International Economics

-Analyzing and explaining the economic interactions among sovereign nations

Topic 0 –Introduction

Gravity model of trade:

Autarky: The situation where there is no trade between countries.

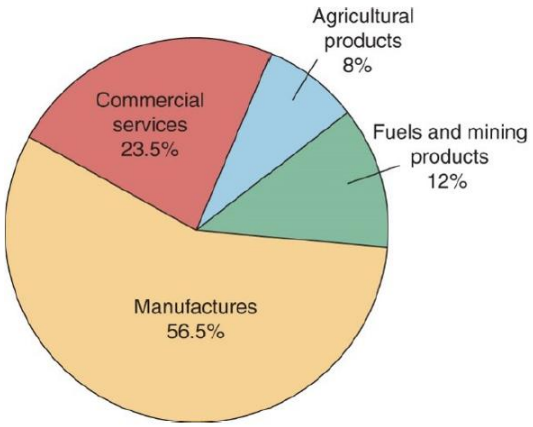
GDP: gross domestic product. Measure of economic size/mass.

Gravity model of trade: Model used to explain to some extend how much trade occurs between countries.
Suppose we have two economies, i and j, with the GDP of respectively Y_i and Y_j. The amount of trade between these, $T_{ij,}$ can be described using the gravity model of trade:
$T_{ij} = A \cdot Y_i \cdot Y_j / D_{ij}$

Where D_{ij} is the distance between the two economies and A is a constant.
From this we see that trade increases the larger the economies are (in terms of GDP) and decreases the further the distance is (due to transportation and communication costs).

Note: to fit real world data more closely, some economists use a variation of the gravity model of trade, $T_{ij} = A \cdot Y_i^a \cdot Y_j^b / D_{ij}^c$. However, even without the modification, the gravity model of trade does give a pretty good approximation of the amount of trade between countries.

Trade trends:
-The distance in terms of transportation and communication costs has decreased over the years, leading to growing international trade.
-Trade policies still have a huge impact on how much and between whom goods and services are traded.
-It is largely manufactured goods that are traded today.



The composition of world trade, 2015

Topic 1 – Ricardian model

Ricardian model:

Note for you who are reading through this chronologically:
All the models we are going to go through in these notes seek to explain why and how trade occur. Take it nice and slow, and I'm sure you'll be a Master of international economics in no time. It's really not that complicated. Keep your head cool and we'll make it together!

Unit labor requirement: the number of hours of labor it takes to produce one unit of a good. Different products require more labor per unit than others. E.g. it might require 1 hour of labor to produce a unit of cheese while requiring 2 hours of labor to produce a unit of wine. We denote the unit labor requirement for cheese and wine respectively a_{LC} and a_{LW}.

Production possibility frontier (PPF): graph depicting all the production possibilities within an economy given a limited amount of resources.
Consider the situation where an economy is producing only cheese and wine and the only input in the production of these is labor, which the economy has a supply, L, of. If it produces a quantity of cheese, Q_c, this will require $a_{LC}Q_c$ labor, because a_{LC} was the amount of labor required to produce one unit of cheese. Because the economy has a limited supply of labor, L, the follow equation must be the production possibility frontier for this economy:

$$a_{LC}Q_c + a_{LW}Q_c \leq L$$

Opportunity cost: When allocating resources more of one product can be produced at the cost of producing less of another product. This is called opportunity cost.
Producing a unit of cheese requires a_{LC} labor hours, each of which could have been used to produce $1/a_{LW}$ units of wine. Therefore, the opportunity cost of producing cheese in terms of wine is a_{LC}/a_{LW}. This is also the slope of the PPF ($-a_{LC}/a_{LW}$ because it is a cost, i.e. it is decreasing)

Wages and the autarky equilibrium: Considering Pc to be the price of one unit of cheese, the hourly wage of producing cheese, w_c, is P_C/a_{LC}.
In autarky perfect competition and free labor mobility, wages have to be equal among products for all of them to be produced, i.e. for both wine and cheese to be produced the following has to be true:
$P_C/a_{LC} = P_W/a_{LW}$, or rewritten $P_C/P_W = a_{LC}/a_{LW}$.
The relative price of cheese has to be equal to the opportunity cost of cheese in terms of wine for both products to be produced in autarky. This is the autarky equilibrium.

Ricardian model: Approach to explaining international trade through differences in the productivity of labor among sovereign nations.
Different countries might not have the same unit labor requirement due to differences in climate, technology, education, etc. This leads to countries trading goods, through which everyone benefits and are able to increase their overall PPF.

*Note: when analyzing two countries, home and foreign, * will be used in the notation of foreign. E.g. foreign's cheese unit labor requirement will be denoted* a^*_{LC}.

Comparative advantage: When one economy faces a lower opportunity cost than another economy, i.e. home has comparative advantage in production of cheese when $a_{LC}/a_{LW} < a^*_{LC}/a^*_{LW}$. When this is the case, it must be true that foreign has comparative advantage in production of wine.

Absolute advantage: When one economy can produce a product using fewer resources than another economy, i.e. home has absolute advantage over foreign in production of cheese when $a_{LC} < a^*_{LC}$.

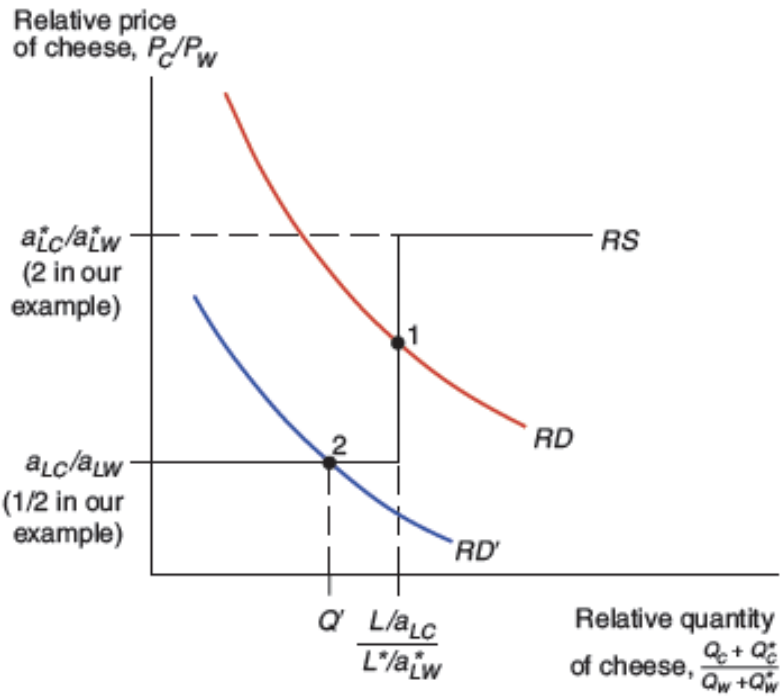
Relative supply and demand: when examining trade between two economies, it is relevant to consider more than just the supply and demand of one good. To keep track of both cheese and wine, we look at the relative supply (RS) and the relative demand (RD), i.e. we label the graph axis relative quantity of cheese, $(Q_C + Q^*_C)/(Q_W + Q^*_W)$, and relative price of cheese, P_c/P_W.

To draw the relative supply curve, let us first assume that home has comparative advantage in production of cheese, $a_{LC}/a_{LW} < a^*_{LC}/a^*_{LW}$.
-When the relative price of cheese in terms of wine is lower than the opportunity cost at home, $P_C/P_W < a_{LC}/a_{LW}$, only wine will be supplied at home and at foreign (because foreign's opportunity cost is even higher than that of home).
-When the price of cheese in terms of wine is equal to the opportunity cost at home, $P_C/P_W = a_{LC}/a_{LW}$, both cheese and wine will be supplied at home, and foreign will still only supply wine.
-When the price of cheese in terms of wine is higher than the opportunity cost at home, $P_C/P_W > a_{LC}/a_{LW}$, only cheese will be supplied at home, and foreign will still only supply wine
-When the price of cheese in terms of wine is equal to the opportunity cost at foreign, $P_C/P_W = a^*_{LC}/a^*_{LW}$, only cheese will be supplied at home, and foreign will supply both wine and cheese
-When the price of cheese in terms of wine is higher than the opportunity cost at foreign, $P_C/P_W > a^*_{LC}/a^*_{LW}$, only cheese will be supplied at home and at foreign, i.e. the relative cheese supply goes to infinity because there are no wine production.

From these arguments we get the strangely looking relative supply curve seen on the next page.

The vertical part of the RS curve is at $(L/a_{LC})/(L^*/a^*_{LW})$, because when the relative price of cheese is between the opportunity cost of home and foreign, home is only producing cheese and foreign is only producing wine, i.e.
All labor at home can produce a total of L/a_{LC} cheese.
All labor at foreign can produce a total of L^*/a^*_{LW} wine.

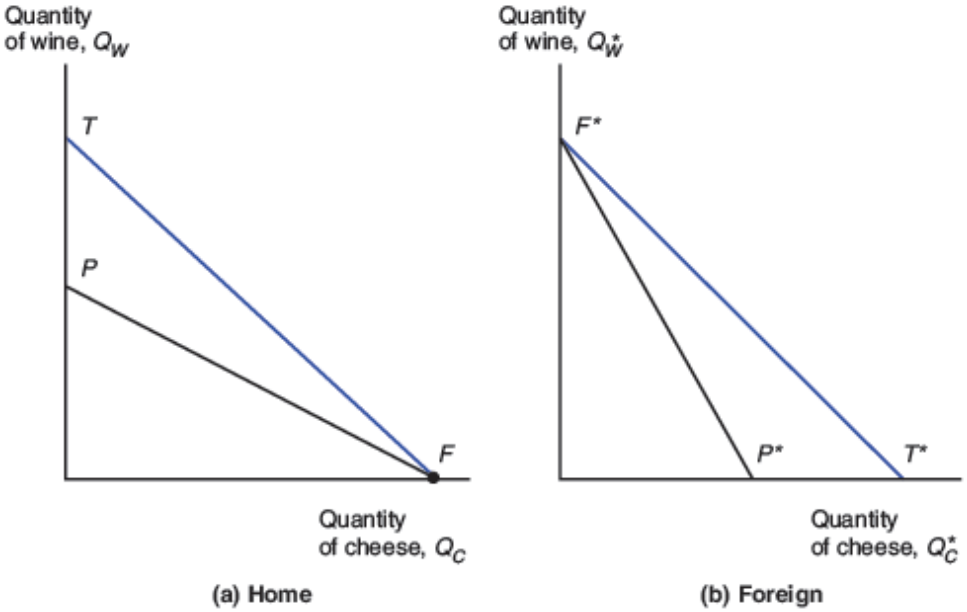
The relative demand curve is downward sloping because as the relative price of cheese rises, people will tend to buy relatively more wine.



Direct producing method: Producing the good directly, e.g. 1 hour of labor will yield $1/a_{LW}$ units of wine.

Indirect producing method: Producing another good and trading it for the good you want, e.g. 1 hour of labor will yield $1/a_{LC}$ units of cheese which you can sell for $P_C \cdot 1/a_{LC}$ and purchase $(P_C \cdot 1/a_{LC}) / P_w$ units of wine. This will make you better off if $(P_C/a_{LC}) / P_w > 1/a_{LW}$.

Gains from trade: When economies focus their production on the good they have a comparative advantage in producing and use the indirect producing method to acquire the other good, their overall PPF will improve. This is illustrated below. The blue line is the PPF with international trade.



Comparative advantage with many goods: In reality countries trade more than just two goods. Let's assume they trade a number, N, of goods.
Assign a number from 1 to N to each good.
Finally, arrange the unit labor requirement ratios for each good, so that we get a line from the good that home is relatively most efficient at producing to the good that home is relatively least efficient at producing:
$a^*_{L1}/a_{L1} > a^*_{L2}/a_{L2} > a^*_{L2}/a_{L2} > \dots > a^*_{LN}/a_{LN}$

Producing a good, i, at home will cost $w \cdot a_{Li}$, while this same good will cost $w^* \cdot a^*_{Li}$ to produce in foreign.
It is cheaper to produce at foreign if $w \cdot a_{Li} > w^* \cdot a^*_{Li}$, or rearranged $a^*_{Li}/a_{Li} < w/w^*$.
So any good in the line above where $a^*_{Li}/a_{Li} < w/w^*$ will be produced at foreign, while any good where $a^*_{Li}/a_{Li} > w/w^*$ will be produced at home, i.e. goods where foreign's relative unit labor requirement is lower than home's relative wage, will be produced in foreign.

Derived demand: The part of demand for a good originating from foreigners wanting to import the good.

Nontraded goods: Taking transportation costs into account, some goods might more expensive to import than for home to produce itself, even though foreign is more efficient at producing them. In this case, home will produce these goods itself instead of trading them.

