Exercise Sheet 4: Short solutions.

Exercise 1

a) The marginal product of labor in the clothing sector equals the derivative of Q_C with respect to L_C:

$$\frac{\partial Q_C}{\partial L_C} = \frac{1}{2}\sqrt{\frac{K}{L_C}} \tag{1}$$

We see that the marginal product of labor in the clothing sector is decreasing in labor per capital, $\frac{L_C}{K}$. The marginal product of labor in the food sector is given by

$$\frac{\partial Q_F}{\partial L_F} = \frac{1}{2}\sqrt{\frac{T}{L_F}} \tag{2}$$

so it is decreasing in the amount of labor per land $\frac{L_F}{T}$

b) The marginal product of capital is given by $\frac{\partial Q_C}{\partial K} = \frac{1}{2}\sqrt{\frac{L_C}{K}}$ so it is increasing in labor per capital $\frac{L_C}{K}$. The marginal product of land is $\frac{\partial Q_F}{\partial T} = \frac{1}{2}\sqrt{\frac{L_F}{T}}$ so it is increasing in the amount of labor per land.

c) + d)The wage in sector equals the value of the marginal product in each sector. Hence the wages in the clothing sector (w^C) and the food sector (w^F) are given by:

$$w^C = \frac{1}{2}\sqrt{\frac{K}{L_C}}P_C \tag{3}$$

$$w^F = \frac{1}{2}\sqrt{\frac{T}{L_F}}P_F \tag{4}$$

Perfect labor mobility implies that the wages in both sectors must be the same: $w^C = w^F$. Setting $w^C = w^F$ and solving for $\frac{L_C}{L_F}$ gives:

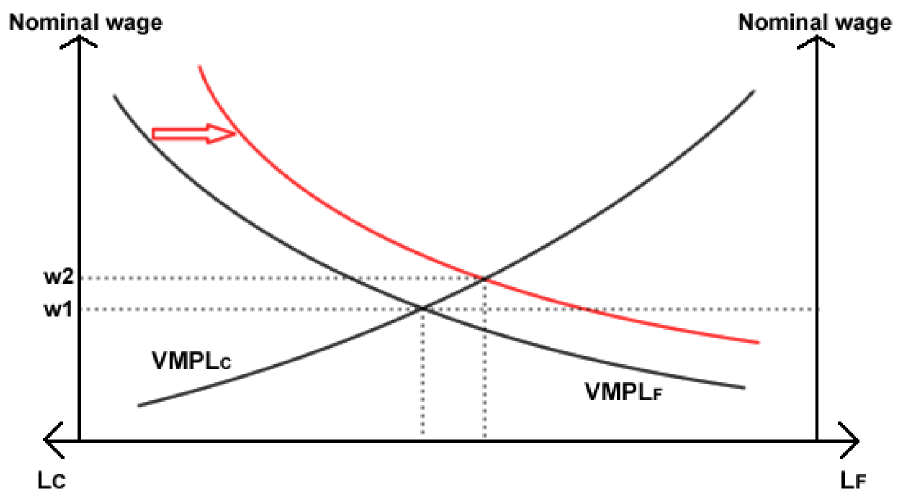
$$\frac{L_C}{L_F} = \frac{K}{T}\left(\frac{P_C}{P_F}\right)^2 \tag{5}$$

So we see from this expression that labor moves from food to clothing $\left(\frac{L_C}{L_F} \text{ increases}\right)$

if the relative price of clothing $\frac{P_C}{P_F}$ increases. We also see that labor moves from clothing to food $\left(\frac{L_C}{L_F} \text{ decreases}\right)$ if the amount of land (T) increases.

