Uses and misuses of long term modelling *in framing debates on climate policies*

Bali

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In illo tempore …….et nunc ‘nihil novi sub sole’?

- 1979 1st world conference on Climate Change
- 1985-1986 first experiments with 3D GCM
- **1988: the G7 decides ….**
- 1992: Rio de Janeiro UNFCCC
- **1995: Berlin Mandate**
- 1997: Kyoto Protocol
- **2000: COP6 Den Hagen semi-failure**
- 2001: COP7 Marrakech accord/US out
- 2004: Kyoto into force
- **2005: G8 declaration: a new area?**
- 2008: Bali … was it all for nothing?
- **2009: Copenhagen,** failure or end of an hypnosis?

A diplomatic momentum accompanied by the 'arts and crafts' of long term modelling

From 1990 to 2006 about 1500 studies and 5600 world long term scenarios to respond the following questions:

- **When to abate GHGs emissions? ….. at what degree?**
- **Where to abate and who will pay the burden?**
- **How to act?**
  - **What content of technical choices and policies?**
  - **What incentives and coordination tools?**

The parameters of the *when, where, who, how* flexibility issues … and the task of modelling exercises

- decoupling between E/GDP: **exponential versus logistic trends in the demand for energy services (ES)**
- No regret potentials **in the conversion EF -> EU –> ES**
- **The race between innovation on low carbon energy supply and the dynamics of energy demand**
- **What role for price and non prices policies in driving the pace and direction of innovation**
- Costs Concepts : **investment costs? GDP losses (or gains)? Welfare Losses (or gains)? Present values?**
- **Value or surrogate value of climate change damages**

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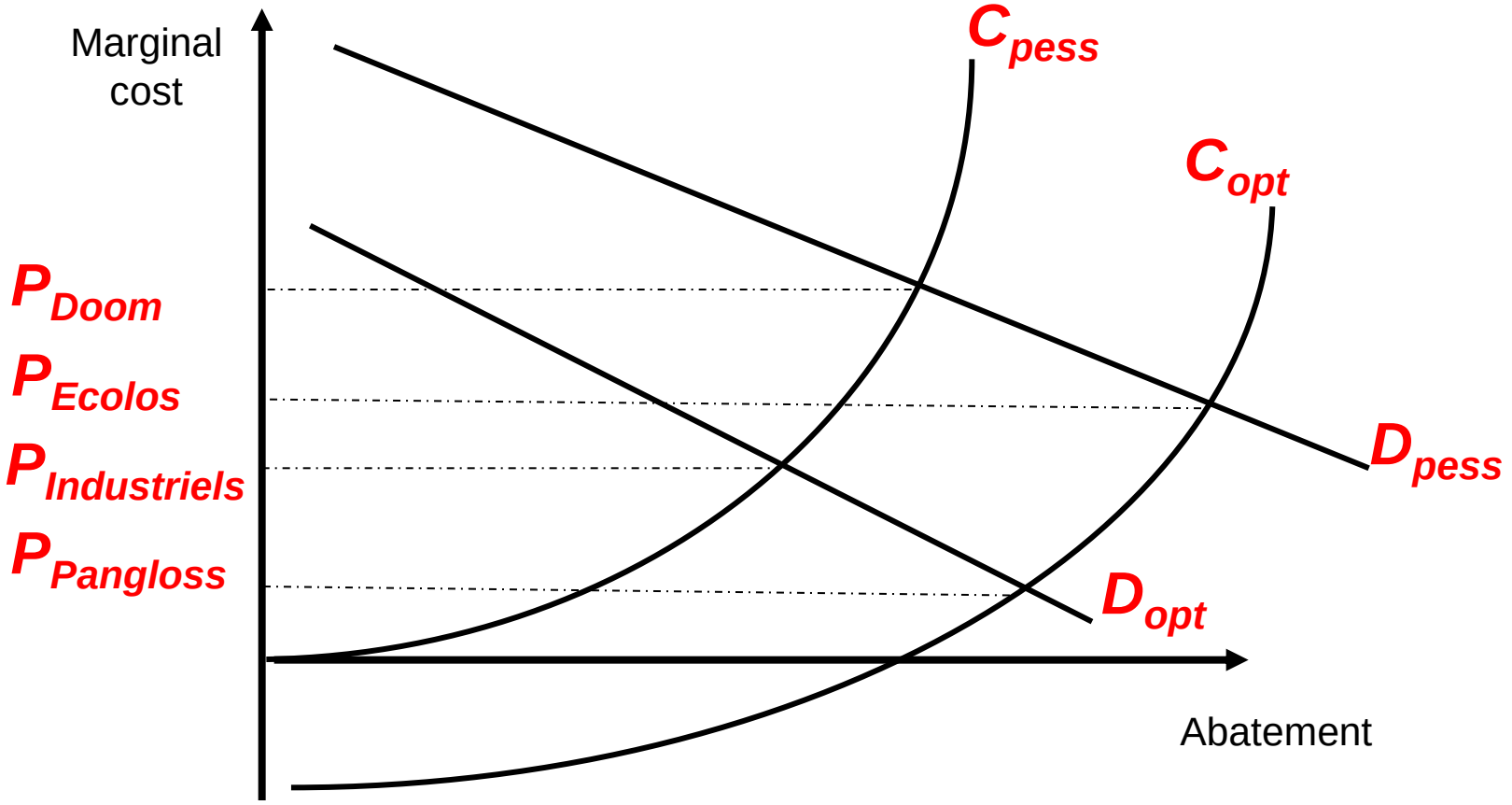
When flexibility …. about the 2°K objective and other matters

« we shall, recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius……" Copenhagen accord

Why, before 95, many analysts supported price coordination



2K: 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

Cheap 2K? Yes … in a 'first best' world

« **The most ambitious pathways [350-450 ppm CO2] are possible** » with a macroeconomic impact comprised between +0.5 and -3% of the GDP in 2030 with technologies currently known and a uniform carbon price between 5 and 80 $/tCO2 in 203O

… *with a serious and **'never read' caveat :***

'Most models use a global **least cost approach** to mitigation portfolios and with universal emissions trading, assuming **transparent markets, no transaction cost,** and thus **perfect implementation** of mitigation measures throughout the 21st century.' (AR4 WGIII SPM Box 3)

Without forgetting:

A **widespread benevolence** to compensate the loosers during the transition period

