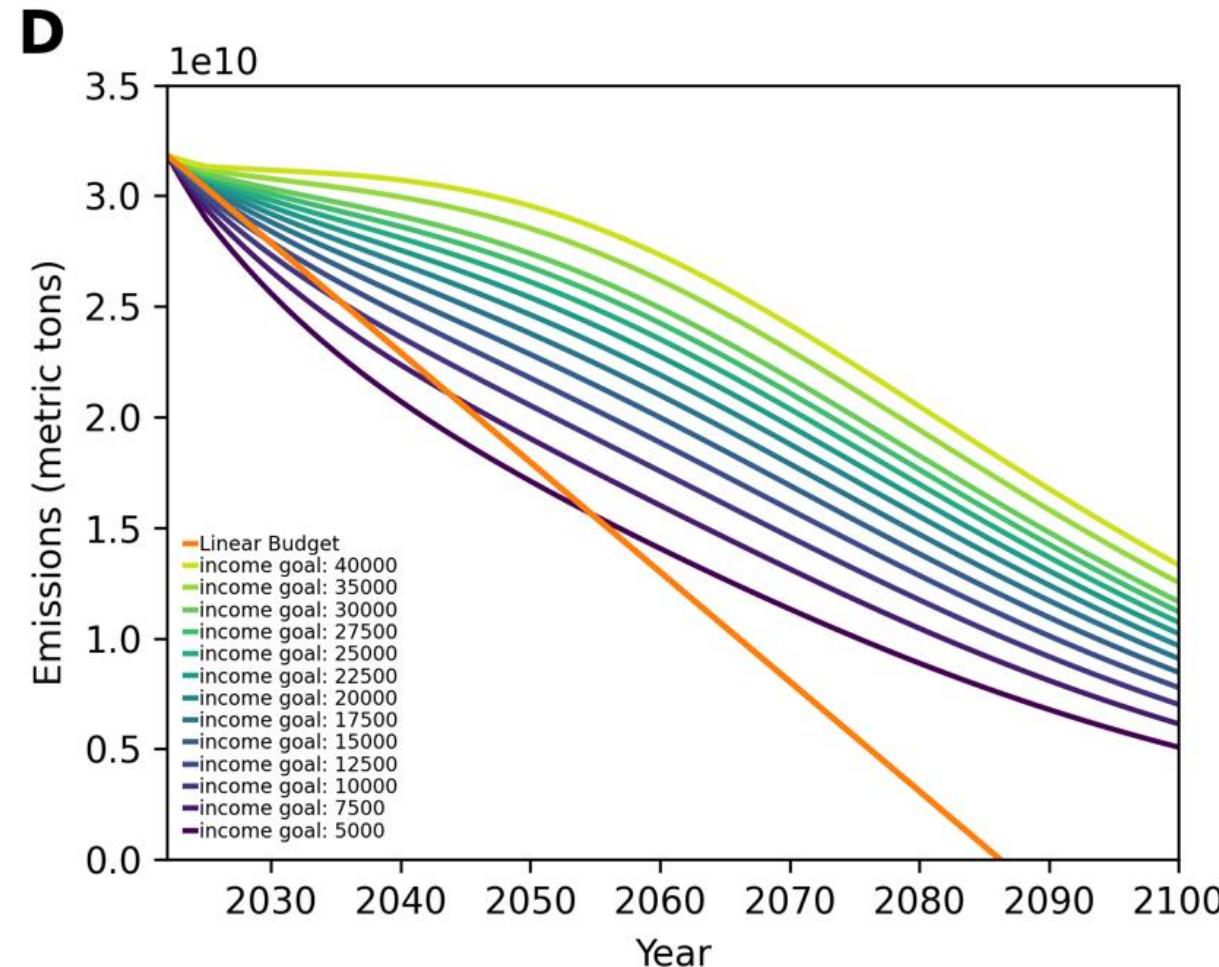
All countries converge to Costa Rica level income till **2100** (ii)



