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Chaire Modélisation prospective
au service du développement durable

Sectoral targets for developing countries: Combining "Common but differentiated responsibilities" with "Meaningful participation"

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Outline

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2. Model
3. Scenarios
4. Results
5. Conclusion

1. Motivation

Why a global emission cap is unlikely... (at least in the short run)

- Principle of “common but differentiated responsibilities” (article 4 of the UNFCCC)
- Absolute emissions caps often viewed as a constraint to economic growth and to the right to development
- Increases in the energy costs Large distributional consequences in developing countries...
- Risk of “Dutch disease” in case of a large North-South transfer
- Lack of monitoring capacities
- Large North-South transfers hardly acceptable (in the North) and credible (in the South)

Limiting global warming to 2°C ?

- Developing countries participation to a global climate agreement is likely to be weak
 - List of heterogeneous policy measures
(Copenhagen Accord (UNFCCC 2009))
 - Difficulty or impossibility of any assessment
 - Not cost efficient
- US administration still insists on a meaningful participation of major developing countries
 - 56% of the global total GHG emissions come from non-Annex I parties emissions in 2005.
- Without their participation, the “2°C” is out of reach!!

A sectoral target for developing countries as a short term solution

- Less stringent commitments have been proposed by scholars and stakeholders where only some sectors are constrained.
 - European Commission (2009) proposed a « sectoral crediting mechanism »
- Lack of quantitative assessments
 - Assessment of possible emission reduction achieved by such policies Amatayakul et al. (2008), Amatayakul and Fenhann (2009), Schmidt et al. (2008)
 - Absence of economic impact assessement

Assessing the economic impact of a sectoral target for developing countries

- 2 policy scenarios :
 - Developed countries continue with Kyoto Type absolute commitments
 - Developing countries adopt an emission trading system limited to their electricity generation
(linked to developed countries cap-and-trade system)
- Why electricity sector?
 - The highest emitting sector (41% of CO₂ emissions from fuel combustion in 2007 – increasing by 60% since 1990 (IEA, 2009)
 - Near future massive investment in electricity generation
(WEO IEA 2009 projections: a growth in electricity demand by 76% from 2007 to 2030 - 4800 GW additional capacity will be required)
→ **Avoid the “carbon lock-in”**
 - High abatement potential & Easy emission trading implementation

2. The Imacsim-R model

- General equilibrium, Dynamic, Hybrid
- 12 regions, 12 sectors
- Recursive, annual time step
- Explicit technologies in some sectors including electricity generation
- Calibrated on GTAP & IEA energy balances
- Fossil CO₂ emissions only

3. Scenarios

- BAU
- Global_Cap
- Annex_I_only
- Elec_Households
- Elec_Rebates

“Benchmark” Scenarios

- **BAU**
 - business-as-usual
 - No climate policy
- **Global_Cap**
 - Worldwide cap & trade from 2013 on, no climate policy until 2012
 - Emission targets based on Contraction & Convergence in 2100
 - Stabilisation at around 450 ppm CO₂
- **Annex_I_only**
 - Same emissions as Global_Cap in Annex I
 - Trade of allowances with each other
 - No climate policy in the South

Sectoral Target Scenarios

- Elec_Household

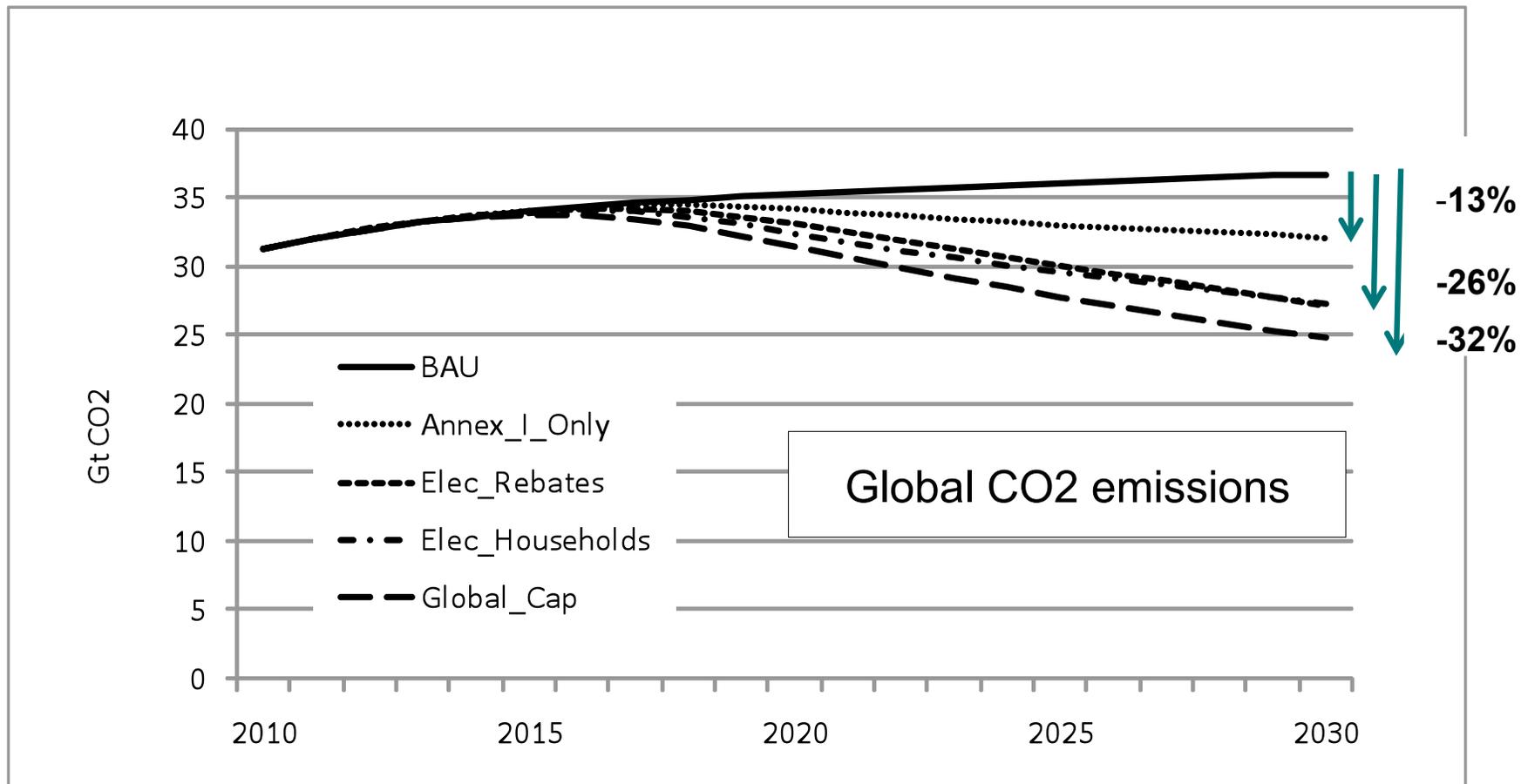
- Same emissions as Global_Cap in Annex I, Trade allowances with each other
- Sectoral target for electricity generation in the South
- Same CO₂ price as in the North
- Allowances auctioned, receipts recycled lump-sum to households
- No net allowance trade between North & South

- Elec_Rebates

- Same as Elec_Household except that South auction receipts recycled as electricity generation firms production subsidy.