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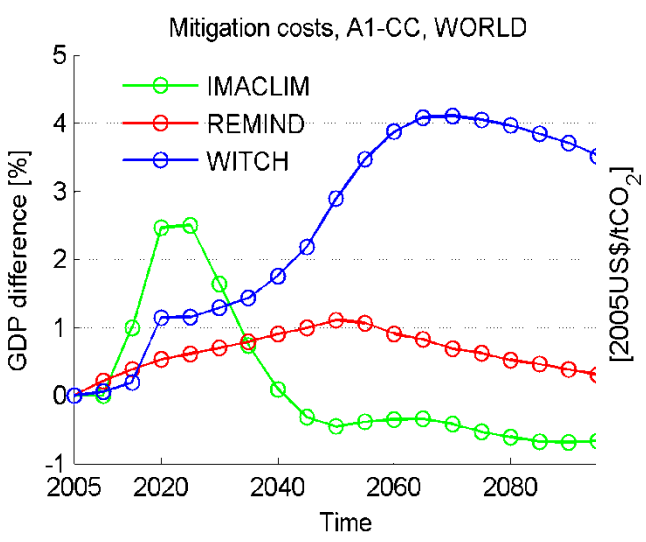
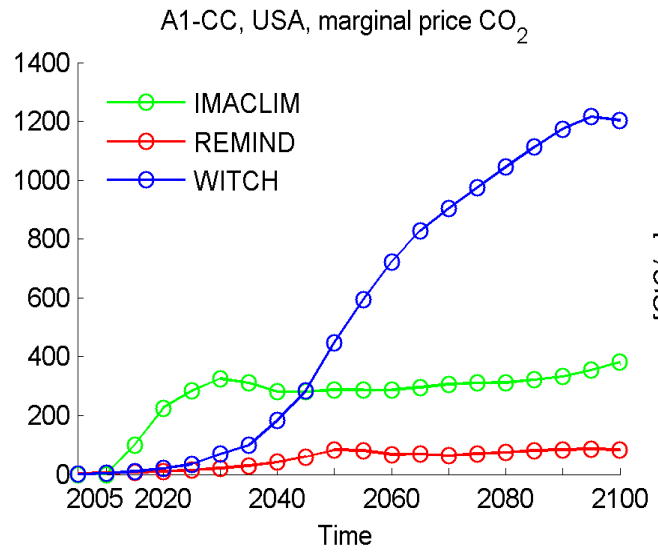
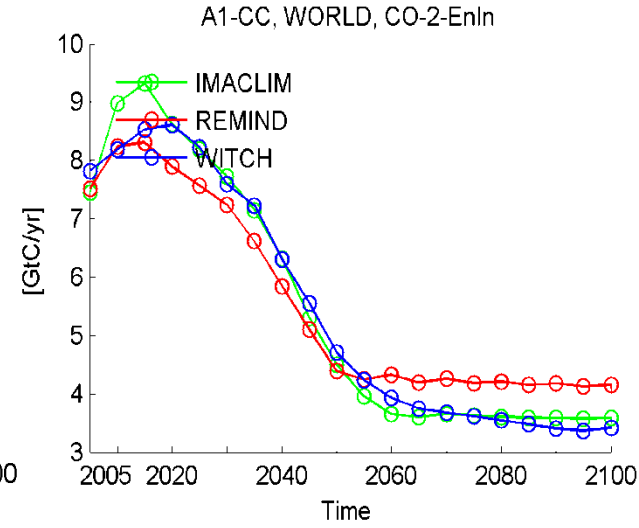
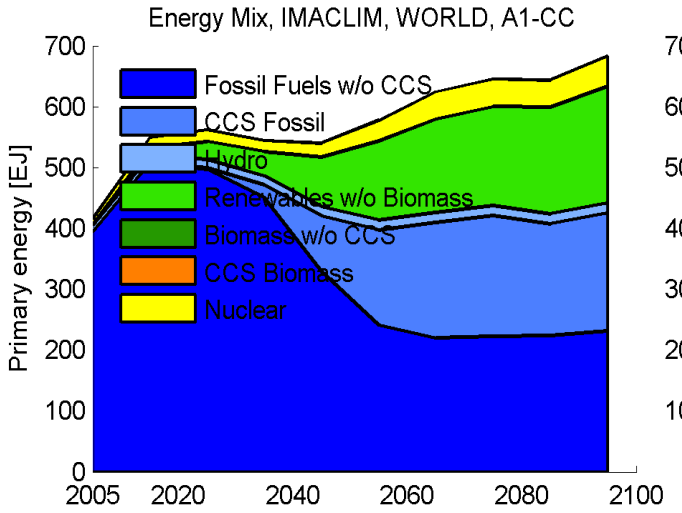
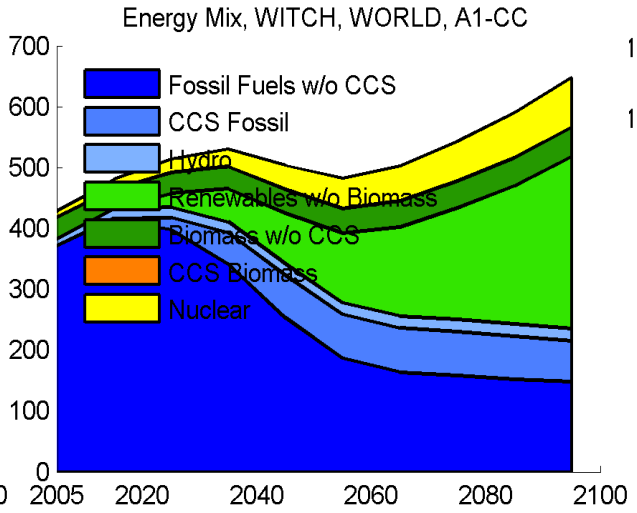
What non perfect expectations change ? Mind the transition

