

The Trade Workhorse: The Heckscher-Ohlin Model

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► Last time

- The specific factors model:
 - Analyze trade and the income distribution
 - A short-run model: some factors can only be used to produce a single good
 - Trade can hurt owners of some factors
 - As trade “grows the pie”, the right taxes can improve welfare for all
- Political economy:
 - Trade often unpopular as losses from trade are concentrated in an industry, while benefits are diffused
- Migration:
 - In the simplest model, migration hurts high wage labor
 - Again, the pie grows, so that taxes can compensate

- ▶ Today: The Heckscher-Ohlin Model
 - ▶ Introduction
 - ▶ The point
 - ▶ The model
 - ▶ Setup and assumptions
 - ▶ Production possibilities
 - ▶ Production and prices
 - ▶ Autarchy equilibrium
 - ▶ Trade equilibrium
 - ▶ The big four theorems
 - ▶ The problems
 - ▶ Assumptions
 - ▶ Evidence
 - ▶ Moving forward

- ▶ Quick note on this chapter of the textbook.

Heckscher-Ohlin: Rise of a theory

- ▶ From a book by Ohlin published in 1933
- ▶ Original point → trade and long-run income distribution
- ▶ Attractive model
 - ▶ Elegant: Can be analyzed graphically
 - ▶ Enough complexity to tackle many trade issues
 - ▶ Effect of trade liberalization
 - ▶ Effect of tariffs
 - ▶ Effect of technological change on trade patterns
 - ▶ Effect of technological change on income distributions
 - ▶ Clear, testable predictions
 - ▶ Developed and extended by famous economists
 - ▶ Ohlin (Nobel 1979)
 - ▶ Samuelson (Nobel 1970)

Heckscher-Ohlin: Downfall

- ▶ Some quotes:

- ▶ *... the Heckscher-Ohlin model is hopelessly inadequate as an explanation for historical and modern trade patterns, unless we allow for technological differences across countries.*

-Robert Feenstra, Distinguished Professor of Economics at University of California, Davis, 2004

- ▶ *It is time to declare Stolper-Samuelson [an important result of the HO model] dead. Stolper-Samuelson says that trade liberalization will raise the real income of the abundant (unskilled) labor in poor countries. Stolper-Samuelson, qua theorem, is not wrong, of course. But if we use it, as we so often have, as if it provides a reliable answer to this question of real human significance, then it is worse than wrong - it is dangerous.*

-Donald Davis, Professor of Economics at Colombia University and Prachi Mishra, Senior Economist, IMF 2007

Heckscher-Ohlin: Why the hate?

- ▶ Heckscher-Ohlin is a scientific theory: testable predictions
- ▶ Predictions have often not been backed up by data
- ▶ Assumptions also seem unusual in the modern world

The point

- ▶ Heckscher-Ohlin about long-run effects of trade
- ▶ Embodied in the idea that all factors are costlessly mobile

The point

- ▶ Famous implications are the four theorems (paraphrase):
 1. *Heckscher-Ohlin*: Countries with more of a resource will export goods for which that resource is more useful in production
ex: China exports labor intensive manufactured goods
 2. *Rybczynski*: If country gets more of a resource, then the output of the good that uses that resource intensively will rise while the output of the other good will fall.
ex: if Denmark got more labor, it would increase its production of textiles
 3. *Stolper-Samuelson*: A change in the price of a final good for which a particular resource is more useful in production will increase the payments to that resource
ex: if the price of textiles goes up, Chinese workers get higher wages
 4. *Factor-price equalization*: Trade should cause resource prices to converge
ex: Danish and Chinese workers should be paid the same wages

Model - Plan of attack

- ▶ Setup and assumptions
- ▶ Production possibilities
- ▶ Production and prices
- ▶ Autarchy equilibrium
- ▶ Trade equilibrium

Setup

- ▶ Two countries: Home (H) and Foreign (G)
- ▶ Two goods: Clothes (C) and Food (F)
- ▶ Two factors: Labor (L) and Capital (K)
- ▶ Sometimes called the $2 \times 2 \times 2$ model