Topic 2 – Specific factors model

Specific factors model:

Note for you who are reading through this chronologically:
That's one model down. Wasn't too difficult was it? We'll take a look at two more models within comparative advantage before moving on. You made it through the first one, so I'm sure you can do these easily too. Let's go!

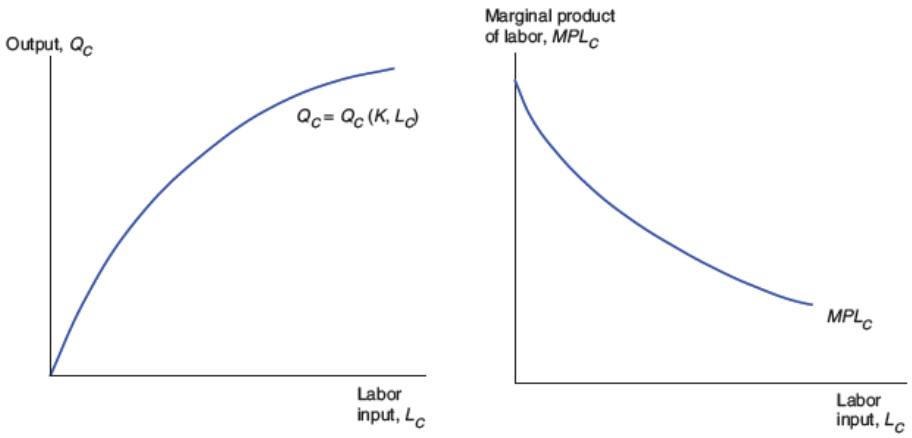
Mobile factor: A factor in production that can move freely between sectors. In this model labor (L) will be a mobile factor.

Specific factor: A factor in production that cannot move freely between sectors, i.e. the factor can only be used in the production of one good. In this model capital (K) and land (T) will be specific factors.

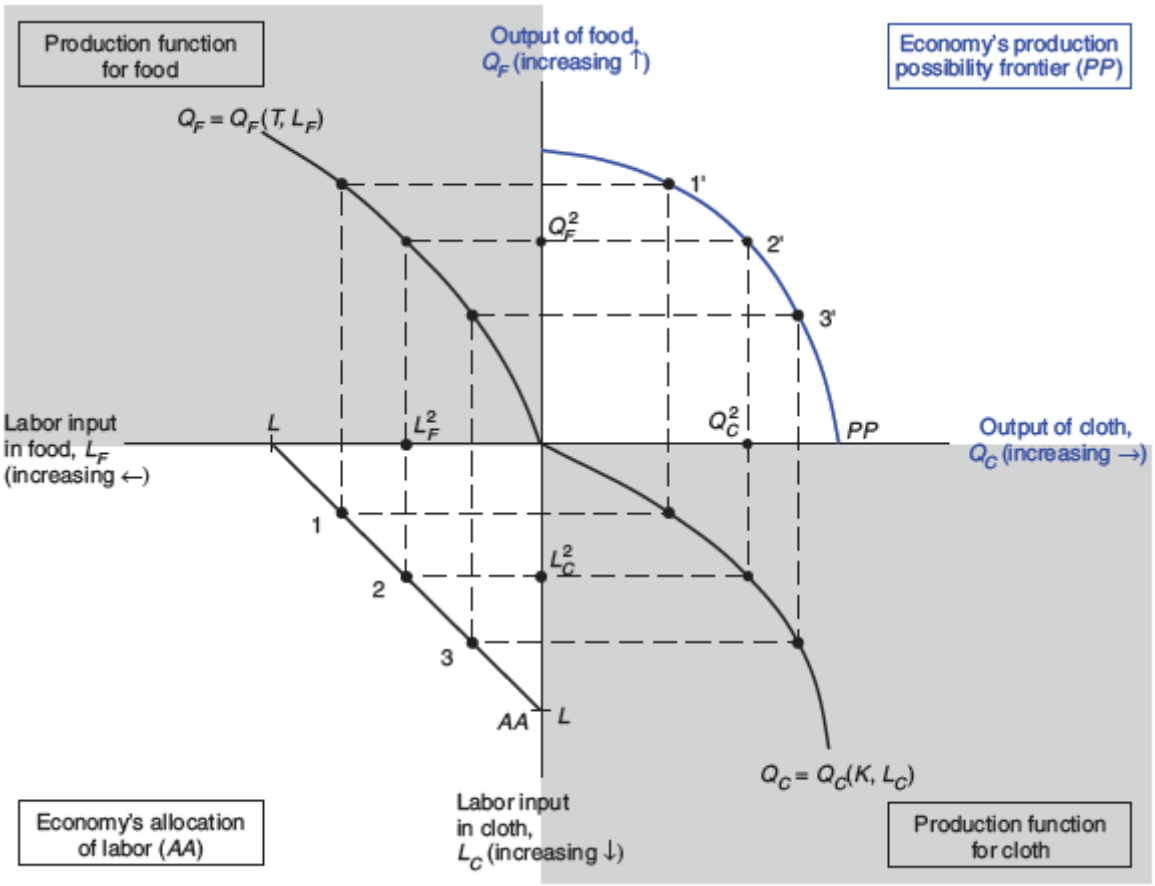
Specific factors model: The Ricardian model explained that there are gains from trade. However, some people still oppose trade. This is because even though the overall welfare increases, income distribution is not necessarily affected equally. Some might not benefit from trade, and that is what this model seeks to explain by looking at other factors than labor - factors that might not be mobile across sectors.

Production function: Function that describes the relation between inputs and output.
Let's assume that two products are produced, cloth and food. Capital is specific to cloth and land is specific to food. They both require labor. The production functions to describe the amount of cloth, Q_c, and food, Q_F, is thus as follows:
$Q_c = Q_c(K, L_C)$
$Q_F = Q_F(T, L_F)$

L_c is the amount of labor employed in the production of cloth and L_F is the amount employed in food. Thus with full employment $L_c + L_F = L$.
There are *diminishing returns to labor,* due to the fact that every additional worker will be able to produce relatively less given a fixed amount of land and capital, i.e. the *marginal product of labor,* MPL, is decreasing. Looking at the production of cloth graphically we have that:



Production possibility frontier: The PPF of the specific factors model is the upper right quardrant in the diagram below (the things market in blue). The other 3 quadrants show how the PPF relate to the amount of labor employed in each sector. E.g. if L_C increases by one, then Q_C increases by MPL_C, while L_F decreases by one, causing Q_F to decrease by MPL_F.



Producing an extra unit of cloth requires $1/MPL_C$ labor hours, each of which could have been used to produce MPL_F units of food. Therefore, the opportunity cost of cloth in terms of food is MPL_F/MPL_C. This is also the slope of the specific factors model's PPF ($-MPL_F/MPL_C$ because it is a cost, i.e. it is decreasing). *Note: normally when we say "in terms of" we divide by what it should be in terms of. However, when dealing with marginal products as here, it is opposite.*

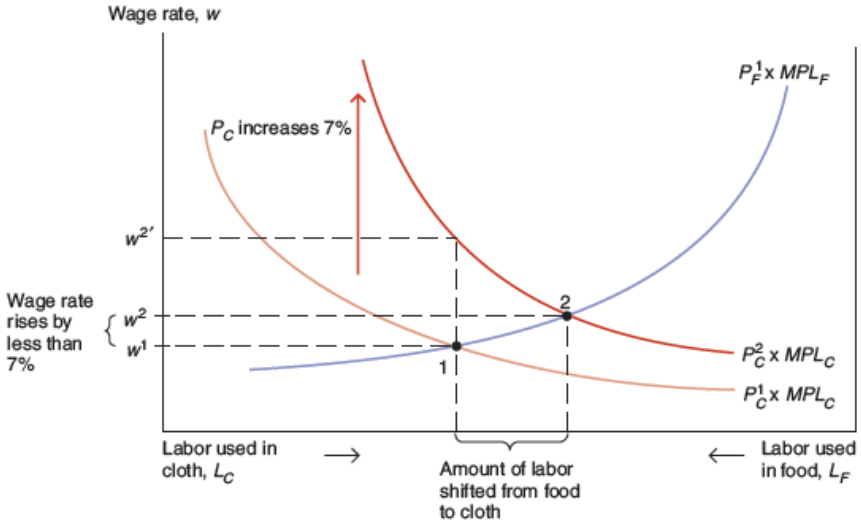
Wages and the autarky equilibrium: Employers will demand labor up until the point where the value produced by an additional person-hour is equal to the cost of that person-hour, i.e. where MPL * P = w

In autarky perfect competition and free labor mobility, wages has to be equal among products for all of them to be produced, i.e. for both cloth and food to be produced the following has to be true:

$MPL_C * P_C = MPL_F * P_F$, or rewritten $P_C / P_F = MPL_F / MPL_C$

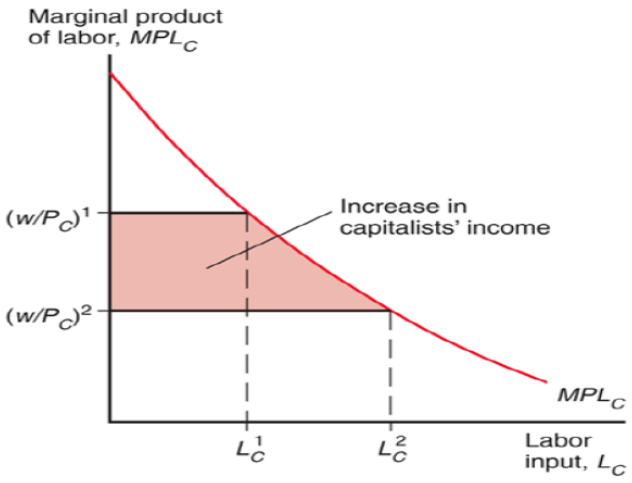
The relative price of cloth has to be equal to the opportunity cost of cloth in terms of food for both products to be produced in autarky. This is the autarky equilibrium.

If the relative price changes, labor will adjust/shift until the equilibrium condition is met again. Let's assume that the price of cloth rises by 7%. Then labor will shift away from food production and relatively more labor will be used in the production of cloth. The increase in wages will, however, be less than 7% because of diminishing returns to labor as illustrated in the graph below.

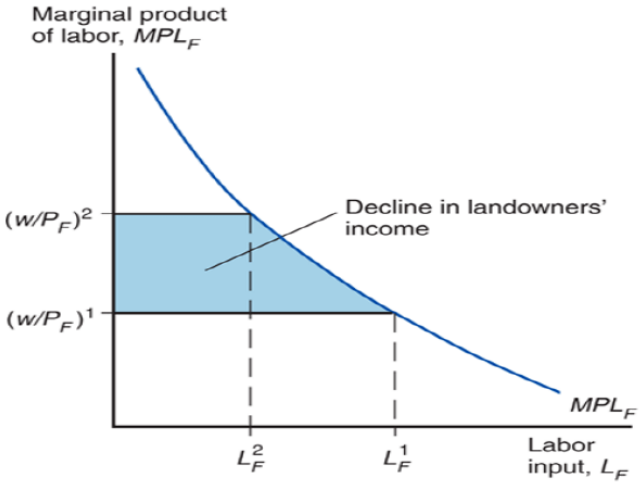


Because a higher relative price of cloth leads to an increase in relative cloth output, we can graph this as a RS curve.
The RD curve will be downward sloping because as the relative price of cloth rises, people will tend to buy relatively more food.
Point 1 in the graph is the autarky equilibrium.

Income distribution: Three main groups can be identified in the specific factors model; workers, owners of capital and owners of land. Let's look at the implications of the price rise in the above example for these:
-Workers: the price of cloth rose more than the wage rate. That means that workers' real wage in terms of cloth decreased. However, their real income in terms of food increased. We cannot say whether they are better off from this. The effect is ambiguous.
-Owners of capital: the price of cloth (their income) rose more than wage rate (their costs), so they are definitely better off.
-Owners of land: because the wage rate of workers (their costs) rose, owners of land are worse off. In addition, the price of cloth also rose, so they can buy less cloth with any given amount of income.
The implications for land and capital owners is shown graphically on the next page.



