International Economics I
The Classical Framework: The Specific Factors Model

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Questions

- why do countries trade? because it brings gains:
  - what is needed for trade to be beneficial?
  - which are the gains from trade
  - who gains and who loses from trade in each country?

Plan

- we'll answer within the framework of the classical model with specific factors:
  - 2 goods: manufactures, M, and agricultural goods, A
  - 3 factors of production:
    - labor, L, used to produce A and M (L mobile between sectors)
    - land, T, used to produce A (T specific factor)
    - capital, K, used to produce M (K specific factor)
  - technology with decreasing marginal productivity of factors
  - convex preferences
  - perfect competition + full employment

Preview of the Answers

- what is needed for trade to be beneficial?
  - diverse trading partners $\longrightarrow$ different relative price of goods
- which are the gains from trade?
  - every country expands its choice set
- why opening to trade?
  - firms *specialize* in the good that becomes relatively more expensive
    - income$\uparrow$ $\longrightarrow$ consumers can demand more of both goods (gains from *specialization*)
  - consumers can demand different quantities from the produced ones (gains from *exchange*)
- who wins and who loses from trade in each country?
  - winner: specific factor of the good that becomes relatively more expensive
  - loser: specific factor of the good that becomes relatively cheaper
  - uncertain: mobile factor

Production: Technology

- production function of manufactures

$$Q_M = Q_M(K, L_M)$$

  - Q_M = quantity of M produced
  - L_M = labor employed in manufactures
  - K = capital

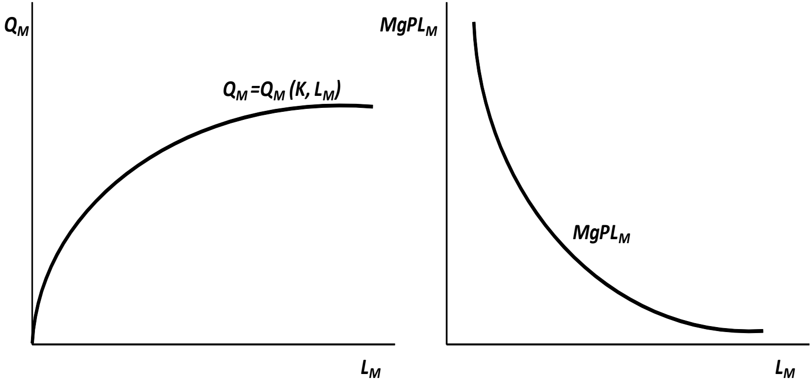
- production function of agricultural goods

$$Q_A = Q_A(T, L_A)$$

  - Q_A = quantity of A produced
  - L_A = labor employed in agriculture
  - T = land

- decreasing marginal productivity of labor, $MgPL_M$ and $MgPL_A$:
  - every additional worker produces less than the previous ones

Production: Technology



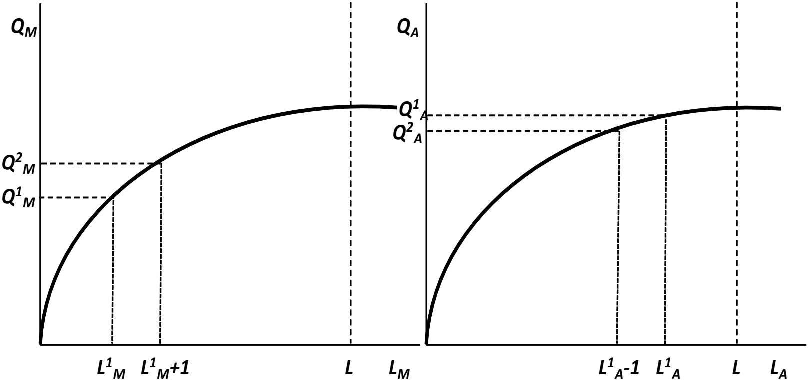
Production Possibility Frontier (PPF)

- how much of each good can the economy produce?
- labor endowment $= L$
- in equilibrium, L is allocated between the production of M and A

