Catherine

Introduction to International Economics

Reading

Main Theories (Micro)

Adam Smith — basis of trade is absolute advantage

Ricardo — comparative advantage, productivity, technology

Neoclassical — relative factor abundance (Heckscher-Ohlin)
specific factors

Explain inter-industry Trade,
But why intra-industry?

Monopolistic Competition

Krugman's new trade theory
intra-industry trade (preferences)

Heterogeneous Firms

Melitz's new-new trade theory
Selection Effects (Firm, Brand)

History

Of the Balance of Trade — David Hume, 1758
The Wealth of Nations — Adam Smith, 1778

British trade policy debate in early 19th → discursive, informal; moder-oriented

country 1 imports > exports
country 2 exports > imports
(stakeholder)

import > export : inflows of capital
deficit
(foreigners willing to take a state)

Average of import and export as percentage of National Income (2018) :
- USA ~17%
- Canada ~35%
- Germany ~40%

Seven Themes

1. Gain from Trade

1992 US presidential election
- Ross Perot : giant sucking ground
- Bill Clinton : NAFTA (include Mexico)

* NAFTA : North America Free Trade Agreement

① one more efficient at producing everything
(less efficient : pay lower wages to complete)
② locally abundant in resources : export
locally scarce in resources : import
③ narrow ranges of good ⇒ greater efficiency
④ risky assets : diversification, variability↓

con : income distribution
(real wages of less-skilled workers in the US has been declining)

2. Pattern of Trade

- ✓ Climate and Resources
- ✓ differences in labor productivity
- ✓ Supplies and Demand of K, L, Land

3. How much Trade – Protectionism

- shield domestic industries · place limits on import
- subsidize exports

4. Balance of Trade

- trade surplus e.g. China
- trade deficit e.g. US (huge since 1982)

5. Exchange Rate Determination

fixed by government action > determined by marketplace

6. International Policy Coordination

e.g. Germany interest rate ↑ (1990)
⇒ precipitate recession in rest of Western Europe

GATT (General Agreement on Tariffs and Trade)
—— enforced by WTO

7. International Capital Market

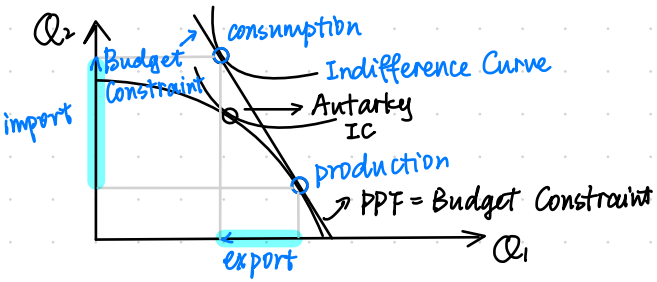
- ✓ special regulations (obey / evade domestic ones)
- ✓ special risks: currency fluctuations, national default

Week 1:
Ricardian Model

Lecture

Immisirising Growth
Dutch Disease
Balassa-Samuelson Effect
Ricardian Model

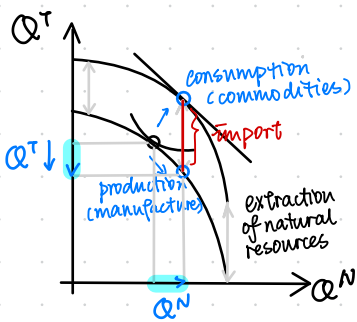
From Autarky to Trade



$$\frac{P_1}{P_2} < \frac{P_1^w}{P_2^w}$$

Term of Trade $= \frac{\text{price of export}}{\text{price of import}}$

Dutch Disease (Corden and Neary, 1982)



tradable { Natural Resources ↑ booming / Manufacturing / Agriculture

non-tradable: Services

1. Resource Movement Effect (could be negligible)

direct decentralization

lagging sector (Manufacturing) —production→ booming sectors (Resources)

⇒ unemployment

2. Spending Effect

a transfer of foreign exchange in tradables

indirect deindustrialization

⇒ p^N ↑, real exchange rate ($\frac{p^N}{p^T}$) ↑

⇒ export competitiveness of manufacturing ↓

declining manufacturing sector:

① commodity prices more volatile ⇒ TOT ↓

② difficult in face of shock (resource depletes)

③ "learning by doing", technology, innovation

④ unemployment

Balassa-Samuelson Effect (1964)

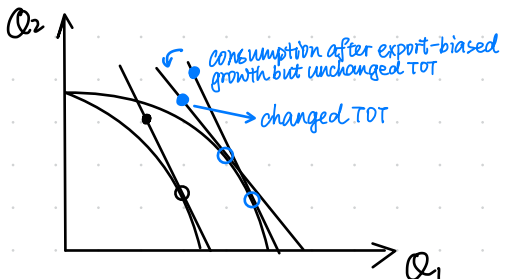
Assumptions: competitive labor markets within countries, thus wage equalization between traded and non-traded goods sectors

$\text{Wage} = P^{NT} \cdot MPL^{NT} = P^{T} \cdot MPL^{T}$ ↑

↑ asy. "=" fixed by world ↑ technology-advanced

Therefore, Richer countries, higher $\frac{P^{NT}}{P^{T}}$

Immiserizing Growth



Export biased growth may worsen Term of Trade:

1. very biased growth
2. high price inelasticity
3. trade large relative to GDP

Other harmful scenario: growth in other countries' import ⇒ worsen our GDP

Comparative Advantage

autarky prices determinants { differences in technologies; differences in endowments; differences in tastes

Ricardo's Theory. Technological Differences

Assumptions: 1. 2 countries (Home, Foreign)
2. 2 goods
3. 1 factor of production – Labor
   a_i^k: unit labor requirement for i goods in k country
4. Labor freely move between industries but not countries
5. perfect competitive industries, utility maximizers, no tariffs

Specialization: $\frac{P_1^H}{P_2^H} < \frac{P_1^W}{P_2^W} \Rightarrow$ Home specializes in Good 1
(complete specialization)

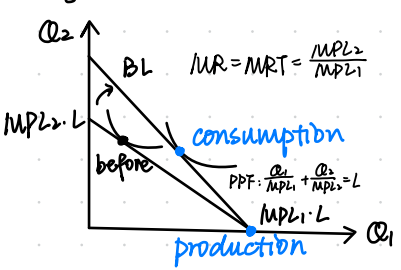
Supply Side

Constant Returns to Scale (CRTS) Technology:

$$\begin{cases} Q_1 = MPL_1 \cdot L_1 \\ Q_2 = MPL_2 \cdot L_2 \end{cases}$$

Labor market equilibrium: $L_1 + L_2 = L$

$\frac{P_1}{P_2} = \frac{MPL_2}{MPL_1}$ ($MR = P \cdot MPL = W$, equal)



Demand Side

Budget Constraint: $P_1Q_1 + P_2Q_2 = WL$ Same as the PPF in autarky

Utility Maximization: $MRS = \frac{MU_1}{MU_2} = \frac{P_1}{P_2} = \frac{MPL_2}{MPL_1}$

→ Free Trade | Budget Constraint: $P_1^W Q_1 + P_2^W Q_2 = P_1^W MPL_1 \cdot L$

Extension to Many Goods

(Dornbush, Fischer, Samuelson, 1977)

Assumption: a continuum of goods: $z \in [0,1]$

unit labor requirement: $a(z)$ in H and $a^*(z)$ in F

factor endowments: L in H and L^* in F

prices: $p(z) = C(z) = w \cdot a(z)$, $p(z^*) = C(z^*) = w^* \cdot a^*(z)$

(price, marginal cost, wage)

Define: $A(z) = \frac{a^*(z)}{a(z)}$, denote H comparative advantage in z

Assume: $A'(z) < 0$, goods ranked by declining H comparative advantage

Define: $\omega = \frac{w}{w^*}$ (CA locus) to determine the threshold good $\tilde{z}$, such that $\omega = A(\tilde{z})$.

derived by: $w\,a(\tilde{z}) = w^*\,a^*(\tilde{z})$

Utility: $\ln U = \int_z b(z) \ln x(z)\,dz$, where $\int_z b(z)\,dz = 1$, $b(\cdot)$ exogenous

Utility maximization s.t. Budget Constraint:

$$\text{Max } \ln U \text{ s.t. } \int_z p(z)x(z)\,dz \le I \quad (I \text{ for Income},\ I = wL)$$

FOC: $\mathcal{L} = \int_z b(z) \ln x(z)\,dz + \lambda\left(I - \int_z p(z)x(z)\,dz\right)$

$$\Rightarrow b(z)\frac{1}{x(z)} - \lambda p(z) = 0 \Rightarrow x(z) = b(z)\frac{1}{\lambda p(z)} = \frac{b(z)}{p(z)} I$$

$$I = \int p(z)\frac{b(z)}{\lambda p(z)}\,dz \Rightarrow I = \frac{1}{\lambda}\int_z b(z)\,dz = \frac{1}{\lambda} \Rightarrow \lambda = \frac{1}{I}$$

(interpretation of λ: marginal utility of income)

$$\Rightarrow x(z) = \frac{b(z)}{p(z)} I$$

$$\therefore \ln U = \int_z b(z)\left[\ln b(z) + \ln I - \ln p(z)\right] dz$$

$$= \int_z b(z) \ln b(z)\,dz + \ln I - \int_z b(z) \ln p(z)\,dz$$

$$\Rightarrow \ln\left(\frac{U}{I}\right) = \ln w - \left[\int_z b(z) \ln p(z) - C\right]$$

price index, weight = preference

Denote this price index as $P = \int_z b(z) \ln p(z) - C$

$$\Rightarrow \ln\left(\frac{U}{I}\right) = \ln\left(\frac{w}{P}\right)$$ real wage

Labour Market Equilibrium

Equilibrium: $L = L^D = \int_0^{\tilde{z}} l^D(z)\,dz$

Demand for domestic labor in sector z is given by:

$$\begin{aligned} l^D(z) &= a(z)[x(z) + x^*(z)] \\ &= a(z)\left[\beta(z)\frac{I + I^*}{P(z)}\right] \\ &= a(z)\left[\beta(z)\frac{wL + w^*L^*}{wa(z)}\right] \\ &= \beta(z)\frac{\omega L + L^*}{\omega} \quad \left(\omega = \frac{w}{w^*}\right) \end{aligned}$$

