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

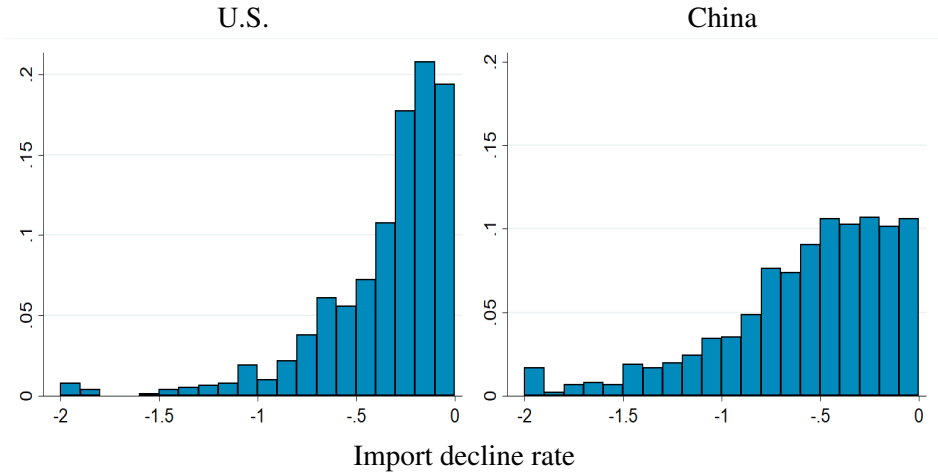
Trade: Innovation on imports vs. new varieties

- 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.

Romer + Ricardo Model: Inference

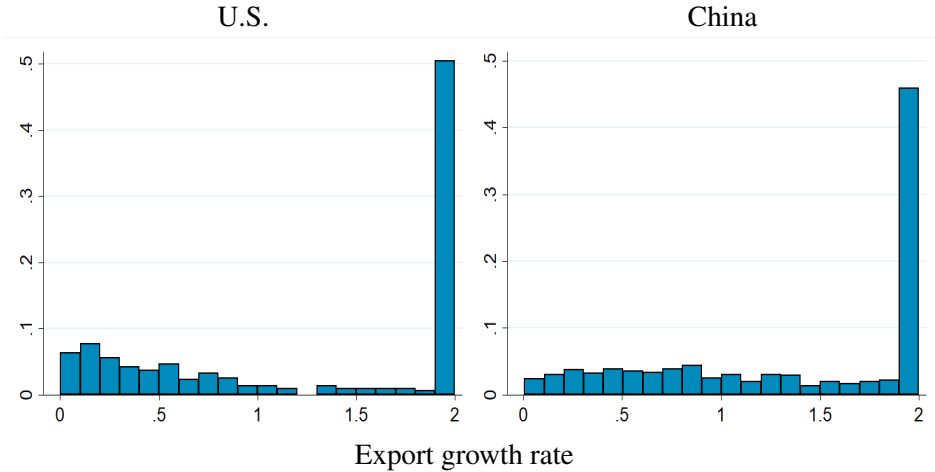
- Growth and trade determined by innovation rate and type of innovation
- Type of innovation affect the *distribution* of import and export growth rates
  - New varieties or innovation on imports $\rightarrow$ new exports (or large increases)
  - Innovation on imports $\rightarrow$ exit of imports (or 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

