The Home Market Effect and Patterns of Trade Between Rich and Poor Countries

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Introduction

- Empirically rich (poor) countries tend to export high (low) income elastic products

- Standard trade models assume *homothetic preferences* to focus on the supply side determinants of the patterns of trade

- Just adding *nonhomothetic preferences* in the standard models would, *ceteris paribus*, make rich countries *import* high income elastic goods

- *Virtually* all models of trade with nonhomothetic preferences *assume* that the rich have CA in high income elastic goods.
  - ✓ **Ricardian:** Flam-Helpman (1987), Stokey (1991), Matsuyama (2000), Fieler (2011)
  - ✓ **Factor endowment**: Markusen (1986), Caron-Fally-Markusen (2014)

These models suggest that the rich export high income elastic goods *despite* they demand relatively more of them.

- Here, we explain *why* the rich have CA in high income elastic goods based on *Home Market Effect*, suggesting that the rich export high income elastic goods *because* they demand relatively more of them.

Home Market Effect (HME): Krugman's (1980) example

- Two Dixit-Stiglitz monopolistic competitive sectors, α & β, with iceberg trade costs
- One factor of production (labor)
- Two countries of equal size, A & B, *mirror-images* of each other
  - A is a nation of α-lovers; with the minority of β-lovers.
  - B is a nation of β-lovers, with the minority of α-lovers.

In equilibrium,

- **Under autarky**, proportionately large share of firms in A operates in sector α.
- **Under trade**, disproportionately large share of firms in A operates in sector α.
- A becomes a net-exporter in α; B a net exporter in β.

Key Insight: With scale economies and positive but finite trade costs, a relatively larger domestic market is a source of comparative advantage.

Notes: In Krugman (1980),

- Demand composition differs across countries due to ***exogenous variations in taste***
- The mirror image setup obscures crucial factors of HME. Also restricts comparative static exercises

This Paper: Krugman-type HME model with demand composition difference due to nonhomothetic preferences. Also dispenses with the mirror-images setup.

- *Continuum* of Dixit-Stiglitz monopolistic competitive sectors with iceberg trade costs
- Two countries; may differ only in *per capita labor endowment* and *population size*.
- Preferences across sectors: ***Implicitly Additively Separable Nonhomothetic CES***
  - Sectors indexed such that their income elasticity is increasing in the index.
  - The Rich has relatively larger domestic market than the Poor in the higher indexed

Under Trade Equilibrium, HME implies
- The Rich's share of firms are disproportionately larger in higher-indexed sectors
- The Rich run trade surpluses (deficits) in higher (lower)-indexed sectors.

Comparative Statics: *Due to endogenous demand compositions*, uniform productivity improvement and a trade cost reduction cause
- *Product cycles:* The Rich switches from a net exporter to a net importer in the middle
- *Welfare gaps to widen (narrow),* when different sectors produce substitutes (complements)
- When two countries differ in size, a trade cost reduction has additional effects due to the ToT change; *Leapfrogging* and *Reversal of the patterns of trade*

Explicitly vs. Implicitly Additive Separability: Hanoch (1975)

Explicit Additivity: $u = \int_0^1 f_s(c_s)ds$; CES if $u = \int_0^1 \omega_s (c_s)^{1-1/\eta} ds$

Pigou's Law: $\dfrac{\text{Income Elasticity of Good s}}{\text{Price Elasticity of Good s}}$ = constant

Two Problems:

i) Empirically false (Deaton 1974 and others)

ii) Conceptually impossible to disentangle the effects of income elasticity differences from those of price elasticity differences

Implicit Additivity: $\int_0^1 f_s(u, c_s)ds = 1$; CES if $\int_0^1 \omega_s(u)(c_s)^{1-1/\eta} ds = 1$

i) Price elasticities & income elasticities can be separate parameters.

ii) *Nonhomothetic CES* if $\dfrac{\partial \log \omega_s(u)}{\partial u}$ varies with *s*. When we can index s to make it monotone increasing in s, $\dfrac{\partial^2 \log \omega_s(u)}{\partial s \partial u} > 0$, *log-supermodularity*

Fajgelbaum-Grossman-Helpman (2011); FGH

- A monopolistic competitive sector producing indivisible products with trade costs, with two segments, H&L, across which products are *vertically* differentiated.
- A competitive outside sector producing the divisible numeraire to pin down the ToT
- Each household consumes one unit of a particular product from either H or L.
  - A *discrete choice model* a la McFadden, a *nested-logit demand structure*
  - The rich consumers more likely to choose an H-product if marginal utility of the numeraire is higher when combined with an H-product
- The Rich (Poor) becomes a net-exporter of high-quality H (low-quality L) products.

FGH focuses on specialization along the quality dimension within a single industry.
Our model focuses on specialization across a broader range of industries.

Some Advantages of Our Framework

- A minimum departure from the standard HME models
- Parsimonious and yet flexible
  - Comparative statics with any number of sectors and the ToT effect
  - Income elasticities are separate parameters from price elasticities
  - Different sectors may produce substitutes, as in Flam-Helpman (1987), Stokey (1991), and FGH (2011), or complements, as in Matsuyama (2000)

Organization of the Paper

1. Introduction
2. HME with Nonhomothetic Preferences
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    - 2.2 Autarky Equilibrium
    - 2.3 Trade Equilibrium and Patterns of Trade
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3. HME with Exogenous Taste Variations: A Comparison
4. Adding an Outside Goods Sector
5. Concluding Remarks

Appendix: Two Lemmas

Home Market Effect with Nonhomothetic Preferences

One Nontradeable Factor (Labor)

Two Countries: (j or k = 1 or 2)

N^j identical households with labor endowment h^j, supplied inelastically at w^j.

- $w^j h^j = E^j$: Household Income (and Expenditure)
- $L^j = h^j N^j$; Total Labor Supply in j

N^j and h^j are the only possible sources of heterogeneity across the two countries.

