Monopolistic Competition and Trade

Empirical phenomenon of intra-industry trade

- **Neoclassical trade theory predicts *inter-industry* trade based on differences in technology and/or factor endowments**

- **Empirical analysis of European Economic Community (EEC) found evidence for *intra-industry trade* (IIT)**

- **Early work focused on measurement, Balassa (1965), Grubel and Lloyd (1975)**

- **Overlap in trade flows, i.e., Grubel and Lloyd index:**

$$GL^j = 1 - \frac{\left| X^j - M^j \right|}{(X^j + M^j)} \qquad 0 \leq GL^j \leq 1$$

Monopolistic competition and trade

- Observed IIT a key challenge to neoclassical orthodoxy (Leamer, 1992)
- Monopolistic competition has become standard model for rationalizing IIT
- Different models based on preference structure:
  - Krugman (1979;1980) uses Dixit and Stiglitz’s (1977) “love of variety” approach to preferences
  - Helpman (1981) uses Lancaster’s (1977) “characteristics” approach to preferences
- General equilibrium version of model developed by Helpman and Krugman (1985)

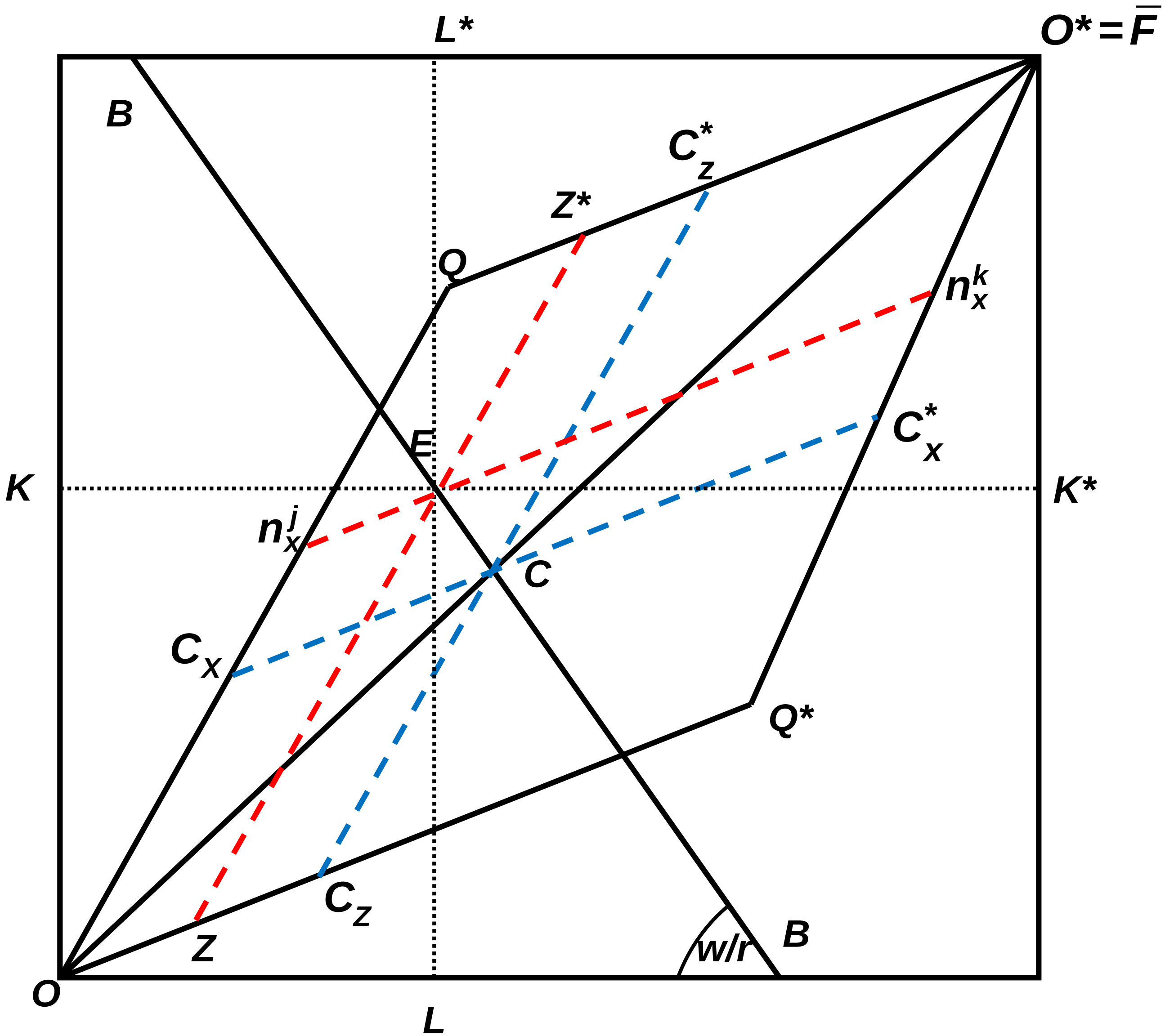
Monopolistic competition and trade

- **Assume two countries *j* and *k*, two factors, *K* and *L*, two industries: competitive *Z* producing homogeneous good under constant returns, and monopolistically competitive *X* producing n_x varieties under increasing returns**

