

24th Annual Conference on Global Economic Analysis

Results from the EMF36 on Post-Paris Carbon Pricing

Distributional effects of carbon pricing on households: a case study for Brazil under the Paris Agreement goals

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EMF36 – CarPri after Paris

Research Design

- Rafael Garaffa, Bruno Cunha, Talita Cruz, Paula Borges, André Lucena and Angelo Gurgel. <https://doi.org/10.1016/j.eneco.2021.105396>. Energy Economics (2021).

I. Policy design

- EMF36 – CarPri after Paris

II. Household incidence

- Recycling schemes / Tax rebates
 - Equal-yield through transfer adjustment, lump-sum (carbon revenue), or tax rebates

III. Distributional consequences

<i>Baseline</i>	<i>Ambition</i>	<i>Cooperation</i>
- IEO	- NDC	- REF
- WEO	- NDC+	- GLOBAL
	- NDC-2C	- PARTIAL
		- EUR_CHN
		- ASIA

Distributional effects of carbon pricing in Brazil under the Paris Agreement

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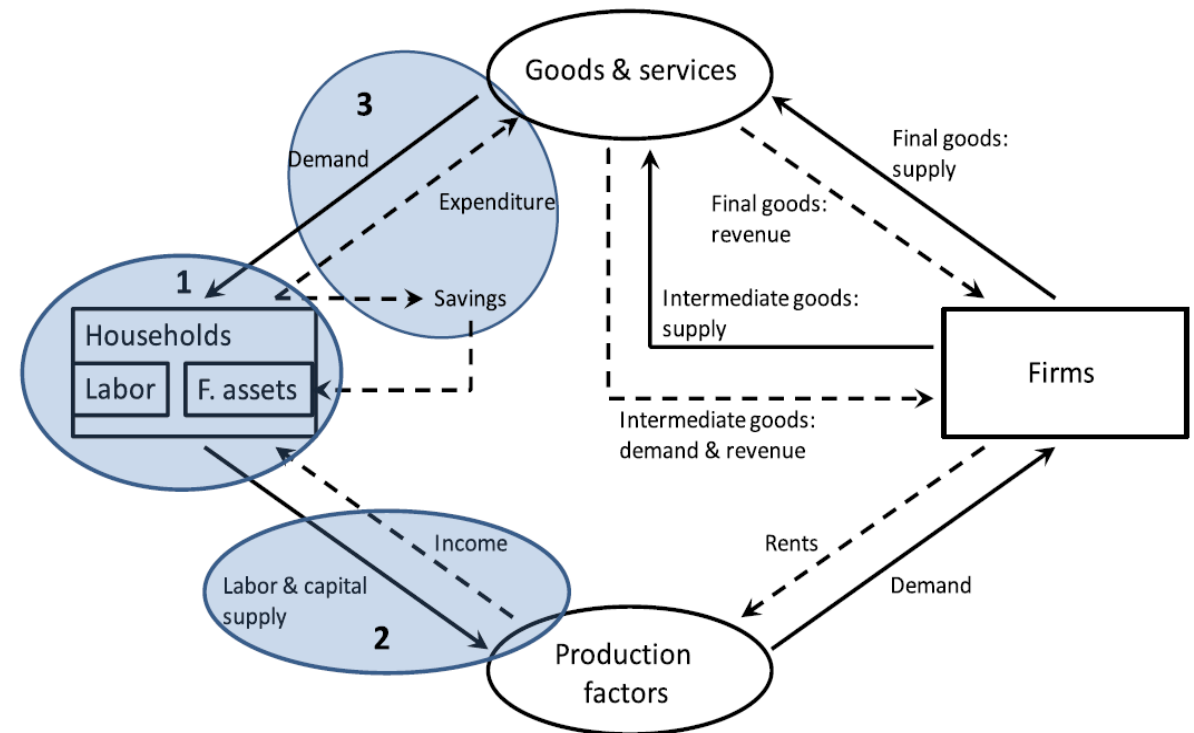
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Methods for including income distribution in global CGE models

State of the Art

van Ruijven, B., O'Neill, B., and Chateau, J. Energy Economics 51 (2015) 530–543

- I. Multiple households (multi HH)
- II. Micro-simulation (MS)
- III. Direct modeling of income distribution