Tradeable Goods:

- A continuum of monopolistically competitive sectors, $s \in [0,1]$,
- Each sector produces a continuum of tradable differentiated goods, $\nu \in \Omega_s = \Omega_s^1 + \Omega_s^2$,

Ω_s^j: Disjoint sets of differentiated goods in sector s produced in country j in equilibrium

Household Preferences: Two-Tier structure

Lower-level, usual Dixit-Stiglitz aggregator (Homothetic within each sector)

$$\tilde{C}_s^k \equiv \left[\int_{\Omega_s} \left(c_s^k(\nu) \right)^{1-\frac{1}{\sigma}} d\nu \right]^{\frac{\sigma}{\sigma-1}}; \ \sigma > 1, \quad s \in [0,1]$$

Upper-level, $\tilde{U}^k = U\left(\tilde{C}_s^k, s \in [0,1]\right)$, ***implicitly*** given by

$$\int_0^1 (\beta_s)^{\frac{1}{\eta}} \left(\tilde{U}^k\right)^{\frac{\varepsilon(s)-\eta}{\eta}} \left(\tilde{C}_s^k\right)^{\frac{\eta-1}{\eta}} ds \equiv 1; \ \beta_s > 0 \text{ and } \sigma > \eta \neq 1$$

- $(\varepsilon(s) - \eta)/(1-\eta) > 0$ for global monotonicity & quasi-concavity
- $\int_0^1 \varepsilon(s) ds = 1$, without loss of generality.
- If $\varepsilon(s) = 1$ for all $s \in [0,1]$, standard homothetic CES
- If $\varepsilon(s) \neq 1$, ***nonhomothetic.*** Index sectors so that $\varepsilon(s)$ is ***increasing*** in $s \in [0,1]$. Then,

$$\omega\left(s, \tilde{U}^k\right) \equiv (\beta_s)^{\frac{1}{\eta}} \left(\tilde{U}^k\right)^{\frac{\varepsilon(s)-\eta}{\eta}}$$ is ***log-supermodular*** in s and $\tilde{U}^k$.

Lemma 1: For a positive value function, $\hat{g}(\bullet;x)$: [0,1] → R₊, with a parameter *x*, define

$$g(s;x) \equiv \frac{\hat{g}(s;x)}{\int_0^1 \hat{g}(t;x)dt} \text{ (a density function) and } G(s;x) \equiv \int_0^s g(t;x)dt = \frac{\int_0^s \hat{g}(t;x)dt}{\int_0^1 \hat{g}(t;x)dt}$$

(its cumulative distribution function).

If $\hat{g}(s;x)$ is ***log-supermodular*** in *s* and *x*, *i.e.* $\frac{\partial^2 \log \hat{g}(s;x)}{\partial s \partial x} > 0$,

i) $\frac{g(s;x)}{g(s;x')}$ is decreasing in s for $x < x'$; **Monotone Likelihood Ratio (MLR)**

ii) $G(s;x) > G(s;x')$ for $x < x'$. **First-Order Stochastic Dominance (FSD)**

The happier households put more weights on the higher-indexed goods.

Household Maximization: Two-Stage Budgeting

1st Stage (Lower-level) Problem: Chooses $c_s^k(\nu)$ for $\nu \in \Omega_s$ to:

$$\text{Max } \tilde{C}_s^k \equiv \left[\int_{\Omega_s} \left(c_s^k(\nu)\right)^{1-\frac{1}{\sigma}} d\nu \right]^{\frac{\sigma}{\sigma-1}}, \text{ subject to } \int_{\Omega_s} p_s^k(\nu) c_s^k(\nu) d\nu \le E_s^k,$$

$p_s^k(\nu)$ & $c_s^k(\nu)$: the unit consumer price and consumption of variety $\nu \in \Omega_s$;

E_s^k: Expenditure allocated to sector-s, taken as given.

Solution:

$$c_s^k(\nu) = \left(\frac{p_s^k(\nu)}{P_s^k} \right)^{-\sigma} C_s^k = \frac{\left(p_s^k(\nu)\right)^{-\sigma}}{\left(P_s^k\right)^{1-\sigma}} E_s^k, \quad \text{where } P_s^k \equiv \left[\int_{\Omega_s} \left(p_s^k(\nu)\right)^{1-\sigma} d\nu \right]^{\frac{1}{1-\sigma}}$$

C_s^k: the maximized value of $\tilde{C}_s^k$, satisfying $E_s^k = P_s^k C_s^k$.

2[nd] stage (Upper Level) Problem: Choose $E_s^k = P_s^k C_s^k$ to:

$$\text{Max } \tilde{U}^k, \text{ subject to } \int_0^1 (\beta_s)^{\frac{1}{\eta}} \left(\tilde{U}^k\right)^{\frac{\varepsilon(s)-\eta}{\eta}} \left(C_s^k\right)^{\frac{\eta-1}{\eta}} ds \equiv 1 \text{ and } \int_0^1 P_s^k C_s^k ds = \int_0^1 E_s^k ds \leq E^k.$$

Solution: *the share of sector-s in k's expenditure,* m_s^k

$$m_s^k \equiv \frac{E_s^k}{E^k} \equiv \frac{P_s^k C_s^k}{E^k} = \frac{\beta_s \left(U^k\right)^{\varepsilon(s)-\eta} \left(P_s^k\right)^{1-\eta}}{\int_0^1 \beta_t \left(U^k\right)^{\varepsilon(t)-\eta} \left(P_t^k\right)^{1-\eta} dt},$$

where U^k is the maximized value of $\tilde{U}^k$, given implicitly by:

$$\left(E^k\right)^{1-\eta} \equiv \int_0^1 \beta_s \left(U^k\right)^{\varepsilon(s)-\eta} \left(P_s^k\right)^{1-\eta} ds. \qquad (U^k \text{ is strictly increasing in } E^k.)$$

Notes:

- $\partial \log(m_s^k / m_{s'}^k) / \partial \log(U^k) = \varepsilon(s) - \varepsilon(s')$. Higher-indexed more income elastic; Income elasticity differences are constant across different per capita income levels.
- $\beta_s \left(U^k\right)^{\varepsilon(s)-\eta} \left(P_s^k\right)^{1-\eta}$ is *log-supermodular* in *s* and U^k. From **Lemma 1**, for fixed prices, a higher E^k (and U^k) shifts the expenditure share towards higher-indexed.

The Rest of the model: Deliberately kept the same with Krugman (1980).

Iceberg Trade Costs: Only $1/\tau < 1$ fraction of exports survives shipping, reducing the export revenue to its fraction, $\rho \equiv (\tau)^{1-\sigma} < 1$

CES Demand for each good; $D_s(\nu) = A_s^j (p_s^j(\nu))^{-\sigma}$, $\nu \in \Omega_s^j$, where

$A_s^j \equiv b_s^j + \rho b_s^k \ (k \neq j)$: Aggregate demand shifter for the producers in j in s

$b_s^k \equiv \beta_s \left(E^k\right)^\eta \left(U^k\right)^{\varepsilon(s)-\eta} N^k \left(P_s^k\right)^{\sigma-\eta}$; k's demand shifter for sector s

Standard CES demand curve, but U^k affects b_s^k and hence A_s^j differently across s.

Constant Mark-Up: ψ_s units of labor to produce one unit of each variety in sector-*s*

$$p_s^j(\nu) = \frac{w^j \psi_s}{1 - 1/\sigma} \equiv p_s^j \quad \text{for } \nu \in \Omega_s^j$$

Free Entry (Zero-Profit) Condition: ϕ_s units of labor per variety to set up in sector-*s*.

Labor Market Equilibrium: $\int_0^1 f_s^j ds = 1$, f_s^j: sectoral share in employment (and value-added) and, if appropriately normalized, in the measure of firms (and varieties).