Therefore, $wL = \int_0^{\tilde{z}} \beta(z)(\omega L + L^*)\,dz = (\omega L + L^*)\theta(\tilde{z})$

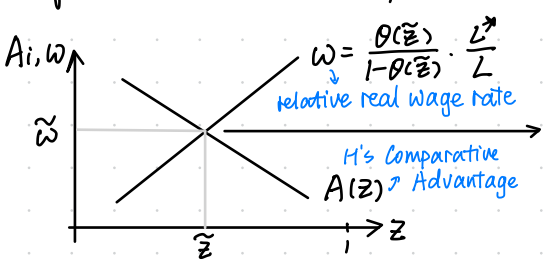
, where $\theta(\tilde{z}) = \int_0^{\tilde{z}} \beta(z)\,dz$, share of world spending on H goods

Relative wage rate $\omega = \frac{L^*}{L}\frac{\theta(\tilde{z})}{1-\theta(\tilde{z})}$ $\left(wa(\tilde{z}) = w^*a^*(\tilde{z}) \Rightarrow \omega = \frac{w}{w^*} = \frac{a^*(\tilde{z})}{a(\tilde{z})} = A(\tilde{z})\right)$

"Labour Market Equilibrium Locus | LME L"

since $\frac{d\omega}{d\tilde{z}} \propto \theta'(\tilde{z}) = \beta(\tilde{z}) > 0$, LME L is upward-sloping

Equilibrium and Comparative Statics

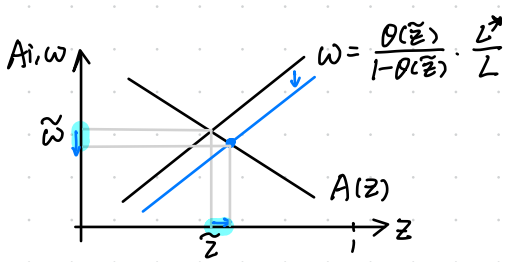


Labor Market Equilibrium Locus

by definition of $\tilde{z}$, $\tilde{\omega} = A(\tilde{z})$

Comparative Advantage

1. Home Labor Force increases ($L \uparrow$)

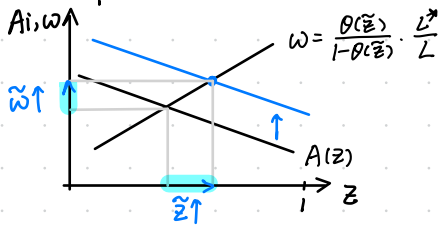


$\tilde{z} \uparrow$, $\tilde{\omega} \downarrow$, $w \downarrow$, $p(z) = wa(z) \downarrow$

$\begin{cases} \text{Welfare}^F \uparrow : \text{imports cheaper} \\ \text{Welfare}^H \downarrow : \text{real wages } \frac{w}{P} \downarrow \end{cases}$

($P = \int_z \beta(z)\ln p(z) - C$, whole range of z)

2. Improvement in Home Technology ($A(z)\uparrow$)

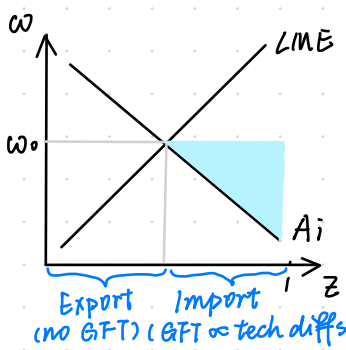


$\tilde{w}\uparrow$, $\tilde{z}\uparrow$, $p(z) = \overset{(\uparrow)}{w} \cdot \overset{(\downarrow)}{a(z)}$ Why offset by TOT↓

$\begin{cases} \text{Welfare}^H\uparrow : \Delta w\uparrow < \Delta A(z)\uparrow, \ \frac{w}{p}\uparrow \\ \text{Welfare}^F\uparrow : \text{lower import prices} \end{cases}$

Gains From Trade

Gains arise from imported goods only.



Autarky

$\ln(U^A) - \ln(L) = \ln w - \ln p$

$\ln(p) = \int_0^1 \beta(z)\ln[w\cdot a(z)]\,dz - \int_0^1 \beta(z)\ln\beta(z)\,dz$

$= \ln w + \int_0^1 \beta(z)\ln a(z)\,dz - \int_0^1 \beta(z)\ln\beta(z)\,dz$

$\Rightarrow \ln(U^A) - \ln(L) = -\int_0^1 \beta(z)\ln a(z)\,dz + \int_0^1 \beta(z)\ln\beta(z)\,dz$

Relative per Capita welfare.