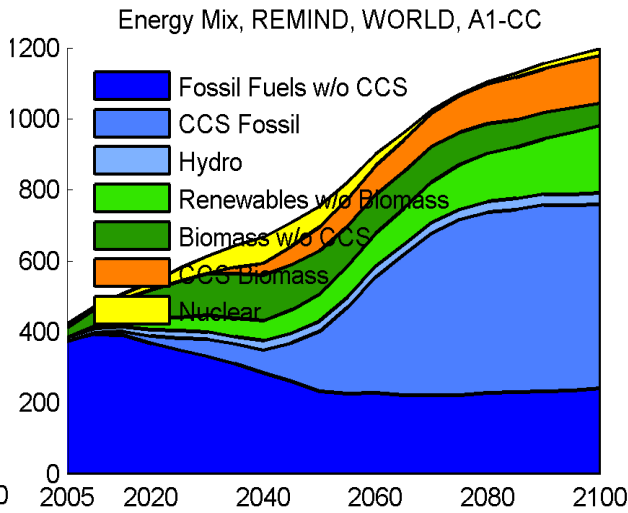






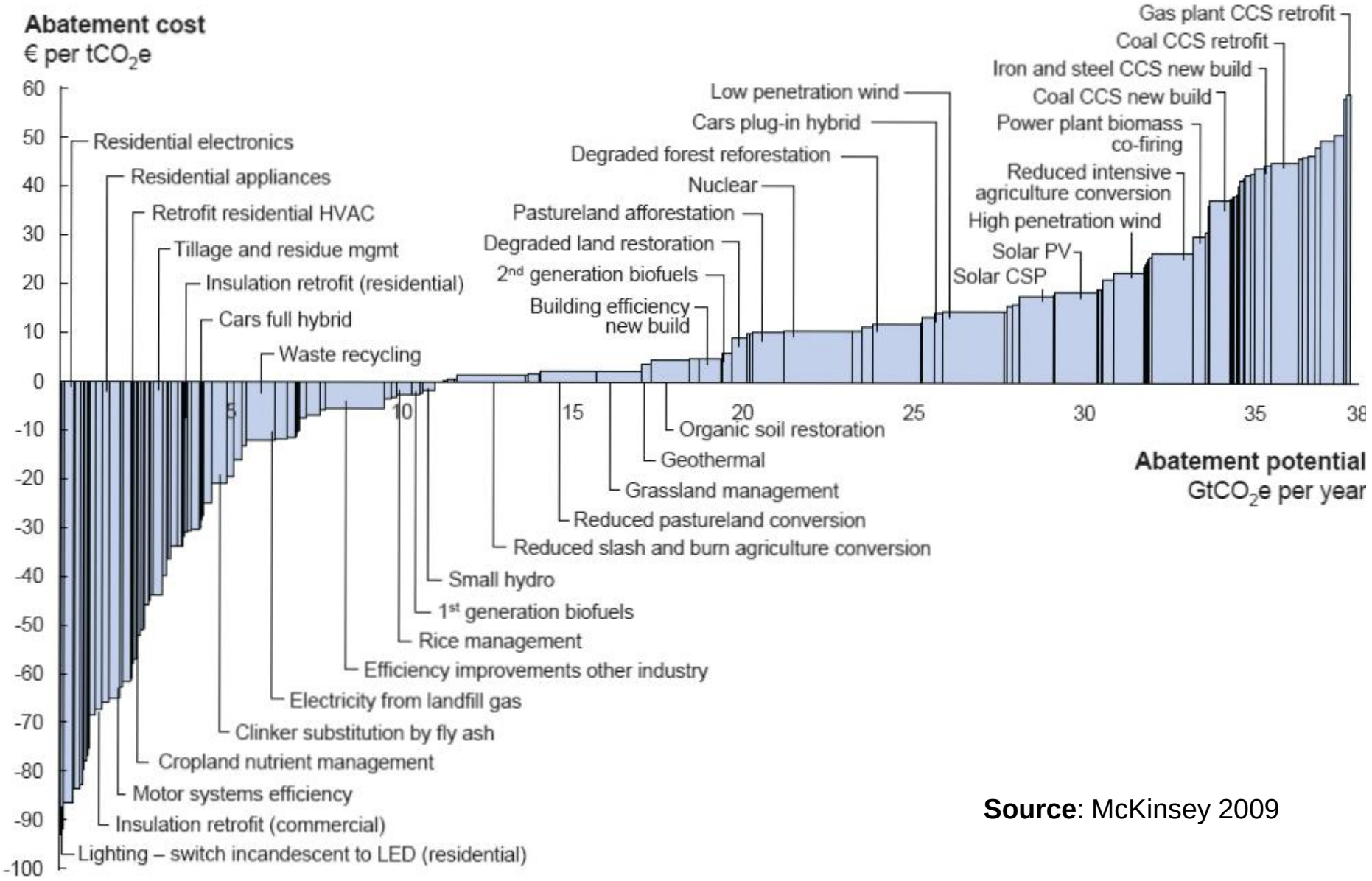






The « second best » … margins of freedom for ‘cheap action’?

Global GHG abatement cost curve beyond business-as-usual – 2030



Source: McKinsey 2009

Forgotten lessons from modeling exercises?

- **Do we need massive ‘no-regret’ potentials, the fear of a catastrophe (Waisman), an almost null preference for the present (Stern) to act?**