Autarky Equilibrium **($\rho = 0$):**

Standard-of-Living: $U_0^k = u(x_0^k)$ where $x_0^k \equiv (h^k)^{\sigma} N^k = (h^k)^{\sigma-1} L^k$

where $u(x)$ is defined implicitly by $(x)^{\left(\frac{1-\eta}{\sigma-\eta}\right)} \equiv \int_0^1 \left(\beta_s (u(x))^{(\varepsilon(s)-\eta)}\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)} ds$.

- $U_0^k = u(x_0^k)$ is increasing both in h^k and in N^k. Aggregate increasing returns
- Even if $h^1 > h^2$, $U_0^1 < U_0^2$ holds when $L^1 / L^2 < (h^1 / h^2)^{1-\sigma} < 1$.

Market Size (and Firm) Distributions: $f_s^k = m_s^k = \dfrac{\left(\beta_s (u(x_0^k))^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}}{\int_0^1 \left(\beta_t (u(x_0^k))^{(\varepsilon(t)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}} dt}$

Notes:

- In autarky, firms (and labor) are distributed proportionately with market sizes.
- $\left(\beta_s (u(x_0^k))^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}$ is *log-supermodular* in s and x_0^k. From **Lemma 1,**

With a higher $x_0^k \equiv (h^k)^{\sigma} N^k$, the household becomes happier and spends relatively more on higher-indexed goods *in equilibrium*.

- Compare $m_s^k = \dfrac{\left(\beta_s\left(u(x_0^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}}{\int_0^1 \left(\beta_t\left(u(x_0^k)\right)^{(\varepsilon(t)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}} dt}$ & $m_s^k = \dfrac{\beta_s\left(U^k\right)^{\varepsilon(s)-\eta}\left(P_s^k\right)^{1-\eta}}{\int_0^1 \beta_t\left(U^k\right)^{\varepsilon(t)-\eta}\left(P_t^k\right)^{1-\eta} dt}$ and

notice $\dfrac{\sigma-1}{\sigma-\eta} > 1$ iff $\eta > 1$.

Given price indices, $U \uparrow$ shifts the expenditure toward the higher-indexed.

In equilibrium, this causes entries (exits) and hence more (less) varieties in the higher (lower)-indexed sectors, reducing the effective relative prices of higher-indexed goods, which amplifies (moderates) the shift if η > (<) 1.

- $\dfrac{d\log u(\lambda x)}{d\log\lambda} = \dfrac{\lambda x u'(\lambda x)}{u(\lambda x)} = \zeta(\lambda x)$ is increasing (decreasing) in x, if η >(<) 1. Hence,

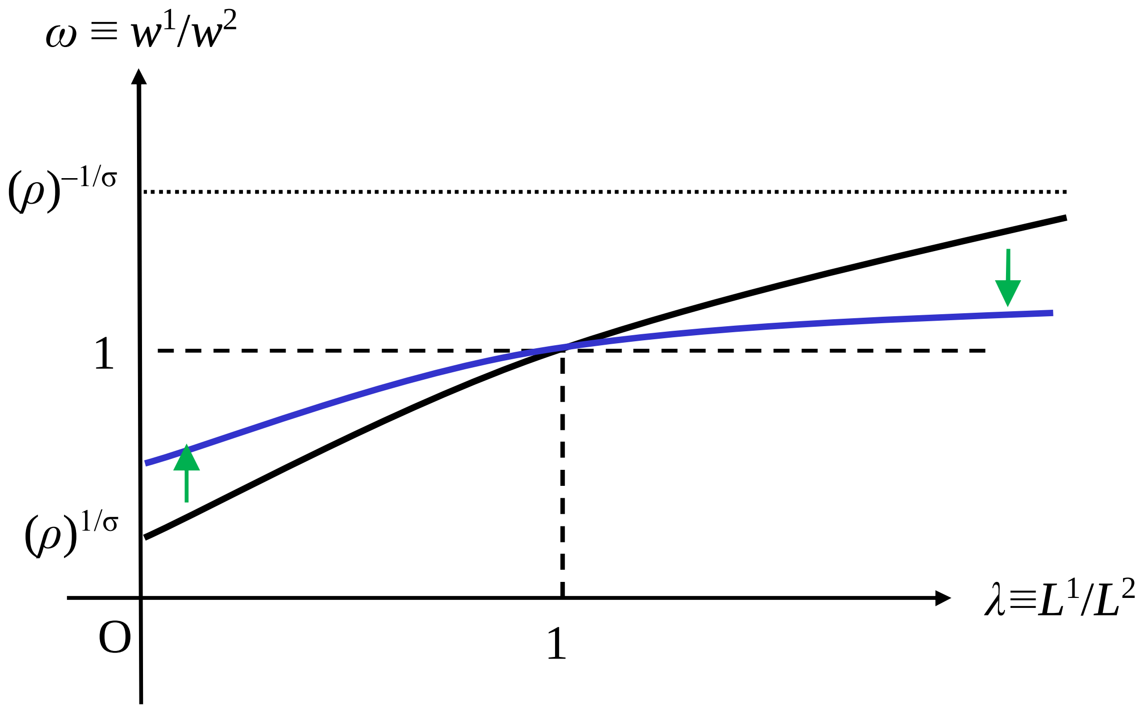
  i) If $\eta < 1$, gains from a percentage increase in x is lower at a higher x.

  ii) If $\eta > 1$, gains from a percentage increase in x is higher at a higher x.

Trade Equilibrium and Patterns of Trade

Figure 1: (Factor) Terms of Trade Determination

$$\frac{L^1}{L^2} = \Lambda(\omega;\rho) \equiv (\omega)^{2\sigma-1}\frac{1-\rho(\omega)^{-\sigma}}{1-\rho(\omega)^{\sigma}}, \text{ where } \omega \equiv \frac{w^1}{w^2}.$$



- The factor price lower in the smaller economy (Aggregate increasing returns)
- Globalization ($\tau\downarrow$ or $\rho\uparrow$) reduces the smaller country's disadvantage and hence the factor price differences.