Changes in capitalists' income

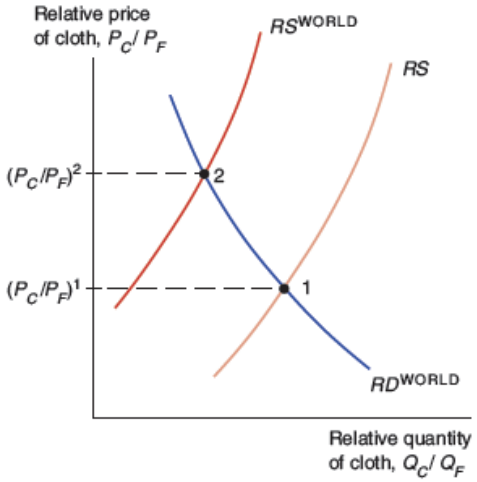


Changes in landowners' income

Specific factors model and trade: Due to differences in labor productivity, countries have different relative prices. When home opens up to trade it will face a RS and RD determined by the world. Assuming that consumption is similar across countries, RD will not change. However, RS will shift due to differences in technology and abundance of specific factors.
Let's assume a situation where $MPL_C > MPL^*_C$ for any amount of labor employed.
From this we know that at the autarky equilibrium in each country ($P_C / P_F = MPL_F / MPL_C$) the following must also be true:

$$P_C / P_F = MPL_F / MPL_C \quad < \quad MPL^*_F / MPL^*_C = P^*_C / P^*_F$$

Therefore, in this situation the world relative price of cloth is higher than that of home, which means that when home opens up to trade, owners of capital will be better off, owners of land will be worse off and the effect on workers will be ambiguous. This example is shown in the graph to the right.
These effects would have been vice versa if instead $MPL_C < MPL^*_C$ for any amount of labor employed.



Budget constraint: An equation specifying the maximum amount purchasable/ consumable for an economy.
To see if there are overall gains from trade in the specific factors model, we need to look at whether or not the maximum amount of consumables increases of decreases with trade.
Without trade the amount of a good produced must be equal to the amount consumed/demanded, D. Therefore, we have that $D_C = Q_c$ and $D_F = Q_F$.
With trade a country can sell some of one good and instead purchase another, increasing the consumption of this good above the maximum normally producible. However, the value of

consumption can still not exceed the value of production, because the country has to pay for whatever it purchases. The following must therefore be the budget constraint with trade:

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

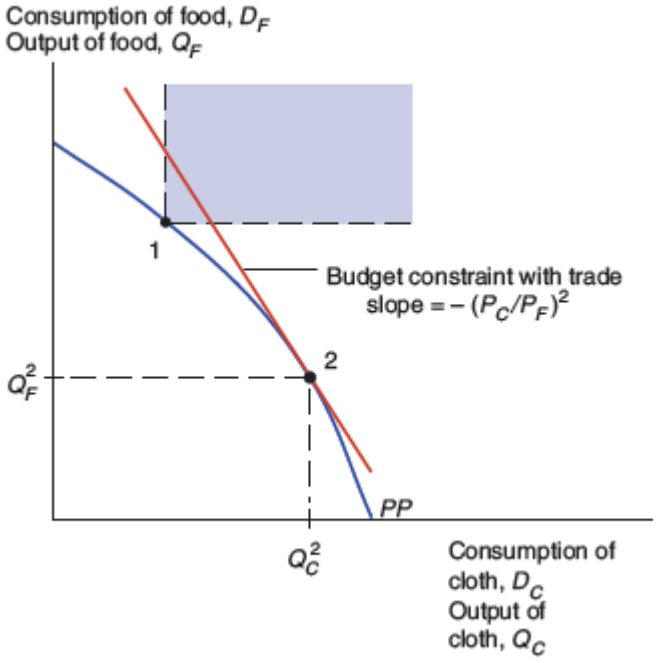
which can be rewritten

$D_F - Q_F = (P_C / P_F) \cdot (Q_C - D_C)$

from this we see that that the economy's food imports has to be equal to the relative price of cloth times the economy's exports of cloth.

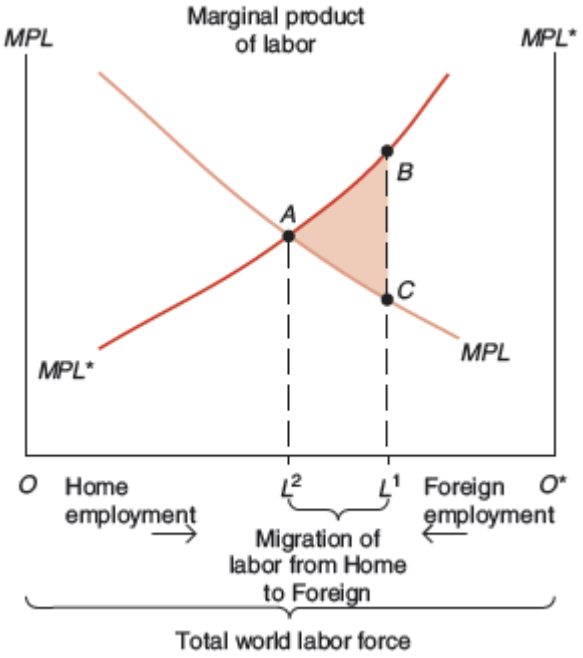
This budget constraint has the slope P_C / P_F. In the graph to the right we combine it with the PPF. From this we see that unless the economy is currently consuming in exactly point 2, it will be able to consume more when opening up to trade than it could in autarky. Say the economy was producing at point 1 in autarky. Any point in the shaded area will allow it to consume more of both goods.

Thus, we can conclude that there are aggregate gains from trade. Because more of each good can be consumed with trade each individual can in principle consume more.



International labor mobility: Up until now we have only considered labor mobility within a country between sectors. But in reality, labor can often move across borders as well.

For simplicity, let us assume that there is only one good, thus there will be no trade. However, labor will still move across borders towards where the wages are higher. The graph on the right illustrates this. Starting at L_1, MPL* is higher than MPL. This higher productivity in foreign also means that wages in foreign are higher. Thus, workers will migrate to foreign, MPL* will decrease, leading to decrease in wages in foreign. Meanwhile MPL will increase, increasing wages at home. This continues until the wages in home and foreign at equal at L_2.



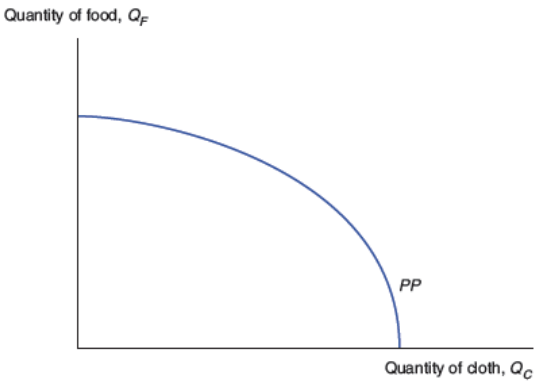
Topic 3 – Heckscher-Ohlin model

Heckscher-Ohlin model:

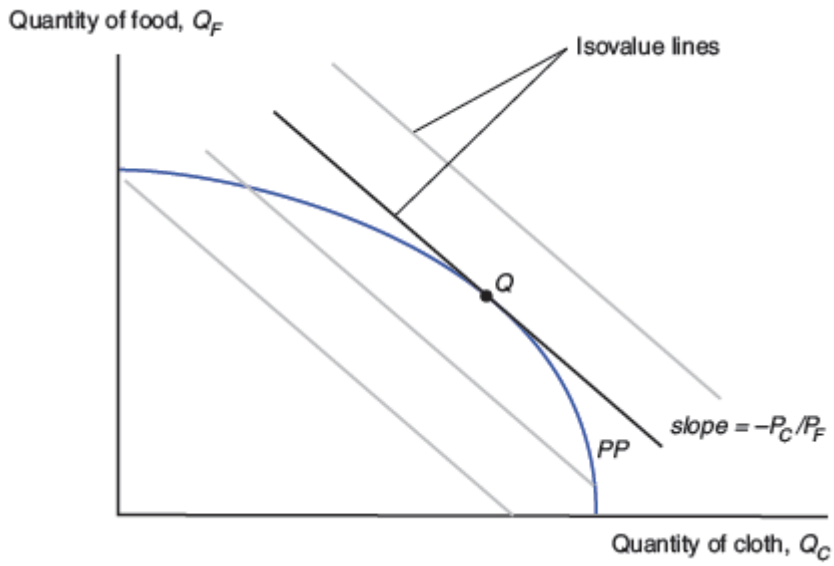
Note for you who are reading through this chronologically:
Okay, I admit it. That specific factors model was a bit more complicated. But you made it! You should be proud. We now move to the next and final model within using comparative advantage as an explanation for international trade. If you are still keeping up (which you of course are), you will for sure be able to understand this one as well. Have fun, and good luck!

Comparative advantage in the HO-model: In both the Ricardian and the specific factors model, comparative advantage was due to differences in labor requirement (technology). In the HO-model we will look at the long-run. Here there are no differences in technology and capital is no longer a specific factor, but instead a mobile factor. Comparative advantage will come from differences in factor endowments (e.g. some countries might have more land available than others).

Production possibility frontier: to graph the PPF in the HO-model we will have to set up the situation first.
Let us assume this time that capital and labor are the only factors in production of cloth and food. We thus have the following production functions:
$Q_C = Q_C(K_C, L_C)$
$Q_F = Q_F(K_F, L_F)$
K_C and K_F is respectively the amount of capital used in production of cloth and food.
We will assume that different factor mixes can be used to produce both goods - *factor substitutability*. From these assumptions we get the following PPF:



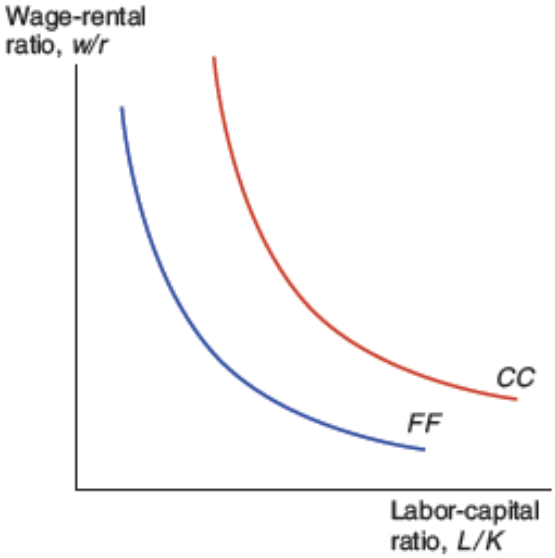
Isovalue line: a line along which the value of output is constant.
The value of the economy's production, V, is
$V = P_C \cdot Q_C + P_F \cdot Q_F$
The slope of this is $-P_C / P_F$. The economy will produce where the slope of the PPF is equal to the slope of the isovalue line to maximize profits. I.e. where the opportunity cost of producing cloth in terms of food is equal to the relative price of cloth. This is shown in the graph on the next page (they produce at point Q).



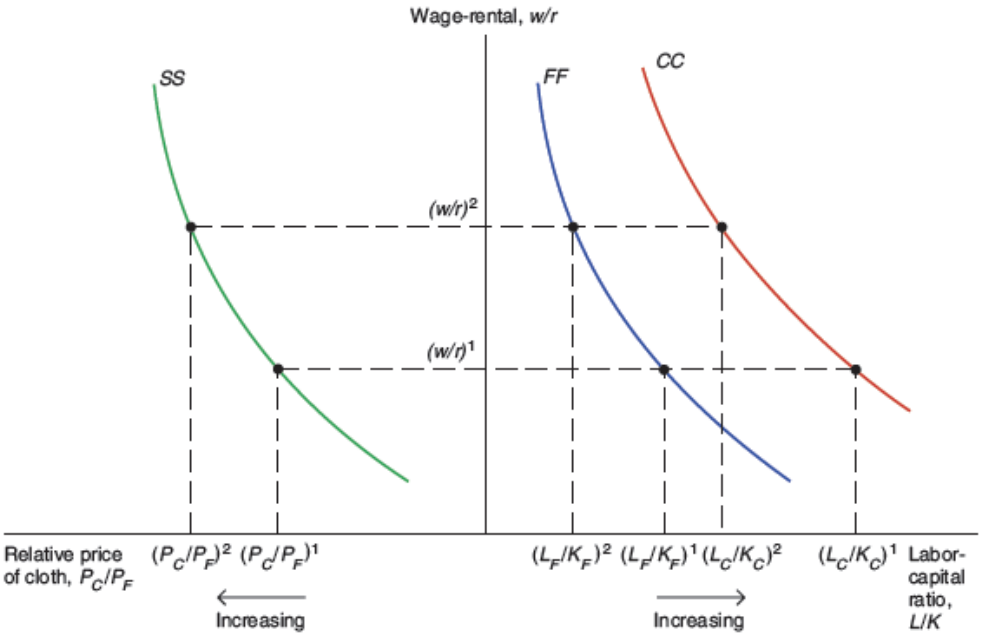
Optimizing output: To maximize profit producers of goods will choose a mix of capital and labor so that costs are minimized. Labor requires wages, w, to be paid, and capital requires rent, r, to be paid.
Producers of cloth will choose labor and capital so that the wage to capital ratio is equal to the marginal productivity of labor to marginal productivity of capital ratio, i.e.:
$w / r = MPL_C / MPK_C$
Likewise, producers of food will choose labor and capital so that
$w / r = MPL_F / MPK_F$

Factor intensity: From the optimization of output we see that there is a corresponding relationship between the wage-rent ratio and the labor-capital ratio.

