ECBS 6060: International Trade
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Endowment-based theories

The integrated equilibrium

The integrated equilibrium

- To emphasize factor proportions, we assume away all other differences:
  1. Preferences are identical and homothetic.
  2. Technologies are the same.
- There are many countries, only differing in their factor endowments.
- (What is the difference between factors and goods?)

The integrated equilibrium

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  - The equilibrium of the world economy where both goods and factors are mobile.
- We derive trade patterns in the IE.
- And study conditions for its existence.

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Setup

- World endowment of factor $n \in N$: $\bar{V}_n$.
- Identical, CRS, quasi-concave production function of good $i \in I$. Unit cost function: $c_i(w)$.
  - Unit factor requirements:

$$a_{ni}(w) = \frac{\partial}{\partial w_n} c_i(w)$$

- Identical, homothetic preferences.
  - Consumption share:

$$\alpha_i(p) = \frac{\partial e(p)}{e(p) \partial p_i}$$

- Perfect competition.

Conditions of IE

- Profit maximization. For all i,

$$p_i \leq c_i(w), \text{ with } = \text{if } x_i > 0.$$

- Factor market clearing. For all n,

$$\sum_i a_{ni}(w)\bar{x}_i = \bar{V}_n$$

- Goods market clearing. For all i,

$$\alpha_i(p) = \frac{\bar{x}_i}{\sum_j p_j \bar{x}_j}.$$

Carving up the world

- Divide the world into J countries.
- Country j has endowment $\{V_n^j\}$.
- Under what conditions can the IE sustained?
- We need to put restrictions on the set of endowments, $\mathbf{V}$.

Why IE is a useful benchmark

- If we can replicate the IE, all countries face the same good and factor prices.
- Hence $a_{ni}^{j} = a_{ni}(w)$ and $\alpha_{i}^{j} = \alpha_{i}(p)$ for all country j.
- Clearly, profit and utility maximization will continue to hold.
- So will goods market clearing.
- But can we fully employ all factors in each country?

Full employment in each country

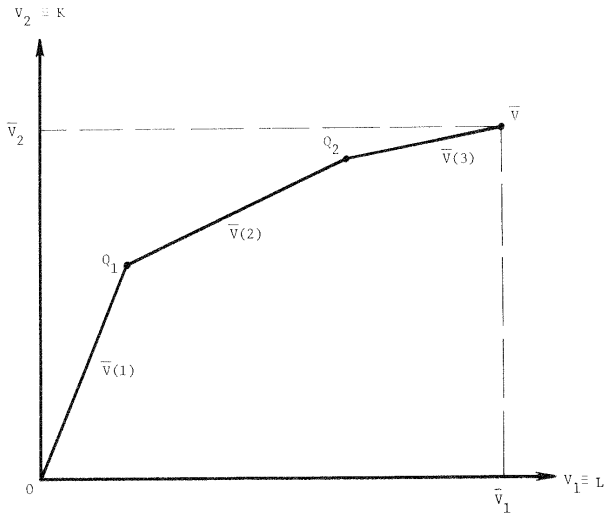
- Factor markets clear in each country j:

$$\sum_i a_{ni}(w)x_i^j = V_n^j \,\forall n.$$

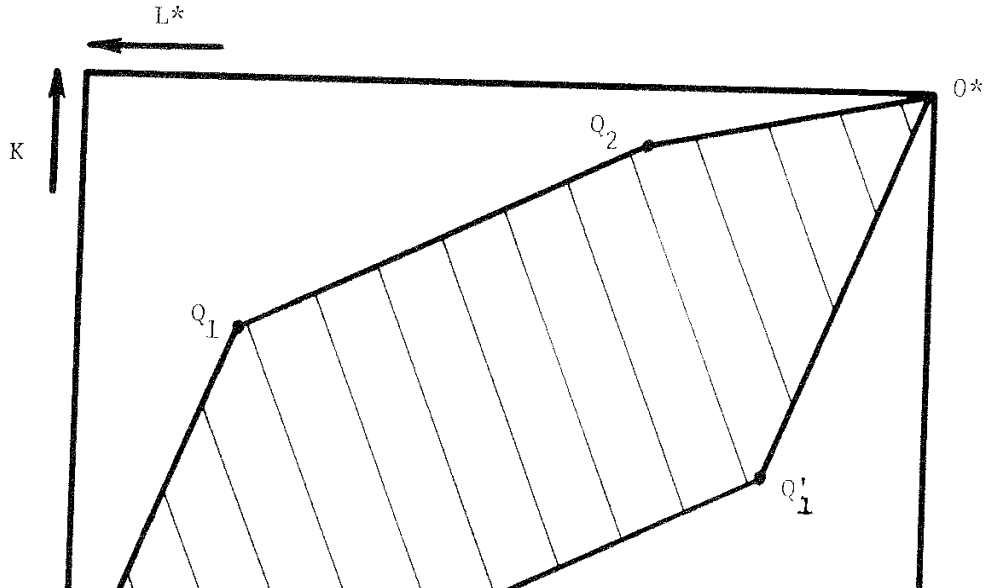
- Are there x_i^js such that this holds and the world produces the *same amount* as in the IE

$$\sum_j x_i^j = \bar{x}_i \,\forall i?$$

Factor demands of total world output in each sector



The set that replicates the integrated equilibrium



Factor price equalization

- As long as endowments are not *too different* across countries, we can replicate the integrated equilibrium even if factors cannot flow across borders.
- This will equalize factor prices, so that factors do not *want* to move.
- In this equilibrium, trade flows *substitute* for factor flows.