$\ln\left(\frac{U}{L}\right) - \ln\left(\frac{U^*}{L^*}\right) = -\int_0^1 \beta(z)\ln a(z)\,dz + \int_0^1 \beta(z)\ln a^*(z)\,dz$

$= \int_0^1 \beta(z)\ln A(z)\,dz$

Gains from Trade: $\ln\left(\frac{w}{p}\right)_F - \ln\left(\frac{w}{p}\right)_A$ (Free Trade, Autarky)

In free trade:

$\ln\left(\frac{w}{p}\right)_F = \ln w_F - \left[\int_0^{\tilde{z}} \beta(z)\ln(w_F\cdot a(z))\,dz + \int_{\tilde{z}}^1 \beta(z)\ln(w_F^* a^*(z))\right]$

$= \ln w_F - \left[\theta(\tilde{z})\ln w_F + \int_0^{\tilde{z}} \beta(z)\ln a(z)\,dz\right.$

$\left. + (1-\theta(\tilde{z}))\ln w_F^* + \int_{\tilde{z}}^1 \beta(z)\ln a^*(z)\,dz\right]$

$= [1-\theta(\tilde{z})]\ln w_F - \int_0^{\tilde{z}} \beta(z)\ln a(z)\,dz - \int_{\tilde{z}}^1 \beta(z)\ln a^*(z)\,dz + C$

$\ln\left(\frac{w}{p}\right)_F - \ln\left(\frac{w}{p}\right)_A = [1-\theta(\tilde{z})]\ln w_F - \int_{\tilde{z}}^1 \beta(z)\ln A(z)\,dz \quad \left[+C - \int_0^1 \beta(z)\ln\beta(z)\right]$

$= \int_{\tilde{z}}^1 \beta(z)\,[\ln A(\tilde{z}) - \ln A(z)]\,dz$

H gains only on its imported goods: $z \geq \tilde{z}$.

Main Insights

more specialization ⇒ gains↑ (but require sectoral adjustment)

export: just a means to the end, the end is consumption / imports

Week 2 & 3:
Neoclassical Model

Lecture

Heckscher-Ohlin Model
Stolper-Samuelson Theorem
Rybczinski Theorem

Specific Factors Model

Basis for Trade

(Eli) Heckscher, (Bertil) Ohlin, (Paul) Samuelson

Differences in factor endowments (labour, capital, land, etc) across countries determine autarky prices, thus determine trade

Factor Endowment ⇒ Autarky Prices ⇒ Trade

Capital Abundance (Factor Abundance) a concept for COUNTRIES

$\frac{\text{Labour}}{\text{Capital}}$: labour abundance

(vice versa: capital abundance)

Capital Intensity a concept for SECTORS

⇒ income inequality

Assumptions

2x2x2 model: two countries, two goods, two factors of production

Full employment: $\begin{cases} L_S + L_C = \bar{L} & \text{(shorts and cars)} \\ K_S + K_C = \bar{K} & \text{(Labor and Capital)} \\ L_S^* + L_C^* = \bar{L}^* \\ K_S^* + K_C^* = \bar{K}^* \end{cases}$

Home is Capital Abundance: $\frac{\bar{L}}{\bar{K}} < \frac{\bar{L}^*}{\bar{K}^*}$ (WLOG)

Mobility in factors of production between sectors (but not internationally)

Constant returns to scale production functions identical in Home and Foreign.

$\begin{cases} Q_S = F_S(L_S, K_S) \\ Q_C = F_C(L_C, K_C) \end{cases}$ $\xrightarrow[\text{requirements}]{\text{unit input}}$ $\begin{cases} b_{LS} = \frac{L_S}{Q_S} ; b_{KS} = \frac{K_S}{Q_S} \\ b_{LC} = \frac{L_C}{Q_C} ; b_{KC} = \frac{K_C}{Q_C} \end{cases}$

Factor intensities: car production is more capital intensive

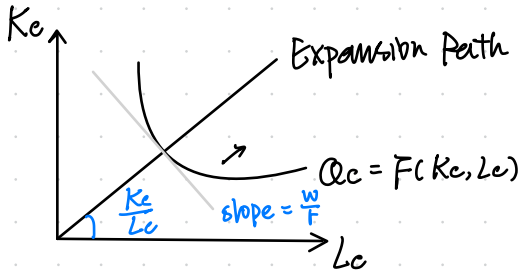
$\frac{b_{KC}}{b_{LC}} > \frac{b_{KS}}{b_{LS}} \Leftrightarrow \frac{b_{LS}}{b_{KS}} > \frac{b_{LC}}{b_{KC}}$

Factor earnings: wage income (W) for L and rental income (R) for K

☆ At any level of $\frac{W}{R}$, shirts remain labour intensive relative to cars in both countries (no factor intensity reversals)

Optimized unit cost functions: $C_S(W,R)$, $C_C(W,R)$ for 1 unit

satisfying: $b_{LS} = \frac{\partial C_S(W,R)}{\partial W}$, $b_{KS} = \frac{\partial C_S(W,R)}{\partial R}$, $b_{LC} = \frac{\partial C_C(W,R)}{\partial W}$, $b_{KC} = \frac{\partial C_C(W,R)}{\partial R}$



Isoquant:
slope = $-MRT = -\frac{w}{r}$

$\frac{Kc}{Lc}$ ← represented — Factor Intensity — depends on → $\frac{w}{r}$

No complete specialization!