Standard-of-Living: summarized by a single index, x_ρ^k

$$U_\rho^1 = u\left(x_\rho^1\right), \text{ where } x_\rho^1 \equiv \frac{(1-\rho^2)x_0^1}{1-\rho(\omega)^{-\sigma}} > x_0^1\;;\; U_\rho^2 = u\left(x_\rho^2\right), \text{ where } x_\rho^2 \equiv \frac{(1-\rho^2)x_0^2}{1-\rho(\omega)^{\sigma}} > x_0^2$$

$u(x)$, defined as before. **Gains from trade**

Market Size Distributions: $m_s^k = \dfrac{\left(\beta_s\left(u(x_\rho^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}}{\left(x_\rho^k\right)^{\left(\frac{1-\eta}{\sigma-\eta}\right)}} = \dfrac{\left(\beta_s\left(u(x_\rho^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}}{\int_0^1\left(\beta_t\left(u(x_\rho^k)\right)^{(\varepsilon(t)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}dt}$

$\left(\beta_s\left(u(x_\rho^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}$ is *log-supermodular* in *s* & x_ρ^k. From **Lemma 1**, if $u\left(x_\rho^1\right) < u\left(x_\rho^2\right)$

i) **MLR:** $\dfrac{m_s^1}{m_s^2} = \left(\dfrac{x_\rho^1}{x_\rho^2}\right)^{\left(\frac{\eta-1}{\sigma-\eta}\right)}\left(\dfrac{u(x_\rho^1)}{u(x_\rho^2)}\right)^{(\varepsilon(s)-\eta)\left(\frac{\sigma-1}{\sigma-\eta}\right)}$ is strictly decreasing in *s:*

ii) FSD: $\int_0^1 m_t^1 dt > \int_0^1 m_t^2 dt$

The Rich (Poor) has relatively larger domestic markets in higher(lower)-indexed sectors.

Firm Distributions: $f_s^1 = \dfrac{m_s^1 - \rho(\omega)^{-\sigma} m_s^2}{1-\rho(\omega)^{-\sigma}}$; $f_s^2 = \dfrac{m_s^2 - \rho(\omega)^{\sigma} m_s^1}{1-\rho(\omega)^{\sigma}}$

HME; $\dfrac{f_s^1}{f_s^2} > \dfrac{m_s^1}{m_s^2} > 1$; $\dfrac{f_s^1}{f_s^2} = \dfrac{m_s^1}{m_s^2} = 1$; or $\dfrac{f_s^1}{f_s^2} < \dfrac{m_s^1}{m_s^2} < 1$.

Sectoral Trade Balances: From $NX_s^1 = -NX_s^2 \equiv V_s^1 \rho b_s^2 (w^1)^{1-\sigma} - V_s^2 \rho b_s^1 (w^2)^{1-\sigma}$,

$$NX_s^1 = -NX_s^2 = \frac{\rho w^2 L^2}{(\omega)^{-\sigma} - \rho}\left(m_s^1 - m_s^2\right) = \frac{\rho w^1 L^1}{(\omega)^{\sigma} - \rho}\left(m_s^1 - m_s^2\right) \propto \left(m_s^1 - m_s^2\right).$$

Determined by the difference in ***the Demand Composition, not in the Market Size***.

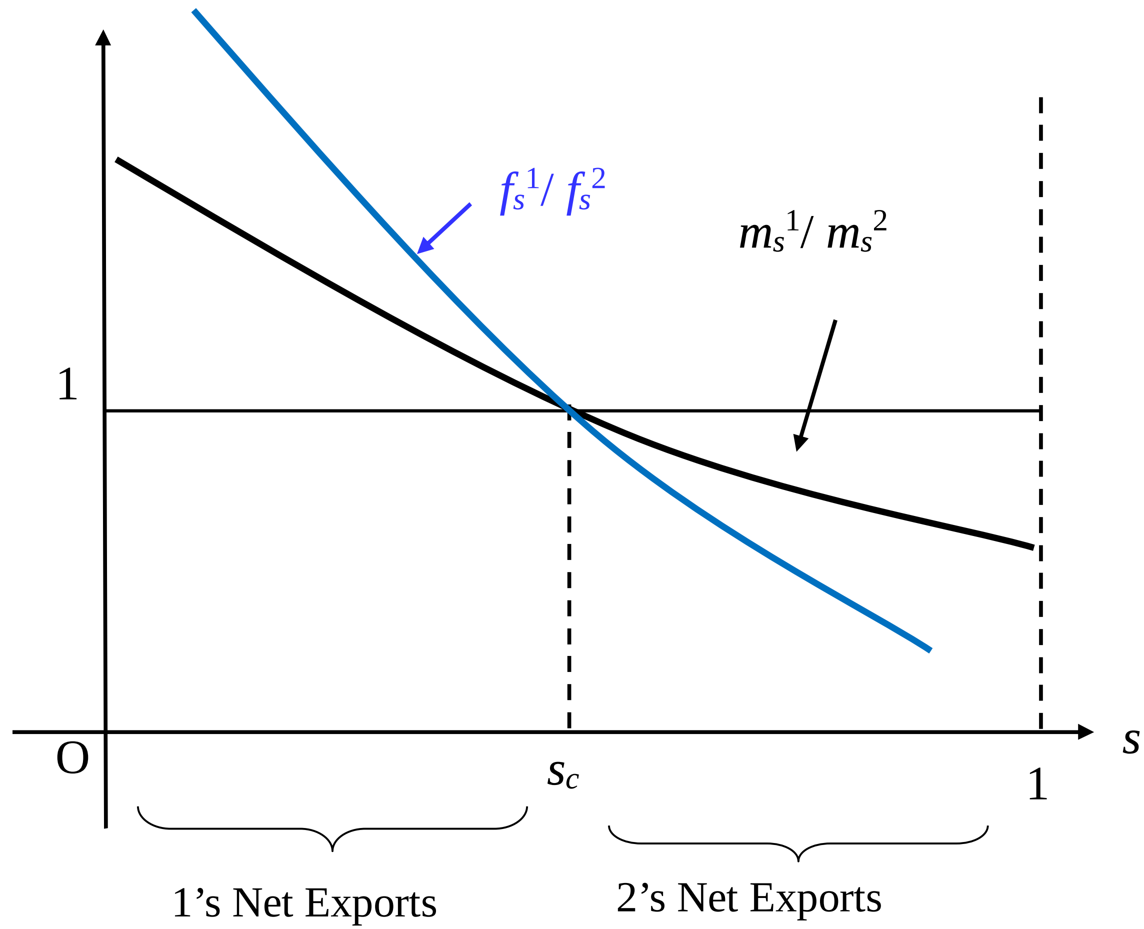
$U_\rho^1 = u\left(x_\rho^1\right) < U_\rho^2 = u\left(x_\rho^2\right)$ → m_s^1 / m_s^2 is strictly decreasing in s →

a **unique cutoff sector,** $s_c \in (0,1)$, such that

$NX_s^1 = -NX_s^2 > 0$ for $s < s_c$; $NX_s^1 = -NX_s^2 < 0$ for $s > s_c$.