$\rightarrow$ 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

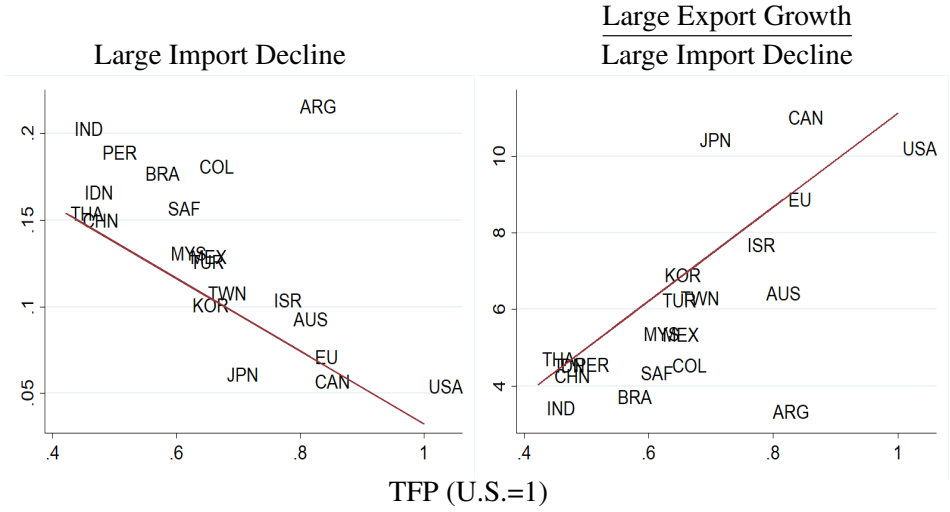
Innovation in country j: Romerian and Ricardian growth

- Creation of new varieties: κ_j
  - Random draw over quality of country j's existing products
- Quality ladder growth on domestic products: λ_j
  - Quality improvement over existing product $\sim$ Pareto $(1, \theta)$
  - Always replace incumbent producer
- Quality ladder growth on imported products: δ_j
  - Quality improvement over foreign incumbent $\sim$ Pareto (α, θ)
  - $\alpha = 1$ 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

	Domestic Innovation	Foreign Innovation
Existing products in j		
Exported	λ_j	$\delta_k \left(\frac{w_j}{w_k \tau}\right)^{\theta}$
Imported	$\delta_j \left(\frac{w_k \tau}{w_j}\right)^{\theta}$	λ_k
New products in j		
New to World	κ_j	κ_k
New to country j	–	$\delta_k \left(\frac{w_l}{w_k}\right)^{\theta}$

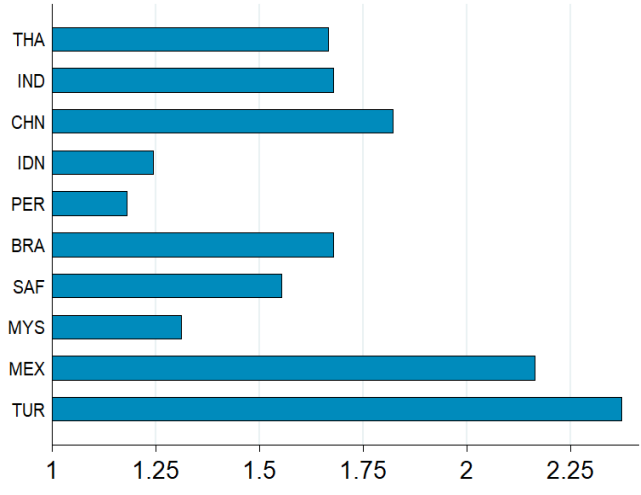
Inference: Distribution of import decline and export growth



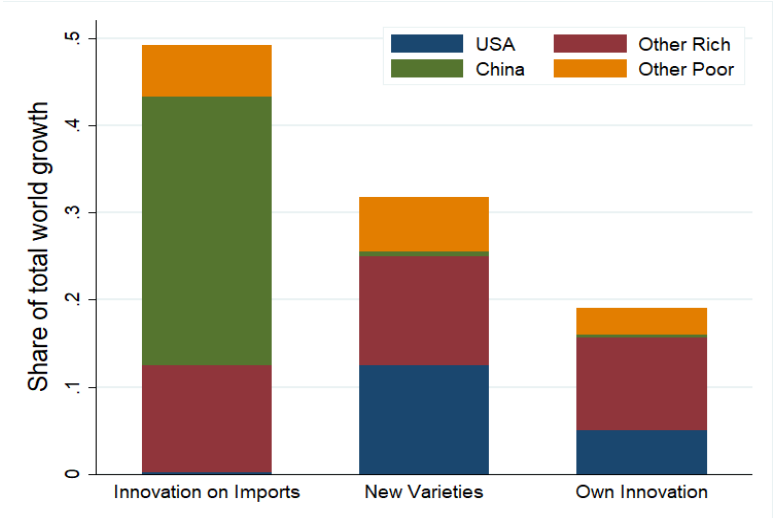
Inference: Large vs. small α for poor countries

