Framework

- An economy with two sectors and three factors of production
- Factors of production: land, labor and capital
- Labor mobile between sectors
- One of the sectors uses labor and land in production
- The other sector uses labor and capital in production

Given this framework, it is appropriate to apply the specific factors model. This model assumes that some factors are mobile, while other factors are specific to certain sectors in the economy. We assume that the sectors are cloth production (C) and food production (F). Cloth production uses labor (L_C) and capital (K), while food production uses labor (L_F) and land (T, for terrain). The production in the two sectors can be represented in production functions, in which production is a function of the factors of production. The model can be used to capture income distribution effects of international trade.

(1) $Q_C = Q_C(K, L_C)$

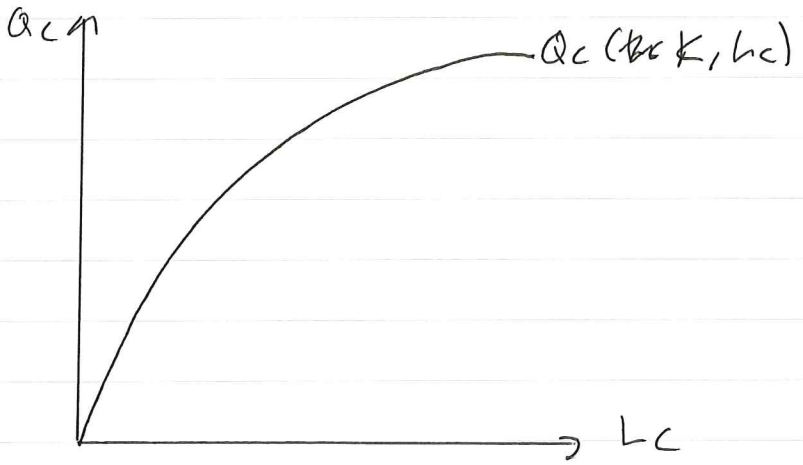
(2) $Q_F = Q_F(T, L_F)$

(3) $L = L_C + L_F$

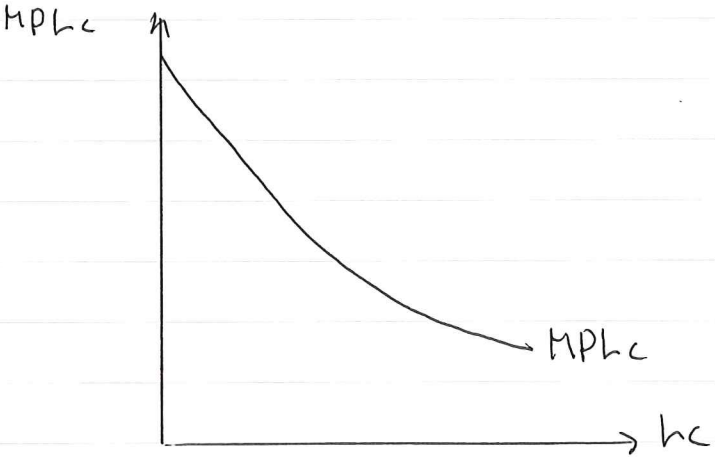
(1) Production function for cloth. An increase in K or L_C will increase production of cloth (Q_C). We assume that there is diminishing returns of labor, i.e. increased labor increases production with less the greater the production already is.

We also assume ~~diminishing returns~~ diminishing marginal product of labor in the cloth sector (MPL_C), which is the increase in production when the labor used in cloth increases by 1.

This can be illustrated graphically:

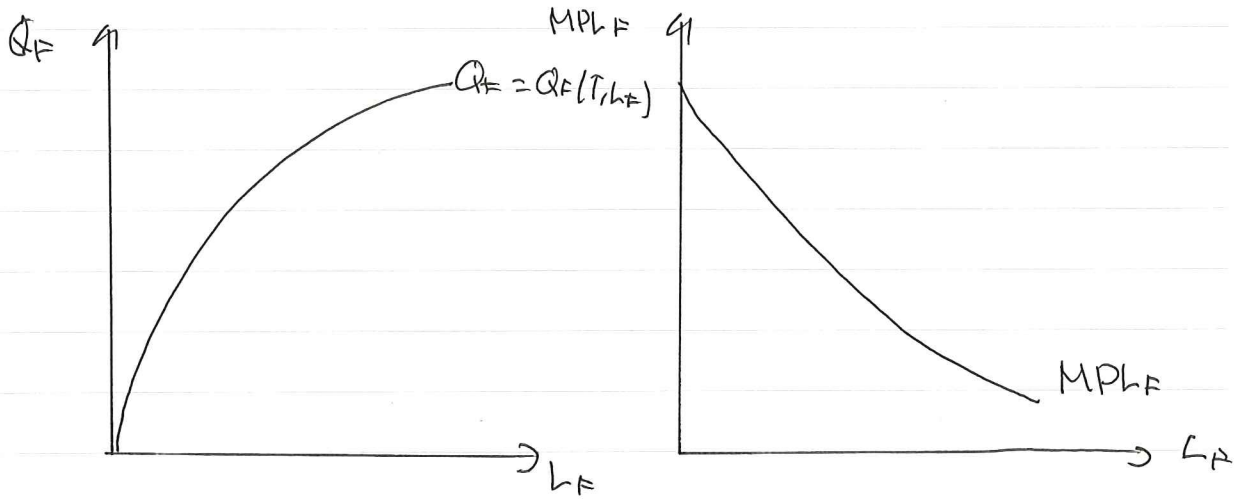


The production function is concave and increasing in L_C.



The marginal product of labor decreases with L_C. The greater the number of workes, the less one extra worker increases production.

(2) Production function for food. The same as described with ~~Q_H~~ cloth production is the case with food production. The production function is increasing and concave, i.e. with diminishing returns to labor. The marginal product of labor for food production (MPL_F) is decreasing with labor used in food production (L_F).



(3) The labor restraint. L is the total labor supply. The total labor supply of the economy has to equal the amount of labor used in production of cloth and the amount of labor used in production of food. Thus, ~~no unemployment~~ full employment is assumed in the model, as labor is either employed in the cloth sector or the food sector.

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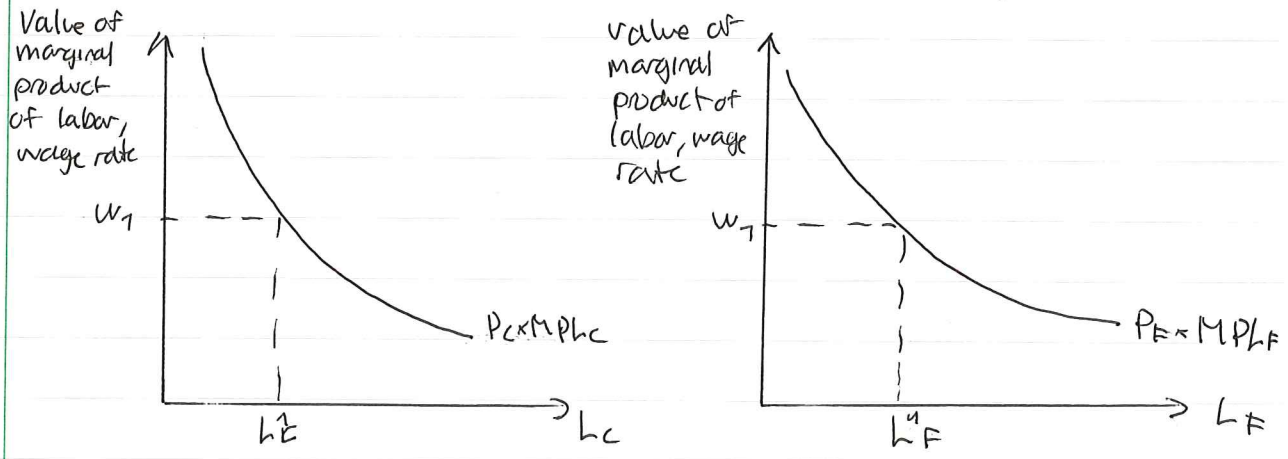
Further, we make assumptions about the wages in the two sectors. We assume perfect competition, and the workes are thus paid the value of their marginal products, the price times MPL.

(4) $P_F \times MPL_F = w$

(5) $P_C \times MPL_C = w$

Where P_F – price of food
P_C – price of cloth
w – wage rate

This can be illustrated graphically. The value of the marginal products of labor is the demand curve for labor. The demand for labor is decreasing with the wage rate, as firms are willing to hire less workes the higher the wage rate, and more workers the lower the wage rate is.



For example, at $w = w_1$ in the cloth sector, $L = L_C^1$ labor is employed. At $w = w_1$ in the food sector, $L_F = L_F^1$ is employed. Taking into account equation (3), $L = L_C + L_F$, the two labor demand curves cannot be analyzed separately. For the relationship to hold, one has

