



CENTRE  
INTERNATIONAL  
DE RECHERCHE  
SUR L'ENVIRONNEMENT  
ET LE DÉVELOPPEMENT



Chaire Modélisation prospective  
au service du développement durable

# Reducing the costs of Copenhagen climate pledges in a post-Kyoto world

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# Introduction

- The International climate governance: uncertainties around a Post Kyoto framework, even if ...
- The 2°C target was adopted in official texts: Copenhagen, Cancun
- Annex I & emerging countries took non-binding commitments: Copenhagen pledges

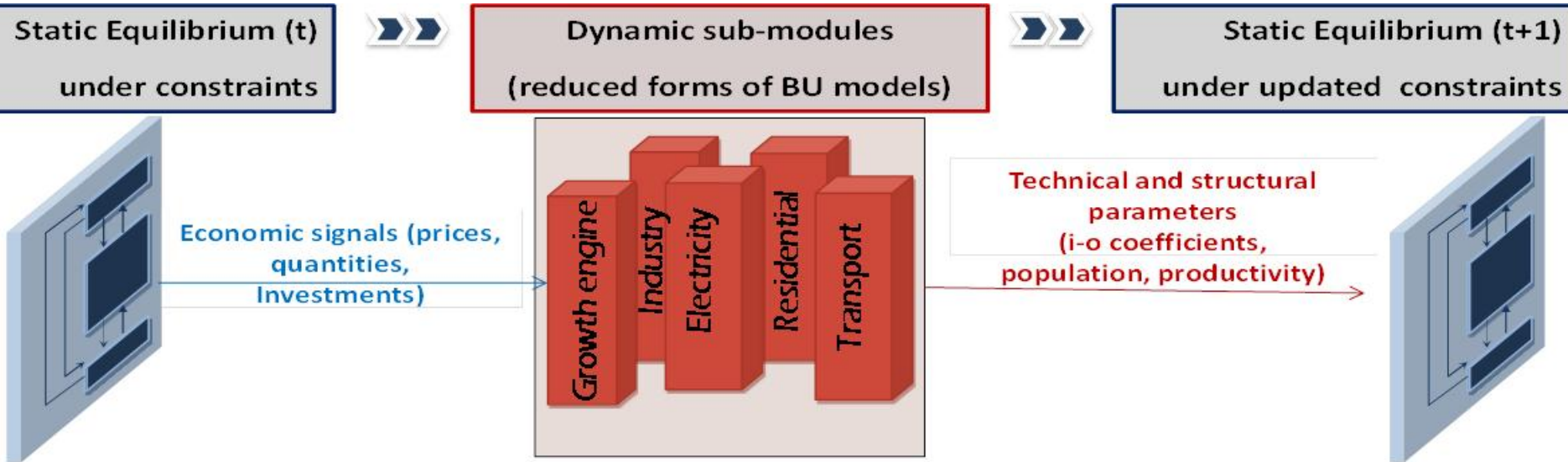
## *A key challenge:*

involving emerging countries beyond Copenhagen pledges

- Addressing an extended Copenhagen pledges framework
  - Design of the future climate policy architecture (burden sharing, quotas allocation, national policies)
  - Assessing macroeconomic impacts for developing and developed countries
  - Articulating international and national policies minimizing mitigation costs at the global and regional level
- A second best modeling framework