- Small α 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



Sources of *world* growth

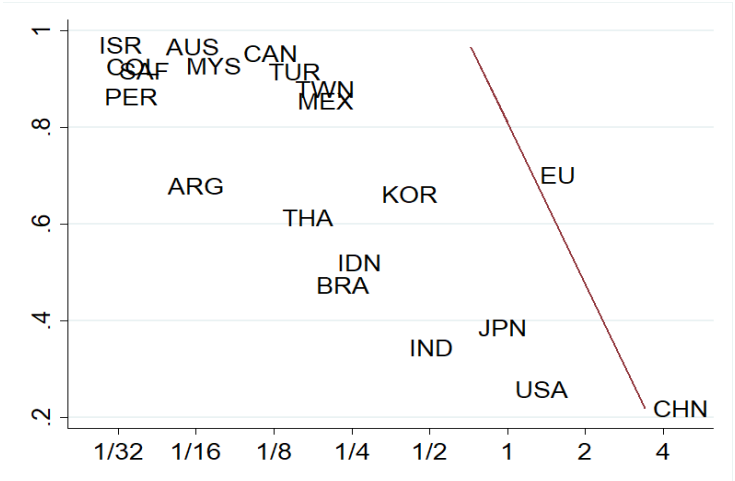


Sources of *country* growth

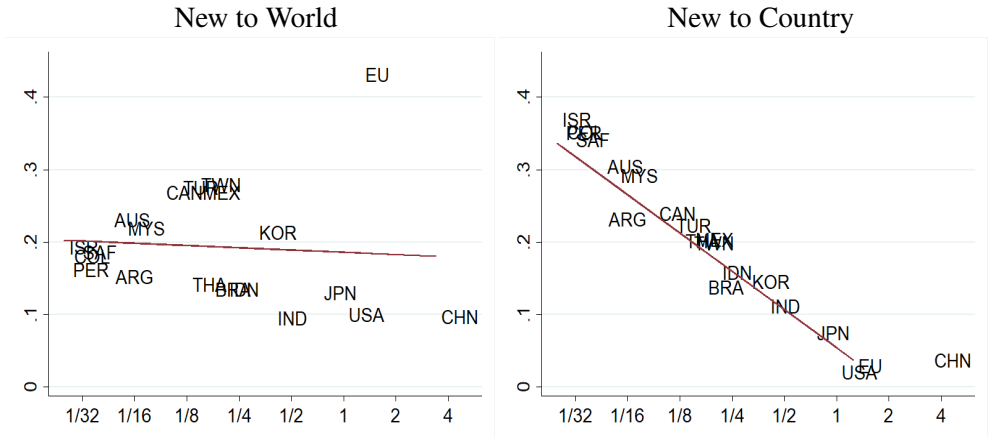
	U.S.	Other Rich	China	Other Poor
Domestic Innovation on Imports	1.1%	10.3%	76.0%	19.3%
New Products	64.4%	51.9%	14.7%	46.4%
Foreign Innovation	25.8%	64.6%	21.9%	60.4%

