

## EC3355 International Trade

### Problem Set 5: Heckscher-Ohlin model

Consider a country which can produce two separate goods food ( $F$ ) and manufactures ( $M$ ) using two inputs: skilled labour ( $S$ ) and unskilled labour ( $L$ ). The production of each good requires inputs to be used in fixed proportions:

Food requires 3 units of  $L$  and 1 unit of  $S$  for each unit of  $F$ .

Manufactures requires 1 unit of  $L$  and 2 units of  $S$  for each unit of  $M$ .

Let  $\bar{L}, \bar{S}$  be the total amount of unskilled and skilled workers in the economy and  $P_f, P_m$  the output prices.  $W^U, W^S$  are the wages of unskilled and skilled labour.

1. Find production costs and hence the output price (price = marginal cost) for each good in terms of factor prices.

**Answer:** We know that to produce  $Q_m$  units of  $M$  we need  $2Q_m$  skilled workers and  $Q_m$  unskilled workers, which makes that the total costs are  $W^U L_m + W^S S_m = (W^U + 2W^S)Q_m$ . Marginal costs are therefore  $W^U + 2W^S$  and as price equals marginal costs we have  $P_m = W^U + 2W^S$ .

Applying the same logic to the food sector we get:

$$TC(food) = (3W^U + W^S)Q_f; \quad MC(food) = 3W^U + W^S; \quad P_f = 3W^U + W^S$$

2. Find factor prices in terms of output price and show how an increase in  $P_f$  affects  $W^U, W^S$ .

**Answer:**  $P_m = W^U + 2W^S, P_f = 3W^U + W^S$ . Solve both for  $W^U$ :

$P_m = W^U + 2W^S \rightarrow W^U = P_m - 2W^S$ . Substitute this into price for food.

$$P_f = 3W^U + W^S = 3(P_m - 2W^S) + W^S = 3P_m - 5W^S \text{ or } W^S = \frac{3P_m - P_f}{5}.$$

Use  $W^S$  to solve for  $W^U$ :

$$W^U = P_m - 2W^S = P_m - 2\frac{3P_m - P_f}{5} = \frac{2P_f - P_m}{5}.$$

$$W^S = \frac{3P_m - P_f}{5}, W^U = \frac{2P_f - P_m}{5}.$$

How does  $p_f$  affect factor prices?

$$\frac{\delta W^U}{\delta P_f} = \frac{2}{5} > 0$$

$$\frac{\delta W^S}{\delta P_f} = \frac{-1}{5} < 0$$

$$\frac{\delta W^U}{\delta P_f} \frac{P_f}{W^U} = \frac{2P_f}{2P_f - P_m} > 1$$

An increase in food price lowers the return to skilled labour and increases the real return to unskilled labour. This is due to the fact that food is intensive in unskilled labour, whereas manufactures are intensive in skilled labour.

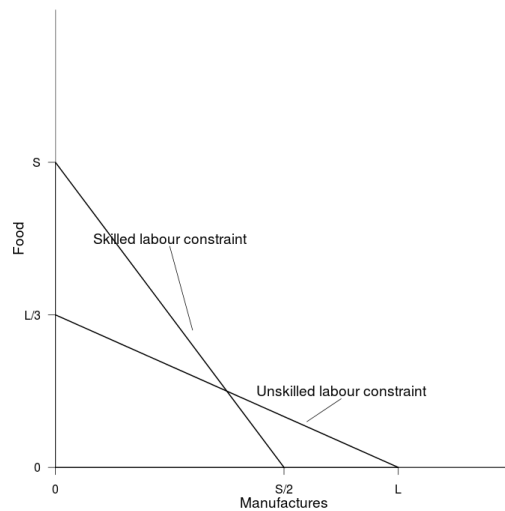
Additionally, the return on unskilled labour increases more than the food price so the real return of unskilled labour increases in terms of food or manufactures.

3. Draw the production possibilities frontier (ppf). (*Note:* In this example there is no factor substitution.)

**Answer:** Resource constraints are:

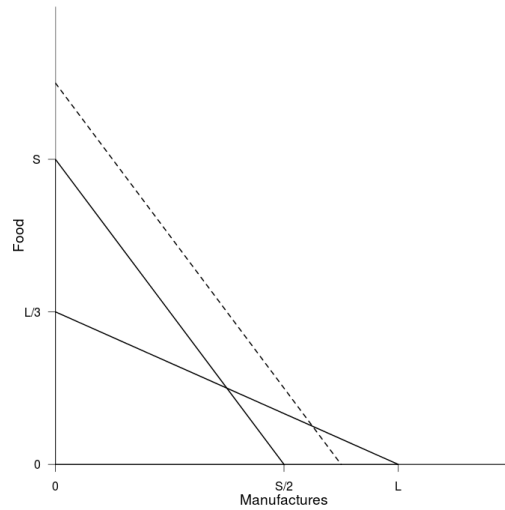
Unskilled labour:  $Q_m + 3Q_f \leq \bar{L}$ .

Skilled labour:  $2Q_m + Q_f \leq \bar{S}$ .



4. Assume that there is an increase in the supply of skilled labour. Show how this will shift the ppf and the production point where both inputs are fully used.

**Answer:**



5. Does trade between industrialised and developing countries validate the Heckscher-Ohlin model? **Answer:** This trade flows does seem to validate the HO-model since most developing countries export more unskilled labour-intensive goods such as clothing, while industrialised economies tend to export more capital- and skill-abundant goods such as chemicals and machinery.
6. Suppose when Belarus opens up to trade, it imports cars, a capital-intensive good. According to the Heckscher-Ohlin theorem, is Belarus capital abundant or labour abundant?

**Answer:** Belarus is labour abundant as it imports a capital abundant good.

7. What will be the impact of opening trade on the real wage in Belarus?

**Answer:** Belarus will specialize in the labour-intensive product which will lead to an increase in the relative demand for labour in the labour-intensive industry. This cause an increase in the relative wage which will lead to a decrease in the number of workers hired per unit of capital, reducing labour/capital ratio. By the law of diminishing returns, the decrease in the labour/capital ratio leads to a rise in the marginal produce of labour in both industries. Which means that real wage will increase in Belarus as a result of trade.

8. What will be the impact of opening trade on the real rental on capital?

**Answer:** The real rental on capital will decrease because the world relative price of cars is lower than Belarus' no-trade relative price. More specically, with a lower labour/capital ratio in both industries, the marginal product of capital decreases so that the real rental on capital falls.

9. Which group (capitalists or labour) would support policies to limit free trade?

**Answer:** The capital owners will support policies to limit free trade because they suffer a loss due to the decrease in the relative price of cars when Belarus engages in trade.