Methods for including income distribution in global CGE models

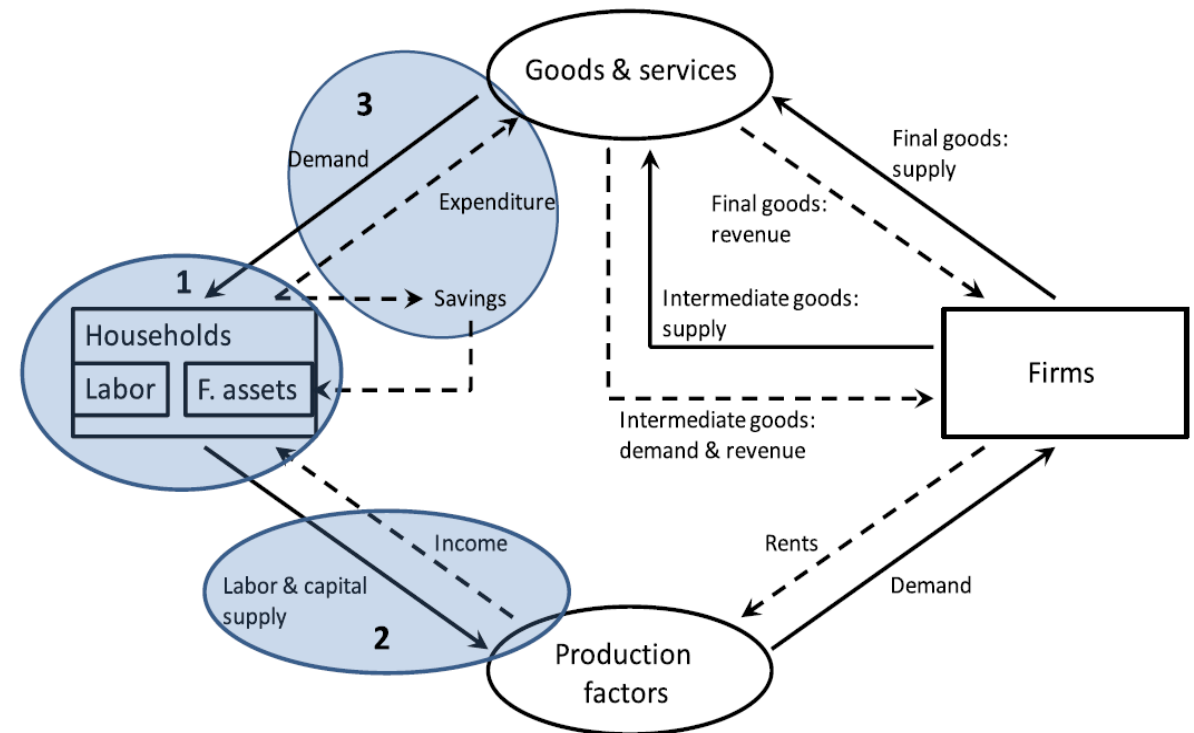
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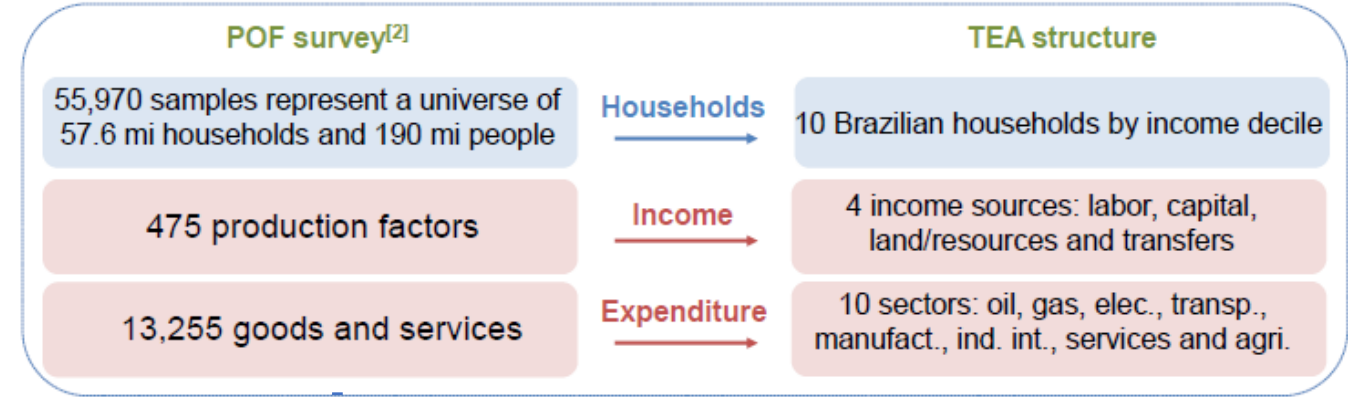
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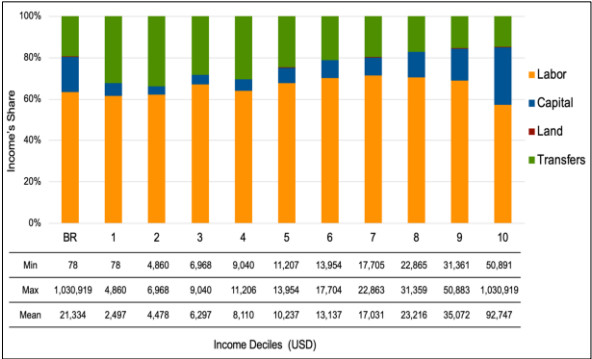
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Methods – Multiple Households