In the situation where L_C/K_C is greater than L_F/K_F for any given w/r, we say that cloth production is labor intensive and thus also that food production is capital intensive. If we graph the relationship between L_C/K_C and w/r (call it CC), and between L_F/K_F and w/r (call it FF) in this situation, we get the graph to the right.



Factor prices: Following from the example on the previous page, if the wage-rent ratio increases, this does not only mean that less labor will be used in the production of each good, but also, because cloth in this example is labor intensive, the relative price of cloth will also increase. This relationship is shown in the graph below.



Rybczynski theorem: An increase in the supply of one factor (holding the prices of goods fixed) will increase the production of the good which uses that factor intensively.

Note: follow along closely here. This is where we explain why trade occurs in the HO-model.

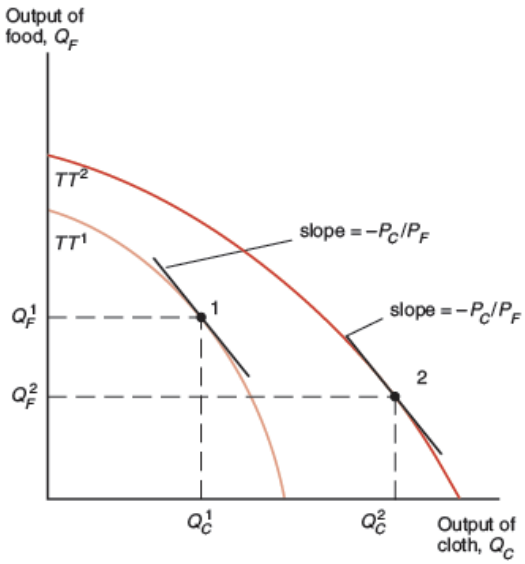
We still assume that cloth is labor intensive, and food is capital intensive. Now let us see what happens if we make home labor abundant.

With more labor the PPF will expand (graph to the right). However, because cloth is labor intensive, the expansion will be biased towards cloth. Producers will still produce so that the slope of the isovalue line ($-P_C/P_F$) is equal to the slope of the PPF as explained earlier. This will cause the output of cloth to increase, but the output of food to decrease.

To sum up, an economy that is abundant in one factor, will be relatively more efficient at producing the good that are intensive in this factor.

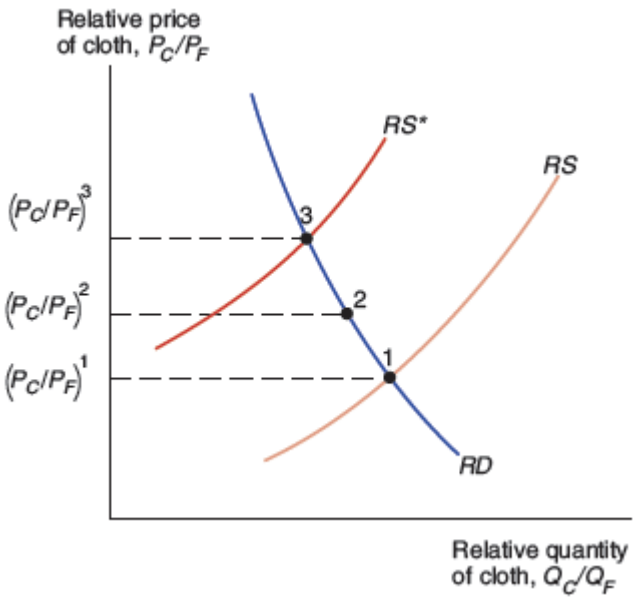
If home is abundant in labor, it has comparative advantage in cloth production.

(note that if home is labor abundant foreign must be capital abundant. Abundance is defined in terms of ratio, not quantity).



Heckscher-Ohlin theorem: The country that is abundant in a factor exports the good whose production is intensive in that factor.

For any relative price of cloth, home's relative supply of cloth will be greater than that of foreign (due to the comparative advantage of home in production of cloth). Thus, home's relative supply curve would be to the right to of foreign's. With trade, the world relative price will converge somewhere in-between. This is what the graph to the right shows. With a higher relative price of cloth home will produce a higher relative quantity of cloth while foreign will produce another good and instead purchase part of their consumption of cloth from home. I.e. home exports cloth.



Factor-price theorem: Trade causes factor returns to converge immediately. This was what we saw in the example above. The relative price converged. We say that *equalization of factor prices* was taking place.

Stolper-Samuelson theorem: In each country, the income of the abundant factor increases with trade, while that of the scarce resource decreases.

Home's workers are made better off with a rise in relative price of cloth, because this in turn also increases their wage.

Home's owners of capital are made worse off because they can buy effectively less cloth when the relative price rises.

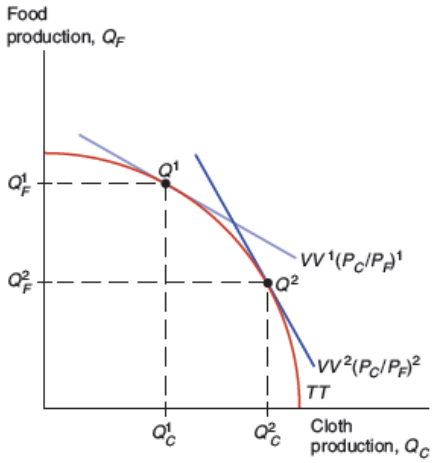
Topic 4 – Standard trade model

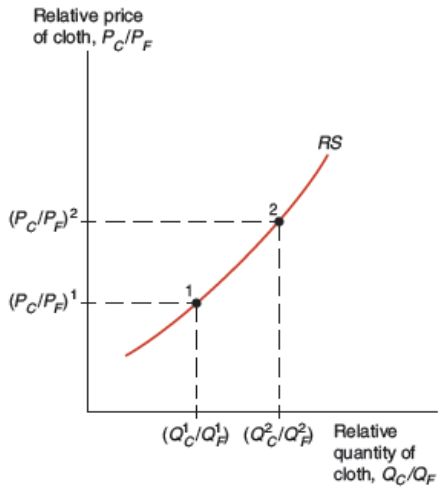
Standard trade model:

Note for you who are reading through this chronologically:
Can you feel it? You are well on your way to becoming a Master of International Economics! Let's sum up what we've learned so far:
-The Ricardian model taught us about the basics of comparative advantage by looking at just one factor of production.
-The specific factors model expanded this to several factors of production and included consequences of trade on income distribution in the short-run.
-The Heckscher-Ohlin model then allowed factors to move across sectors, suggested differences in factor endowment as a reason for comparative advantage and looked at the long-run consequences of trade on income distribution.
I know what you're thinking right now. "Isn't there some way we could combine all of these models?". You are right, yes there is! It's called the standard trade model and it will act as the climax of our comparative advantage adventure. No time for anymore chit-chat, let's do it!

Choice of production: As in the HO model the economy will produce where the slope of the PPF is equal to the slope of the isovalue line to maximize profits.

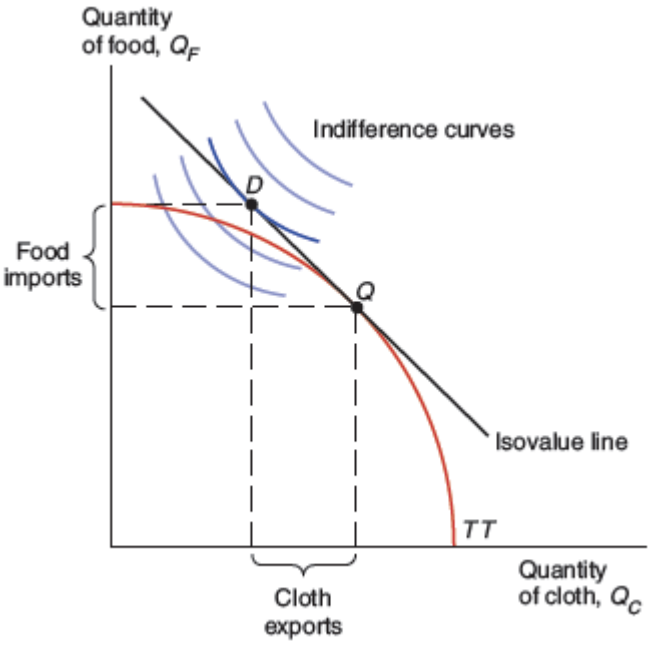
This slope, $-P_C/P_F$, can be related to the relative supply curve. As the relative price of cloth changes, so will the slope of the isovalue line and the relative quantity of cloth produced. I.e. an increase in the relative price of cloth will cause the isovalue line to become steeper.
Meanwhile production of cloth will also increase, which will cause the relative quantity of cloth supplied to increase.
This example is depicted in the graphs to the right.



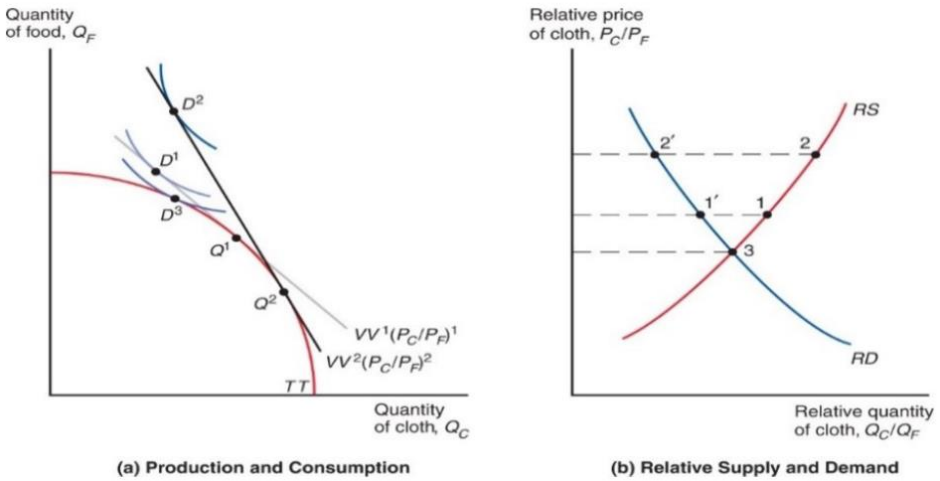


Choice of consumption: Now we know how much the economy will supply. However, due to trade, the economy can choose to consume another combination of goods than what it produces. The choice of what to consume depends on *indifference curves* (recall the concept from microeconomics).
Just a quick summary of indifference curves:
-They depict all the combinations of consumption of goods that yield the same utility level for the consumer.
-They are downward sloping.
-Indifference curves up and to the right yield a higher utility.
-Indifference curves have diminishing returns.

Economies will choose a level of consumption so that the isovalue line of their production is tangent to the highest reachable indifference curve. This is illustrated in the graph to the right.
Since this point (D) is not on their PPF, they will export cloth and use the money to import food instead. This way welfare is optimized in the economy.



Now suppose that the relative price of cloth increases. This means that the isovalue line will become steeper and the economy will be able to reach a higher indifference curve and thereby increase welfare. This effect can be broken into two parts. First, the economy can reach a higher indifference curve -> income effect. Second, the change in relative price leads to a shift along the indifference curve -> substitution effect. This whole process is shown in the graph below.
The economy moves from D^1 to D^2, slightly decreasing exports of cloth and increasing imports of food.
In the absence of trade, the economy would produce and consume at D^3.



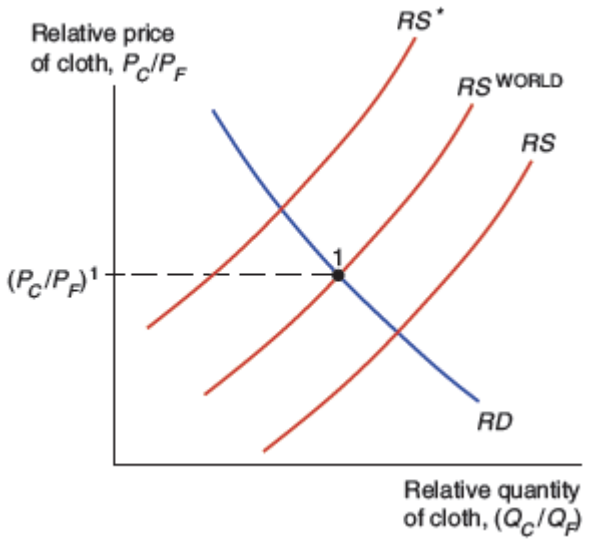
Terms of trade: The price of the good the country initially exports divided by the price of the good it initially imports. If the price of the good that the economy exports increases or the price of the good it imports decreases, so that its overall terms of trade increases, the economy's welfare will increase.