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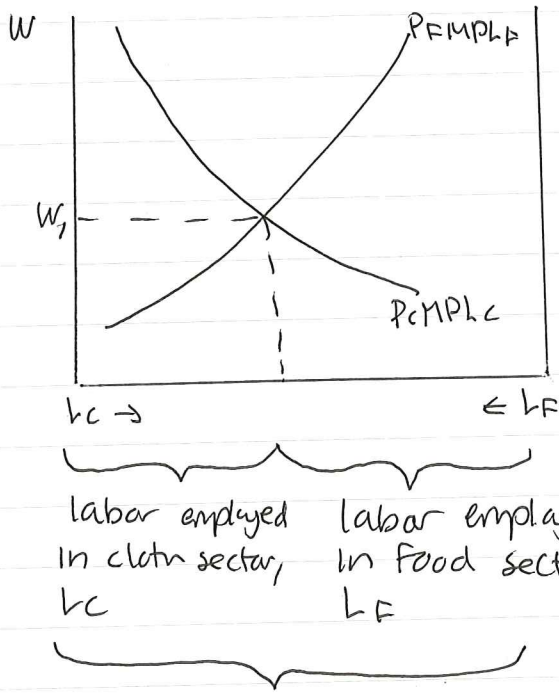
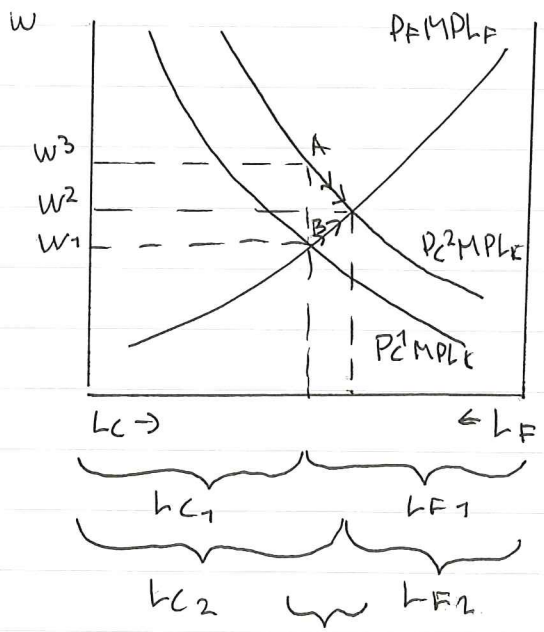
to look at the ~~relationship~~ relationship between the labor demands. The labor demand for food is mirrored, such that L_F is ~~increasing~~ increasing leftward instead of rightward.



The equilibrium wage rate in this case, is at $w = w_1$. A change in the prices of food or cloth will shift the labor demand curve in the food and cloth sectors, respectively. An increase in both prices in the same proportion will not change the labor allocation, but only increase wages. To see how prices affect the labor allocation, we assume that $P_C \uparrow$. This shifts the labor demand in cloth and increases the wage rate. The amount of labor employed in the cloth sector increases, as it is assumed that workers prefer to work in the sector that pays the highest wages. The result is shown graphically on the next page.



labor moved from food to cloth sector

The wage rate increases from w_1^1 to w^2. However, the increase in prices is higher than the increase in wages. The curve shifts equal to the distance AB. Had the wages increased equally, the wage rate would have been w^3. However, as more labor is employed in the cloth sector, the marginal product of labor decreases, and thus the wage decreases. ~~There is movement~~ Consequently, less labor is employed in the food sector and the marginal product of labor increases. There is movement along the two labor demand curves until a new equilibrium is reached at $w = w^1$. Thus, an increase a price of a product increases the wage rate and causes a higher proportion of the labor force to be employed in the sector in which the price has increased. This, in turn, increases production in that sector, because an increase in either of the factors of production will increase production. This production

