

United States shale resources production : Looking at implications for world competitiveness through the lens of a general equilibrium model



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Introduction

We analyse the effect of shale gas production across region, especially US, and its impact on competitiveness, by looking at :

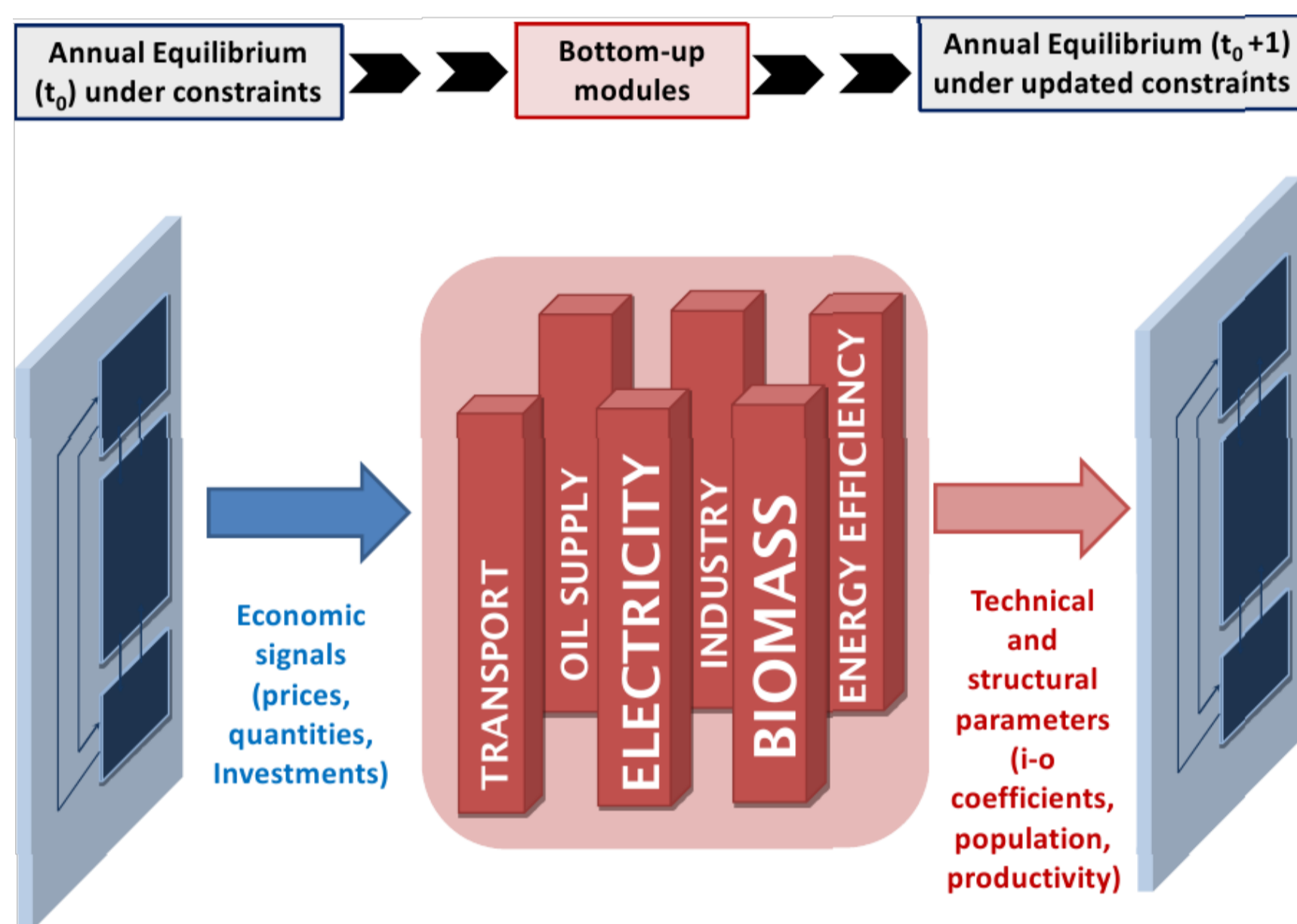
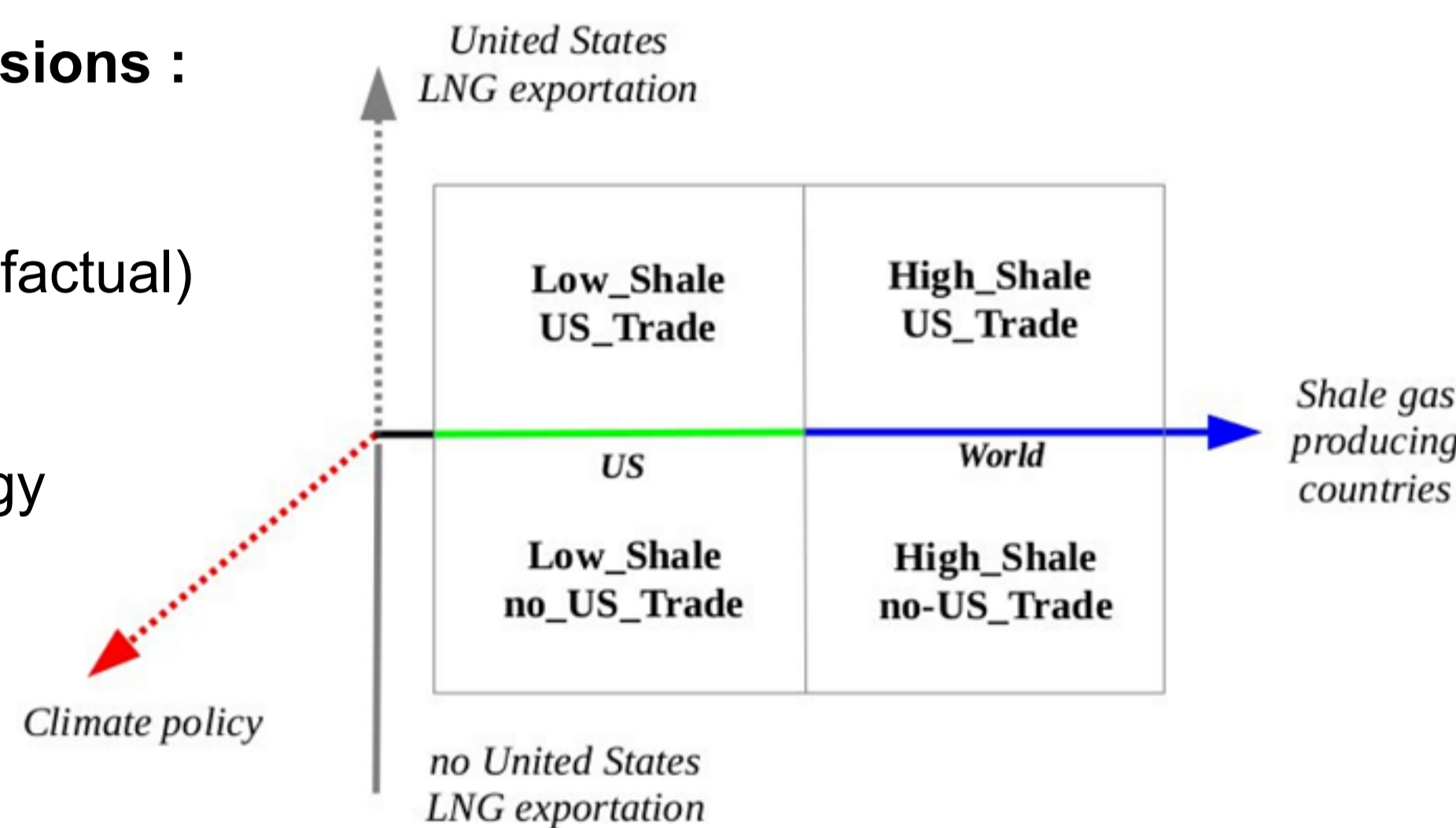
- Real **GDP** deviation measured in **Merchandise Exchange Rate (MER)**
- **Resiliency** patterns of selected economies regarding trade (China, India, Europe)

