Climate finance and investment allocation in a CGE model

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1. Background

- Climate finance (CF) can be regarded as an opportunity to address sustainability, **change development patterns** towards long-term green growth, avoiding a lock-in of carbon intensive infrastructures.
- In 2015/2016: an avg of US$410 bn was disbursed as CF (Buchner et al., 2017). By 2035: **investment** required to meet credible emissions framework could reach up to **US$53 tn** (OECD, 2017).

2. Question / Literature gap

- Can climate finance induce **productivity shocks** in developing countries under constrained GHG emission scenarios?
- Missing links between the real and the monetary sides of the economy in CGE models.

3. Methods

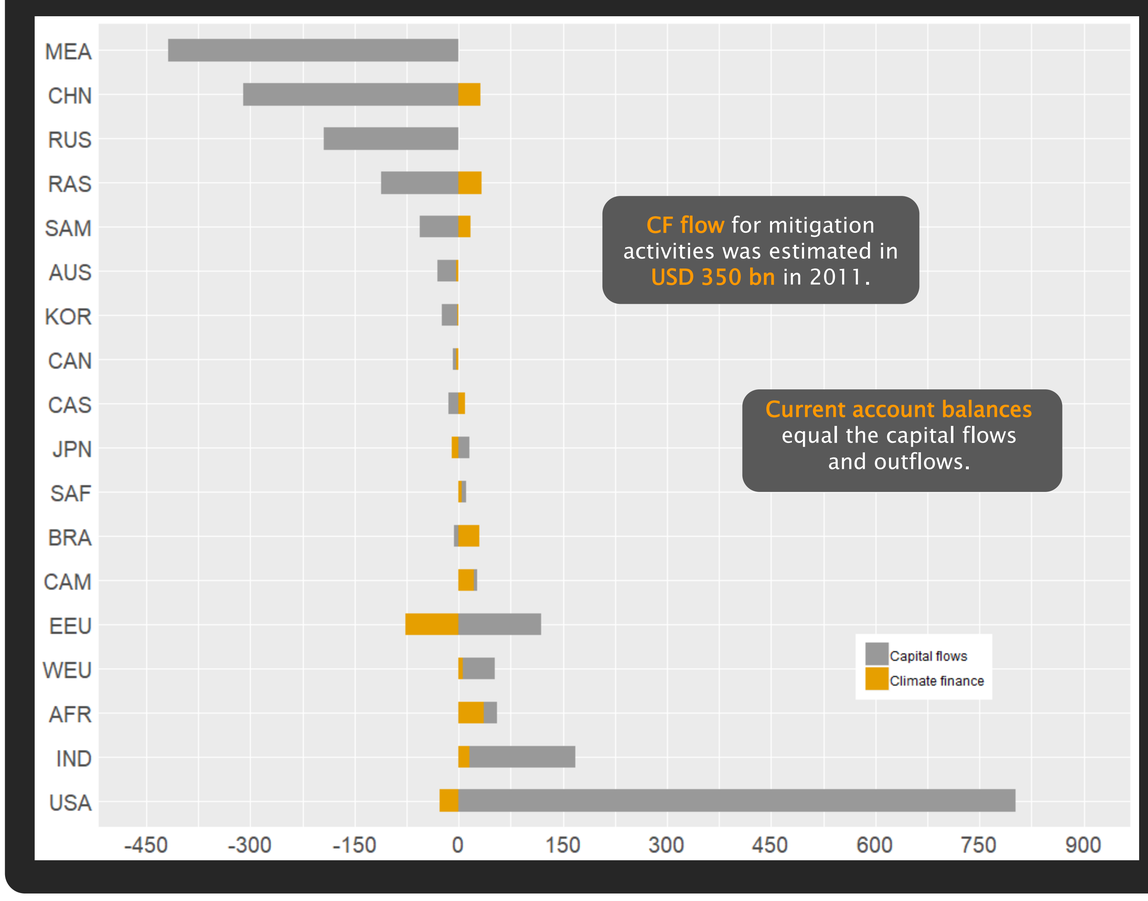
- TEA (Total Economy Assessment) is a CGE model based on the MIT EPPA6 and on GTAPinGAMS, tracking the global economy (18 regions and 16 sectors) in a dynamic recursive setup.
- Capital stock evolves at each period with the **formation of new capital**, depending on the investment level in that period and the capital depreciation rate, as shown in Equation: $K_{r,t} = I_{r,t} + (1 - \delta_r)K_{r,t-1}$
- We setup a **global carbon market** and then simulate it under two carbon budget **scenarios**: 2°C (1,000 GtCO2) and 1.5°C (400 GtCO2), without regional carbon budget allocation.