- **Targets and timetables as a ‘trade-off’ under uncertainty**

- **The meaning of the 2°K : overshoot or not overshoot?**

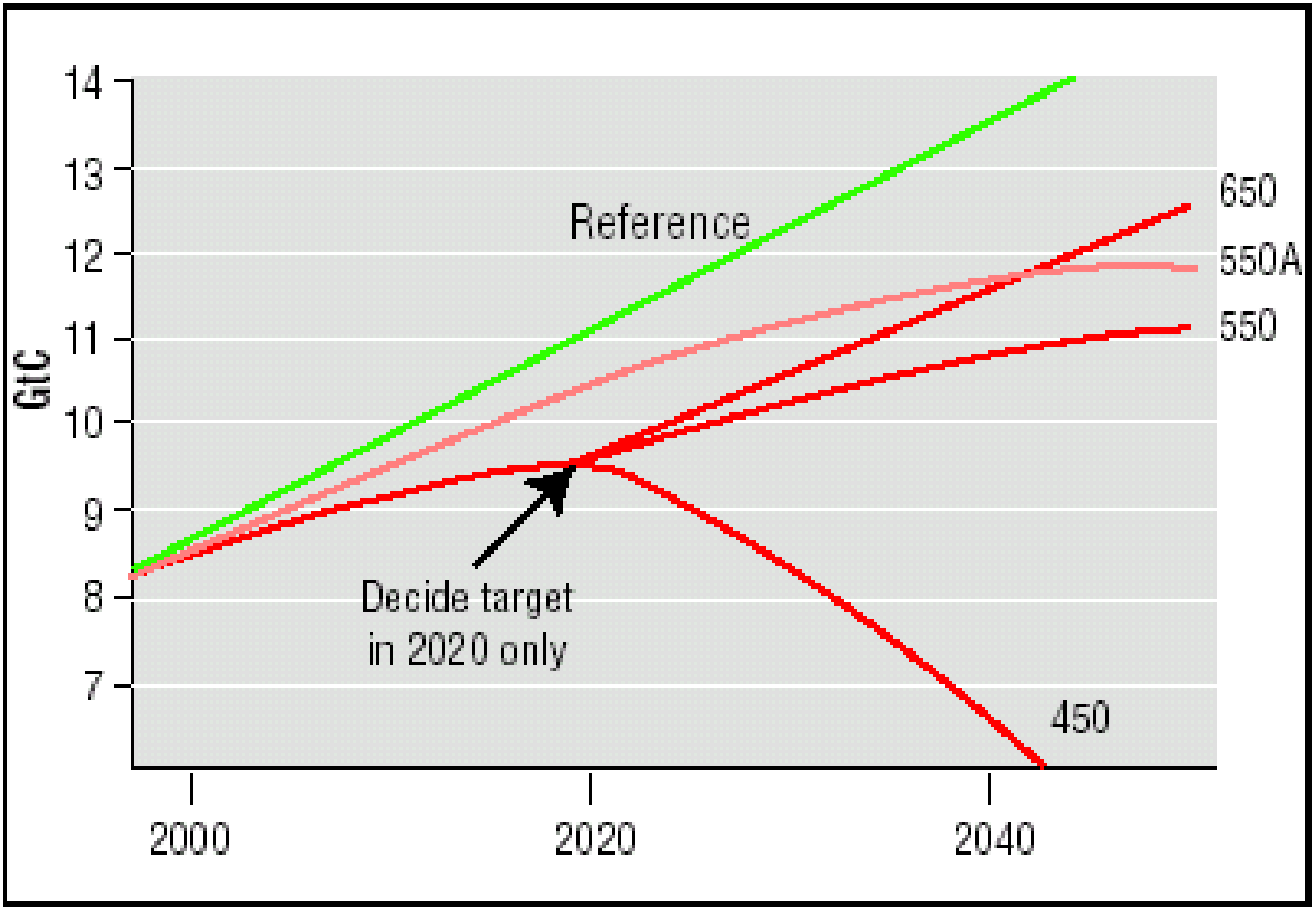
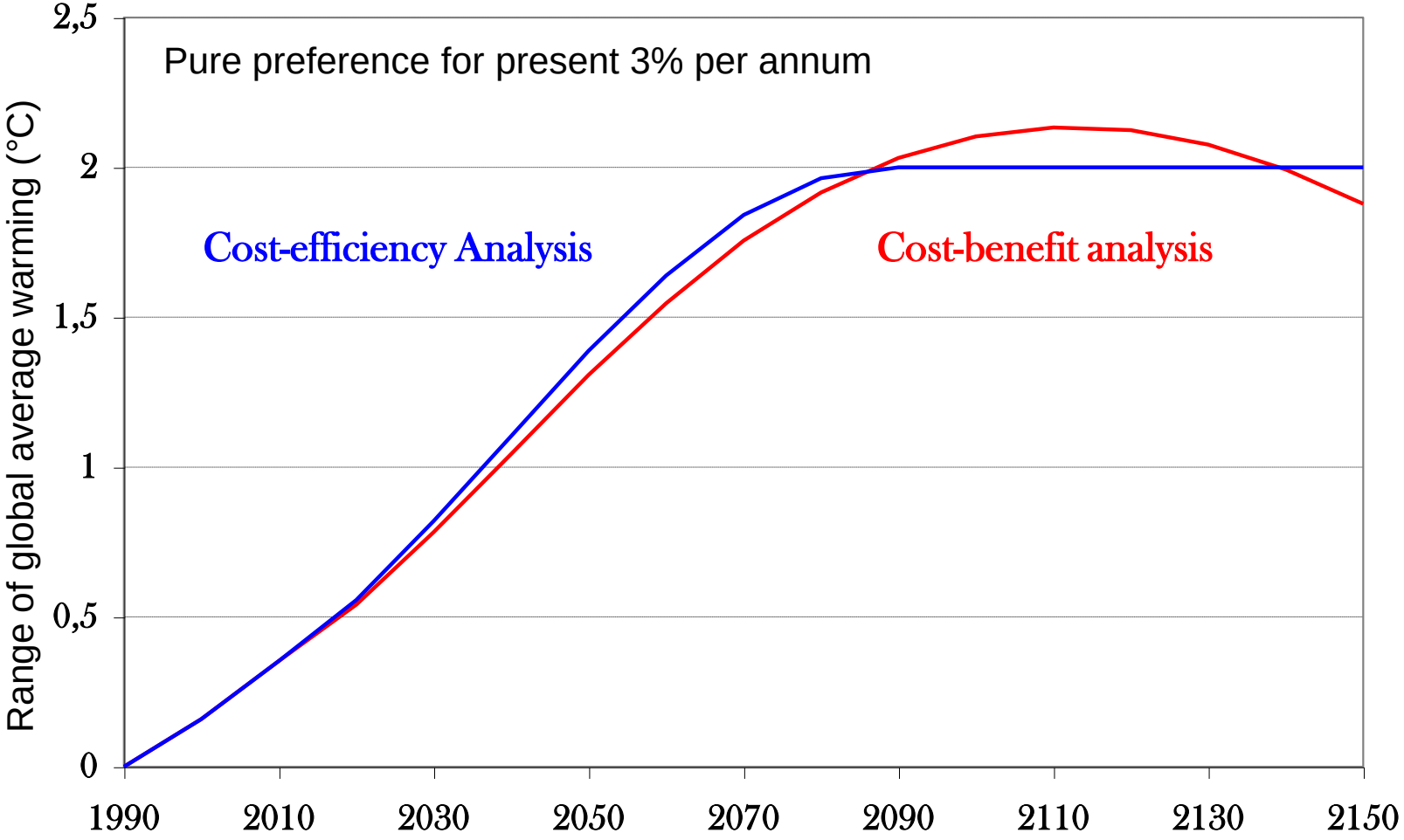
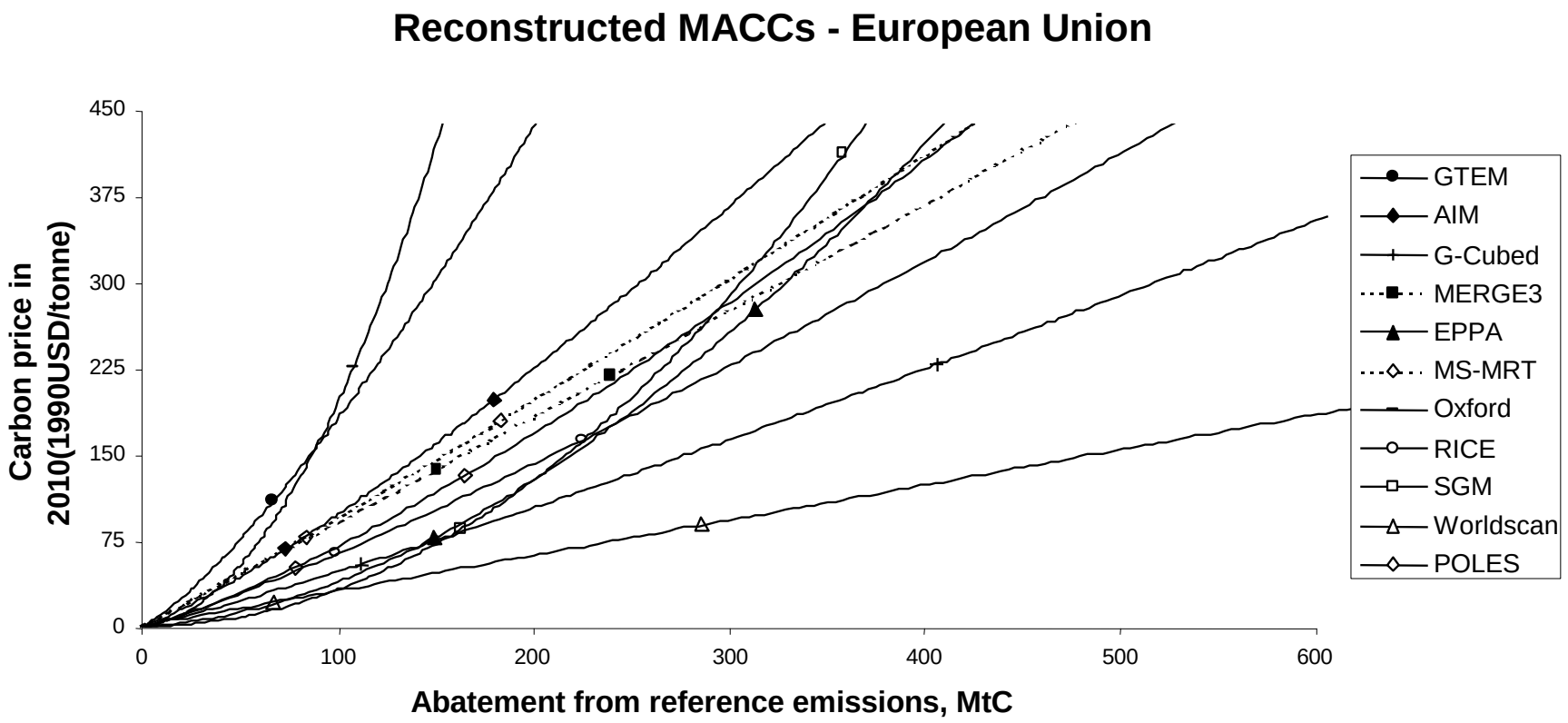


