Characterizing Supply-Side Drivers of Structural Change in the Construction of Economic Baseline Projections

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The paper deals with the following issues:

- (i) what are the main stylized-facts of structural change that CGE model projections should try to reproduce?
- (ii) how would alternative assumptions about the drivers of supply-side structural change will affect the economic baseline projections?
- (iii) what are the common practices to calibrate these desired projections? Overview of the model participating to the OECD-GTAP-EU Workshop (Paris, January 2018)

What Structural Changes in CGE models baseline?

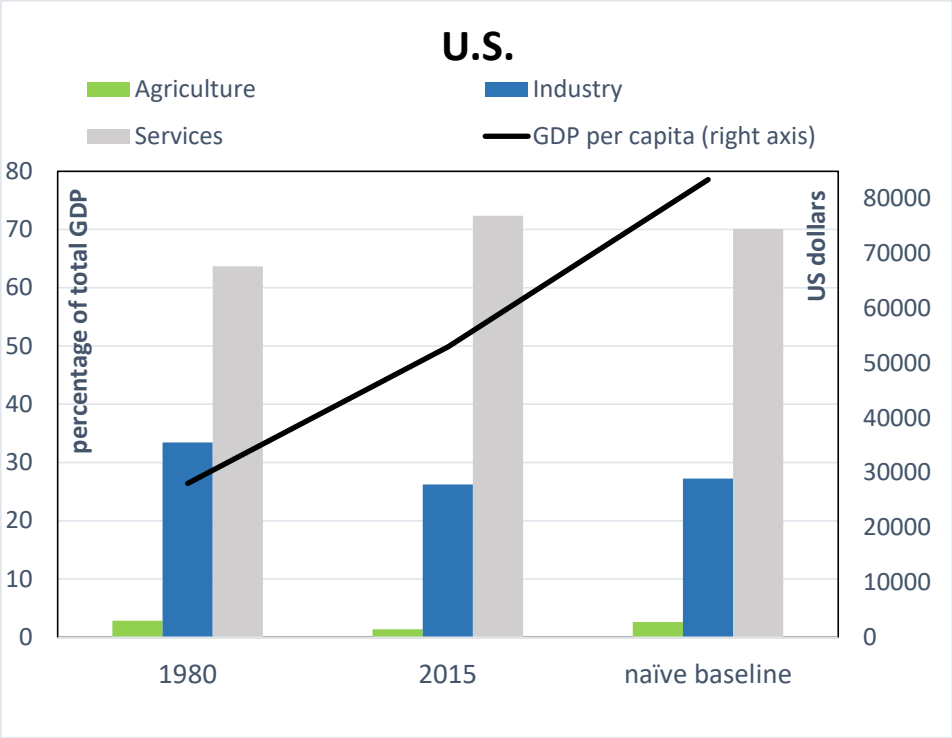
- By structural changes we mean by changes in the sectoral composition of economies. The paper focus on the drivers of supply-side of this structural change in CGE: technically any change in functional forms / equations parameters on the supply side.
- Assumptions made about structural changes will matter for long-run issues.
- Even with no additional assumption, running the model would involve some “endogenous” structural change.
- Here the issue is how to calibrate this structural changes towards some desired outcomes?

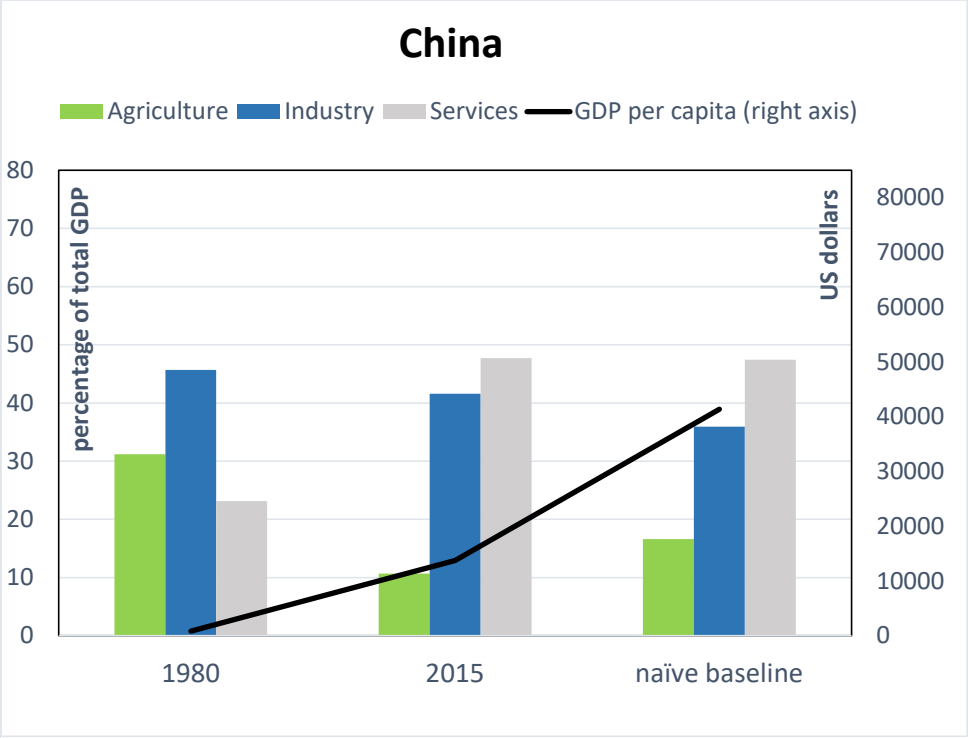
Changes in parameters of the production function as drivers of supply-side structural change