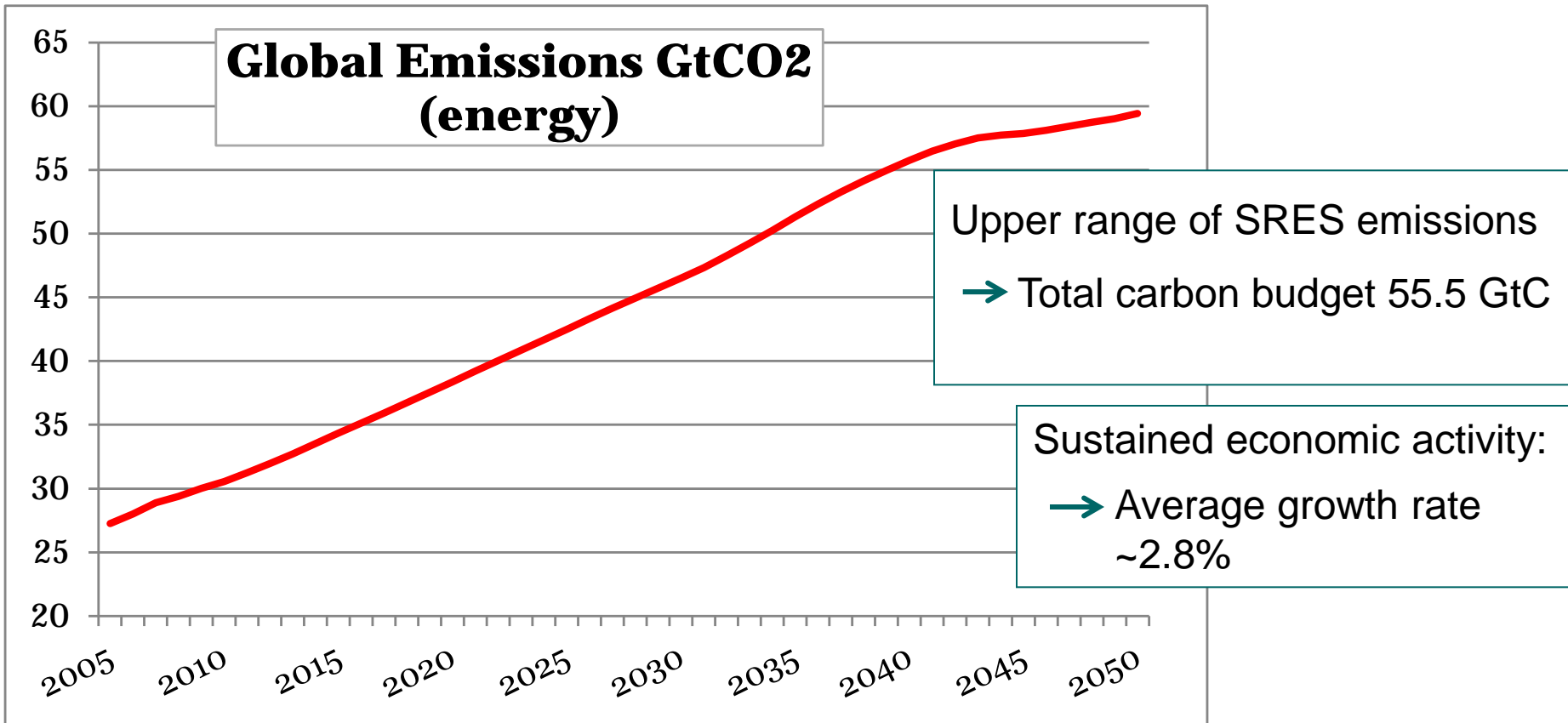
# The Imaclim-R model

multi-region and multi-sector Dynamic General Equilibrium



- Hybrid matrix: consistency between money and physical quantities  
(Calibrated on GTAP & IEA energy balances)
- Annual time step, recursive succession of :
  - **Static equilibria:** second best economy
  - imperfect expectations, market imperfections, partial use of production factors (unemployment)
  - **Dynamic modules:**  
evolution of technical and structural constraints → inertia