Figure TS.10a: *Optimal carbon dioxide emissions strategy, using a cost-effectiveness approach.*

source: IPCC/WGIII/TS p.67


Pure preference for present 3% per annum
Range of global average warming (°C)
2,5
2
1,5
1
0,5
0
Cost-efficiency Analysis
Cost-benefit analysis
1990
2010
2030
2050
2070
2090
2110
2130
2150

A message difficult to transmit: cost uncertainty



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The price to pay for transmission losses: a lost deal at COP6?

	Neutral stance		Optimistic stance	
	Models reaching Kyoto commitments	Models keeping emissions below 1990 levels	Models reaching Kyoto commitments	Models keeping emissions below 1990 levels
RP $35	8%	50%	13%	67%
RP $50	25%	75%	50%	83%
RP $75	50%	83%	67%	92%
RP $100	75%	83%	83%	92%

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Where flexibility ….
‘cap & trade’ and the development/environment Gordian Knot

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Economics of the « misinterpreted » Kyoto framework

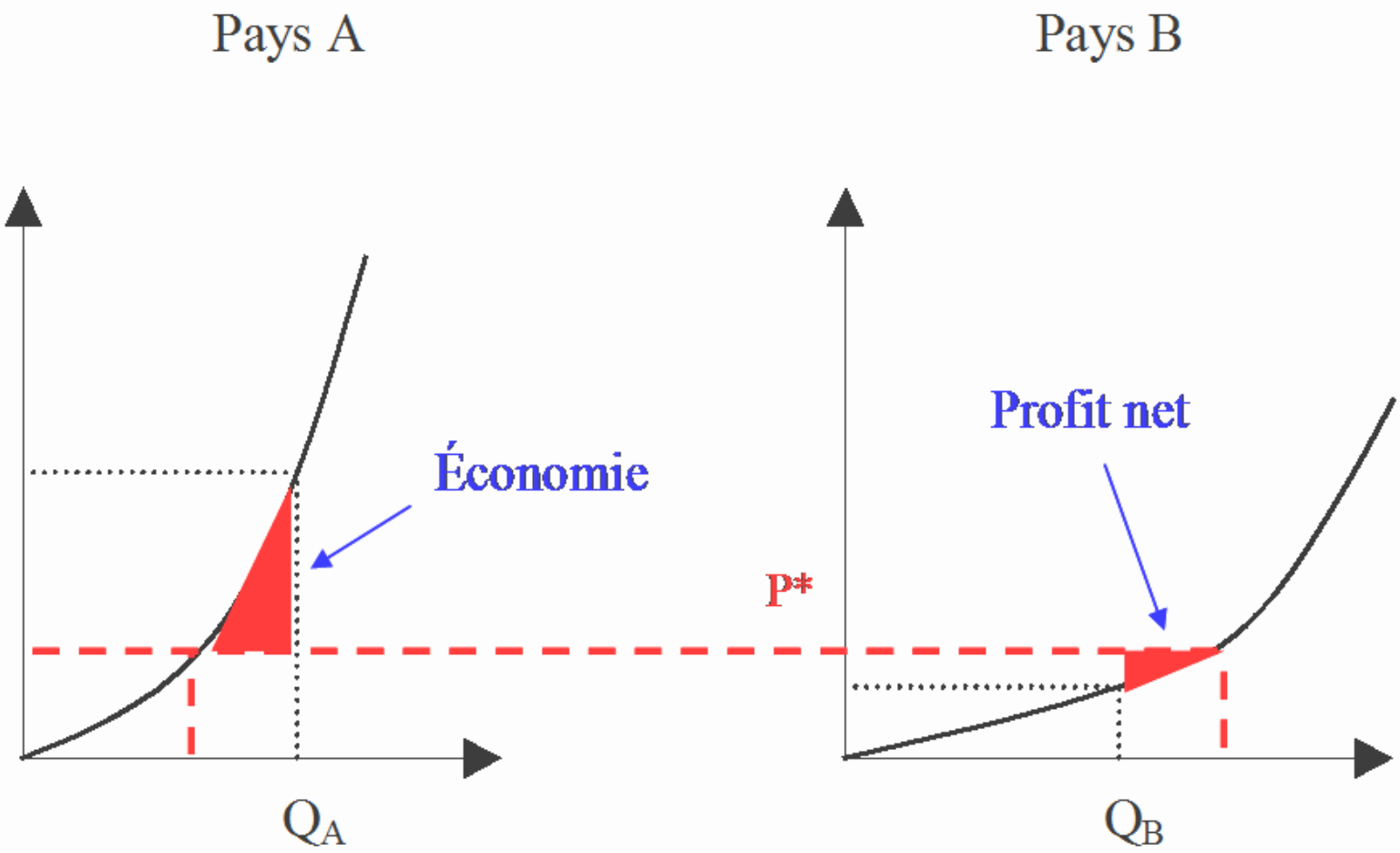
- Equate carbon prices across countries and sectors
- Minimize total costs of given abatement targets
- Prevent distorsion in international competition

- A single world carbon price

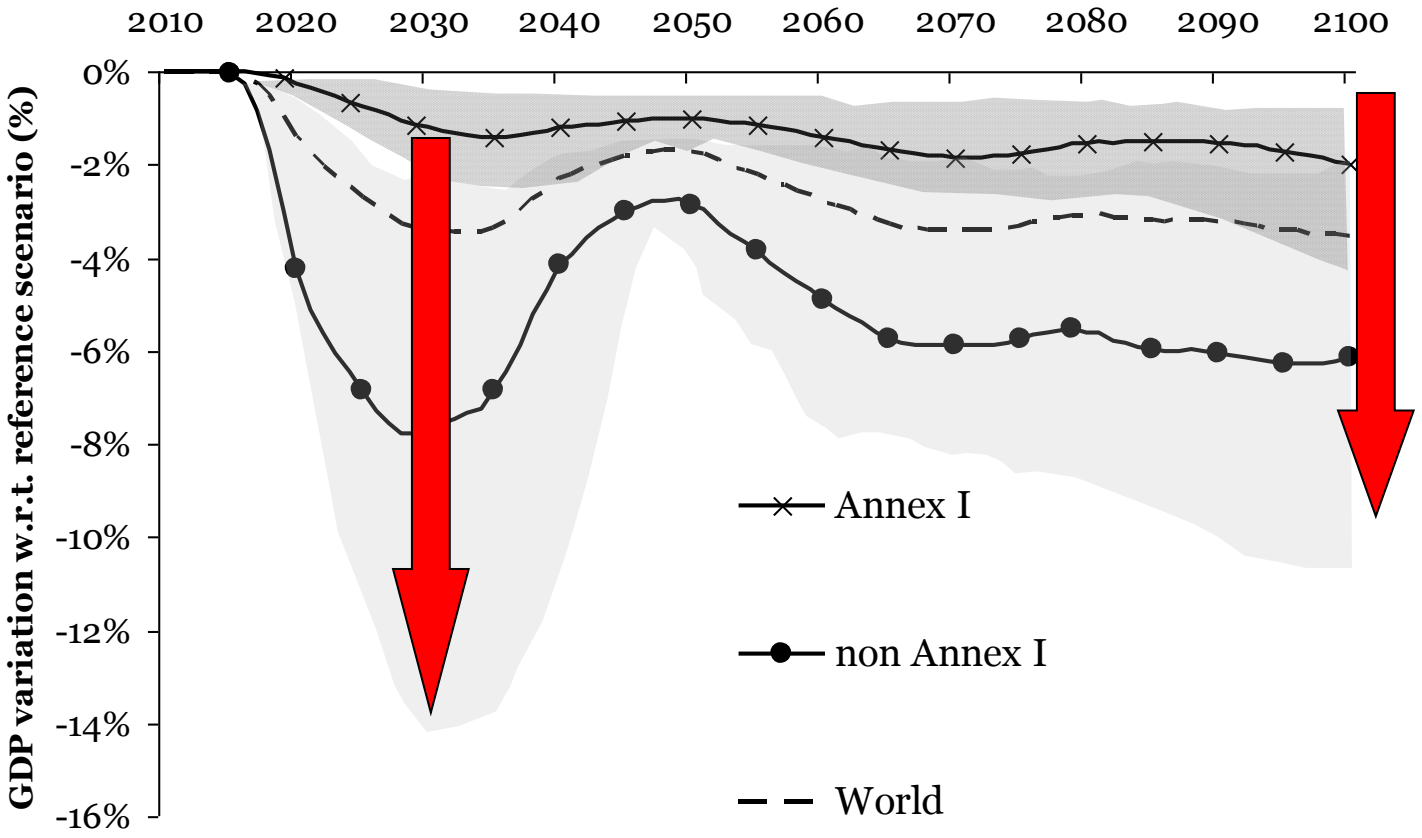
- CAP and TRADE: reconciling environmentalist political will, national sovereignty, economic rationality and transfers to developing countries

… A « tabulae rasae » utopia ?