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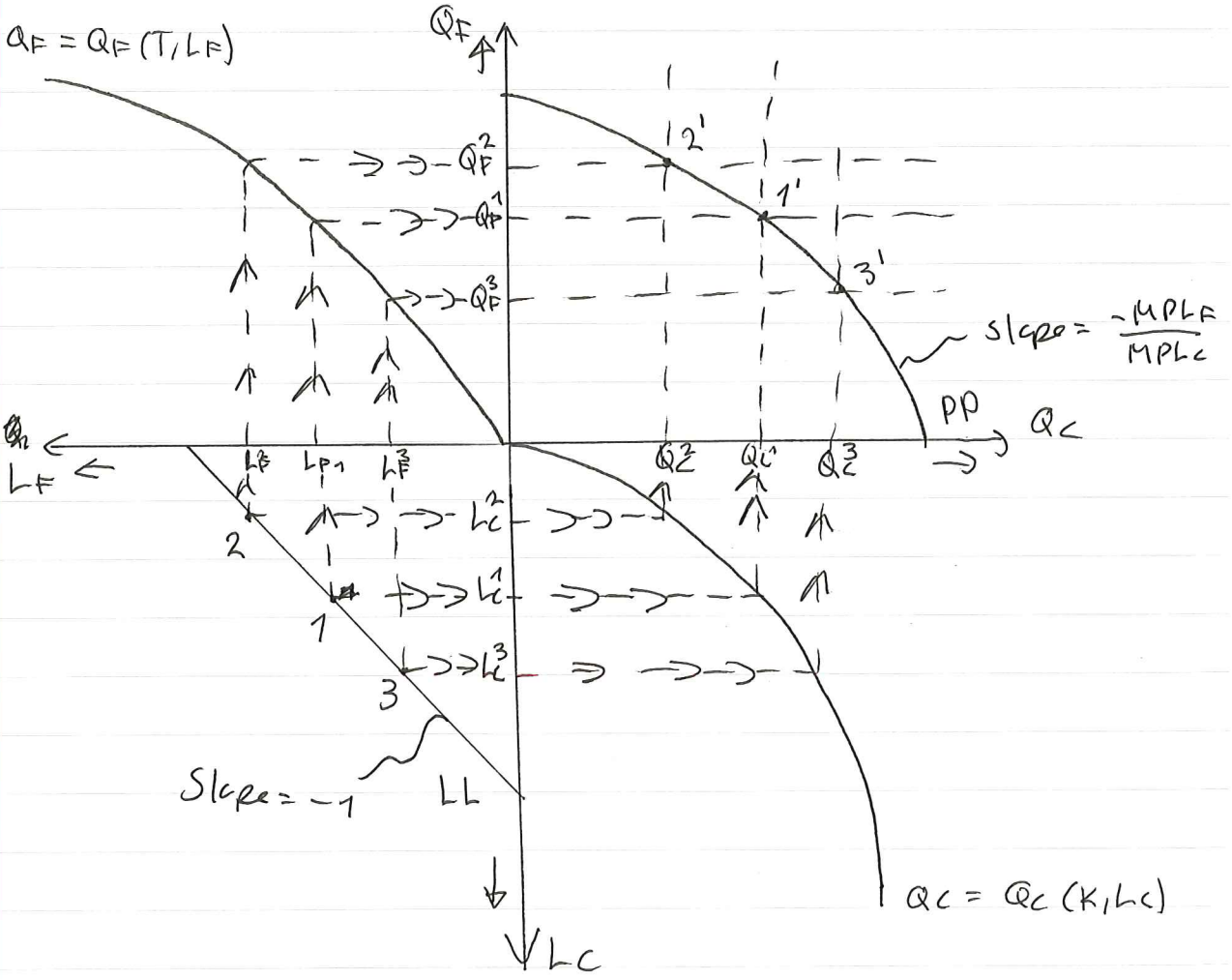
in the cloth sector will increase. This conclusion will be used later to derive the country's relative supply curve. First, the production possibility ~~curve~~ frontier will be derived.

To derive the production possibility ~~curve~~ frontier (PP-curve), we apply the production functions for the two sectors and a curve that shows the allocation of labor between the sectors. The production functions are flipped, and the direction in which they increase is shown with an arrow.



~~Starting in point 1~~ The LL-curve shows the allocation of labor between the sectors. Starting in point 1, the allocation of labor is such that $L_F = L_F^1$ and $L_C = L_C^1$. Given this allocation of labor, $Q_F = Q_F^1$ and $Q_C = Q_C^1$. This can be seen by going in the direction indicated on the figure to find the production for the given labor employed on the production functions.

In point 2, the allocation of labor in food has increased relative to the allocation in cloth., $L_F = L_F^2$, $L_C = L_C^2$, $L_F^2 > L_F^1$, $L_C^2 < L_C^1$. As a result, Q_F increases and Q_C decreases, $Q_F = Q_F^2$, $Q_C = Q_C^2$, $Q_F^2 > Q_F^1$, $Q_C^2 < Q_C^1$

In point 3, the opposite is the case. L_C has increased relative to L_F, and $Q_C = Q_C^3$ which is ~~more~~ higher than $Q_F = Q_F^3$.

If this is done with all allocations of labor on the LL-curve, we will get a smooth curve as seen in the figure. Allocations 1, 2 and 3 of labor corresponds to production allocations between the food and cloth sectors of 1', 2' and 3'. This is the production possibility curve, and it shows the production possibilities of a country for given resources. When more is produced of one good, less is produced of another. This represents the opportunity costs an economy faces when production increases of one good relative to another. The PP-curve has its curved shape in this case due to the diminishing marginal productivities of labor. The slope of the curve is $-\frac{MPL_F}{MPL_C}$.

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To see how the relative price of the two goods we look at the country's production level before trade.

