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
  - **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, \( \alpha \) & \( \beta \), 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 \( \alpha \)-lovers; with the minority of \( \beta \)-lovers.
  - B is a nation of \( \beta \)-lovers, with the minority of \( \alpha \)-lovers.

In equilibrium,
- In autarky, proportionately large share of labor in A employed in sector \( \alpha \).
- Under trade, disproportionately large share of labor in A employed in sector \( \alpha \).
- **HME:** A is a net-exporter in \( \alpha \). (And B is a net-exporter in \( \beta \)).
- 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: Income elasticity of Sector \( s = \text{const.} \) (Bergson’s Law is a special case)

- Price elasticity of Sector \( s \)
  - Empirically false (Deaton 1974 and others)
  - 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 \( \int_{0}^{1} \omega_s(u)(c_s)^{1-1/\eta} ds = 1 \)

- Sector-specific income elasticities, unrelated to price elasticities
- 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
- 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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Appendix: Two Lemmas
Home Market Effect with Nonhomothetic Preferences
One Nontradeable Factor (Labor)

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

- $N^j$: $j$ 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, $\nu \in \Omega_s = \Omega_s^1 + \Omega_s^2$, $\Omega_s^j$: 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)

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

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

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

- \((\varepsilon(s) - \eta)/(1 - \eta) > 0\) 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,

\[
\omega(s, \tilde{U}^k) \equiv (\beta_s)^{\frac{1}{\eta}} \left( \tilde{U}^k \right)^{\frac{\varepsilon(s)-\eta}{\eta}} \text{ is log-supermodular in } s \text{ and } \tilde{U}^k.
\]
**Lemma 1:** For a positive value function, \( \hat{g}(\bullet; x) : [0,1] \rightarrow \mathbb{R}_+ \), with a parameter \( x \), define

\[
g(s;x) \equiv \frac{\hat{g}(s;x)}{\int_0^1 \hat{g}(t;x)dt} \quad \text{(a density function)} \quad \text{and} \quad G(s;x) \equiv \int_0^s g(t;x)dt = \frac{\int_0^s \hat{g}(t;x)dt}{\int_0^1 \hat{g}(t;x)dt} \quad \text{(its cumulative distribution function)}.
\]

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 sectors.
Household Maximization: Two-Stage Budgeting

1st Stage (Lower-level) Problem: Chooses $c^k_s(v)$ for $v \in \Omega_s$ to:

Max $\tilde{C}^k_s \equiv \left( \int_{\Omega_s} \left( c^k_s(v) \right)^{\frac{1}{\sigma}} dv \right)^{\sigma-1}$, subject to $\int_{\Omega_s} p^k_s(v)c^k_s(v)dv \leq E^k_s$,

$p^k_s(v)$ & $c^k_s(v)$: the unit consumer price and consumption of variety $v \in \Omega_s$;

$E^k_s$: Expenditure allocated to sector-s, taken as given.

Solution: $c^k_s(v) = \left( \frac{p^k_s(v)}{P^k_s} \right)^{-\sigma}$

$C^k_s = \left( \frac{p^k_s(v)}{P^k_s} \right)^{-\sigma} E^k_s$, where

$P^k_s \equiv \left( \int_{\Omega_s} \left( p^k_s(v) \right)^{1-\sigma} dv \right)^{1-\sigma}$; Dixit-Stiglitz price index in sector-s

$C^k_s = \text{Maximized } \tilde{C}^k_s$, satisfying $E^k_s = P^k_s C^k_s$. 

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2nd stage (Upper Level) Problem: Choose $E^k_s = P^k_s C^k_s$ to:

$$\text{Max } \tilde{U}^k, \text{ subject to } \int_0^1 (\beta_s)^{\eta} (\tilde{U}^k)^{(\varepsilon(s)-\eta)} (C^k_s)^{\eta-1} ds \equiv 1 \text{ and } \int_0^1 P^k_s C^k_s ds = \int_0^1 E^k_s ds \leq E^k.$$ 

Solution:

$$m_s^k = \frac{E^k_s}{E^k} = \frac{P^k_s C^k_s}{E^k} = \frac{\beta_s (U^k)^{(\varepsilon(s)-\eta)} (P^k_s)^{1-\eta}}{\int_0^1 \beta_t (U^k)^{(\varepsilon(t)-\eta)} (P^k_t)^{1-\eta} dt}, \text{ sector-s share in k’s expenditure}$$

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

$$(E^k)^{1-\eta} = \int_0^1 \beta_s (U^k)^{(\varepsilon(s)-\eta)} (P^k_s)^{1-\eta} ds. \quad (U^k \text{ is strictly increasing in } E^k.)$$

Notes:

- $\frac{\partial \log(m^k_s / m^k_{s'})}{\partial \log(U^k)} = \varepsilon(s) - \varepsilon(s')$. Higher-indexed more income elastic; Income elasticity differences are constant across different per capita income levels (unlike Stone-Geary).
- $\beta_s (U^k)^{(\varepsilon(s)-\eta)} (P^k_s)^{1-\eta}$ 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, $\rho \equiv (\tau)^{-\sigma} < 1$