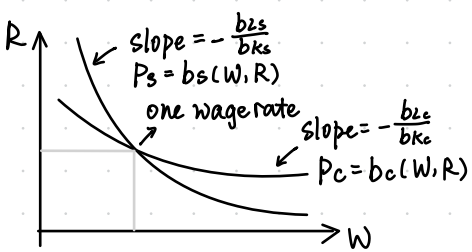
Comparative Advantage in H-O model

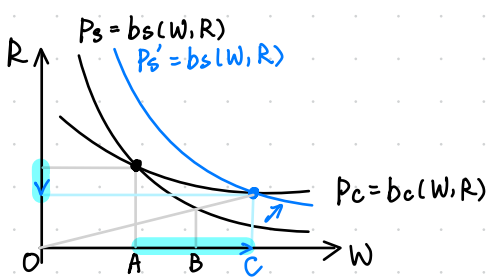
labour abundant country ⇒ CA in labor intensive goods (have higher $\frac{R}{w}$, i.e. low wages) / even under same technology

Implication of H-O model:
if a country produces both goods, then factor prices depend only on goods prices and not on factor supplies

⇒ Factor prices = f (Goods prices, ~~factor supplies~~)

some more explanations:
US (Capital intensive), China (Labor intensive)
if they can trade frictionlessly (without any tariffs, ···)
given that the above statement:
⇒ Labor prices = Capital prices
Evidence against 'international immigration lowers wages'





increase in Ps ($\frac{BC}{OB}$)↑ ⇒ more than proportional increase in W ($\frac{AC}{OA}$)↑, fall in R↓

Stolper-Samuelson Theorem (p, w, R)

- A 1% increase in the price of the labour intensive good causes wages to rise more than 1%, and return to capital to fall.

magnification effect

- Why?
  - Price increase implies an equivalent increase in the unit cost of producing shirts.
  - But unit costs should stay the same in the car industry (why?)
  - Since shirt production is more labour intensive, the only way both could happen is if W/R rises.
  - But the only way for W/R to rise and keep costs unchanged in cars is for R to fall.
  - With R falling, W must rise more than price to satisfy the zero-profit condition in shirts.

= car price

$\frac{W\uparrow\uparrow}{R\downarrow}$

$W^c + R^c = const$

$$\begin{cases} P_S = b_{LS} W + b_{KS} R \\ P_C = b_{LC} W + b_{KC} R \end{cases}$$

changes in goods prices have significant effects on income distribution

$$\begin{cases} \text{Home} \\ \text{Foreign} \end{cases} \xrightarrow{\text{trade}} \begin{matrix} W\downarrow, K\uparrow \\ K\downarrow, W\uparrow \end{matrix}$$

(assumption: incomplete specification)

Factor Price Insensitivity Theorem

When a country produces both goods in equilibrium and goods prices stay unchanged, factor prices do not change. This implies, factor prices do not respond to changes in factor supplies.

goods price = constant, factor price $\neq f$(factor supplies)

Rybczynski Theorem

$(Q; L, K)$ endowment

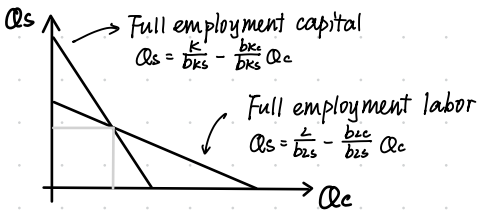
—— factor supplies matter !

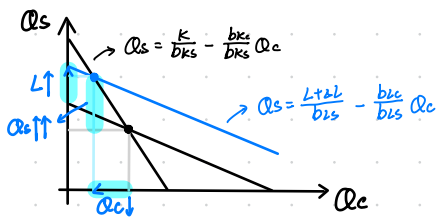
Assume supply of labour increases, then

{ production of the labour intensive good (shirt) expands ↑
production of the capital intensive good (car) contracts ↓

Factor market equilibrium conditions:

$$\begin{cases} b_{LS}Q_S + b_{LC}Q_C = L \\ b_{KS}Q_S + b_{KC}Q_C = K \end{cases} \Rightarrow \begin{cases} Q_S = \frac{L}{b_{LS}} - \frac{b_{LC}}{b_{LS}}Q_C \\ Q_S = \frac{K}{b_{KS}} - \frac{b_{KC}}{b_{KS}}Q_C \end{cases} \quad \left(\frac{b_{KC}}{b_{KS}} > \frac{b_{LC}}{b_{LS}}\right)$$





Results: $\left(\frac{L}{K}\right)^A > \left(\frac{L}{K}\right)^B \Rightarrow \left(\frac{P_S}{P_C}\right)^A < \left(\frac{P_S}{P_C}\right)^B$ (countries: A and B)

Labour abundant country has comparative advantage in labor intensive good
Labour supply ↑ 1% ⇒ Q_S ↑↑ >1%, Q_C ↓

$$\begin{cases} b_{LS}Q_S + b_{LC}Q_C = L \\ b_{KS}Q_S + b_{KC}Q_C = K \end{cases} \Rightarrow$$