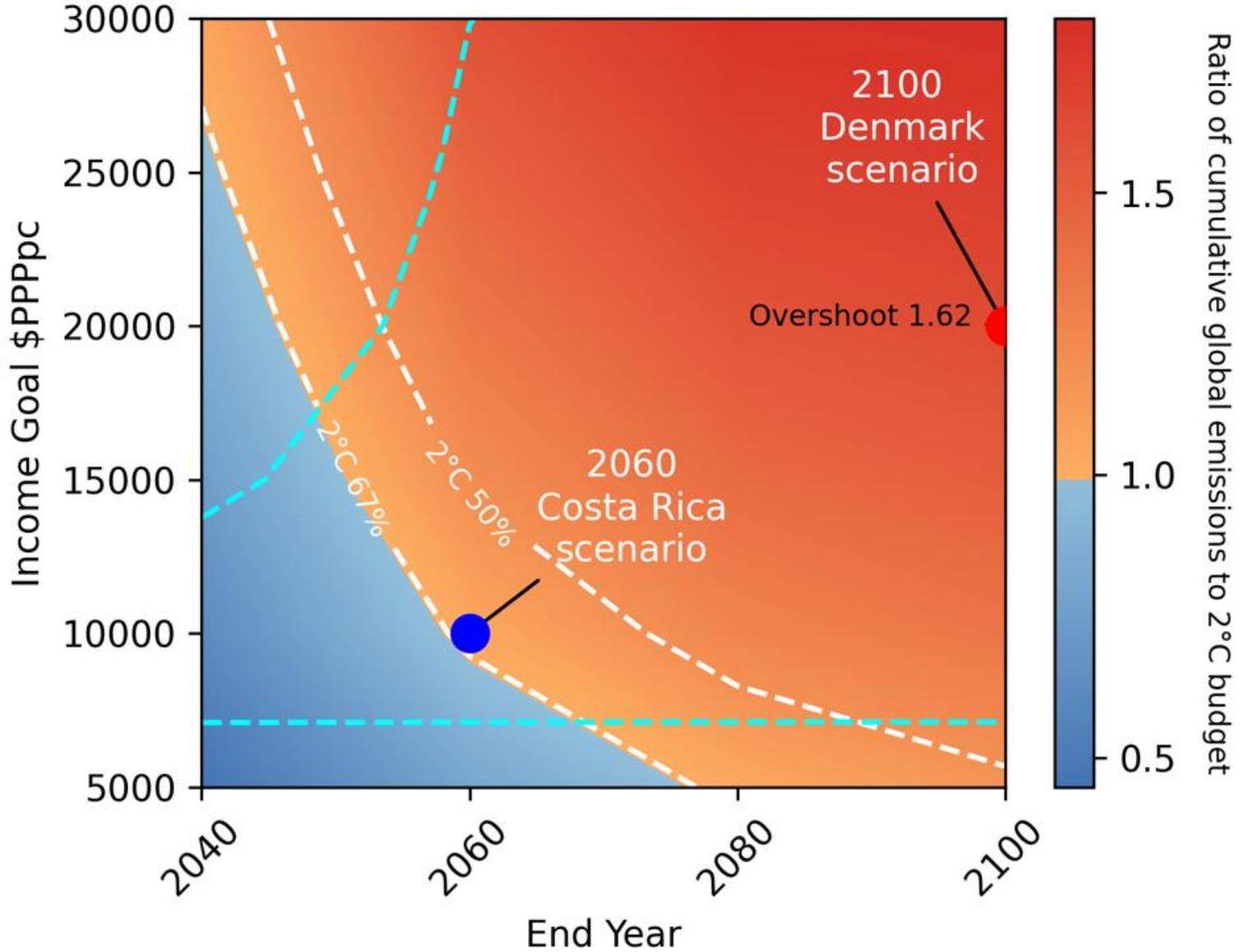
All countries converge to Costa Rica level income till **2100** (iii)



Several emission trajectories until 2100 (i)