From (4) and (5) we have that

$$P_F MPL_F = P_C MPL_C (= w)$$

$$\Rightarrow \frac{MPL_F}{MPL_C} = \frac{P_C}{P_F}$$

absolute value of slope of budget line

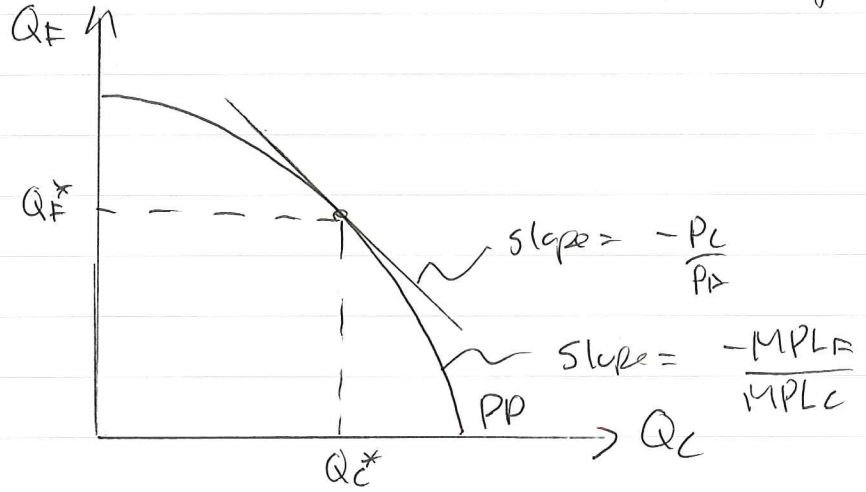
absolute value of slope of PP-curve

The value of production has to equal the value of consumption without trade. $V = P_C Q_C + P_F Q_F$

$$\Rightarrow Q_F = -\frac{P_C}{P_F} Q_C \qquad \frac{\partial Q_F}{\partial Q_C} = -\frac{P_C}{P_F}$$

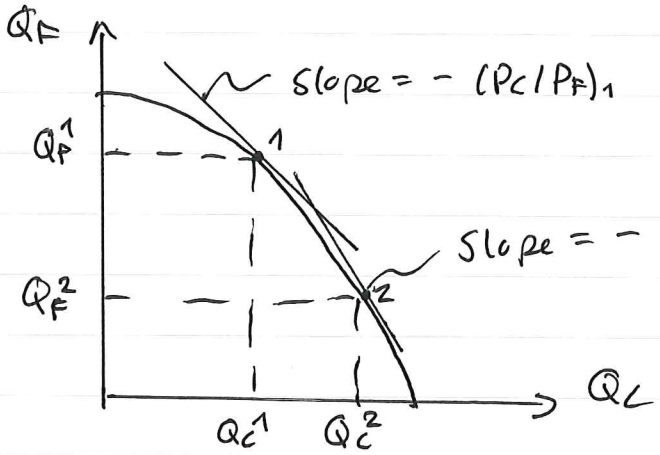
by slope of budget constraint

Thus, the slope of the budget line has to equal the slope of the PP-curve to give the pre-trade production of food and cloth. The budget line captures the fact that, before trade, the country has to produce what it consumes. Production is where the budget line is tangent to the production possibility curve.

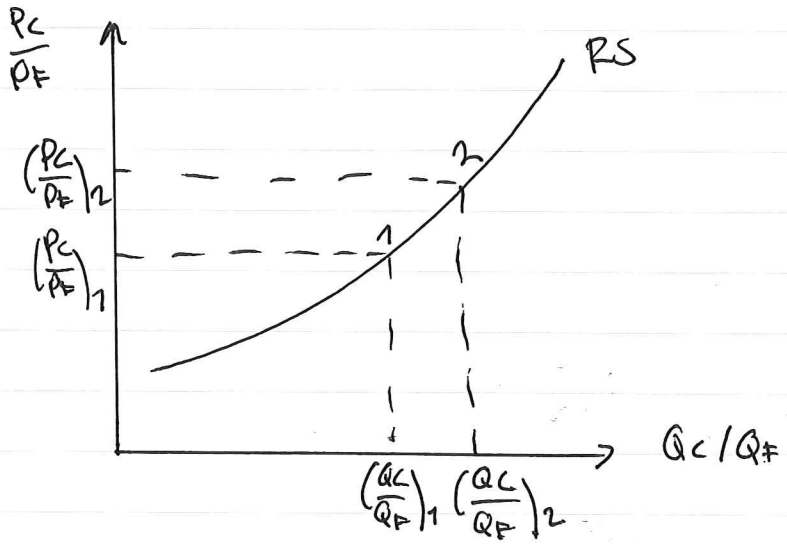


Pre-trade production will be $Q_F = Q_F^*$ and $Q_C = Q_C^*$. From before, we know that $\frac{P_C}{P_F} \uparrow \Rightarrow L_C \uparrow \Rightarrow Q_C \uparrow$. This is also the case when we look at relative production and prices. This is the basis of the relative supply curve. To show this, we assume that the price of cloth increases relative to the price of food. ($\frac{P_C}{P_F} \uparrow$). This increases the slope of the

budget line and thus makes it steeper.