A simple economic argument …. too simple?

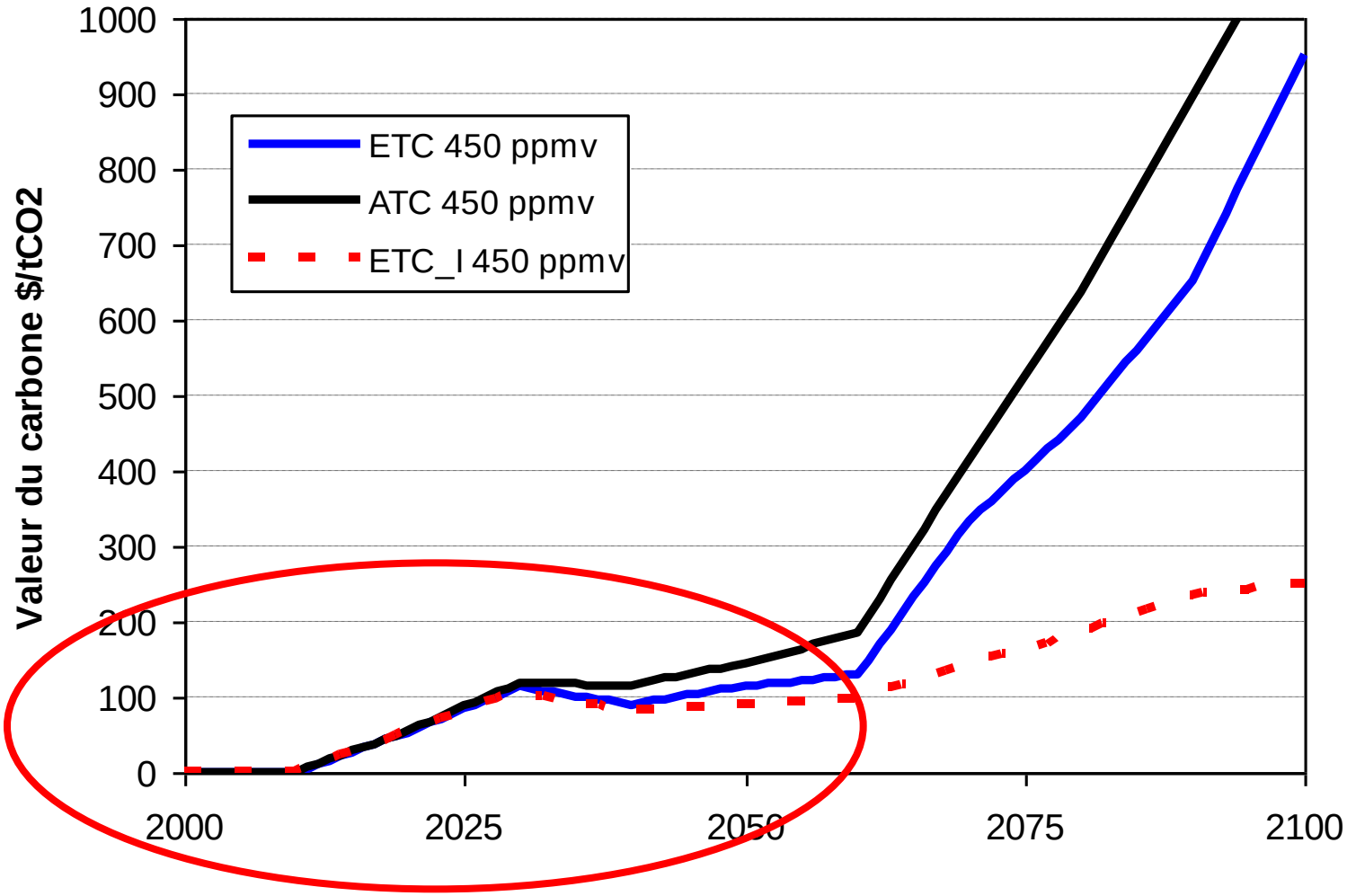


A « carbon price only regime …. or why developing countries are concerned by 'cap & trade' (520 scenarios)