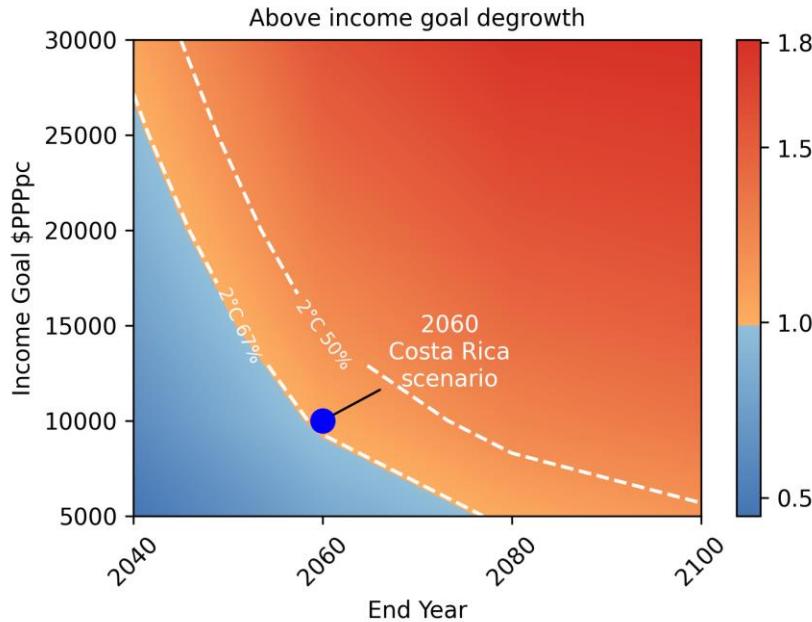


Carbon emissions until point of convergence



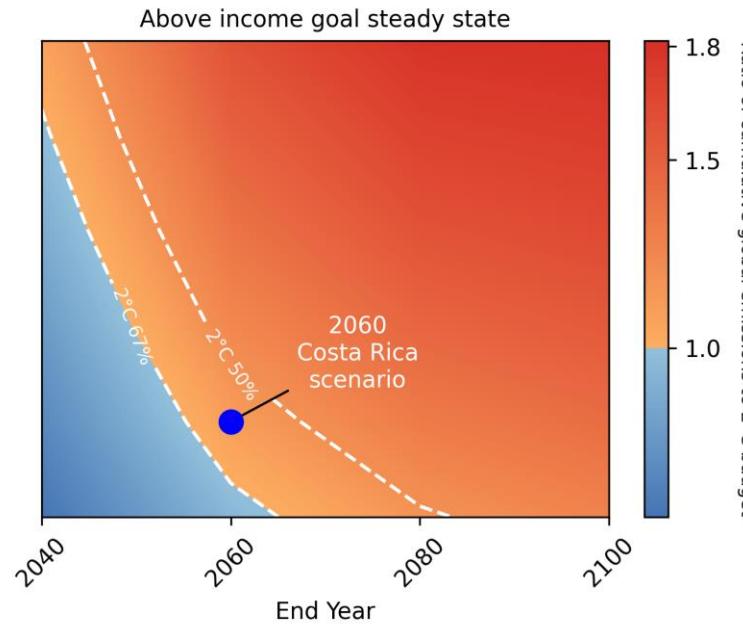
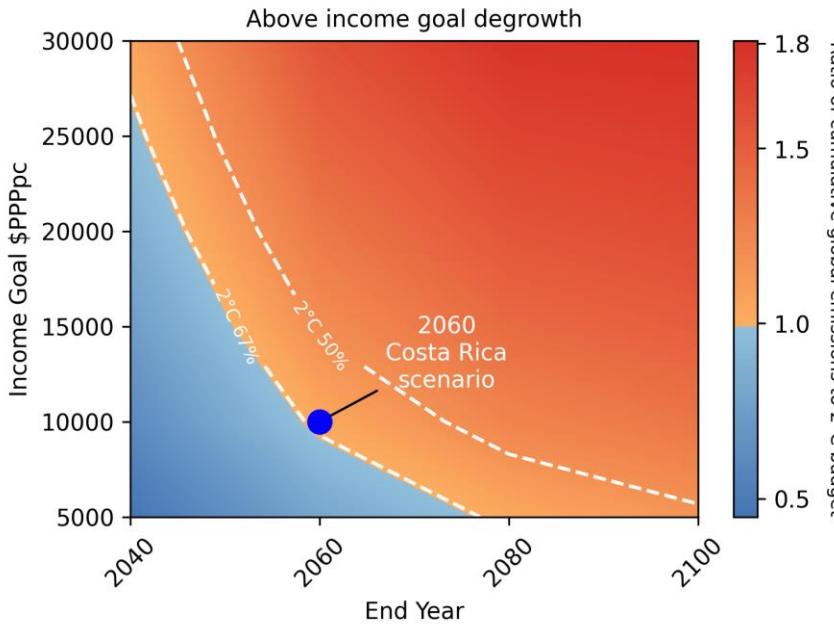
Carbon emissions until point of convergence