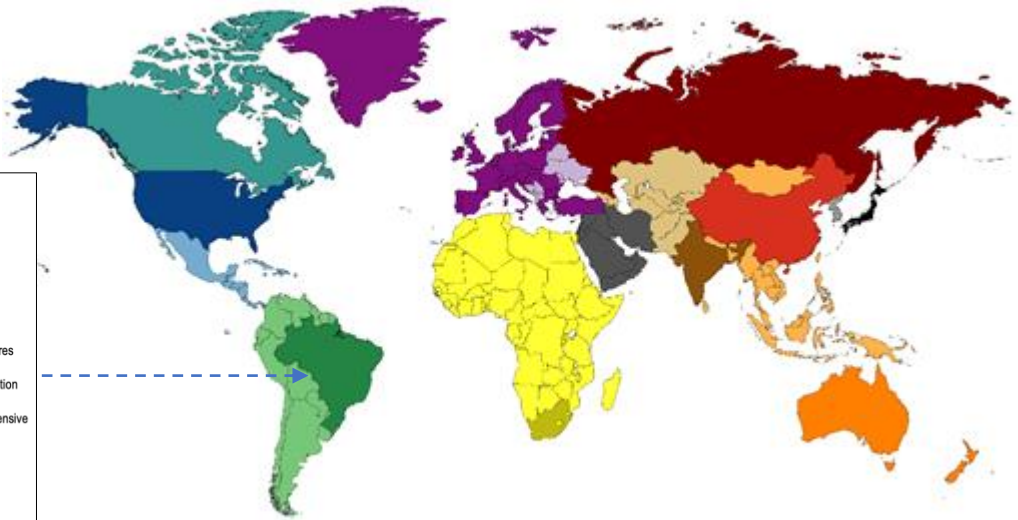
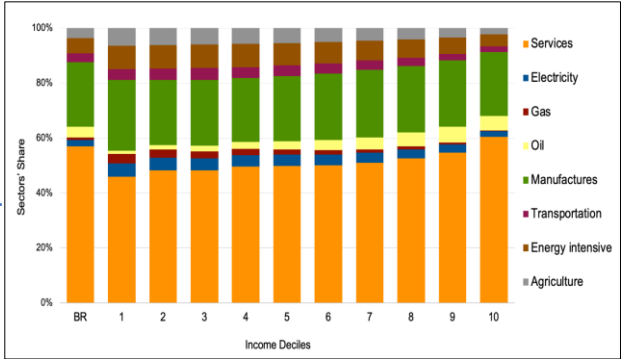


TEA (Total Economy-Assessment) model (Cunha et al., 2020) is a recursive dynamic multi-regional CGE model