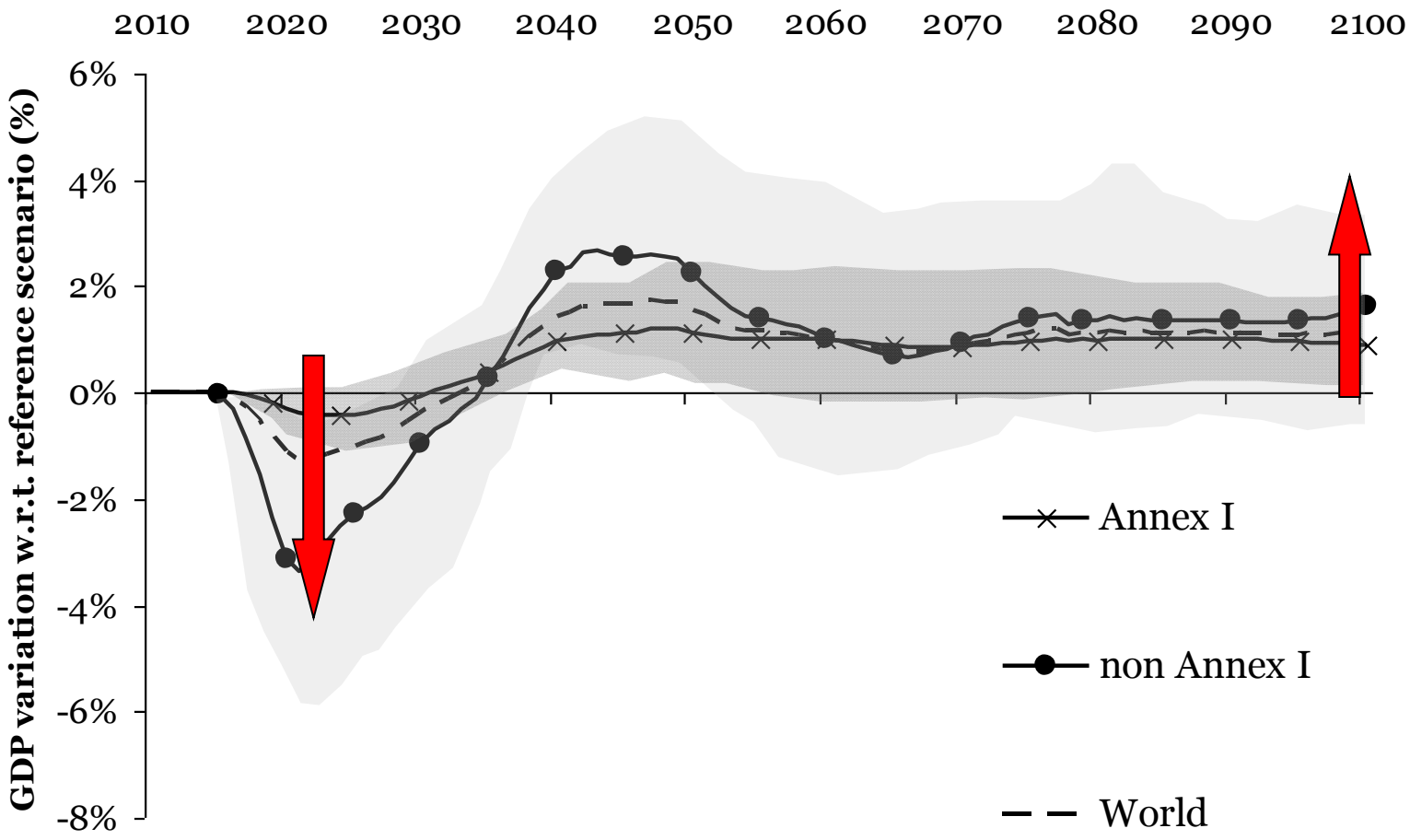


(450ppm CO2 stabilisation scenarios)

What if …. infrastructures policies

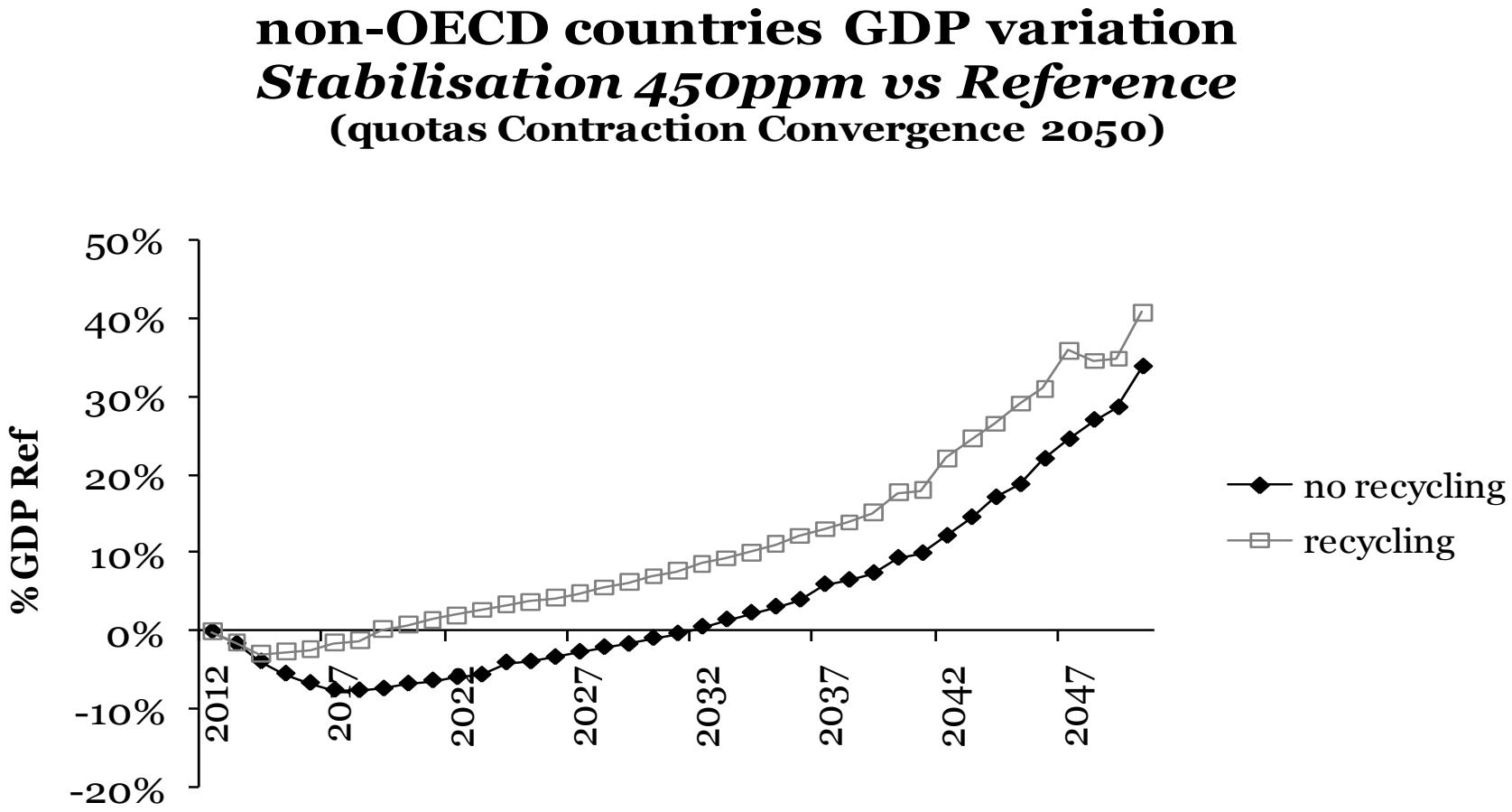


infrastructures + fiscal policies (520 scenarios)



(450ppm CO2 stabilisation scenarios)

Back to 'cap and trade' ….. when transfers become more affordable (central scenario)



In a 2nd (real) best world: turning the reasoning upside down ….

- **do not try** to « share the burden » of a given target …. and to ask the question « **who picks the remainder?** »

- follow the **descending order** of objectives the CDM in the Kyoto Protocol,

  - **assisting countries in achieving their Sustainable Development objectives**
  - **assisting non Annex B countries in contributing to the UNFCCC objectives**
  - **helping Annex B countries in meeting their Kyoto commitments**

– It would be then possible to « **negotiate targets** »

And from now on?

Towards better models …. a better use of prospective exercises

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The Hybrid Modelling Agenda