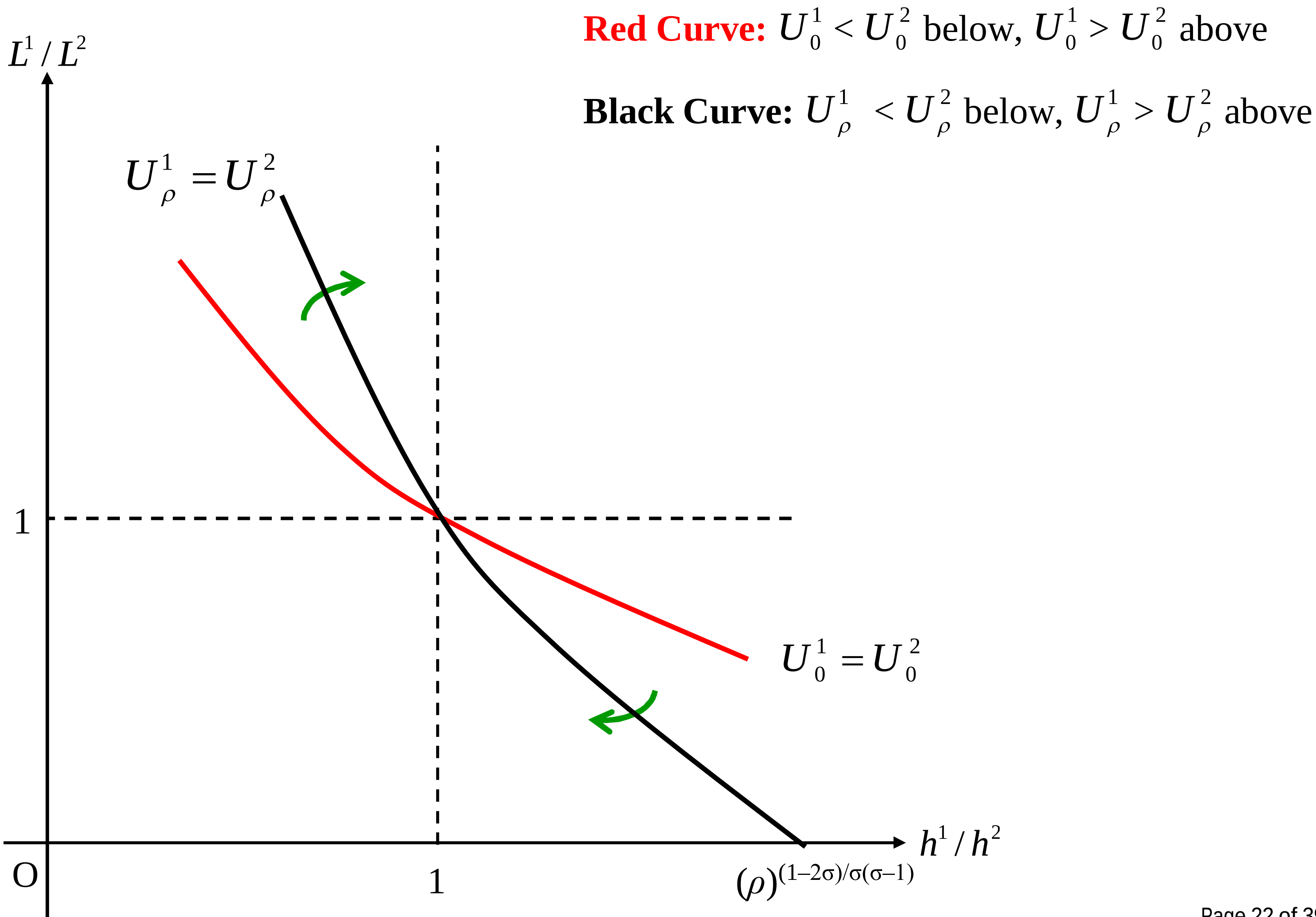
Figure 2: Home Market Effect and Patterns of Sectoral Trade Balances:

For $U_\rho^1 = u(x_\rho^1) < U_\rho^2 = u(x_\rho^2)$



The Rich (Poor) runs surpluses in the higher-(lower-) indexed sectors, which produce with higher (lower) income elastic goods.

Figure 3: Ranking the Countries



Comparative Statics

Uniform Productivity Improvement: $(\partial\log(h^1) = \partial\log(h^2) \equiv \partial\log(h) > 0)$

h^1/h^2, L^1/L^2, $\omega = w^1/w^2$, x_0^1/x_0^2, x_ρ^1/x_ρ^2 all unchanged, with $\partial\log(x_\rho^1) = \partial\log(x_\rho^2) = \sigma\partial\log(h) > 0$.

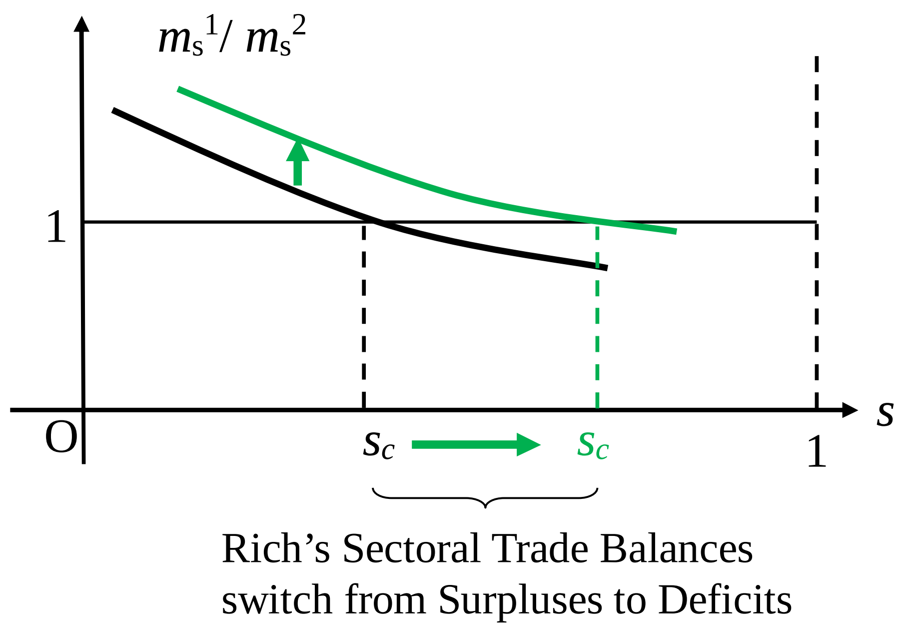
- Both $U_\rho^1 = u(x_\rho^1)$ *and* $U_\rho^2 = u(x_\rho^2)$ go up. Since $\left(\beta_s\left(u(x_\rho^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}$ is *log-supermodular* in *s* and x_ρ^k, from **Lemma 1,** the market size distributions shift toward higher-indexed sectors in both countries, in the sense of MLR and FSD.

- $\operatorname{sgn}\dfrac{\partial\log(U_\rho^1/U_\rho^2)}{\partial\log(h)} = \operatorname{sgn}(\eta-1)\operatorname{sgn}(x_\rho^1 - x_\rho^2)$, from **Lemma 2.**

  Welfare gaps widen (narrow) if sectors produce substitutes (complements).