Income



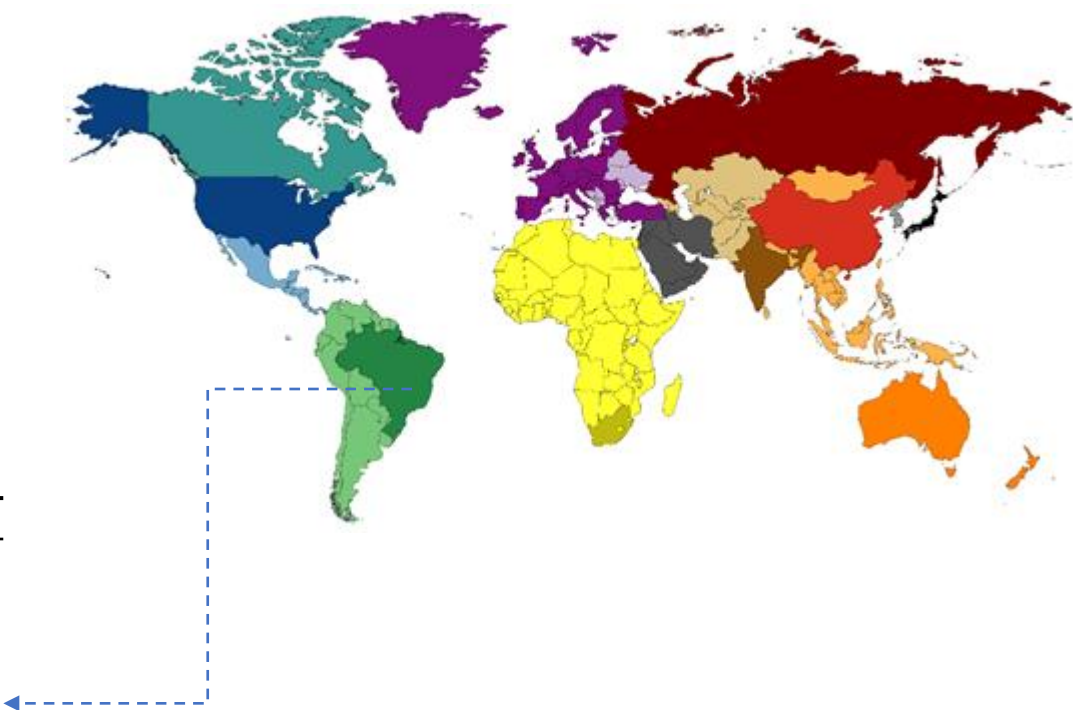
Expenditure



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Policy Scenarios

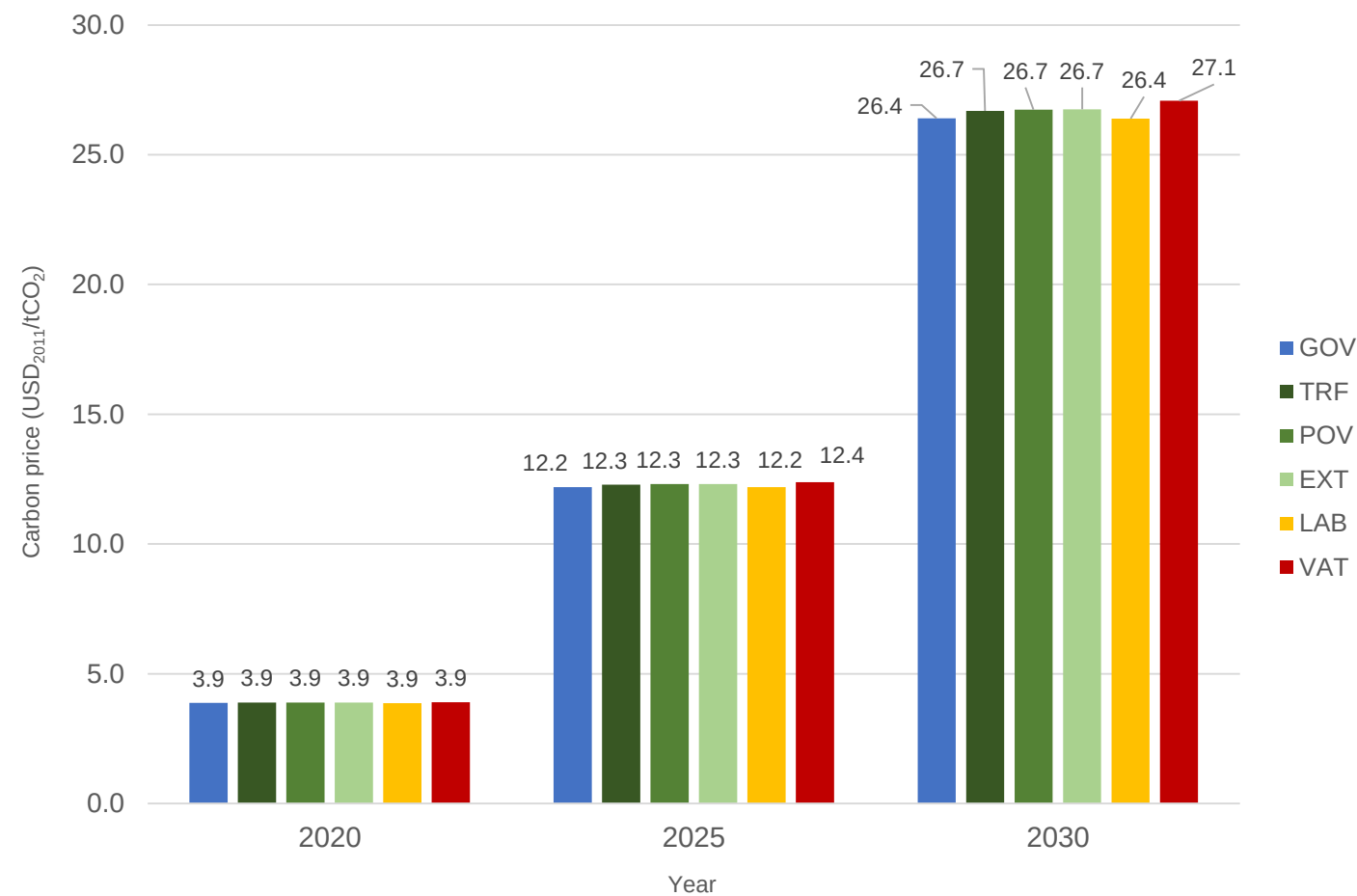
- I. Different carbon revenue recycling schemes
- II. Worldwide carbon policy
- III. Questions:
 - Double dividend hypothesis
 - Distributional effects
 - Social spending in Brazil



