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

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Introduction

- Sectors differ widely in their income elasticities (Engel's Law) and rich (poor) countries are net-exporters in high (low) income elastic sectors.

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

- Adding *nonhomothetic preferences* in the standard models would, *ceteris paribus,* make rich countries *importers* in high income elastic sectors

- To be empirically consistent, the existing GE models of trade with nonhomothetic preferences *assume* that the rich (poor) have CA in high (low) income elastic sectors
  - ✓ **Ricardian:** Flam-Helpman(1987), Stokey(1991), Matsuyama(2000), Fieler(2011)
  - ✓ **Factor endowment**: Markusen(1986), Caron-Fally-Markusen(2014)

In these models, the rich export in high income elastic sectors *despite* their domestic markets in these sectors are relatively large.

- In our model, the rich have CA in high income elastic sectors, *because* their domestic markets in these sectors are relatively large, due to *Home Market Effect*

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
    - o A is a nation of α-lovers; with the minority of β-lovers.
    - o B is a nation of β-lovers, with the minority of α-lovers.

In equilibrium,

- In autarky, *proportionately* large share of labor in A employed in sector α.
- Under trade, *disproportionately* large share of labor in A employed in sector α.
- **HME:** A is a net-exporter in α. (And B is a net-exporter in β).
- Quantitatively, HME is more important with a *smaller* trade cost

Key Insight: With scale economies & *small but positive* trade costs, cross-country difference in the domestic market size distribution across sectors is a source of CA.

Notes: In Krugman (1980),

- Demand composition differs across countries due to *exogenous variations in taste*
- "Mirror-image" obscures that HME comes from the cross-country difference in the market size *distribution* across sectors, *not* in the *absolute* market size in each sector.
- Also restricts the range of comparative static exercises.

Our Model: GE HME with domestic demand composition difference due to nonhomothetic preferences. Also drops the mirror-images setup.

- 2 countries; differ in *per capita labor endowment* (h) & *population* size (N)
- *Continuum* of Dixit-Stiglitz monopolistic competitive sectors with iceberg trade costs
- Preferences across sectors: *Implicitly Additively Separable Nonhomothetic CES*, with sectors different only in their income elasticity, which is increasing in the sector index.

Patterns of Trade:

- Rich's demand composition more skewed towards higher-income elastic sectors
- Rich's labor disproportionately employed in higher-income elastic sectors
- Rich becomes a net-exporter in higher-income elastic sectors, *regardless of the relative country size*

Comparative Statics: *Due to endogenous demand compositions*, uniform productivity improvement and a trade cost reduction (globalization!) cause

- *Product cycles:* The Rich switches from a net exporter to a net importer in the middle
- *Welfare gaps to widen (narrow)*, if different sectors produce substitutes (complements)

With unequal country sizes,

- *Endogenous Ranking of Countries: Leapfrogging* and *Reversal of the patterns of trade*; The country higher in h but smaller in $L = hN$ may be poorer is a less globalized world, becomes richer with globalization, as it moves ToT in its favor.

Explicit vs. Implicit (Direct) Additive Separability: Hanoch (1975)

Explicit (Direct) 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: $\dfrac{\text{Income elasticity of Sector s}}{\text{Price elasticity of Sector s}}$ = const. (**Bergson's Law** is a special case)

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 (Direct) 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) Sector-specific income elasticities, unrelated to price elasticities

ii) If $\partial \log \omega_s(u)/\partial u$ varies with *s*, ***nonhomothetic** CES*. If sectors are indexed to make $\partial \log \omega_s(u)/\partial u$ increasing in s, $\omega_s(u)$ is ***log-supermodular***

iii) If $\omega_s(u)$ is ***isoelastic** in u*, $\partial \log \omega_s(u)/\partial u$ depends only on s, not on u, consistent with the stable slope of the Engel curve; e.g., Comin-Lashkari-Mestieri (2015)

Fajgelbaum, Grossman, Helpman (2011)

- One monopolistic competitive industry, producing horizontally & vertically (quality)-differentiated, indivisible products with trade costs (e.g., Auto industry).
  - ✓ with a numeraire sector in the background, large enough to kill GE and ToT effects
- A *discrete choice a la* McFadden, with *nonhomotheticity*. Each consumer buys a unit of one product with richer consumers more likely to buy a higher-quality product.
- Income distribution as a source of CA; the country with first-order stochastic dominant distribution become a net-exporter of higher-quality products, if it is not too small.

