Transition towards a low carbon society …sad economic news ?

Jean-Charles HOURCADE

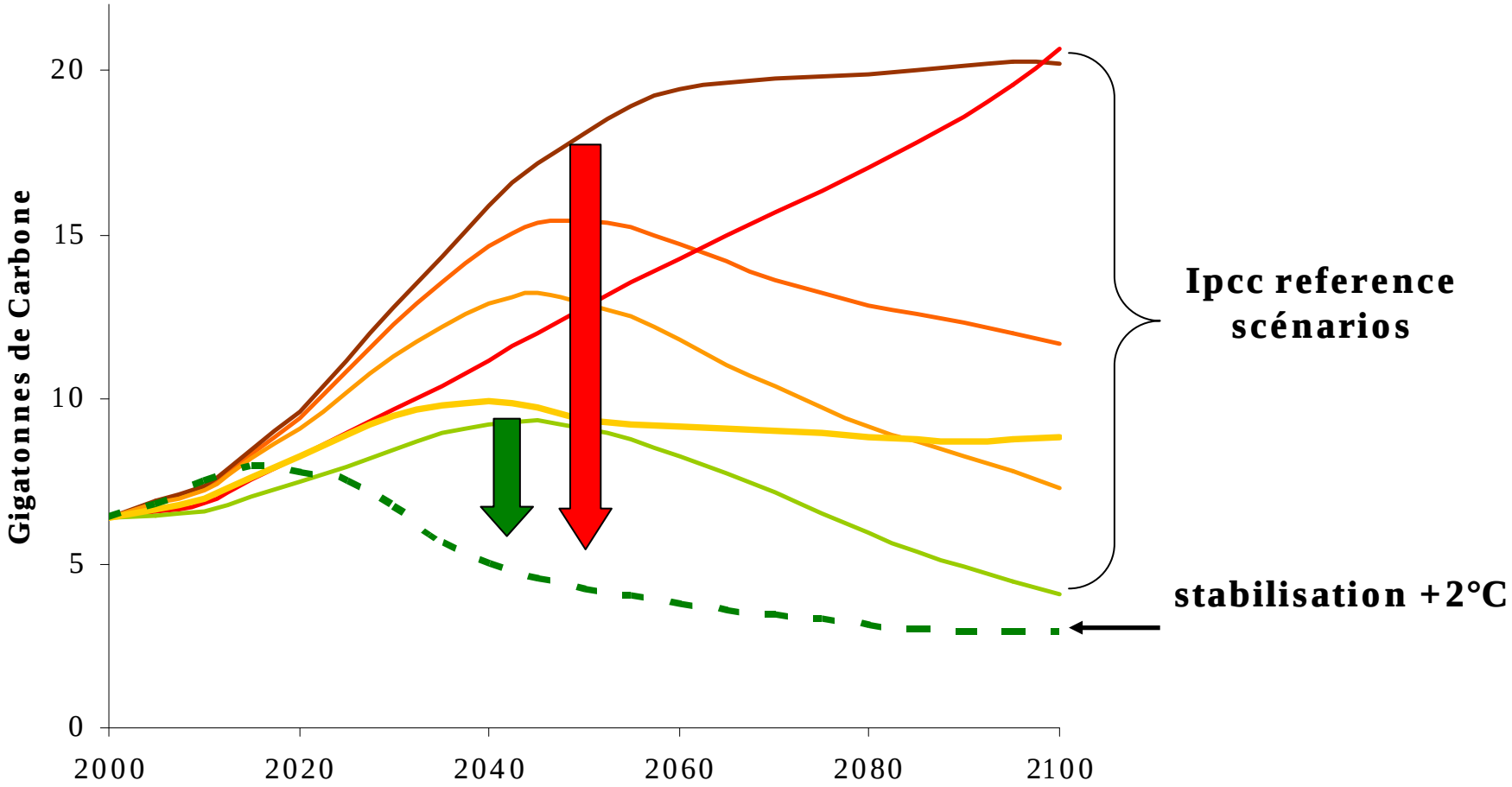
CIRED

(CNRS – EHESS – ENPC– AgroParisTech- CIRAD)

GIS Climat

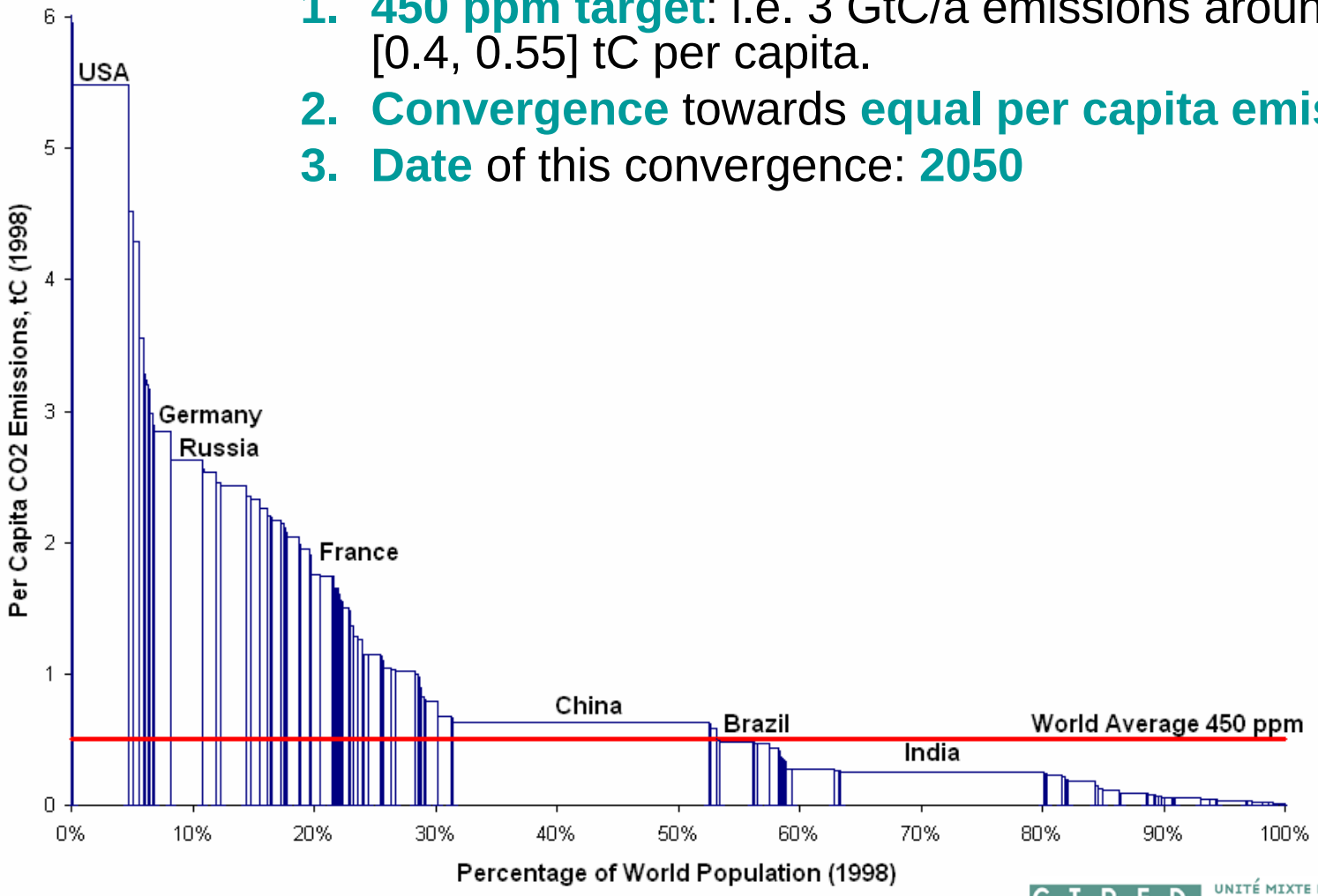
September, 25th, 2008

F4/2°C/450 ppm; from which reference scenario?