4. Results

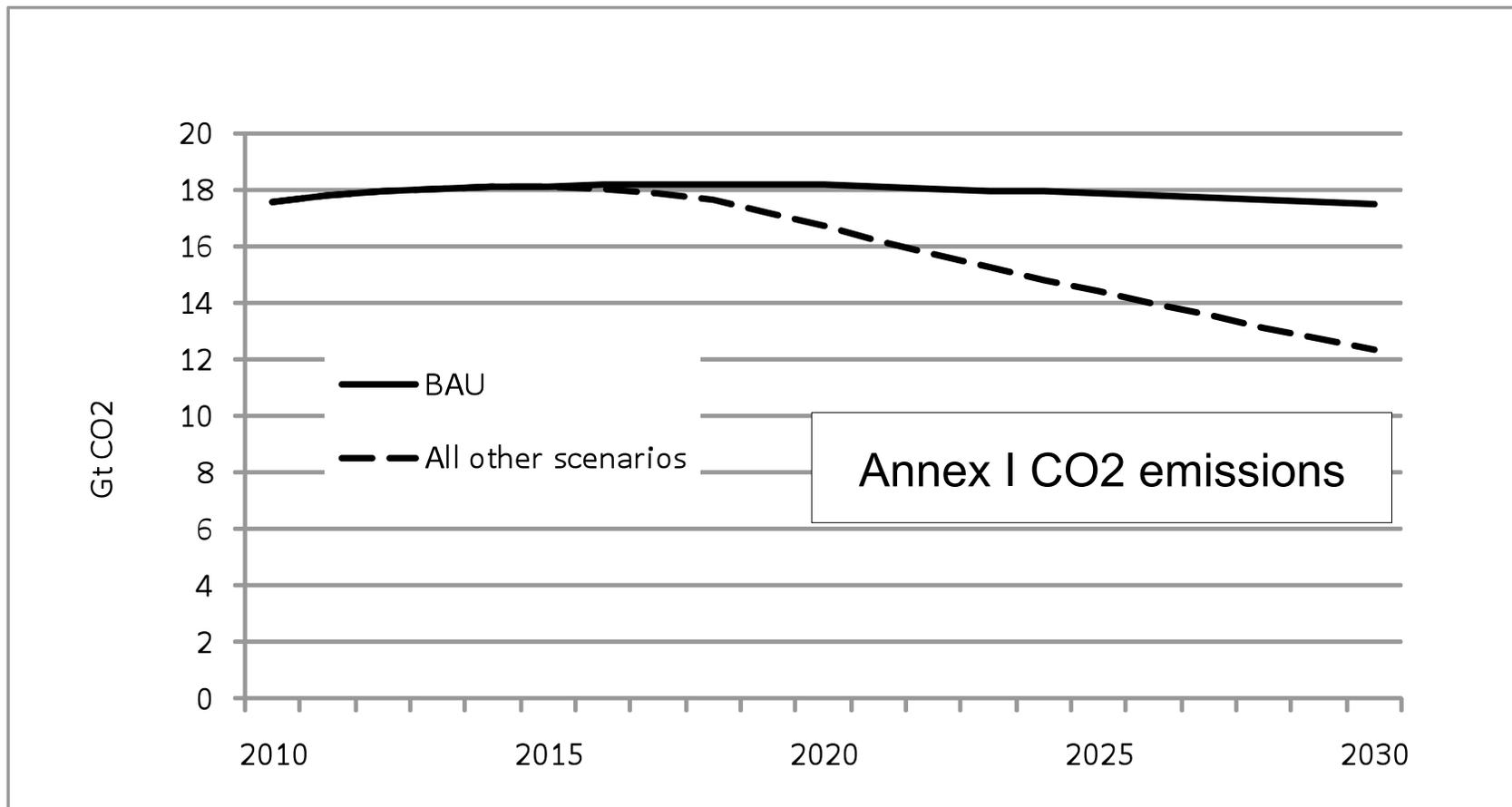
CO₂ emissions



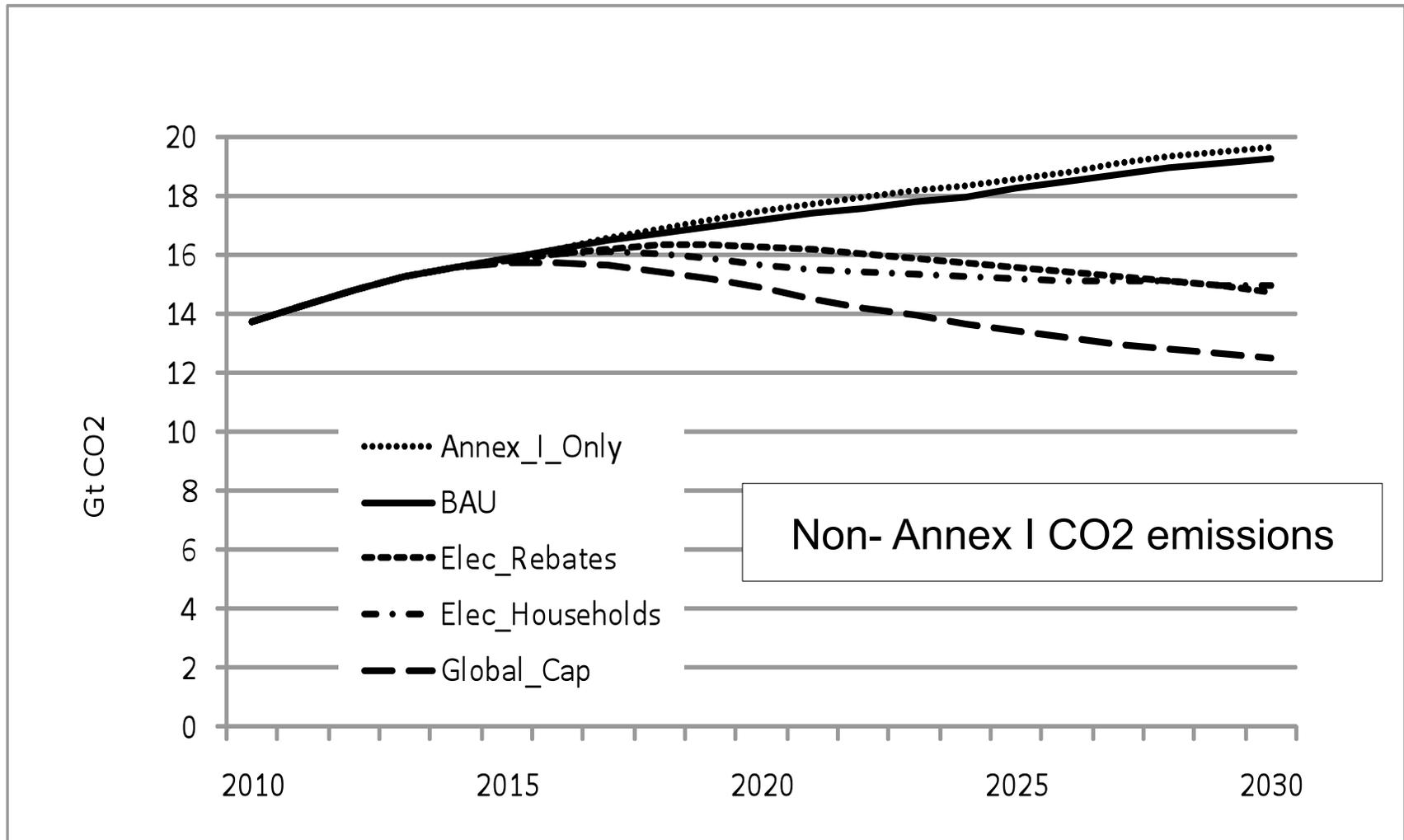
The sectoral approaches provide almost as much abatement as the global cap-and-trade system