Tag	Policy scenarios (carbon revenue condition)
GOV	Kept within the public budget
TRF	Directly and equally transferred to households (lump-sum)
POV	Directly transferred to households below poverty line (lump-sum)
EXT	Directly transferred to households below extreme poverty line (lump-sum)
LAB	Rebates on labor taxes
VAT	Rebates on sales taxes
NoBRA	No carbon revenue for Brazil (all other regions have)

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Results

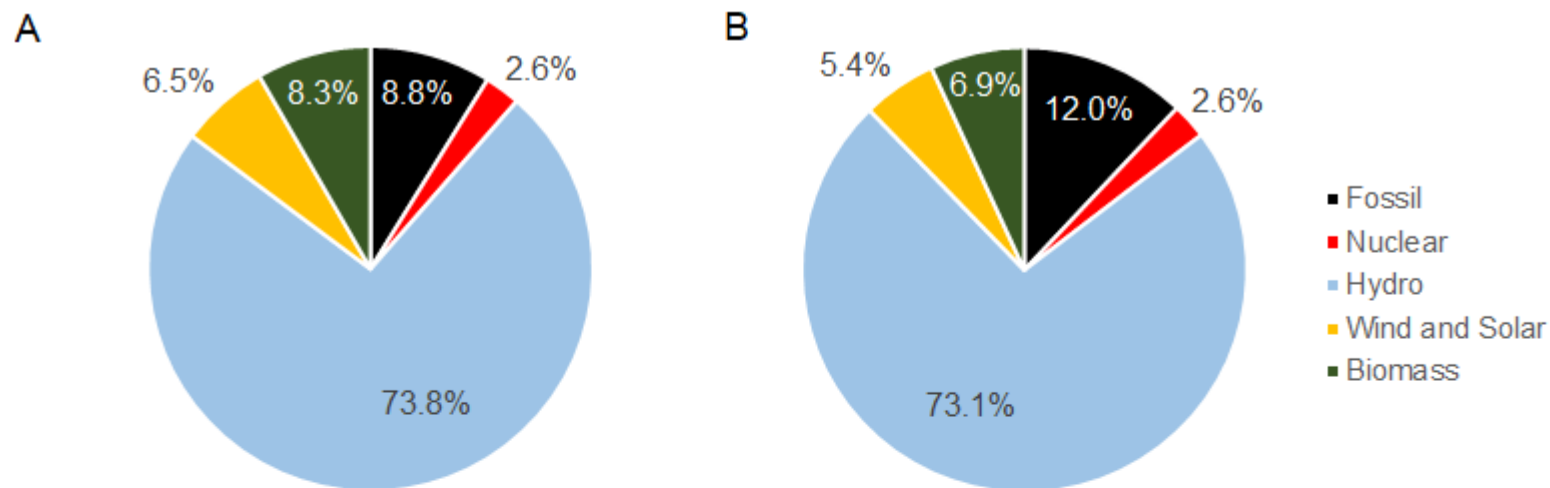


Carbon prices by scenario (2020-2030). Values in USD₂₀₁₁/tCO₂.