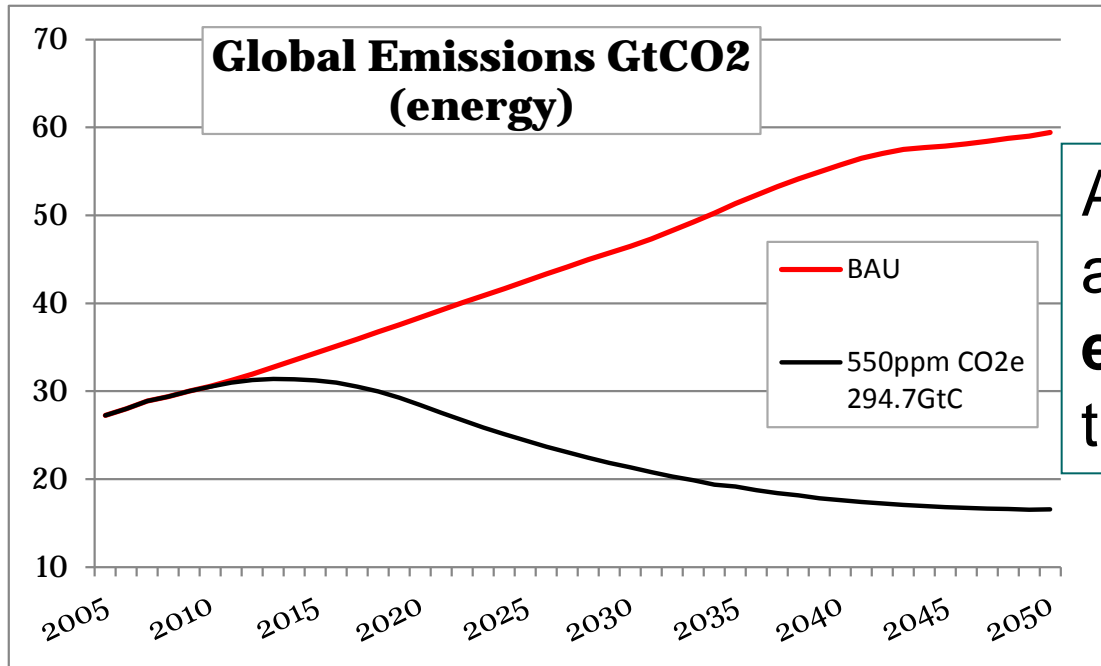
# The baseline scenario BAU



*BAU scenario belongs to the A SRES family*

# Climate policy scenarios

Given a prescribed CO<sub>2</sub> emission objective

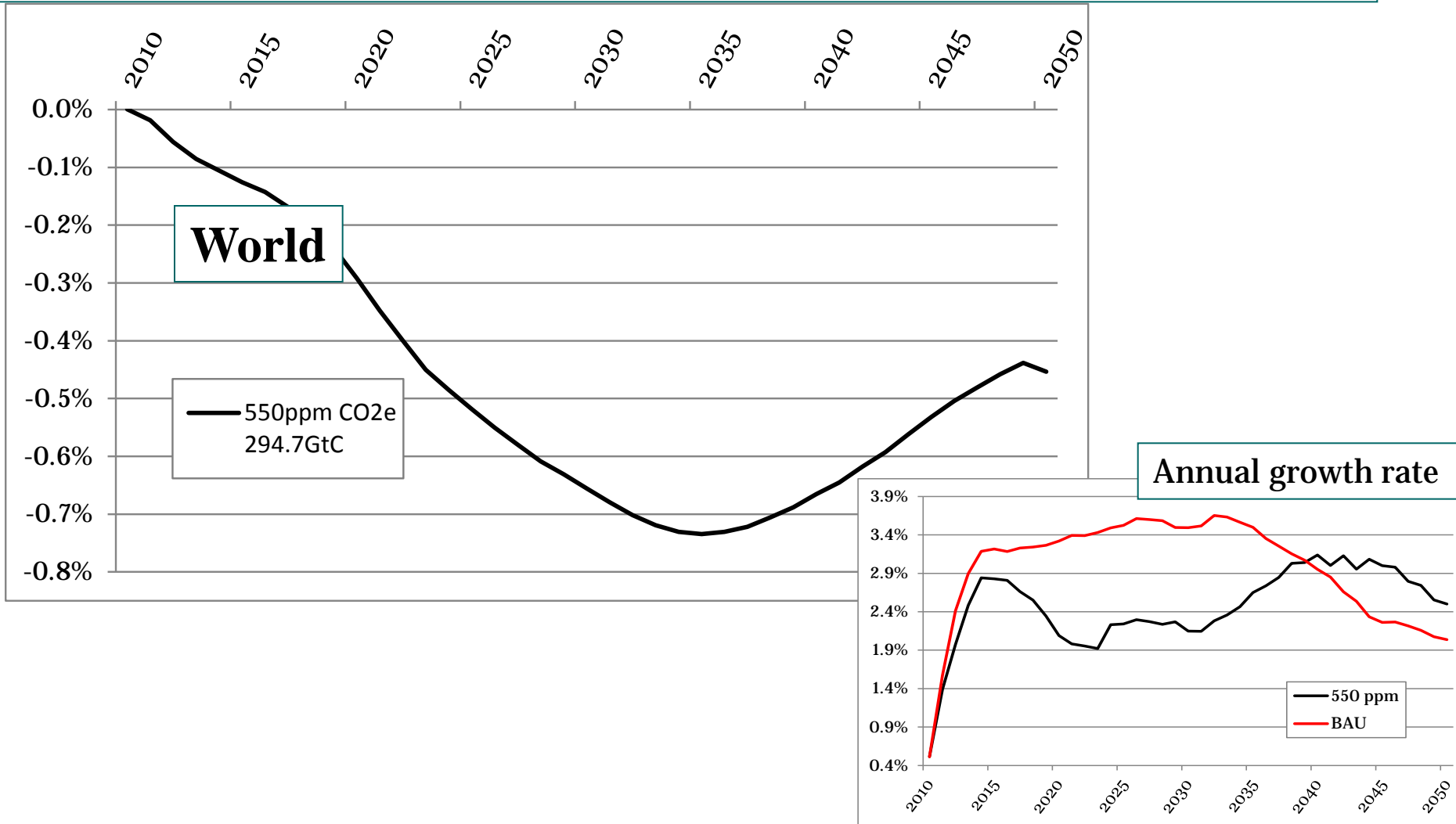


At each date,  
a **carbon price** is  
**endogenously calculated**  
to abate carbon emissions

What consequences in terms of **macro-economic costs** ?