The increase in $\left(\frac{P_C}{P_F}\right)$ causes Q_C to increase, and Q_F to decrease. Q_C ↑ from Q_C^1 to Q_C^2, Q_F ↓ from Q_F^1 to Q_F^2. This implies that an increase in the relative price of cloth increases the relative supply of cloth, as Q_C increases relative to Q_F, $\left(\frac{Q_C}{Q_F}\right)$ ↑.



Point 1 and 2 on the PP-curve corresponds to point 1 and 2 on the relative supply curve. The relative supply and demand is used to show the effect of international trade. This is because the goods that are imported and exported cannot be analyzed separately. General equilibrium analysis is often applied,

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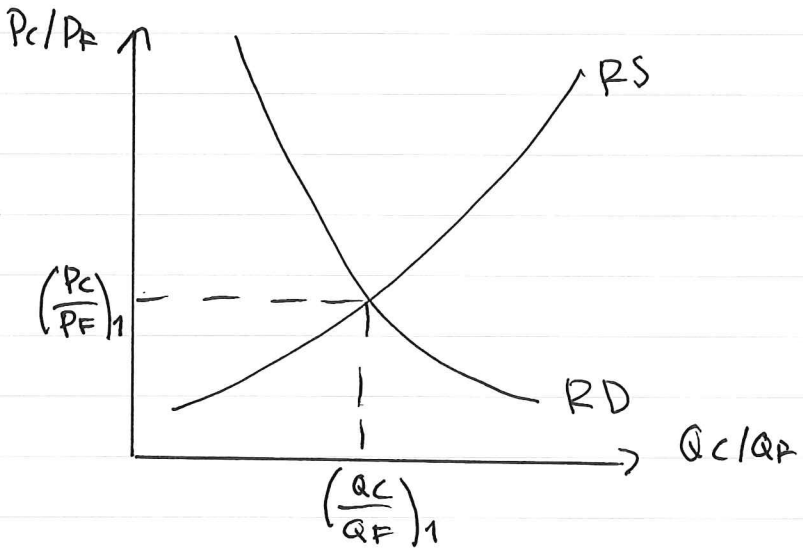
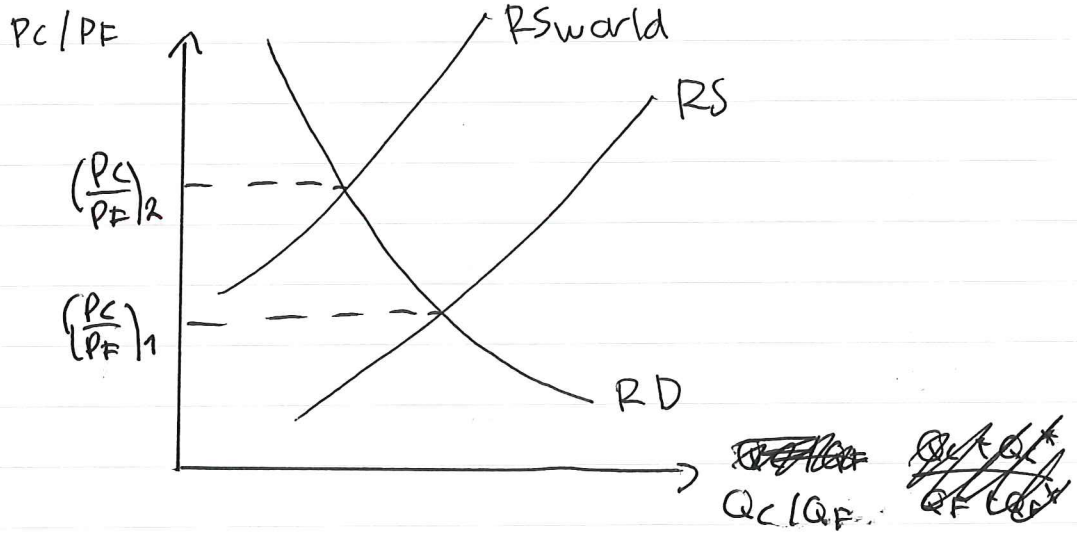
so the relationship between multiple markets can be analyzed. In this case the Market for cloth and food. In the specific factors model, it is assumed that the preferences in the two trading countries are the same. Thus, their relative demand curves will be the same. The relative demand curve is downward sloping, because at lower relative price of cloth, the consumers will demand a relatively higher quantity of cloth, and vice versa. Putting the relative supply and demand curves together, we get the relative price and quantity of cloth ~~relat~~ in terms of food pre-trade.