FGH: *Intra*-industry trade, designed to address IO issues
- Focus on within-industry quality specialization; on within-country inequality
- Abstract from patterns of trade across sectors, from cross-country inequality, from ToT effects; exogenous country ranking
- HME due to the *absolute* domestic market size difference

Here: *Inter*-industry trade, designed to address development/structural change issues
- Focus: patterns of trade across sectors producing very different (even complementary) goods; ToT effects; cross-country inequality; endogenous country ranking
- Abstract from within-industry quality specialization; from within-country inequality
- HME due to the *relative* domestic market size difference

Organization of the Paper

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4. Adding an Outside Goods Sector
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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)

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

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

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

cumulative distribution function).

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

i) $\dfrac{g(s;x)}{g(s;x')}$ 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 sectors

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: $c_s^k(\nu) = \left(\dfrac{p_s^k(\nu)}{P_s^k}\right)^{-\sigma} C_s^k = \dfrac{\left(p_s^k(\nu)\right)^{-\sigma}}{\left(P_s^k\right)^{1-\sigma}} E_s^k$, where

$P_s^k \equiv \left[\int_{\Omega_s} \left(p_s^k(\nu)\right)^{1-\sigma} d\nu\right]^{\frac{1}{1-\sigma}}$; Dixit-Stiglitz price index in sector-s

C_s^k = Maximized $\tilde{C}_s^k$, satisfying $E_s^k = P_s^k C_s^k$.

2nd 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:

$$m_s^k \equiv \frac{E_s^k}{E^k} \equiv \frac{P_s^k C_s^k}{E^k} = \frac{\beta_s \left(U^k\right)^{\varepsilon(s)-\eta} \left(P_s^k\right)^{1-\eta}}{\int_0^1 \beta_t \left(U^k\right)^{\varepsilon(t)-\eta} \left(P_t^k\right)^{1-\eta} dt},$$ *sector-s share in k's expenditure*

where U^k = Maximized $\tilde{U}^k$, given by (implicitly additive) indirect utility function:

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

Notes:

- $\dfrac{\partial \log(m_s^k / m_{s'}^k)}{\partial \log(U^k)} = \varepsilon(s) - \varepsilon(s')$. Higher-indexed more income elastic; Income elasticity differences are constant across different per capita income levels (unlike Stone-Geary).
- $\beta_s \left(U^k\right)^{\varepsilon(s)-\eta} \left(P_s^k\right)^{1-\eta}$ 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.

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

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

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

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 employment share (and value-added) and, if appropriately normalized, in the measure of firms (and varieties).

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

Define an increasing function, $u(\bullet)$, implicitly by $(x)^{\left(\frac{1-\eta}{\sigma-\eta}\right)} \equiv \int_0^1 \left(\beta_s (u(x))^{(\varepsilon(s)-\eta)}\right)^{\left(\frac{\sigma-1}{\sigma-\eta}\right)} ds$.

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

- $U_0^k = u(x_0^k)$ increasing in h^k and N^k.

Aggregate increasing returns

- Even if $h^1 > h^2$, $U_0^1 < U_0^2$ holds for $L^1 / L^2 < (h^1 / h^2)^{1-\sigma} < 1$.

The smaller country is poorer in spite of higher per capita labor endowment.

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

- Labor is distributed proportionately with market sizes; $f_s^k = m_s^k$
- $\left(\beta_s (u(x_0^k))^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}$ 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 households are happier and spend relatively more on higher-indexed sectors *in equilibrium.*

- $$\frac{\partial \log(m_s^k / m_{s'}^k)}{\partial \log\left(u(x_0^k)\right)} = \left(\frac{\sigma - 1}{\sigma - \eta}\right) \frac{\partial \log(m_s^k / m_{s'}^k)}{\partial \log(U^k)} > (<) \frac{\partial \log(m_s^k / m_{s'}^k)}{\partial \log(U^k)}, \quad \text{iff } \eta > (<) 1.$$

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 composites of goods, which amplifies (moderates) the shift if η > (<) 1.