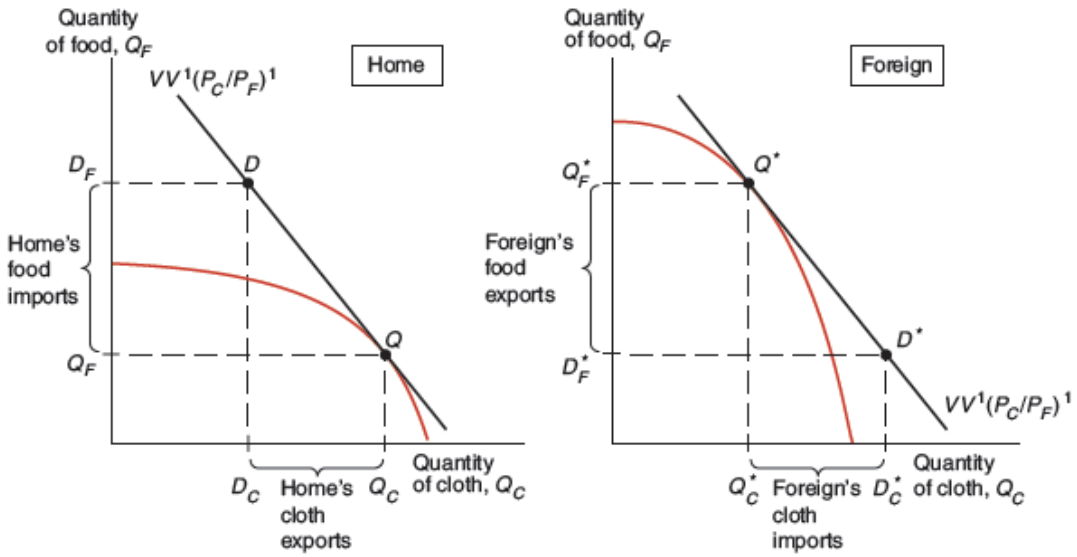
Trade equilibrium in the standard trade model: to determine the equilibrium, we will have to find the world's RD and RS and the intersection of these.

We assume that home and foreign have the same preferences in consumption, i.e. their RD curves are the same. We will also assume that home produces a higher relative quantity of cloth than foreign, i.e. $Q_C / Q_F > Q^*_C / Q^*_F$ at any given price, i.e. home's RS curve will be further to the right. To find the world relative supply we divided the total amount of cloth produced with the total amount of food,

$RS_{world} = (Q_C + Q^*_C) / (Q_F + Q^*_F)$

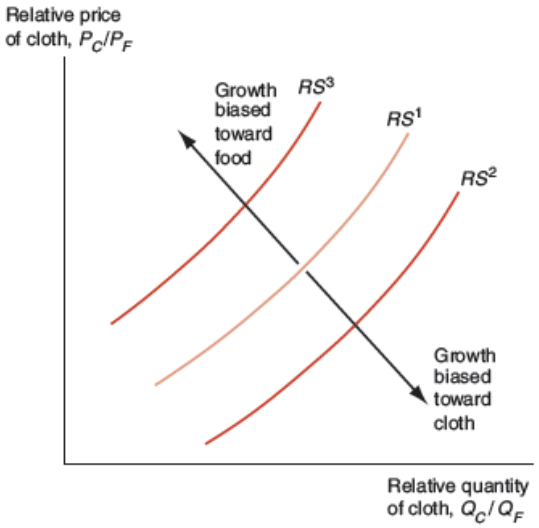
This is what is depicted on the graph to the right, where equilibrium is at point 1. At this point home will want to export cloth and import food and foreign vice versa. This is what is shown in the graphs below.





Biased growth: So far, we have seen that growth can come from two sources. The Ricardian model taught us that the PPF can expand in the direction of a sector if that sector experiences technological progress, lowering the resource requirement per unit in production. The HO model taught us that an increase in a factor will lead to biased growth towards the good which Is production intensive in this factor.

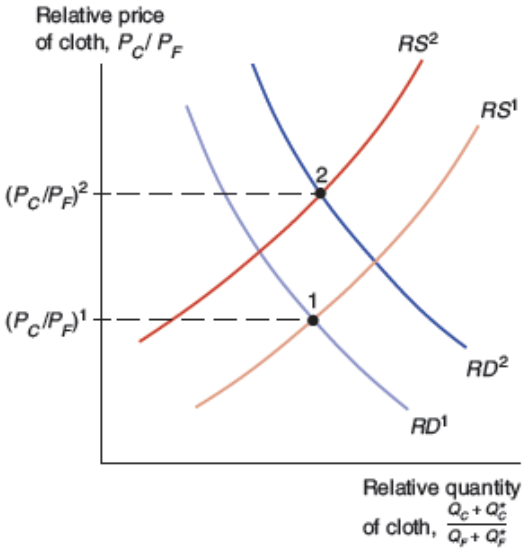
We can relate the biased growth to the RS curve. If the growth is biased towards cloth and relative prices do not change, the relative supply of cloth will increase, i.e. the RS curve shifts rights. And vice versa if growth is biased towards food. This is illustrated in the graph to the right.



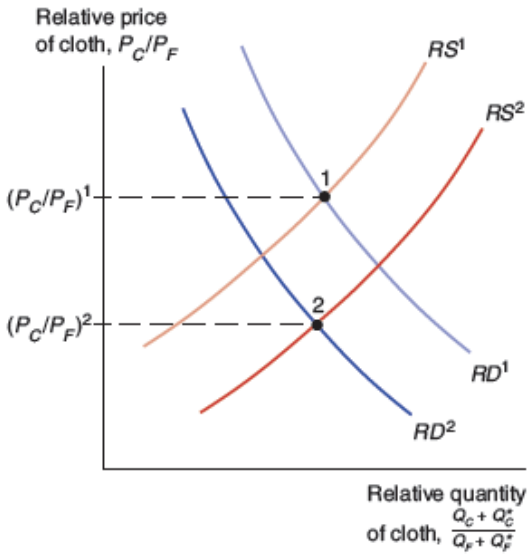
Because a rightward shift of the relative supply curve will lower the relative price of cloth, exporters of cloth are actually made worse off when growth is biased towards cloth. Their terms of trade are worsening.

If home is exporting cloth and importing food, export biased growth (cloth) will make home's terms of trade worse and import biased growth (food) will make it better. Note that the growth can happen in any country. It is the effect on the world relative supply that worsens/betters home's terms of trade.

Tariff: A tariff can be compared to a tax on imports. It makes the good more expensive at home than abroad. E.g. a food tariff will make home's domestic relative price of food higher, compared to the world, while consequently making its domestic relative price of cloth lower. This will incentivize production of food at home, while discouraging consumption of food. Because of this the welfare effect is ambiguous. However, home's terms of trade will have improved at the expense of the rest of the world. The effect is shown in the graph to the right.



Export subsidy: An export subsidy is a payment made to domestic producers for selling abroad. It makes the good more expensive at home than abroad. E.g. a cloth subsidy will make home's domestic relative price of cloth higher, compared to the world, while consequently making its domestic relative price of food lower. This will incentivize production of cloth for export, while discouraging consumption of cloth. Because of this the welfare effect is ambiguous. However, home's terms of trade will have worsened to the benefit of the rest of the world. The effect is shown in the graph to the right.



Topic 5 – Trade policy instruments

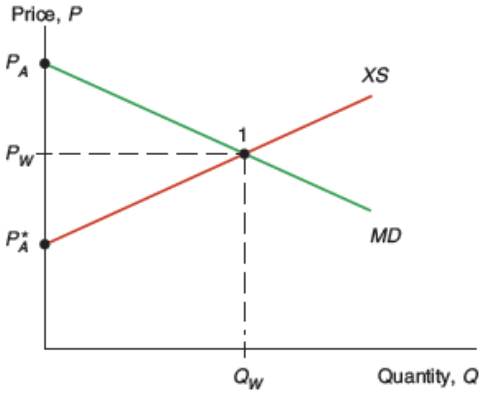
Trade policy instruments:

Note for you who are reading through this chronologically:
That's it. You made it! No more comparative advantage models to take into account. We found out that trade benefits countries in general, but that there sometimes are winners and losers. Due to this, completely free trade is often not a reality. We began looking a bit into this in the previous topic. Barriers such as tariffs, quotas and non-tariff barriers restrict and alter the flow of trade. Sounds interesting right? Let's take a closer look at the effects of these!

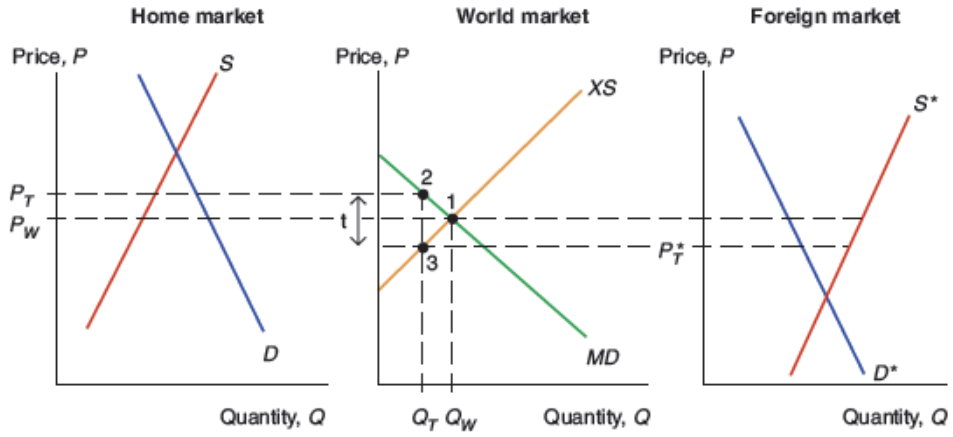
Import demand curve: a curve that expresses the excess of what home consumers demand, D, over what home producers supply, S. We denote this MD = D – S. This is how much home will want to import of a good. This graph in shown below.

Export supply curve: a curve that expresses the excess of what foreign producers supply, S*, over what foreign consumers demand, D*. We denote this XS = S* - D*. This is how much foreign will want to export of a good. This graph is shown below.

Trade equilibrium: The equilibrium world price can be found at the intersect between the MD and XS curves as seen to the right.

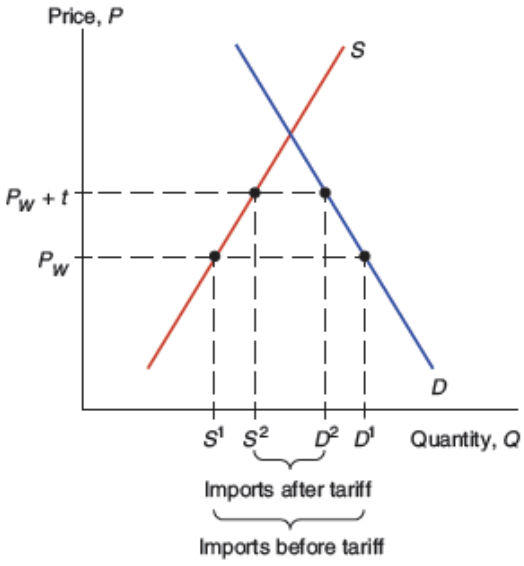


Specific tariff: A specific amount charged for each unit of imported goods. This way the price of the good, P, will be the foreign price, P*, plus the tariff, t, so that:
At home: P = P* + t
At foreign: P* = P – t
Such a tariff will cause home to want to import less and foreign to want to export less, thereby decreasing world trade as seen in the graphs below.

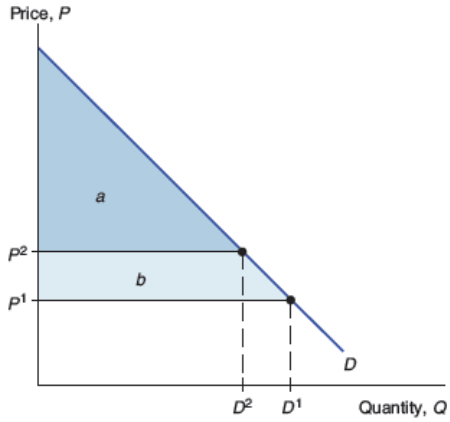


We also see in these graphs that the tariff effect is shared by home and foreign.