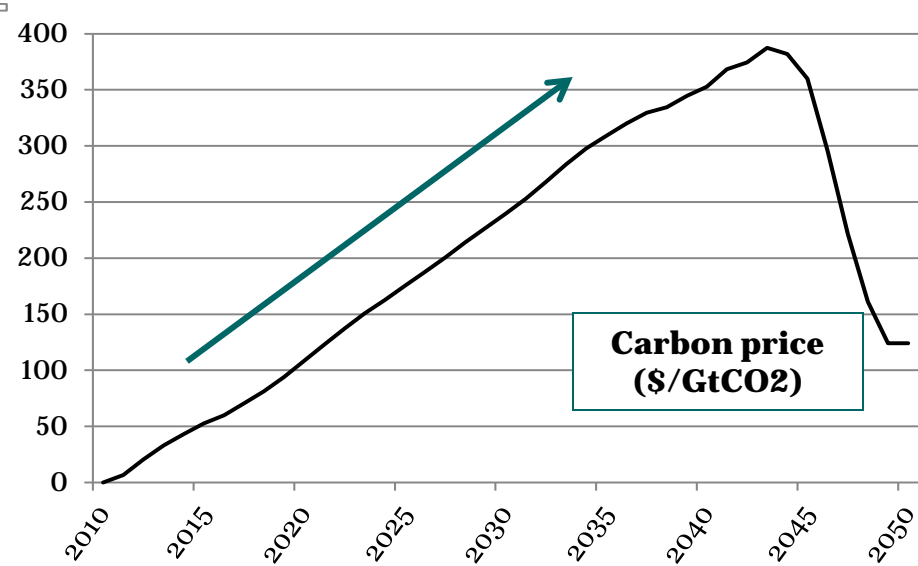
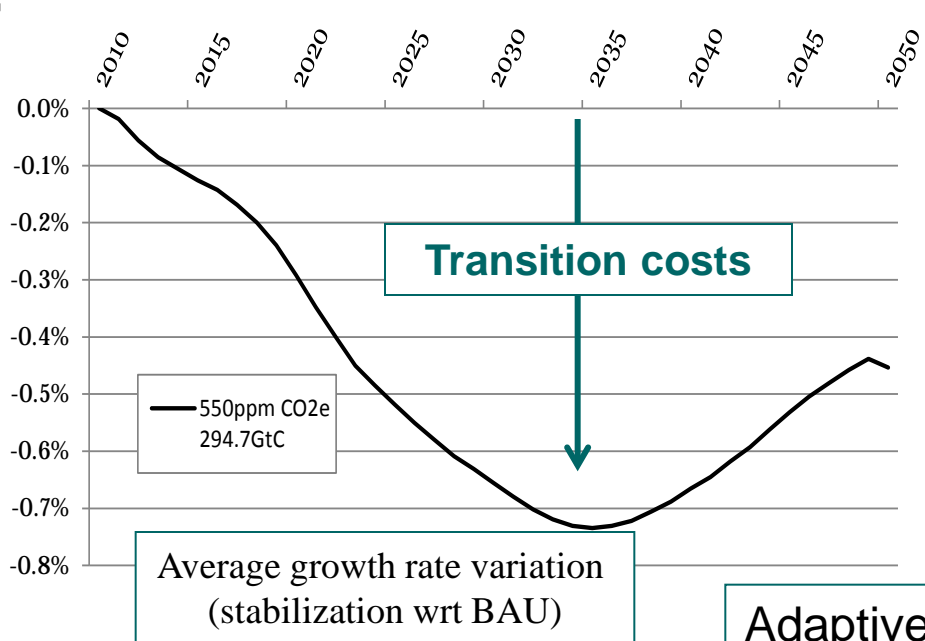
# Mitigation costs

**Difference in average growth rate  
between climate and reference scenario**



# Mitigation costs

## Short term



Adaptive expectations  
 Inertia on installed capital & end-use equipment  
 →  
 Only high carbon prices to redirect investments choices

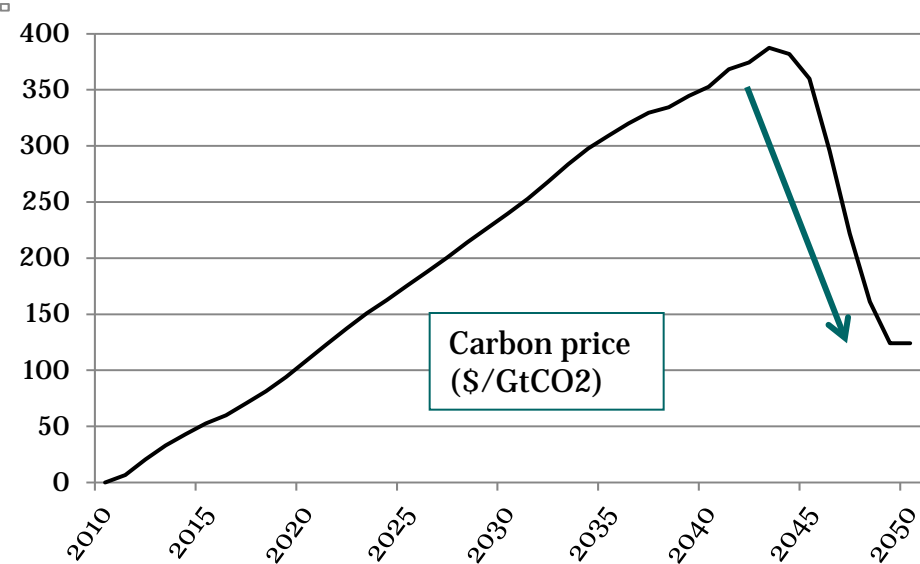
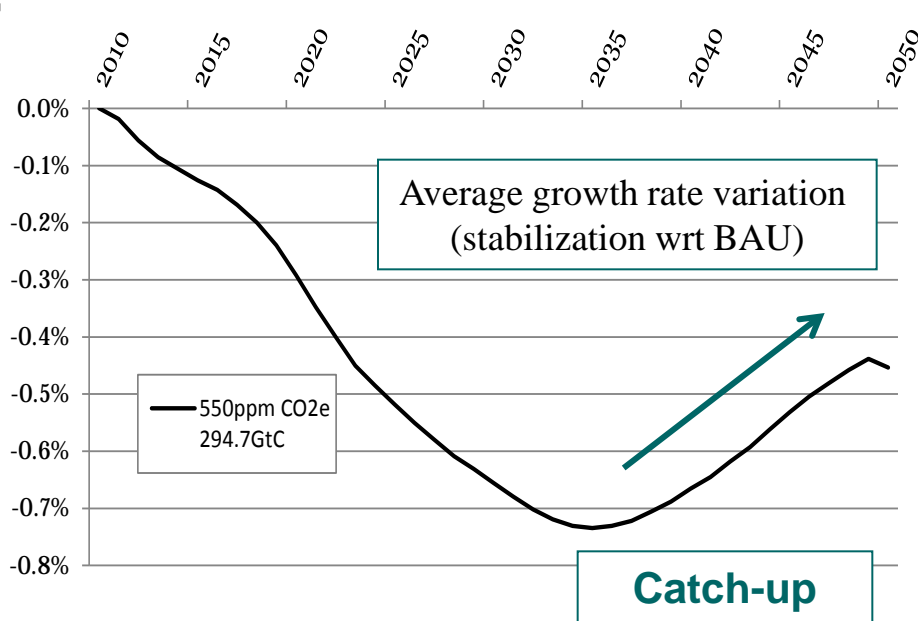
Increase of