- **Lemma 2ii:** $\dfrac{d \log u(\lambda x)}{d \log \lambda} = \dfrac{\lambda x u'(\lambda x)}{u(\lambda x)} = \zeta(\lambda x)$ is increasing (decreasing) in x, if η >(<) 1.

  Hence,

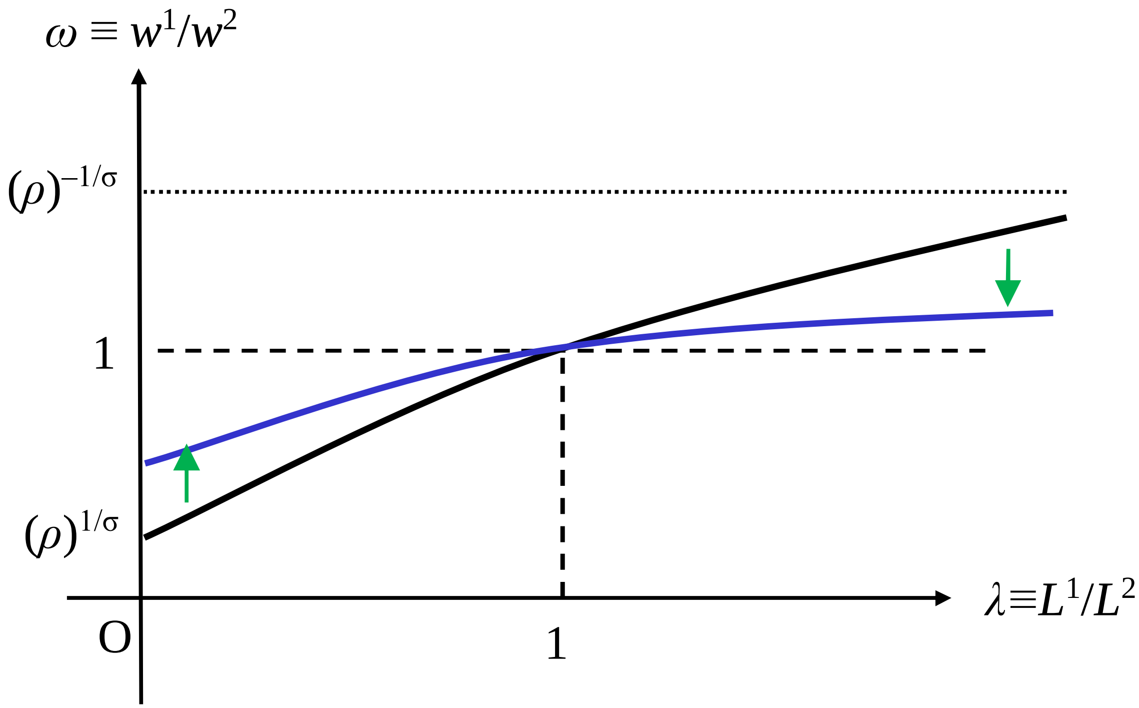
  i) If $\eta < 1$, gains from a percentage increase in x is lower at a higher x.

  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 (τ ↓ or ρ ↑) 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.

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

$$\frac{f_s^1}{f_s^2} > \frac{m_s^1}{m_s^2} > 1; \qquad \frac{f_s^1}{f_s^2} = \frac{m_s^1}{m_s^2} = 1; \qquad \frac{f_s^1}{f_s^2} < \frac{m_s^1}{m_s^2} < 1.$$

Disproportionately large shares of labor are employed in the sectors, in which the country spend larger shares of its expenditure relatively to the ROW.

