MSc in Economics for Development

Trade Theory for Development

Week 6 Class

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Consultation hours: Friday, 2-3pm, Weeks 1,3-8 (MT)

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References

- Deardorff's Glossary of International Economics
  - http://www-personal.umich.edu/~alandear/glossary/
    - See 'figs' in menu.

- Feenstra, R. C., 2004, *Advanced International Trade: Theory and Evidence,* Princeton University Press
  - Chapter 1 + Appendix
  - Start of Chapter 2

- Neary, J.P., 2009, *Putting the "New" into New Trade Theory: Paul Krugman's Nobel Memorial Prize in Economics*, Scand. J. of Economics 111(2), 217–250, 2009
  - Pages 225-231

Overview: Heckscher-Ohlin Diagrams

- The Heckscher Ohlin model shows that factor endowments can drive trade in a 2 country, 2 factor, 2 good setup
- The Lerner diagram is used to look at how factors are used in production in the H-O model, and has three components
  a. Revenues are shown using unit-value isoquants
  b. Costs are shown using the unit iso-cost line
  c. Scaling up moves production out along the sides of the cone of diversification
- The Lerner diagram illustrates a number of results, which we will investigate with the help of Deardorff's online examples
- Global production and inter-industry trade can be illustrated using the Integrated World Equilibrium diagram
- Intra-industry trade can be illustrated using the Integrated World Equilibrium diagram with monopolistic competition

The Heckscher Ohlin model shows that factor endowments can drive trade in a 2 country, 2 factor, 2 good setup

Model overview

- This model has 2 countries (*D,F*), 2 factors (*L,H*) and 2 goods *i*=(*1,2*)
- We use low (*L*) and high (*H*) skilled labour as factors as they are generally immobile.
- The model is used to show that trade can be driven by differences in factor endowment, rather than in technology (see Ricardian model).
- The model is both empirically valuable (see Wood (2008)), and intuitively useful.

Model setup

Output

$y_i = f_i(L_i, H_i)$

- f_i is increasing, concave and homogeneous of degree 1 (thus constant returns to scale - CRS)

Prices

(p_1, p_2) set exogenously at world prices by free trade

Costs

$$c_i(w,r) = \min_{Li,Hi>0}(wL_i + rH_i \mid f_i(L_i,H_i) = 1)$$

$$= wa_{iL}(w,r) + ra_{iH}(w,r)$$

$$a_{iL}(w,r) = \frac{\partial c_i}{\partial w}$$

- $c_i(w,r)$ is the unit cost function, which we can scale up due to CRS.
- $a_{iL}(w,r)$ is the amount of labour needed to produce 1 unit of good *i* at factor prices (*w,r*).
- by construction