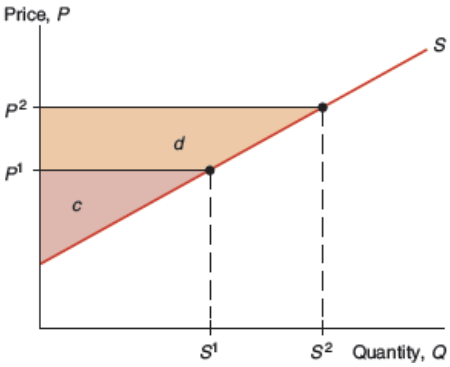
The world price is unaffected because we assume that home is a small country. Very few countries can affect the world price on their own because they make up only a small share of the total world trade. If we take a closer look at home's supply and demand curves (graph to the right), we see that their desire to import has decreased with the tariff. To see whether or not they are better off with the tariff, we must look at the overall welfare.



Consumer surplus: The difference between the consumers' marginal willingness to pay and the price of the good, i.e. the area under the demand curve above the price. If prices rise, consumer surplus decreases as shown in the graph to the right.



Producer surplus: The difference between the price and the producers' marginal willingness to sell the good, i.e. the area above the demand curve under the price. If prices fall, producer surplus decreases as shown in the graph to the right.



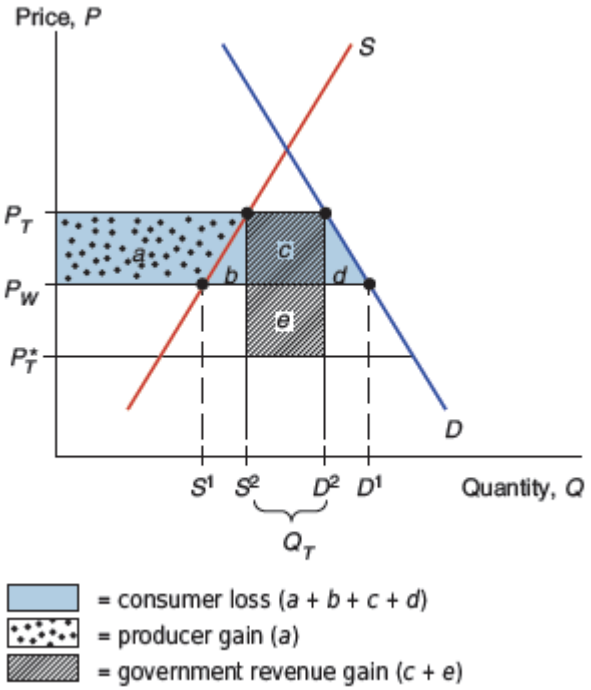
Welfare and tariff: Welfare is measured as consumer surplus + producer surplus + government revenue. We can look at the effects of a tariff on welfare. A price increase will decrease consumer surplus, increase producer surplus and the government will earn revenue of the amount that is still imported, t · (D – S). This is what is shown in the graph to the right. The efficiency loss is area b+d, but government has terms of trade gains of area e.

In general, the tariff net welfare costs are

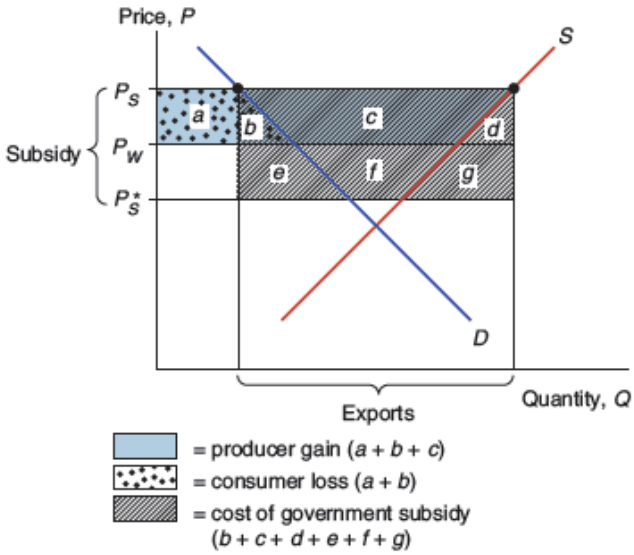
= Consumer losses – producer gains – gov. rev.

= (a + b + c + d) - a - (c + e)

= b + d - e



Welfare and export subsidy: When granting a subsidy government pays s to producers and thus the foreign price becomes P* = P - s. That means that the price in the importing country is lowered and the price in the exporting country is increased. Because the government is not experiencing any revenues, but is instead faced with costs, this having an even worse impact on overall welfare than the tariff. This is shown in the graph to the right. The efficiency loss is area b+d, while the government has terms of trade losses of e+f+g.



Topic 6 – External economies of scale

External economies of scale:

Note for you who are reading through this chronologically:
That last topic became a bit more superficial huh? I agree. Let's get back to explaining why countries specialize and trade in more concrete terms. Comparative advantage offered one perspective on this subject, and we will now proceed to look at another - economies of scale. Do you realize that you are over half way through this? And you know the best part? It's only getting easier from here! Remember to enjoy the journey before it ends.

Economies of scale: when production inputs increase output more than proportionally, i.e. there are increasing returns. Doubling inputs will more than double output. This is different from what we assumed when looking at comparative advantages, where the returns where constant.

With economies of scale, it is more beneficial for countries to specialize in the production of a few goods. However, because consumers still want to consume a variety of products, trade occurs.

The increase in productivity can come from two different sources. Either the total number of firms can increase (*external economies of scale)* or the output of each firm can increase (internal economies of scale). In this section of the notes, we'll focus on external economies of scale.

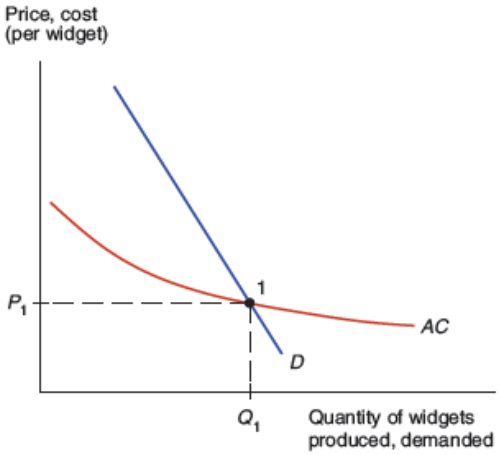
External economies of scale: if the market structure consists of many small firms, this is evidence of external economies of scale. This often leads to perfect competition among firms. Once external economies of scale has been set up in a location, it is unlikely to shift, because all the firms are deriving cost benefits from each other, which only increases as time passes and more firms join.

Specialized suppliers: More firms means that suppliers will have sufficient customers to set up and supply them with very specialized equipment for production. A single firm would not be sufficient for a specialized supplier to set up.

Labor market pooling: Many firms within the same industry can create a pooled market for workers with highly specialized skills. This way employers will have less risk of labor shortage and workers will have less risk of unemployment.

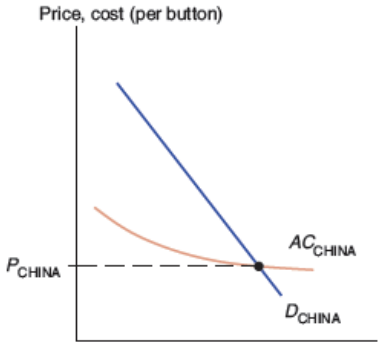
Knowledge spillovers: A cluster of firms can benefit from knowledge spillovers from each other. A new and more efficient way of production can be copied by competitors or new and better products can inspire other firms to also develop. These knowledge spillovers can happen when firms investigate other firms' products, or simply when workers are at the local pub talking about work.

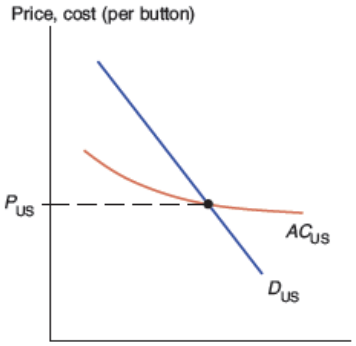
Market equilibrium: in external economies of scale the supply curve is downward sloping, i.e. the more that is produced, the lower the price the firm will be willing to sell at. In perfect competition the price equilibrium will be at the intersect of the supply curve and the average cost curve, i.e. the point where firms make no additional profit. This is seen in the graph to the right.



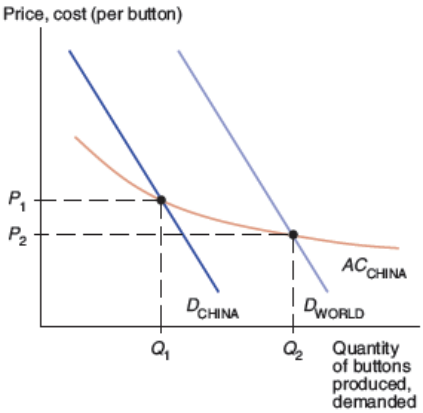
External economies of scale, autarky vs. trade: If we assume first that there is no trade and china and the U.S. are producing buttons. We assume that China faces a lower average cost than the U.S. as seen in the graphs to the right.

What happens when we open up to trade?

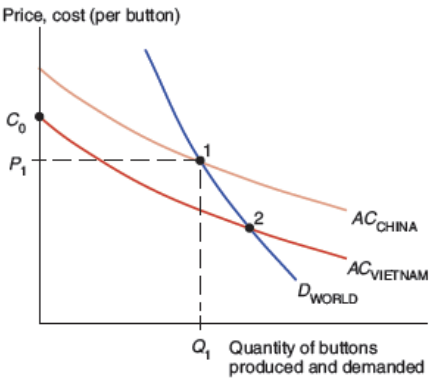




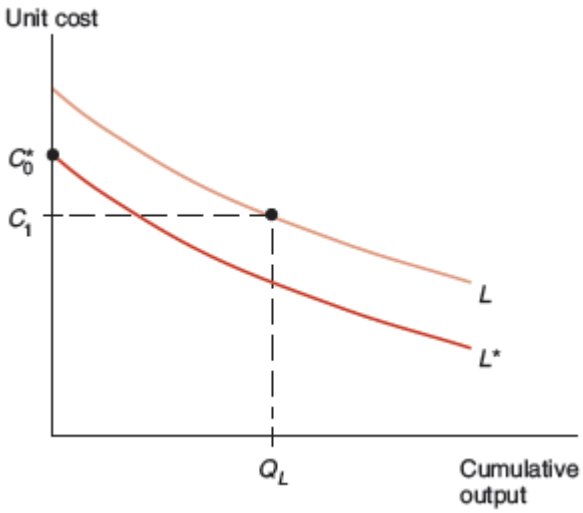
The Chinees button production industry will expand because they face a lower average cost. This will lead to an even lower average cost. The opposite will happen in the U.S., where the button industry will contract, leading to higher average cost. In the end all production will in theory happen in China as seen in the graph to the right. This will result in lower prices than any of the autarky situations.



Lock-in effect: When a sufficiently low average cost has been reached, it is unlikely that production will shift to another country. Even if that country could potentially achieve a lower average cost, it cannot get past the startup barrier where average cost is higher. This is illustrated in the graph to the right, where C_0 is the cost that Vietnam initially would have to face if it were to enter the button industry. Thus, the welfare of Vietnam is actually decreased because of economies of scale.



Dynamic increasing returns: Another benefit of economies of scale, besides just sheer scale, is the learning curve effect. With experience, firms will learn to produce goods more efficiently. The more they have produced in their lifetime, the more they will have learned and the more efficient they can produce. The unit cost is decreasing with cumulative output as shown in the graph to the right. A firm might be able to produce at a lower cost per unit than other because of dynamic increasing returns, even though the other firm potentially could produce at the lowest cost if it had as much experience.



Topic 7 – Internal economies of scale

Internal economies of scale:

Note for you who are reading through this chronologically:
Wow, that was a short and easy topic. Let's take a look at internal economies of scale. Hopefully that will be a little more challenging and fun for a soon-to-be Master of international economics such as yourself.

Internal economies of scale: if the market structure consists of one or a few large firms (respectively called a monopoly or an oligopoly), this is evidence of internal economies of scale. This often leads to imperfect competition because of monopolistic behavior. For the first time in these notes, the subjects we are analyzing are not price takers, but instead *price setters.* They can choose how much to produce and impact the price of their goods.

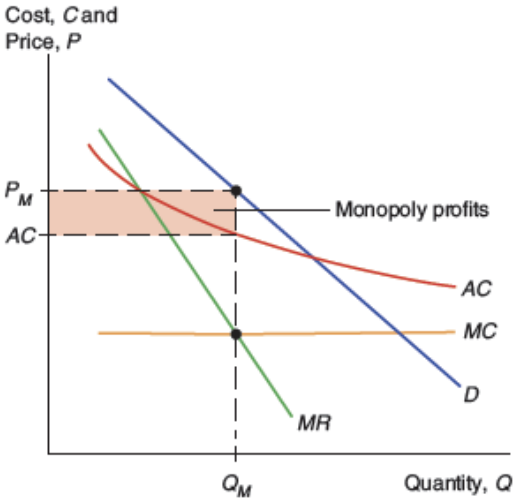
Marginal revenue (MR): the revenue a firm gets for selling an extra unit. Found by deriving revenue with respect to Q.
How much a firm sells, Q, depends negatively on the price it sets, P, thus $Q = A - B \cdot P$, where A and B are constants. In the appendix to chapter, it is proven that for this type of equation $MR = P - Q/B$

Cost (C): the fixed cost, F, a firm faces plus the marginal cost of producing one more unit, c, times the number of units produced, Q, i.e. $C = F + c \cdot Q$

Average cost (AC): total cost divided by output, i.e. $AC = F/Q + c$

Marginal cost (MC): the amount it costs the firm to produce an extra unit. Found by deriving the cost with respect to Q, i.e. $MC = c$.