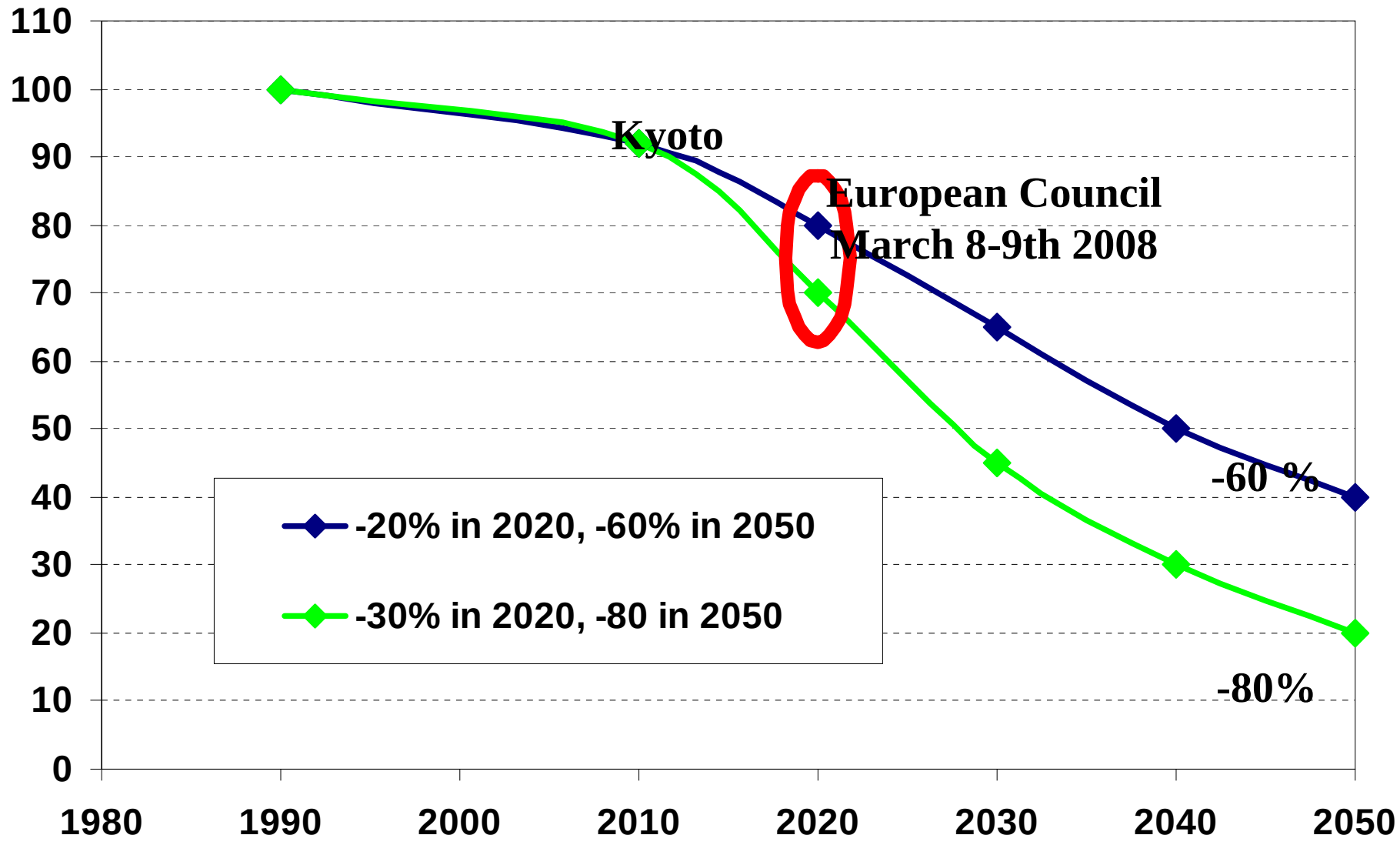
Behind the ‘Factor 4’ mantra

1. **450 ppm target**: i.e. 3 GtC/a emissions around 2050 i.e. [0.4, 0.55] tC per capita.
2. **Convergence** towards **equal per capita emissions**
3. **Date** of this convergence: **2050**



C.I.R.E.D. UNITÉ MIXTE DE RECHERCHE EHESS ET CNRS - UMR 8568

European targets: voluntarism or utopia?



Source : P. Criqui

Taxes/cap-and-trade, the same economic 'vulgate'

- Put a **price** on carbon to internalize its **social cost**
- **Equalize marginal costs** across countries and sectors to minimize costs of a given environmental target
- **Trigger investments** in low carbon technologies
- **No distortions** in **international industrial competition**

… a 'tabula rasa' utopia?

Taxes vs. Quotas: how they differ?

- **Taxes:**
  - No international transfers
  - Control of microeconomic costs
  - Social costs < Micro costs (control of fiscal interactions)
  - Uncertain environmental output

- **Tradable Quotas :**
  - International transfers (incentive for developing countries)
  - The unresolved issue of equitable initial allocation rules
  - Social costs < Micro costs only if quotas are auctioned
  - Cost uncertainty but (expected) certainty about emissions,

Stumbling blocks: the heterogeneity of the real world

Heterogeneity of **income levels** and decreasing marginal utility of income

Heterogeneous **households consumptions structures**: basic needs, meteorological conditions, urban forms, density

Heterogeneous impacts on **economic sectors** (e.g. air transport vs. steel production): cost structures, exposition, inertia

Heterogeneous **preexisting taxes and price structures**

Heterogeneity of **macroeconomic feedbacks** and **local co-dividends**

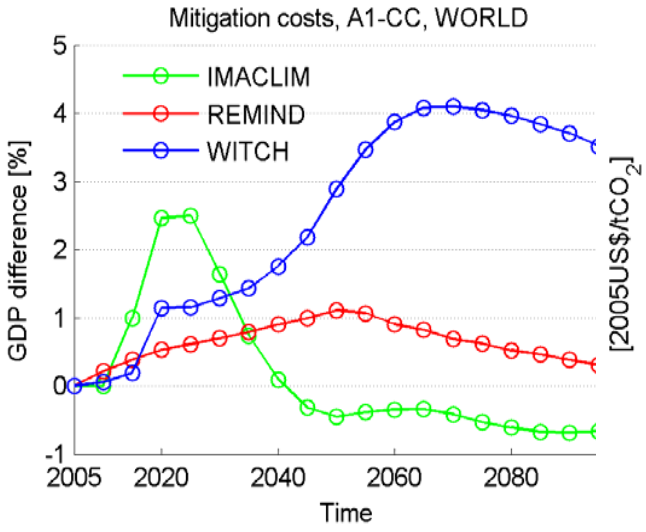
IPCC: challenging physics but good economic news?