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

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

Due to the cross-country difference in ***the domestic market size distribution across sectors, not in the domestic market size in each sector***

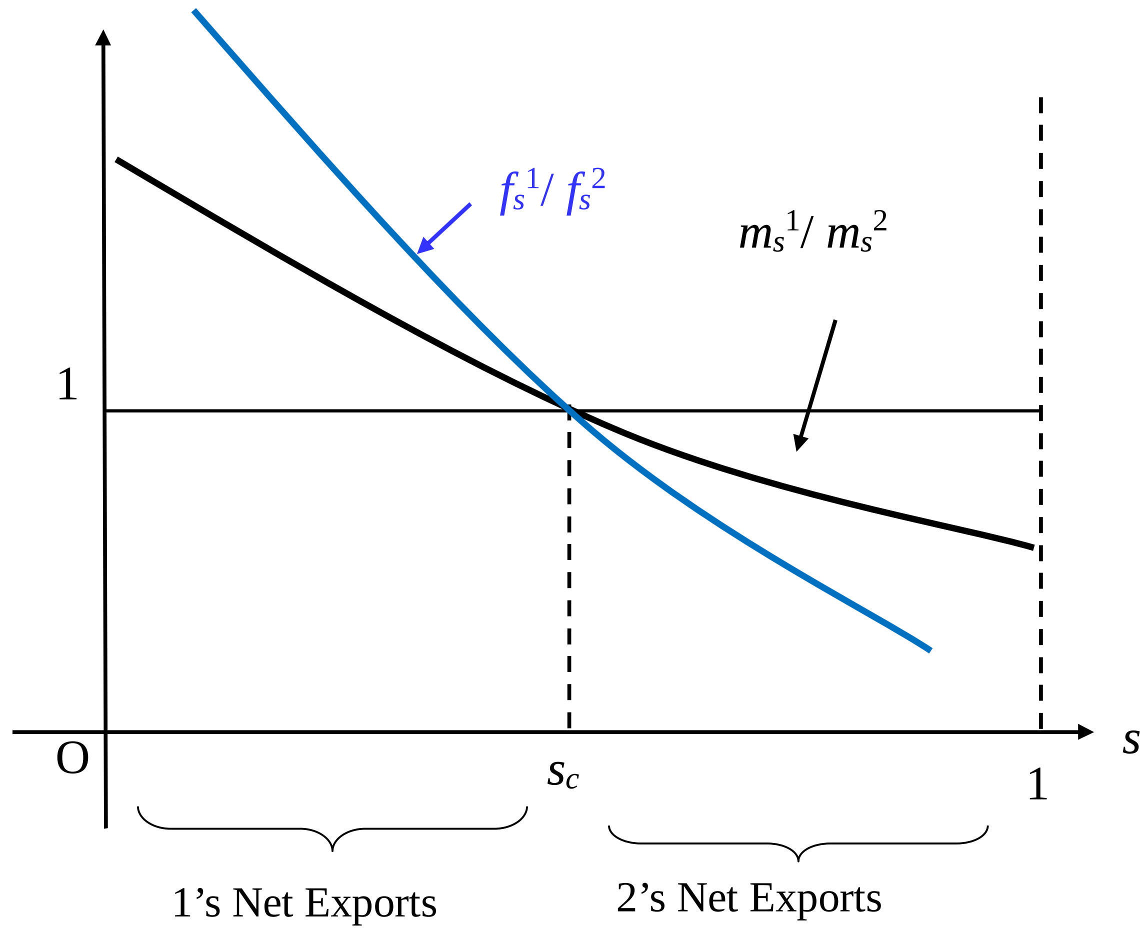
$U_\rho^1 = u\left(x_\rho^1\right) < U_\rho^2 = u\left(x_\rho^2\right) \rightarrow m_s^1 / m_s^2$ is strictly decreasing in s $\rightarrow$

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 higher (lower) income elastic sectors.