Before trade, $(\frac{Q_C}{Q_F})_1$ will be produced and demanded at a relative price of $(\frac{P_C}{P_F})_1$.

Next, we analyze how international trade will affect this economy.

The model assumes that there is a difference between the relative price domestically, and the world relative price. It does not state what the difference is caused by. It could be difference in technology as in the Ricardian Model, or a difference in resource endowments, as in the Heckscher-Ohlin Model (factor-proportions). The relative price of cloth is higher on the world market than at home. We assume that the home country has a comparative advantage in the production of cloth. This mean that the opportunity cost of cloth in terms of food is lower in this country than for the trading partner, for example. This can be because the country is better endowed with capital or that it is more productive in producing cloth (better technology). This implies that, with trade, the home country will export cloth and import food.



Trade has income distribution effects, welfare effects and an effect on the production mix in the economy of the home country. Particular emphasis will be made on income effect

In gereal, we have that opening for trade benefits the owners of the ~~sf~~ factor of production specific to the export industry. The owners of the factor of production specific to the import industry loses. The effect on workes ("owners" of labor), is ~~ambiguous~~ ambiguous. To show this, we again apply equations (4) and (5), the relationship between the wage rate and the value of the marginal products of labor. As discussed, in a competitive market economy, the workes are paid their marginal product of labor.

$(5')\ P_C MPL_C = W \Rightarrow MPL_C = \frac{W}{P_C}$

$(4')\ P_F MPL_F = W \Rightarrow MPL_F = \frac{W}{P_F}$

When $\left(\frac{P_C}{P_F}\right)\uparrow$, relatively more labor is employed in the cloth sector than in the food sector. This implies that MPL_C goes down. Because MPL_C is equal to the real wage, and thus the wage the real wage in relation to cloth also goes down. The wage can be used to buy less cloth than before. The opposite is the case for food. Relatively less labor is employed in the food sector than before. $MPL_F \downarrow$ and thus $W\downarrow$. Thus, the real wage in relation to food goes up. The wage can be used to buy more food than before.

$\frac{W}{P_C}\downarrow \quad \frac{W}{P_F}\uparrow \Rightarrow$ unclear ~~whether~~ if the workes lose or gain from trade

The effect on workes depends on the ~~size~~ size of the increase in relative prices, and also the proportion of income an individual worker spends on cloth and food.

The capital owners gain, because the increase in the relative price of cloth increases their income. Also, as more labor is employed in the sector, the labor becomes less expensive as the wage rate goes down. The model does not say how ~~anything~~ anything about the relationship between the use of the different factors of production. But it is still possible to conclude that their costs of production decreases because the cost of labor goes down regardless of how much labor is used relative to capital in the production of cloth.

The landowners lose, because they face a lower relative price for food. ($\frac{P_C}{P_F} \downarrow$ implies $\frac{P_F}{P_C} \downarrow$). The ~~cost~~ cost of labor increases, and thus their production costs.

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Welfare effect of trade

Trade ~~increases~~ expands the consumption possibilities for the country's consumers.

With trade, the country does not have to consume what it produces. The restriction is that the value of production has to equal the value of consumption.

$$P_C D_C + P_F D_F = P_C Q_C + P_F Q_F$$

$$P_F D_F - P_F Q_F = P_C Q_C - P_C D_C$$

$$P_F (D_F - Q_F) = P_C (Q_C - D_C)$$

$$(D_F - Q_F) = \frac{P_C}{P_F} (Q_C - D_C)$$

where

$(D_F - Q_F)$ – imports of food. Consumption of food is higher than production of food

$(Q_C - D_C)$ – exports of cloth. Production of cloth is higher than consumption of cloth

$\frac{P_C}{P_F}$ – the relationship between price of exports (P_C) and price of imports (P_F). The terms of trade.

This can be illustrated graphically as a budget line. ~~The export~~ The country's imports have to equal the relative price of the country's exports. The more the country exports, the more it can import.