Perfect Comp

$p_1 = c_1(w,r) = a_{1L}w + a_{1H}r$
$p_2 = c_2(w,r) = a_{2L}w + a_{2H}r$

- Perfect competition implies zero profits and prices equal costs

Full Employ't

$a_{1L}y_1 + a_{2L}y_2 = L$
$a_{1H}y_1 + a_{2H}y_2 = H$

$\Rightarrow$

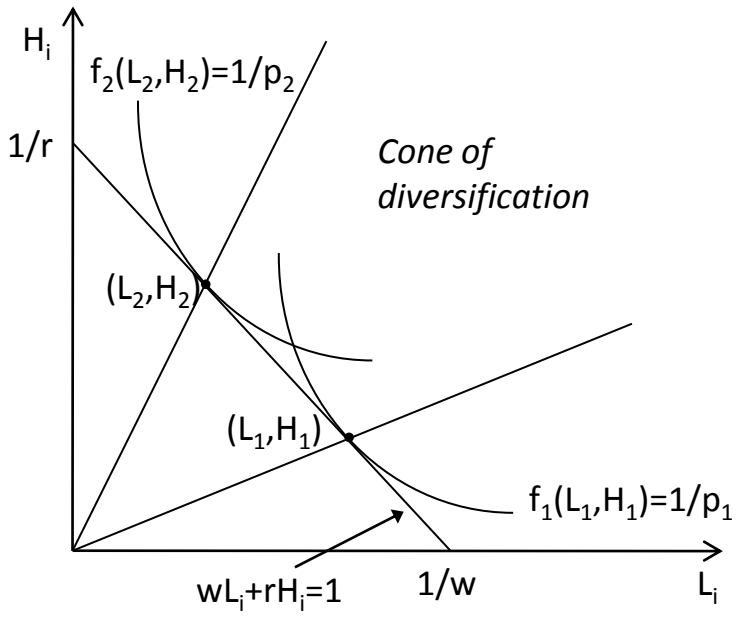
$L_1 + L_2 = L$
$H_1 + H_2 = H$

- Each country's endowment (L,H) is fully employed

The H-O system of eqn's

The Lerner diagram is used to look at how factors are used in production in the H-O model, and has three components

The Lerner Diagram



•Considers unit values (p_iy_i) rather than just quantities (y_i) so includes the effect of prices

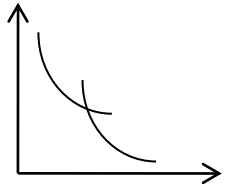
Assumes Perfect Competition...

This means that Revenues...

•Revenue shown in **unit-value isoquants**

$p_i y_i = p_i f_i(L_i, H_i) = 1$

a.



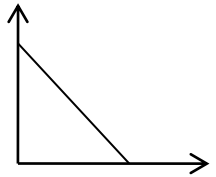
...equal Costs

•Costs shown in **unit iso-cost lines**

$c_i(w,r)\, y_i = a_{iL}y_i w + a_{iH}y_i r$

$= L_i w + H_i r = 1$

b.



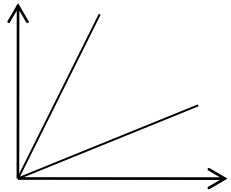
...And Constant Returns to Scale

•We assume revenues (p_iy_i) = costs (c_iy_i) = 1

•Determine factor mixes (L_1,H_1) and (L_2,H_2)

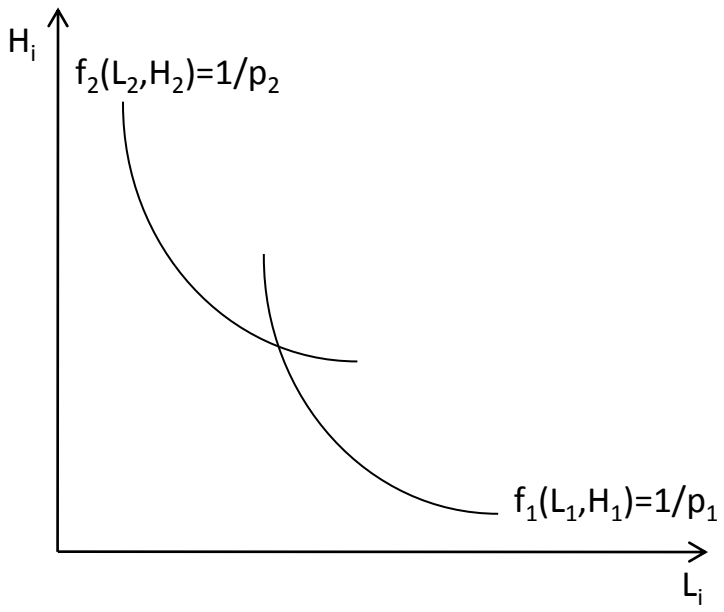
•Scaling up just moves out along **cone of diversification**

c.