Ranking the Countries: Trade-off between human capital & country size:
Smaller country with *higher h* can be poorer at a low ρ but is richer at high ρ

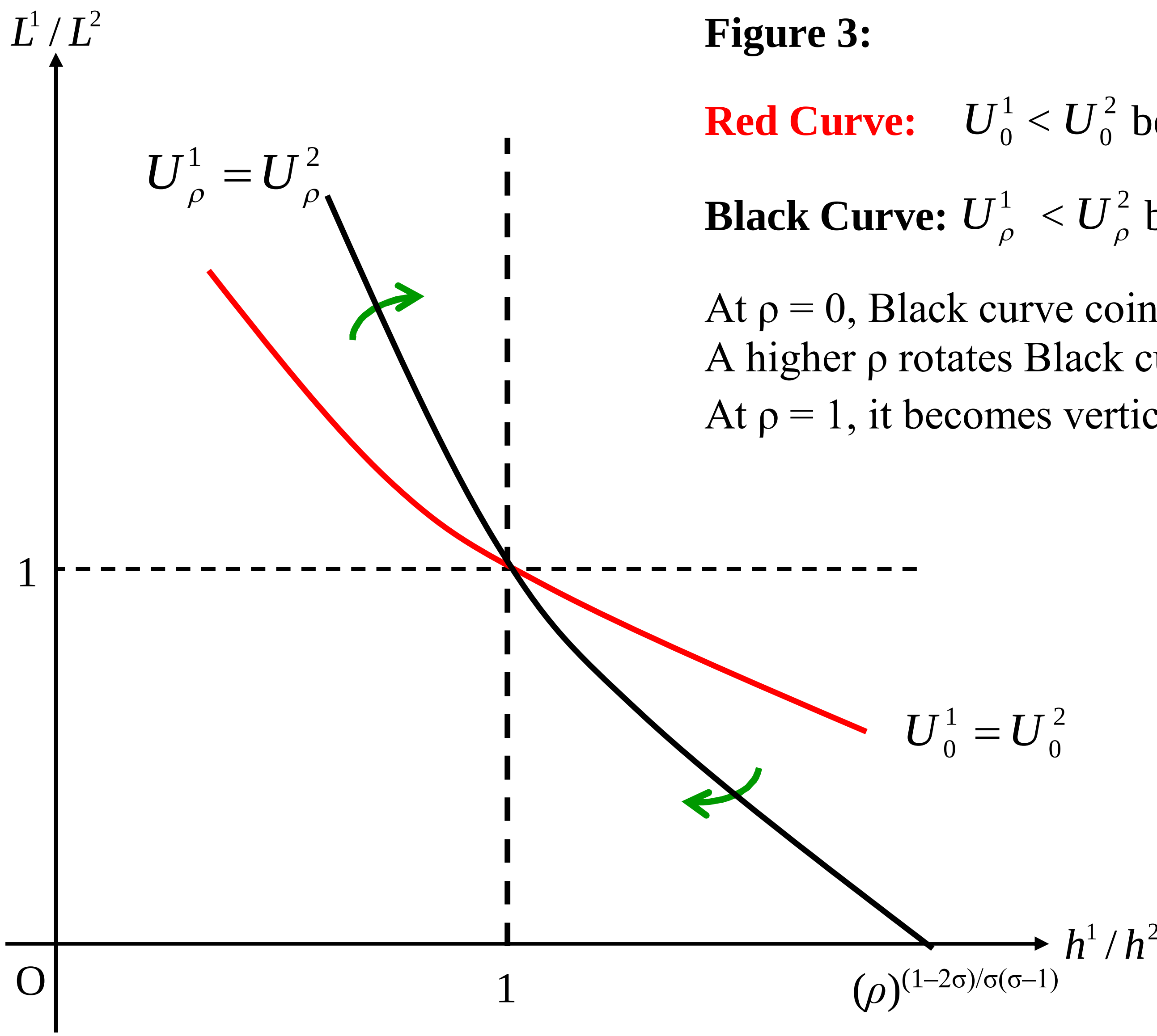


Figure 3:

Red Curve: $U^1_0 < U^2_0$ below, $U^1_0 > U^2_0$ above

Black Curve: $U^1_\rho < U^2_\rho$ below, $U^1_\rho > U^2_\rho$ above

At ρ = 0, Black curve coincides with Red curve.
A higher ρ rotates Black curve clockwise,
At ρ = 1, it becomes vertical at $h^1/h^2 = 1$

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 $\partial\log(x_\rho^1) = \partial\log(x_\rho^2) = \sigma\partial\log(h) > 0$.