4. Data

- GTAP9 database and Climate Policy Initiative – CPI reports
- UNFCCC Submitted Biennial Update Reports
- OECD Stats for ODA, OOF and private flows by country and region

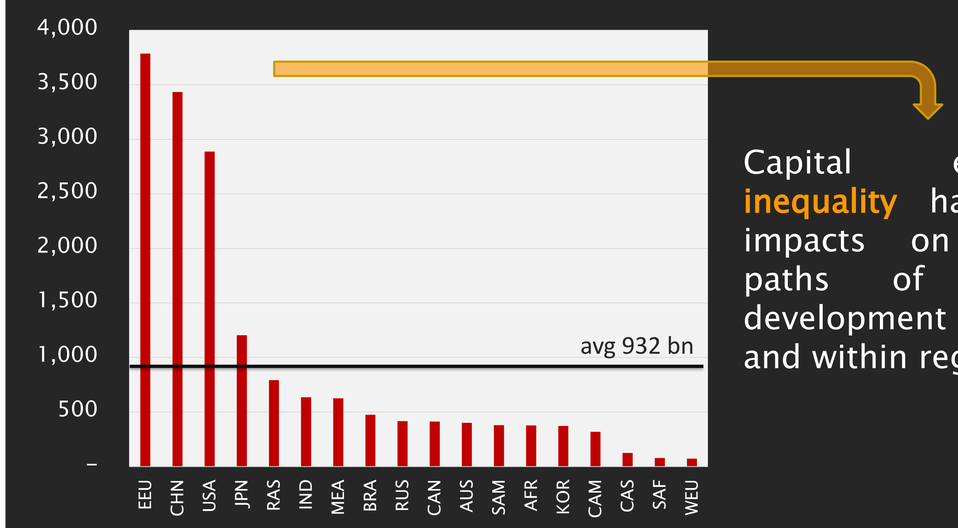
5. Flows

Figure 1. Capital flows and climate finance estimate (in 2011USD bn).
Source: own elaboration based on GTAP9 database, OECD (2017) and Buchner et al. (2011, 2012).



6. Stocks

Figure 2. Capital endowments per region. Values in 2011 USD bn.
Source: GTAP9 database