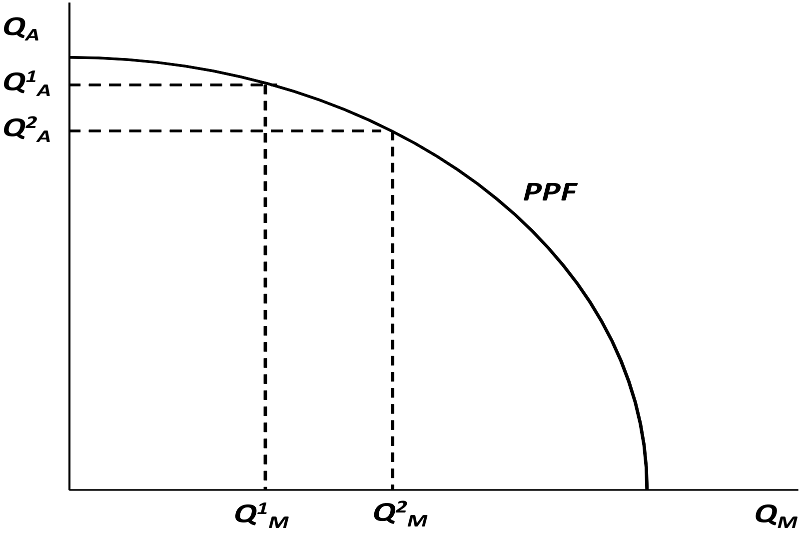
$$L_M + L_A = L$$

- for given labor allocation, $\left(L_M^1, L_A^1\right)$, the economy produces
  - $Q_M^1 = Q_M\left(K, L_M^1\right)$ of manufactures
  - $Q_A^1 = Q_A\left(T, L_A^1\right)$ of agricultural goods
- if we move 1 worker from A to M:
  - how do quantities Q_M^2 and Q_A^2 change?
  - the PPF curve tells us

Production Possibility Frontier (PPF)



Production Possibility Frontier (PPF)



PPF: Explanation and Analytical Expression

- assume $Q_A^1 >> Q_M^1$
  - given decreasing returns, Q_M increases more than Q_A falls
  - since the abundance of A relative to M implies a low *opportunity cost* of increasing the production of M
  - this is why the PPF is concave
- analytically, shifting one hour of work from A to M:
  - increases the production of M by a quantity equal to the marginal productivity of labor, $MgPL_M$
  - reduces the production of A by a quantity equal to the marginal productivity of labor, $MgPL_A$
  - the *opportunity cost* of M relative to A is equal to the slope of the PPF:

$$-\frac{MgPL_A}{MgPL_M}$$

Relative Supply: Optimal Production

- in perfect competition, firms:
  - take goods and factors prices as given
  - decide how much to produce to maximize profit

$$\max_{L_i} \pi_i = P_i Q_i (L_i, F) - w_i L_i \text{ for } i = M, A \text{ and } F = K, T$$

  - optimality condition: marginal cost of labor equals its marginal product
    - ★ note: marginal product=price*marginal productivity!

$$\begin{aligned} w_M &= P_M \times MgPL_M \\ w_A &= P_A \times MgPL_A \end{aligned}$$

    - ★ note: the owner of the specific factors earns $MgPL_i - w_i / P_i$ on each worker up to the last one hired

Relative Supply: Equilibrium Production

- wages must be equal in both sectors since labor is mobile between M and A

$$w_M = w_A = w$$

- equilibrium production of M and A:
  - lies at the tangency between the PPF and the line of the relative price of M:

$$-\frac{MgPL_A}{MgPL_M} = -\frac{P_M}{P_A}$$

    i.e., opportunity cost of M = relative price of M
  - given technology and factor endowment, what determines production is the *relative price*