**CES Demand for each good:** \( D_s(\nu) = A_j^s (p_j^s(\nu))^{-\sigma}, \nu \in \Omega^j_s \), where

\[
A_j^s \equiv b_j^s + \rho b_k^j \ (k \neq j): \ \text{Aggregate demand shifter for the producers in } j \text{ in } s
\]

\[
b_k^s \equiv \beta_s^j (E^k)\eta (U^k)^{\varepsilon \nu(s) - \eta} N^k(P_k^s)^{-\eta}; \ k's \ demand \ shifter \ for \ sector \ s
\]

Standard CES demand curve, but \( U^k \) affects \( b_k^s \) and hence \( A_j^s \) differently across \( s \).

**Constant Mark-Up:** \( \psi_s \) units of labor to produce one unit of each variety in sector-\( s \)

\[
p_j^s(\nu) = \frac{w_j^s \psi_s}{1 - 1/\sigma} \equiv p_j^s \ \text{for } \nu \in \Omega^j_s
\]

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

- **Labor Market Equilibrium:** \( \int_0^1 f_j^s ds = 1 \), \( f_j^s \): 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
\[
\left( x \right)^{(1-\eta)/\sigma-\eta} = \frac{1}{0} \left( \beta_s \left( u(x) \right)^{(\varepsilon (s)-\eta)/\sigma-\eta} \right)^{\sigma-1/\sigma-\eta} \, ds.
\]

**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:**
\[
m_s^k = \frac{\left( \beta_s \left( u(x_0^k) \right)^{(\varepsilon (s)-\eta)/\sigma-\eta} \right)^{\sigma-1/\sigma-\eta}}{\int_0^1 \left( \beta_t \left( u(x_0^k) \right)^{(\varepsilon (t)-\eta)/\sigma-\eta} \right)^{\sigma-1/\sigma-\eta} \, dt}
\]

- Labor is distributed proportionately with market sizes; \(f_s^k = m_s^k\)
- \(\left( \beta_s \left( u(x_0^k) \right)^{(\varepsilon (s)-\eta)/\sigma-\eta} \right)^{\sigma-1/\sigma-\eta}\) 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*.
\[
\frac{\partial \log(m_s^k / m_s^{k'})}{\partial \log(u(x_0^k))} = \left(\frac{\sigma - 1}{\sigma - \eta}\right) \frac{\partial \log(m_s^k / m_s^{k'})}{\partial \log(U^k)} > (<) \frac{\partial \log(m_s^k / m_s^{k'})}{\partial \log(U^k)}, \text{ iff } \eta > (<) 1.
\]

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 \( \eta > (<) 1. \)

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

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, $x^k_\rho$

$$U^1_\rho = u(x^1_\rho), \text{ where } x^1_\rho \equiv \frac{(1 - \rho^2)x^1_0}{1 - \rho(\omega)^{-\sigma}} > x^1_0; \quad U^2_\rho = u(x^2_\rho), \text{ where } x^2_\rho \equiv \frac{(1 - \rho^2)x^2_0}{1 - \rho(\omega)^{\sigma}} > x^2_0$$

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

**Market Size Distributions:**

$$m^k_s = \frac{\left( \beta_s \left( \frac{u(x^k_\rho)}{x^k_\rho} \right)^{\frac{\epsilon(s)-\eta}{\sigma-\eta}} \right)^{\frac{\sigma-1}{\sigma-\eta}}}{\left( x^k_\rho \right)^{\frac{1-\eta}{\sigma-\eta}}} = \frac{\left( \beta_s \left( \frac{u(x^k_\rho)}{x^k_\rho} \right)^{\frac{\epsilon(s)-\eta}{\sigma-\eta}} \right)^{\frac{\sigma-1}{\sigma-\eta}}}{\int_0^1 \left( \beta_s \left( \frac{u(x^k_\rho)}{x^k_\rho} \right)^{\frac{\epsilon(s)-\eta}{\sigma-\eta}} \right)^{\frac{\sigma-1}{\sigma-\eta}} dt}$$

$$\left( \beta_s \left( \frac{u(x^k_\rho)}{x^k_\rho} \right)^{\frac{\epsilon(s)-\eta}{\sigma-\eta}} \right)^{\frac{\sigma-1}{\sigma-\eta}}$$ is log-supermodular in $s$ & $x^k_\rho$. From **Lemma 1**, if $u(x^1_\rho) < u(x^2_\rho)$

i) **MLR:**

$$\frac{m^1_s}{m^2_s} = \left( \frac{x^1_\rho}{x^2_\rho} \right)^{\frac{\eta-1}{\sigma-\eta}} \left( \frac{u(x^1_\rho)}{u(x^2_\rho)} \right)^{\frac{\epsilon(s)-\eta}{\sigma-\eta}}$$ is strictly decreasing in $s$:

ii) **FSD:**

$$\int_0^1 m^1_t dt > \int_0^1 m^2_t dt$$

The Rich (Poor) has relatively larger domestic markets in higher(lower)-indexed sectors.
Employment Distributions: \[ f_s^1 = \frac{m_s^1 - \rho(\omega)^{-\sigma} m_s^2}{1 - \rho(\omega)^{-\sigma}}; \quad f_s^2 = \frac{m_s^2 - \rho(\omega)^{\sigma} m_s^1}{1 - \rho(\omega)^{\sigma}} \]

\[ \frac{f_s^1}{f_s^2} > \frac{m_s^1}{m_s^2} > 1; \quad \frac{f_s^1}{f_s^2} = \frac{m_s^1}{m_s^2} = 1; \quad \frac{f_s^1}{f_s^2} < \frac{m_s^1}{m_s^2} < 1. \]

_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; \[ NX_s^1 = -NX_s^2 = \frac{\rho w_s^2 L_s^2}{(\omega)^{-\sigma} - \rho} (m_s^1 - m_s^2) = \frac{\rho w_s^1 L_s^1}{(\omega)^{\sigma} - \rho} (m_s^1 - m_s^2) \propto (m_s^1 - m_s^2). \]

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

\[ U_{\rho}^1 = u(x_{\rho}^1) < U_{\rho}^2 = u(x_{\rho}^2) \rightarrow m_s^1 / m_s^2 \text{ is strictly decreasing in } s \rightarrow \]

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

\[ NX_s^1 = -NX_s^2 > 0 \text{ for } s < s_c; \quad NX_s^1 = -NX_s^2 < 0 \text{ for } s > s_c. \]
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 \( \rho \) but is richer at high \( \rho \)

Figure 3:

**Red Curve:** \( U_0^1 < U_0^2 \) below, \( U_0^1 > U_0^2 \) above

**Black Curve:** \( U_\rho^1 < U_\rho^2 \) below, \( U_\rho^1 > U_\rho^2 \) above

At \( \rho = 0 \), Black curve coincides with Red curve.
A higher \( \rho \) rotates Black curve clockwise,
At \( \rho = 1 \), it becomes vertical at \( h^1 / h^2 = 1 \)
Comparative Statics
Uniform Productivity Improvement: \((\partial \log(h^1) = \partial \log(h^2) \equiv \partial \log(h) > 0)\)

\(h^1 / h^2,\ L^1 / L^2,\ \omega = w^1 / w^2,\ x_0^1 / x_0^2,\ x_\rho^1 / x_\rho^2\) 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 \((\beta_s (u(x_\rho^k))^{(e(s) - \eta)} \frac{\sigma - 1}{\sigma - \eta})\) is log-supermodular in \(s\) and \(x_\rho^k\), from Lemma 1, the market size distributions shift toward higher-indexed sectors in both countries, in the sense of MLR and FSD.

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

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

- \(\text{sgn} \frac{\partial \log(m_s^1 / m_s^2)}{\partial \log(h)} = \text{sgn}(x_\rho^2 - x_\rho^1) \rightarrow s_c\) goes up.
**Figure 4: Product Cycles Due to Uniform Productivity Improvement**

- 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: \( L^1 = L^2 = L \)

\[
\omega = 1 \rightarrow x^k_\rho = (1 + \rho)x^k_0 = (1 + \rho)(h^k)^\sigma N^k = (1 + \rho)(h^k)^{\sigma-1} L
\]

The relative factor price fixed at \( \omega = 1 \) and independent of \( \rho \). No ToT change

- The country with higher per capita labor endowment is richer.
- A higher \( \rho \) is isomorphic to a uniform increase in \( h^k \).

Figure 4: Product Cycles Due to Globalization
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 $\rho$,
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 $\rho$,
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,

\[
\tilde{U}^k \equiv \left[ \int_0^1 (\beta_s^k)^{\frac{1}{\eta}} \left( \tilde{C}_s^k \right)^{\frac{1}{\eta}} ds \right]^\eta 
\]

normalized to \( \int_0^1 (\beta_s^k)^{\frac{\sigma-1}{\sigma-\eta}} ds = 1 \)

with *exogenously different* weights \( \beta_s^k \), and \( \beta_s^1 / \beta_s^2 \) strictly decreasing in \( s \).

Then,

**Standard-of-living:** \( U^k_{\rho} = (x_{\rho}^k)^{\frac{1}{\sigma-1}} \)

**Market Size Distribution:** \( m_s^k = (\beta_s^k)^{\frac{\sigma-1}{\sigma-\eta}} \) \( \Rightarrow m_s^1 / m_s^2 = (\beta_s^1 / \beta_s^2)^{\frac{\sigma-1}{\sigma-\eta}} \)

strictly decreasing in \( s \).

Otherwise, the same
Notes:

- $m_s^1 / m_s^2$ depends solely on the exogenous preferences parameters. Independent of $\rho$ 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