In CGE models, the production process for each sector structure is represented by a transformation function "F". It associates output Y, primary factors (K,L,Land) and intermediate demands (energy, services, manufacturing, etc.): F (t, Y, TFP λ_K K, λ_L TFP L, λ_{NR} TFP NR, $\lambda_{ID(i)}$, λ_{LAND} TFP LD, ID(i)... $\lambda_{ID(j)}$. ID(j)) = 0, for all sector

- Focus here is changes in efficiency variables λ_{PF} of the primary factors (PF = K,L, Land, NR) , including common Total Factor Productivity (TFP)
- changes in intermediate demands efficiency $\lambda_{ID(i)}$. These also include the changes in Autonomous Energy efficiency ($\lambda_{e(ei)}$).
- Not considered here : dynamics of the primary factors variables K,L, NR in the baseline (Jean Fouré's paper), changes in preferences (Mun's paper) or in trade pattern (Eddy's paper)

Value-added by economic activity and GDP per capita: 1980, 2015 and "*naïve* baseline" projection for 2050

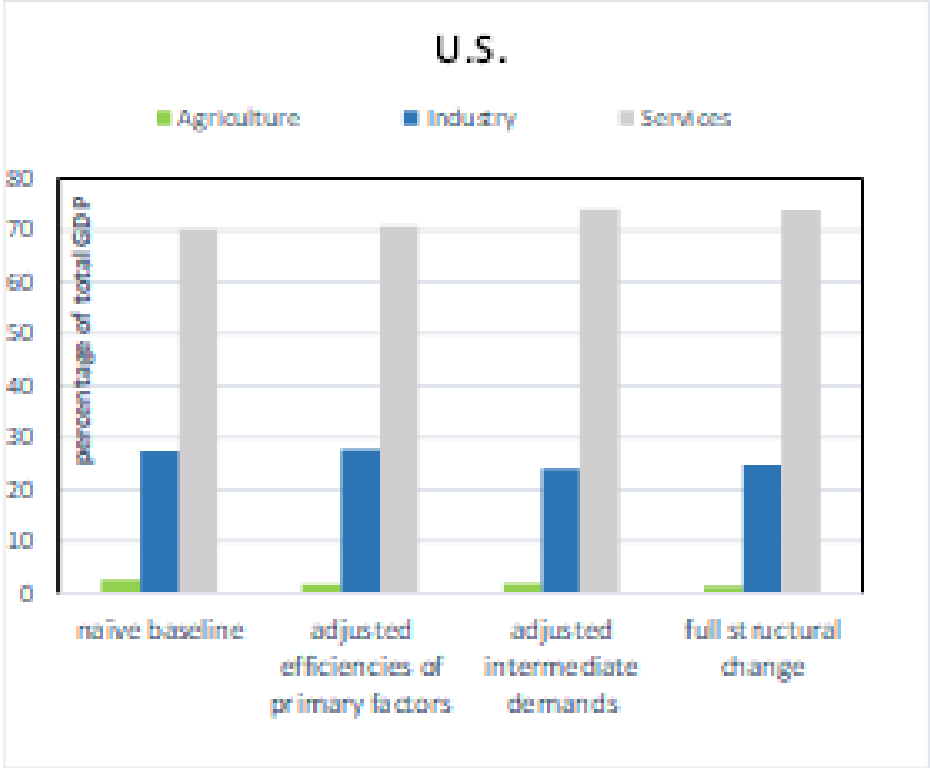


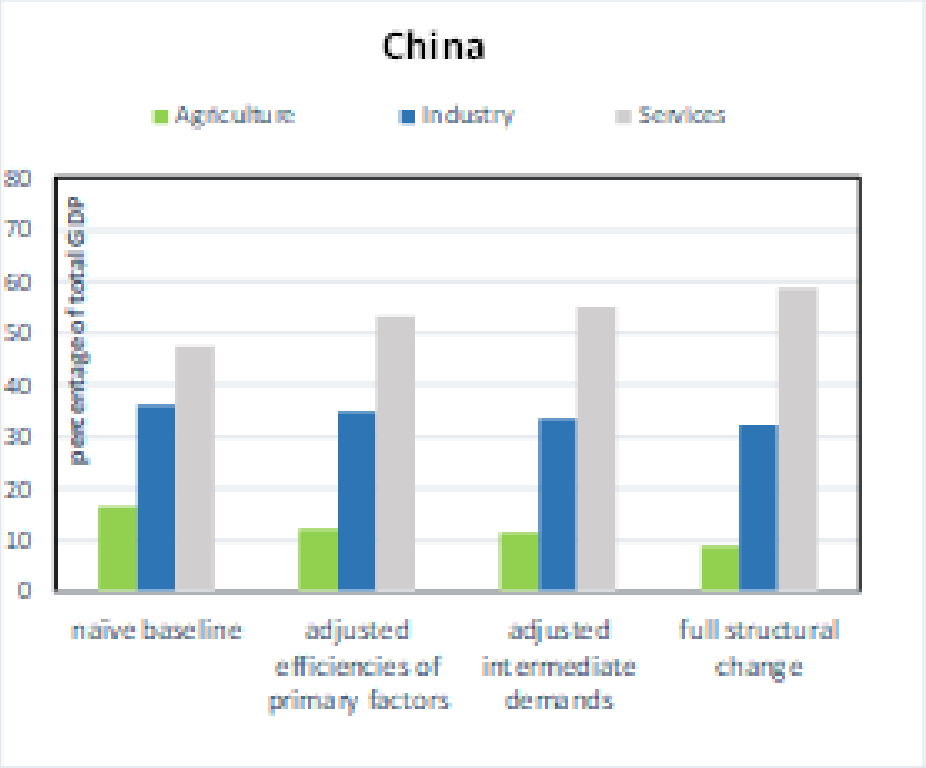


Source: OECD ENV-Linkages model

Unrealistic features: Despite catching up, China sectoral composition of economy is not changing a lot, even if household preference are not homothetic → need to adopt structural change assumptions.

Adopting supply-side assumptions corrects for declining services shares in the *naïve baseline* in 2050





Source: OECD ENV-Linkages model

We run 3 alternative baselines characterized by alternative assumptions on the drivers of supply-side structural change. (1) a baseline with “adjusted efficiencies of primary factors” (2) a baseline with “adjusted intermediate demands” (3) a baseline with “full structural change” that combines assumption of scenarios (1) and (2).

Review of common practices of model participation to the CGE baseline workshop (January 2018)

- The paper also presented additional simple simulations with different assumptions on drivers of structural change and showed that CGE baselines that exploit available information on projected supply-side structural change tend to be more realistic than baselines that leave structural changes to be endogenously determined by the model.