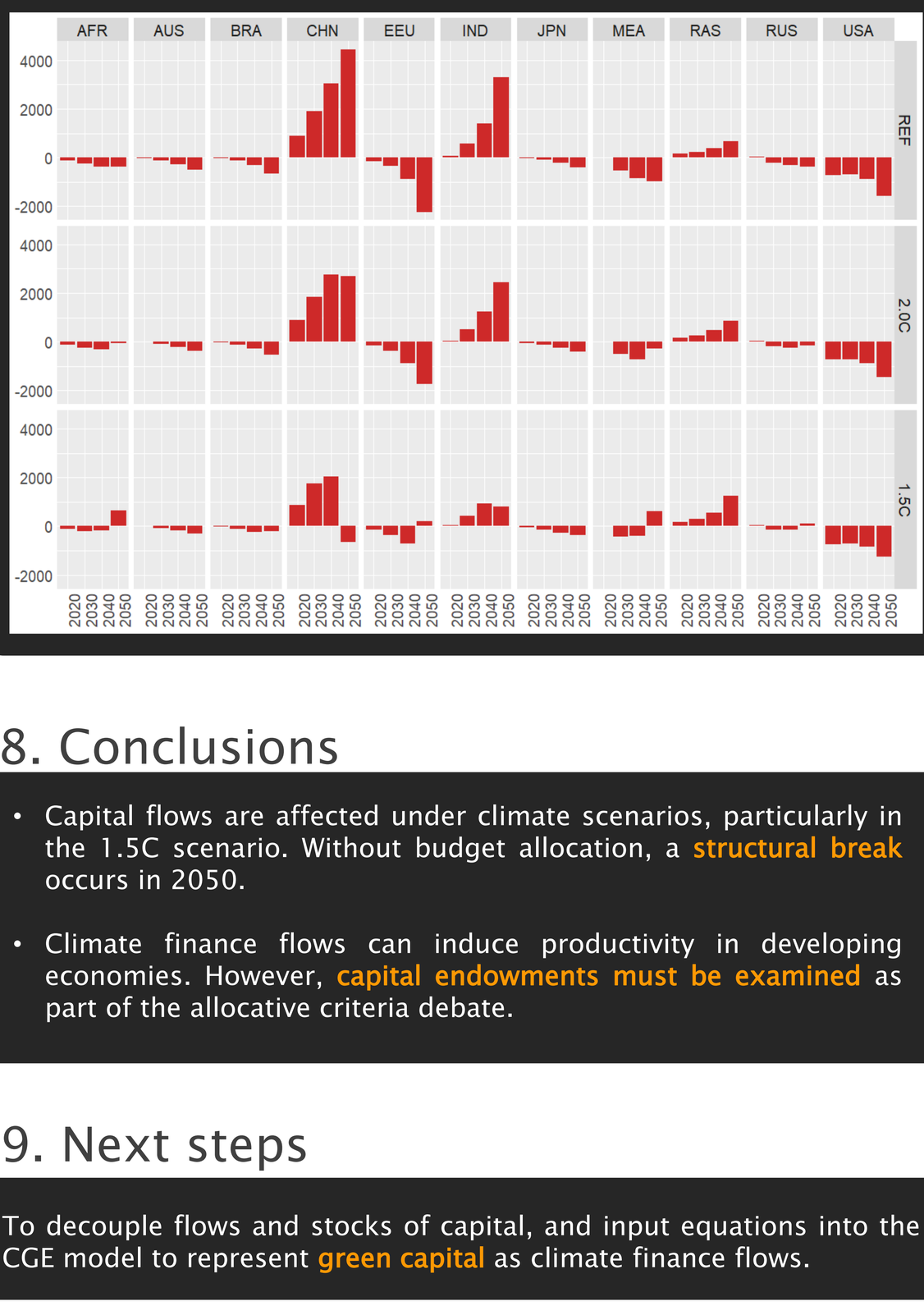
Capital endowment **inequality** has enduring impacts on long-run paths of economic development (between and within regions).

7. Findings

Table 1. GHG emissions, average price and total value by scenario

Scenario	Cumulative GHG emissions by 2050 (MtCO2e)	Avg Price (USD/MtCO2e)	Total Value (2050 USD bn) FV @5%
2.0C	300,374	127.5	38,283
1.5C	235,825	429.6	101,316

Figure 3. Capital flows in REF, 2.0C and 1.5C scenarios – 2020-2050.
Values in 2011 USD bn.



8. Conclusions

- Capital flows are affected under climate scenarios, particularly in the 1.5C scenario. Without budget allocation, a **structural break** occurs in 2050.
- Climate finance flows can induce productivity in developing economies. However, **capital endowments must be examined** as part of the allocative criteria debate.

9. Next steps

To decouple flows and stocks of capital, and input equations into the CGE model to represent **green capital** as climate finance flows.

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Full references and additional information

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