- $\operatorname{sgn}\dfrac{\partial\log(m_s^1/m_s^2)}{\partial\log(h)} = \operatorname{sgn}(x_\rho^2 - x_\rho^1)$ → s_c goes up.

Figure 4: Product Cycles Due to Uniform Productivity Improvement



- As everyone becomes more productive, they shift their spending towards the higher-indexed.
- The relative weights of the sectors in which the Rich runs surpluses go up.
- To keep the overall trade account between the two countries in balance, the Rich's trade account in each sector must deteriorate.
- The Rich switches from being the net-exporter to the net-importer in middle sectors.

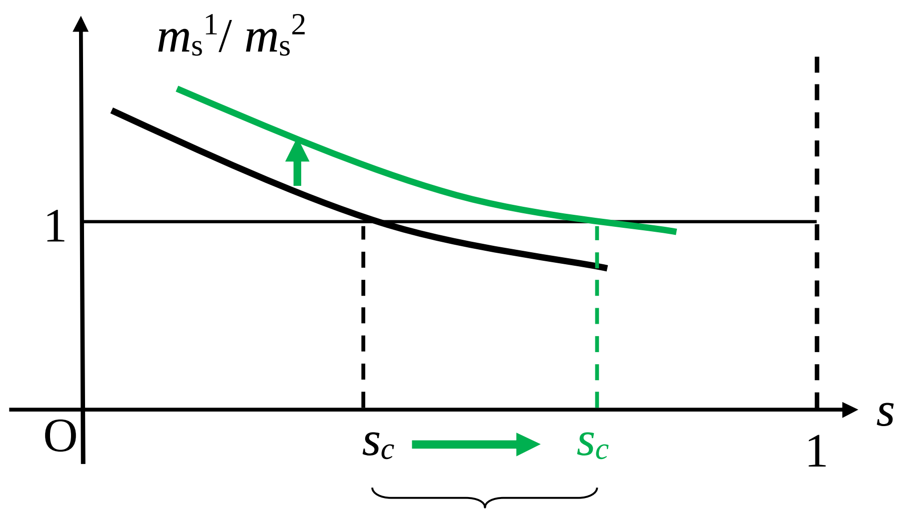
Globalization, a higher $\rho = (\tau)^{1-\sigma}$**, when two countries are equal in size:** $L^1 = L^2 = L$

$$\omega = 1 \rightarrow x_\rho^k = (1+\rho)x_0^k = (1+\rho)\left(h^k\right)^\sigma N^k = (1+\rho)\left(h^k\right)^{\sigma-1} L$$

The relative factor price fixed at $\omega = 1$ and independent of ρ. No ToT change

- The country with higher per capita labor endowment is richer.
- a higher $1+\rho$ is isomorphic to a uniform increase in h^k.

Figure 4: Product Cycles Due to Globalization



Rich's Sectoral Trade Balances switch from Surpluses to Deficits

Globalization, a higher $\rho = (\tau)^{1-\sigma}$, when two countries are unequal in size:

Leapfrogging and Reversal of the Patterns of Trade

For $h^1/h^2 > 1$ and below the Red curve,

$U_\rho^1 < U_\rho^2$ at a low ρ,
Closer to autarky, Country 1 is poorer due to its disadvantage of being smaller, running surpluses in lower-indexed.

$U_\rho^1 > U_\rho^2$ at a high ρ,
Globalization leads to a factor price convergence, which makes the smaller but smarter 1 richer, running surpluses in higher-indexed.

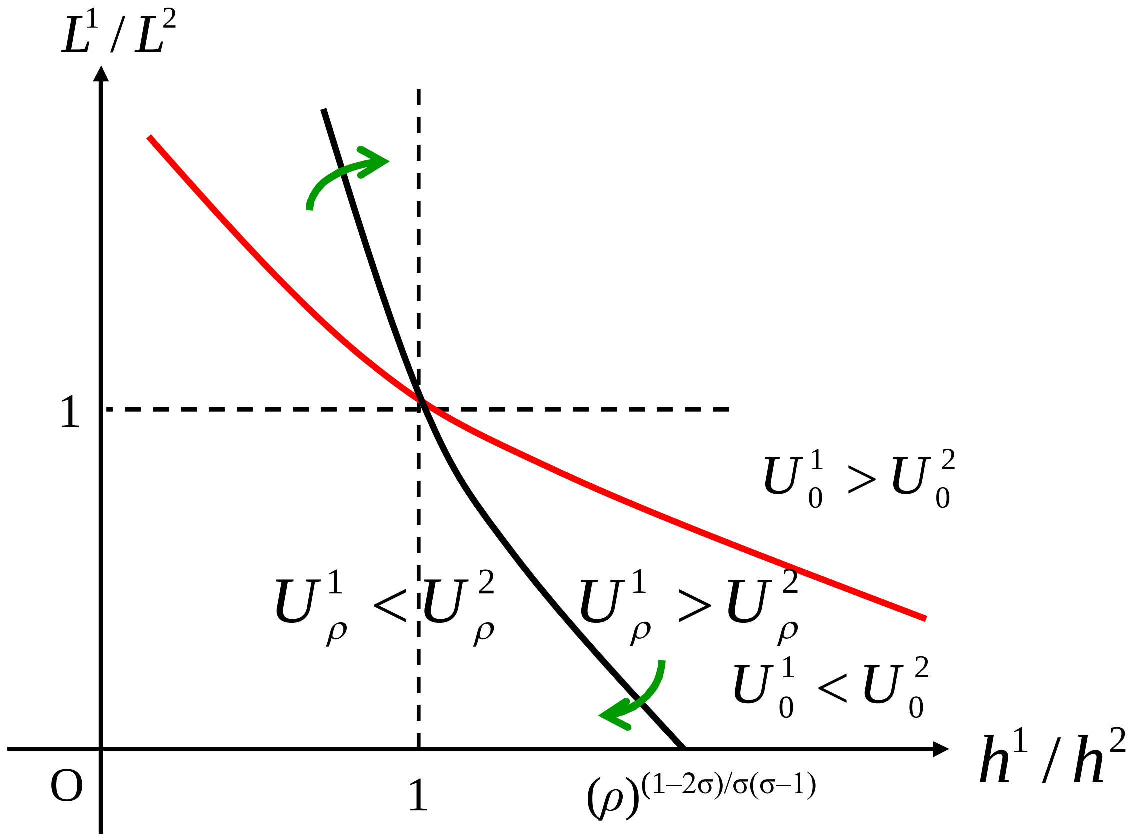


Figure 5

HME with Exogenous Taste Variations: A Comparison

An Extension of Krugman (1980):

Keep the same structure, except the upper-level preferences are homothetic CES,

$$\tilde{U}^k \equiv \left[\int_0^1 (\beta_s^k)^{\frac{1}{\eta}} \left(\tilde{C}_s^k\right)^{1-\frac{1}{\eta}} ds\right]^{\frac{\eta}{\eta-1}}, \qquad \text{normalized to } \int_0^1 (\beta_s^k)^{\frac{\sigma-1}{\sigma-\eta}} ds = 1$$

with different weights β_s^k, and β_s^1 / β_s^2 strictly decreasing in *s*.