a. Revenues are shown using unit-value isoquants

Lerner diagram: Unit-value isoquants

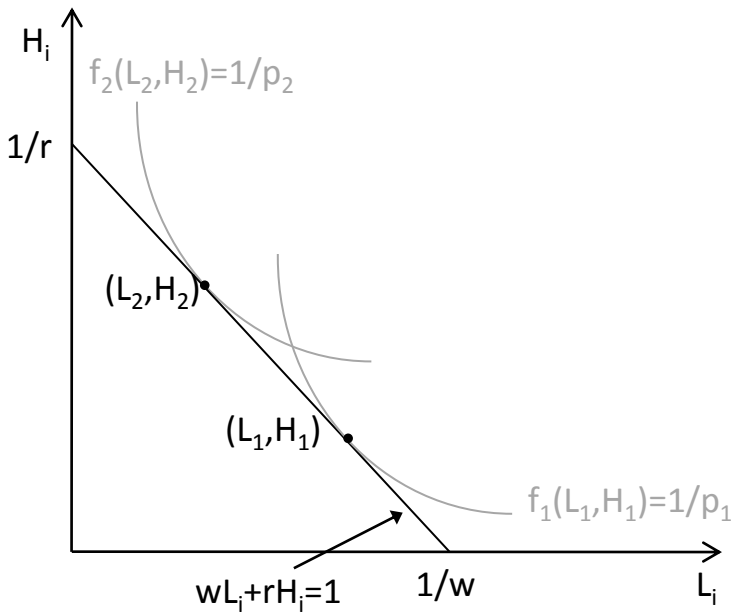


Properties

- The isoquants describe the set of factor combinations where the value of output = 1: $p_i y_i = p_i f_i(L_i, H_i) = 1$
  - As the axes describe quantities we look at the different combinations of L_i and H_i that can be used to make $y_i=1/p_i$
- The goods prices (p_1, p_2) are given exogenously
  - Assume free trade: the price of each good is the same in all countries
  - Would be determined in global general equilibrium
- The isoquants are convex in (L_i, H_i) as $y_i = f_i(L_i, H_i)$ is concave in (L_i, H_i)
  - If you don't have enough H, you need to make up for it with lots of L
- The isoquants are different for each industry because the production functions differ
  - In this example, sector 2 is skill intensive and sector 1 is labour intensive

b. Costs are shown using the unit iso-cost line

Lerner diagram: Unit iso-cost line



Properties

•The unit iso-cost line describes the set of factor combinations where the total cost equals 1

$$c_i(w,r)\, y_i = wL_i + rH_i = 1$$

•The factor prices (wage *w*, and rent *r*) are found endogenously, and are **insensitive** to endowments (L,H)

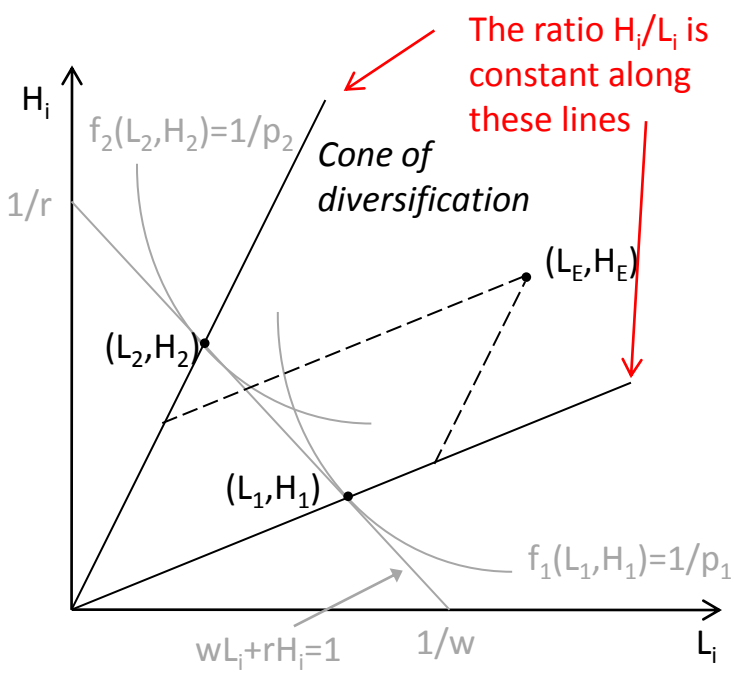
- •Assume perfect competition in goods markets, so $p_i\, y_i = c_i\, y_i = 1$, for both sectors i=1,2
- •We know what $p_1\, y_1 = 1$ *and* $p_2\, y_2 = 1$ look like from the previous slide
- •Both sectors face the same cost curve $c_i(w,r)\, y_i$ as they are competing for labour and skill (so pay the same wages)
- •So, $c_i(w,r)\, y_i = wL_i + rH_i = 1$ must be tangent to both $p_1\, y_1 = 1$ *and* $p_2\, y_2 = 1$.
- •This tangent defines the unique ratio of factor prices *(w/r)*, and in turn the cost curve