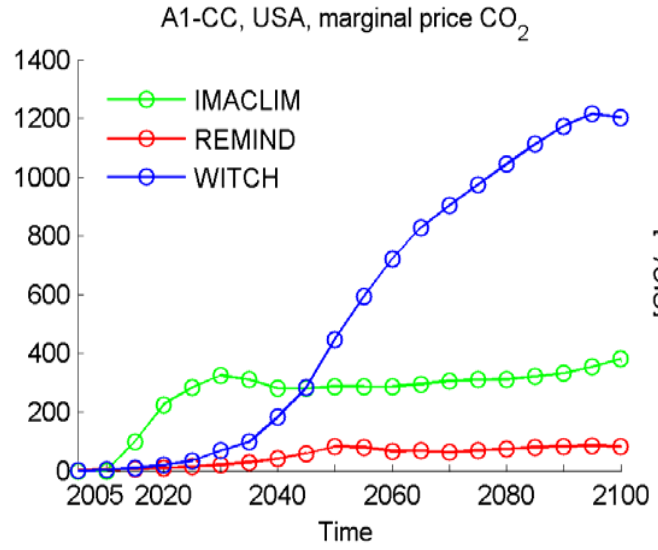
Category	Radiative forcing (W/m^2)	CO_2 concentration[c] (ppm)	CO_2-eq concentration[c] (ppm)	Global mean temperature increase above pre-industrial at equilibrium, using "best estimate" climate sensitivity[b], [c] (°C)	Peaking year for CO_2 emissions[d]	Change in global CO_2 emissions in 2050 (% of 2000 emissions)[d]	No. of assessed scenarios
I	2.5-3.0	350-400	445-490	2.0-2.4	2000-2015	-85 to -50	6
II	3.0-3.5	400-440	490-535	2.4-2.8	2000-2020	-60 to -30	18
III	3.5-4.0	440-485	535-590	2.8-3.2	2010-2030	-30 to +5	21
IV	4.0-5.0	485-570	590-710	3.2-4.0	2020-2060	+10 to +60	118
V	5.0-6.0	570-660	710-855	4.0-4.9	2050-2080	+25 to +85	9
VI	6.0-7.5	660-790	855-1130	4.9-6.1	2060-2090	+90 to +140	5
						Total	177

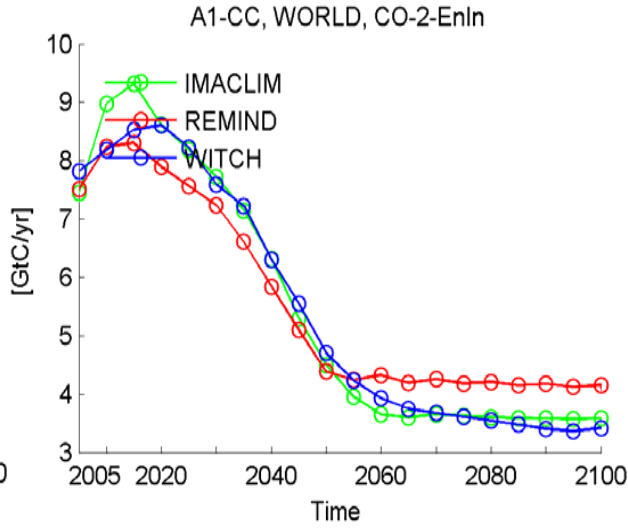
Stabilization levels (ppm CO_2-eq)	Median GDP reduction[d] (%)	Range of GDP reduction[d], [e] (%)	Reduction of average annual GDP growth rates[d], [f] (percentage points)
590-710	0.2	-0.6-1.2	<0.06
535-590	0.6	0.2-2.5	<0.1
445-535[g]	not available	<3	<0.12

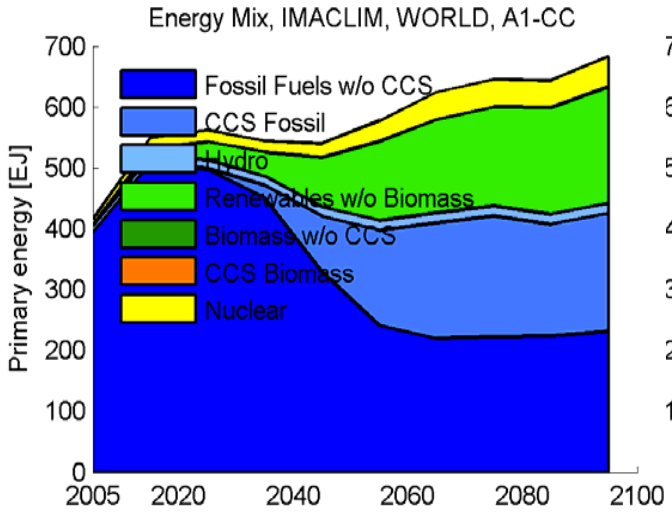
Stabilization levels (ppm CO_2-eq)	Median GDP reduction[b] (%)	Range of GDP reduction[b], [c] (%)	Reduction of average annual GDP growth rates[b], [d] (percentage points)
590-710	0.5	-1 - 2	<0.05
535-590	1.3	slightly negative - 4	<0.1
445-535[e]	not available	<5.5	<0.12

