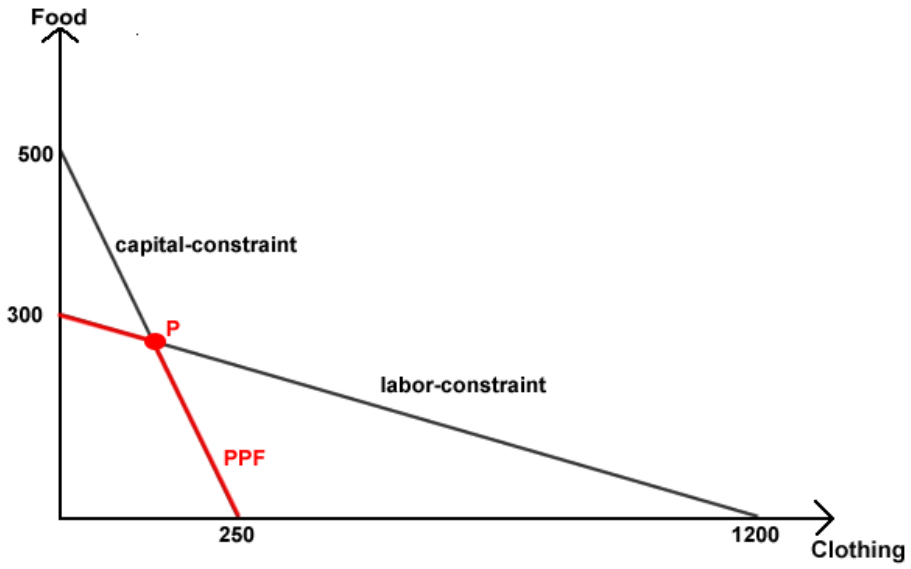
Exercise Sheet 3: Short solutions.

Exercise 1

a) Since $\frac{a_{LF}}{a_{KF}} > \frac{a_{LC}}{a_{KC}}$, food is relatively labor intensive and clothing relatively capital intensive.

b) Let Q_C be the quantity of clothing produced, and Q_F be the quantity of food produced. The capital-constraint is then given by $a_{KF}Q_F + a_{KC}Q_C = 500$. The labor-constraint is given by $a_{LF}Q_F + a_{LC}Q_C = 1200$. Graphically:



The only production point where both labor and capital are fully employed is point P.

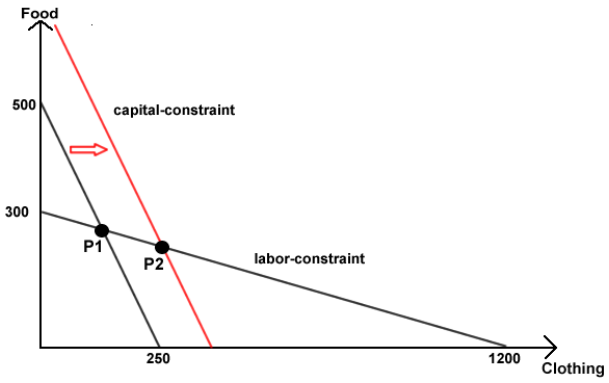
c) To know autarky prices we would have to know something about taste patterns in this economy (i.e. the indifference curves). However, since it must hold that $\frac{P_C}{P_F} = \text{MRT}$ at the autarky production points, we can say that $\frac{1}{4} \leq \frac{P_C}{P_F} \leq 2$, since the MRT is never below $\frac{1}{4}$ and never above 2.

d) The country produces at point P, where both labor and capital are fully employed. To compute the wage and the capital rental rate we must equal production costs with prices:

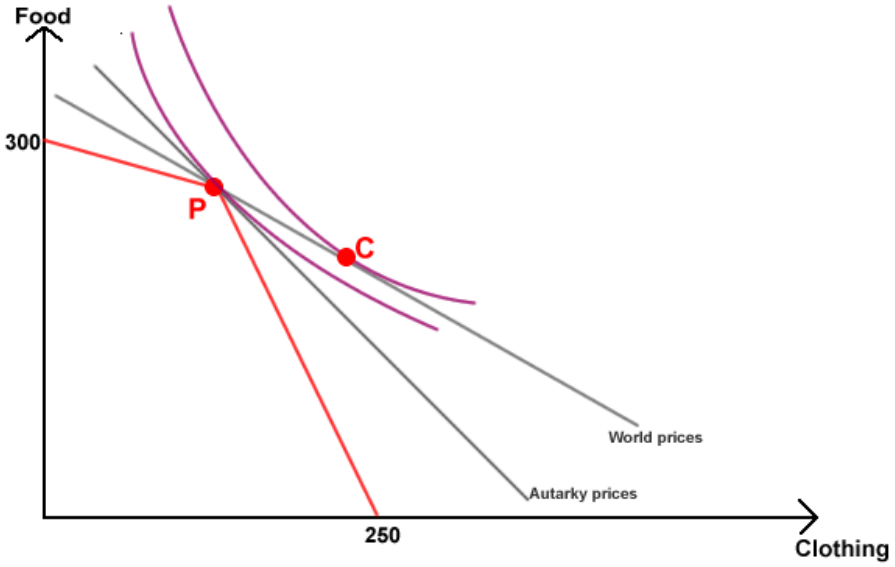
$$\begin{aligned} 4w + r &= P_F \\ w + 2r &= P_C \end{aligned}$$

Solving yields w = $\frac{5}{7}$\$ and r = $\frac{15}{7}$\$.

e) The production of clothing (the capital intensive good) increases and the production of food (the labor intensive good) decreases (graphically, an increase in the capital stock means that the capital constraint line moves outwards. See the graph below. Production moves from point P1 to P2 in the graph below). What is the intuition behind this result? If the stock of capital increases, the production of the capital-intensive good (clothing) has to increase (if not, the additional capital could not be employed). However, the production of clothing also requires some labor. If the production of clothing is increased, labor has to move away from the food sector to the clothing sector, decreasing output in the food sector. This result illustrates the Rybczynski theorem that says that, if the endowment one production factor increases (capital), output of the good that uses this factor intensively (clothing) increases, while output of the other good (food) decreases.



f) The domestic economy still produces at point P. It exports food and imports clothing, consuming at point C. (the graph below provides an illustration)



g) To compute wages and capital rental rates, we have to do the same calculation as in d) just with the new (world) prices of food and clothing:

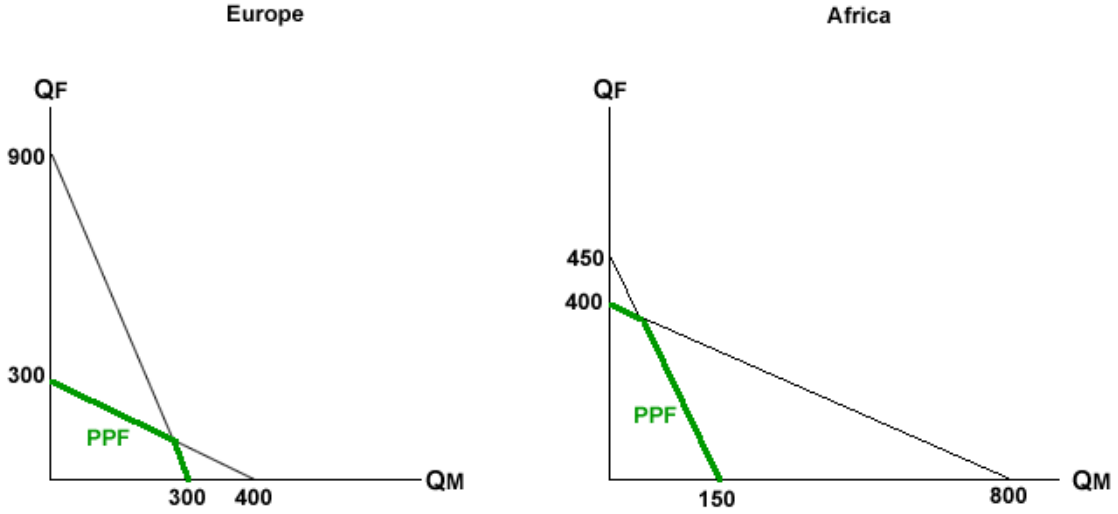
$$\text{Clothing: } 3\$ = w + 2r$$
$$\text{Food: } 5\$ = 4w + r$$

Solving gives w = 1\$ and the capital rental rate is given by r = 1\$. As predicted by the Heckscher-Ohlin theory, the relatively abundant production factor (labor) gains from opening up to trade while the relatively scarce factor (capital) loses. Furthermore, the result confirms the Stolper-Samuelson theorem which states that if the relative price of one good increases (in this case food), the return of the factor used extensively in the production of this goods increases (labor in this case) while the return of the other factor decreases.