•The points of tangency (L_1,H_1) and (L_2,H_2) describe the combination of H and L where the value of production = value of costs (=1 by construction)

- •This can be scaled up

c. Scaling up moves production out along the sides of the cone of diversification

Lerner diagram: Cone of diversification



Properties

- The cone of diversification describes how production is scaled up
  - Assume constant returns to scale, so the ratio of skill and labour in producing each good remains the same (along the branches of the cone)
  - The branches could be found by connecting the points where $p_iy_i=1$ and $p_iy_i=2$ and $p_iy_i=3$ etc.

- A country will only produce both goods if the endowment (E) is within the cone of diversification
  - Only within the cone can positive multiples of (a_{1L}, a_{1H}) and (a_{2L}, a_{2H}) be added to give (L_E,H_E). See dotted lines on diagram.

$$\begin{pmatrix} a_{1L} \\ a_{1H} \end{pmatrix} y_1 + \begin{pmatrix} a_{2L} \\ a_{2H} \end{pmatrix} y_2 = \begin{pmatrix} L_E \\ H_E \end{pmatrix}$$

  - Outside the cone only one good will be produced, otherwise there would be negative production. See Deardorff's examples next slide.

The Lerner diagram illustrates a number of results, which we will investigate with the help of Deardorff's online examples.

Stolper Samuelson (1941) Theorem

"An increase in the relative price of a good will increase the real return to the factor used intensively in that good, and reduce the real return to the other factor"

Rybczynski (1955) Theorem

"An increase in a factor endowment will increase the output of the industry using it intensively, and decrease the output of the other industry"