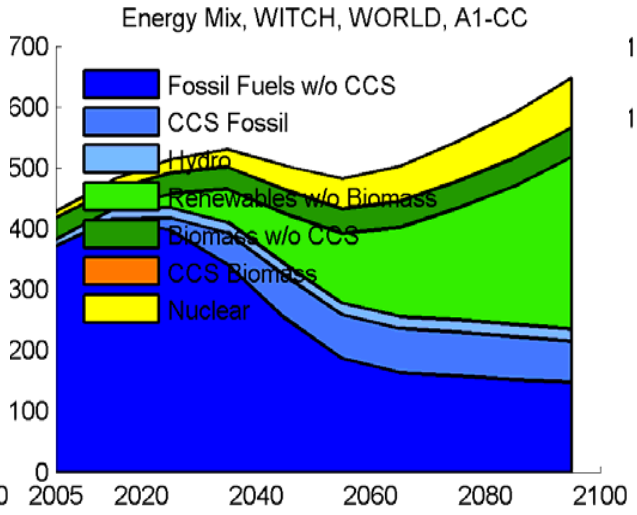
A1 – contraction and convergence

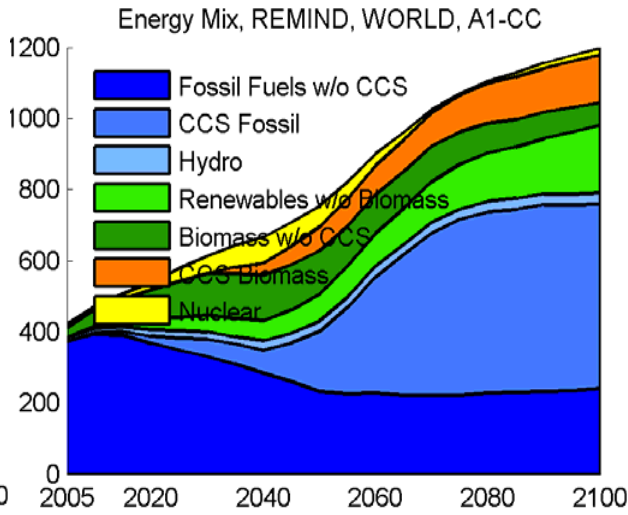












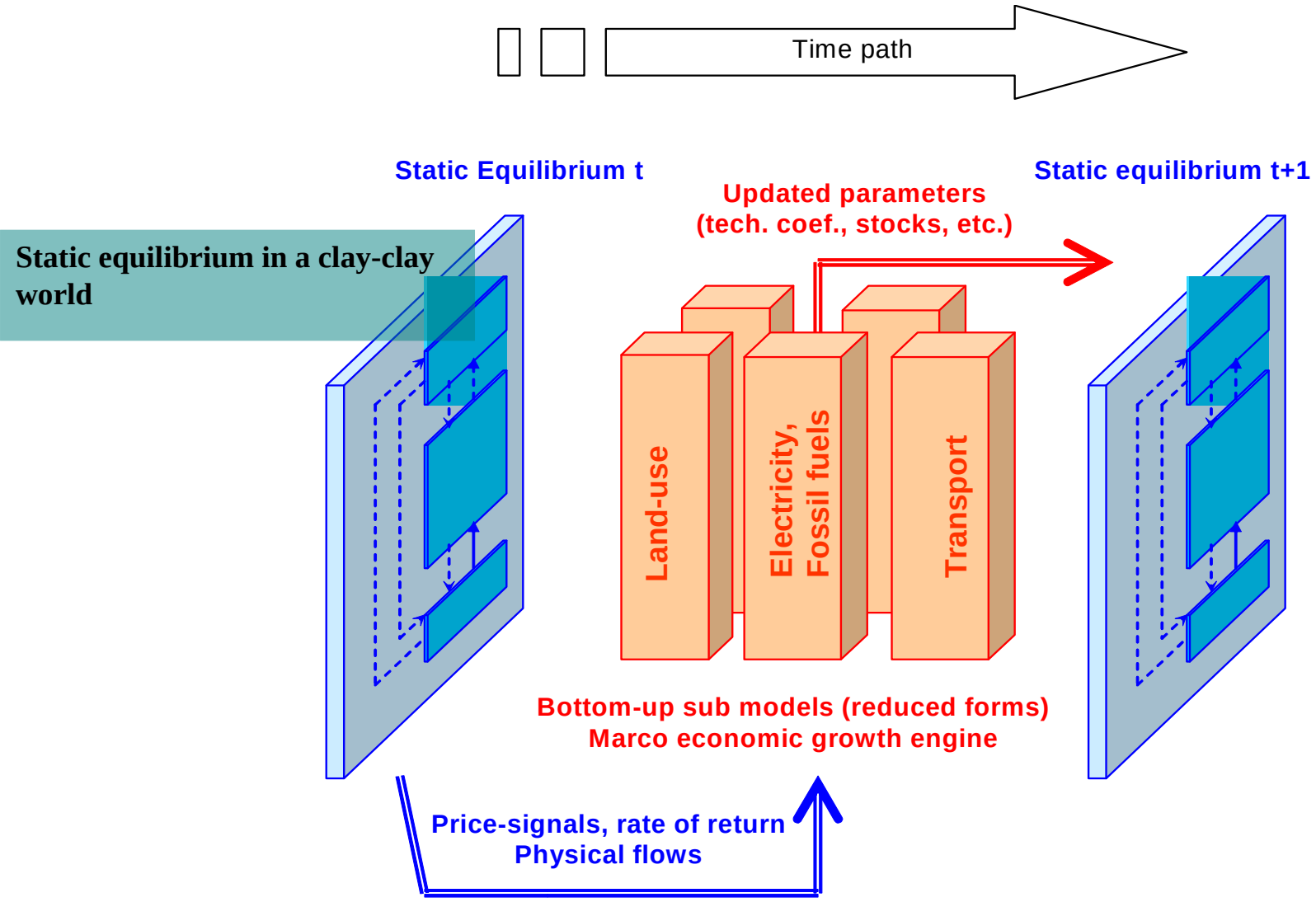
Our pessimism lies in our modelling principles

- An **hybrid modelling** in physical and money flows so as to
  - secure the dialogue with sector - based expertise (drivers of the dematerialisation of the economy, sources of technical **inertia,** technical asymptotes in efficiency gains
  - overcome the PPP vs MER difficulty for measuring income (back to Debreu's dual representation)

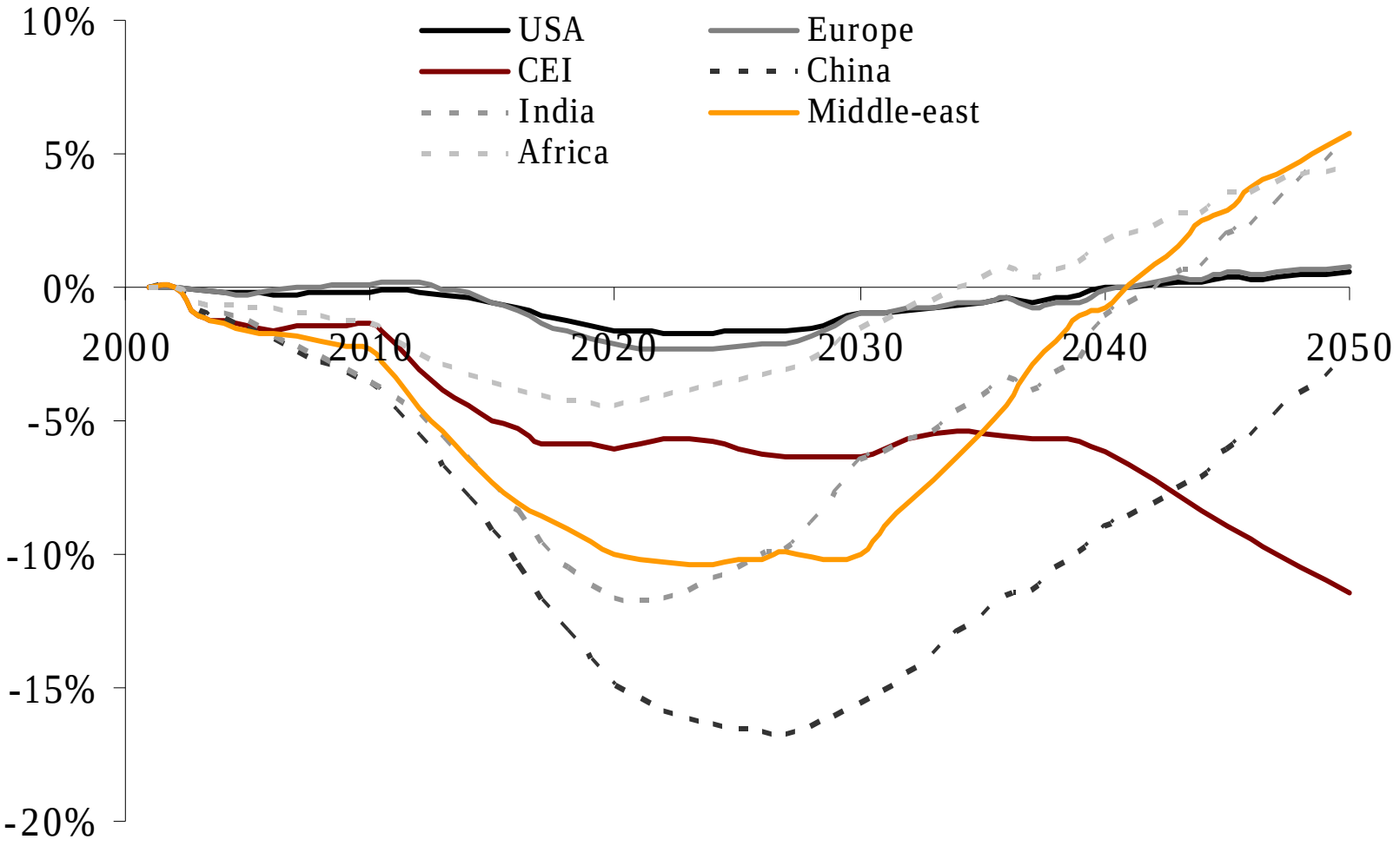
- A **growth engine with disequilibrium …**
  - **imperfect foresight** and routine behaviours
  - energy (and other) price cycles
  - **structural imbalances (endebtedness, unemployment and informal economy) and endogenous shocks**

- In which structural changes and the pace and direction of TC are **endogenized** linkages so that the impact of various development patterns can be discussed

A recursive and modular architecture: static equilibria + dynamic relations informed by sector based expertise

