

14.662 Recitation 4

Canonical Models of Trade and Technology

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Why Study Trade?

- Trade patterns have changed drastically over the past 35 years
 - Increasing share of low income countries in world manufacturing
 - More trade between low- and middle-income countries
 - “Hyper-specialization” in many emerging economies
 - See Hanson (2012) (“The Rise of Middle Kingdoms”) for more
- Strong anecdotal links between trade and increased wage inequality
- Canonical intuition: opening of trade between developed (skill-endowed) and developing (unskill-endowed) economies analogous to decline in relative supply of skill in developed countries
- How can we formalize this story? What is the role of technology?

A Simple Model of Trade and Inequality

- Two tradable goods, Y_h and Y_l ; representative utility $(Y_l^\rho + Y_h^\rho)^{1/\rho}$
- Production: $Y_h = A_h H$ and $Y_l = A_l L$ for skilled/unskilled H and L
- Without trade, relative price of skill-intensive goods is

$$\begin{aligned} \frac{p_h}{p_l} &= \frac{\partial U / \partial Y_h}{\partial U / \partial Y_l} = Y_h^{\rho-1} / Y_l^{\rho-1} \\ &= \left(\frac{A_h H}{A_l L} \right)^{\rho-1} \equiv p^{US} \end{aligned}$$

- The skill premium is the ratio of the marginal value products:

$$\omega^{US} = \frac{\partial Y_h / \partial H}{\partial Y_l / \partial L} p^{US} = (A_h / A_l) p^{US}$$

A Simple Model of Trade and Inequality (cont.)

- Suppose U.S. starts trading with a LDC with same technology A_h, A_l
- LDC labor endowments: \hat{H} and \hat{L} with $\hat{H}/\hat{L} < H/L$
- Unique world relative price with trade:

$$p^W = \left(\frac{A_h (H + \hat{H})}{A_l (L + \hat{L})} \right)^{\rho-1} > p^{US}$$

Trade increases price of skill-intensive good. Why?

- Unique skill premium with trade:

$$\omega^W = (A_h/A_l)p^W > p^W$$

Trade with developing countries increases wage inequality

- Opposite effect on prices and wages for the LDC

A One-Good Model

- The above model easily generalizes to a workhorse Heckscher-Ohlin
 - Central notion: differences in factor endowments drive trade patterns
- Can work through the math, but graphical intuition (via Lerner diagrams) often sufficient
- Warm-up: one sector and (as above) two factors.
- Basic H-O assumptions: CRTS and quasi-concave production function, perfect competition, homothetic representative preferences (i.e. no income effects)
- Production function gives isoquants in factor space, wage ratio gives slope of isocost curve (and intersections give inverse wage)
- How to graph skill-biased (e.g. factor-biased) technical change?

SBTC in a One-Good Model

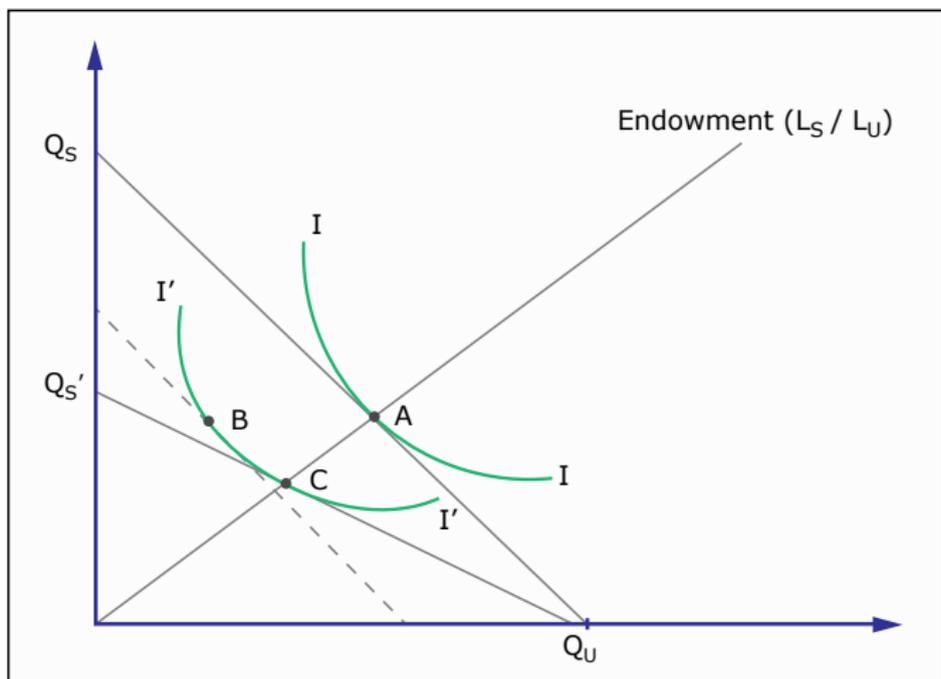


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- Excess demand for skilled labor at pre-SBTC prices: $w'_S/w'_U > w_S/w_U$

