EC3355 International Trade
Problem Set 4: Specific factor model

Consider Nambutu which is a country with a small open economy. It produces two goods, X and Y, and initially only exports good X. You are hired by the government of Nambutu in order to advise them on trade by analysing how a number of scenarios could affect the following:[1]

i output of X and Y

ii real wage of labour

iii real rental price of capital in the X industry

iv quantity of X exported

You are given the following scenarios:

(*Tip: Graphs are extremely useful in explaining the changes*)

1. Due to the adaptation of a new technology, world output of Y has increased while the price of X has remained constant.

   Answer: Due to an increase in world output the price of Y will decrease which will lead to a lower value of the marginal product of labour ($p_y MP_{Ly}$). This means that the labour market equilibrium will be found at a lower nominal w', where more labour will be employed in the X industry. Therefore, output of X rises and output of Y falls.

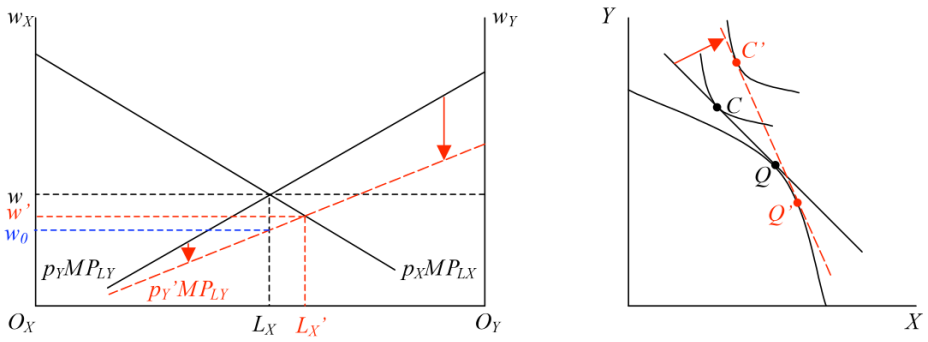
   The effect on real wage is ambiguous. It has fallen in nominal terms, and therefore also with respect to X as its price has remained constant. The price of Y has fallen and the wage would have to have fallen to w_0 to equal that fall in price (this is the drop in $p_y MP_{Ly}$). This isn't the case so w/p_x is down, but w/p_y is up.

   Nominal payments to capital in the X industry have increased, since

[1] Diagrams are taken from Alan Deardorff.

the increase in L_x increases capital's marginal product (or note the increased area below $p_x MP_{Lx}$ above w'). Since p_x is unchanged and p_y has fallen, this is a real increase.

Looking at output and consumption in the PPF diagram, we see that output of X has increased, while consumption of X may have risen or fallen (it is shown having risen, moving from C to C') depending on income and substitution effects. Without any assumption about preferences, we can't be sure that exports of X increase.



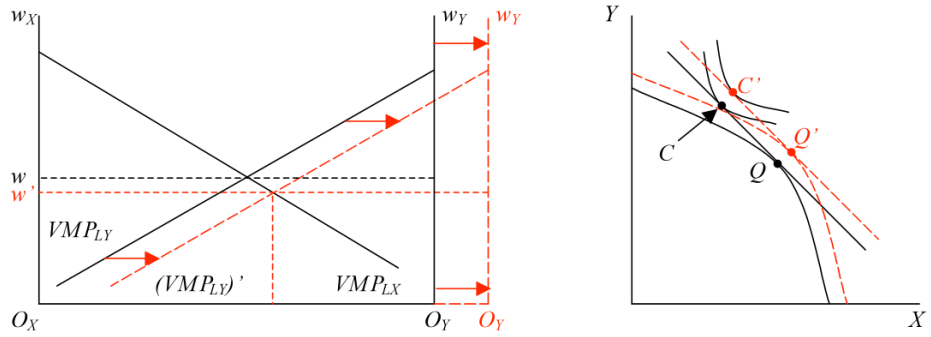
2. The country relaxes some of the immigration laws opening its borders for foreign workers which leads to an increase in the size of the labour force.

Answer: The increase of labour will lead the diagram to expand horizontally since the x-axis is the labour endowment. We expand the diagram at the O_y side which means that the intersection moves right as well, although not by the same extend and at a lower w.

The fall in wage, holding prices and capital endowment fixed, means that there is a decrease in the marginal product of labour as a result of expanding employment in both industries. Output will therefore increase in both industries.

The decrease in wages is a real decline since the prices of the goods are fixed. The increase in labour also increases the returns to capital in X, as well as Y, since prices are fixed.

Again, we can't make any statement about export since both production and consumption of X increases.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3. Climate change leads to an increase in the incidence of extreme weather events. As a result a category 5 hurricane has destroyed part of the country's capital stock employed in industry Y.