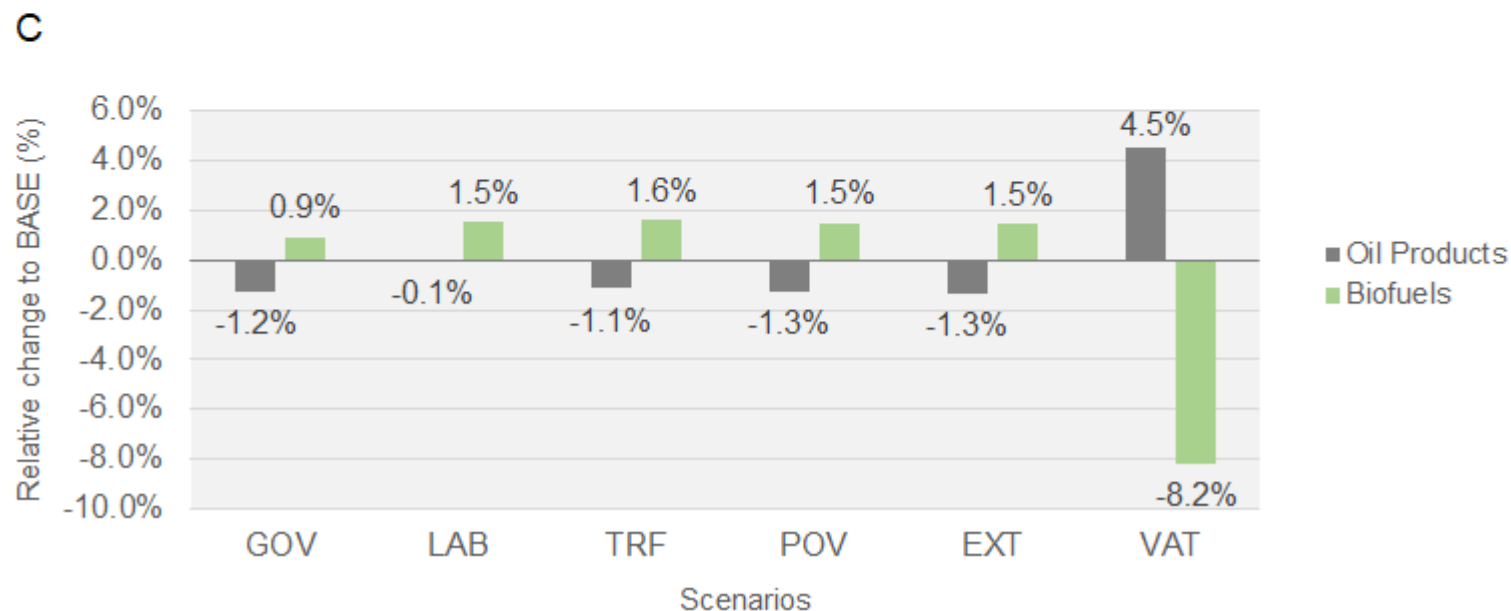
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Results

Electricity generation by energy source in 2030. Share of total (%) in **scenarios (A)** and in all **baseline (B)**