If high income countries enter steady state or continue growing



Carbon emissions until point of convergence

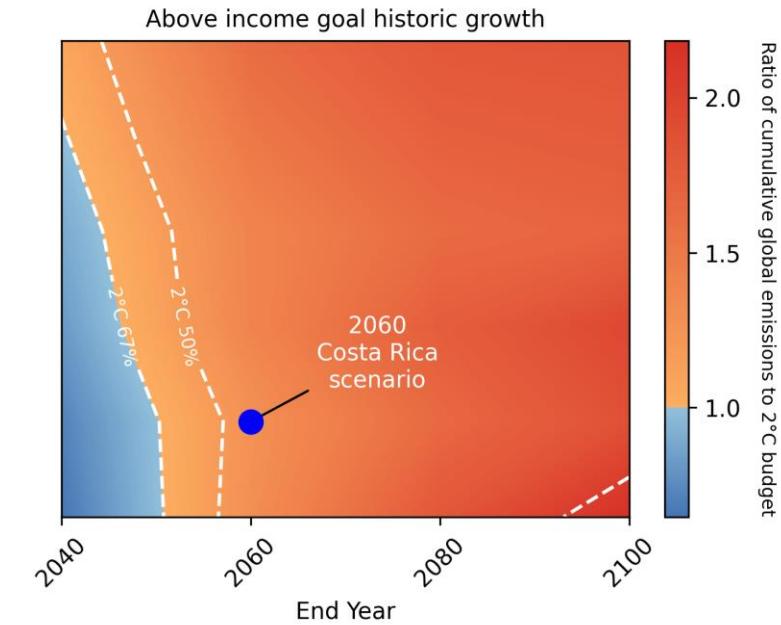
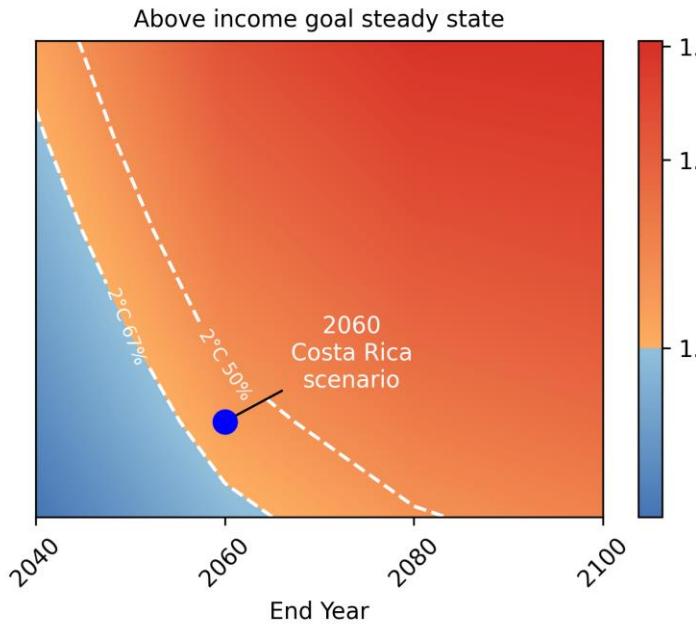
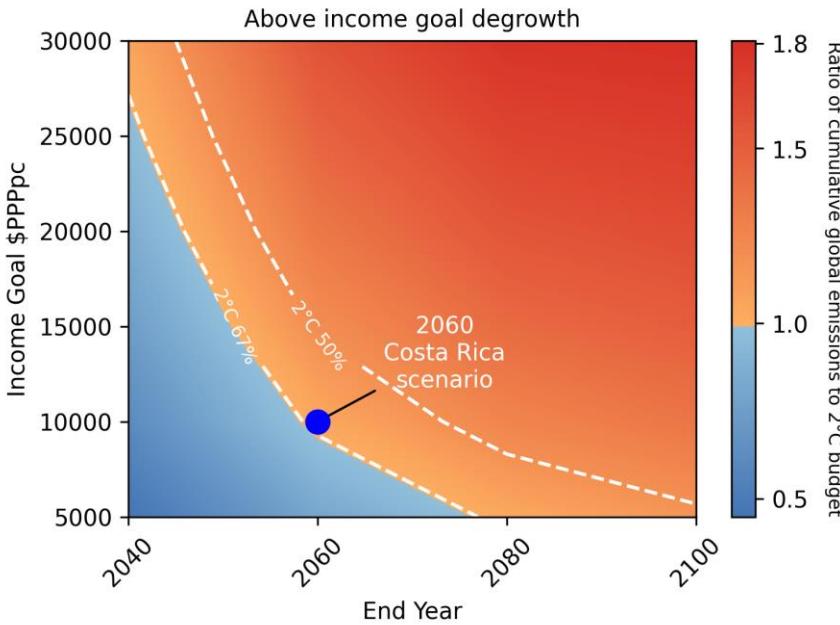
If high income countries enter steady state or continue growing



