International Economics B
8. Monopolistic competition and international trade: Basic model

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Monopolistic competition and international trade

- **Two seminal papers by Krugman:**
  - **Krugman, P.R. (1979), "Increasing Returns, Monopolistic Competition, and International Trade,"** *Journal of International Economics* **9, 469–479.**
  - **Krugman, P. (1980), "Scale Economies, Product Differentiation and the Pattern of Trade,"** *American Economic Review* **70, pp.950–959.**

Krugman (1979, JIE)

- A simple formal model in which trade is caused by economies of scale instead of differences in factor endowments or technology
  - Market structure: Chamberlinian monopolistic competition
- Explains international trade in a large number of differentiated products: consistent with the empirical literature on intra-industry trade.

Model setup

- **General equilibrium model**
  - **An economy with one factor of production, labor**
  - **A large number of goods indexed by i**
- **Households**
  - **Assumed to share the same utility function, into which all goods enter symmetrically:**

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

  - **Define $\epsilon_i = -v'/(v''c_i)$, which is the elasticity of demand facing an individual producer, and assume $\epsilon_i'(c_i) < 0$.**
  - **Endowed with 1 unit of labor**

- **Production technology**
  - **All goods are assumed to be produced under the same production function ($\alpha, \beta > 0$):**

$$x_i = \begin{cases} 0 & l_i < \alpha \\ (l_i - \alpha)/\beta & l_i \geq \alpha \end{cases}$$

    $\Rightarrow$ Labor used in producing each good: $l_i = \alpha + \beta x_i$
  - **Production requires a fixed amount of labor α**
  - **Cost function: $C(x_i) = w\alpha + w\beta x_i$**

    $\Rightarrow$ Decreasing AC and constant MC
- **Labor market**
  - **Total labor force $=$ population $= L$**
  - **Full employment condition:**

$$L = \sum_{i=1}^{n} l_i = \sum_{i=1}^{n} [\alpha + \beta x_i]$$

Autarkic equilibrium

- Under autarky, domestic production of each good must equal the sum of domestic households' consumptions of the good:

$$x_i = Lc_i.$$

- Symmetry across firms $\Rightarrow$ All goods actually produced will be produced in the same quantity and at the same price; $x_i = x$ & $p_i = p \; \forall i$
- Three variables to be determined at the autarkic equilibrium:
  1. Price of each good relative to wages (p_i/w)
  2. Output of each good (x_i)
  3. Number of goods produced (n)

- **A representative household maximize U subject to a budget constraint $\Rightarrow$ FOC:**

$$v'(c_i) = \lambda p_i, \quad i = 1, \cdots, n$$

  - **λ: shadow price on the budget constraint, which can be interpreted as the marginal utility of income**

- **$\Rightarrow$ Inverse demand facing an individual firm i:**

$$p_i = \lambda^{-1} v'(x_i/L)$$

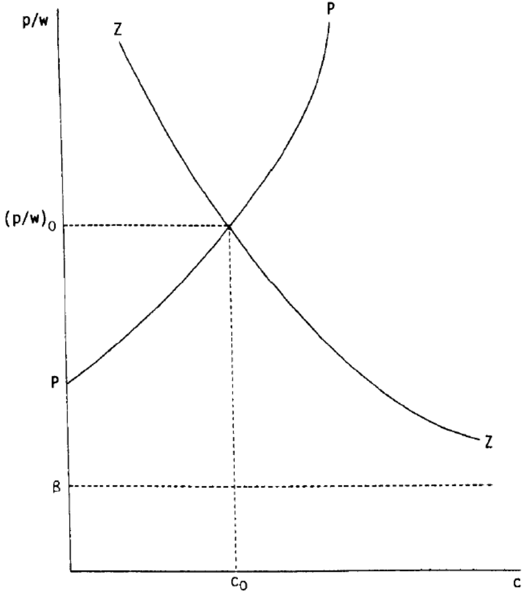
  - **If the number of goods produced is large, each firm's pricing policy will have a negligible effect on the marginal utility of income, so that it can take λ as fixed.**
  - **$\Rightarrow$ Elasticity of demand facing the firm is $\epsilon_i = -v'/(v'' c_i)$.**