→ 80% of the abatement of Global_Cap (compared to BAU) in 2030

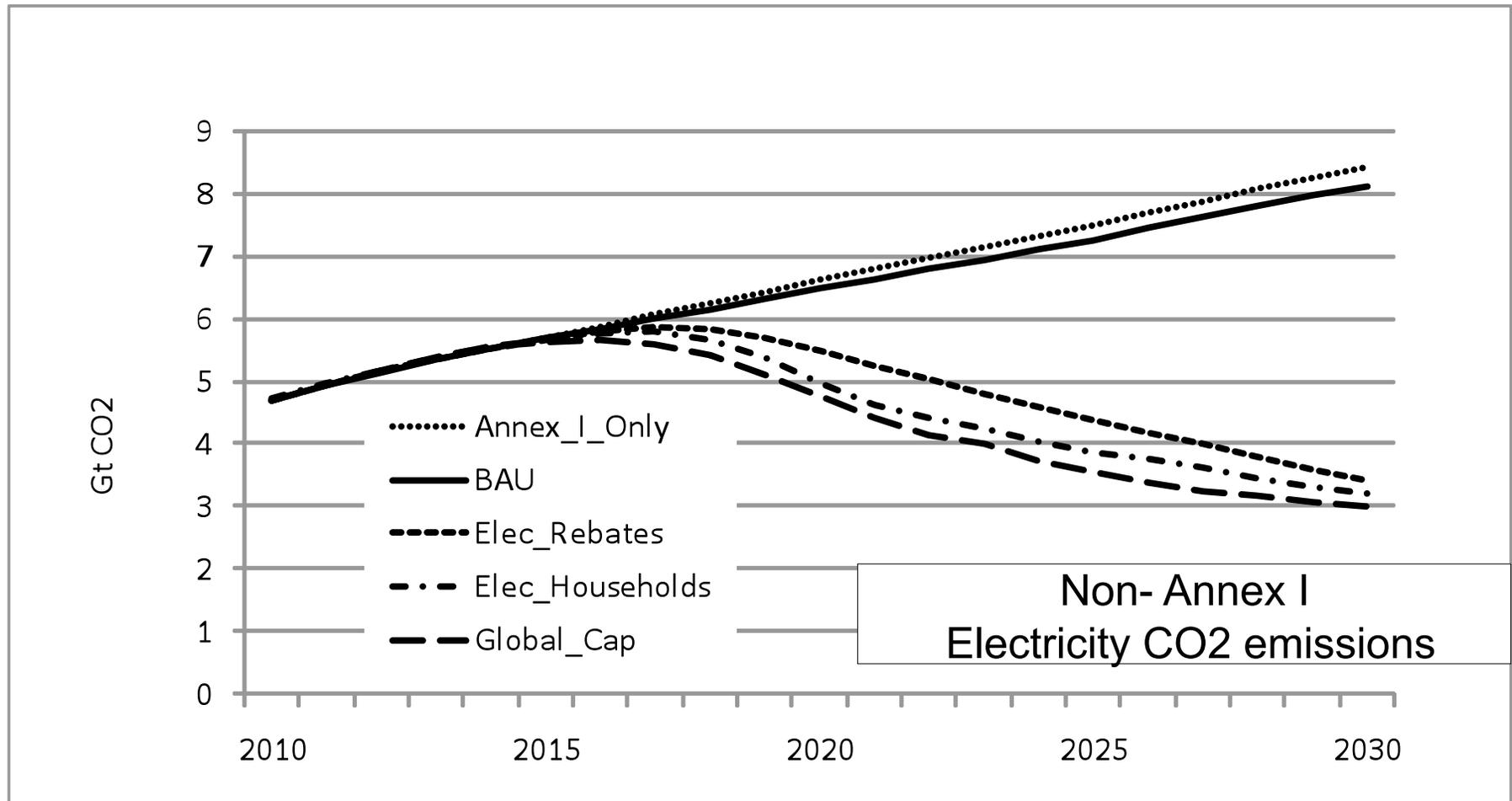
CO₂ emissions... Annex I



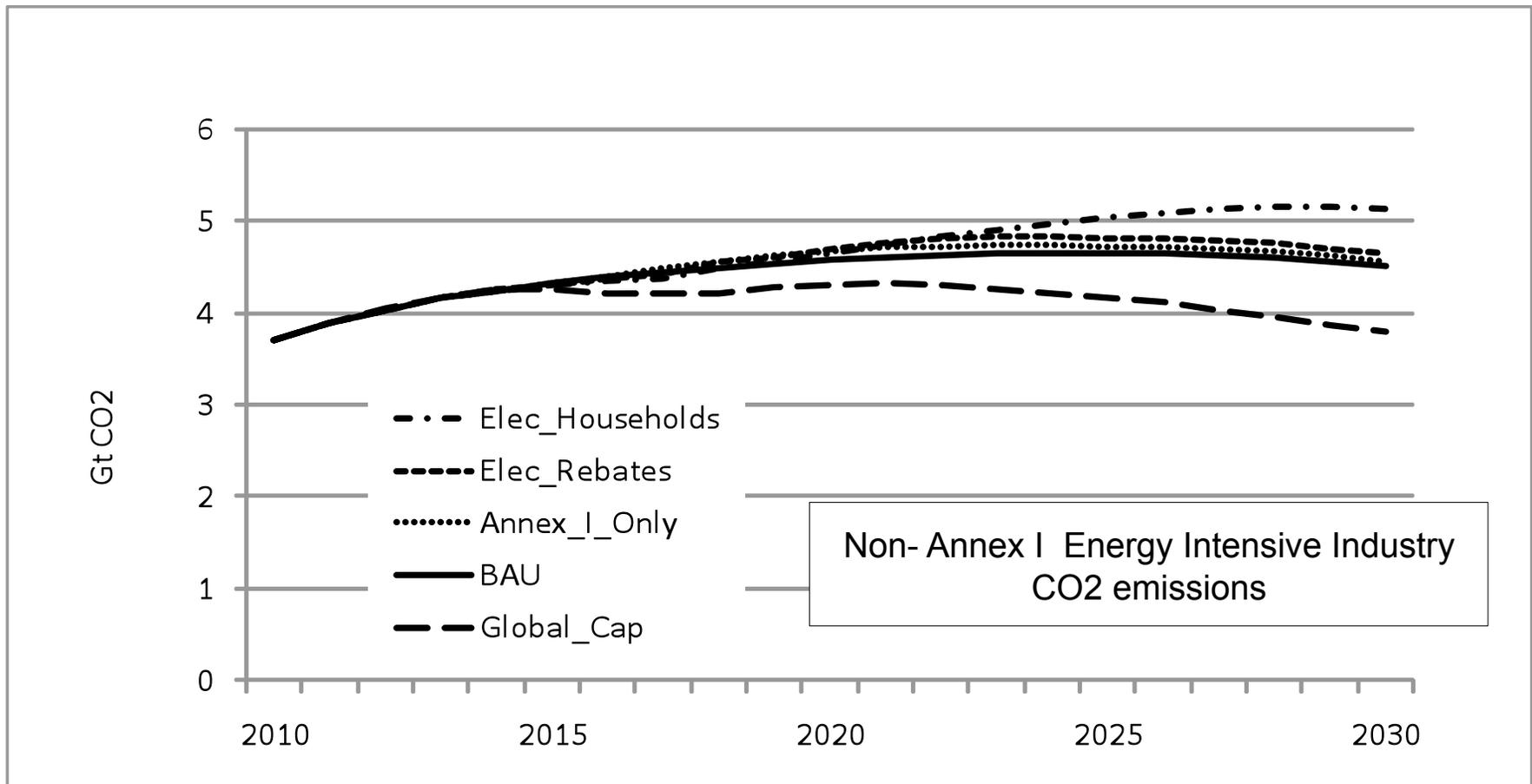
CO₂ emissions... Non-Annex I



CO₂ emissions from Power Generation ... Non-Annex I

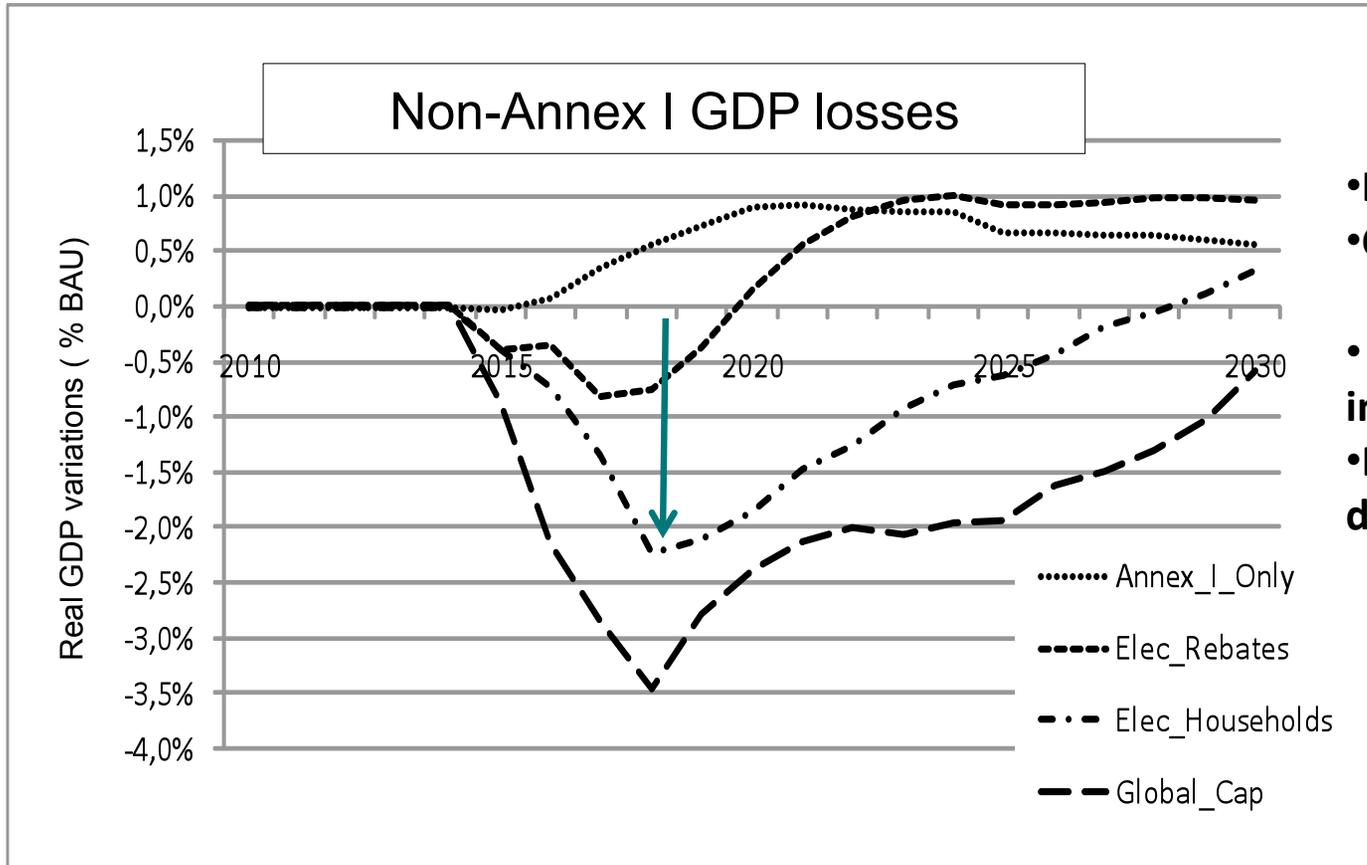


