Beware of back of a napkin calculation

Example: China:

- Constant growth rate is 8% per year → China × 21 in 40 years;
- Linear convergence of growth rate of 8% to 3% in 40 years → China × 8 in 40 years;
- Major consequences for the raw material markets, carbon emissions, the strategies of multinationals, the political order, etc.
- finding plausible significant orders:
- Also useful for economic policies simulation (i.e. MIRAGE Model).

Project of the Centre of Prospective Studies and International Information

- Growth scenario for 2050 horizon for 122 countries
- Improvements in comparison to literature:
  - Theoretical framework:
    - Production function of three factors: Labor, capital and energy
    - Two forms of technical progress (energy, capital-labor)
    - Imperfect mobility of capital
    - Savings rate related to the life cycle
    - Consistent Balassa-Samuelson effect
  - Empirical Work
    - Econometric estimates
    - World Crisis: projections as of 2013 (GDP at its potential level)

Principal elements

- Active population
  Population: United Nations (Median fertility)
  Participation rates by age: ILO until 2020, constant afterwards
- Accumulation of Capital
  Investment relative to the savings by a typical Feldstein-Horioka relationship
  Savings rates relative to the life cycle, growth and GDP per capita
  Depreciation rate of 6% (MIRAGE)
- Energy consumption
  Relative to energy prices and productivity
- Technical progress
  Retrofit of TFP accelerated by human capital: Upgrading human capital towards the educative border
  Energy productivity: Double catch (U-curve)
  - Balassa-Samuelson Effect
  Consistent with the production function
Investment rate
% GDP

Savings-investment imbalance
% GDP
Capital stock
Billions of dollars in 2005
Energy Efficiency
(Distance from the border in %, advanced countries and BRIC)


Energy productivity
Developing countries
Human capital
(Years of schooling, in % of U.S. level)
Total Factor Productivity (TFP)
% of American level
Increase of Gross Domestic Product (GDP) % per year, fixed price

GDP in Volume
Billions of Dollars in 2005
GDP
Parts in the world GDP, in Dollars in 2005
GDP per capita

$ Purchasing Power Parity in 2005, % of American level
Real Exchange rate against the dollar
100 in 2005
Comparison with the Organization for Economic Co-operation and Development and the Goldman-Sacks
Comparison with OECD and GS
2050 Horizon

CPSII versus OECD, 2012-2025, PPP

CPSII versus GS, 2012-2025, courant $
Large countries’ conclusions

- China and India increased by 13 times between 2008 and 2050 at fixed prices, while the U.S. by two times, EU by 1.6. China is expected to surpass the U.S. in 2030 while India is expected to surpass Japan in 2035.
- Taking into account the relative prices changes: China × 16, India × 20, USA × 2, EUx 1.4. China is expected to surpass the U.S. in 2025 and India is expected to surpass Japan around 2030.
- China is still 10% below the U.S. in terms of living standards in 2050.
- Significance orders for downstream studies.

Morocco
Morocco

GDP per capita
$PPP in 2005, in % of American level