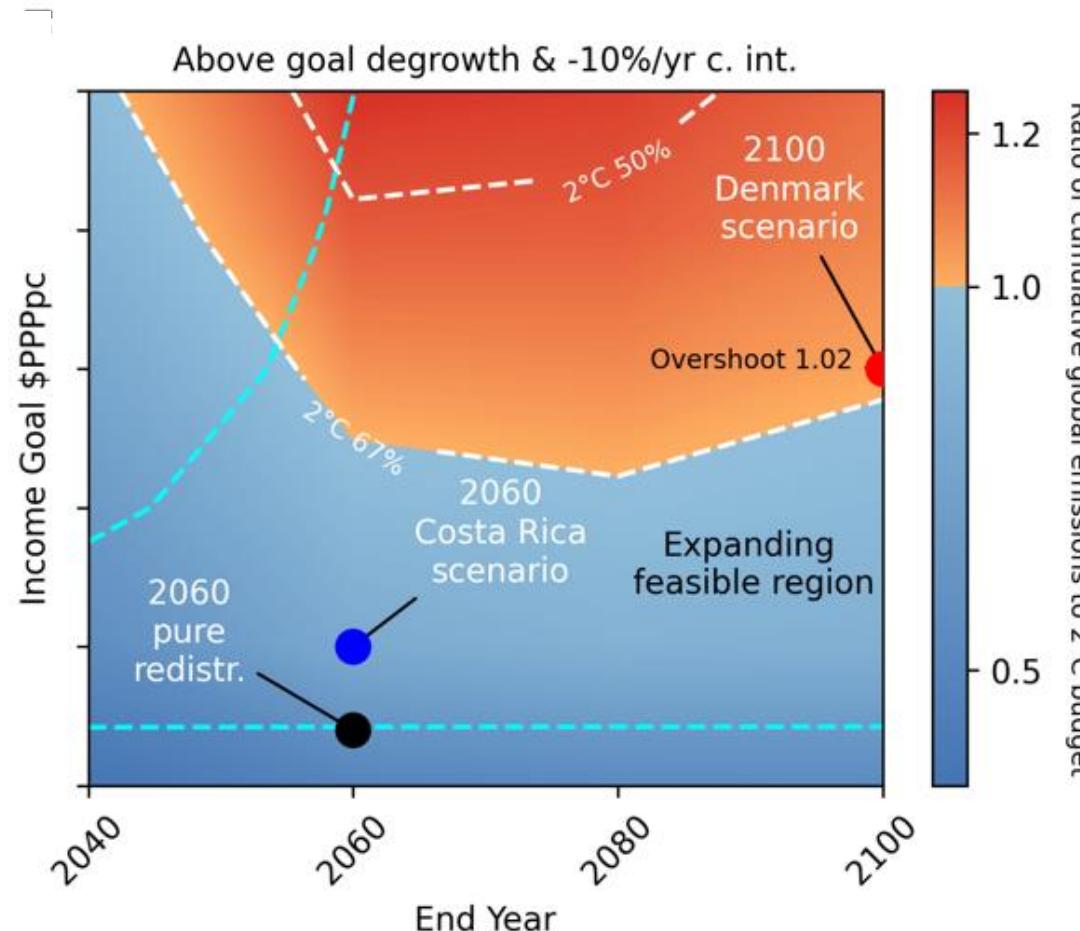
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Carbon emissions until point of convergence

If high income countries enter steady state or continue growing



Only extreme decarbonization plus degrowth for high income groups expands feasible scenarios



Discussion

A few generic observations

- Under a wide range of assumptions:
 - (1) Economic convergence is basically infeasible within climate budgets
 - (2) Extreme decarbonization rates + degrowth in high-income countries may enable a reasonable range of scenarios
 - (3) Continued growth in high-income countries is a problem for high incomes in currently poor places with climate constraints

A model critique

- Surely, a rather simple computational model
- Within country inequality needs to be modelled (still need to compare to Min and Rao 2018 systematically)
- Cannot compare with the IAMs in systemic consideration
- E.g. a climate feedback on growth is missing entirely, possibly drastic implications

Thank you for listening.