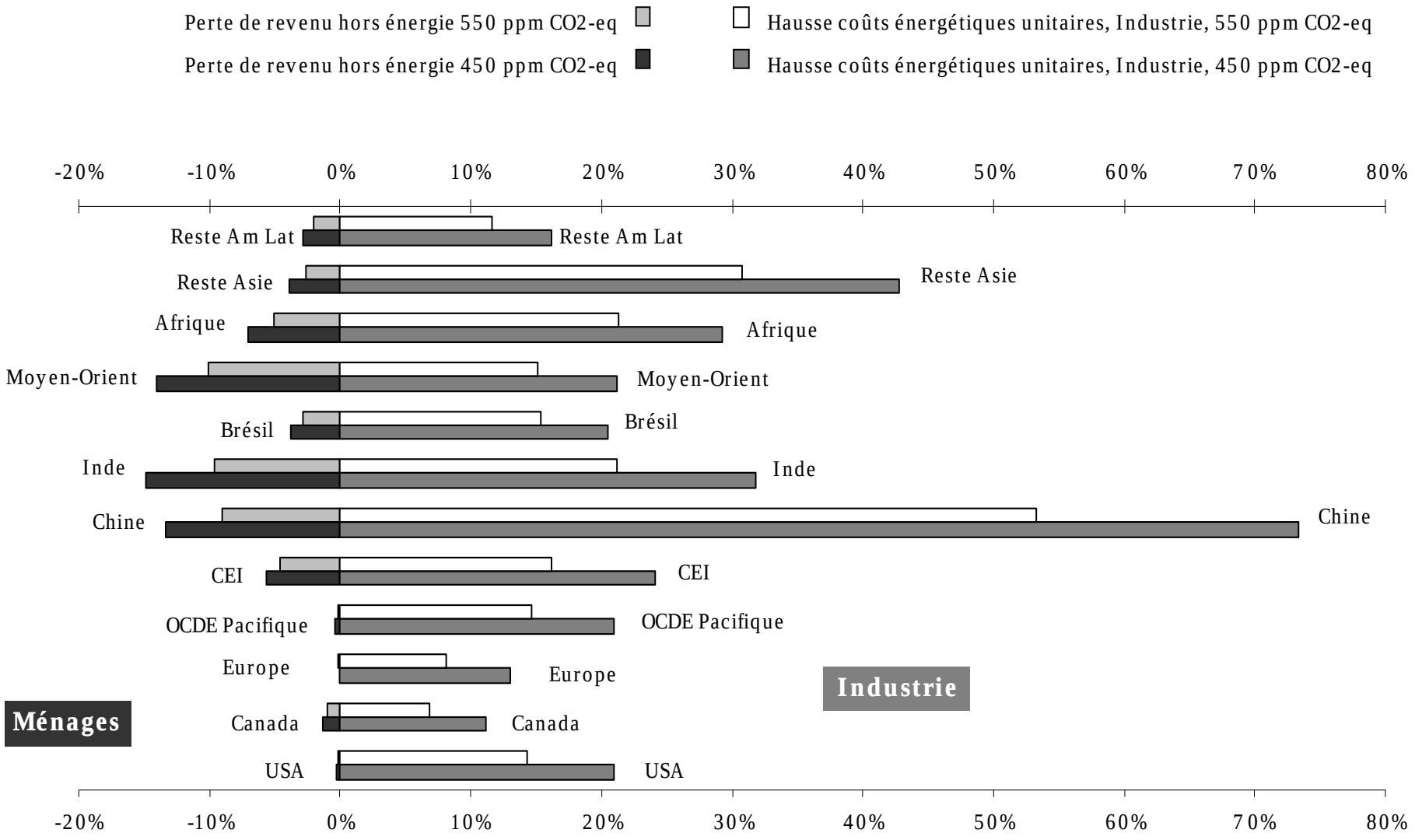


Reassuring end points: mind the transition!



Scenario 550 ppm CO2-eq, Imaclim-R model
Crassous (2008)

Why such transition costs in emerging economies?



C.I.R.E.D. UNITÉ MIXTE DE RECHERCHE EHESS ET CNRS - UMR 8568

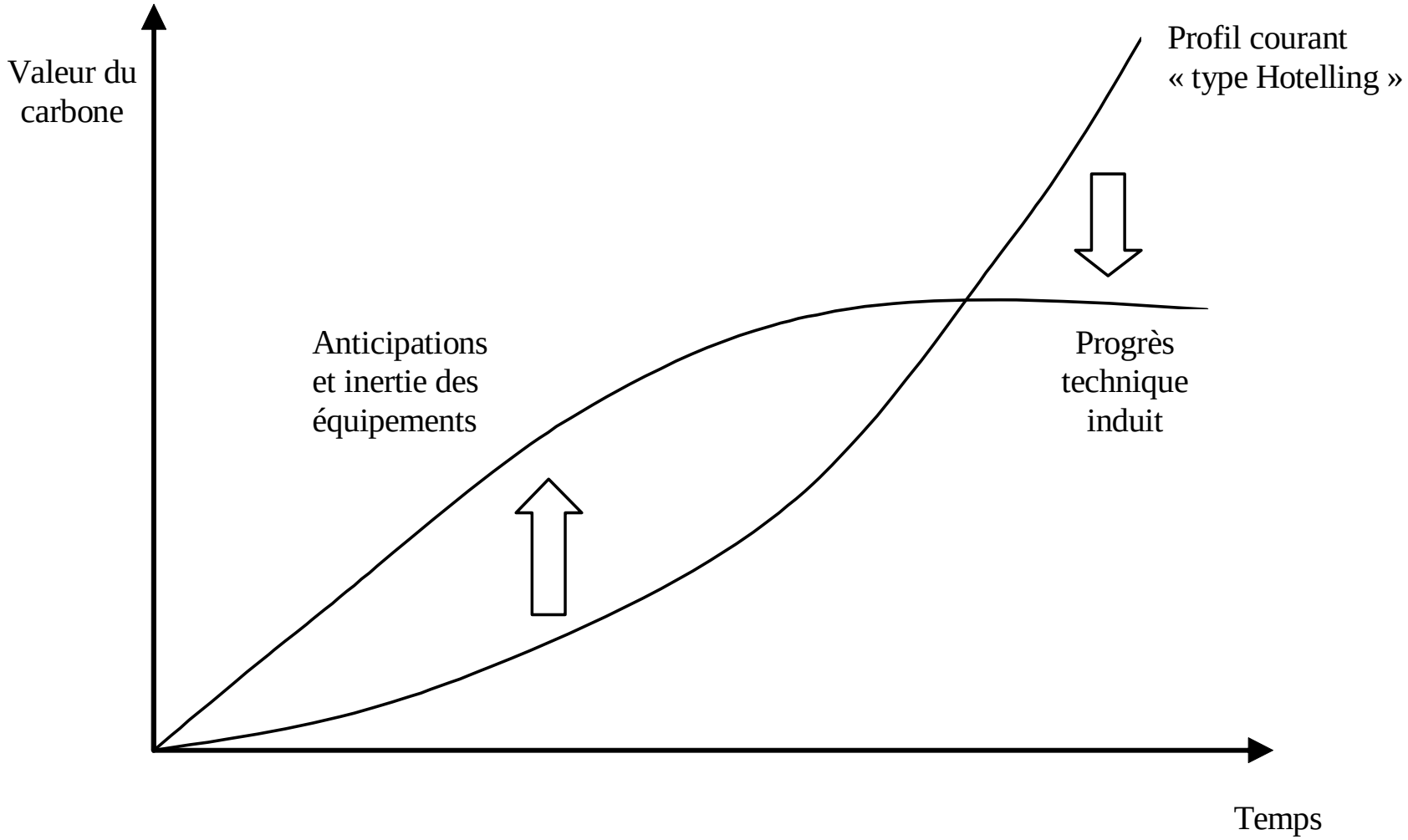
Compensatory transfers for a « fair » burden sharing

- **Unrealistic amounts** (direct or through quotas allocation) for a *per capita* allocation and a 450 ppm CO_2-eq

