Technology Gaps, Trade, and Income

by Thomas Sampson (LSE)

Discussion by

Pau Roldan-Blanco

(Bank of Spain)

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Highlights

- **Sampson (2019) in a nutshell:**
  - R&D/adoption model that generates technology gaps within & across countries.
  - Rationalizes:
    1. Ricardian CA based on cross-country differences in R&D efficiency.
    2. Income inequality across countries.
  - *Quantification:* Accounts for 1/3rd of wage inequality among OECD countries.
- **Sources of heterogeneity:**
  1. *Firm level:* R&D "capability" ($\Rightarrow$ if $\psi \leq \psi^*$ adopt; else R&D)
  2. *Industry level:*
     (i) Degree by which firms learn from local vs. global frontier (*spillover localization*).
     (ii) Degree by which laggard firms benefit from knowledge (*backwardness advantage*).
  3. *Country level:* Efficiency of innovation system ($\Rightarrow$ absolute advantage in R&D)

Highlights

- **R&D technology:** (country s; industry j; productivity θ)

$$\frac{\dot{\theta}}{\theta} = \underbrace{\psi}_{\substack{\text{Firm's}\\ \text{R\&D}\\ \text{capability}}} \cdot \underbrace{B_s}_{\substack{\text{Efficiency}\\ \text{innovation}\\ \text{system}}} \cdot \underbrace{\left(\frac{\theta}{\underbrace{\chi_{js}}_{\text{Local knowledge}}} \right)^{-\gamma_j}}_{\text{Advantage of backwardness}} \cdot \ell^R - \delta, \quad \text{where } \chi_{js} = \underbrace{\left(\theta_{js}^{\text{frontier}}\right)^{\frac{\kappa_j}{1+\kappa_j}}}_{\text{Local}} \cdot \underbrace{\left(\chi_j^{\text{world}}\right)^{\frac{1}{1+\kappa_j}}}_{\text{Global}}$$

- **Key object** $\rightarrow$ Industry's *innovation dependence* (ID_j)
  - $\equiv$ elasticity of industry's average productivity to country's efficiency (B_s).
  - ID_j is $\downarrow$ in advantage of backwardness (γ_j), and $\uparrow$ in degree of spillover localization (κ_j).

- **Key predictions:**

1. Technology gaps:

   Countries with higher R&D efficiency have CA in more innovation-dependent industries.

   (i.e. CA in industries with lower γ and higher κ).

2. Cross-country inequality:

   Results from differences in R&D efficiency, and is $\uparrow$ in degree of innovation dependence.

   (i.e. higher inequality for lower γ and higher κ on average).

Plan for the Discussion

1. Implications for industry composition and reallocation.
2. Long-run trends in growth and inequality.
3. The role of backwardness vs. localization.

Comment 1: Industry composition and reallocation

- **In the model:**
  - CA in industries that profit most from efficiency of national innovation systems.
  - These are industries where:
    (i) leading firms have strong advantage (low γ)
    (ii) spillovers are localized (high κ).
- **Implications for distribution of firms?**
  - *Intra*-industry selection effects in CA industries...
    - Leaders specialize in R&D and become more dominant $\rightarrow$ Concentration $\uparrow$?
  - ...might lead to *inter*-industry reallocation.
    - Laggard incumbents exit to higher-γ industries + entry of productive firms.
    - Further diffusion through selection-innovation feedback.
      [Perla, Tonetti, Waugh ('15), Sampson ('16)]
- **Suggestions:**
  - Extensions: (i) monopolistic (oligop.?) competition; (ii) spillovers across firms.
  - Study implications for industry concentration $\Rightarrow$ Amplifies income dispersion?

Comment 2: Growth and inequality trends

- **In the data:** Have ↑ in global diffusion ⇒ ↑ growth? ↓ cross-country inequality?
- **Integration in the model:**
  - Growth rate g increasing in R&D spillovers, but independent of:

    (i) localization (as κ affects gaps but not productivity growth)

    (ii) trade costs (as $\tau\downarrow$ has pure market size effect).
  - Similarly → Inequality only affected by dispersion in B_s and ID_j.
- **Suggestions:**
  - Extension with growth effects from openness. For example:
    1. Expands set of markets from which to learn [Buera and Oberfield ('16)]
    2. Implies competition effects, stronger for less efficient firms [Aghion et al. ('17)]
  - **Or...** Explore trends in innovation dependence:
    1. Calibrate two models → Target income inequality in 1980 and 2018.
    2. Compute implied change in the dispersion in B_s's and ID_j's.
    3. Transitional dynamics?
  - Interpret trends in B_s and ID_j as the effects of rise of ICTs?

Comment 3: Backwardness vs. localization

- Estimation:
  - *Goal:* Explain observed income inequality through differences in R&D efficiency.
  - *Strategy:* Back out R&D efficiency (B_s) and innovation-dependence (ID_j) from data.
  - *Result:* Model can account for about one-third of nominal wage dispersion.
- Contributors to income dispersion $\rightarrow$ How much due to...?
  1. Cross-industry differences in backwardness (γ).
  2. Cross-industry differences in degree of localization of spillovers (κ).
- **Suggestions:**
  - *Exercise 1:*
    1. Compare baseline calibration with two counterfactuals: (i) $\gamma_j = \gamma$, (ii) $\kappa_j = \kappa$.
    2. Compute share of cross-country income dispersion generated by each.
  - *Exercise 2:* Target average income inequality for each industry in the data. Then:
    1. Back out implied ID_j's.
    2. Study whether inequality is associated with dispersion in γ_j's or κ_j's.

Conclusion

- Excellent paper! (elegant, ambitious, lots of testable predictions)
- ***Contribution:*** Proposes micro-foundations for:
  - Origins of technology gaps and CA between countries.
  - Global inequality driven by:
    1. Cross-country differences in efficiency of national innovation systems.
    2. Unequal learning depending on distance from frontier.
- My suggestions:
  1. Explore more micro (intra-industry) implications.
  2. Study dynamics and long-run trends.
  3. Disentangle role of different ingredients.