New products include products new to country

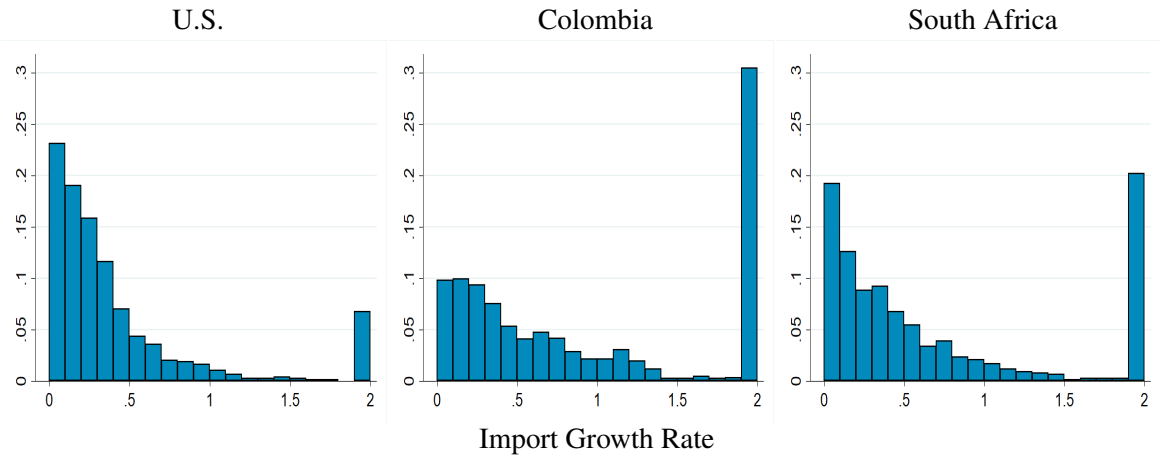
Growth from foreign innovation



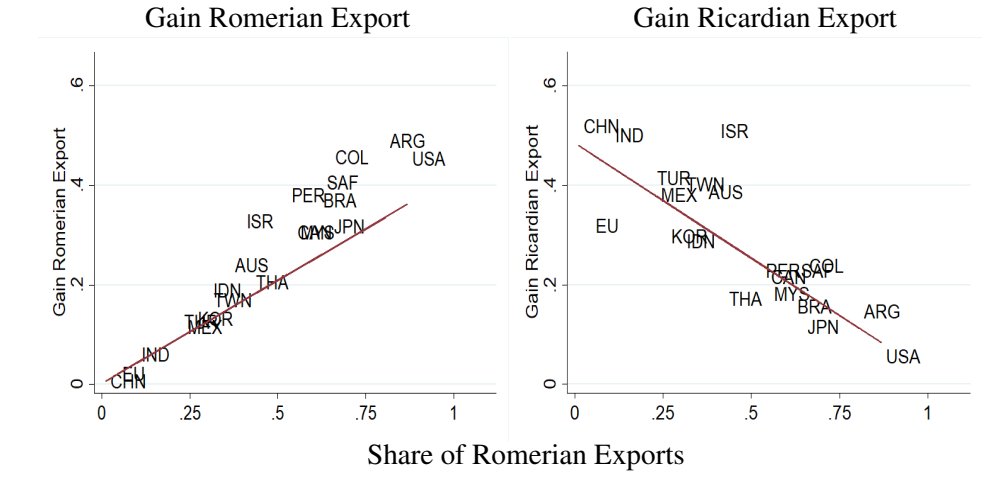
Growth from foreign new products



Empirical distribution of import growth, U.S. vs. Colombia/South Africa

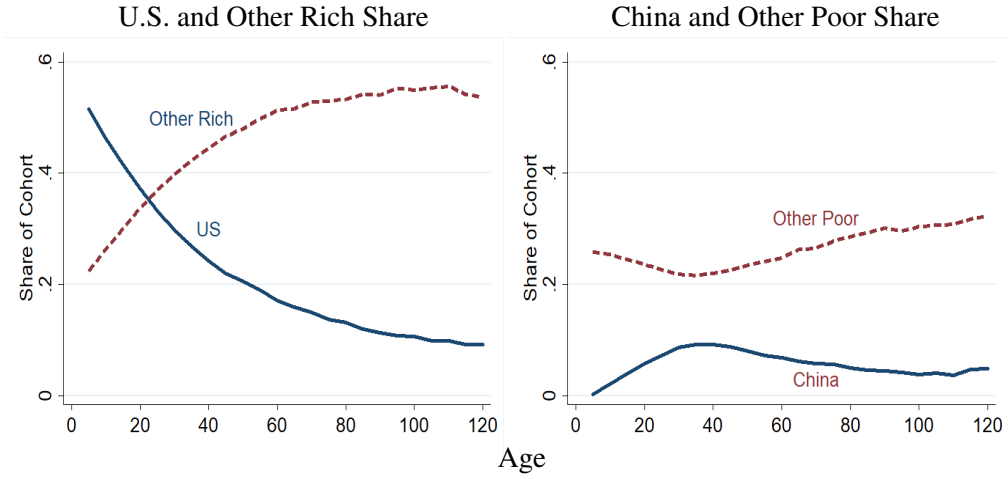