- Production costs & Consumption prices
- Unemployment

→ High transition costs

# Mitigation costs

## Medium term



- Induced Technological change, learning by doing
- Consumption structure change



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

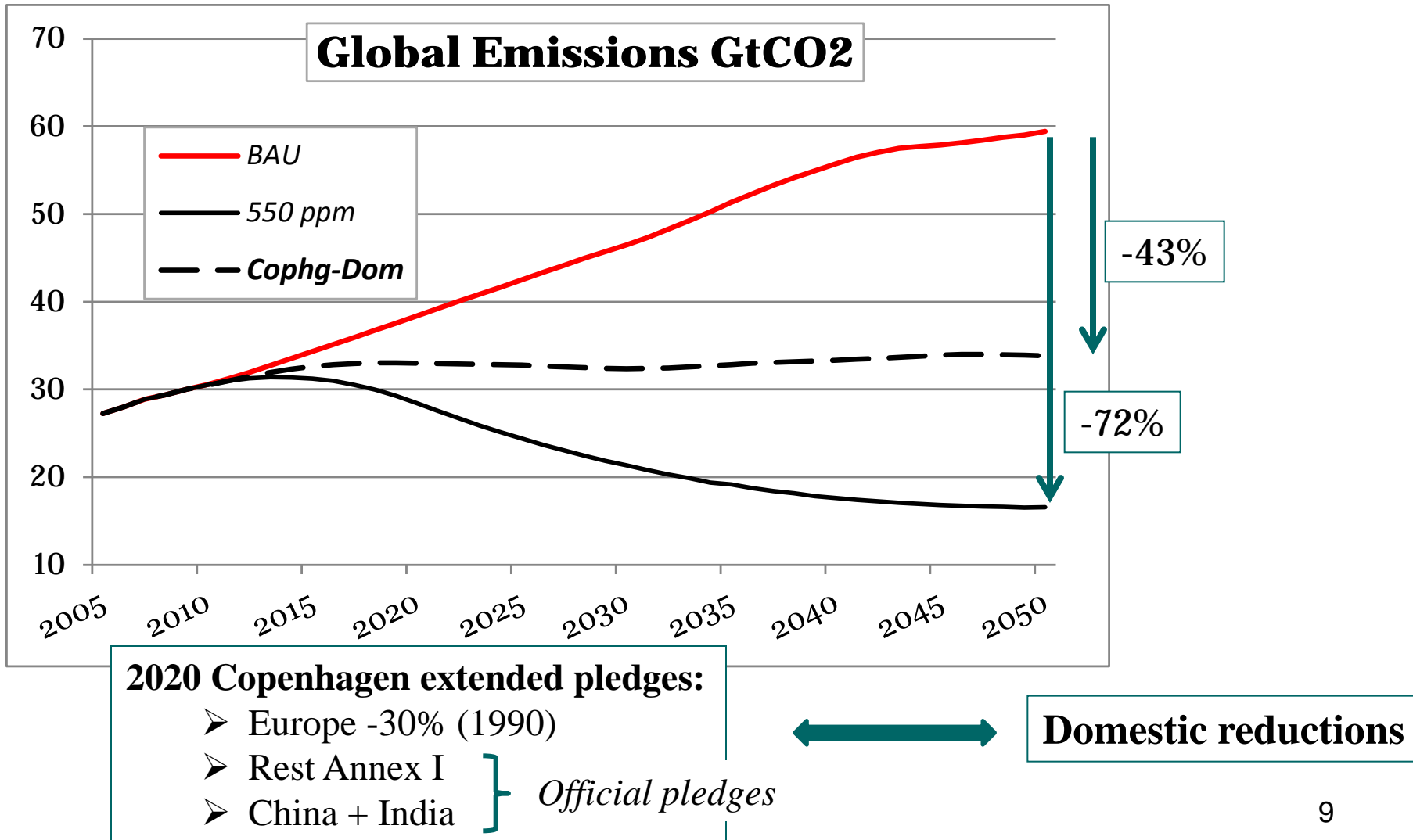


Correction of BAU sub-optimalities

Sufficient level ....  
.....to reach most mitigation potential in the residential, industrial and power sectors