- **Firm i maximizes its profits $\Pi_i = p_i x_i - (\alpha + \beta x_i)w$.**
    - **Each individual firm, being small relative to the economy, can ignore the effects of its decisions on the decisions of other firms.**
- **Profit maximization requires $MR = MC$, or**

$$p_i = \frac{\epsilon}{\epsilon - 1}\beta w.$$

- **Profits will be driven to zero by entry of new firms.**
    - **Equilibrium will be reached at a point where MR equals MC and the price equals AC (Chamberlin's tangency condition).**

- **Characterization of the long-run equilibrium using the relationship between per-capita consumption c and price in wage units p/w**
- **Pricing condition $(MR = MC) \Rightarrow p/w = \beta\epsilon/(\epsilon - 1)$**
    - **Price lies everywhere above MC**
    - **$\epsilon'(c) < 0 \Rightarrow$ RHS increases with c**
- **Zero-profit condition: $px - (\alpha + \beta x)w = 0$ $\Rightarrow p/w = \beta + \alpha/(Lc)$**
    - **Rectangular hyperbola above the line $p/w = \beta$**


p/w
Z
P
(p/w)0
P
Z
β
c0
c

- **Long-run equilibrium:**

$$\frac{p}{w} = \frac{\beta\epsilon(c)}{\epsilon(c)-1} \qquad \text{(PP schedule)}$$
$$\frac{p}{w} = \beta + \frac{\alpha}{Lc} \qquad \text{(ZZ schedule)}$$

$\Rightarrow$ **Equilibrium levels of c and p/w**

- **Equilibrium number of varieties (or firms): from full-employment condition,**

$$n = \frac{L}{\alpha+\beta x}, \quad \text{where } x = Lc.$$

Effects of labor force growth (i.e., increase in L)

- No effect on PP, but ZZ shifts left.
- At the new equilibrium, c and p/w fall.
  - Because of the assumption that PP is upward-sloping
- Nevertheless, both the output of each good and the number of goods produced rise.
  - $x = \alpha/(p/w - \beta)$ from the zero-profit condition $\Rightarrow x$ increases if $p/w \downarrow$.
  - Since $n = L/(\alpha + /\beta Lc)$, a rise in L and a fall in c imply a rise in n.
- Representative individuals' welfare rises.
  1. There is a rise in the real wage w/p.
  2. There is also a gain from increased choice, as the number of available products increases.

Free trade equilibrium

- Suppose there exist two economies.
  - The countries are assumed to have identical tastes and technologies
- In a conventional model,
  - there would be no reason for trade to occur between these economies, and
  - no potential gains from trade.
- In this model, however, there will be international trade and each country will gain from trade.

- **Suppose that trade is opened b/w two economies at zero transportation cost.**
- **Welfare in both countries will increase, both because of higher w/p and increased choice.**
  - **Symmetry will ensure that $w = w^*$ and $p = p^*$.**
  - **The effect will be the same as if each country had experienced an increase in its labor force; ∃ an increase both in the scale of production and in the range of goods available for consumption.**
- **Direction of trade (i.e., which country exports which goods) is indeterminate.**
  - **Each good will be produced only in one country because firms have no incentive to compete for markets.**

- **Volume of trade is determinate.**
  - **Consumers maximize $U = \sum_{i=1}^{n} v(c_i) + \sum_{j=n+1}^{n+n^*} v(c_j)$.**
  - **Number of goods produced in each country will be proportional to the labor forces:**

$$n = \frac{L}{\alpha + \beta x}, \quad n^* = \frac{L^*}{\alpha + \beta x}.$$

  - **All goods have the same price $\Rightarrow$ expenditures will be proportional to the country's labor force.**
  - **Share of imports in home country expenditures will be $L^*/(L + L^*)$ $\Rightarrow$ value of imports in each country:**

$$M = wL \cdot \frac{L^*}{L + L^*} = \frac{wLL^*}{L + L^*} = M^*$$

$\Rightarrow$ Trade is balanced, and the volume of trade is maximized when $L = L^*$.

