Innovation, Growth and Competitiveness

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Based on


Jena, 30.7-3.8, 2012
What is the competitiveness (of a country)?

- ”the degree to which, under open market competition, a country can produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding domestic real income” (OECD, 1992)
- ”The only meaningful concept of competitiveness at the national level is productivity (…) If a nation loses the ability to compete in a range of high-productivity/high wage industries, its standard of living will be threatened” (Porter, 1990)
- Growth and trade: The external constraint matters….
Explaining competitiveness

- Cost competitiveness questioned: the "Kaldor paradox" (1978)
- Thirlwall (1979): The external constraint, cost competitiveness and "non-price factors" (income elasticities)
- Kaldor (1981): "non-price factors" cannot be taken for granted, but needs to be explained.
- Fagerberg (1988): "non-price factors" reflect the ability to develop & exploit technology
A simple Schumpeterian growth model

Assume that the GDP of a country \( Y \) is a function of its **technological knowledge** \( T \) and its **capacity** for exploiting the benefits of knowledge \( C \):

\[
Y = f(T, C)
\]

The technological knowledge is a function of knowledge (or innovation) created in the country \( N \) and knowledge diffused to the region from outside \( D \):

\[
T = h(N, D)
\]

The diffusion of external knowledge follows a logistic curve \( d \), where \( T_{*\text{\text{cap}}} \) and \( T_{i\text{\text{cap}}} \), represent the frontier country and the country under consideration, respectively:

\[
d = \gamma - \gamma T^{gap} \quad \text{ ( } T^{gap} = \frac{T_{i\text{\text{cap}}}}{T_{*\text{\text{cap}}} } \text{ )}
\]
Why do growth rates differ?

By differentiation and substitution we arrive at the following solution for growth of GDP, using small case letters for growth rates (e.g., $y = \frac{dY}{Y}$, etc.):

$$
y = \gamma \varepsilon_{YT} \varepsilon_{TD} - \gamma \varepsilon_{YT} \varepsilon_{TD} T^{gap} + \varepsilon_{YT} \varepsilon_{TN} n + \varepsilon_{YC} c
$$

where $\varepsilon_{YT} = \frac{\partial Y}{\partial T Y}$ refers to the partial elasticity of GDP with respect to technology (similar for other variables).

Model applied to cross country samples by Fagerberg (1987) and Fagerberg and Verspagen (2002) : All three factors matter, but imitation becomes harder through time, and importance of innovation increases.
Including international trade . .

Assume that exports of a country (i) depend on four factors: its technological competitiveness (T), its capacity to exploit technology commercially (C), its price competitiveness (P) and world demand (W):

\[ X = f(T, C, P, W) \]

Exports

\[ T = \frac{T_i}{T_{world}} \]
\[ C = \frac{C_i}{C_{world}} \]
\[ P = \frac{P_i}{P_{world}} \]

where

Since imports in this model are the “world’s” exports – inverse of the equation above with domestic demand (Y) replacing world demand, we get:

\[ M = g\left(\frac{1}{T}, \frac{1}{C}, \frac{1}{P}, Y\right) \]

Imports
Linking trade & growth: The external constraint

If we assume that trade is in balance, we get:

$$XP = M$$

Finally consider as earlier that technology depends on both national sources ($N$) and diffusion ($D$) from abroad, and that the latter follows a logistic curve. By totally differentiating, substituting and rearranging, the following solution for growth of GDP follows:

$$y = \gamma \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} - \gamma \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} T^{gap} + \varepsilon_{TN} \frac{\varepsilon_{XT} + \varepsilon_{MT}}{\varepsilon_{MY}} n + \frac{\varepsilon_{XC} + \varepsilon_{MC}}{\varepsilon_{MY}} + \frac{\varepsilon_{XP} + \varepsilon_{MP} + 1}{\varepsilon_{MY}} p + \frac{\varepsilon_{XW}}{\varepsilon_{MY}}$$

which reminds us about the simple Schumpeterian growth model ...
Conclusion from the model: Growth = Catch-up potential + Competitiveness

**WHAT to measure:**

- **Technology Competitiveness:** Creation of new knowledge (technology) in the country (innovation) relative to that of competitors.
- **Capacity Competitiveness:** Growth in the capacity to exploit knowledge, independently on where it is created, relative to that of competitors.
- **Price Competitiveness:** Change in relative prices in common currency.
- **Demand Competitiveness:** Growth of world demand weighted by the ratio between the income elasticity for exports and that of imports (*Thirlwall – Kaldor*).

**HOW to measure:**

- **Technology:** R&D, patents, publications and ICT infrastructure.
- **Capacity:** Education, governance, financial system.
- **Price:** Growth in unit labour cost.
- **Demand:** Growth of world demand weighted by export composition.
Technology Competitiveness: 1980-2002

- Losing momentum
- Moving ahead
- Catching up
- Falling further behind

Legend:
- Europe
- North & South America
- Asia & Oceania
- Africa
Price Competitiveness: 1980-2002

- Losing momentum
- Moving ahead
- Catching up
- Falling further behind
Demand Competitiveness: 1980-2002

- Falling further behind
- Losing momentum
- Moving ahead
- Catching up
Explaining growth: 90 countries, 1980-2002

<table>
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Analyzing the dynamics: Lessons

- High explanatory power, robust results
- Potential for diffusion is important, but conditional on:
  - Technology competitiveness
  - Capacity competitiveness
  - Price competitiveness
  - Demand competitiveness
- Some countries disadvantaged by factors related to geography, history and nature
- «Virtuos» and «Vicious» «circles»: Self-reinforcing processes caused by feedbacks from growth on technology and capacity (Fagerberg 1988; endogenous capacity)
- What is the relevance with respect to the current crisis?