Hicks-Neutral technology change

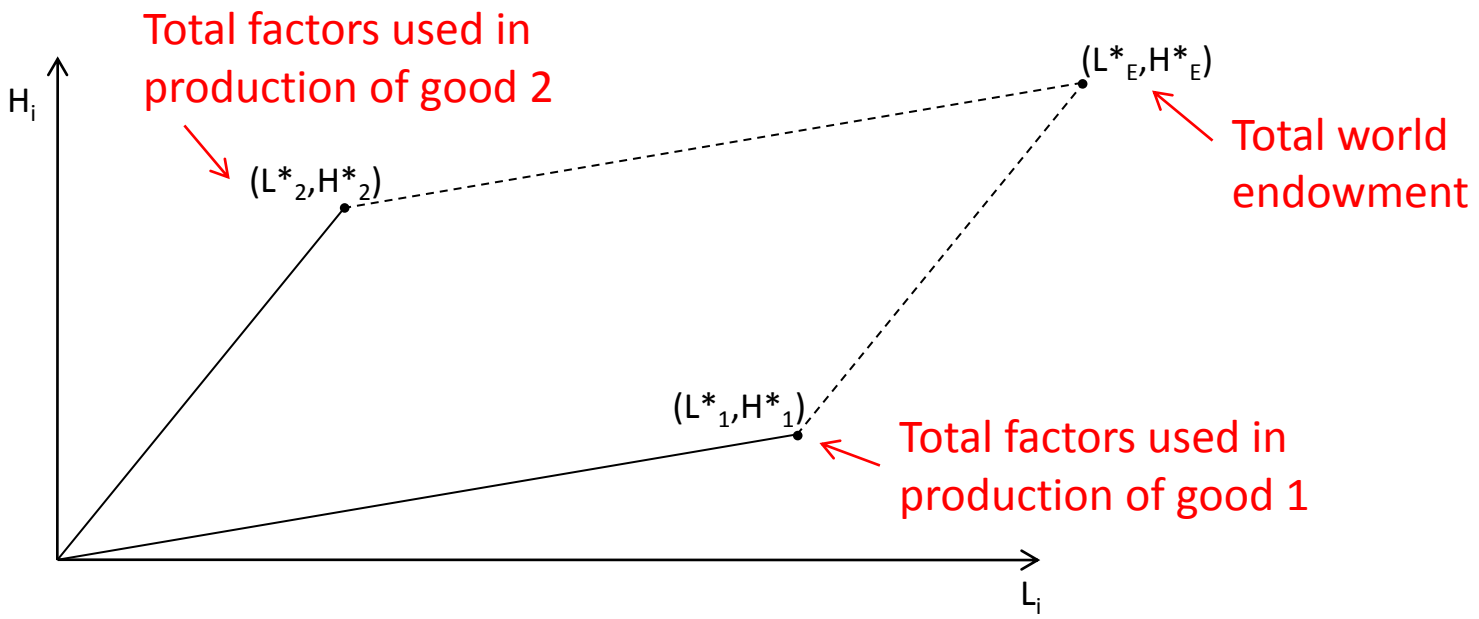
"An improvement in the production technology of a good will increase the real return to the factor used intensively in that good, and reduce the real return to the other factor"

Factor price equalisation

"If two countries have free trade, with identical technologies, different factor endowments, produce both goods and Factor Intensity Reversals don't occur, then factor prices are equalised in both countries."

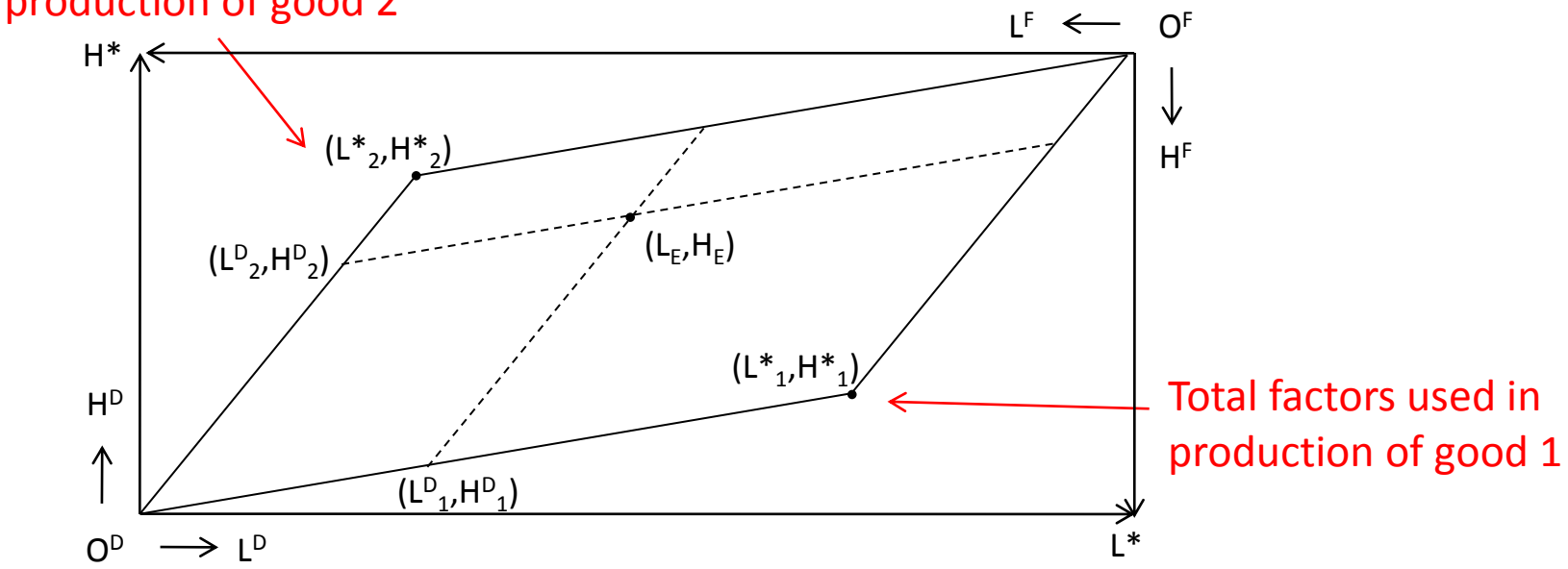
Integrated World Equilibrium (IWE)
1. Production in a world without borders