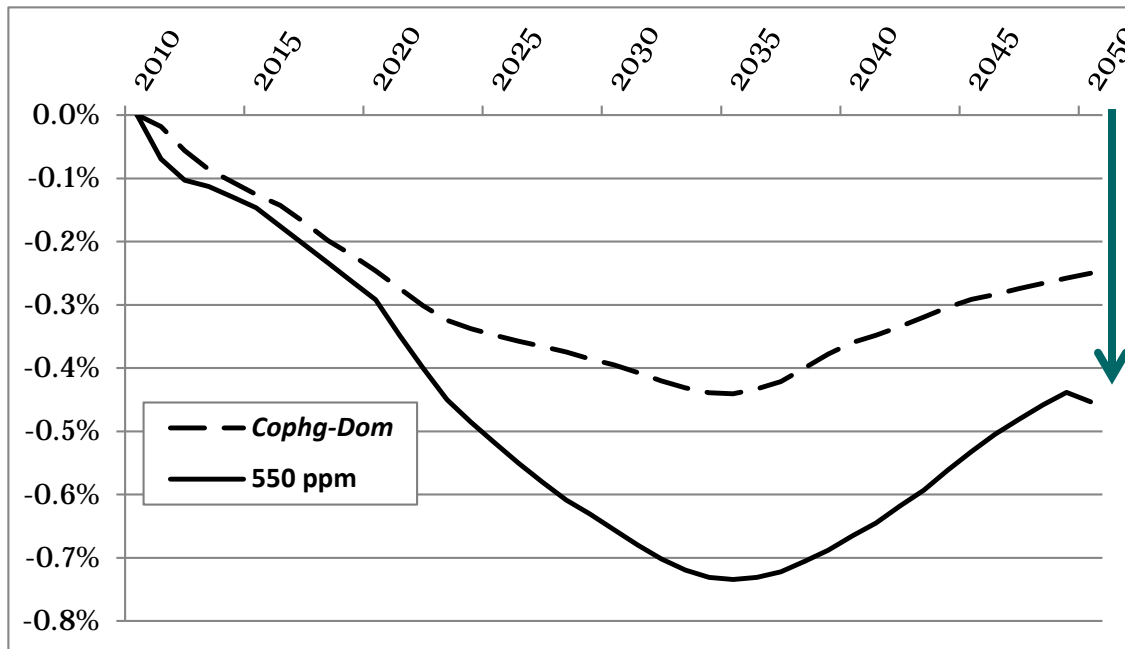


# “Copenhagen-extended” scenario



# “Copenhagen-extended” scenario macro-economic costs

Average growth rate variation  
(stabilization wrt BAU)



High costs remain!

Necessity to introduce accompanying measures to reduce the *Copenhagen* mitigation costs ...!



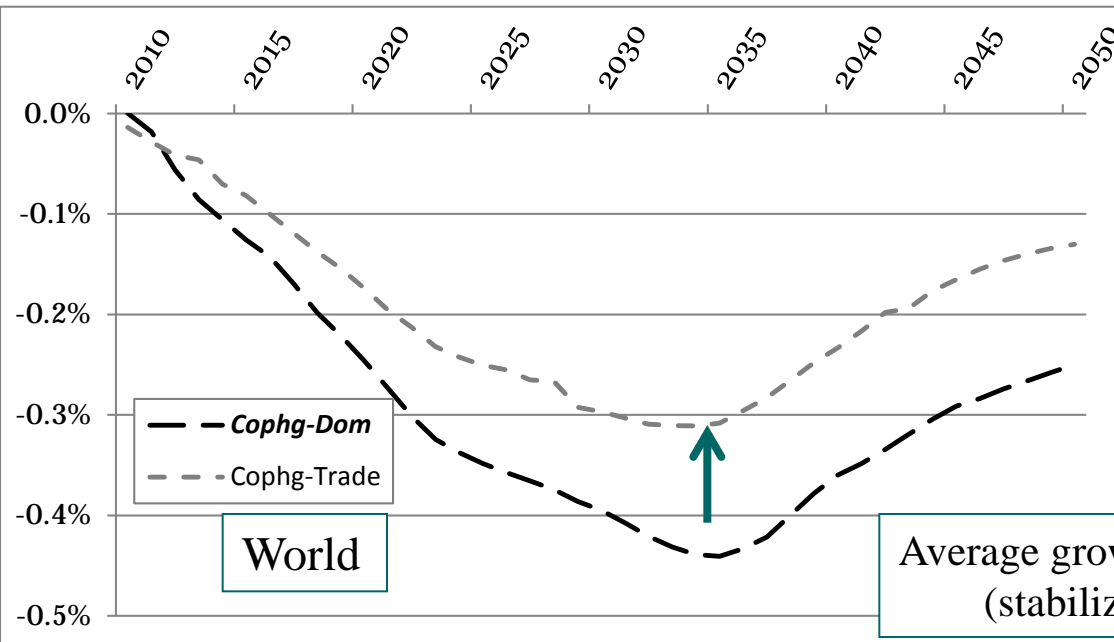
**Possibility of action:**

- Global level
- Local level

# *Copenhagen-extended &* **Global complementary measures**

## **Annex I & Developing countries:**

- **Combine their reduction efforts (uniform global CO2 price)**
- **Tradable permits scheme**