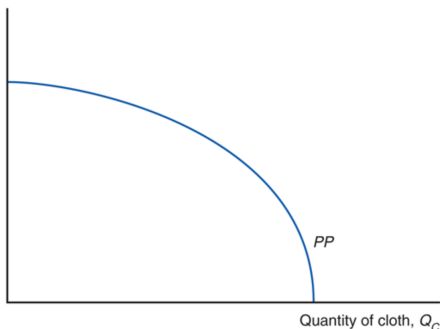
Setup

- ▶ Clothes and Food can be produced with combinations of Labor and Capital
- ▶ Both countries have the same production technology
- ▶ Production technologies are Constant Returns to Scale (double both inputs, double output)
- ▶ Each country has a different endowment of Labor and Capital
- ▶ Labor and Capital cannot move between countries, even in the long run
 - ▶ No shipping of machines allowed
 - ▶ No moving abroad
- ▶ As before, competitive firms with zero profit

Production Possibilities Frontier

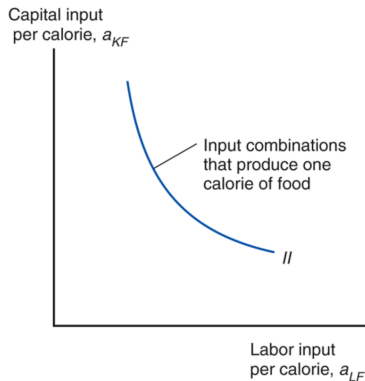
- ▶ Recall: Slope = take a bit of Labor from Food production and put it into Clothes production
- ▶ Now also: Slope = take a bit of Capital from Food production and put it into Clothes production
- ▶ In notation: Slope = $-\frac{MPL_F}{MPL_C} = -\frac{MPK_F}{MPK_C}$ (why must ratios equal?)
- ▶ Why is the frontier concave?

Quantity of food, Q_F



Input Possibilities

- ▶ Fix the amount of, say, Food we want to produce
- ▶ Slope = if I want to use a bit more Labor, how much Capital is freed up?
- ▶ $\frac{dQ}{dK} = MPK_F$, $\frac{dK}{dQ} = \frac{1}{MPK_F}$
- ▶ Slope = $-\frac{\frac{1}{MPK_F}}{\frac{1}{MPL_F}} = -\frac{MPL_F}{MPK_F}$
- ▶ Why is the curve convex?

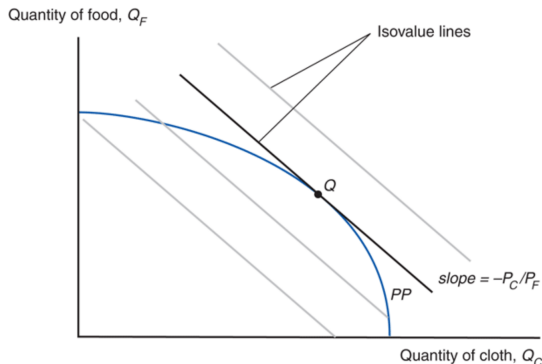


Pause

- ▶ We have described the environment
- ▶ We have described what it is possible to produce
- ▶ Now how do output prices affect production?
- ▶ How do input prices affect input choice?

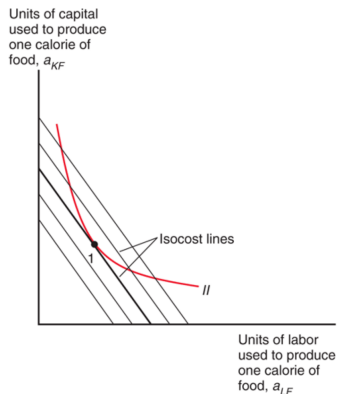
Output price ratio and production

- ▶ Suppose we have the price ratio $\frac{P_C}{P_F}$
- ▶ Then $\frac{P_C}{P_F} = \frac{MPL_F}{MPL_C} = \frac{MPK_F}{MPK_C}$ (why?)
- ▶ Production given by the point on the PPF tangent to $-\frac{P_C}{P_F}$