- **Figure 1 shows combined factor endowments of *j* and *k*, where with full employment, $\bar{F}$ is fully utilized, *OQ* of resources used in *X*, and *OQ** used in *Z*, and vector *OO** can be interpreted as world GDP, Y^w**

- **Define *OQO*Q** as factor-price equalization set (FPE), if endowment is *E*, country *j* devotes On_x^j resources to *X* and *OZ* to *Z***

Figure 1: Trade Equilibrium



Monopolistic competition and trade

- ***BB*** **through *E*, with slope of *w/r* gives income levels of $Y^j = OC$ and $Y^k = CO^*$ on diagonal *OO**, all income going to factors and spent on consumption**

- **C_x and C_z are consumption of *X* and *Z* by country *j*, and there is simultaneous inter and intra-industry trade:**

  - *j* imports *Z* from *k*, and is net-exporter $(n_x^j - C_x)$ of *X*

  - *k* exports *Z* to *j*, and is net-importer$(C_x^* - n_x^k)$ of *X*

  - Net trade flows in X occur because $n_x^j > n_x^k$

- **Capital-abundant country *j* is net-exporter of capital-intensive good, and labor-abundant country *k* exports labor-intensive good (H-O model)**

Monopolistic competition and trade

- **<u>Key empirical prediction</u>: share of IIT larger between countries that are similar in terms of factor endowments and relative size**

- **Helpman's (1987) results support prediction using 4-digit SITC data for 14 OECD countries over period 1970-81:**

(1)

$$GL^{jk} = \alpha + \beta_1 \log\left[\frac{Y^j}{N^j}\right] - \left[\frac{Y^k}{N^k}\right] + \beta_2 \min(\log Y^j, \log Y^k)$$

$$+\beta_3 \max(\log Y^j, \log Y^k) + \mu^{jk}, \quad \beta_1 < 0, \beta_2 > 0, \beta_3 < 0$$

- **Hummels and Levinsohn (1995) re-ran (1) for 1962-83 with GDP/worker – replicated Helpman**

Monopolistic competition and trade

- **<u>Key empirical prediction</u>: volume of trade as share of GDP increases as countries become more similar in size – assuming structure of monopolistic competition**

- **Helpman's (1987) results support prediction with data for 14 OECD countries over period 1956-81:**

$$(2) \qquad \frac{V^A}{Y^A} = e_A \left[1 - \sum_{j \in A} (e_A^j)^2 \right]$$

where for country group A, V^A is volume of trade, Y^A is aggregate GDP, e^A is share of world GDP, and e_A^j is share of j's GDP in A's GDP

- **Right-hand side of (2) is measure of size dispersion – increases as countries become more similar in size**

Empirical evaluation of monopolistic competition story

- (2) is a form of gravity model – but it seems to fit trade in both differentiated and homogeneous goods

- Empirical issue becomes one of determining which theoretical model works best in a given data sample (Evenett and Keller, 2002)

- Gravity equation predicts volume of trade between two countries will be proportional to their GDPs and inversely related to any trade barriers between them – typical specification:

$$(3) \qquad T^{jk} = \beta_0 (Y^j)^{\beta_1} (Y^k)^{\beta_2} (D^{jk})^{\beta_3} (A^{jk})^{\beta_4} u^{jk}$$

Empirical evaluation of monopolistic competition story

- **Evenett and Keller derive theoretical restrictions on country income parameters that form basis of hypothesis testing**

- **Use model similar to Helpman and Krugman, allowing for differing degrees of specialization:**

- **<u>Case 1</u>: Perfect specialization *X* and *Z* differentiated**

s^c is country $c = j,k$ share of world spending, X^c (Z^c) is equilibrium quantity of variety X(Z), Y^c is GDP, world GDP is $Y^w = Y^j + Y^k$, and let good Z be *numeraire*, where p^z=1, so that relative price of variety X is p^x

Empirical evaluation of monopolistic competition story

- Assuming balanced trade, where $s^c = Y^c/Y^w$, both countries demand all varieties according to their share of world GDP, imports being given as:

(4) $$M^{jk} = s^j[p_x n_x^k x^k + n_z^k z^k]$$

(5) $$M^{kj} = s^k[p_x n_x^j x^j + n_z^j z^j]$$

where terms in brackets are GDP of *k* and *j* respectively, therefore:

(6) $$M^{jk} = s^j Y^k = \frac{Y^j Y^k}{Y^w} = s^k Y^j = M^{kj}$$

i.e., gravity equation, imports being proportional to GDP

Empirical evaluation of monopolistic competition story

- <u>Case 2</u>: Perfect specialization, *X* and *Z* homogeneous

  Assume *X* is capital-intensive and *Y* labor-intensive, *j* being relatively well-endowed in capital, and *k* in labor

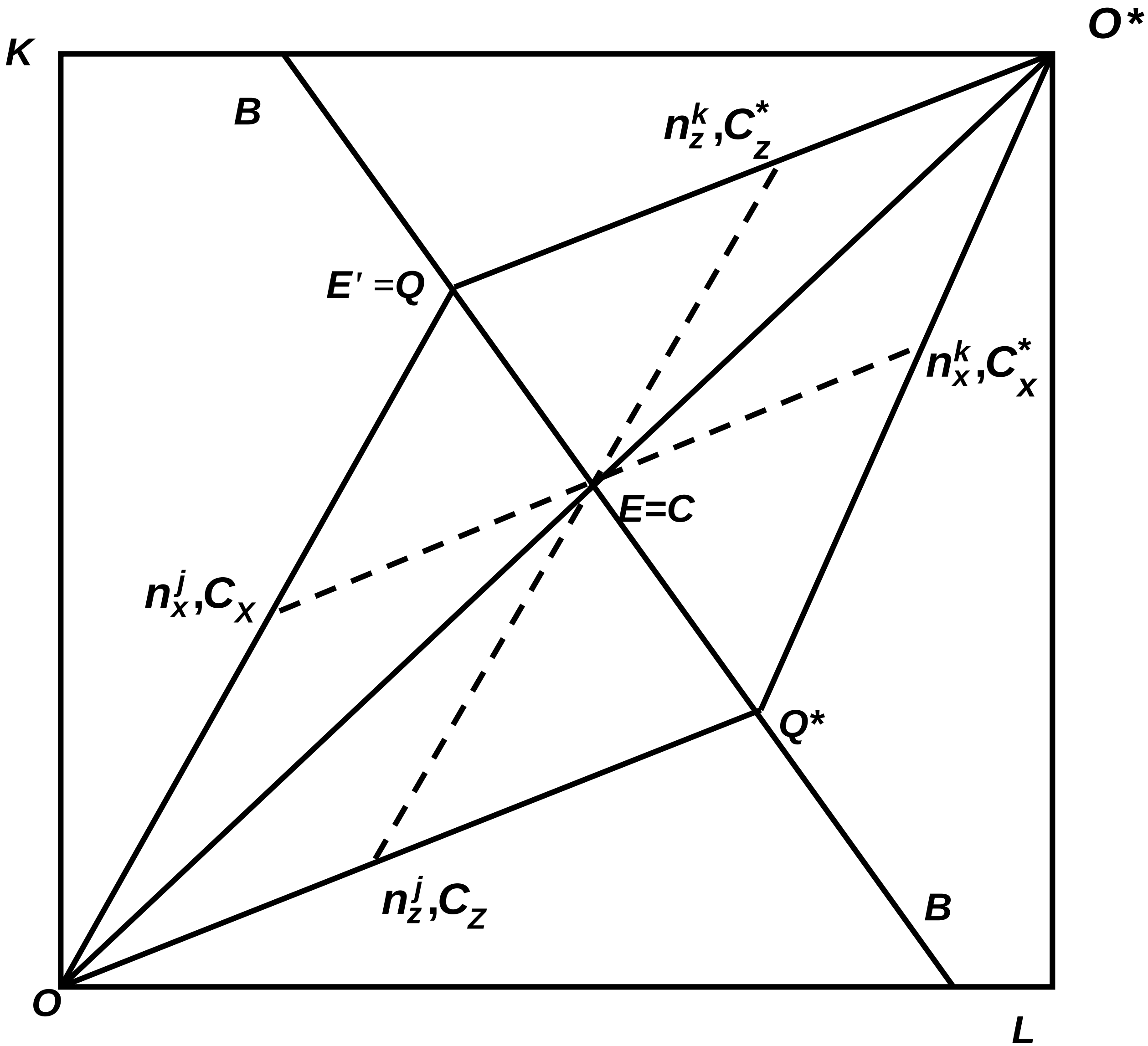
  With perfect specialization, X^c production of *X*, Z^c of *Z*, $X^j = X^w$, and $Z^k = Z^w$, and value of production is GDP, $p_x X^j = Y^j$ and $Z^k = Y^k$, therefore:

  (7) $$M^{jk} = s^j Z^k = s^j Y^k = \frac{Y^j Y^k}{Y^w}, M^{kj} = s^k p_x X^j = s^k Y^j = \frac{Y^j Y^k}{Y^w}$$

  Identical to (6), and again imports are proportional to GDP - known as *multi-cone* H-O model

  Both equilibria can be described in figure 2

Figure 2: Perfect Specialization



Empirical evaluation of monopolistic competition story

- **Case 3: Imperfect specialization *X* differentiated and *Z* homogeneous**

  Assume *X* is capital-intensive and *Y* labor-intensive, *j* being relatively well-endowed in capital, and *k* in labor

  For endowments inside FPE, volume of bilateral trade:

  (8) $$T^{jk} = s^k p_x X^j + s^j p_x X^k + (Z^k - s^k Z^w)$$

  where first term on right-hand side is *j*'s exports, other terms are its imports of other varieties of *X* and good *Z*, i.e. M^{jk}

Empirical evaluation of monopolistic competition story

- Suppose $\gamma^j = Z^j / p_x X_j + Z_j$, share of Z in j's GDP, and also $(1-\gamma^j)$ share of X in j's GDP

With balanced trade, $M^{kj} = s^k p_x X^j$, then $M^{kj} = s^k (1-\gamma^j) Y^j$

Gravity equation (6) can be rewritten as:

(9) $$M^{jk} = (1-\gamma^j)\frac{Y^j Y^k}{Y^w}$$

Compared to (6), implies bilateral imports lower than case where both goods are differentiated, and volume of trade higher, the lower is share of Z in GDP

Empirical evaluation of monopolistic competition story

- <u>Case 4</u>: Imperfect specialization, *X* and *Z* homogeneous

Volume of bilateral trade:

(10) $$T^{jk} = p_x(X^j - s^j X^w) + (Z^k - s^k Z^w)$$

where first term on right-hand side is *j*'s exports, and second term are its imports, and $M^{jk} = M^{kj}$

Given $X^w = (X^j + X^k)$, M^{jk} can be rewritten as:

$$M^{jk} = (1-\gamma^j)Y^j - s^j(1-\gamma^j)Y^j - s^j(1-\gamma^k)Y^k$$

and with $s^k = (1-s^j)$, this becomes:

