

Climate finance under a CGE framework: decoupling financial flows in GTAP database

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Climate finance and global commitments

▶ Climate finance

- ▶ The financing required for an orderly transition to a low carbon, climate resilient **global economy** (World Bank, 2017).
- ▶ Refers to **local, national or transnational financing**, which may be drawn from public, private and alternative sources (UNFCCC, 2017).

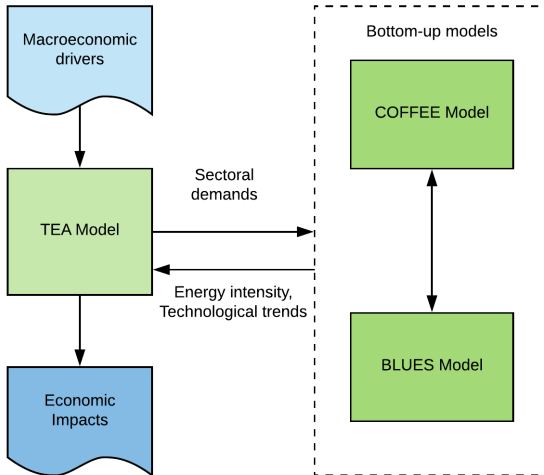
▶ Commitments

- ▶ Copenhagen (2009) \$100bn p.y. commitment to support climate action in developing countries.
- ▶ Paris Agreement (2015) developed countries shall provide scale-up financial resources to assist developing countries with respect to both mitigation and adaptation activities.

Research outline

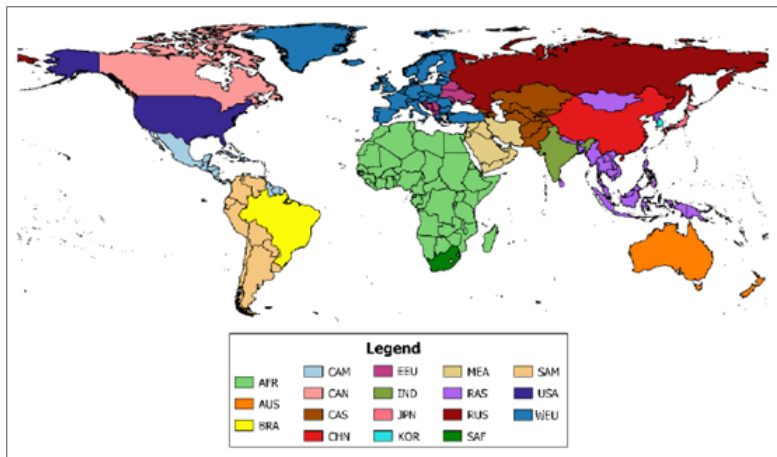
- ▶ **Question:** Can climate finance induce productivity shocks on developing countries under constrained GHG emission scenarios?
 - ▶ Technological deployment required for negative emissions (bottom-up models)
 - ▶ Explore the changes in productivity that result within the CGE model
- ▶ **Literature gap:** Missing links between the real and the monetary sides of the economy in CGE models.
 - ▶ Financial Social Accounting Matrix (FSAM).
- ▶ **Steps:**
 - ▶ Identify the net capital inflows according to regional aggregation (GTAP database)
 - ▶ Identify climate finance flows (other databases)
 - ▶ Decouple the stock of capital in the CGE model

Modeling framework – CGE and bottom-up models



- . TEA (Total Economy Assessment)
- . COFFEE (COMputable Framework For the Energy and Environment)
- . BLUES (Brazilian Land Use and Energy System)

Regional breakdown in 18 regions



Legend: AFR (Africa), AUS (Australia and New Zealand), BRA (Brazil), CAM (Central America), CAN (Canada), CAS (Caspian Region), CHN (China), EEU (Eastern Europe), IND (India), JPN (Japan), KOR (South Korea), MEA (Middle East), RAS (Rest of Asia and Oceania), RUS (Russia), SAF (South Africa), SAM (South America), USA (United States) and WEU (Western Europe).