- Consider a world where there are no national barriers, and factors can move freely around the world. Factor prices would be equal around the world
- World production could be represented in a giant Lerner diagram



Integrated World Equilibrium (IWE)
2. Production in a world with borders

- Now consider the world is divided into two countries, and each is given a factor endowment that can't move across borders.
  - The factor endowment is in the cone of diversification for both countries
- World production could be represented by combining two Lerner diagrams



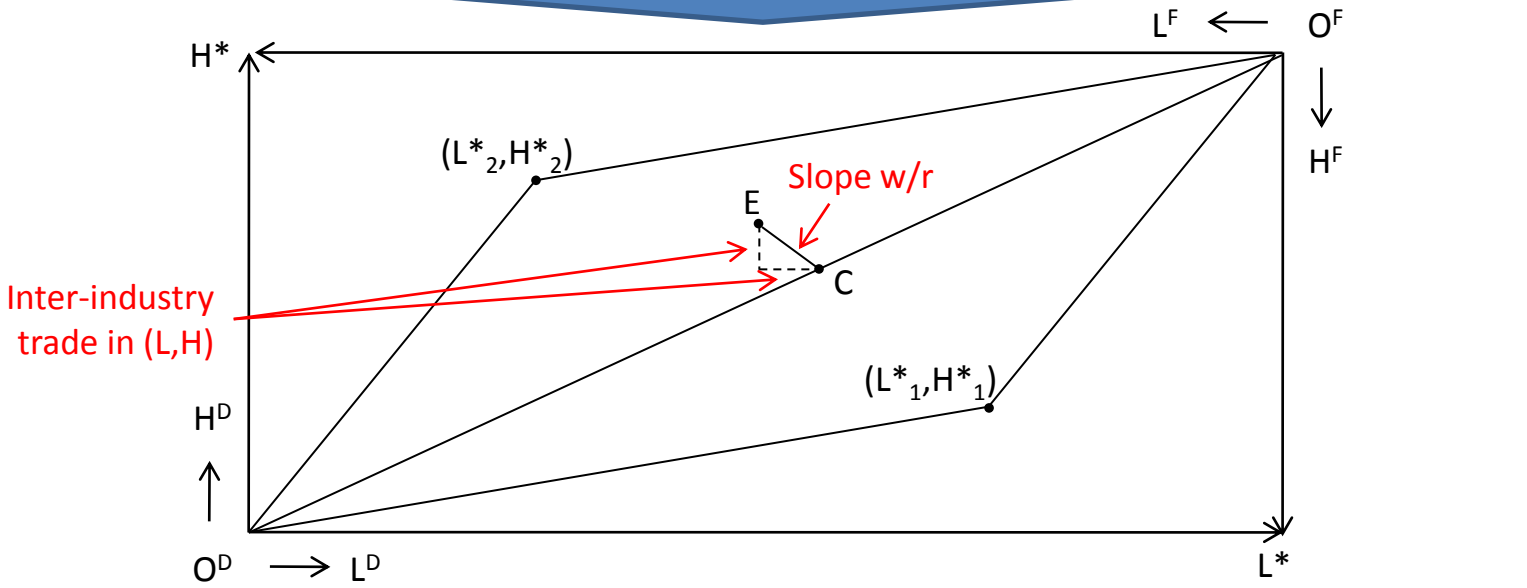
The "world without borders" result can be replicated and factor price equalisation holds again