Exogeneous hypothesis on **balance of paiement** (at the equilibrium in 2050) drives part of the results.

1 Building forward-looking scenarios

Scenarios on three dimensions :

- Shale gas producers :
 - No producers (counter-factual)
 - US only
 - All the world
- US gas exportation strategy
 - Exportation via LNG
 - no exportations
- Climate policies



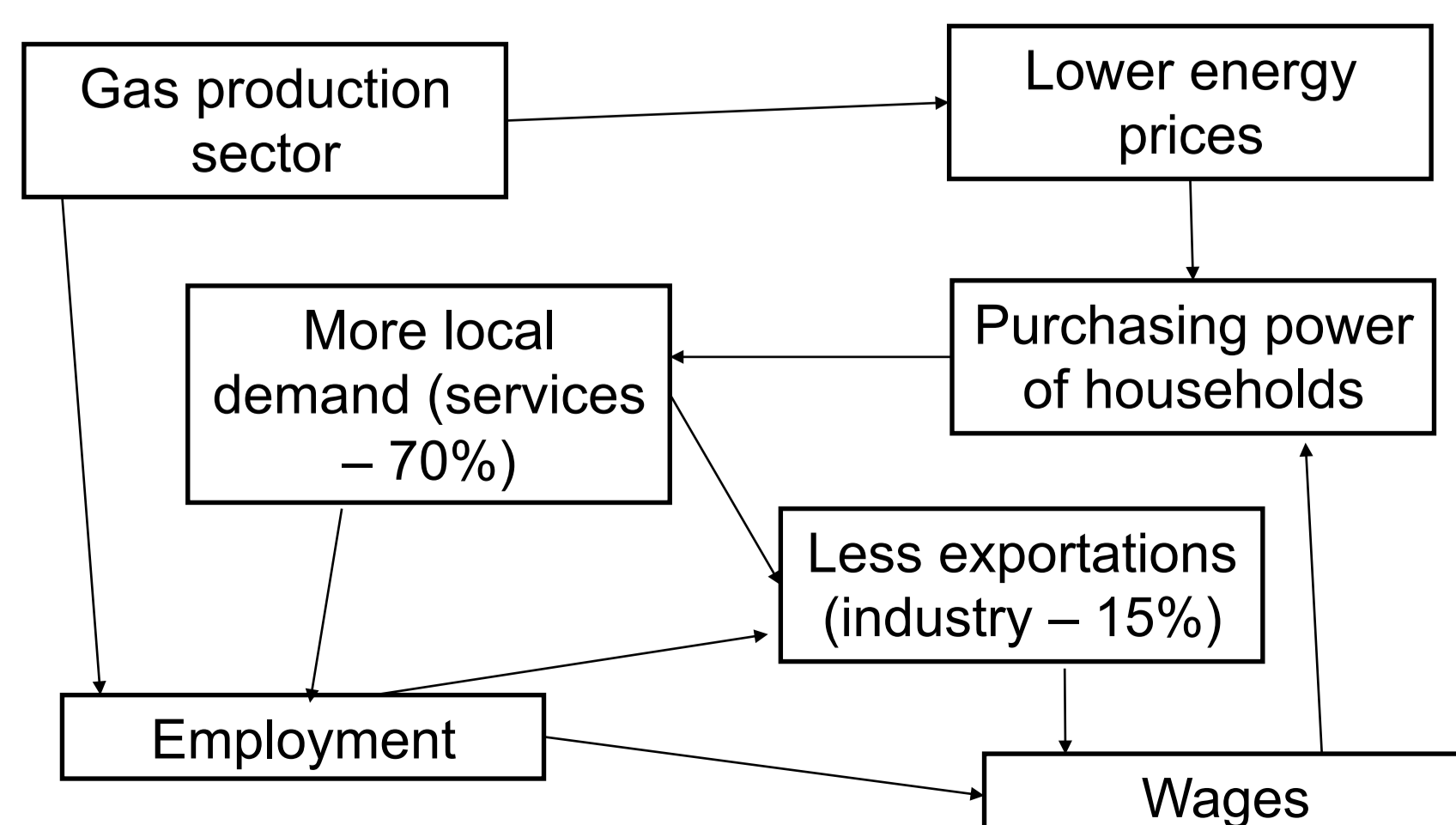
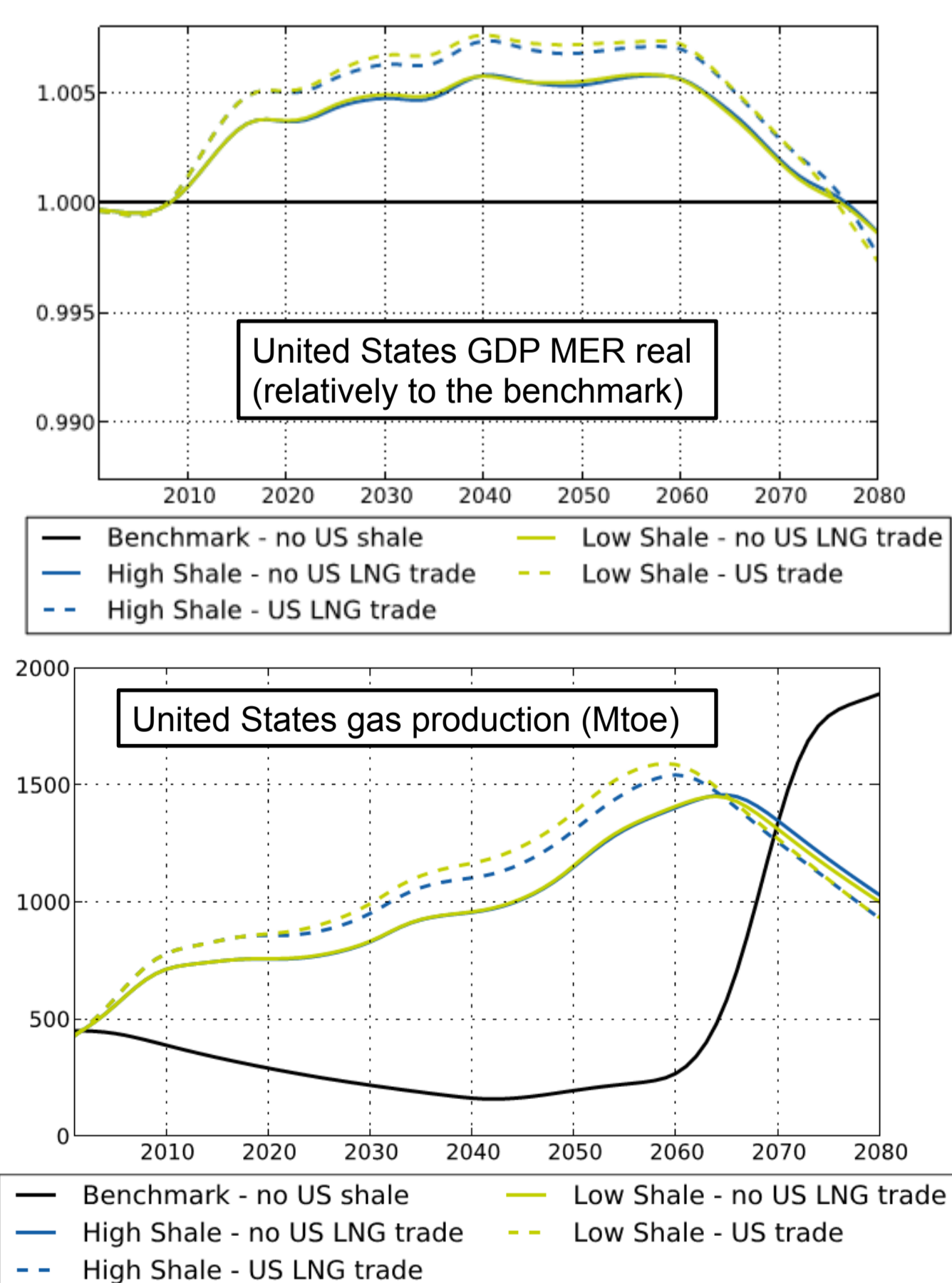
The Imaclim-R CGE model :