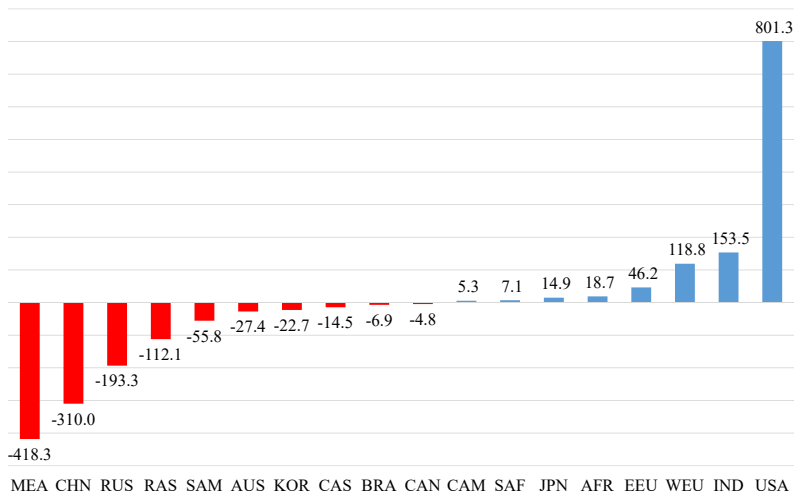
Sectoral breakdown in 18 sectors

Table: TEA sectoral breakdown

Sector	Code	Description
Agriculture	AGR	Agriculture crops and vegetables
	LIV	Livestocks
Energy	COL	Coal
	CRU	Crude Oil
	ELE	Electricity
	GAS	Natural Gas
	OIL	Petroleum coal products
Industry	I_S	Iron and steel
	CRP	Chemical rubber and plastic
	NMM	Manufacture of non-metallic mineral products
	MAN	Others manufacture
Transport	OTP	Transport nec
	WTP	Water transport
	ATP	Air transport
Services	SER	Services
	DWE	Dwellings

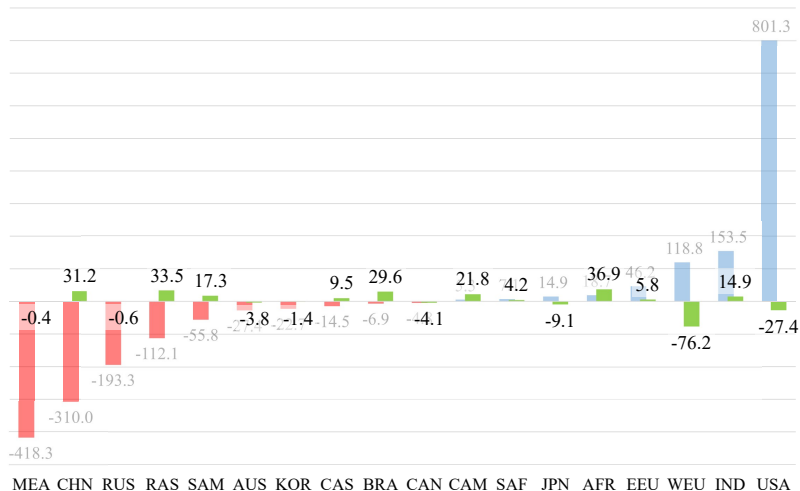
1st step: Net capital inflows from the GTAP database

Figure: Net capital inflows in TEA regions (in USD billions) – year 2011.
Source: own elaboration based on [1].



2nd step: Climate finance flows

Figure: Climate finance flows estimates (in USD billions) - year 2011.
Source: own elaboration based on [2],[3],[4].



3rd step: Decoupling capital stock

- ▶ Formation of new capital at each period:

$$K_{r,t}^{cgds} = I_{r,t}^{cgds} + (1 - \delta_r)K_{r,t-1}^{cgds} \quad (1)$$

$$K_{r,t}^{cfin} = I_{r,t}^{cfin} + (1 - \delta_r)K_{r,t-1}^{cfin} \quad (2)$$

where:

- ▶ $K_{r,t}^{cgds}$ is the stock of capital goods in region r in time t ;
- ▶ $I_{r,t}^{cgds}$ is the investment in new capital goods (other than climate finance tagged) in region r in time t ;
- ▶ $K_{r,t}^{cfin}$ is the stock of green capital in region r and time t ;
- ▶ $I_{r,t}^{cfin}$ the climate finance investment in new capital goods in region r and time t ; and
- ▶ δ_r is the depreciation rate in region r .

Final Remarks

- ▶ Work to date
 - ▶ Data has been prepared to address the research question.
 - ▶ Now, introducing green capital into the model to calibrate the baseline.
- ▶ Limitations
 - ▶ Absence of climate finance data at a country level for the base year (2011).
 - ▶ Flows might be overestimated depending on the markers used (e.g., Rio markers).
- ▶ Further research
 - ▶ Development of a FSAM database (a task of high complexity) could help the research community.

Thank you!

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References

- ▶ [1] A. Aguiar, B. Narayanan, and R. McDougall, An overview of the GTAP 9 data base, *Journal of Global Economic Analysis*, vol. 1, no. 1, pp. 181–208, 2016.
- ▶ [2] B. Buchner, A. Falconer, M. Herv-Mignucci, C. Trabacchi, and M. Brinkman, *The landscape of climate finance*, tech. rep., Climate Policy Initiative, Venice, 10 2011.
- ▶ [3] B. Buchner, A. Falconer, M. Herve-Mignucci, and C. Trabacchi, *The global landscape of climate finance 2012*, Climate Policy Initiative, 2012.
- ▶ [4] OECD, *Total flows by country and region (ODA+OOF+Private)*, 2017. Available in <http://stats.oecd.org/>