Trade in a Two-Good, Two-Factor Economy

- Now suppose two goods, with one skill-intensive and the other unskill-intensive
 - E.g. $Y_s = \alpha_s H^{\beta_s} L^{1-\beta_s}$ and $Y_u = \alpha_u H^{\beta_u} L^{1-\beta_u}$ with $\beta_s > \beta_u$
- Isocosts as before; isoquants become iso*value* curves (include prices)
- Consider small skill-intensive economy that opens to trade
 - Assume both goods produced in equilibrium (i.e. equilibrium lies in “the cone of diversification”)
 - Assume prices are parametric (because the country is small)
- As above, trade raises relative price of skill-intensive good; iso*value* curve shifts towards the origin. Relative wage of skilled labor rises
- New insight: relative use of skilled labor within each sector *falls*

A Skill-Intensive Economy Opens to Trade

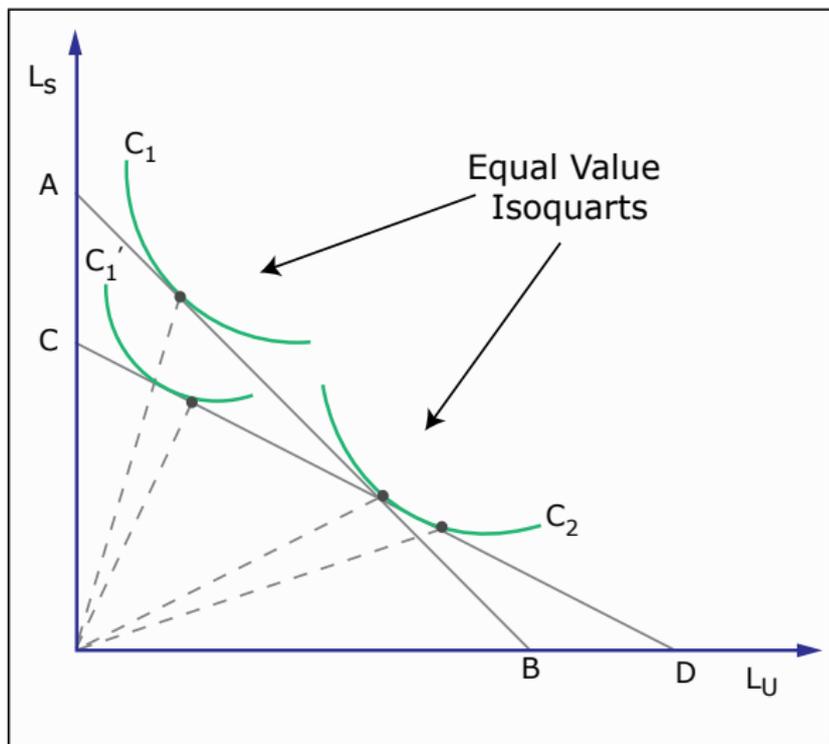


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- Higher price of skill-intensive good: $w'_S/w'_U > w_S/w_U$

Factor-biased Technical Change in a Small Open Economy

- Consider technical change biased towards the skilled factor, saving in equal proportion in each sector
 - Value isoquants shift equally towards the origin
 - Corresponds to β_s and β_u rising proportionately in earlier model
- Because the economy is small, no effect on world prices; no change in relative wages (though all workers are better off)
- Compare to earlier SBTC example with one good; economy accommodates change in effective factor supply by shifting production across goods, so demand for factors is in effect perfectly elastic
 - This is the basis for Leamer's (1994) criticism of the SBTC explanation for falling relative unskilled wages
- But what if the economy is large, or if technical change is pervasive (Krugman, 1995)?