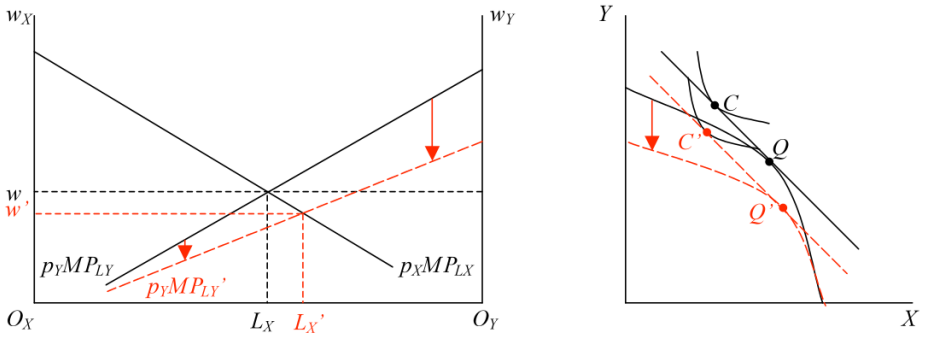
   Answer: Due to the sudden decrease in capital stock we see a drop in the marginal product of labour. The change in the diagram is similar to that in question 1 except the cause is different here as changes in MP_{Ly} causes the shift and not a change in p_y.

   Due to lower productivity the PPF will decrease since less of Y can be produced. The production possibilities of X are unaffected. As a matter of fact more labour will be allocated to X leading to an increase in the output of X. This means that the output of Y will fall first due destruction of capital and second to movement of labour away from the industry.

   Real wages will fall as the nominal wages change and prices remain the same.

   Surviving capital in Y will gain: w decreases but p_y doesn't change which means that there is decrease in MP_{Ly}. The marginal product depends on the ratio of capital to labour so there must have been a decrease in K_y/L_y which corresponds with an increase in MP_{Ky} and therefore r_Y. p_X is unchanged, this is a real increase.

   For this case we see that the output of X has increases while the fall in income reduces its consumption so the surplus will be exported.



Consider another country, San Monique, which produces textile and food. You have the following information about the economy and are asked to examine the effect of changes in international prices on the economy. For the textile industry sales revenue was 150, payments to labour equalled 100, and payment to capital 50.
For the food industry sales revenue was 150, payments to labour equalled 50, and payments to land 100.
Let's say that we hold the price of textile constant and that there is a 10% increase in the price of food accompanied by a 5% increase in wage.

4. Calculate the impact of the price increase of food on the rental to land and rental to capital.

   Answer: We know that the rents to land and capital are calculated as:

$$r_K = \frac{p_c * Q_c - w * L_c}{K}$$
$$r_T = \frac{p_f * Q_f - w * L_f}{T}$$

   A change in the rents is equal to:

$$\Delta r_K = \frac{\Delta p_c * Q_c - \Delta w * L_c}{K}$$
$$\Delta r_T = \frac{\Delta p_f * Q_f - \Delta w * L_f}{T}$$

   Rewriting this using percentages we get for land:

$$\frac{\Delta r_T}{r_T} = \frac{\frac{\Delta p_f}{p_f} p_f * Q_f - \frac{\Delta W}{W} W * L_f}{r_T * T}$$

   Which is $\frac{10\% * 150 - 5\% * 50}{100}$ or 12.5%.

   There is no change in the price of the textiles so for capital we get: $\frac{-5\% * 100}{50}$ or -10%.

5. Discuss what has happened to the real rental on land and the real rental on capital.

   Answer: Due to the 10% price increase in food we see that the rents on land increase and the capital rents decrease. The landowners are better of as the percentage increase in rentals is larger than the percentage increase in price. Capitalists are worse off since the price of textiles remained constant. This means that there is a decline in their

ability to purchase both goods as capital rents are lower.
We've seen that for an increase in p_f, that

$$\frac{\Delta r_K}{r_K} < 0 < \frac{\Delta w}{w} < \frac{\Delta p_f}{p_f} < \frac{\Delta r_T}{r_T}$$

6. Let's say that instead the price of textile falls by 10%. Who would be better off: capitalists or landowners? And how would this decrease affect labourers?

   Answer: We assume that the wage will fall by 5%. In this case the decrease in the capital rents is $\frac{-10\%*150+5\%*100}{50}$ or a decrease of 20%.
   For land we find that there is an increase of 2.5%: $\frac{5\%*50}{100}$.

   So again, capitalists are worse off and landowners are better off. The effect on labour is ambiguous as although the price of textiles decreases more than wage, they loose in terms of ability to buy food.

Consider two countries, Isthmus and San Marcos , which both produce the same land-intensive good which isn't traded. Isthmus' economy employs 120 workers and has a marginal productivity of labour of 10, while San Marcos' economy employs 60 workers which have a marginal productivity of labour of 20 Let's say that 30 workers move from Isthmus to San Marcos, marginal productivity of labour is now 15 in both countries.

7. Calculate what kind of effect this has on the landowners and output in Isthmus

   Answer: Home output decreases by 30*10+1/2*(5*30)=375. Landowners' loss is 1/2*(5*30)=75

8. Calculate what kind of effect this has on the landowners and output in San Marcos

   Answer: Foreign output will increase by 30*15+1/2*(5*30)=525. Landowners' gain is 75.

9. What is the general welfare effect? Is the world better or worse off by this labour migration?

   Answer: The general welfare effect is an increase of 150. Labourers move to the more productive country increasing output.