Integrated World Equilibrium (IWE)
3. Consumption in a world with borders

- Now consider consumption, assuming consumers have the same preferences in both countries
  - Consumption must lie on the line $O^D O^F$, as all output (comprised of factors) must be consumed.
  - Where on the line is determined by income

$$income = p_i y_i = c_i(w,r)\, y_i = wL_i + rH_i$$

  - So, E and C must line on the same income (or iso-cost) line with slope *w/r*

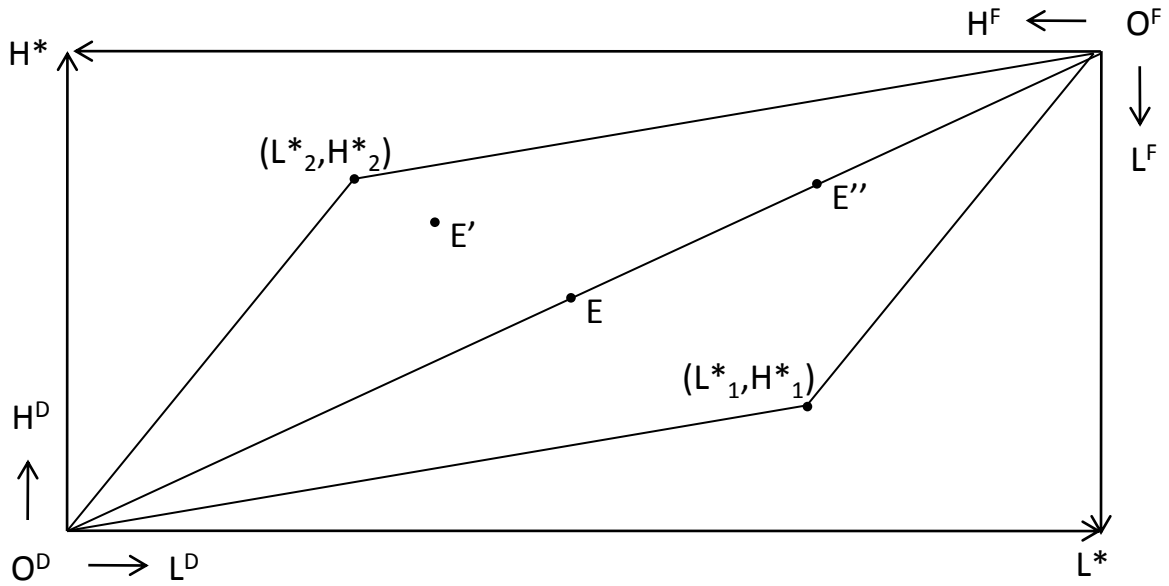


Integrated World Equilibrium (IWE)
4. Adding monopolistic competition and intra-industry trade

- Now let one of the sectors be monopolistically competitive:

$$U = x_1^{1-\mu} x_2^{\mu} \quad \text{where} \quad x_2 = \left(\sum_{j=1}^{N} x_{2j}^{\theta} \right)^{1/\theta}$$

- Refer to Neary (2009)
- Consumers demand all varieties *j* of good 2, however some varieties are produced at home and others overseas. This causes intra-industry trade.



E	•Midpoint of $O^D O^F$ •Intra-industry trade is highest – both countries export half of good 2
E'	•D produces more of good 2 •Intra-industry trade is lower
E''	•D produces more of good 2 •Intra-industry trade is lower

Summary: Heckscher-Ohlin Diagrams

- The Heckscher Ohlin model shows that factor endowments can drive trade in a 2 country, 2 factor, 2 good setup
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