- Dynamic recursive model of the world economy
- 12 regions, 12 sectors

- **Hybrid matrixes in values, energy and « physical » content (Mtoe, pkm)**
 - Secure the consistency of the engineering based and economic analyses
 - Explicit accounting of inertias on equipment stocks
 - Endogenous and exogenous TC, technical asymptotes, basic needs
- **Solowian growth engine in the long run but transitory disequilibrium**
 - Unemployment, excess capacities
 - Investments under imperfect foresight (informed by sectoral models)
 - Trade and capital flows under exogenous assumption about debts

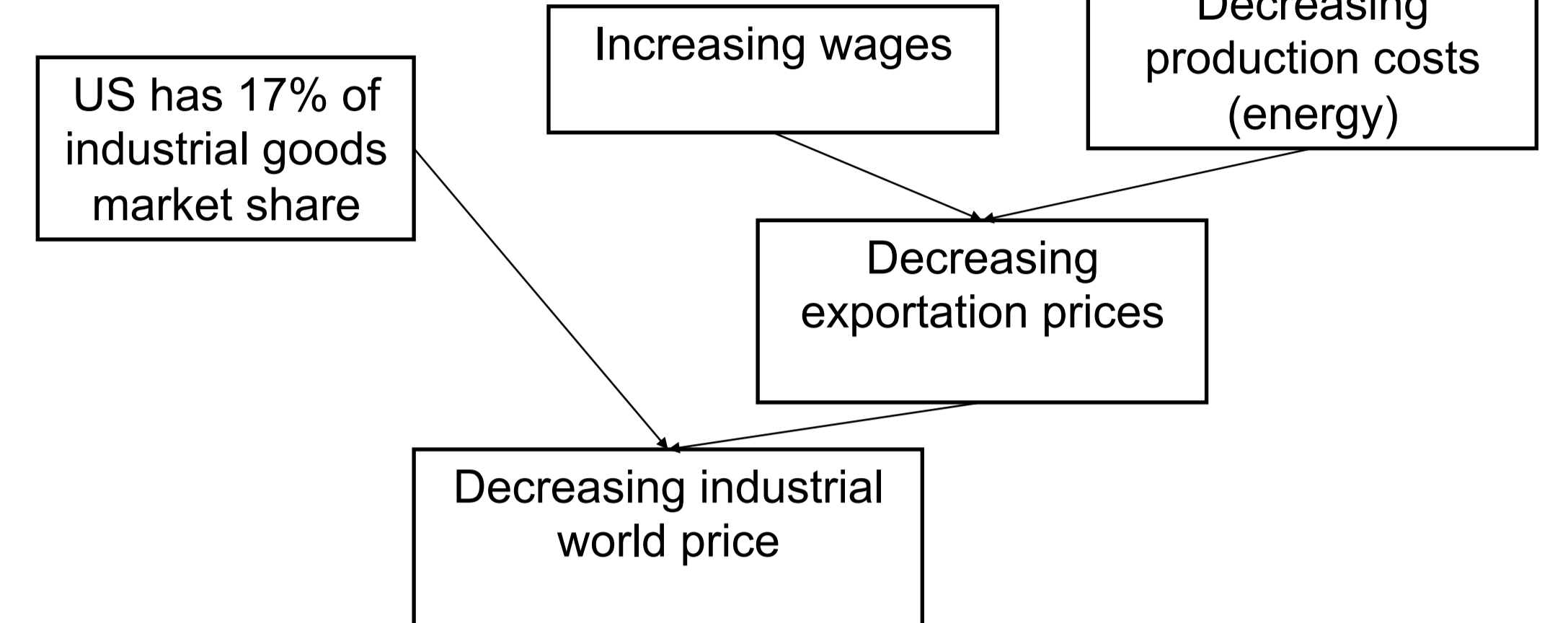
2 Structural change within the U.S.

- 0.5 % GDP gain alleviated around 2040 even with a growing production of gas
- Lower gas price leads to :
 - Substitution from coal to gas in electricity power generation
 - Lower industrial goods prices
 - Substitution from refined oil to electricity and gas in heating systems (so more in transport)
- A stronger dependency on refined oil creates lock-ins past 2040 when tensions occurs on oil markets (gas in transport systems ?)
- A reduction of gas importation along with exogeneous constainted capital balance leads to a reduction of exportations