$$M^{jk} = s^k(1-\gamma^j)Y^j - s^j(1-\gamma^k)Y^k$$

Empirical evaluation of monopolistic competition story

- **The gravity equation becomes:**

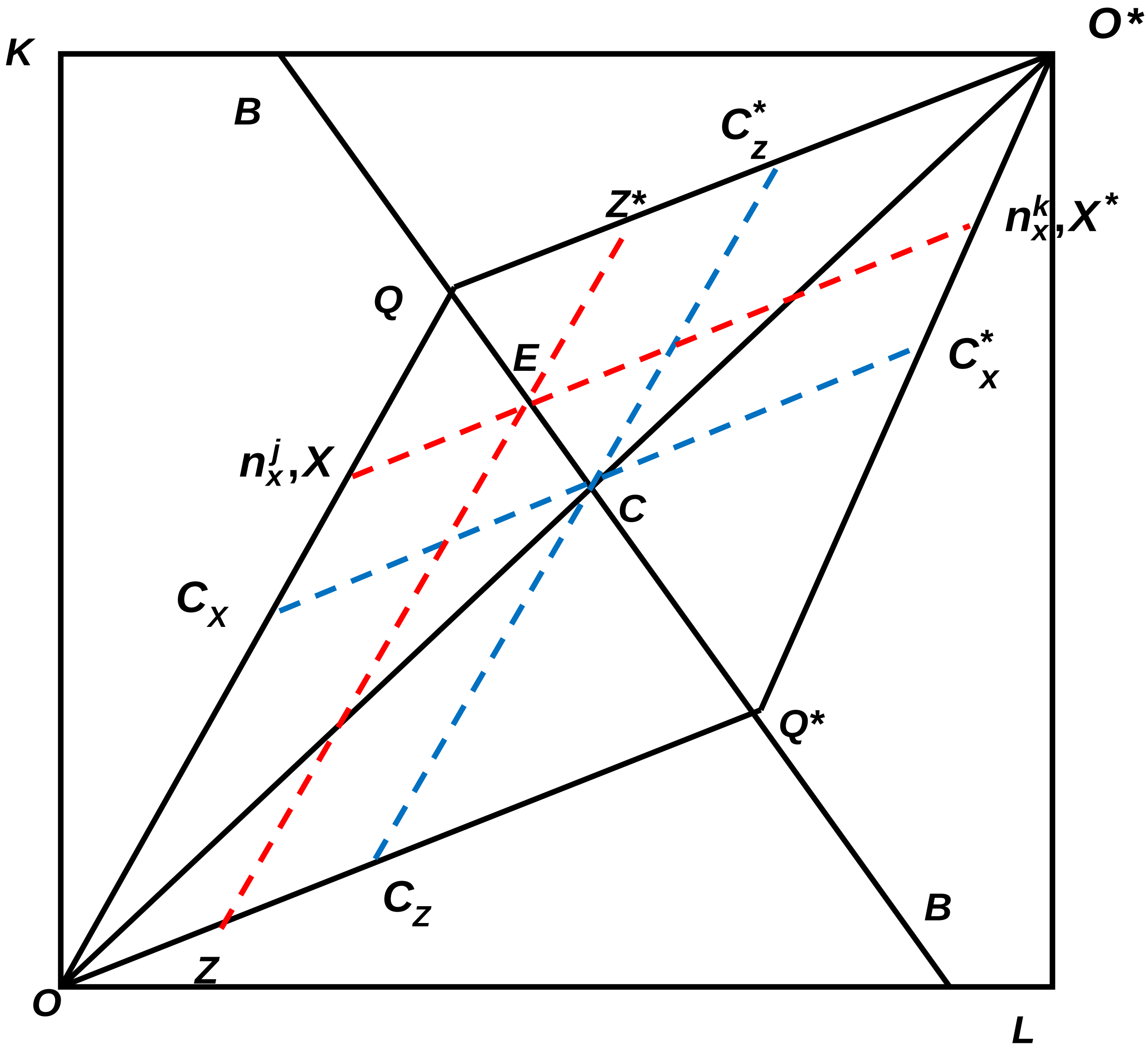
(11) $$M^{jk} = (\gamma^k - \gamma^j)\frac{Y^j Y^k}{Y^w}$$

As capital-labor ratios of two countries converge, so that $\gamma^k \to \gamma^j$, and in the limit, no trade when $\gamma^k = \gamma^j$

If $\gamma^k = 0$, and $\gamma^j = 1$, (7) is special case of (11)

- **(9) and (11) are illustrated in figure 3, i.e., either intra-industry trade in *X*, inter-industry in *X* and *Z*, or inter-industry trade in *X* and *Z* (*uni-cone* H-O model)**

Figure 3: Imperfect Specialization



Empirical evaluation of monopolistic competition story

- Evenett and Keller tested these 4 versions of gravity model based on classifying 1985 4-digit SITC data for 58 countries into differentiated vs. homogeneous goods

- Perfect specialization:

$$(12) \quad M_v^{jk} = \alpha_v \frac{Y_v^j Y_v^k}{Y^w} + \mu_v^{jk}, \qquad \alpha_v = 1$$

Sample split into high and low IIT samples:

- high IIT sample, $\alpha_v = 0.087$
- low IIT sample, $\alpha_v = 0.052$

i.e., perfect specialization in either differentiated or homogeneous goods over-predicts bilateral trade

Empirical evaluation of monopolistic competition story

- **Imperfect specialization with differentiated and homogeneous goods:**

(13) $$M_v^{jk} = (1-\psi_v^j)\frac{Y_v^j Y_v^k}{Y^w} + \mu_v^{jk}, \qquad (1-\psi_v^j) < 1$$

Estimated for cases where *j*(*k*) is capital-abundant, median value of $(1-\psi_v^j) = 0.086$

- **Imperfect specialization with homogeneous goods:**

(14) $$M_v^{jk} = (\psi_v^j - \psi_v^k)\frac{Y_v^j Y_v^k}{Y^w} + \mu_v^{jk}, \qquad (\psi_v^j - \psi_v^k) < 1$$

Estimated for cases where *j*(*k*) is capital-abundant, median value of $(\psi_v^j - \psi_v^k) = 0.04$

Empirical evaluation of monopolistic competition story

- Evenett and Keller conclude:
  - perfect specialization in increasing returns and multi-cone model over-predicts bilateral trade
  - mixed support for increasing returns model with imperfect specialization
  - uni-cone H-O model works well
- Overall, both factor endowments and scale economies can explain different components of variations in production and trade