Trade
The Heckscher Ohlin model

Final
Practice final posted

Final for Seniors (by email June 1, 5 pm)
Due Thurs June 4 noon
Baxter 133

Final for non-seniors (posted June 5, 5 pm)
Due Wed June 9 noon
Outline

• Trade
  – Trade flows
  – Patterns of capital intensity
• A two factor model
• Interpretation
• Paths of development?
  – Import substitution
  – Export led growth
• Fix K, L
• $X(K,L) = L^{\alpha K^{1-\alpha}}$ and $Y(K,L) = L^{\beta K^{1-\beta}}$ production function
• $U(X,Y) = X^{0.5}Y^{0.5}$ is utility
• Need to find out X, Y, K_x, K_y, L_x, L_y, p_x, p_y, r, w.
  – Aggregate budget constraint $rK+WL=p_xX+p_yY$
  – Demand for $X=0.5I/p_x=rK+wL/2p_x$
  – Demand for $Y=0.5I/p_y=rK+wL/2p_y$
  – Demand for $L_x=\alpha C/w= \alpha p_xX/w$
  – Demand for $L_y=\beta C/w= \beta p_yY/w$
  – Demand for $K_x=(1-\alpha)C/r=(1-\alpha)p_xX/r$
  – Demand for $K_y=(1-\beta)C/r=(1-\beta)p_yY/r$
Wages and interest rates

– Demand for $L_x=\alpha C/w= \alpha p_x X/w$
– Demand for $L_y=\beta C/w= \beta p_y Y/w$
– IMPLIES $w(L_x+L_y)= \alpha p_x X+\beta p_y Y$
– But recall $p_x X=rK+wL/2=py Y$
– So $w(L_x+L_y)= (\alpha+\beta)p_y Y$
– And $k(L_x+L_y)= (1-\alpha+1-\beta)p_y Y$
– Take ratio $wL/rK= (\alpha+\beta)/(1-\alpha+1-\beta)$ or
– $r/w=(L/K)(1-\alpha+1-\beta)/(\alpha+\beta)$ Set $w=1$ then $r$ is known.
– Cost of capital is increasing in $L$, decreasing $K$, and $\alpha$, $\beta$ (intensity of labor use)
• Countries are now endowed with K and L
• Given a price ratio
• Cars chose more K, less L than Clothes
Cars and Clothes

• Fix K and L
• Suppose you only make car
• Then as you reduce cars how much do you increase Clothes
Equilibrium under autarky

- You will be on the PPF
- At Equilibrium MU of Cars = Mu of Clothes => price ratio between cars and clothes
- On the input side
- \( r/w = (L/K)(1-\alpha+1-\beta)/(\alpha+\beta) \)
Price of X and Y

• Back to the cost minimization pb
  – Min wL +rK sbjt to L^{1-\alpha}K \alpha >X
  – => min wL +rK +\lambda(L^{1-\alpha}K-\alpha-X)

• FOC
  – w=\lambda\alpha(L^{1-\alpha}K^{1-\alpha}); r=\lambda(1-\alpha)(L^{1-\alpha}K) ; L^{1-\alpha}K =X
  – Take ratio of first two => w/r=(K/L)(\alpha/(1-\alpha)) or
  – L= K(r/w) (\alpha/(1-\alpha)) and K= L(w/r)(1-\alpha)/ \alpha
  – Back in last equation
  – X=L^{1-\alpha}{K(r/w)(\alpha/(1-\alpha))^{1-\alpha}=\{(r/w) (\alpha/(1-\alpha))\}^{\alpha}K
  – Or K(X)=X\{(\alpha)/(ar)\}^{\alpha} L(X)=X\{(\alpha)/(w(1-\alpha))\}^{1-\alpha}
  – Now costs  C(X) = wL +rK
  – or wX\{(\alpha)/(w(1-\alpha))^{1-\alpha} +rX\{(\alpha)/(w(1-\alpha))\}^{\alpha}
  – or X \{w\{(\alpha)/(w(1-\alpha))^{1-\alpha} +r\{(\alpha)/(w(1-\alpha))\}\}^{\alpha}

• C(X)=X\{r^{1-\alpha}w^{\alpha}\{(\alpha)/(1-\alpha))^{1-\alpha}+\{(1-\alpha)/(\alpha)\}^{\alpha}
Price of X and Y (2)