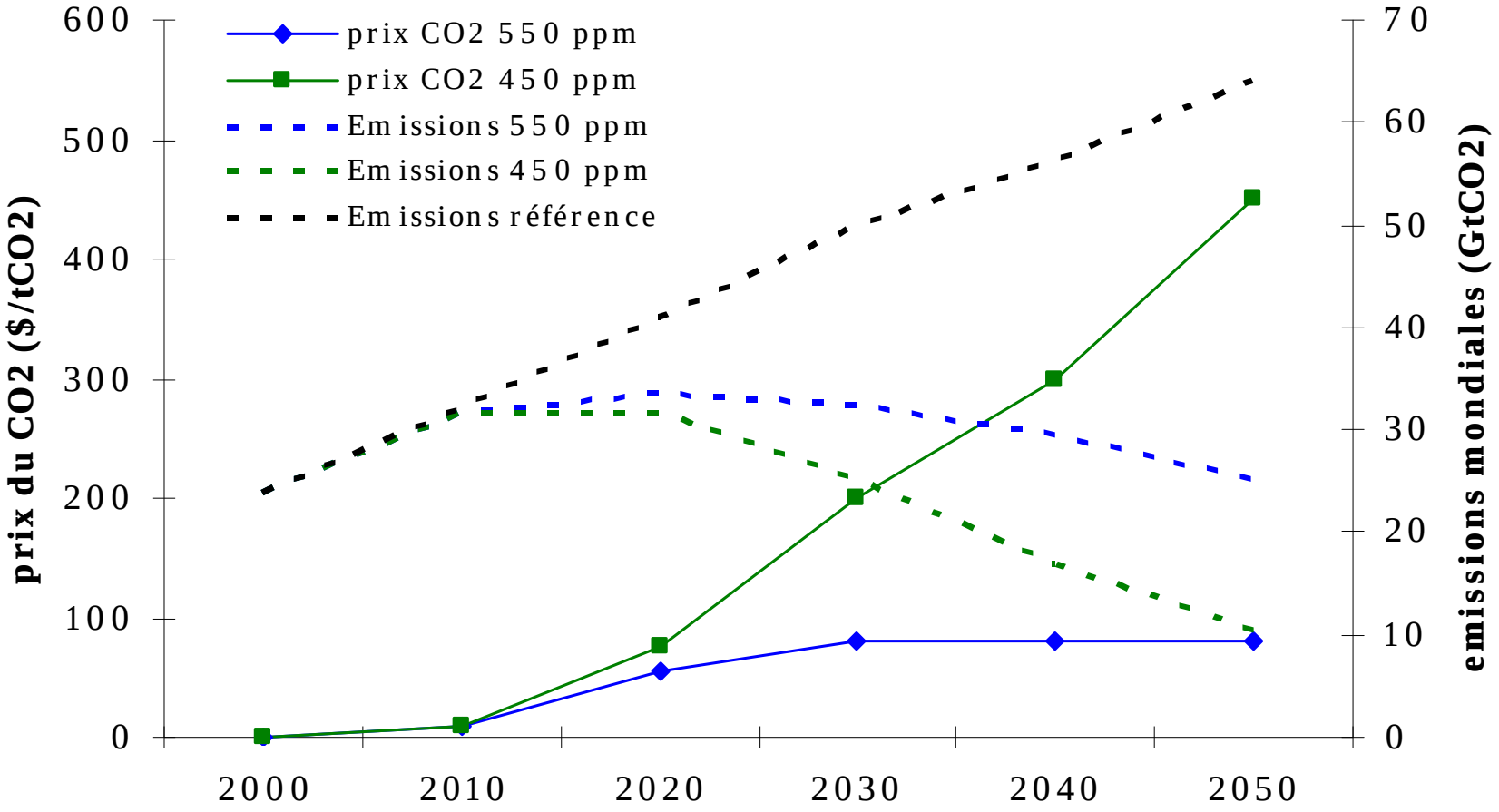
Afrique	+8% of GDP
Inde	+6% of GDP
CEI	-4% of GDP (better-off thanks to gas exports)
Europe	-1.2% of GDP
USA	-1.7% of GDP

- **Political untimeliness**

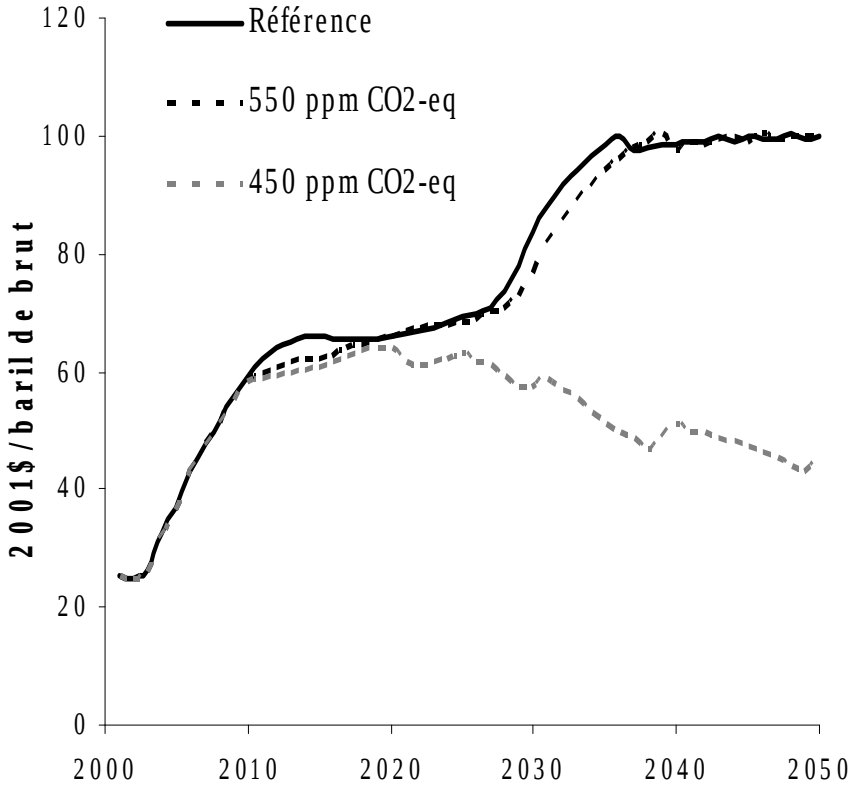
Carbon price profile: an underestimated difficulty