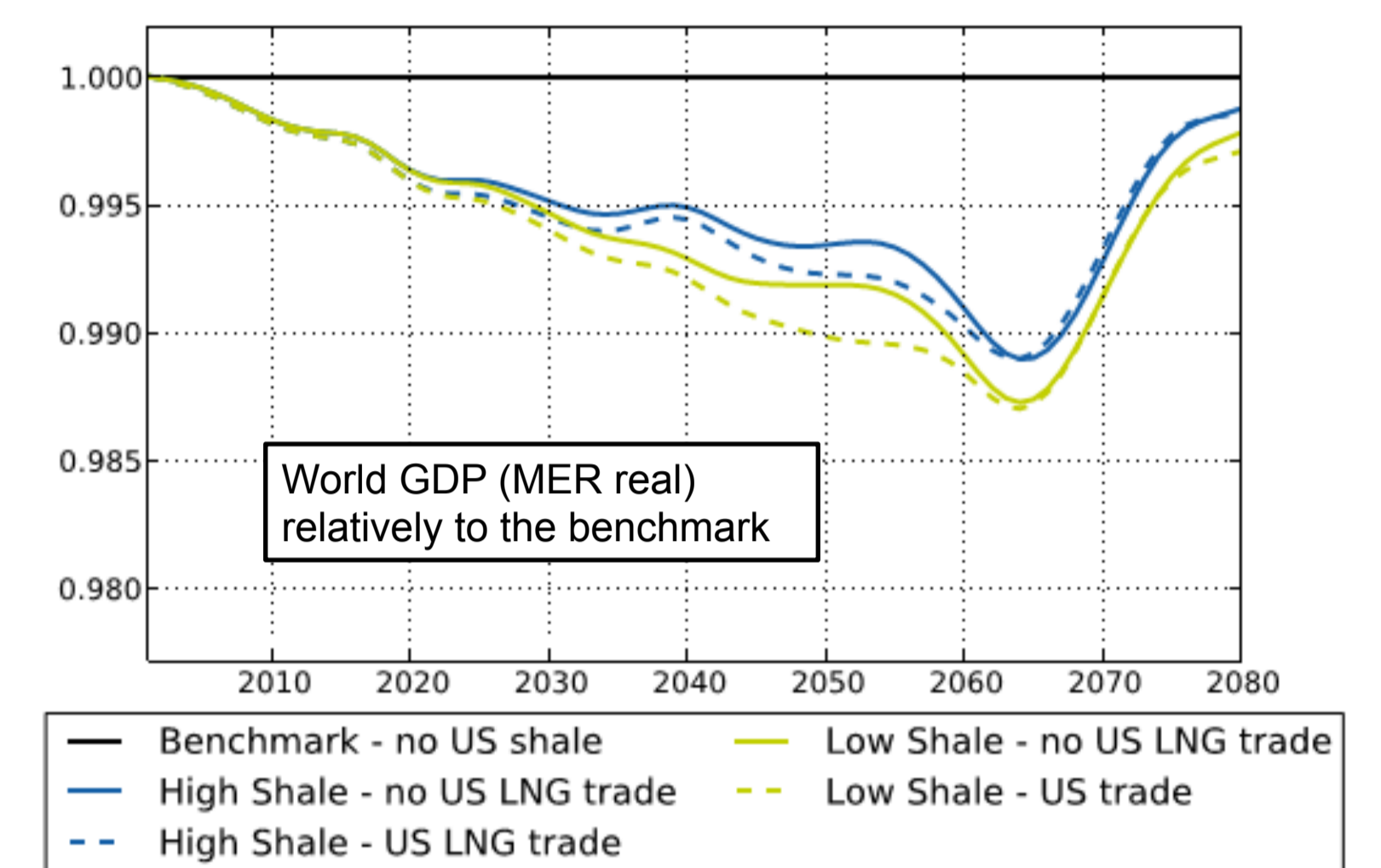
3 Impact on global markets

- Reduced trade activity of the United States leads to lower industrial world prices :