CO₂ emissions from the energy-intensive industry ... Non-Annex I



GDP Losses

Developing countries



Catch-up

- Induced Technological change
- Consumption structure change

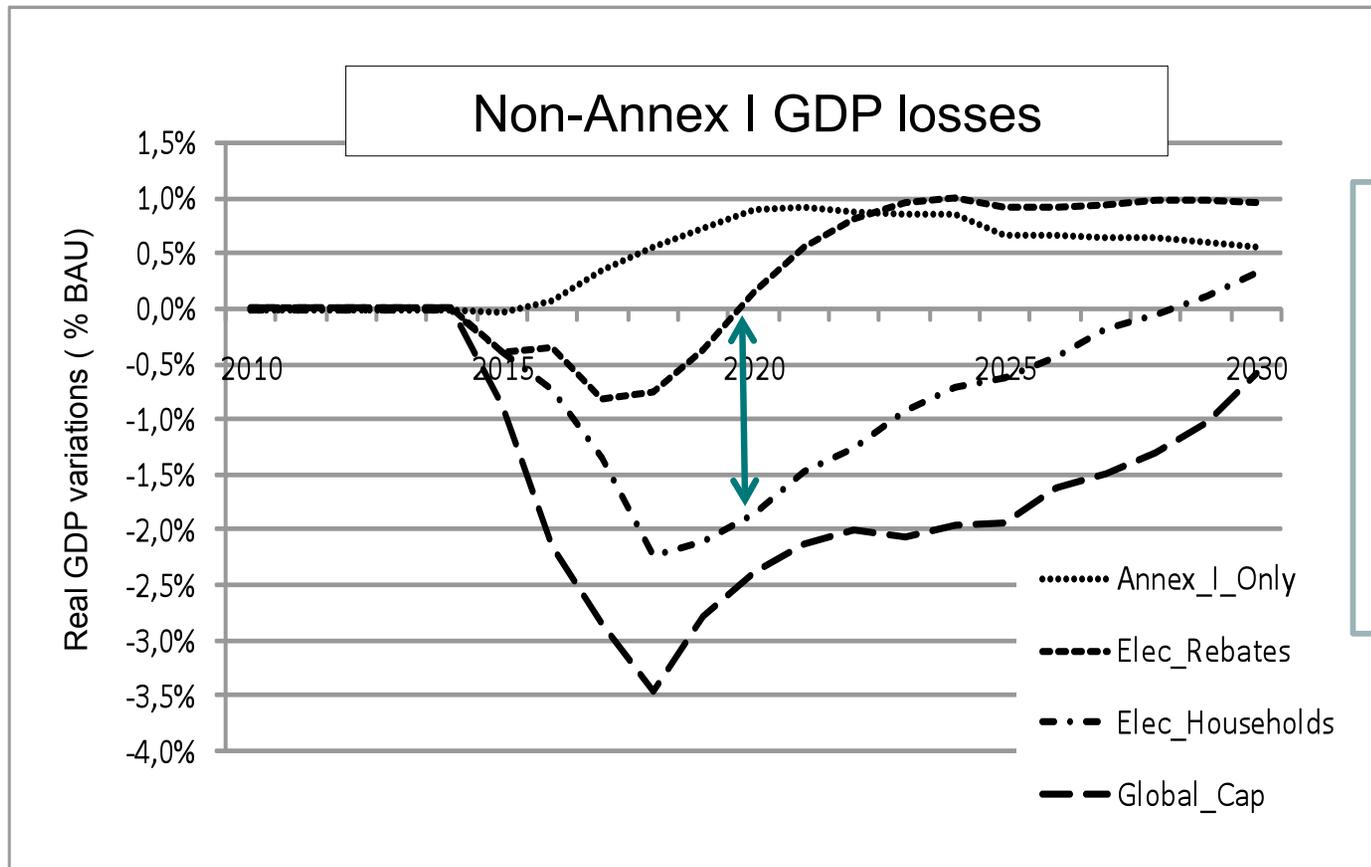


- Less vulnerability to oil price increase
- Reduction of the oil economies dependences