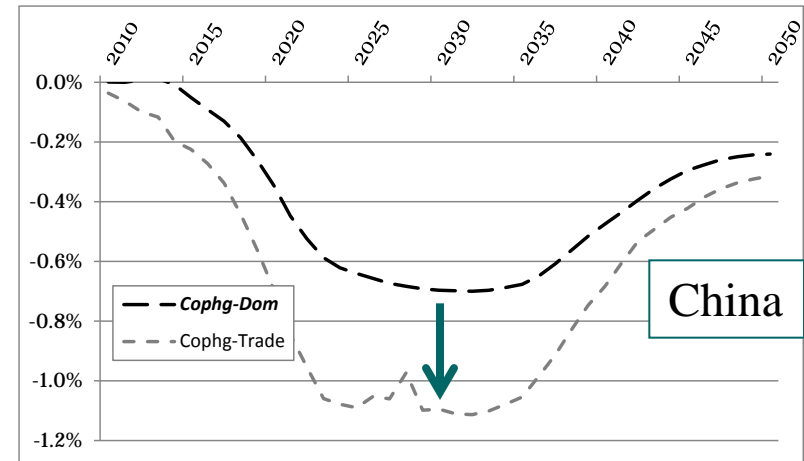
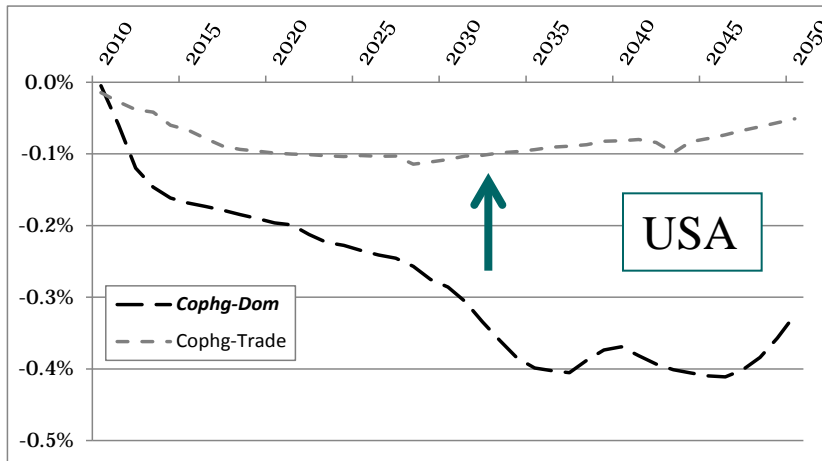
**Regional quota allocations**  
=  
**Copenhagen-extended emissions**

**Emission trading as a way to reduce Global mitigation costs ....**

**BUT...**

# Copenhagen-extended & Emissions trading

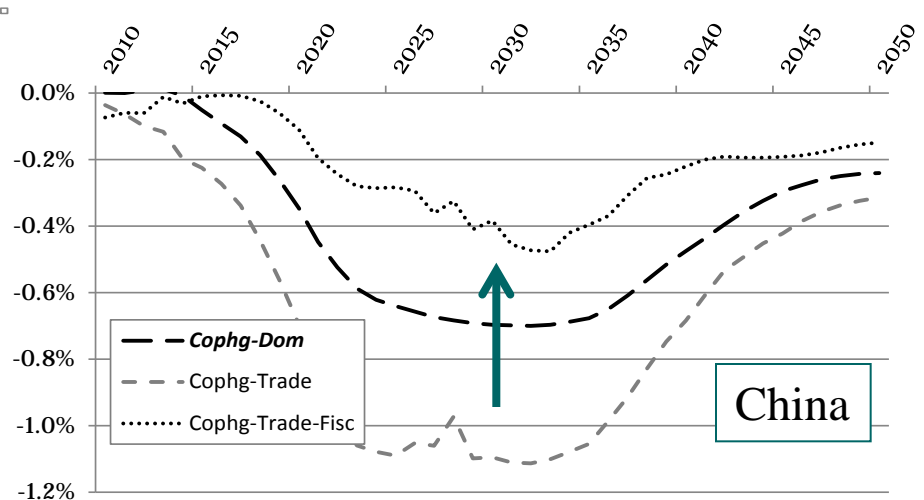
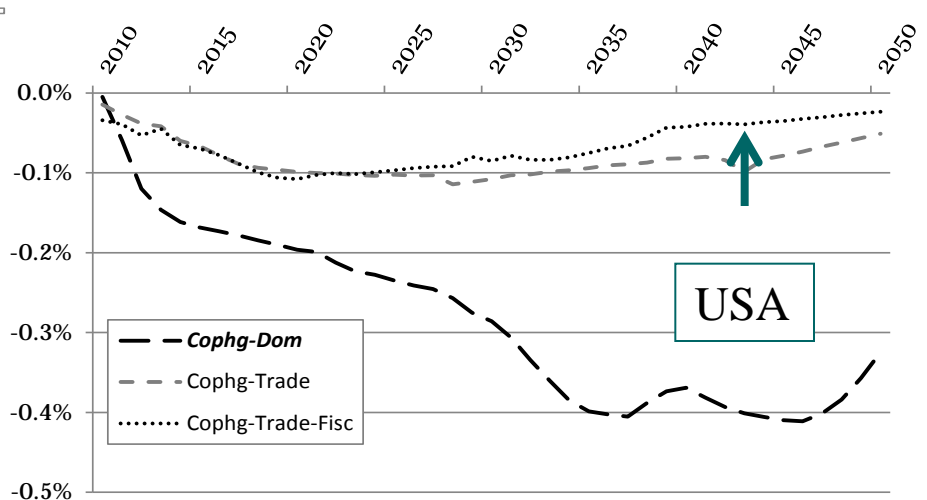
## Regional implications



