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What if energy decoupling of emerging economies was not so spontaneous?

An illustrative example on India

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Motivations

- Reference GHG emissions scenarios are critical for:
  - Estimates of the costs of stabilization
  - Climate policy recommendations
- But, existing reference scenarios are the target of criticisms:
  - Relevance in the light of current emissions trends?
  - Suitability of the modeling methodologies used for developing countries?
  - Too optimistic views on spontaneous energy decoupling?

Objective and methodology

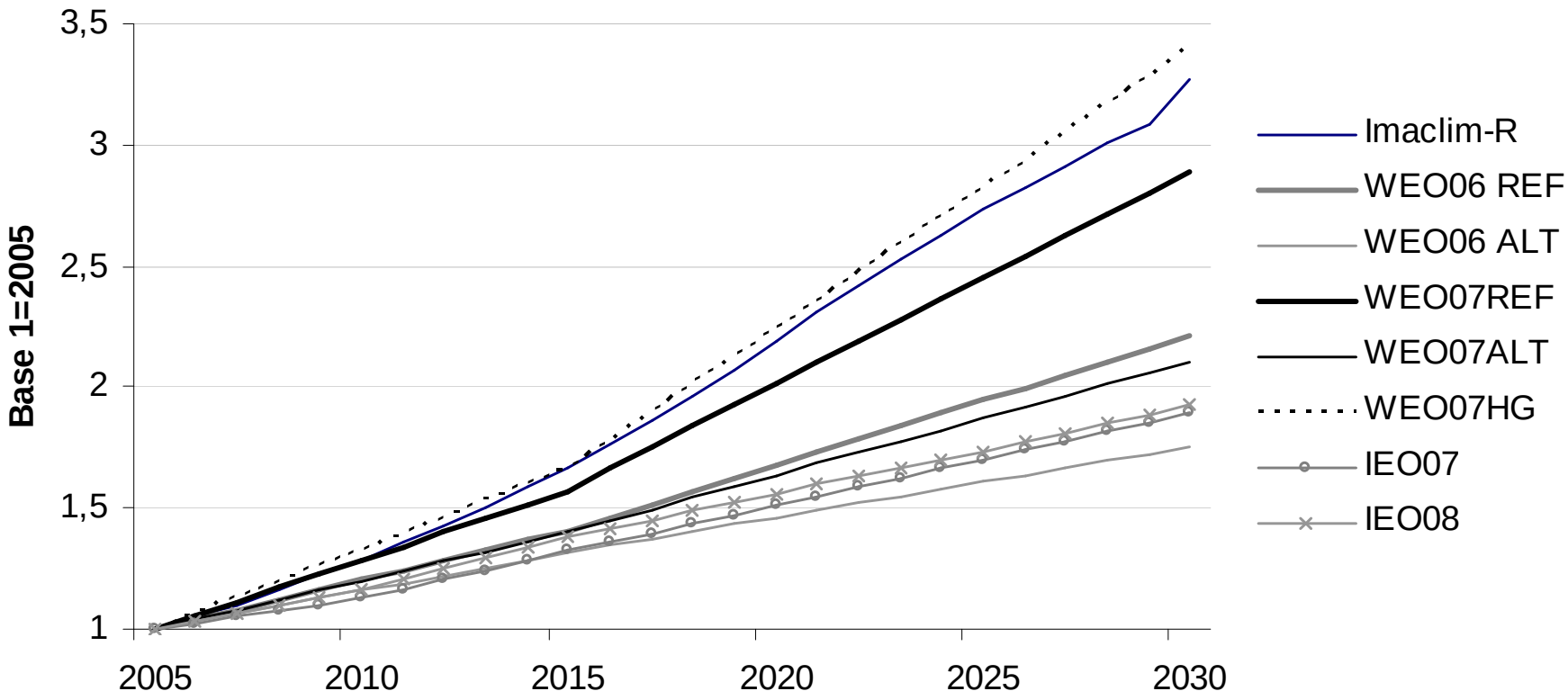
- Build an alternative Reference scenario for India
  - Disentangle the mechanisms driving decarbonisation
  - Explore the constraints that may stall this process
- A modeling framework that does not assume a first best world, IMACLIM-R
  - Hybrid model that captures the feedbacks between energy systems and economic dynamics
  - Imperfect anticipations and inertia of installed equipment
  - Power generation capacity shortage and structural under-investment in the power sector

Sub-optimalities in the power sector

- Capacity shortage estimated to 10 GW (15% of peak)
  - Households and productive sectors are affected by power cuts
  - Hinder productivity and development
  - Forced use of diesel generator
- Administered prices cover only 77% of the average production cost (farmers 12%, residential 56%)
  - Justified by positive externalities on development
  - Low revenue for maintenance and investment
- Low efficiency and high technical and commercial T&D losses

→ Persisting deficiencies?

CO2 emission trajectories



Kaya identity as an ex-post analysis filter

$$E = POP.gdp.IE.IC$$

$$\log\frac{E_t}{E_0} = \log\frac{POP_t}{POP_0} + \log\frac{gdp_t}{gdp_0} + \log\frac{IE_t}{IE_0} + \log\frac{IC_t}{IC_0}$$

	POP	gdp	IE	IC	E
2005-2030					
WEO07REF	0.123	0.546	-0.286	0.077	0.461
WEO07HG	0.123	0.691	-0.366	0.083	0.532
Imaclim-R	0.123	0.491	-0.132	0.005	0.487

Lower growth

Lower energy decoupling

Lower carbon content of energy

GDP growth is constrained by the energy system

- A lasting under-investment in the power sector
  - Persistent capacity shortage
  - Limit to the substitution towards electricity for productive sector
  - Dependency on imported oil
  - Vulnerability to the rise of oil prices
  - Lower GDP growth

Economic growth constrains energy intensity

- GDP growth constrains energy efficiency improvement in two ways:
  - Through the (limited) capacity to finance “clean” technologies
  - Through the pace of capital vintages replacement

Carbon content of the energy: a good surprise?

	2005		2030	
	Imaclim-R	WEO07 REF	Imaclim-R	WEO07 REF
Coal	56%	55%	66%	57%
Oil	34%	34%	19%	30%
Gas	6%	8%	10%	8%
Nuclear	1%	1%	2%	3%
Hydro	2%	2%	2%	2%
Renewables	0%		2%	

Comparison of energy shares of Total Primary Energy Supply

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Lower households' fuel consumption

- Revenue effect
- Price effect

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Coal in power generation

- Low efficiency
- High T&D losses

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- Announces to critical issues:
  - The development of households' energy consumption, through widespread use of private cars
  - The use of coal in power generation

Conclusions (1)

- Illustration of the reasons why existing reference scenarios might be too optimistic on the automatic decarbonisation of economies.

- Methodological point of view:
  - The interactions between the energy system and the economy are crucial
  - Allow to represent countries specificities and sub-optimalities

Conclusion (2)

- Climate policies and negotiations
  - ➢ The challenge for climate policies to lift the barriers to energy intensity improvement in India is considerable
  - ➢ A potential for synergies between development policies and climate policies
  - ➢ But possible larger diffusion of end-use equipments (private vehicles) following the alleviation of barriers to development

    →Careful early planning of infrastructures

Thank you for your attention!

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