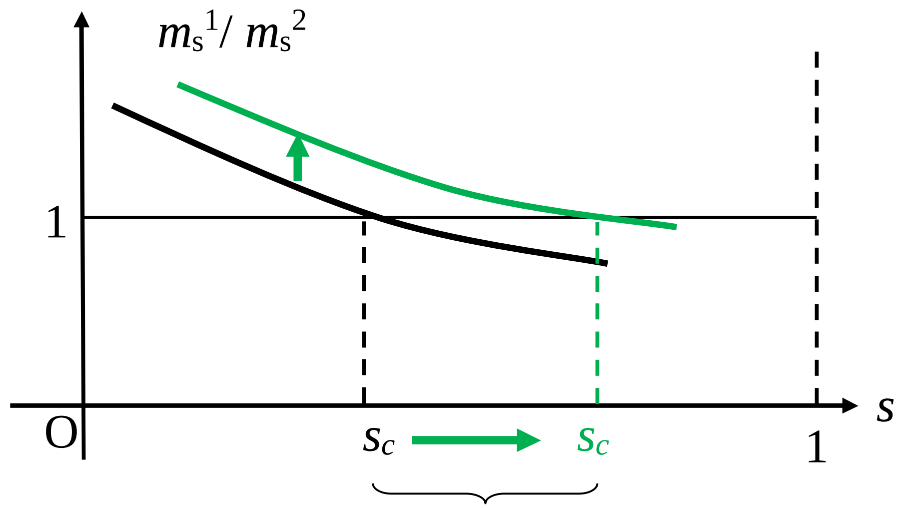
- Both $U_\rho^1 = u(x_\rho^1)$ *and* $U_\rho^2 = u(x_\rho^2)$ go up. Since $\left(\beta_s\left(u(x_\rho^k)\right)^{(\varepsilon(s)-\eta)}\right)^{\frac{\sigma-1}{\sigma-\eta}}$ is *log-supermodular* in s and x_ρ^k, from **Lemma 1,** the market size distributions shift toward higher-indexed sectors in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

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

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

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

Figure 4: Product Cycles Due to Uniform Productivity Improvement



Rich's Sectoral Trade Balances
switch from Surpluses to Deficits

- As the world becomes more productive, the spending shifts 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 the middle.

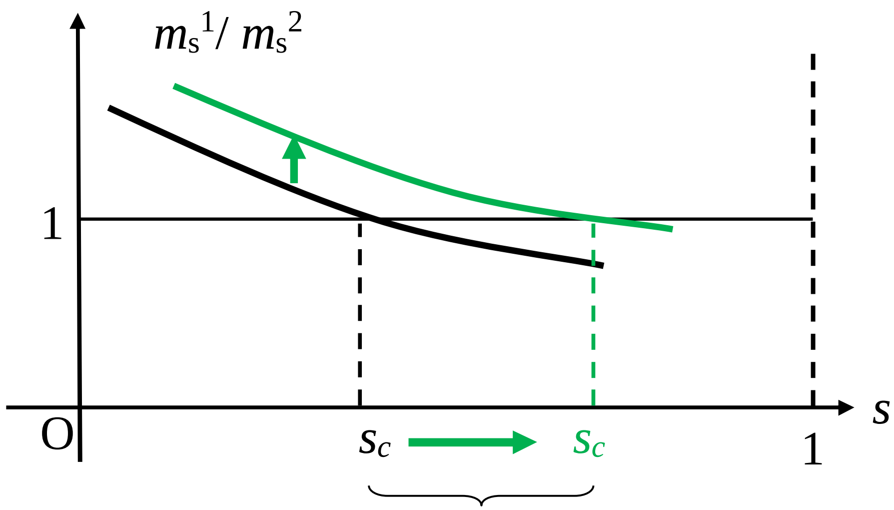
Globalization, a higher $\rho = (\tau)^{1-\sigma}$**, when two countries are equal in size:** $L^1 = L^2 = L$

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

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 ρ 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:

Globalization causes the ToT to change in favor of the smaller country

Leapfrogging and Reversal of the Patterns of Trade

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

$U^1_\rho < U^2_\rho$ at a low ρ,

Closer to autarky, Country 1 is poorer due to its disadvantage of being smaller, running surpluses in lower-indexed.