Exercise 1

a) Europe is capital abundant and Africa is labor abundant $\left(\frac{K^E}{L^E} > \frac{K^A}{L^A}\right)$. Manufactures is capital intensive and food is labor intensive $\left(\frac{a_{LF}}{a_{KF}} > \frac{a_{LM}}{a_{KM}}\right)$.

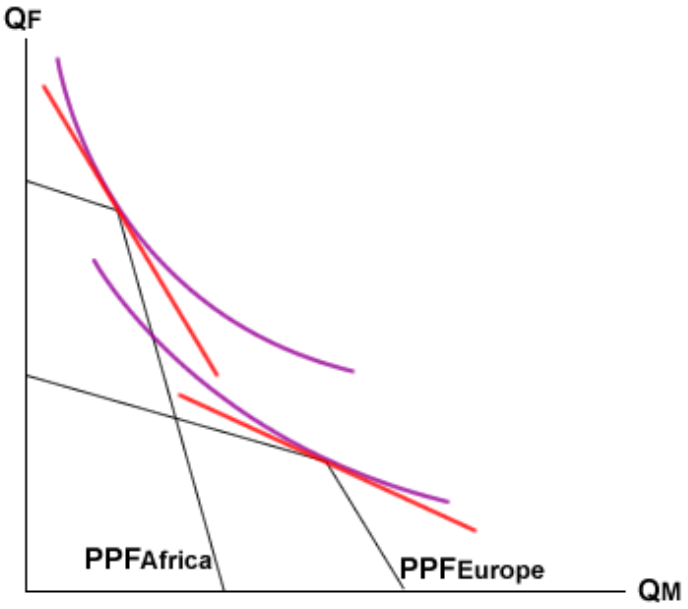
b)



c) If preferences in the two countries are "normal" (i.e. convex indifference curves) the autarky price of food is higher in Europe than in Africa, as illustrated in the graph on the next page (indifference curves are in purple, isovalue lines representing autarky prices are in red).

d) If the two countries trade with each other, the prices at which they trade will lie somewhere in between the autarky prices. This implies that the (relative) price of food with trade will be higher than the autarky price of food in Africa and lower than the autarky price of food in Europe. Now we can apply the Stolper-Samuelson theorem: Workers in Africa and capital owners in Europe will gain from trade while capital owners in Africa and workers in Europe will loose from trade.

e) We can simply argue with the Stoler-Samuelson theorem again and conclude that the real wage is higher in Europe under autarky. Alternatively we can compute wages and capital rental rates in each country. For Europe, the zero profit conditions for



manufactures and food respectively writes:

$$1\$ = 3r + w \tag{1}$$
$$1\$ = r + 2w \tag{2}$$

Solving gives $r = \frac{1}{5}\$$ and $w = \frac{2}{5}\$$. For Africa, the zero profit conditions are:

$$2\$ = 3r + w \tag{3}$$
$$1\$ = r + 2w \tag{4}$$

Solving gives $r = \frac{3}{5}\$$ and $w = \frac{1}{5}\$$. Hence both nominal and real wages are lower in Africa than in Europe under Autarky.

e) Denote the prices of food and manufactures with trade by p_F^T and p_M^T. The zero profit conditions for manufactures and food are now the same for both Europe and Africa:

$$p_M^T = 3r + w \tag{5}$$
$$p_F^T = r + 2w \tag{6}$$

Obviously, both wages and capital rental rates are the same in Europe and Africa with trade. This is the factor prize equalization result of the H-O theory.[1] Note that a crucial

[1]With the rigid technology version of the H-O model considered here, the factor price equalization

assumption behind the factor price equalization is that technology is the same in both countries and countries differ only in their endowments.

f) As discussed above, real wages of workers in Africa increase in this exercise if there is free trade in food (Stolper-Samuelson theorem). Therefore one might conjecture that free trade in agricultural products improves the situation of workers in Africa, decreasing migration to Europe. But let's take a closer look at some of the assumptions that were made in obtaining this result:

- Africa and Europe have the same technology. This assumption does not seem very realistic. If Europe has the better technology than Africa, real wages might still be higher in Europe even with free trade.

- Food is labor intensive. This assumption is also questionable. Modern agriculture might actually require very little labor (think about agriculture in the United States).

theorem is rather trivial. The result is more interesting in more general versions of the H-O model.