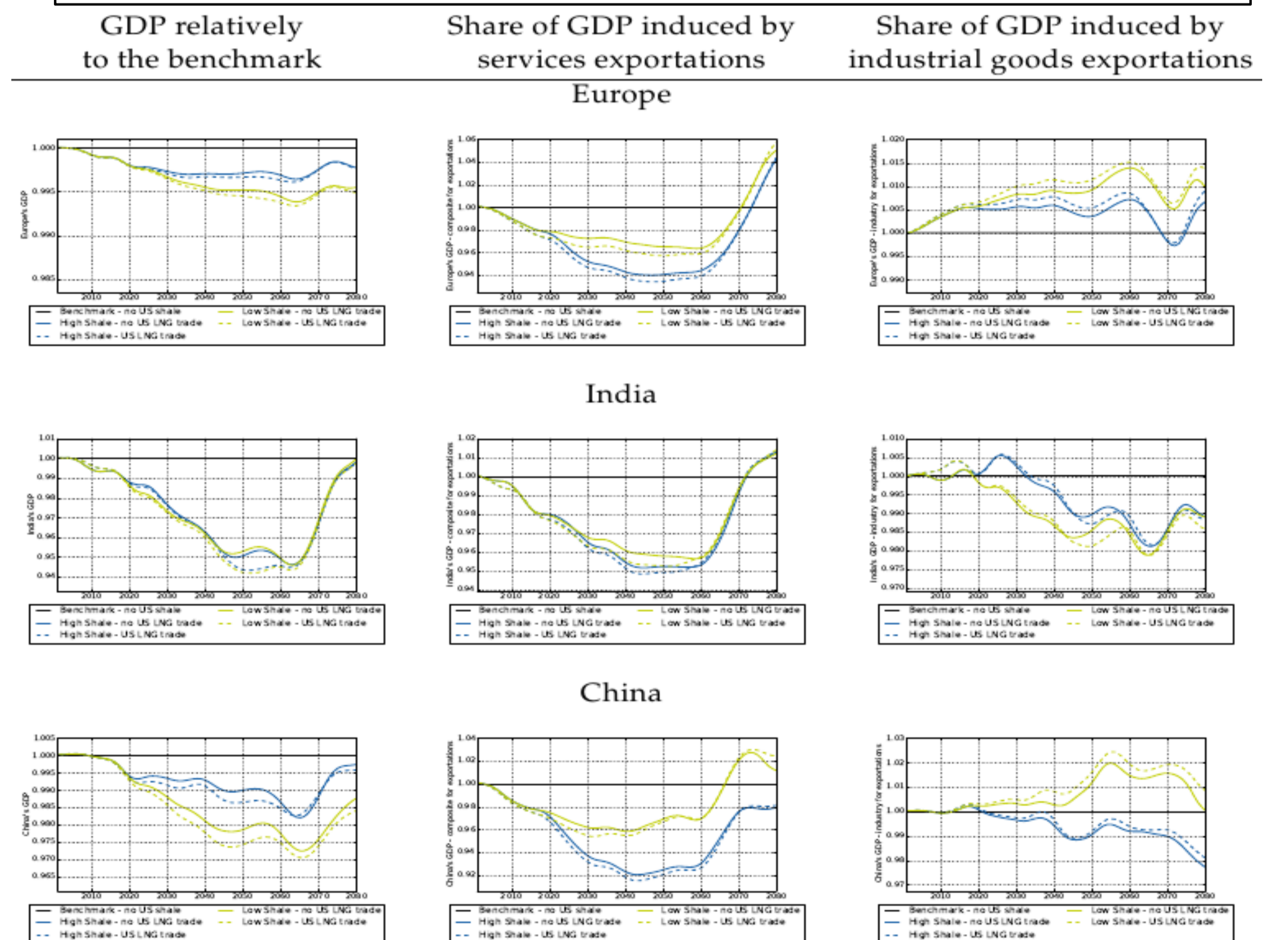
Impact on the world :

- Lower GDP MER real (Purchasing Power Parity GDP are higher)



4 Trade resiliency of selected regions

GDP MER real differences : Whole economy, induced by services exportations, induced by industrial exportations.
Regions : Europe , India, China.



- Share of industrial exports towards US
 - Less exports
 - Lower prices
- Dependency on trade
 - As a GDP share (Exp/GDP)
 - Share of imported industrial goods in production costs
- Labour market
 - Share of wage in production costs
 - Standard of living

	EUR	CHN	IND
Share of industrial exports towards US	26%	8%	1%
Dependency on trade (Exp/GDP)	12%	19%	27%
Share of imported industrial goods in production costs	15%	6%	15%
Labour market (Share of wage in production costs)	15%	10%	8%
Standard of living	High	Low	Low

5 Perspectives

Quid of reality :

- Should shale gas production leads to a faster reduction of balanced of paiement and more exportations ? (contrasted scenarios on world capital flows)
- Relate results to dutch disease dynamics litterature

Further questions :

- Climate mitigation potential and methane leakage ? (ESM linkage)
- Gas markets dynamics and rent transfers (gas market fragmentations and transportation alternatives representations)
- Improving resiliency ? (looking at co-benefits between climate policies and trade)

Ask me as well about my work in implementing capital vintage and technical constraint of energy systems within the DICE model...