(assumption: L↑, K→

Magnification Effect ∈

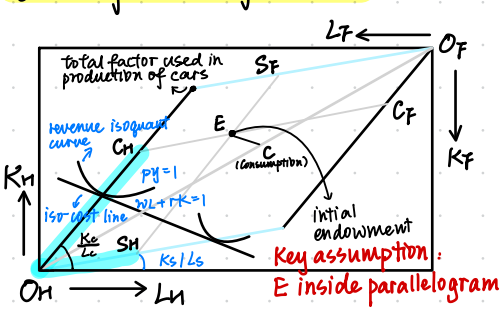
$$\frac{Q_S}{Q_S} b_{LS}\, dQ_S + \frac{Q_C}{Q_C} b_{LC}\, dQ_C = dL \cdot \frac{L}{L}$$

$$\underbrace{\frac{b_{LS}Q_S}{L}}_{\lambda_{LS}} \hat{Q}_S + \underbrace{\frac{b_{LC}Q_C}{L}}_{\lambda_{LC}=1-\lambda_{LS}} \hat{Q}_C = \hat{L} \quad \left(= \frac{dL}{L}\right)$$

$$\Rightarrow \lambda_{LS}\hat{Q}_S^{\uparrow\uparrow} + (1-\lambda_{LS})\hat{Q}_C^{\downarrow} = \hat{L}$$

$$\lambda_{KS}\hat{Q}_S^{\uparrow\uparrow} + (1-\lambda_{KS})\hat{Q}_C^{\downarrow} = \hat{K} = 0 \text{ (assumption)}$$

Cone of diversification



Outside cone of diversification

- Perfect specialisation in both countries
- Rybszynski breaks down (marginal endowment changes has no effect on output ratios - division by zero in both cases)
- Factor price equalisation does not hold
- Endowments don't matter as long as you are inside the cone ("Sufficiently similar")
- They matter outside it
- Output price change has no effect in one country (Stolper-Samuelson does not apply)

the Model's Empirical Validity

Some basis predictions of the HO model fail in the data:

- FPE (factor price equalization) doesn't hold in its naive form
- observed factor endowments are not entirely consistent with revealed CA
- HO predictions more consistent once factor endowments adjusted for technology

(tested by Leontief (1953) and Baldwin (1971)).

Leontief Paradox:

	Imports	Exports
Capital per million USD	2,132,000	1,876,000
Labour (per person-years) per million USD	119	131
Capital-labour ratio (USD per worker)	17,916	14,321
Average years of education per worker	9.9	10.1
Proportion of engineers and scientists in labour force	0.0189	0.0255

- While US was more K-abundant compared to the rest of the world, K-L ratio was higher for imports than exports. This is known as the **Leontief Paradox**.

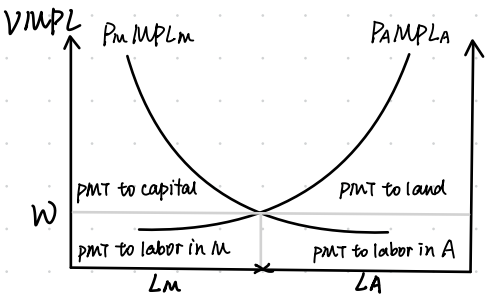
skill premium (empirical: $\frac{\text{college}}{\text{High school}}$ wage ratio)

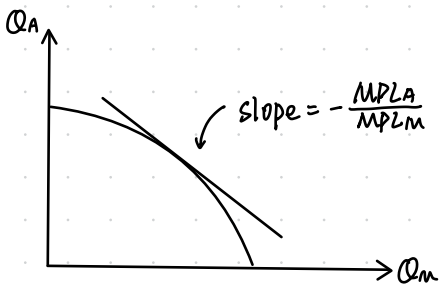
Specific Factors Model

Assumptions:

{ manufacturing: labour, capital, $Q_M = F_M(L, K)$
agriculture: labour, land, $Q_A = F_A(L, T)$

labour: mobile factor; land: specific factor

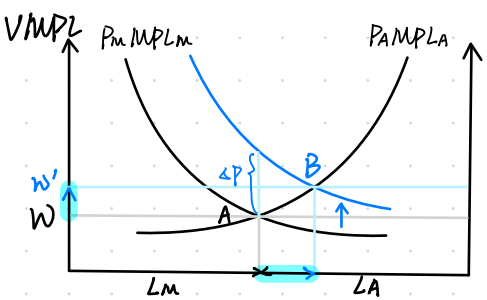




Equilibrium: $\frac{P_M}{P_A} = \frac{MPL_A}{MPL_M}$

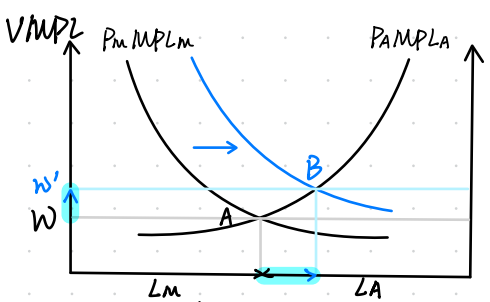
$\int_0^{L_M} P_M MPL_M \, dL = P_M \int_0^{L_M} \frac{\partial Q(L_M, K)}{\partial L} \, dL = P_M Q_M(L_M, K) = \text{Revenue}$

Perfect competition: $wL_M + rK = P_M Q_M(L_M, K)$



Rise in the price of manufacturing

- wage ↑: but Δwage < Δprice
- real wage ↓ in M, ↑ in F
- { owner of capital gain
  { owner of land lose



Rise in the capital shock

- wage (nomial and real) ↑
- { owners of capital lose
  { owners of land lose

Conclusions

1. differences in endowments are a source of comparative advantage
2. trade winners: factors specific to export sectors