Exercise 2

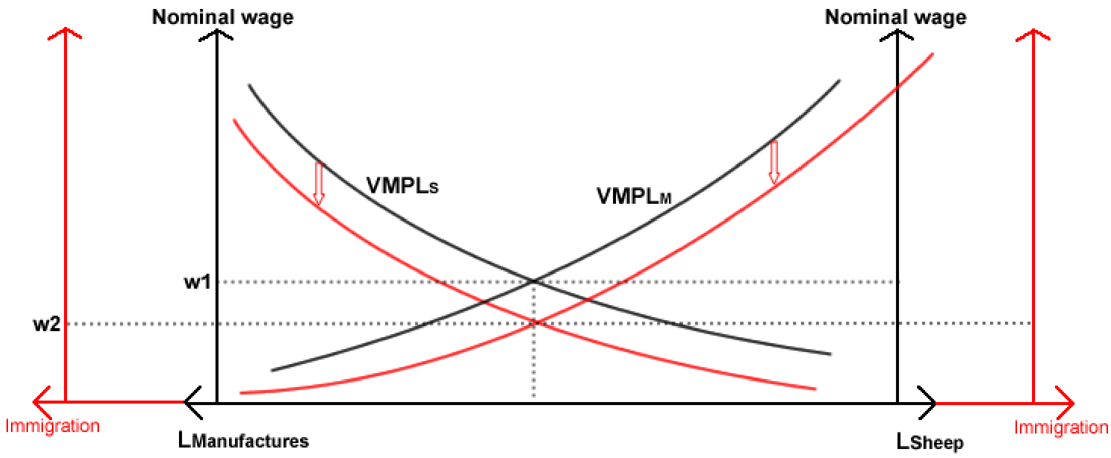
a) Labor moves from the clothing sector to the food sector since the food sector can now pay higher (nominal) wages. Production in the food sector increases and decreases in the clothing sector. Nominal wages increase. However, the price of food is also higher. The effect on the real wage is unclear. VMPL in the graph means "value of the marginal product of labor", which equals the marginal productivity of labor times the price of the good produced in this sector.



b) Since the marginal productivity of labor in the food sector increases, the food sector can pay higher wages than before. Again, labor moves from the clothing sector to the food sector, increasing production in the food sector and decreasing production in the clothing sector. Nominal wages increase. Since world prices did not change, the real wage increases. (The graph looks essentially the same as in a)).

Exercise 3

a) If the total amount of labor increases, more labor per unit of land (or sheep farms) and capital is employed. This increases marginal productivity of both sheep farms and capital, increasing both the rents on sheep farms and capital rents. The wage, both nominal and real, decreases as a result of the lower marginal productivity of labor. Therefore both capitalists and owners of sheep farms are likely to favor a "liberal" immigration policy that increases the labor force in Australia. In the graph, the nominal wage decreases from w1 to w2. Since world prices did not change the real wage decreases as well.



b) If prices in the manufacturing sector increases, manufacturers can pay higher wages. This attracts labor to the manufacturing sector. Since less labor is now employed in the wool sector (combined with higher wages), rents of sheep farms decrease. Hence owners of sheep farms will be opposed to the tariff. (graph is shown in the exercise session)

Exercise 4

a) The marginal product of labor in the oil sector decreases (more labor per oil fields, since the number of oilfields decreased), the curve shifts down. Labor moves away from oil production to whiskey production. Wages (both nominal and real) decrease. The rents to Whiskey factories increase, since there is now more labor per whiskey factory. Rents to oilfields also increase. The last thing is not easy to see - labor moves away form oilfields to whiskey factories, but there are also less oilfields in total. How do we know that there is more labor per oilfield? The intuition is that the same amount of labor is now spread over a smaller total amount of specific factors (oilfields and whiskey factories) and hence more labor is employed per unit of both specific factors.

You can also see it this way: We know that the wage decreases, implying that the marginal product of labor must decrease in both sectors (prices did not change). Since the marginal product of labor depends only on the units of labor employed per unit of the specific factor, we know that, in both sectors, labor per unit of specific factor must have increased.

b) The graph below shows this situation. It the value of the marginal product of labor in oil production increases very much (due to a strong increase in the world price of food), the whiskey sector cannot attract any labor anymore. The nominal wage moves from w1 to w2. The labor allocation moves from L1 to L2. This is an example of the "Dutch Disease" whereby one export industry squeezes out other export industries because it can pay higher wages. (You can also use the name "Dutch Disease" in cases where the other export industry is not complete squeezed out). The name "Dutch Disease" refers to the rising Gas industry in Holland in the 60s that could pay very high wages and squeezed out other export industries.