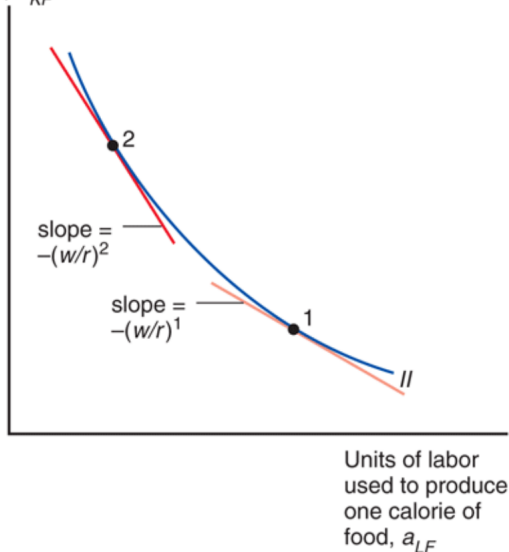
Input price ratio and production

- ▶ Suppose we have the price ratio $\frac{w}{r}$
- ▶ Then $\frac{w}{r} = \frac{MPL_F}{MPK_F} = \frac{MPL_C}{MPK_C}$ (why?)
- ▶ Input bundle given by the point on the input possibilities curve tangent to $-\frac{w}{r}$



Input price change and production

Units of capital
used to produce
one calorie of
food, a_{KF}



Pause

- ▶ We have now described what *can* be produced
- ▶ We have also described how output production is linked to output prices
- ▶ We have also described how input choice is linked to input prices
- ▶ Next we will heuristically describe how input and output prices are linked in equilibrium

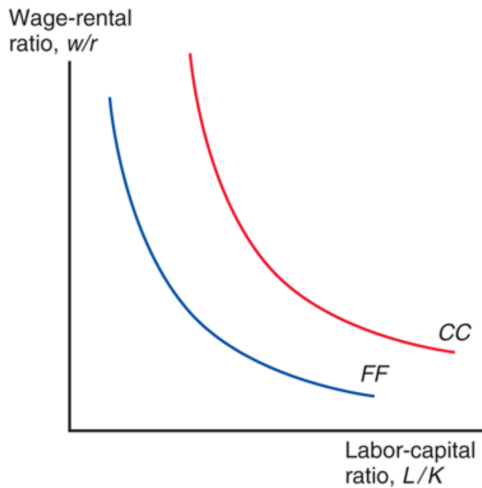
Input and Output Prices

- ▶ Setup
 - ▶ Draw input possibilities curves for both goods on the same chart
 - ▶ Curves are for production of the same value of the two goods
 - ▶ Assume that both goods are produced
 - ▶ Must be line tangent to both curves, with slope wage-rental ratio
- ▶ Food industry is *labor intensive*
 - ▶ That is, for any wage-rental ratio, Food uses a higher proportion of Labor than Clothes
- ▶ Suddenly the price of food rises
 - ▶ If wage-rental ratio doesn't change, negative profits for making clothes, clothes industry closes
 - ▶ If both industries to remain open, wage-rental ratio must rise
 - ▶ Since firms hire less labor and more capital per unit produced, MPL rises and MPK falls
 - ▶ Wages rise (clothes buy more food, and wages paid in clothes rise): $\frac{w}{P_C} = MPL_C = \frac{P_F}{P_C} MPL_F$.
 - ▶ rent falls (food buys less clothes, and rent paid in food falls): $\frac{r}{P_F} = \frac{P_C}{P_F} MPK_C = MPK_F$.

The Stolper-Samuelson Theorem

- ▶ *Stolper-Samuelson*: A change in the price of a final good for which a particular resource is more useful in production will increase the payments to that resource
- ▶ Owners of one input are always hurt by a price change in output goods.
- ▶ Trade in outputs typically changes output prices, so some people are typically hurt by trade.