Monopoly's optimal production: The demand curve is as always downward sloping. We will assume that MC is constant, i.e. what drives AC down as production increases is a fixed cost getting distributed over an increasing number of units. The monopolist will choose to produce a quantity, Q, so that MR = MC. Here the monopolist will earn profits of Q times the difference between the price and average cost. This is all depicted on the graph to the right.



Monopolistic competition: because pure monopoly is very rare in the real world, we will instead look at the situation where a number of firms control the market. None of them big enough to set the prices on their own, but not small enough for there to be perfect competition either. This is called monopolistic competition, as it carries traits of both a monopoly and perfect competition.

Monopolistic competition demand: If we assume a size of the market, S, and a number of firms, n, the demand faced by each firm would be S/n. However, because every firm does not charge the same price, this model has to be adjusted. We can assume that when a firm charges a higher price, P, it will face a lower demand, while when other rival firms charge a higher price, $\bar{P}$, the firm will face a higher demand. How much the prices affect demand will be represented by a constant, b. Putting all this together, we can say that the demand, Q, faced by a firm under monopolistic competition is

$Q = S \cdot [1/n - b \cdot (P - \bar{P})]$

Market equilibrium: To find the market equilibrium we will have to simplify the model a bit. We assume that all firms are symmetric, i.e. they face the same demand and cost functions. To find the equilibrium, we will have to find the intersect between two different relations. The CC curve depicting the relationship between average cost and number of firms. And the PP curve depicting the relationship price and number of firms.

With symmetry, each firm face a demand, S/n. They each supply a quantity, Q, which will be equal to the demand they are facing. Substituting this into the formula for average cost, $AC = F/Q + c$, we get the CC curve, $AC = (n \cdot F / S) + c$.

To derive the PP curve, we assume that each firm acts as a local monopolist, choosing its price without considering how it will affect other firms' prices. I.e. $\bar{P}$ is taken as a given. If we write out the equation for monopolistic demand we get that

$Q = S \cdot [1/n - b \cdot (P - \bar{P})]$

$Q = S/n + S \cdot b \cdot \bar{P} - S \cdot b \cdot P$

the part market in blue and in red are constants. We actually have an equation in the form $Q = A - B \cdot P$, which we earlier described would have $MR = P - Q / B$. Thus, the MR for this would be

$MR = P - Q / (S \cdot b)$

Firms maximize profits by having MR = MC. Because MC = c, we get that

$P - Q / (S \cdot b) = c$

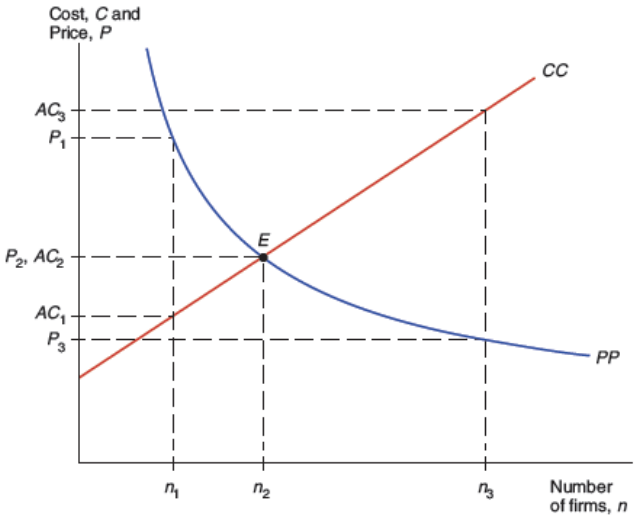
or rewritten

$P = c + Q / (S \cdot b)$

Finally we know that Q = S/n. Substituting this in the equation we get the PP curve

$P = c + 1 / (n \cdot b)$

These CC and PP curves are depicted to the right.

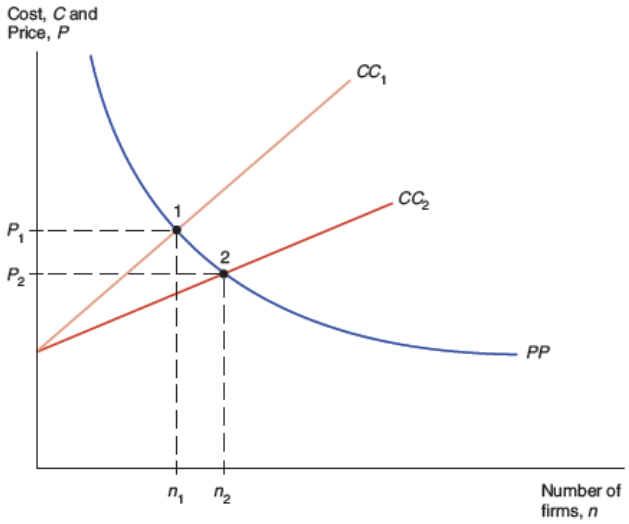


Equilibrium with trade: If we open up to trade, meaning that the market size, S, increases, the intersect between the CC and PP curve changes.

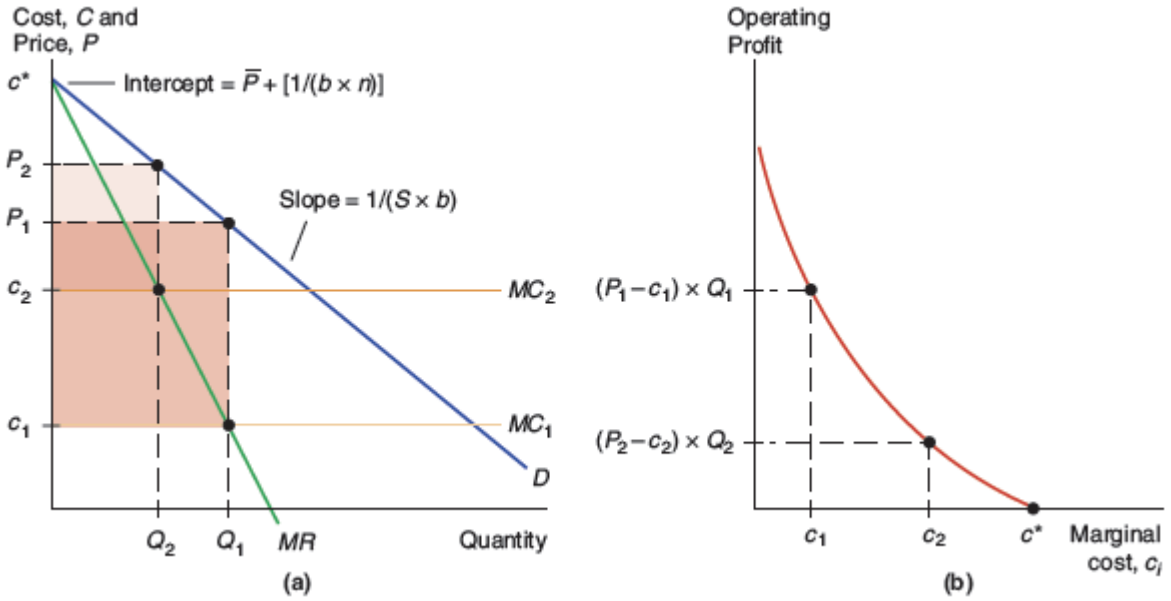
CC: $AC = (n \cdot F / S) + c$

PP: $P = c + 1 / (n \cdot b)$

We see from the equations that the price does not depend on S. Therefore, the PP curve will remain unchanged. However, when S increases the average cost will decrease for any given number of firms. I.e. the CC curve rotates downwards as seen in the graph to the right.

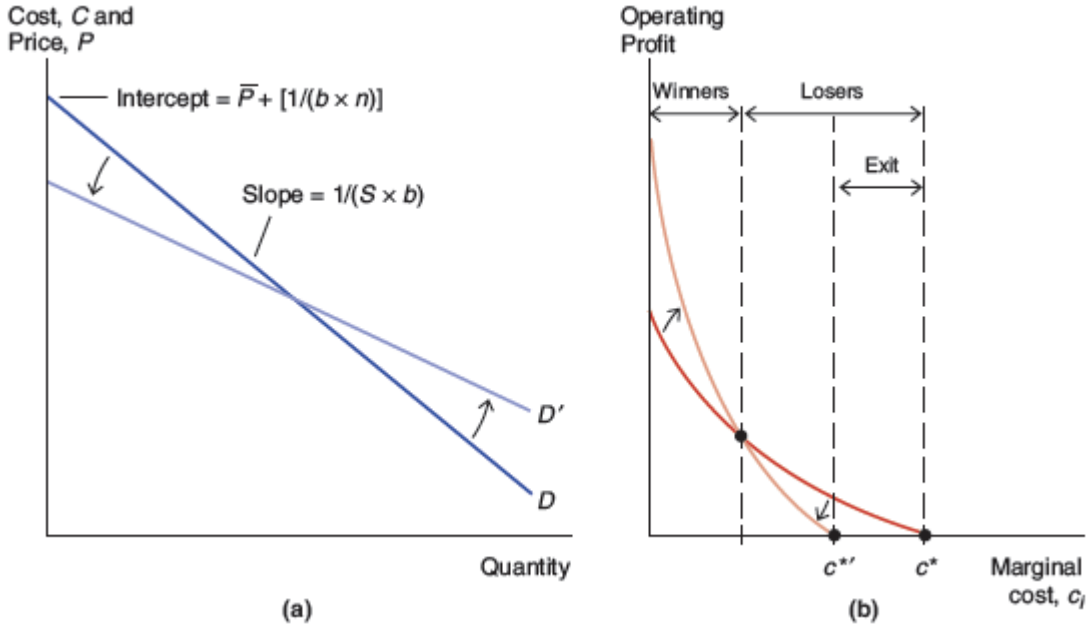


Performance differences between firms: We previously assumed that firms faced the same cost functions. In reality this is not true, due to performance differences. If we assume two firms, firm 1 and firm 2, with the only difference that MC for firm 1 is lower, $c_1 < c_2$. That means they face the same demand, $Q = S/n - S \cdot b \cdot (P - \bar{P})$. Because firms choose a price so that MR = MC, firm 1 will produce a higher quantity at a lower price than firm 2, as illustrated in the graph below. Because the slope of MR is steeper than the demand curve, firm 1 is earning more revenue than firm 2, i.e. $P_1 - c_1 > P_2 - c_2$ (higher mark-up). Thus, we can conclude that more productive firms make higher profits.

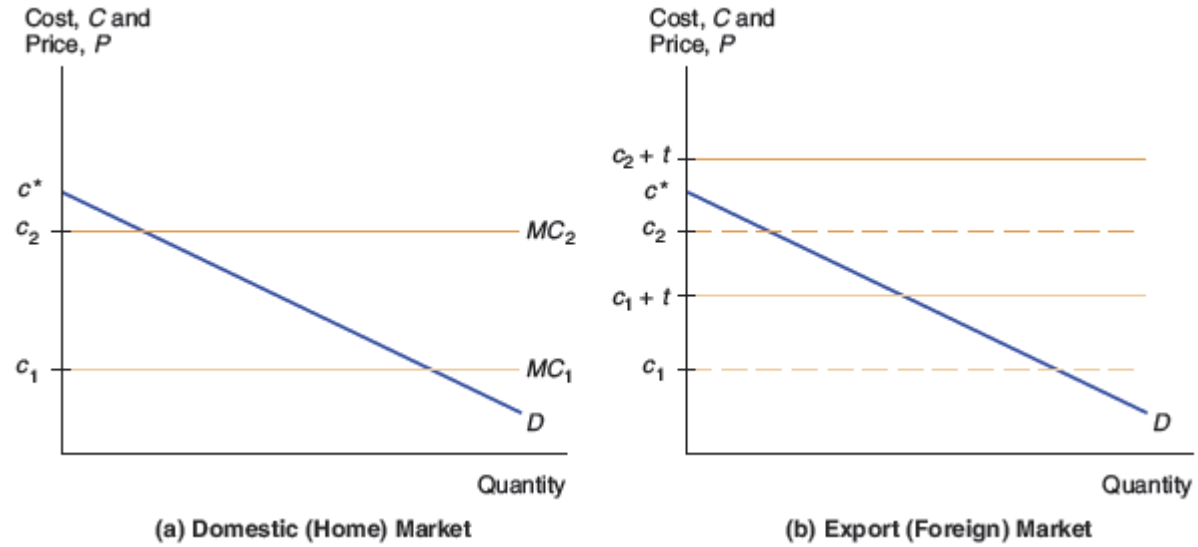


Another thing to notice is the intersect of the demand curve with the y-axis. So long as a firm's MC is not above this intersect, it can make a profit. We call this point, the cost cutoff point and denote it c*.