The sectoral approach with rebates entails much lower GDP losses in developing countries

GDP Losses

Developing countries



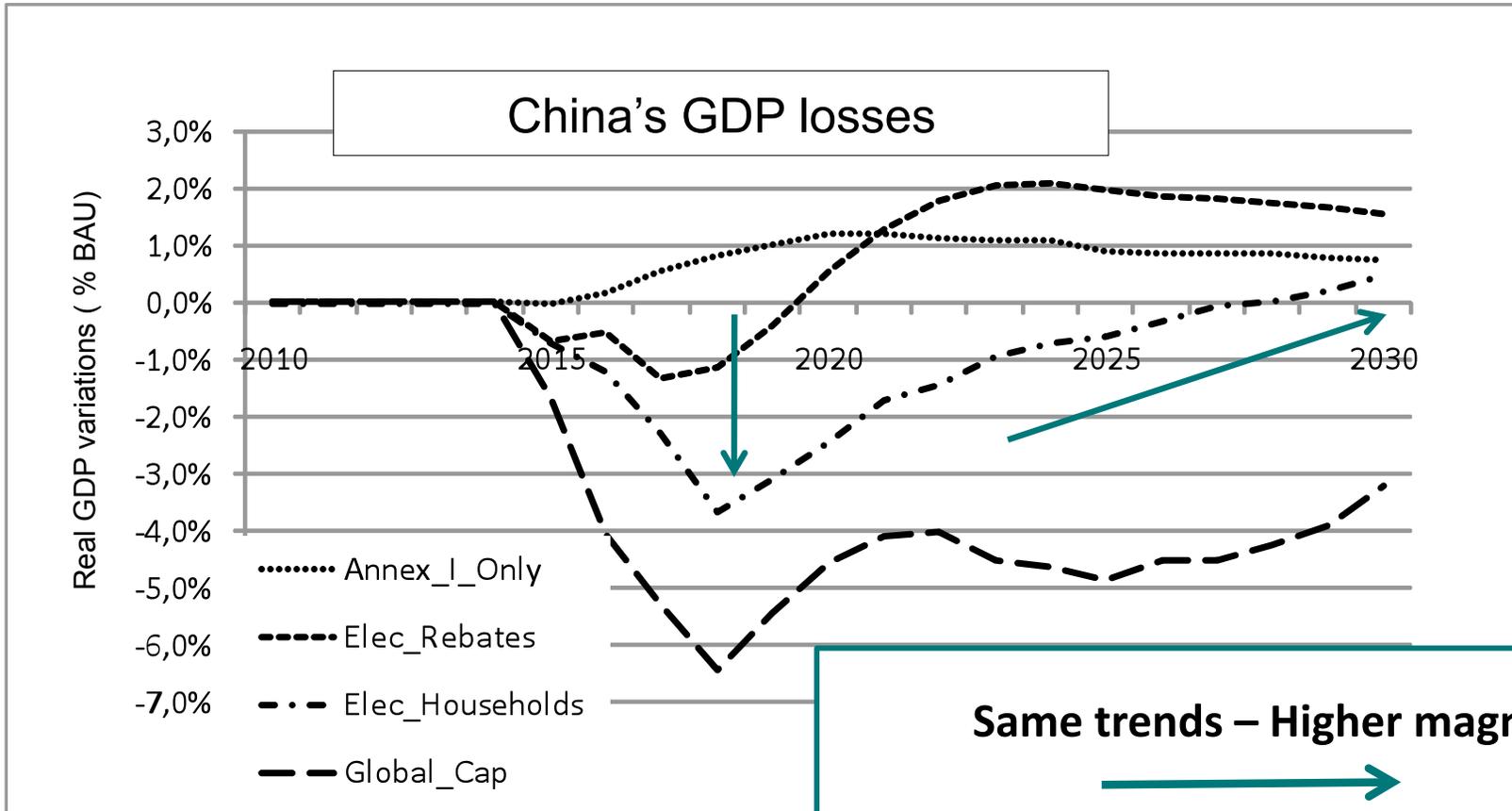
A lump-sum distribution of the Tax revenue to Households



- High increase of electricity prices

The sectoral approach with rebates entails much lower GDP losses in developing countries

GDP Losses ... China



Same trends – Higher magnitude



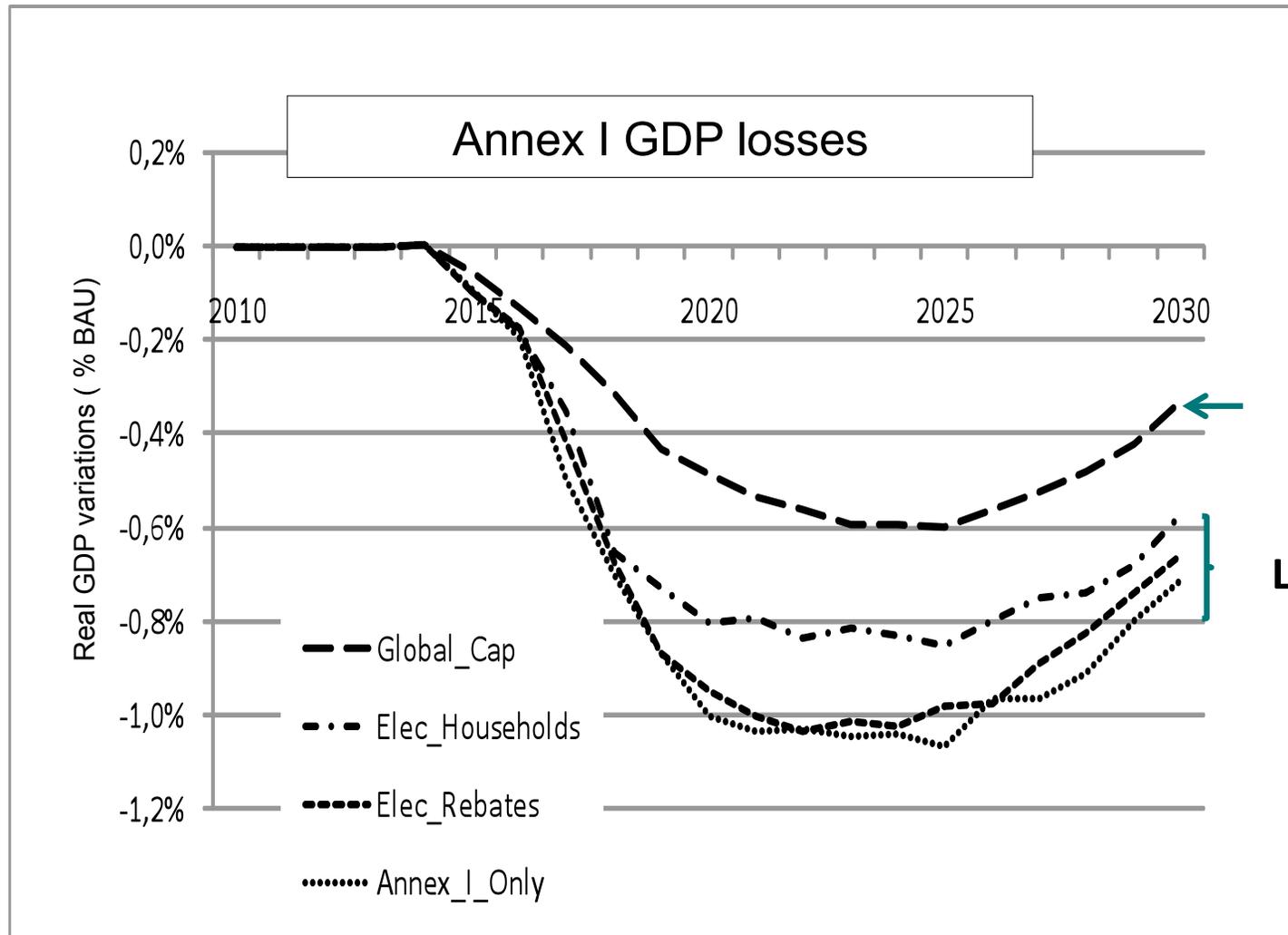
Chinese economy is very CO₂-intensive:

0.6 kg CO₂/US\$ ppp in 2007

0.47 kg CO₂/US\$ ppp world average

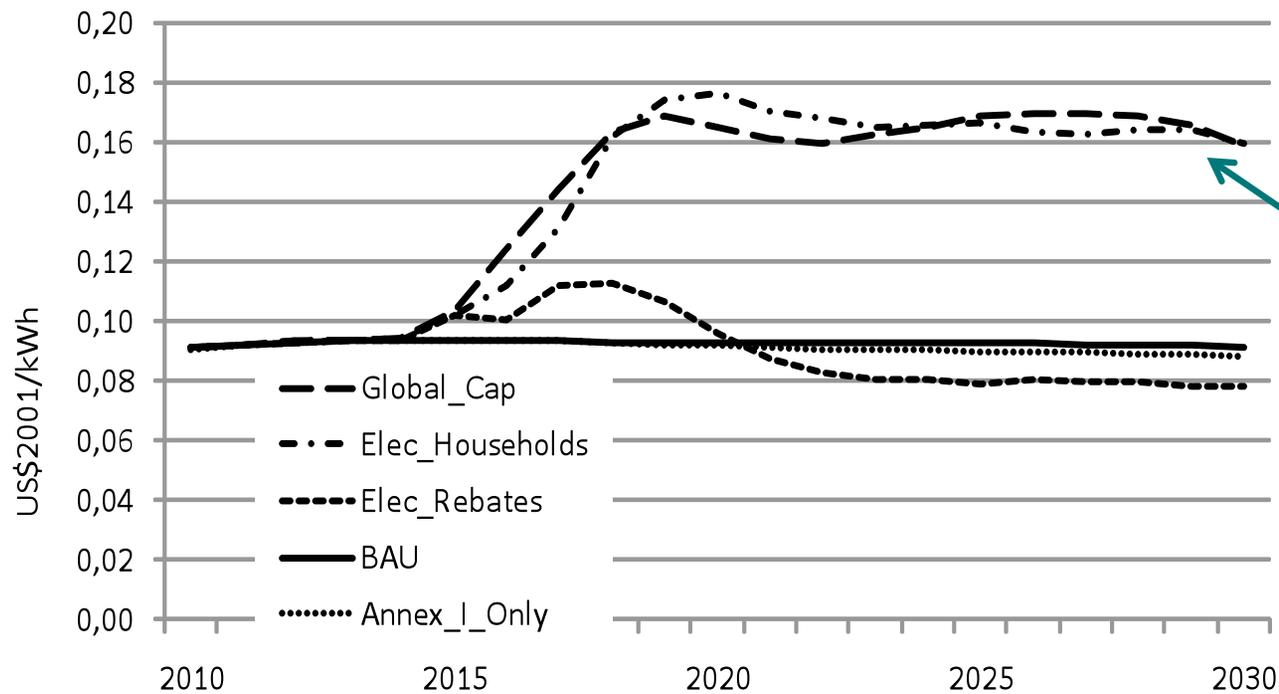
0.48 kg CO₂/US\$ ppp Non-Annex I countries average

GDP Losses ... Annex I



Electricity Markets

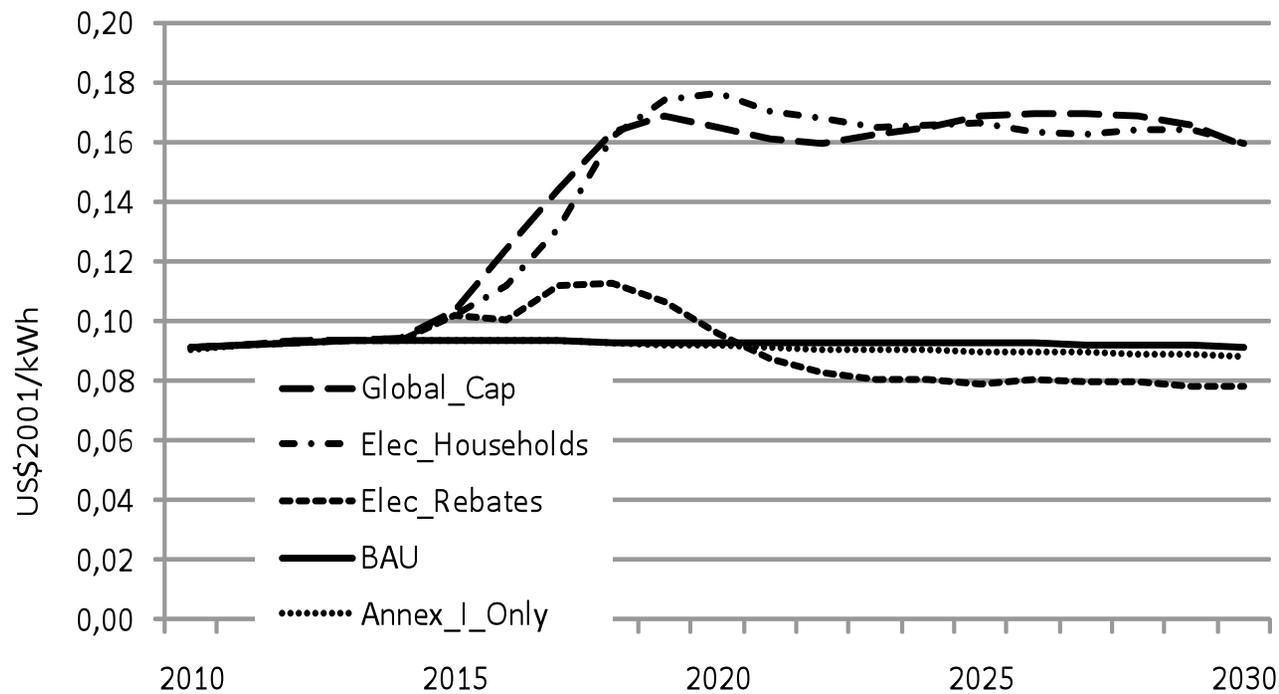
Electricity prices in China



- Producers pass the cost of allowances to consumers
- Cheap fossil fuel technologies replaced by expensive « cleanest » one