- A review of 24 models similarly concludes that when teams calibrate production parameters (efficiency or scale and CES parameters) for both primary factors and intermediate inputs, they produce a more realistic baseline in terms of the future sectoral composition of economies.
- The review indicates that there is no common practice on the choice of the production parameters used to target differences of productivity across sectors. While a majority of the modelling teams choose labor efficiency to play this role, a non-negligible number of teams opt for TFP. This choice generally involving different GDP shares of labor income and services.

other conclusions

- The review also highlights that the calibration of capital efficiency is generally not exploited by modelling teams and simulations illustrate how it could be used to successfully target projection for wage income shares.
- In terms of future developments, more efforts could be used to identify the main characteristics of supply-side structural change associated with economic growth that dynamic CGE models should try to mimic. Using information on the projected dynamics of key sectors, such as services, energy and agriculture, are common good practice among the reviewed models. However, the projections for other sectors are still poorly represented in most CGE baselines.
- While most models try to exploit available sectoral projections, it is difficult to collect comprehensive information on what future economic growth means for future changes in the sectoral composition of the economy.

Thank you

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The drivers of supply-side structural change

The paper deals with structural change involved by change in production modes :

- Changes in production modes and technologies during the baseline horizon:
  - Changes in factor efficiency / sectoral TFP
  - Natural Resources shifter
- Changes in the intermediate demand patterns:
  - Changes in intermediary demands (I-O coefficient structures): Exple shift towards more services inputs
  - Changes in efficiency of some goods: Exple changes in fertilizer efficiency in agriculture / Changes in energy efficiency
- Changes in preference and in trade patterns are considered in other papers of this JGEA issue,