Gain of Romerian/Ricardian exports vs. Romerian trade share

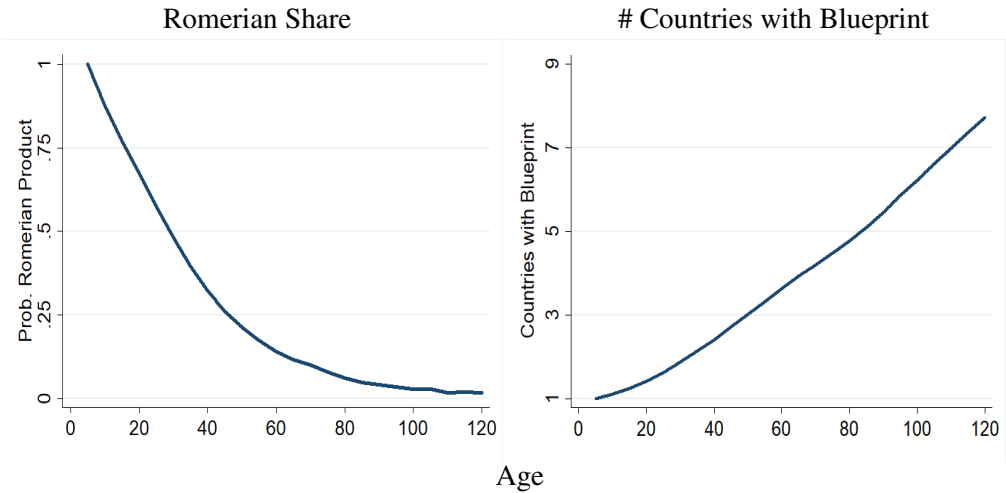


Mostly Romerian exports: US, Argentina
Mostly Ricardian exports: India, China, EU

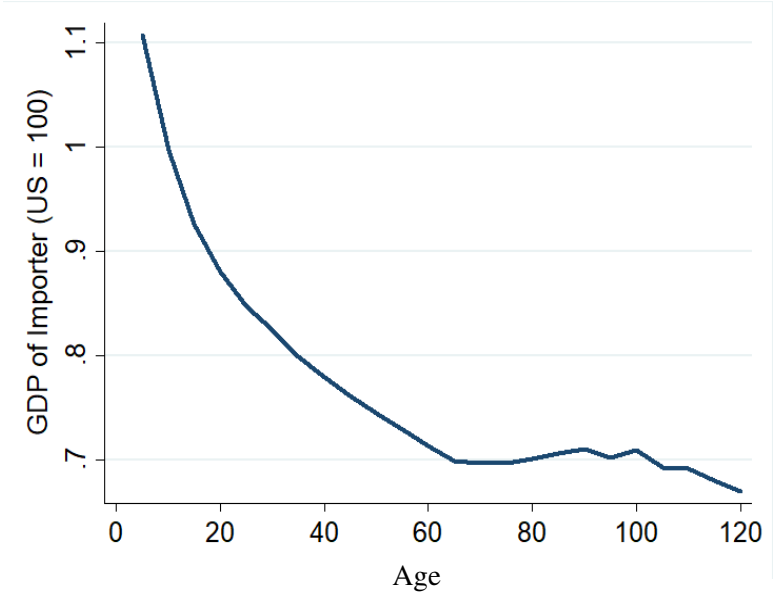
Reallocation of products across countries



Products are “More Ricardian” with age



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