Relative Supply: Equilibrium Production

- if the price of M increases ($P'_M > P_M$):
  - firms want to employ more labor in $M \rightarrow w_M \uparrow$
  - as L moves from A to M, $MgPL_A \uparrow$ and $MgPL_M \downarrow \rightarrow w_A \uparrow$ and $w_M \downarrow$
  - the reallocation of L goes on until $w_M = w_A = w$ and $MgPL_A / MgPL_M = P'_M / P_A$
- overall:
  - relative supply (RS) is increasing in the relative price ($P_M / P_A \uparrow \rightarrow Q_M / Q_A \uparrow$)
  - w increases less than P_M since $MgPL_M / MgPL_A \downarrow$ due to reallocation of L
    - note: this is due to the fact that the other factor is specific and can be interpreted as a short-run effect (we'll see that w varies by more if all factors are mobile)

Relative Demand: Optimal Consumption

- demand of the quantities of M and A maximizes utility subject to the budget constaint
- utility function

$$U = U\left(D_M, D_A\right)$$

  - increasing in the quantities consumed of M and A, D_M and D_A
  - positive and decreasing marginal utilities $(MgUD_A$ and $MgUD_M)$
  - described by convex indifference curves in the space of $\left(D_M, D_A\right)$
    - as we prefer consuming a bit of both goods rather than a lot of one and a little of the other

Relative Demand: Optimal Consumption

- budget constraint

$$P_M D_M + P_A D_A \leq V$$

  - V = disposable income (= value of production)
  - the budget constraint line has slope $-P_M / P_A$:

$$D_A = \frac{V}{P_A} - \frac{P_M}{P_A} D_M$$

- optimal demand of M and A

$$-\frac{MgUD_M}{MgUD_A} = -\frac{P_M}{P_A}$$

  - i.e., indifference curve tangent to the line of the relative price of M

- RD is decreasing in the relative price

Equilibrium in the Closed Economy

- in equilibrium, a closed economy must consume all the quantities produced

$$D_M = Q_M \quad \text{and} \quad D_A = Q_A$$

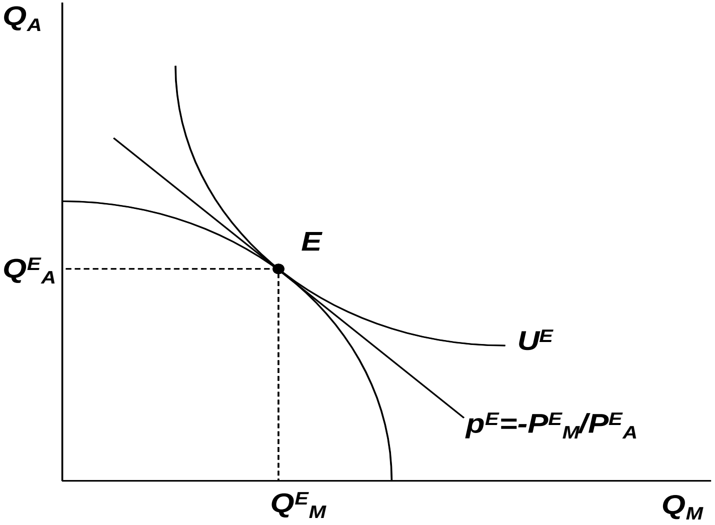
- this is possible only if the PPF and the indifference curve are tangent to the relative price line in the same point
- **note**: in closed economy, two conditions must hold:
  - produced value equals consumed value

$$V = P_M Q_M + P_A Q_A = P_M D_M + P_A D_A$$

  - produced quantities equal consumed quatities of each good

$$D_M = Q_M \quad \text{and} \quad D_A = Q_A$$

Equilibrium in the Closed Economy



Equilibrium in the Open Economy

- good prices are determined in the international market
  - P^I_M and P^I_A make international demand equal international supply
- in open economy, a country can consume different quantities from the produced ones