Performance differences and market increase: If the market size increases, e.g. with trade, the demand function will have a lower intersect and a flatter slope. This means that the cost cutoff point will also be lower, and thus some firms are no longer profitable and must exit the market. In addition, low-cost firms will experience a gain in market share, while high-cost firms will experience a lose in market share. This is what is highlighted in the graphs below.



Trade costs: Up until now we have ignored trade costs, but with the models we have now set up, it is really simple to take into consideration. Trade costs simply means that the marginal cost curve for any firm that wants to engage in trade, will be higher. Thus, only the firms with low enough cost, will be able to be profitable and enter trade as is shown in the graphs below. Here only firm 1 will engage in trade.



Dumping: the situation where a firm's foreign market price (net of transport costs) is below its domestic market price. Lowering the mark-up that a firm is charging for its exports below the mark-up in its domestic country is restricted by trade authorities, as it is deemed to be unfair competition. However, there is actually nothing unfair about it. It is just a move to stay competitive for the firm.

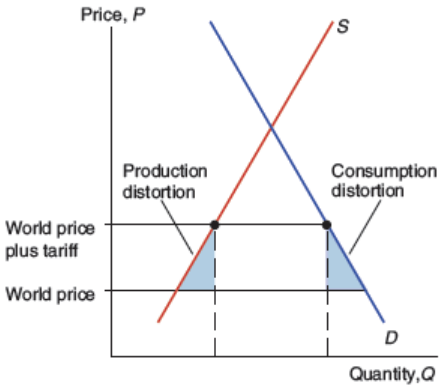
Topic 8 – Political economy of trade policy

Political economy of trade policy:

Note for you who are reading through this chronologically:
The internal economies of scale presented a bit more of a challenge, but nothing you couldn't handle I'm sure. If you're looking forward to some more difficult derivations and explanations as to why international trade occurs, I must unfortunately disappoint you. We are getting to an end of this exciting journey through international economics, and the next few topics will become a bit more… fluffy. Interesting stuff nonetheless, so hang in there and follow along. We're almost through!

Arguments against trade policies:

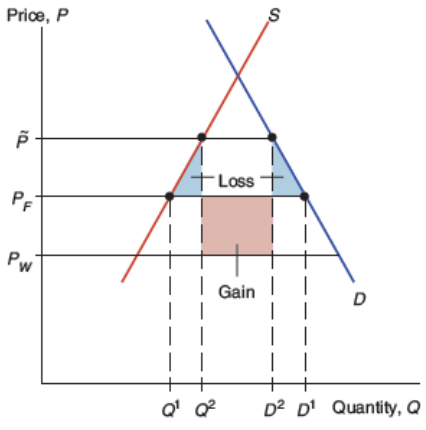
Efficiency loss: trade restrictions causes net loss to the economy due to distortion of the economic incentives of both producers and consumers. We have already looked at this in topic 5, but it is important to recall this in the context of discussing the political economy of trade policies. The efficiency loss is seen in the graph to the right.



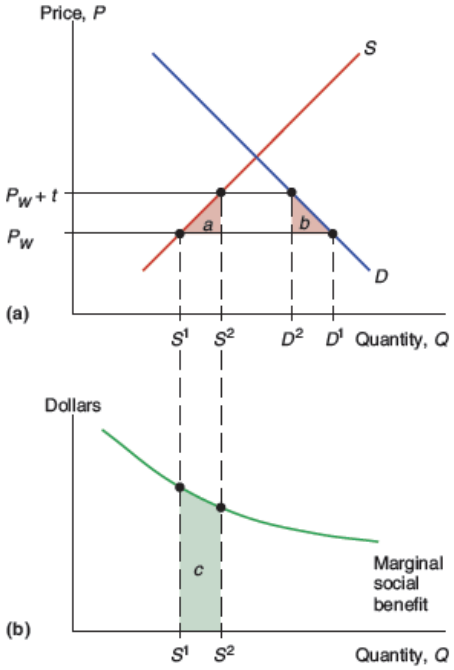
Rent-seeking: Imports are often subject to quotas. When agents spend resources on acquiring licenses to import, it is called rent-seeking. Resources spent on these activities constitute additional social welfare losses from trade policies.

Arguments for trade policies:

National welfare: In the situation of a large country imposing a sufficiently small tariff, terms of trade gains can actually outweigh the losses in efficiency. However, this comes at the cost of welfare in the rest of the world and would only start trade wars between large countries.



Domestic market failures: Situations where the distribution of goods and resources in the economy is inefficient. This is often due to individuals making decisions the benefits themselves rather than the economy. E.g. monopolistic behavior. Or unemployment. Or firms in an industry that by producing more could develop experience and technology that would benefit the economy as a whole, but because they do not see the benefit themselves, they choose not to. In these situations, there are *marginal social benefits* that are not captured through free trade. These hidden benefits might not be measured when calculating the effect of a policy on welfare.



Political models of trade:

First best vs second best theory: The first best policy is no intervention. The theory of the second-best states that no intervention is only desirable when no market failures are present.

Median voter theory: Political parties align their policies with median voter's preferences. If one part of the population wants high tariffs and another part wants low tariffs, the tariffs would be set at some medium level.

Collective action theory: While something might be in the interest for a group, they do not take action because it is not in the interest of any single individual in this group.
E.g. removing a tariff might increase collective welfare by 1 million dollars, but the welfare of each individual is only affected very slightly, say 1 dollar, thus no one takes action.

Topic 9 – International trade accounting

International trade accounting:

Note for you who are reading through this chronologically:
Do you love accounting? And do you love macroeconomics? Then you'll for sure enjoy this next short topic.

National income accounting: national accounts seek to measure a country's gross national product (GNP). This is the value of all final goods and services produced by the country's factors of production and sold on the market in a given time period.
National income should reflect GNP plus international transfers (e.g. aid) minus capital depreciation.

GNP vs. GDP: GNP is the product of all factors owned by people residing in a country, regardless of production location. GDP is the product of all factors located in a country, regardless of their owners' residence.

GNP (closed economy): GNP must equal national expenditure. I.e. output, Y, must equal consumption, C, plus investment, I, plus government spending, G,
$Y = C + I + G$

GNP (open economy): When considering potential trade in GNP, we have to add the current account balance (CA = exports minus import (net exports in macroeconomics)) to the equation:
$Y = C + I + G + CA$
If $0<CA$ the economy is exporting more than it imports – there is a trade surplus. Vice versa we call it a trade deficit.

Balance of payments account: records "money" transferred between countries to finance the current account flows. This is basically the balance sheet for a country.
It tracks the current account (imports and exports), the financial account (assets, e.g. bonds and stocks) and the capital account (intangibles, e.g. trademarks).
The balance of payments account follows the principle of double-entry bookkeeping.
The identity of the account can be set up as:
Current account + Capital account = Financial account

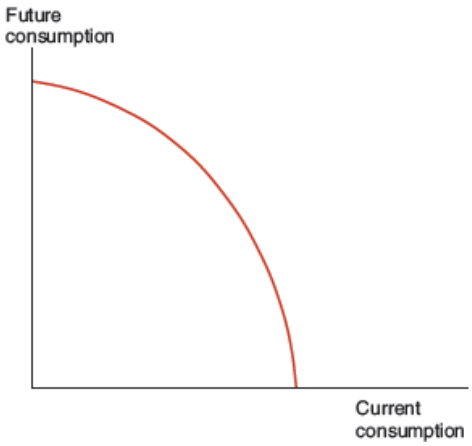
Topic 10 – Intertemporal trade

Intertemporal trade:

Note for you who are reading through this chronologically:
Can you really believe it? This is the last topic! One final step and you'll be Master of international economics. I must say, it has been a true honor bringing you along on this adventure. You should be super proud for making it this far. You are truly amazing. We've had so much fun, haven't we? Oh well, all good things must come to an end. We'll go through this one last topic together, and then I'll wish you the best of luck with the exam and your future career within international economics. I'm sure you'll do great!

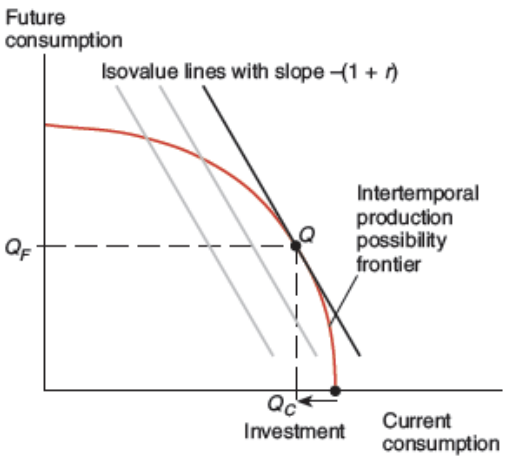
Intertemporal trade: Exchanging goods today for goods tomorrow.
Up until now we have always assumed trade to be balanced, i.e. that CA = 0 meaning that imports equal exports. But what if we open up to the possibility of people making savings or lending? Intertemporal allows for unbalanced trade.

Consider an economy that produces and consumes only one good. Also assume that it only exists for two periods, current and future. Then there will be two types of production, current consumption, Q_C, and future consumption, Q_F. From this we can draw an intertemporal production possibilities frontier as seen to the right. Some countries will be biased towards current consumptions and some will be biased towards future consumptions, i.e. there is intertemporal comparative advantage.



Autarky equilibrium: If a country borrows an amount, x, of a good today, it will have to repay the same amount in the future in addition to rent. Say r is the real interest rate. Then the country will have to repay $x \cdot (1 + r)$ in the future, i.e. the relative price of future consumption is 1/(1+r).
The total value of production over the two periods is thus
$V = Q_C + Q_F/(1+r)$
The optimal point of production will as usual be where the slope of the highest isovalue line is equal to the slope of the intertemporal PPF - shown in the graph to the right. From the value equation above, we get that the slope is –(1+r).

As rent decreases, it becomes more attractive to consume in the future, thus Q_C decreases and Q_F increases.



Intertemporal comparative advantage: Let us assume that home has comparative advantage in Q_C, i.e. P_C/P_F is low and so are the returns on home's future investments. This means that home is better of lending than borrowing. Countries that have comparative advantage in Q_F are better off borrowing than lending.

Intertemporal consumption pattern: The demand for current and future consumption (respectively D_C and D_F) cannot exceed the value of current and future production. This is expressed by the follow equation:

$D_C + D_F/(1+r) = Q_C + Q_F/(1+r)$

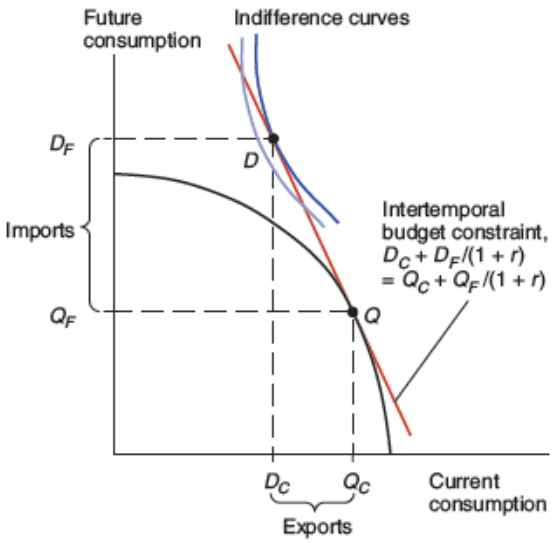
Because of this, production and consumption must lie on the same isovalue line. This is shown in the graph to the right.

We see that home imports (borrows) future consumption and exports (lends) current consumption. Hereby the difference between future demand and future production is equal to excess current production over current demand times the rent:

$D_F - Q_C = (1+r) \cdot (Q_C + D_C)$

We say that trade is *intertemporally balanced.*

Note that in the first period (current) home has a trade surplus, while foreign has a trade deficit.



<u>Savings:</u>

Private savings: income, Y, minus taxes and consumption, $S^p = Y - T - C$

Government savings: taxis minus government spending, $S^G = T - G$

National savings: $S = S^p + S^G$

Closed economy: in a closed economy savings equal investment, $S = I$

Open economy: savings minus current account equal investment, $S – CA = I$