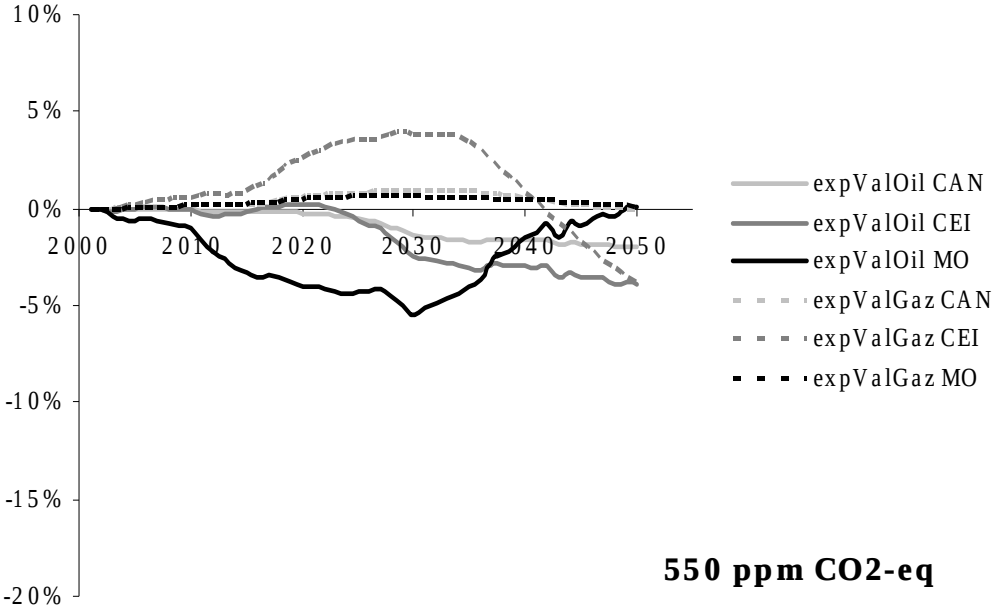


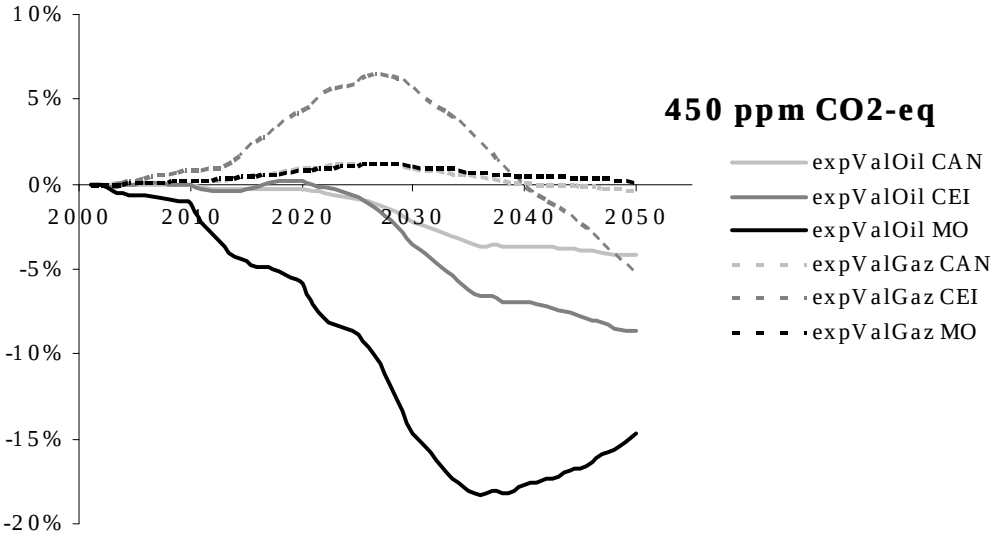
Carbon tax profiles to achieve stabilization



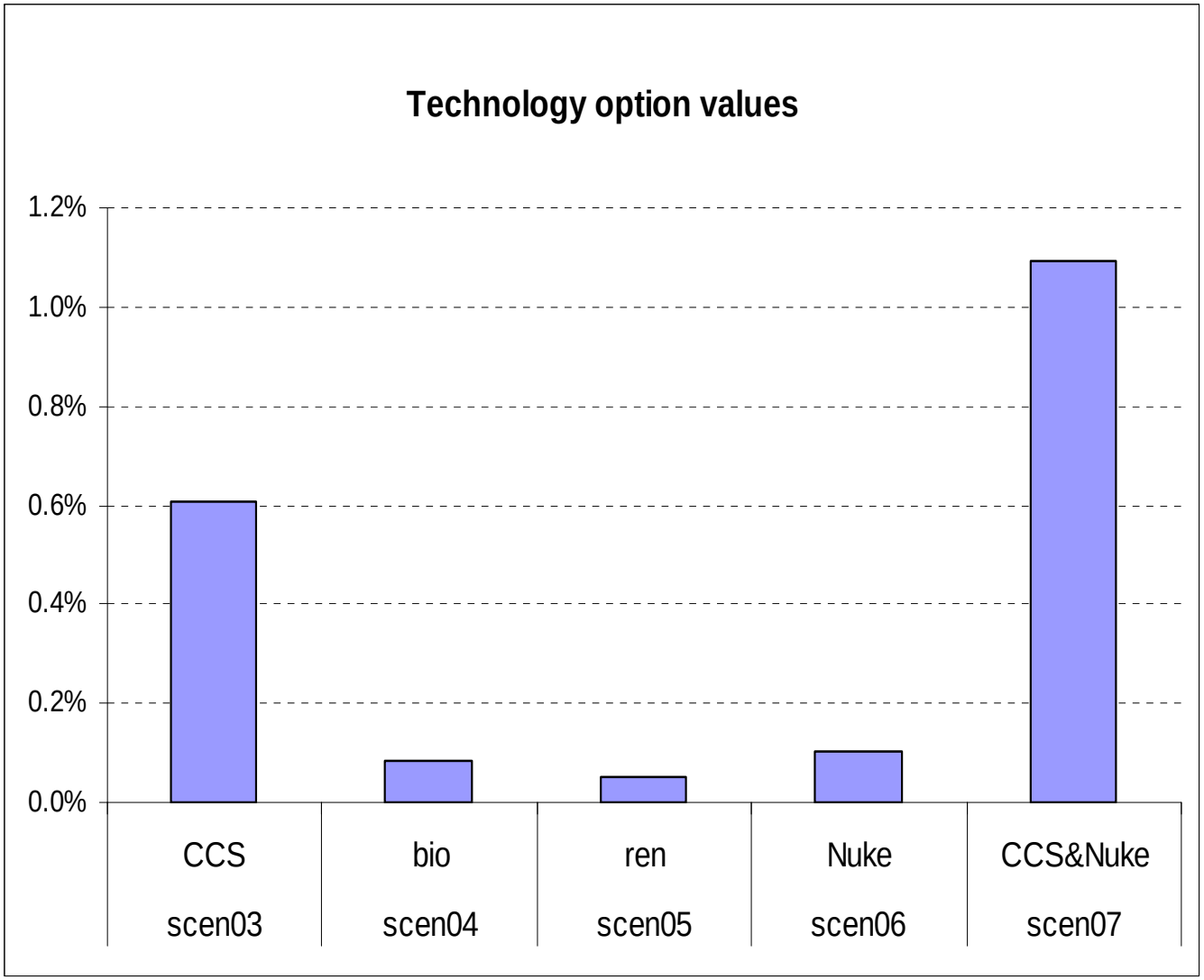
Climate policies and oil prices: depend upon the reactions of OPEC and Russia