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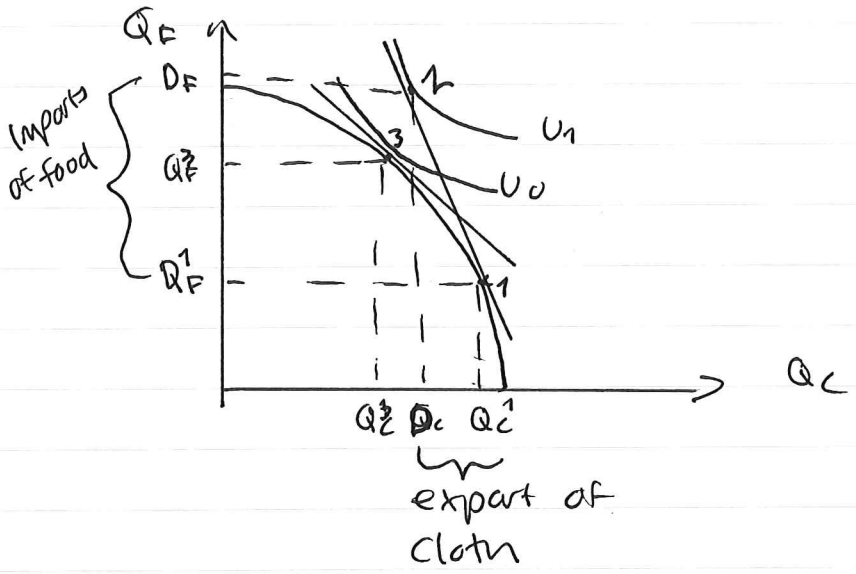
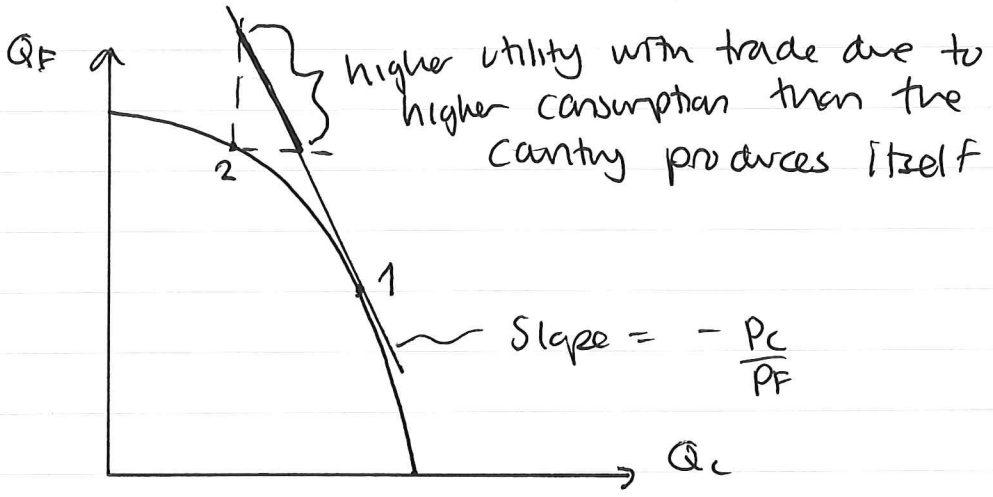


Here, the framework of the specific model is applied to the standard model of trade. In this way, the welfare effect of trade can be analyzed in a simple way. Point 3 is the production and the consumption before trade. The consumption has to lie on the production possibility curve. Production is where the highest possible isovalue line is tangent to the PP-curve. Consumption is at the point where the highest possible indifference curve is tangent to the isovalue line. With trade, consumption and production are not in the same point. Production is at point 1, and consumption is at point 2. The utility of the consumers is higher, as consumption is at a higher indifference curve than before ($U_1 > U_0$). The difference between consumption and production gives the exports of cloth and imports of food. Production is more specialized, and more is produced of cloth relative to food.

More generally, the part of the budget line between the dotted lines represent possible consumption levels that will increase utility with trade. Only if consumption and production is at point 1 will trade not have an effect on consumption.



Her, the pre-trade allocation of production between food and cloth is assumed to be at point 2.

International trade is also an indirect form of production. Instead of producing both goods in equal amount, the country specializes in the good which it produces most effectively. ~~The~~ A unit of this good is sold and traded for the ~~same~~ amount of the other good the value of the exported good gives.
For example: ~~A unit of~~ 1 unit sold of cloth $\left(\frac{P_C}{P_F} * Q_C\right)$ used to buy food.

This "indirect" production is more effective than direct production because the resources are utilized in a more effective way.

In conclusion, international trade effects this economy in several ways. Welfare increases by the expansion of consumption possibilities. The country's resources are utilized more ~~effectively~~ efficiently. The relative price of the exported good, here assumed to be cloth, increases, which implies an improvement in the country's terms of trade. This increases the country's relative competitiveness, because the value of its exports has increased. Thus, one unit of exports can buy more imports. The production of the country shifts toward the good it produces most efficiently, again assumed to be cloth. The most important implication of this model, the specific factors model, is the effect of international trade on income distribution. The owners of the factor specific to the export industry get an increased income, the owners of the factor specific to the import industry get a reduced income. In the example used in this task, the capital owners gain and the landowners lose, as the country exports cloth and imports food. The effect of the real income of workers is ambiguous, as it increases in relation to food and decreases in relation to cloth. The income distribution effects is in this case ~~model~~ short-term, as some factors are assumed to be immobile between sectors. For a long-term income distribution effects, the Heckscher-Ohlin model is applied.