- $C(X) = X\{r^{1-\alpha}w^{\alpha}\}{\alpha/(1-\alpha)}^{1-\alpha} + \{(1-\alpha)/\alpha\}^{\alpha}$
- $C(Y) = Y\{r^{1-\beta}w^{\beta}\}{\beta/(1-\beta)}^{1-\beta} + \{(1-\beta)/\beta\}^{\beta}$
- => costs are linear, and increasing in both r and w
- Marginal cost = price
  - $P_x = \{r^{1-\alpha}w^{\alpha}\}{\alpha/(1-\alpha)}^{1-\alpha} + \{(1-\alpha)/\alpha\}^{\alpha}$
  - $P_y = \{r^{1-\beta}w^{\beta}\}{\beta/(1-\beta)}^{1-\beta} + \{(1-\beta)/\beta\}^{\beta}$
- How does this change with $\alpha$?
  - First $\{\alpha/(1-\alpha)\}^{1-\alpha} + \{(1-\alpha)/\alpha\}^{\alpha}$
    - Goes to 1 when $\alpha$ goes to 0 or 1 and is 2 when $\alpha=1/2$
  - second $\{r^{1-\alpha}w^{\alpha}\}$
    - increasing in $\alpha$ if $w>r$ and decreasing in $\alpha$ if $w<r$
Labor intensity matters when factor prices are different (that is when one factor is scarce relative to the other)
• Equilibrium under autarky

• Capital abundant economy (r is low, w high)
  – Price of capital intensive good will be low
  – Price of labor intensive good will be high
  – Produce a lot of cars not much clothes
  – Consume what you make

• Labor abundant economy (r is high, w low)
  – Price of capital intensive good will be high
  – Price of labor intensive good will be low
  – Produce a lot of clothes not much car
  – Consume what you make

• Gains from trade
  – Prefer to consume a mix...
Two countries
(left lots of K, Right lots of Labor)

Cars

Production possibility frontier

clothes

Cars

Production possibility frontier

clothes
Output choices
(left lots of K, Right lots of Labor)

Cars Production possibility frontier

clothes

Production possibility frontier

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Opening to trade

• Here we make it costless
  – Implication prices in both countries must be the same
  – Here we do not have to worry about the fact that there will be kinks in the frontier (because everything is smooth)
  – Possible price ratios are all those between the capital intensive and labor intensive economy and depend on the relative size of the two economies.
Opening to trade prices must be the same
Opening to trade—Interpretation

• Production in the capital abundant economy becomes more capital intensive
• Production in the labor abundant economy become more labor intensive
• Relative consumption of the two outputs are the same in each country
• Both benefit for sure
Ricardo vs Heckscher-Ohlin

• Ricardo
  – Differences come from technology.
  – Problem is that technology that is embodied in machines or that can be made explicit travels very well.
  – Reverse engineering also reduces pure technical differences

• Heckscher-Ohlin
  – Differences in endowments
  – Here we need to deal more closely with endogenous vs exogenous endowments
Endowments

• Some are exogenous
  – Sunshine, mineral, rain fall, soil quality
• Some are endogenous
  – Capital stock
  – Population
  – Skills/Education of labor force
• Different from technology,
  – Most of these things change slowly
Theories and the patterns of trade

• Both theories do well at explaining patterns of trade up to the 1990s
• Between rich and poor countries
  – Endowment effects
• Between rich countries
  – Technologies and skills within manufacturing
• Then break
  – More and more trade involves trade in semi finished goods
  – More and more trade involves high capital goods
  – So a new emphasis on technologies within a product class (say cars) and the demand for variety
Trade policy: Import substitution

• What is optimal policy?
  • Static answer
    – Free trade
  • Dynamic answer less obvious
    – Problem of growth is one of getting out of resource demand sectors (mining, forestry, agriculture) into manufacturing and services
    – Infant industries
      • When you start you must be a high cost producer so if you have free trade you never start
    – So protection at a decreasing rate
      • Problem is that now you create a lobby against free trade
Trade policy: Export led growth

- Alternative focuses on demand
- Static answer: free trade
- Dynamic answer: less obvious
- Main source of economies involves scale
- Countries that are poor (even if big) are a small share of the world market so firms operate at a small scale
  - Focusing on industries that have an export potential leads to income gains and thus to increases in domestic demand
  - Then you can buy things you are not good at
Conclusion

• Note similarity of trade issues to the Edgeworth box
  – But we have to deal with input and output prices
  – Or production and consumption

• Gains from trade come from
  – Largely in the form of resource savings
  – Buying those things you are not good at making
  – Require inputs that are scarce
  – In the end its all about comparative advantage.