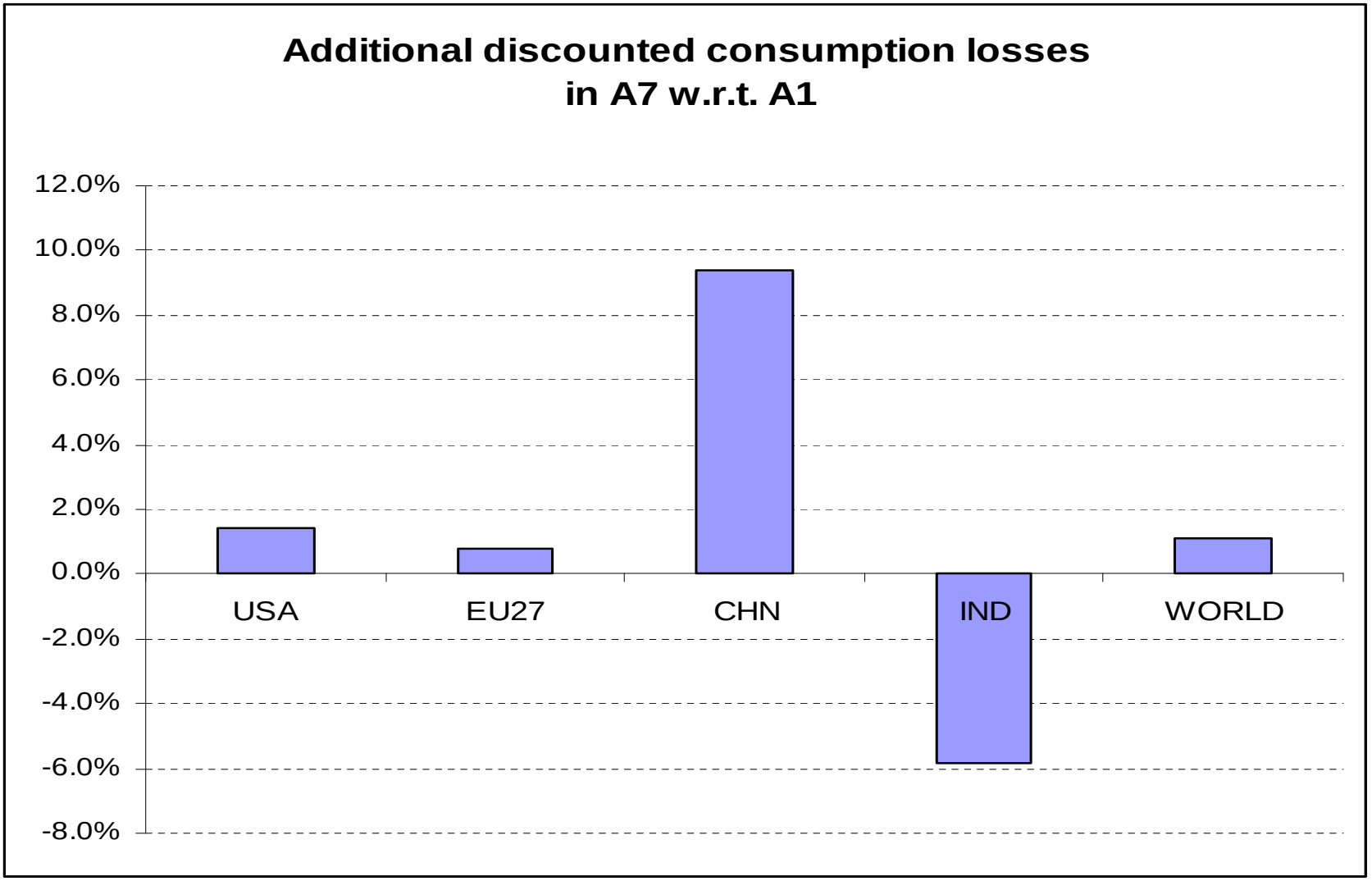
Cost of vetoing some technology options



Caveat:

- Low coal prices→ magnified role for CCS
- Supra additivity of costs

Who pays the price of the vetos (CS+Nuke?)



Lessons: timing of constraints and opportunities

- Climate policies may be **beneficial over the long run**

- But uniform carbon prices (only) will hurt emerging economies over the short run … when the prices remains relatively low!!!

- Important **risks of lock-in** in carbon intensive development pathways

- **Non negotiable « equity »** of the burden sharing and compensations

- The **'Marshall Plan' metaphor** revisited to reorient **infrastructure investments**

- What « optimal » time profile of **Opec's rents**

C.I.R.E.D. UNITÉ MIXTE DE RECHERCHE EHESS ET CNRS - UMR 8568

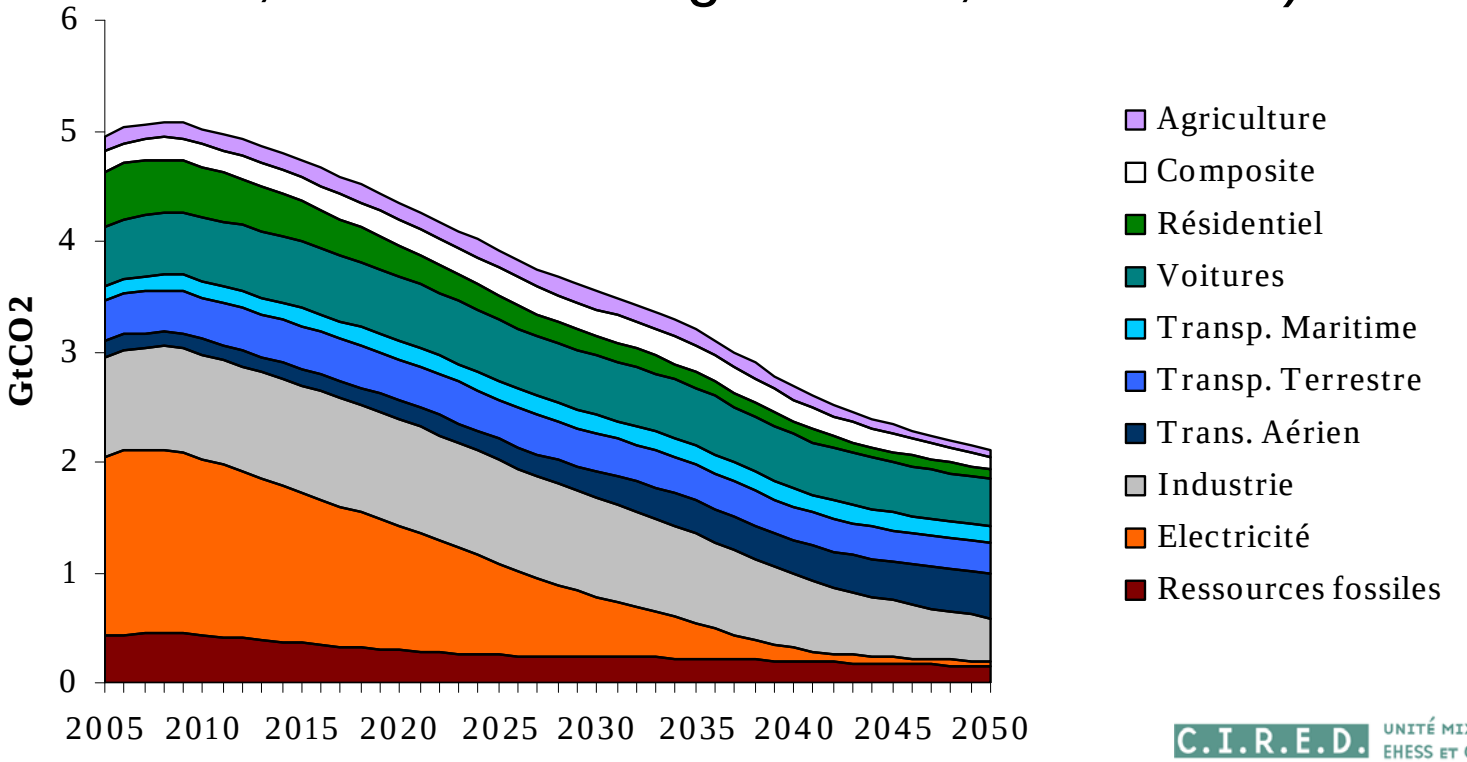
Back to post-Kyoto

How to minimize regulatory uncertainty

C.I.R.E.D. UNITÉ MIXTE DE RECHERCHE EHESS ET CNRS - UMR 8568

Europe in a 450 ppm scenario

- Complete decarbonization of power supply
- Large reductions: Residential -80%, Industry -55%, Agriculture -50%, Composite -45%
- Robust emission trends in transportations (Cars -20%, Air +134%, Terrestrial freight –25%, Total +5%)



The main challenge: the regulatory uncertainty

- A negotiation between two boundaries:
  - « cap and trade » for lack of anything better and an international « prix directeur du carbone»
  - necessary fragmentation of the regime: diverse prices and policy signals

- Risk of self – defeating political announcements and arbitrary decisions

- One first way out: a credible offer to emerging economies as a condition to a sound EU-US-J dialogue and a viable Oecd involvment

- One second way out: from an « impératif catégorique » approach to a mobilizing discourse on opportunities for a sustainable development

- One question: practical and intellectual involvement of industry beyond energy firms and material transformation industry …. product innovation