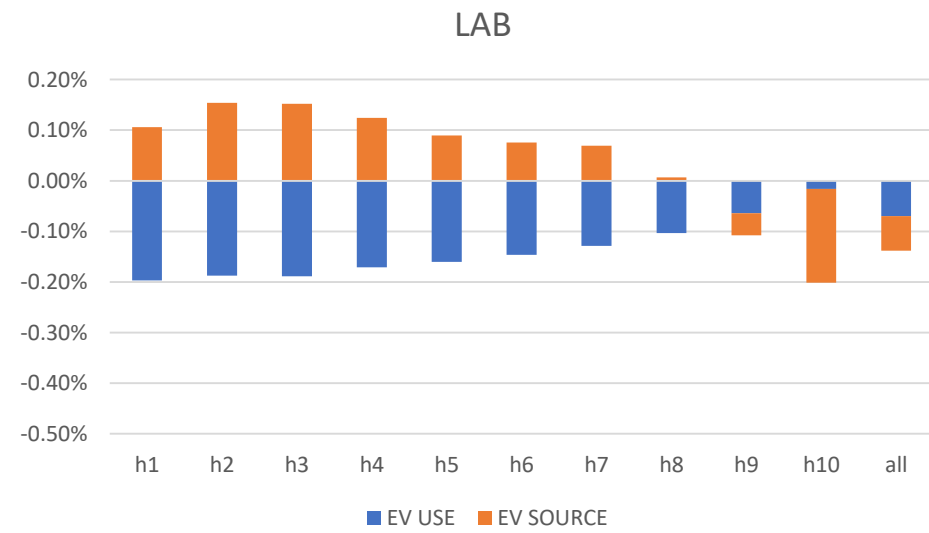
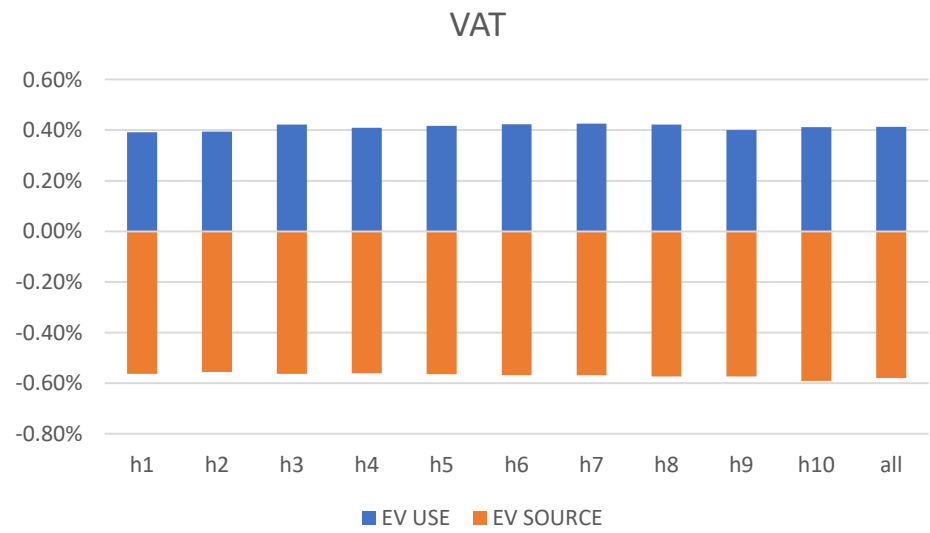
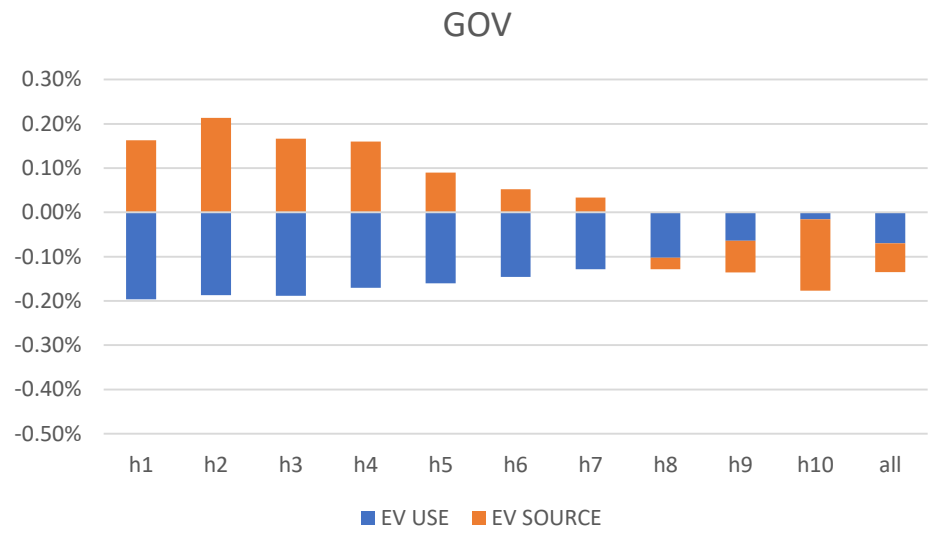
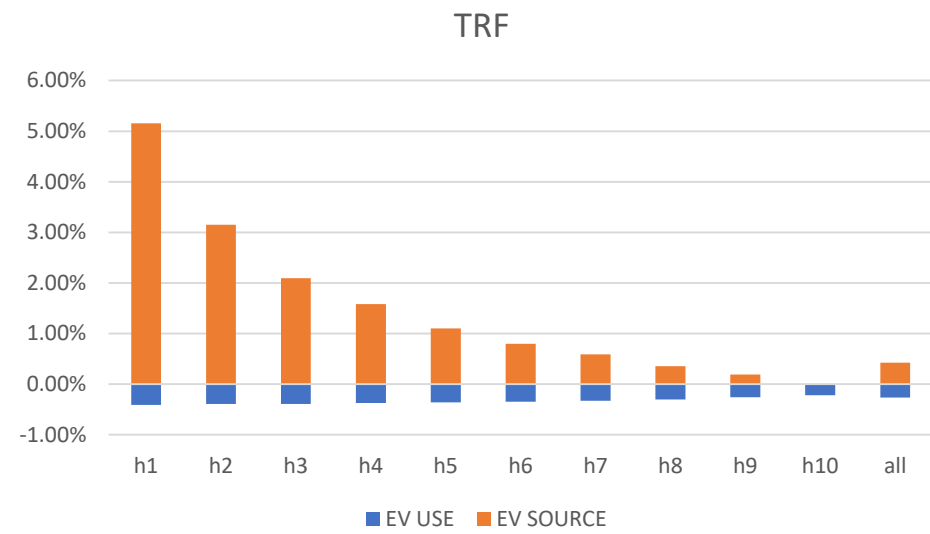


Relative change to Baseline (%) of final **consumption of oil products and biofuels (C)**



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Results – Hicksian Equivalent Variation (% change to Baseline in 2030)