Week 3 & 4
Intra-industry Trade

Lecture

the Krugman Model
Melitz Model

Importance of Intra-industry Trade

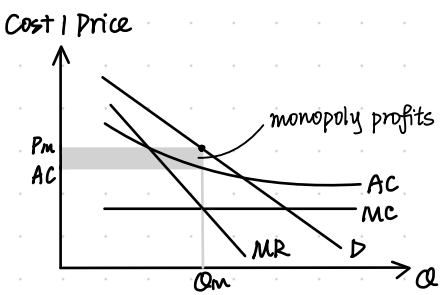
$$I = \frac{min(exports, imports)}{0.5 * (exports + imports)}$$

when only inter-industry: $I = 0$
(as the numerator must be zero)

Metalworking Machinery	0.97
Inorganic Chemicals	0.97
Power-Generating Machines	0.86
Medical and Pharmaceutical Products	0.85
Scientific Equipment	0.84
Organic Chemicals	0.79
Iron and Steel	0.76
Road Vehicles	0.70
Office Machines	0.58
Telecommunications Equipment	0.46
Furniture	0.30
Clothing and Apparel	0.11
Footwear	0.10

Background of the Theorem

Supply side: imperfect competition
— monopolistically competitive + imperfect substitutes



Dixit-Stiglitz (1977): consumers love variety
- identical customers
- utility function = f (varieties) (+)

$U = \sum_{i=1}^{N} v(c_i)$, $v' > 0$, $v'' < 0$

Chamberlinian monopolistic competition:
- each firm has some market power
- many firms, no effect on aggregate variables
- free entry, profits = 0 in equilibrium

Krugman (1979, Journal of International Economics): consumption ↓ ⇒ elasticity ↑
Consumers gains from trade: increase in varieties, lower prices (internal economies of scale)

Firm Heterogeneity

Stylized facts about firms in international trade
1. only a small share of manufacturing firms are exporters — require international knowledges, intellectual property rights
2. exporters are exceptional: larger, more productive, K-intensive, tech-intensive, pay higher wages (Bernard and Jensen, 1999) — little learning by exporting
3. trade liberalization improves industry productivity (Pavcnik, 2002)
   ① force of output expansion (low price) ② import of foreign technology
   ③ exit of low-productivity firms

Melitz Model (2003, Em)

Assumptions:

- Firms are ex-ante identical.
- They have to pay a sunk cost (f_e) to learn their productivity ϕ.
- Firms draw their productivity from a known distribution with a continuous distribution function $G(.)$.
- Firms face iceberg trade costs τ when exporting. (all transport cost ($\tau > 1$), similar to variable costs)
- They also have to pay fixed export costs f_X.
- There are two identical countries, and wages are normalised to unity.

Consumer Demand: $p(q) = q^{-\frac{1}{2}}$

Revenue: $r(q) = qp(q)$

$MR(q) = \frac{1}{2} q^{-\frac{1}{2}}$

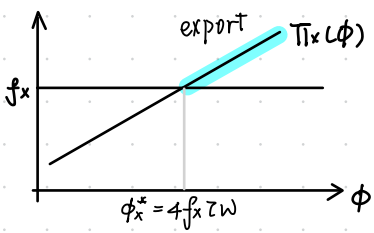
$MC(\phi) = \frac{w}{\phi}$ (w: wage rate, $\phi \in [\underline{\phi}, \bar{\phi}]$)

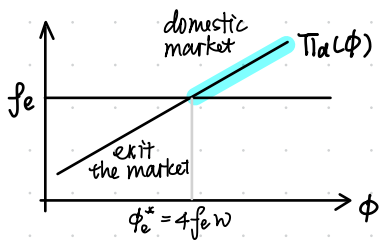
profit maximization: $MC = MR \Rightarrow q_D^* = \frac{\phi^2}{4w^2}$, firm profits $\pi(\phi) = \frac{\phi}{4w}$

marginal cost of exporting: $MC_x(\phi) = \frac{\tau w}{\phi}$

$MR_x(\phi) = \frac{1}{2} q_x^{-\frac{1}{2}}$, optimal quantity of export: $q_x(\phi) = \frac{\phi^2}{4\tau^2 w^2}$, $\pi_x(\phi) = \frac{\phi}{4\tau w}$

Choice of export: $\pi_x(\phi) > f_x$, threshold: $\phi_x^* = 4 f_x \tau w$





self-selection based on productivities

General Equilibrium

production function: $q(\phi, l) = \phi l$

labour market should clear: $\int_{\phi_e}^{\bar{\phi}} l(\phi) dG(\phi) = L$

average productivity: $\bar{\phi} = \int_{\phi_e}^{\bar{\phi}} \phi l(\phi) dG(\phi)$

$l(\phi)$: labour demand distribution of employment over ranges of high/low-ϕ firms

$f_x \downarrow, \tau \downarrow \Rightarrow$ more exporters $\Rightarrow l(\phi) \uparrow \Rightarrow w \uparrow \Rightarrow$ { good for the economy / bad for low-productivity firms