Textbook discussion of Stolper-Samuelson

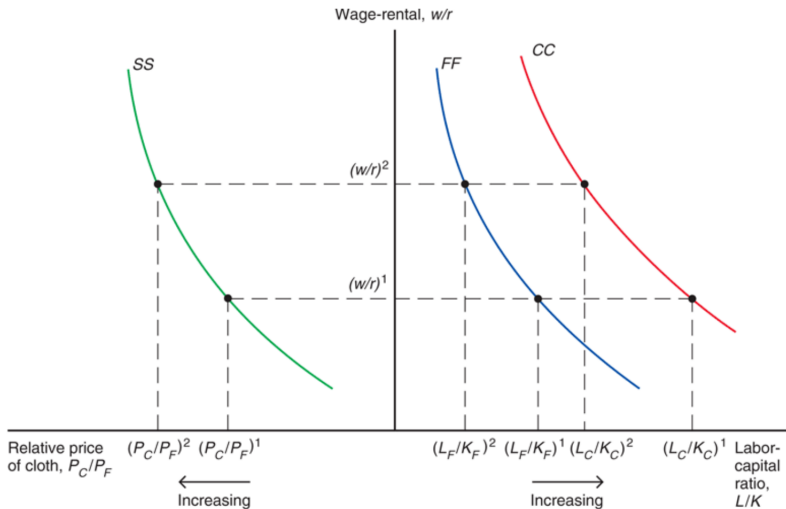


Textbook discussion of Stolper-Samuelson

- ▶ Heuristic: Clothes use relatively more labor, so if price of labor relatively increases, $\frac{P_C}{P_F}$ increases.
- ▶ How did we derive this relationship?



Textbook discussion of Stolper-Samuelson

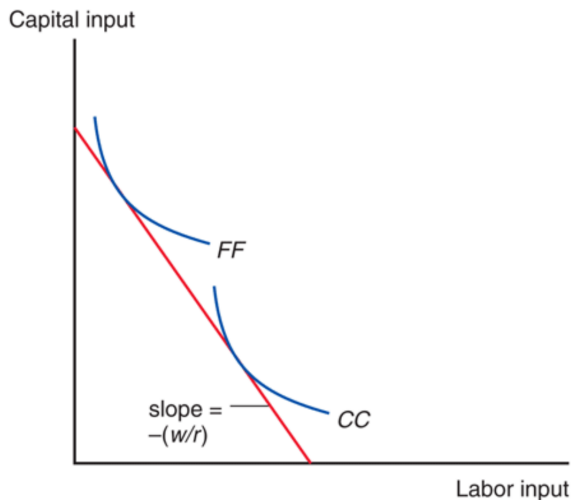


Pause

- ▶ We have now described what *can* be produced
- ▶ We have described how output production is linked to output prices
- ▶ We have described how input choice is linked to input prices
- ▶ We have described how input and output prices are linked (Stolper-Samuelson)
- ▶ Next: How do changes in factor endowments affect production?

Factor endowment changes and production

- ▶ Industry-level Labor-Capital ratios do not depend on aggregate Labor-Capital ratios



Factor endowment changes and production

- ▶ We have the accounting identity:

$$\begin{aligned}\frac{L}{K} &= \frac{L_C}{K} + \frac{L_F}{K} \\ &= \frac{L_C}{K_C} \frac{K_C}{K} + \frac{L_F}{K_F} \frac{K_F}{K}\end{aligned}$$

- ▶ Changes in aggregate $\frac{L}{K}$ do not affect $\frac{L_C}{K_C}$ and $\frac{L_F}{K_F}$
- ▶ If $\frac{L}{K}$ increases, only way for the identity to hold is for Capital to move from the capital intensive industry to the labor intensive industry
- ▶ If Capital moves, since industry Capital-Labor ratios don't change, Labor must move as well
- ▶ That is, $\frac{L}{K}$ increases \rightarrow more Labor-intensive good, less Capital-intensive good

The Rybczynski Theorem

- ▶ *Rybczynski*: If country gets more of a factor, then the output of the good that uses that factor intensively will rise while the output of the other good will fall.