Romer or Ricardo?

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Romer or Ricardo?

- Benchmark growth models
  - Quality ladders (Aghion-Howitt, Grossman-Helpman)
  - New varieties (Romer)

- Benchmark trade models
  - Comparative advantage (Ricardo, Eaton-Kortum)
  - Trade in varieties (Krugman, Melitz)

- Quality ladder models of growth/Comparative advantage models of trade: **Ricardo**

- Growth from increase in varieties/trade in horizontal varieties: **Romer**
Romer + Ricardo Model

- Three familiar ingredients:
  - Trade due to Romerian new varieties and Ricardian comparative advantage
  - Growth due to new varieties and quality improvements
  - Quality ladder growth on imported products (knowledge spillovers across countries)

- Growth: Innovation from all sources
  - Innovation in *all* countries $\rightarrow$ growth (same in all countries)
  - Country specific innovation $\rightarrow$ TFP
Romer + Ricardo Model

Trade: Innovation on imports vs. new varieties

- Trade in Steady State:
  - New varieties $\rightarrow$ Export Romerian products
  - Innovate on imports $\rightarrow$ Export Ricardian products

- Product Life-Cycle
  - Products reallocate across countries
  - Romer $\rightarrow$ Ricardo
  - Technology diffuses to more countries (“more Ricardian”?)
  - Exports diffuse to smaller countries as quality improves/costs fall.
Growth and trade determined by innovation rate and type of innovation

Type of innovation affect the *distribution* of import and export growth rates

- New varieties or innovation on imports $\rightarrow$ new exports (or large increases)
- Innovation on imports $\rightarrow$ exit of imports (or large declines)
Empirical distribution of import decline, U.S. vs. China

More innovation on imports in China compared to U.S.
Empirical distribution of export growth, U.S. vs. China

Innovation on imports + new products about the same in U.S. and China
→ More creation of new products in U.S.
Static portion of our model

- Technology
  - Romerian vs. Ricardian products
  - Linear production in labor (fixed factor)
  - CES demand
  - Fixed cost to sell in each market
  - Variable trade cost to sell in foreign market

- Trade
  - Romerian products sold in countries where profits cover fixed cost
  - Ricardian products also have to be lowest cost supplier in each country

- Distribution of World TFP
  - Technology, labor endowment, and balanced trade
Innovation in country $j$: Romerian and Ricardian growth

- Creation of new varieties: $\kappa_j$
  - Random draw over quality of country $j$’s existing products

- Quality ladder growth on domestic products: $\lambda_j$
  - Quality improvement over existing product $\sim$ Pareto $(1, \theta)$
  - Always replace incumbent producer

- Quality ladder growth on imported products: $\delta_j$
  - Quality improvement over foreign incumbent $\sim$ Pareto $(\alpha, \theta)$
  - $\alpha = 1$ for rich and poor on poor; $\alpha < 1$ for poor on rich
  - Probability of success: $\left(\alpha_j \frac{w_k}{w_j} \tau\right)^\theta$
  - Diminishing returns to innovation due to relative wage
## Growth from Domestic and Foreign Innovation

<table>
<thead>
<tr>
<th></th>
<th>Domestic Innovation</th>
<th>Foreign Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing products in</strong> $j$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exported</td>
<td>$\lambda_j$</td>
<td>$\delta_k \left( \frac{w_j}{w_k \tau} \right)^\theta$</td>
</tr>
<tr>
<td>Imported</td>
<td>$\delta_j \left( \frac{w_k \tau}{w_j} \right)^\theta$</td>
<td>$\lambda_k$</td>
</tr>
<tr>
<td><strong>New products in</strong> $j$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New to World</td>
<td>$\kappa_j$</td>
<td>$\kappa_k$</td>
</tr>
<tr>
<td>New to country $j$</td>
<td>–</td>
<td>$\delta_k \left( \frac{w_l}{w_k} \right)^\theta$</td>
</tr>
</tbody>
</table>
Inference: Distribution of import decline and export growth

Large Export Growth

Large Import Decline

TFP (U.S.=1)
Inference: Large vs. small $\alpha$ for poor countries

- Small $\alpha$ makes it more likely for poor country to replace import from poor compared to rich

Imports from poor vs. rich countries with strongly negative growth

- THA
- IND
- CHN
- IDN
- PER
- BRA
- SAF
- MYS
- MEX
- TUR
Sources of world growth
## Sources of *country* growth

<table>
<thead>
<tr>
<th>Source</th>
<th>U.S.</th>
<th>China</th>
<th>Other Rich</th>
<th>Other Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Innovation on Imports</td>
<td>1.1%</td>
<td>76.0%</td>
<td>10.3%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Domestic Innovation on New Products</td>
<td>52.4%</td>
<td>1.3%</td>
<td>12.8%</td>
<td>12.3%</td>
</tr>
<tr>
<td>Foreign Innovation</td>
<td>25.8%</td>
<td>21.9%</td>
<td>64.6%</td>
<td>60.4%</td>
</tr>
</tbody>
</table>
Growth from foreign innovation

[Graph showing employment growth from foreign innovation with various countries labeled, including ISR, AUS, CAN, TUR, MEX, ARG, THA, KOR, IDN, BRA, IND, JPN, USA, and CHN. The x-axis represents Employment (U.S.=1), and the y-axis shows growth.]
Growth from foreign new products

New to World

New to Country

Employment (U.S.=1)
Empirical distribution of import growth, U.S. vs. Colombia/South Africa

U.S.

Colombia

South Africa

Import Growth Rate
Gain of Romerian/Ricardian exports vs. Romerian trade share

Mostly Romerian exports: US, Argentina
Mostly Ricardian exports: India, China, EU
Reallocation of products across countries

U.S. and Other Rich Share

China and Other Poor Share

Graph showing the share of cohort across different ages for the U.S. and Other Rich Share, and China and Other Poor Share respectively.
Products are “More Ricardian” with age

Romerian Share

# Countries with Blueprint

![Graph showing the decrease in the probability of Romerian products with age and the increase in the number of countries with a blueprint with age.](image-url)
Exports diffuse to smaller countries with age
Recap of our findings

- Growth accounting
  - 43% of growth is Romerian
  - 44% of growth is from foreign innovation
  - U.S. is an outlier: 64% Romerian, 26% from foreign

- Trade accounting
  - Romerian share: 32% for the World, 87% for U.S., 1% for China

- Global product life cycle
  - U.S. share falls, and “other rich” share rises as products age