Pattern of trade

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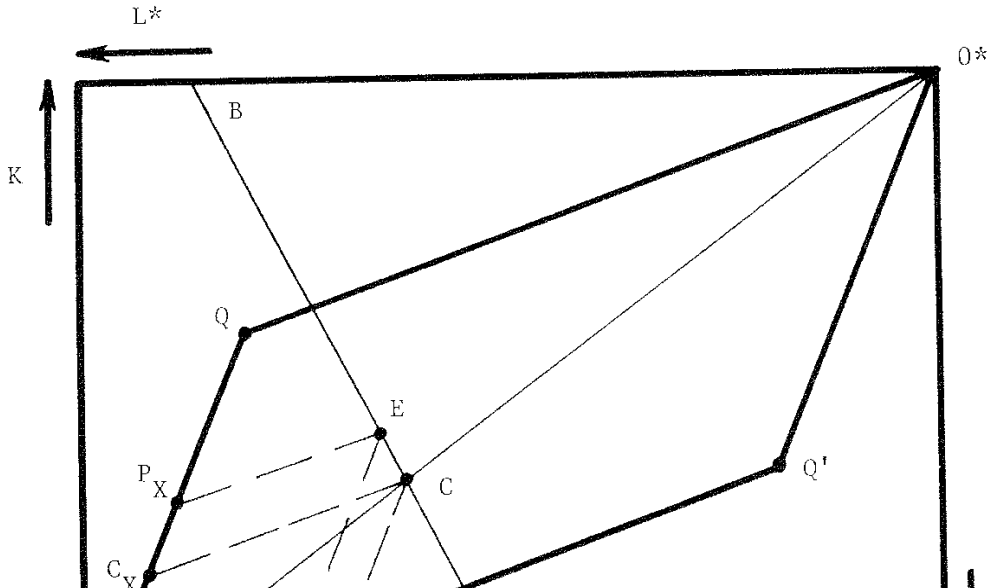
Heckscher–Ohlin theorem

Each country exports the good that uses its abundant factor intensively.

Heuristic proof using the law of comparative advantage

- In the integrated equilibrium, goods prices and factor prices are the same in the two countries.
- In autarky, the labor abundant country has lower relative wage than the capital abundant country.
- The autarky price of the labor intensive good will be lower in the labor abundant country.
- It will hence export the labor intensive good and import the capital intensive one.

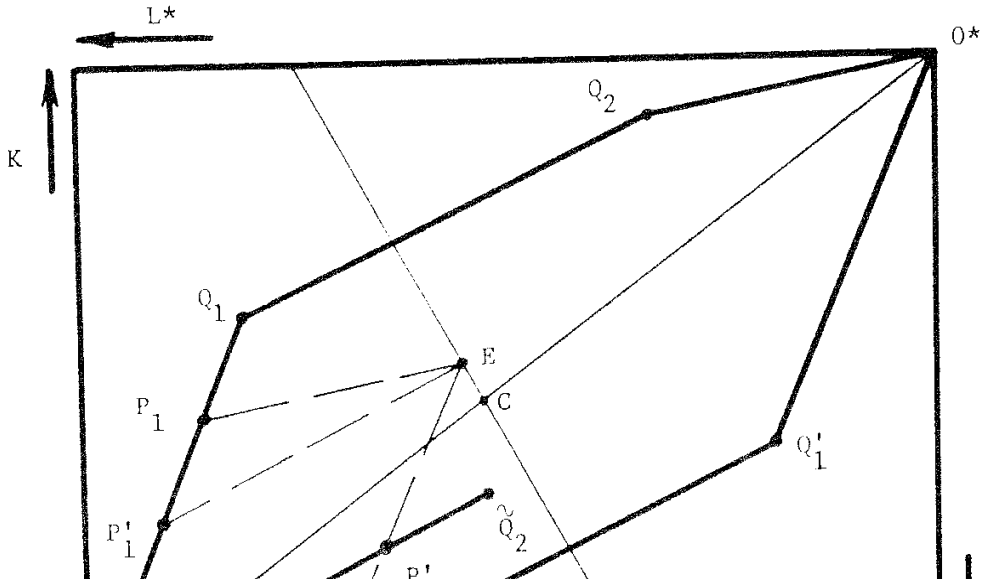
The pattern of trade with 2 goods and 2 factors



More goods than factors

- If we have more goods than factors, the pattern of *goods trade* is indeterminate.
- Luckily, we can still pin down the *factor content* of trade.
  - How much labor, capital, land (etc) are embedded in net exports?