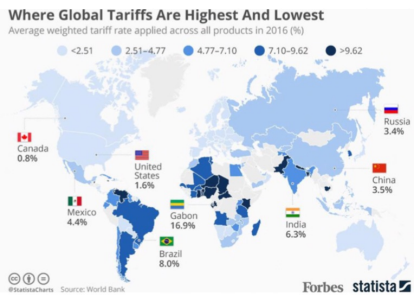
Week 4
Trade Policy

Lecture

Objectives of Trade Policy

1. Raise aggregate welfare
   - First best
   - Second best
2. Redistribute income
   - Between groups
   - To government: tariff revenue
3. policy instruments: tariffs, quotas, export subsidies, 'voluntary' restraints
   - tariffs: ad-valorem taxes on imports collected at borders
   - quotas: quantity limits on trade flows
   - export subsidies: usually forbidden in trade agreement

Tariff reduces total welfare for a small economy
Paradoxically, tariff rates are quite high in small countries



- tariffs generate revenues
- influence of small interest groups

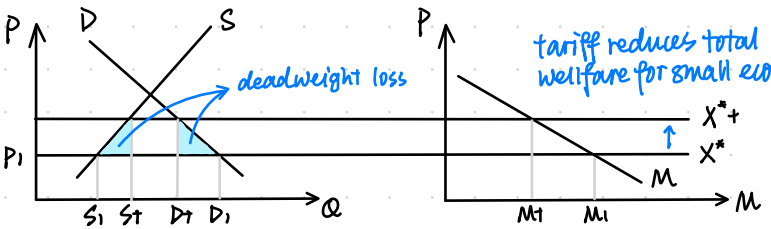
World Trade Organization (WTO)

Founded in January 1995, 153 member states (recent big member: Russia, 2012)
Structure similar to UN (same weight for each vote) than IMF-World Bank
successor to GATT (General Agreement on Tariffs and Trade)
credibility ↓ after Trade War between China and the USA

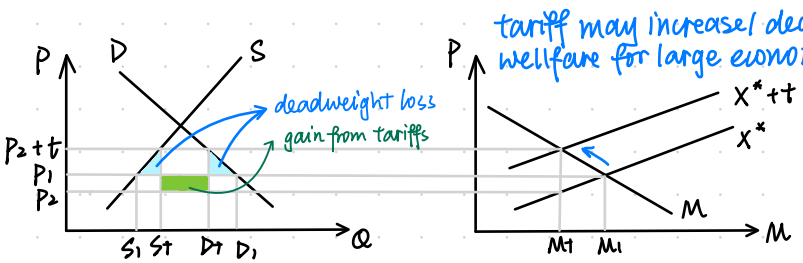
Preferential trade agreements: violate MFN, but allowed under article 24
MFN: most favored nations

- Free trade areas: no internal tariffs e.g. NAFTA
- Customs Unions: no internal tariffs, common external tariff e.g. EU
  free circulation of all goods within the union
- Common Market: free movement of goods, services, capital and labour
  deep integration, product standards, regulation ...

Partial Equilibrium

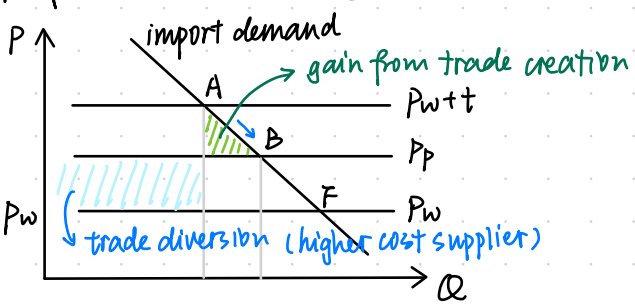


small countries



big countries

Preferential Trade Agreements



Lerner Symmetry

Optimal Tariffs

Small countries: zero!

Large countries: inverse elasticity pricing rule $t = \frac{1}{\varepsilon^{xs}}$ ← elasticity of foreign export supply

Total welfare: $W = \underbrace{v(p)}_{\text{indirect utility}} + \underbrace{tm(p)}_{\text{gov revenue}} + \underbrace{py - cy}_{\text{producer surplus}}$

Home country imposes tariff: $p = p^w + t$

$$\frac{dW}{dt} = \frac{dp}{dt}(v'(p) + y) + m + t\frac{dm}{dp}\frac{dp}{dt} + (p - c'(y))\frac{dy}{dt} = 0$$

profit maximization: $p - c'(y) = 0$

Roy's identity: $v'(p) = -d(p)$

$$\Rightarrow \left(1 - \frac{dp}{dt}\right)m = -\frac{dp^w}{dt}m = -t^*\frac{dm}{dp}\frac{dp}{dt}$$

Noting domestic import demand = foreign export supply:

$$\frac{t^*}{p^w} = \frac{1}{(dx/dp^w)\cdot(p^w/x)} = \frac{1}{\varepsilon^{xs}}$$

Second Best Arguments for Trade Policy

infant industry: takes times to get established
profitable in the long run, firms should be able to borrow

First best: fix capital market

Consequence: (Historic record) many developed countries tried and failed

Countervailing measures:

dumping 傾銷: WTO doesn't regulate it but sets rules on how members can or cannot react to dumping

environment (trade obstacles): some measures are allowed