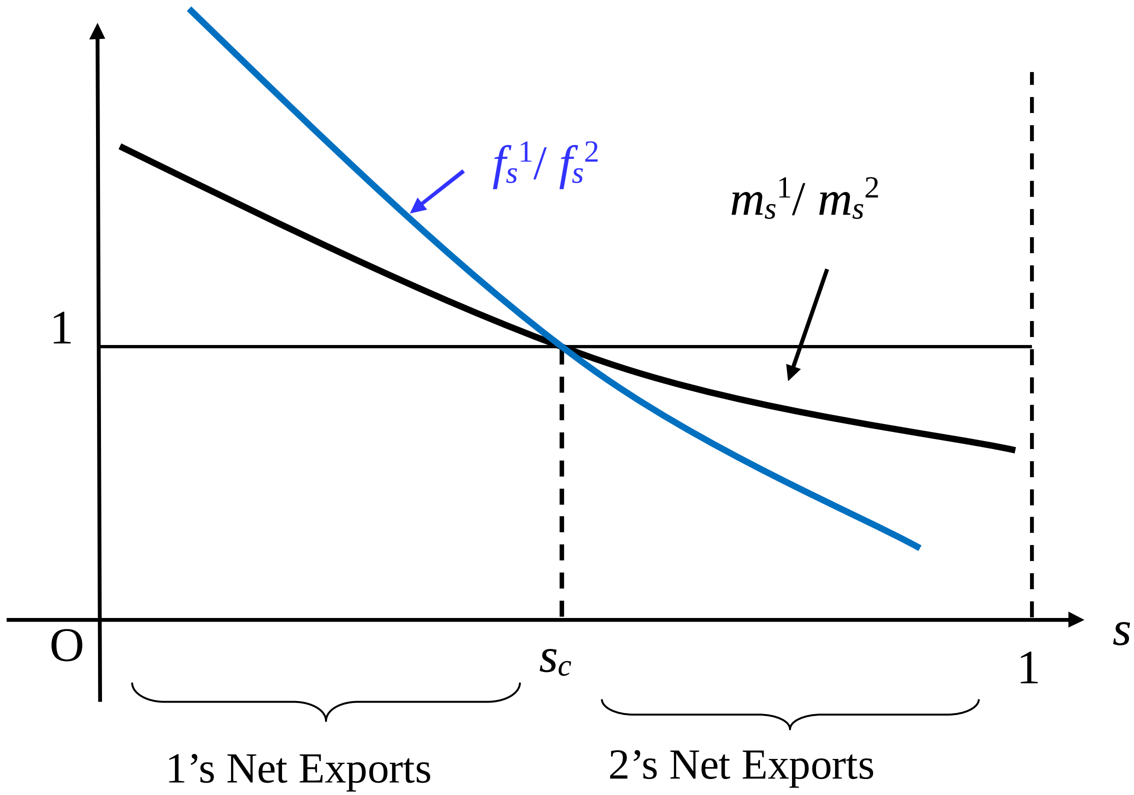
Then,

Standard-of-living: $U_\rho^k = \left(x_\rho^k\right)^{\frac{1}{\sigma-1}}$

Market Size Distribution: $m_s^k = \left(\beta_s^k\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)}$ → $m_s^1 / m_s^2 = \left(\beta_s^1 / \beta_s^2\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)}$ strictly decreasing in *s*.

Otherwise, the same

Figure 2



Notes:

- m_s^1/m_s^2 depends solely on the exogenous preferences parameters. Independent of ρ and h^k. Effects on s_c in the previous model are entirely due to nonhomotheticity.
- Uniform productivity growth cannot change the welfare gap.
- Leapfrogging can occur; Reversal of Patterns of Trade cannot.
- Krugman (1980), a special case with $\eta = 1$, $L^1 = L^2$, and $\beta_s^1/\beta_s^2 = \gamma > 1$ for $0 \le s < 1/2$; $\beta_s^1/\beta_s^2 = 1/\gamma < 1$ for $1/2 < s \le 1$.

Adding An Outside Goods Sector

An Extension of the Helpman and Krugman (1985) Home Market Effect Model

The same structure as before, except

Homogeneous Good (Numeraire): competitive, CRS (1-to-1), zero trade cost

Household Preferences: Three-Tier structure

Lower-level, $\tilde{C}_s^k \equiv \left[\int_{\Omega_s} \left(c_s^k(\nu)\right)^{1-\frac{1}{\sigma}} d\nu\right]^{\frac{\sigma}{\sigma-1}}$; $\sigma > 1, \quad s \in [0,1]$

Middle-level, $\int_0^1 (\beta_s)^{\frac{1}{\eta}} \left(\tilde{U}^k\right)^{\frac{\varepsilon(s)-\eta}{\eta}} \left(\tilde{C}_s^k\right)^{\frac{\eta-1}{\eta}} ds \equiv 1$; $\beta_s > 0$ and $\sigma > \eta \neq 1$,

Upper-level, $\tilde{W}^k = (1-\alpha)\log \tilde{C}_O^k + \alpha \log(\tilde{U}^k)$

$\tilde{C}_O^k$: Household consumption of the numeraire

α: (Fixed) expenditure share of differentiated goods

With a sufficiently small α, both countries produce the numeraire.

- $L^j - \int_0^1 V_s^j ds > 0$; a positive employment in the numeraire sector.
- $w^j = 1$; (Factor) Terms of Trade uniquely pinned down and independent of ρ.
- Each household earns h^k and spends $E^k = \alpha h^k$ on differentiated goods.

The Equilibrium Conditions would be the same otherwise.

Autarky Equilibrium

Standard-of-Living: $W_0^k = (1-\alpha)\log((1-\alpha)h^k) + \alpha \log(u(x_0^k))$,

with $x_0^k \equiv \left(\alpha h^k\right)^{\sigma} N^k = \alpha\left(\alpha h^k\right)^{\sigma-1} L^k$

Market Size Distributions: $m_s^k = \dfrac{\left(\beta_s \left(u(x_0^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}}{\int_0^1 \left(\beta_t \left(u(x_0^k)\right)^{(\varepsilon(t)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}} dt}$

Trade Equilibrium:

Standard-of-Living: $W_\rho^k = (1-\alpha)\log((1-\alpha)h^k) + \alpha\log(u(x_\rho^k))$,

where $x_\rho^k \equiv (1+\rho)(\alpha h^k)^\sigma N^k = (1+\rho)x_0^k$

Market Size Distributions: $m_s^k = \dfrac{\left(\beta_s (u(x_\rho^k))^{(\varepsilon(s)-\eta)}\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)}}{\int_0^1 \left(\beta_t (u(x_\rho^k))^{(\varepsilon(t)-\eta)}\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)} dt}$

Firms Distributions:

From $V_s^1 = \dfrac{m_s^1(\alpha L^1) - \rho m_s^2(\alpha L^2)}{1-\rho} > 0$; $\quad V_s^2 = \dfrac{m_s^2(\alpha L^2) - \rho m_s^2(\alpha L^2)}{1-\rho} > 0$,

$f_s^1 = \dfrac{m_s^1 L^1 - \rho m_s^2 L^2}{L^1 - \rho L^2} > 0$; $\quad f_s^2 = \dfrac{m_s^2 L^2 - \rho m_s^1 L^1}{L^2 - \rho L^1} > 0 \quad$ for $\rho < \dfrac{m_s^1 L^1}{m_s^2 L^2} < \dfrac{1}{\rho}$.