The pattern of trade with 3 goods and 2 factors



Supply side

- Let $\mathbf{A}$ denote the matrix of $[a_{in}]$s.
- Because technology is the same in each country and factor prices equalize, $\mathbf{A}$ is the same across countries.
- The factor content of production is

$$\mathbf{A}\mathbf{X}^j = \sum_{i \in I} a_{in} X_i^j = \mathbf{V}^j.$$

- The factor content of consumption is

$$\mathbf{A}\mathbf{C}^j = \sum_{i \in I} a_{in} C_i^j \neq \mathbf{V}^j.$$

Demand side

- Preferences are homothetic and prices are the same.
- The consumption basket is the same across countries:

$$\mathbf{C}^j = \alpha Y^j.$$

- In world equilibrium, consumption equals production,

$$\sum_{j \in J} \mathbf{C}^j = \alpha \sum_{j \in J} Y^j = \bar{\mathbf{X}}.$$

- Clearly,

$$\mathbf{C}^j = \frac{Y^j}{\sum_{k \in J} Y^k} \sum_{k \in J} \mathbf{C}^k \equiv s^j \bar{\mathbf{C}}.$$

- The factor content of consumption:

$$\mathbf{A}\mathbf{C}^j = s^j \mathbf{A}\bar{\mathbf{C}} = s^j \mathbf{A}\bar{\mathbf{X}} = s^j \bar{\mathbf{V}}.$$

The Vanek equation

- The factor content of net exports,

$$\mathbf{F}^j \equiv \mathbf{A}\mathbf{T}^j = \mathbf{A}(\mathbf{X}^j - \mathbf{C}^j) = \mathbf{V}^j - s^j\bar{\mathbf{V}}.$$

The Heckscher-Ohlin-Vanek theorem

Each country exports the services of its abundant factors.

Balanced trade

- If trade is balanced,
$$p\mathbf{T}^j = 0.$$
- This implies
$$w\mathbf{F}^j = 0.$$
Why?
- That is, some elements of $\mathbf{F}^j$ are positive, others are negative.

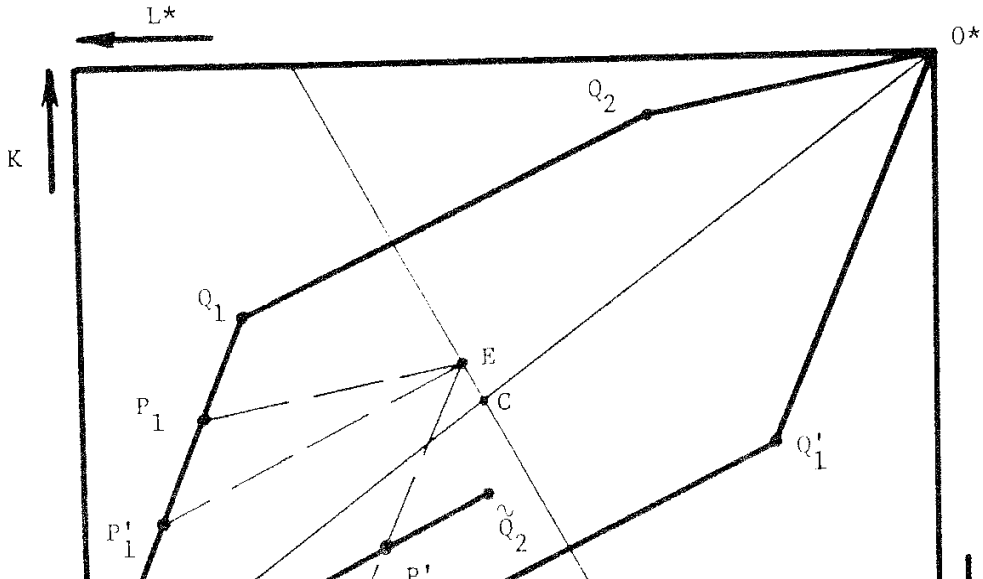
Net factor exports and imports

- Rank factors such that

$$\frac{V_1^j}{\bar{V}_1} > \frac{V_2^j}{\bar{V}_2} > ... > s^j > ... > \frac{V_N^j}{\bar{V}_N}.$$

- The first group of factors ($V_n^j/\bar{V}_n > s^j$) is exported, the second group of factors is imported.

The pattern of trade with 3 goods and 2 factors



Discussion

- The HOV theorem sounds very much like a pure exchange economy. If I have more coconuts and you have more bananas, I will sell you coconuts for bananas.
- However, there were many non-trivial steps involved in deriving it.
- Empirical tests amount to a joint test of all these assumptions.