- ✓ Combining Copenhagen mitigation efforts make it worse for developing countries.... even if they trade emissions permits !
- ✓ Solutions to improve their situation:
  - Change the quota allocation scheme (e.g. Contraction & Convergence)
  - **Implement local measures to reduce GDP losses**

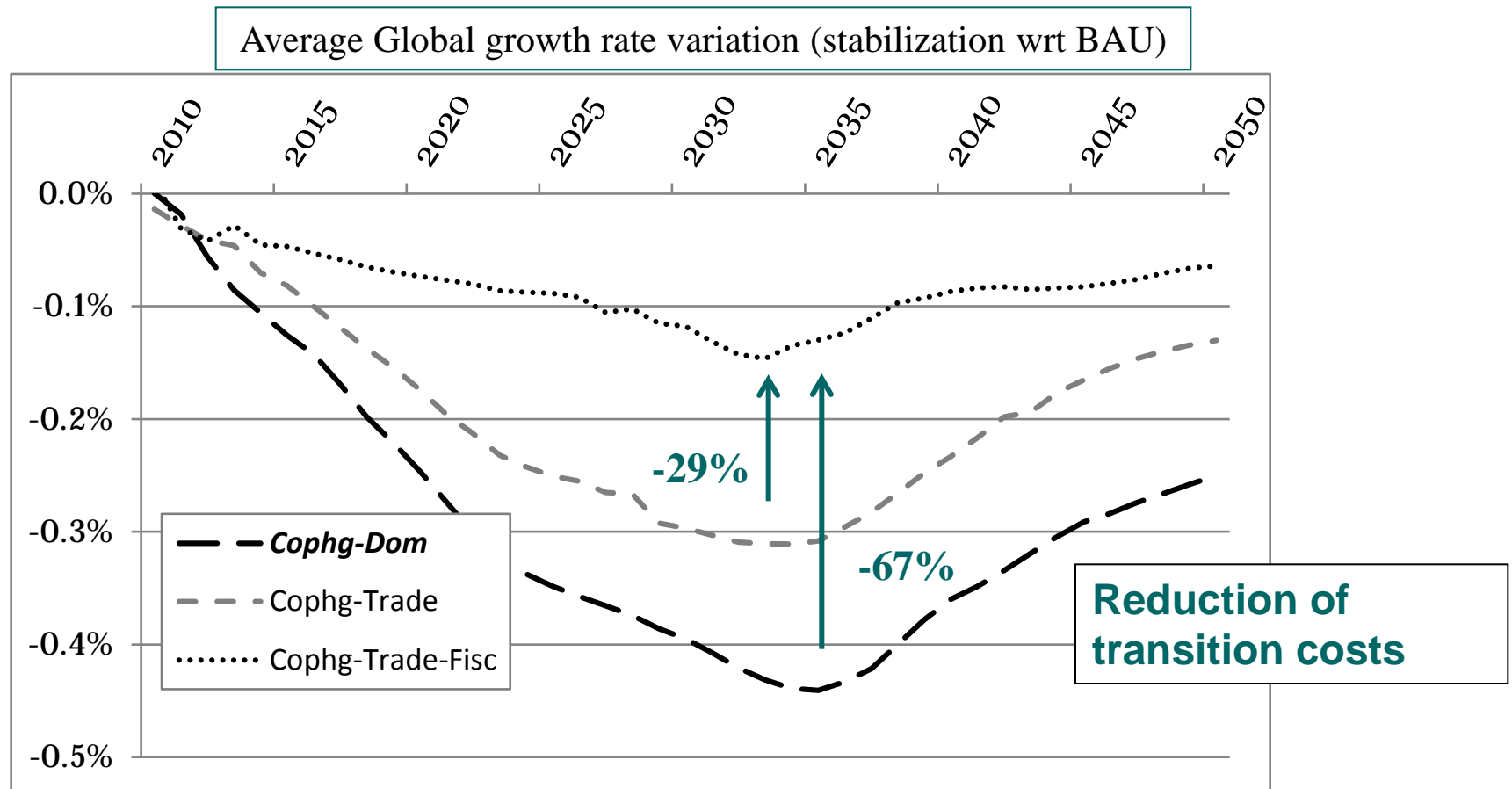
# Copenhagen-extended, emissions trading and fiscal reform

**Real lump-sum recycling of carbon tax revenues:  
Transfer to households + Reduction of production taxes**



- Emerging countries are energy intensive economies
- A carbon tax increases their production costs
- Reduction of production taxes partially offsets the impact of the carbon tax

# Copenhagen-extended, emissions trading and fiscal reform



Combining emissions trading and a well-adjusted fiscal reform significantly reduce global mitigation costs

# Conclusion and perspectives

- An Extended Copenhagen agreement:
  - Hurt countries in the short term
  - Combining efforts + Emissions trading partially limit the transition costs at the global level but have asymmetric implications at the regional level
  - The articulation of international and domestic policies such as adjusted fiscal reform is a way to smooth the transition
- This last option (*quotas + national policies*) is an acceptable framework for developing countries
  - Is aligned with country specific development priorities
  - Offers flexibility for domestic policies to support the transition
  - **A first step towards a more ambitious global climate agreement**

**Thank you ...!!!**

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