Krugman (1980, AER)

- Based on Krugman (1979, JIE)
  - Using more restrictive formulation of demand
- Two extensions:
  1. Effect of transportation costs $\Rightarrow$ Countries with larger domestic markets will have higher wage rates.
  2. "Home market" effects on trade patterns; formal justification for the argument that countries will tend to export those goods for which they have relatively large domestic markets

Basic model

- **All individuals have the same utility function:** $U = \sum_i c_i^{\theta}$, $0 < \theta < 1$.
- **FOC for utility maximization:**

$$\theta c_i^{\theta-1} = \lambda p_i, \quad i = 1, \cdots, n$$

$\Rightarrow$ **(Inverse) demand curve for the ith good:**

$$p_i = \theta \lambda^{-1} (x_i / L)^{\theta-1}$$

- **As in Krugman (1979), each firm's pricing policy will have a negligible effect on λ $\Rightarrow$ Each firm faces a demand curve with an elasticity of $1/(1-\theta)$.**

- **Production side specifications are the same as in Krugman (1979).**
- **Each firm sets the profit-maximizing price:**

$$p_i = \theta^{-1}\beta w.$$

  - **Since θ, β, and w are the same for all firms, prices are the same; $p_i = p \; \forall i$.**
- **In (the long-run) equilibrium, profits are driven to zero:**

$$\pi_i = px_i - \{\alpha + \beta x_i\}w = 0, \quad i = 1, \cdots, n.$$

  - **If $\pi_i > 0$, new firms will enter, causing the MU of income to rise and profits to fall.**

- **Output of a representative firm:**

$$x_i = \frac{\alpha}{p/w - \beta} = \frac{\alpha\theta}{\beta(1-\theta)} \quad i = 1, \cdots, n.$$

  - $x_i = x \ \forall i$

- **Number of goods produced under autarky:**

$$n = \frac{L}{\alpha + \beta x} = \frac{L(1-\theta)}{\alpha}$$

Effects of trade (assuming zero transportation cost)

- **By symmetry, two countries will have the same wage rate and the price of any good will be the same.**
- **Number of goods produced in each country:**

$$n = L(1-\theta)/\alpha, \quad n^* = L^*(1-\theta)/\alpha$$

- w/p **remain unchanged**
  - **Differently from Krugman (1979), elasticity of demand is constant, and thus $w/p = \theta/\beta$ is also constant.**
- **Consumers distribute their expenditure over the $n + n^*$ goods (larger than the autarkic case), and because of this extended range of choice, welfare will increase even though the "real wage" remain unchanged.**

Effects of trade (cont'd)

- Value of home country imports measured in wage units:

$$L\frac{n^*}{n+n^*} = \frac{LL^*}{L+L^*}$$

  - Home households will spend a fraction $n^*/(n+n^*)$ of their income on foreign goods, while foreigners spend $n/(n+n^*)$ of their income on home country products.
- $LL^*/(L+L^*)$ equals the value of foreign country imports; with equal wage rates in the two countries, there is balance-of-payments equilibrium.
- While the volume of trade is determinate, the direction of trade is not.

Transport costs

- Suppose two countries can trade but only at a cost.
- Transportation costs: "iceberg" type
  - Only a fraction g of any good shipped arrives, with $1 - g$ lost in transit.
- The price of a domestic product will be the same as that received by the producer, but foreign products will cost more than the producer's price.
  - If foreign firms charge p^*, home country consumers will have to pay the CIF (cost, insurance and freight) price $\hat{p}^* = p^*/g$.
- It will be shown that the larger country, other things equal, will have the higher wage.

"Home market" effect

- Transportation costs lead to the "home market" effect.
  - Country with a larger market has a disproportionately large share of differentiated-good firms (and so will export that good): $n/L > n^*/L^*$ iff $L > L^*$
- Wholly dependent on increasing returns
  - In a world of diminishing returns, strong domestic demand for a good tends to be associated with imports rather than exports.
- A large number of subsequent studies have been devoted to examine the robustness of the HMEs under different modeling assumptions.