$U^1_\rho > U^2_\rho$ at a high ρ,

Globalization leads to a factor price convergence, which makes the smaller but smarter 1 richer, running surpluses in higher-indexed.

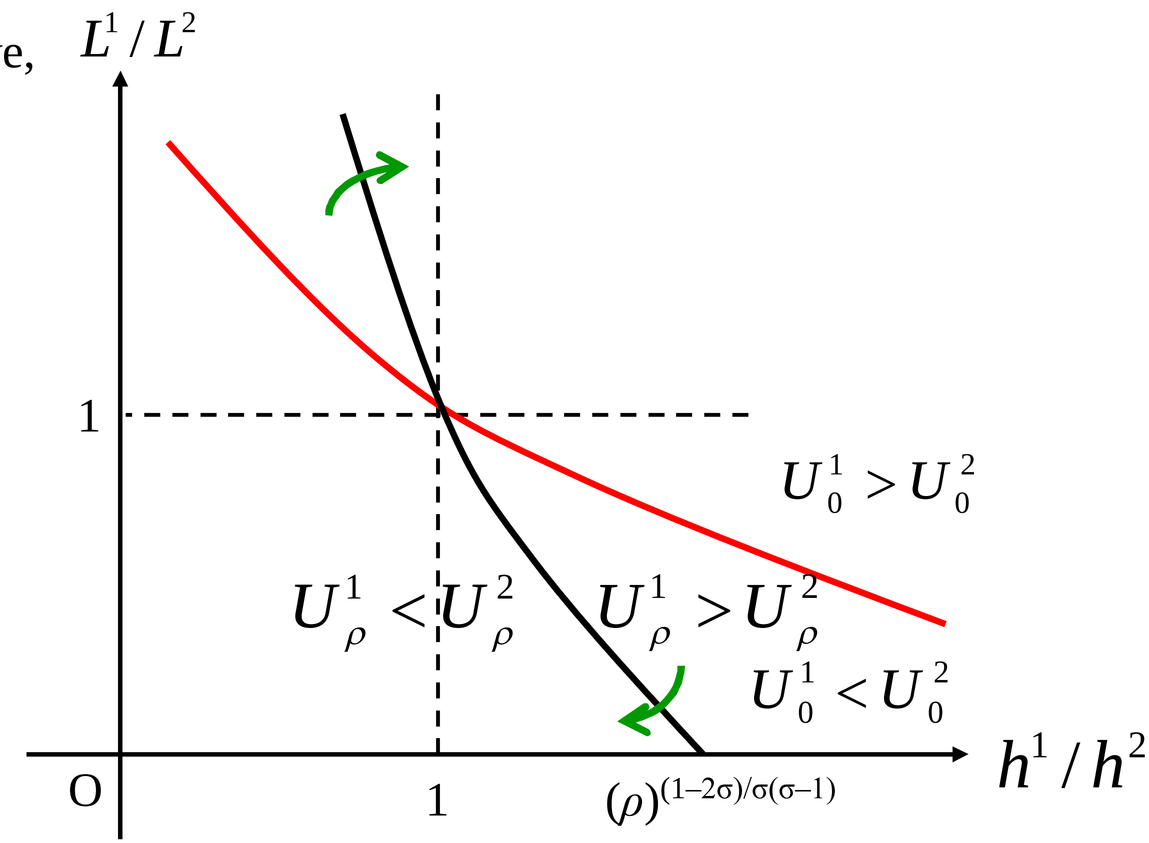


Figure 5

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

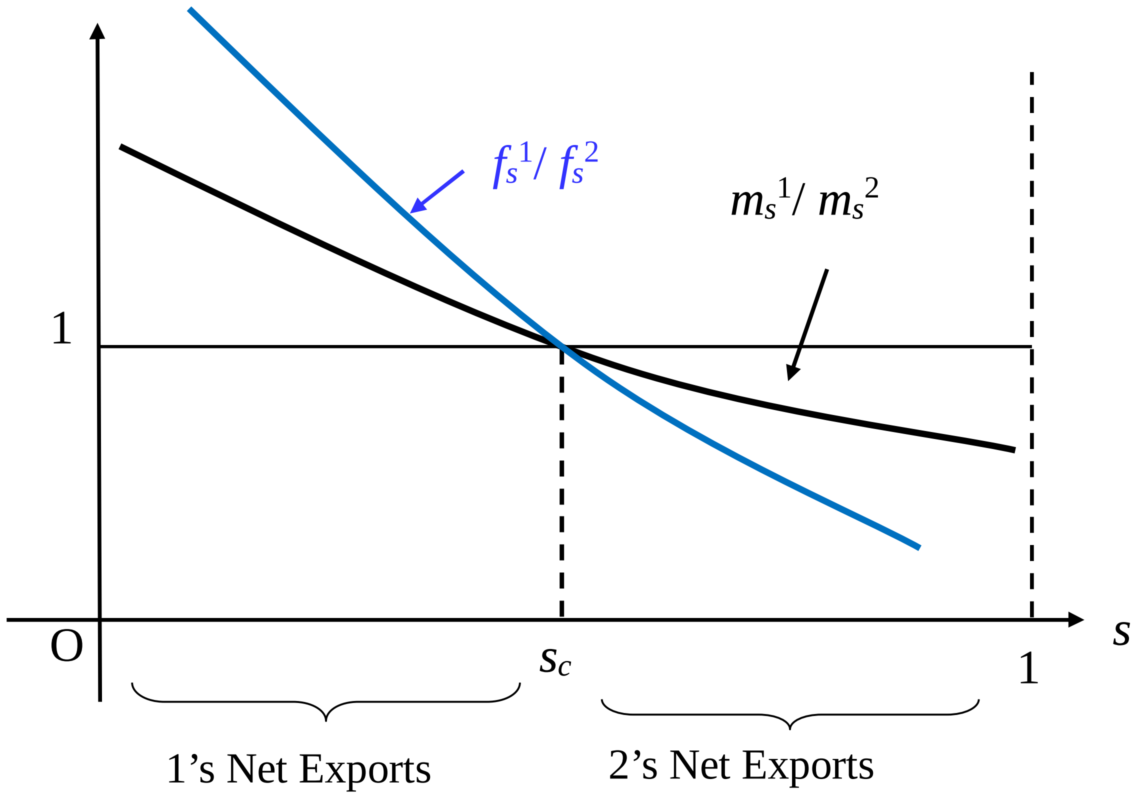
Then,

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 $0 \leq s < 1/2$; $\beta_s^1/\beta_s^2 = 1/\gamma < 1$ for $1/2 < s \leq 1$.

Concluding Remarks

- Empirically, sectors differ widely in their income elasticity; rich (poor) countries tend to be an exporter in higher (lower) income elastic sectors.

- In our model, the rich (poor) have CA in high (low) income elastic sectors due to *Nonhomothetic Preferences & Home Market Effect*
  - ✓ Rich's domestic market size distribution more skewed towards high income elastic.
  - ✓ With scale economies and positive but small trade costs, such cross-country differences in the domestic market size distribution become a source of CA.

- **Comparative Statics:** *Due to endogenous demand compositions*,
  - ✓ *Product cycles:* The Rich switches from an exporter to an importer in the middle
  - ✓ *Welfare gaps to widen (narrow)*, if sectors produce substitutes (complements)
  - ✓ *Leapfrogging* and *reversal of the patterns of trade*; The smaller but smarter country is poorer is a less globalized world, but becomes richer in a more globalized world.

- No previous studies allow for such a variety of comparative statics, because GE models with *imperfect competition, scale economies, positive but finite trade costs* would be intractable with Stone-Geary, CRIE or other **explicitly additively separable nonhomothetic preferences**, which are too inflexible and too restrictive.

- **Implicitly additively separable nonhomothetic CES** help us overcome this difficulty