Sectoral Trade Balances:

$$NX_s^1 = -NX_s^2 \equiv V_s^1 \rho b_s^2 - V_s^2 \rho b_s^1 = \frac{\rho}{1+\rho}(V_s^1 - V_s^2) = \frac{\alpha\rho}{1-\rho}(m_s^1 L^1 - m_s^2 L^2) \propto (m_s^1 L^1 - m_s^2 L^2)$$

What matters is the cross-country difference in the market size in each sector itself.

Trade Balances in Differ. Goods Sectors: $\int_0^1 NX_s^1 ds = -\int_0^1 NX_s^2 ds = \frac{\alpha\rho}{1-\rho}(L^1 - L^2)$

Instead of having a higher factor price, the larger country runs an overall surplus in the differentiated goods sectors, with a deficit in the outside good sector.

Factor Price Equalization Condition; $\alpha < Min\left\langle \frac{(1-\rho)L^1}{L^1 - \rho L^2}, \frac{(1-\rho)L^2}{L^2 - \rho L^1} \right\rangle$

Patterns of Trade: Home Market Effect

- m_s^1 / m_s^2 is strictly decreasing in s, for $x_0^1 < x_0^2 \Leftrightarrow L^1 / L^2 < (h^1 / h^2)^{1-\sigma}$
- When L^1 and L^2 are not too different, a **unique cutoff sector**, $s_c \in (0,1)$ such that

$$NX_s^1 = -NX_s^2 = \frac{\alpha\rho L}{1-\rho}(m_s^1 L^1 - m_s^2 L^2) > 0 \text{ for } s < s_c; < 0 \text{ for } s > s_c.$$

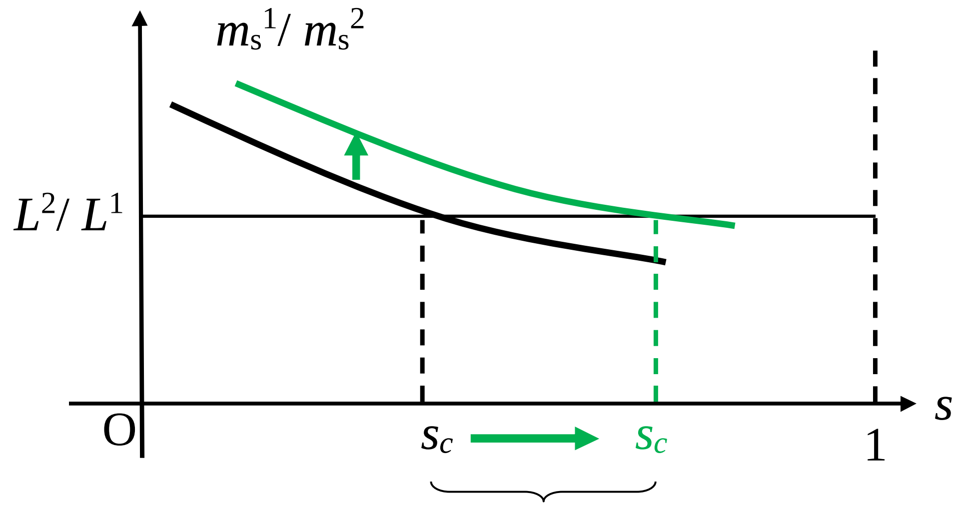
Comparative Statics: With a uniform productivity improvement and globalization,

- m_s^k shifts towards the higher-indexed in the sense of MLR and FSD.
- $\text{sgn}\dfrac{\partial \log(U_\rho^1 / U_\rho^2)}{\partial \log(h)} = \text{sgn}\dfrac{\partial \log(U_\rho^1 / U_\rho^2)}{\partial \log(1+\rho)}$

$= \text{sgn}(\eta - 1)\,\text{sgn}(x_\rho^1 - x_\rho^2)$.

- $\text{sgn}\dfrac{\partial \log(m_s^1 / m_s^2)}{\partial \log(h)} = \text{sgn}\dfrac{\partial \log(m_s^1 / m_s^2)}{\partial \log(1+\rho)}$

$= \text{sgn}(x_\rho^2 - x_\rho^1)$ → $s_c \in (0,1)$ moves up.



In Summary:

- With the ToT pinned down by the numeraire good, a higher ρ does not change ToT change, even when the country sizes are different.
- With no ToT change, the effect of a higher ρ is isomorphic to the effects of uniform productivity improvement (an equi-proportional increase in h^k), as in the $L^1 = L^2$ case of the previous model.
- With no ToT change, Leapfrogging and A Reversal of Patterns of Trade cannot occur.

Two Caveats: Unlike in the $L^1 = L^2$ case of the previous model, $L^1 \neq L^2$ generates the possibility:

- $U^1_\rho < U^2_\rho \iff L^1 / L^2 < \left(h^1 / h^2\right)^{1-\sigma}$ may occur, even if $h^1 > h^2$.
- If L^1 and L^2 are too different, the larger country may run a surplus in all *s*.

Concluding Remarks

- Empirically, goods differ widely in their income elasticities; rich (poor) countries tend to export goods with high (low) income elasticities.

- We aim to explain *why* the rich (poor) have CA in high (low) income elastic goods with two ingredients, *Nonhomothetic Preferences & Home Market Effect*

- Simple intuition
  - ✓ Demand composition of the Rich (Poor) more skewed towards high (low) income elastic goods
  - ✓ With scale economies and positive but finite trade costs, such cross-country differences in the demand composition become a source of comparative advantage.

- No previous studies capture this intuition in a setup flexible and yet tractable enough to allow for a variety of comparative static exercises, because GE models with *imperfect competition*, *scale economies*, *positive but finite trade costs*, and *nonhomotheticity* would be intractable
  - ✓ **Explicitly additively separable nonhomothetic preferences**, such as Stone-Geary or CRIE, are too restrictive and too intractable

- **Implicitly additively separable nonhomothetic preferences** enables us to overcome this difficulty