Electricity Markets

Electricity prices in China

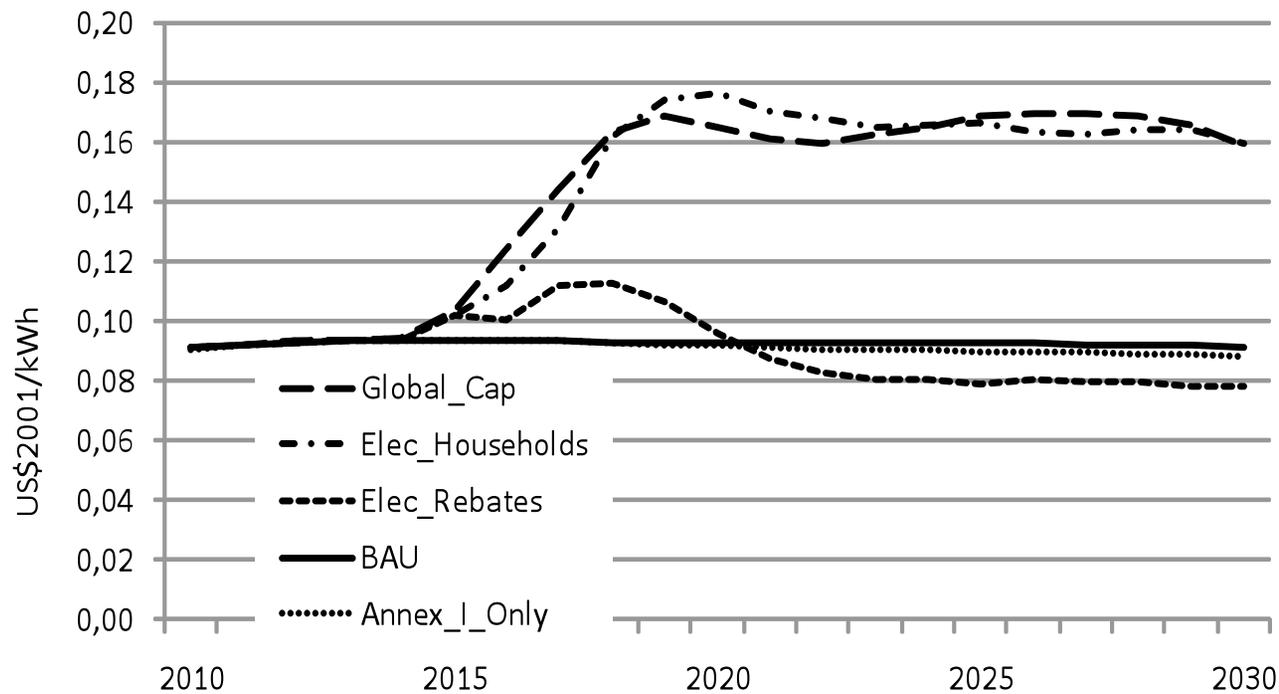


The price Increase due to the CO2 allowances is partially offset by the subsidy

Impacts on electricity markets are much milder with rebates

Electricity Markets

Electricity prices in China



- Learning by Doing in low carbon technologies

- The CO₂ price pushes producers to reduce the share of fossil fuel on their generation mix

(Correction of the model myopia on the energy prices)

Impacts on electricity markets are much milder with rebates

5. Conclusion

Economic assessment of stylized sectoral targets

- In the **Short term**, and as a **transitory device**, Sectoral Targets policies present several advantages :
 - If linked to a well-functioning worldwide GHG market, a target limited to power generation may bring 80% of abatement of a global cap-and-trade
 - With emissions tax receipts recycling as a subsidy to power generation firms, the rise in electricity price and the GDP losses would be limited
 - More in line with the principle of « Common but differentiated responsibilities »
- ➔ Developing countries will be more able to join a global climate policy in the longer term.

Publication

Sectoral targets for developing countries : combining `common but differentiated re-sponsibilities` with `meaningful participation`

Hamdi-Cherif Meriem, Guivarch Céline, Quirion Philippe

Climate Policy, Volume 11, Number 1, 2011 , pp. 731-751(21)

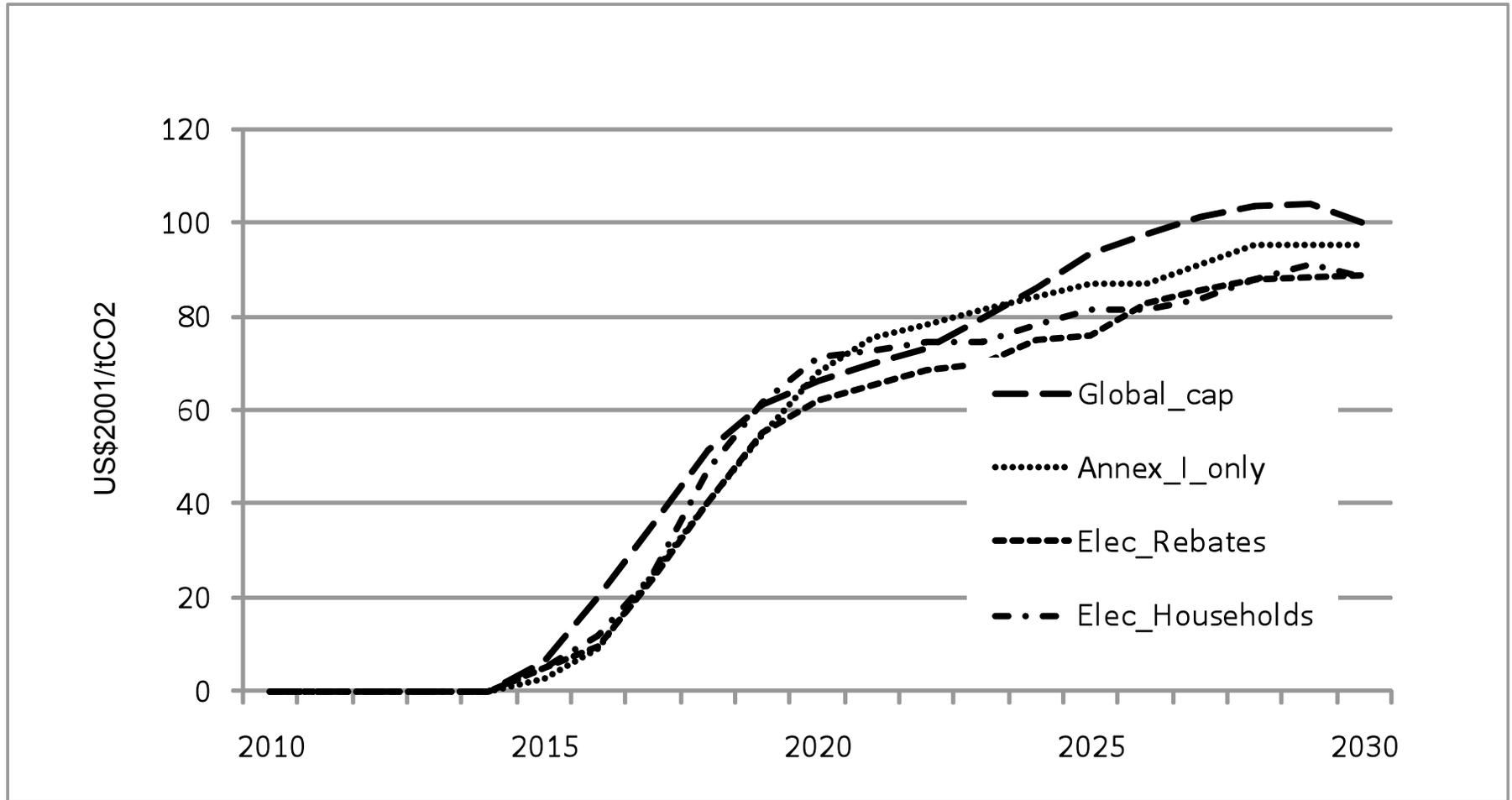
Thank you ...!!!