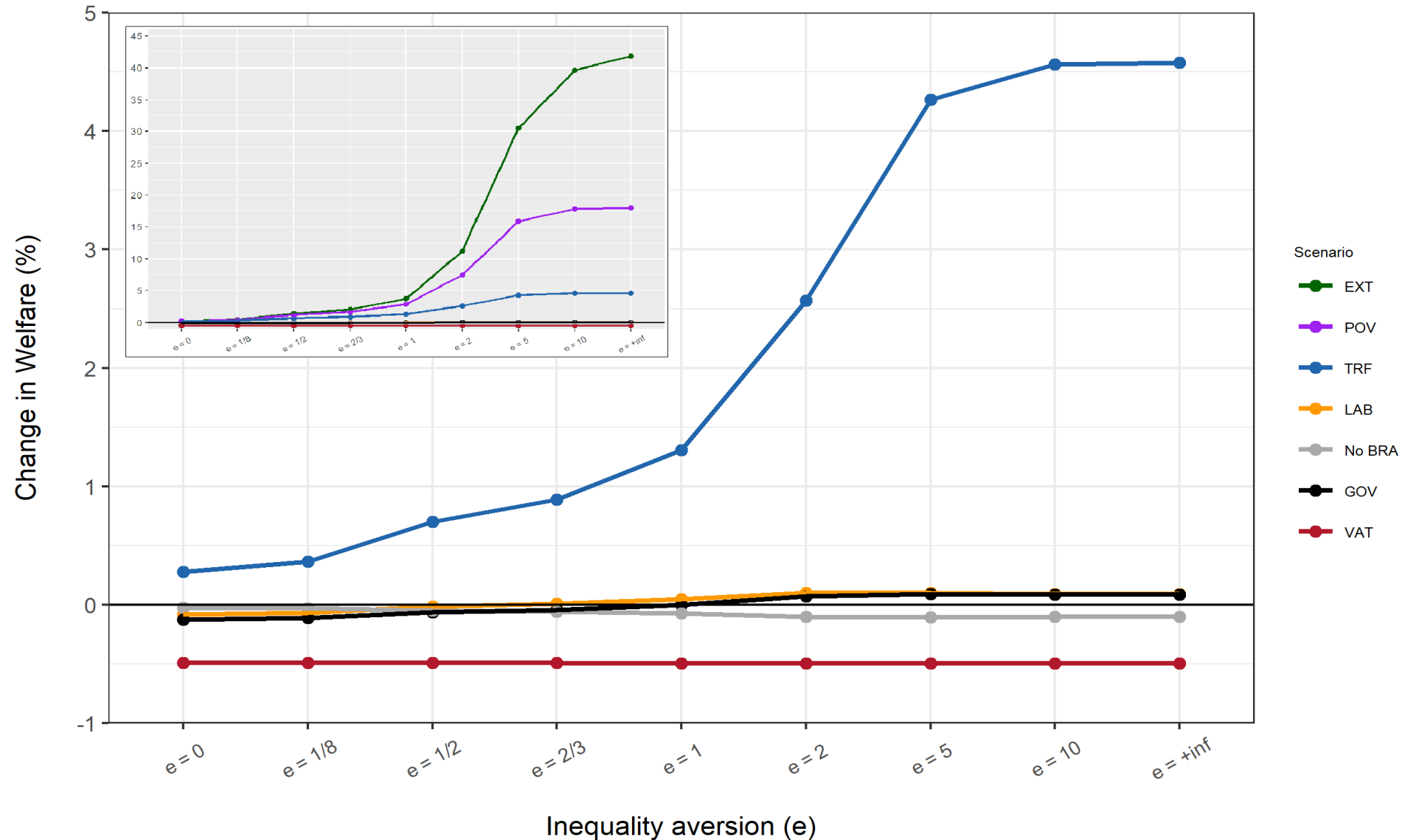


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Results

Indexes (EMF36)

- **Atkinson EDE**
- Gini coefficient
- Theil T index
- Theil L index
- S80/S20 ratio



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Final Remarks

- **Carbon pricing** can be a source of financing of **social spending** in Brazil
 - Lump-sum transfer (on a monthly basis):
 - USD 60 to first-decile households under the **poverty line**
 - USD 140 to first-decile households under the **extreme poverty** line
- **Welfare gains** are found in lump-sum scenarios
 - Source-side impacts prevail
 - Restricted to a few low-income deciles when carbon revenues are recycled through rebates on labor income taxes, suggesting a **weak double dividend**
- **Moderate GDP growth** is found for Brazil
 - Driven by gains in its trade balance due to worldwide carbon pricing

Thank you!

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References

- I. van Ruijven, B. J., O'Neill, B. C., & Chateau, J. (2015). Methods for including income distribution in global CGE models for long-term climate change research. *Energy Economics*, 51, 530-543.
- II. Rafael Garaffa, Bruno Cunha, Talita Cruz, Paula Borges, André Lucena and Angelo Gurgel. doi: 10.1016/j.eneco.2021.105396. *Energy Economics* (2021). In press.