$$D_M \lesseqqgtr Q_M \quad \text{and} \quad D_A \lesseqqgtr Q_A$$

- the only condition that must hold is that produced value equals consumed value

$$V = P^I_M Q_M + P^I_A Q_A = P^I_M D_M + P^I_A D_A$$

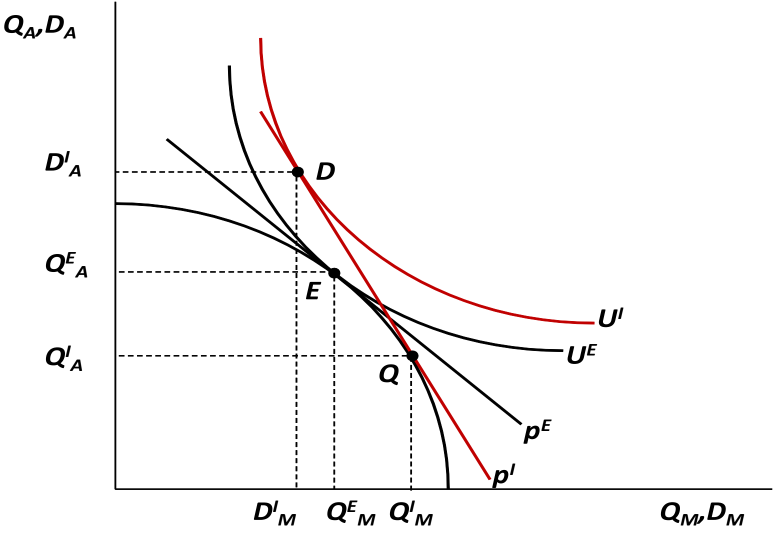
Equilibrium in the Open Economy

- given international prices
  - firms choose the equilibrium production (PPF tangent to the relative price line)
- given international prices and the value of production (i.e., income)
  - consumers choose equilibrium demand (indifference curve tangent to the relative price line)
- if the international relative price is different from the closed economy, production and demand are not equal

$$\frac{P_M^I}{P_A^I} \neq \frac{P_M}{P_A} \Longrightarrow D_M \neq Q_M \quad \text{and} \quad D_A \neq Q_A$$

  - there is international trade!

Equilibrium in Closed and Open Economy



Comparative Advantage and Pattern of Trade

- there is **comparative advantage** in the production of a good (e.g., M) if its *relative price* in closed economy is *lower* than in open economy

$$\frac{P_M^I}{P_A^I} > \frac{P_M}{P_A}$$

- pattern of trade:
  - a country exports its good of comparative advantage (e.g., M)

$$X_M = Q_M^I - D_M^I > 0$$

  - a country exports its good of comparative disadvantage (e.g., A)

$$M_A = D_A^I - Q_A^I > 0$$

- if trading partners are equal,
  - their relative prices in open and closed economy coincide
  - there is no comparative advantage of any country
  - there are no gains from trade

Comparative Advantage and Absolute Advantage

- there is **absolute advantage** in the production of a good (e.g., M) if its *price* in closed economy is *lower* than in open economy
  - a country with absolute advantage in both goods ($P_M^I > P_M$ and $P_A^I > P_A$) may have comparative advantage in only one
  - a country with absolute disadvantage in both goods ($P_M^I < P_M$ and $P_A^I < P_A$) may have comparative advantage in only one
- trade requires CA, not necessarily AA
- there is comparative advantage if countries are different
  - we'll study 2 trade models where comparative advantage arises from:
    - different technologies across countries: Ricardian model
    - different relative factor endowment across countries: Heckscher-Ohlin model

Gains From Trade and Terms of Trade

- assume we export M and import A
  - terms of trade = relative price of export (P^I_M / P^I_A)
- what if our terms of trade deteriorate?
  - we produce less M and more A
  - the value of our production drops
  - we partly stop exporting M and importing A
  - our welfare drops
- in general:
  - if the terms of trade deteriorate (improve), welfare falls (rises)
  - note: no fall in the t-o-t is able to push U below autarky level!

Gains From Trade: Summary and Doubts

- there are GFT so long as:
  - countries are different
  - the PPF is concave (no increasing returns)
  - markets are perfectly competitive
- what if one condition fails?
  - we'll prove that also in case of increasing returns and monopolistic competitions there are GFT, although of a different type
- is trade beneficial for everybody within a country?
  - how does trade affect different factors of production?