Factor-biased Technical Change

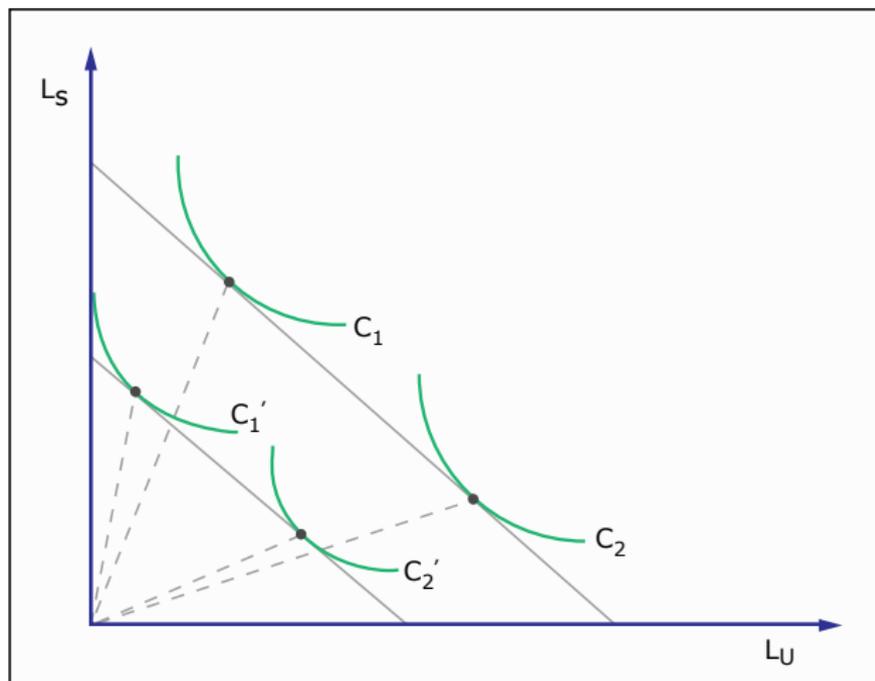


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- Skilled sector relatively contracts to clear labor mkt.: $w'_S/w'_U = w_S/w_U$

Pervasive Factor-biased Technical Change

- What if the technical change affects many countries at once? The world market reacts much like a single country experiencing SBTC
- As unskilled sector relatively grows, global price of unskilled-intensive good declines
- Isovalue curve shifts relatively out, decreasing relative unskilled wages
- Consistent with simultaneous substitution towards skilled labor in most sectors of many developed countries since the 1980s (Berman, Bound, and Machin 1998)

Pervasive Factor-biased Technical Change

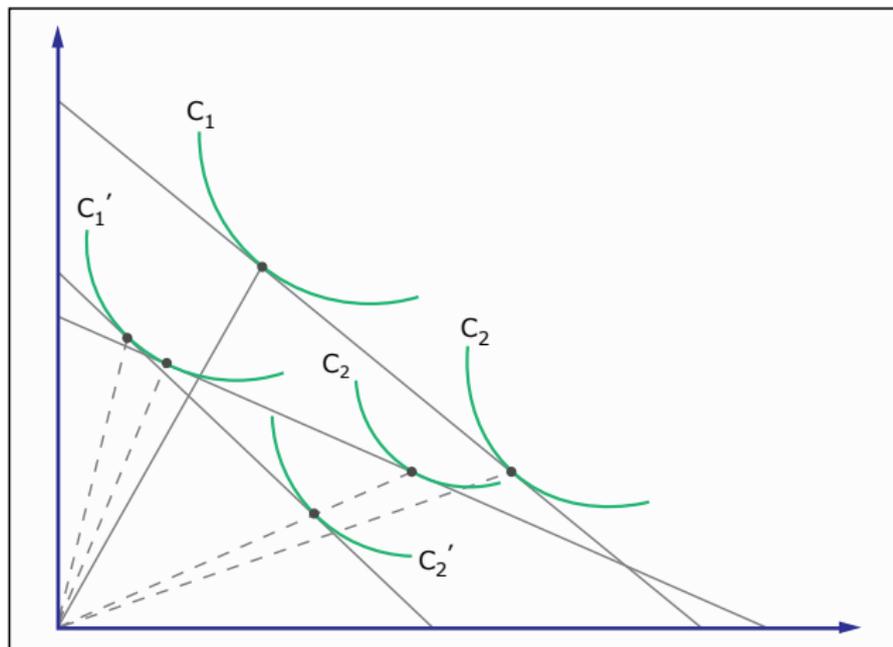


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- Fall in price of unskill-intensive good: $w'_S/w'_U > w_S/w_U$

How does H-O Fall Short?

- Predictions hard to map to / routinely refuted by data
 - Ex.: Leontief 'paradox' (1954): U.S. the most capital-abundant country, yet exports labor-intensive commodities and imports capital-intensive commodities
- Not just about endowments: within-industry productivity varies widely
- Factor Price Equalization does not hold empirically
- Country size and distance appear important
 - Trade between countries diminishes with distance
 - Large countries trade less relative to GDP
 - Countries import more from larger countries
 - Prices more different for countries that are further apart
- Trade flow data more abundant than trade price data (H-O makes no real predictions about trade volumes)
- All of these issues better understood with gravity

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