Meriem Hamdi-Cherif

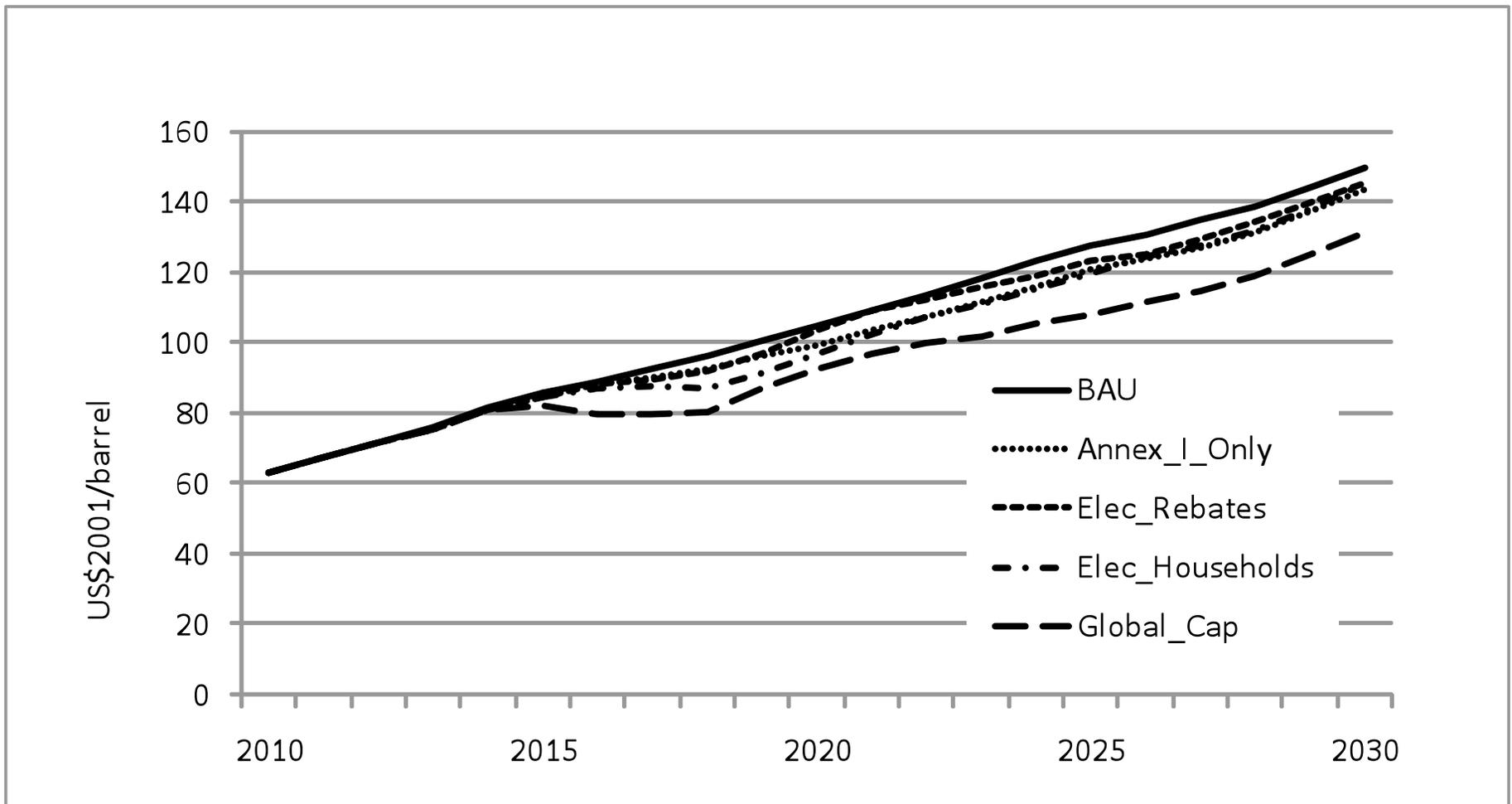
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6. Appendix

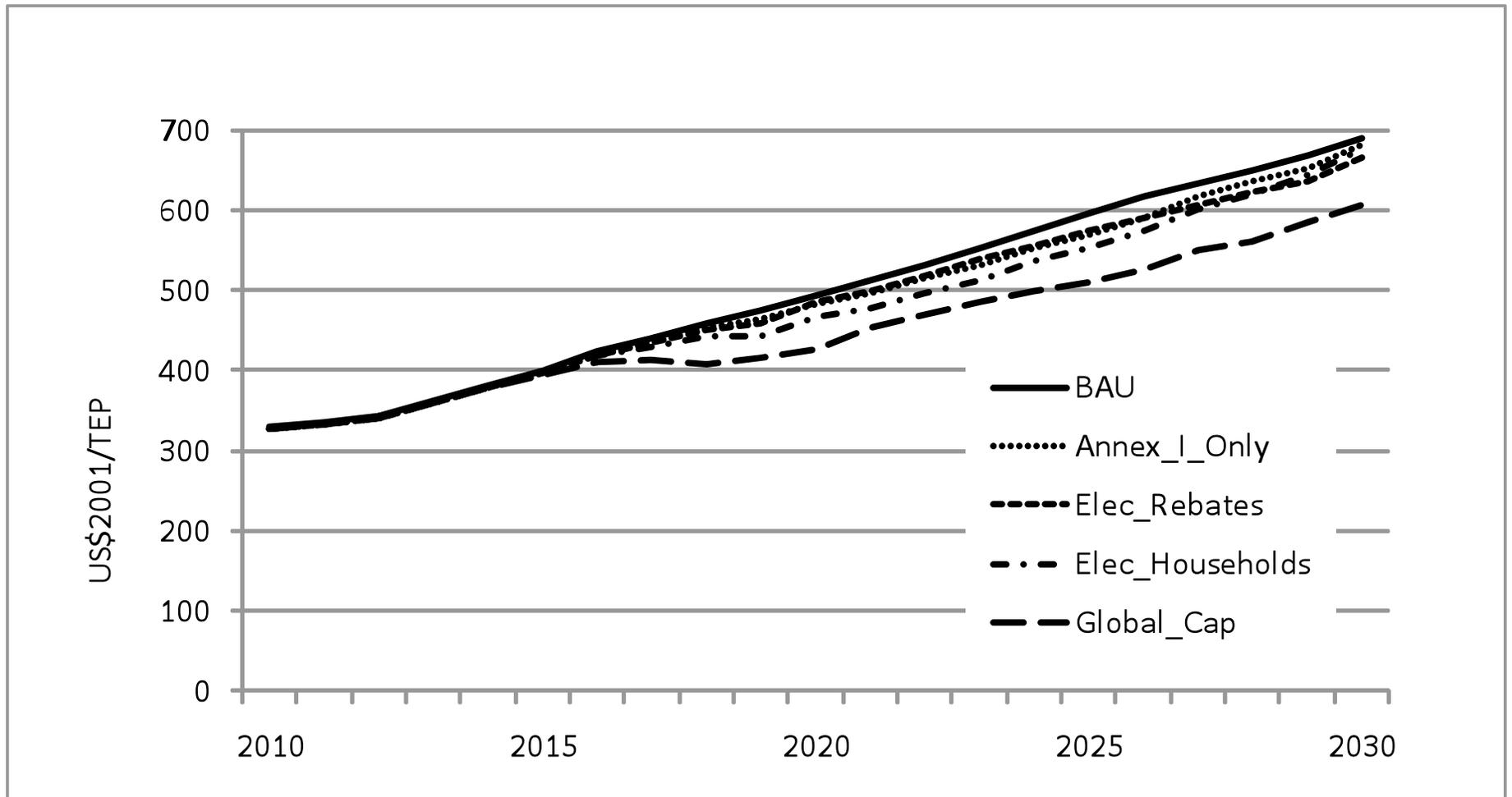
CO₂ Price



Oil World Price



Gas World Price



Coal World Price