The Redistributive Effects of Trade

- we take as a measure of welfare real income in terms of both goods
- consider workers first: w^I / P^I_A and w^I / P^I_M
  - from profit maximization:

$$\frac{w^I}{P^I_M} = MgPL_M \quad \text{and} \quad \frac{w^I}{P^I_A} = MgPL_A$$

  - if $P^I_M / P^I_A \uparrow \to Q^I_M / Q^I_A \uparrow \to L^I_M \uparrow L^I_A \downarrow \to w^I / P^I_M \downarrow w^I / P^I_A \uparrow$
- workers gain in terms of A and lose in terms of M

The Redistributive Effects of Trade

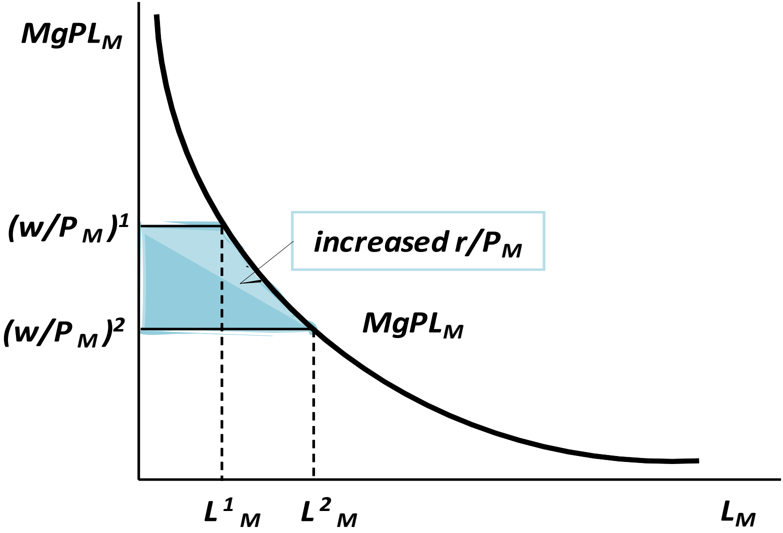
- consider capitalists: income r is profit from M
  - real income

$$\frac{r}{P_M} = Q_M - \frac{w}{P_M} L_M \text{ and } \frac{r}{P_A} = \frac{P_M}{P_A} \frac{r}{P_M}$$

    - ⋆ $P_M / P_A \uparrow \rightarrow Q_M \uparrow \rightarrow L_M \uparrow \rightarrow w / P_M \downarrow \rightarrow$ net effect on r / P_M?

- from profit maximization:
  - capitalists benefit from each additional worker up to the marginal (last) one $(MgPL_M (L) > w / P_M$ for $L < L_M)$
- capitalists employ more workers $(L_M \uparrow)$ + pay them less in real terms $(w / P_M \downarrow)$
  - net effect: $r / P_M \uparrow$
  - $r / P_A = \left(P_M^I / P_A^I\right) r^I / P_M^I \uparrow\uparrow$ since also $P_M / P_A \uparrow$
- capitalists gain with respect to both goods
- landowners lose with respect to both goods

The Redistributive Effects of Trade: Graph



The Redistributive Effects and Welfare

- in the model with specific factors:
  - the factor specific of the exporting sector gains
  - the factor specific of the import-competing sector loses
- does it mean that trade is detrimental?
- NO: there always exists a policy that can redistribute gains and losses so that everybody benefits from trade
  - why?
  - because trade makes the pie bigger!

Generalization: Mobile Factors

- suppose there are 2 factors instead of 3:
  - labor, L, and capital, K
  - employed in both sectors
  - mobile between sectors
  - immobile between countries (no migration, no capital flows)
- the PPF remains concave provided that
  - production functions are different

$$Q_M(K, L) \neq Q_A(K, L)$$

- same gains from trade
- different redistributive effects (we'll see them later on)
  - the model with specific factors captures the short-run effects
  - the model with mobile factors captures the long-run effects