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Lectures 1 to 20

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International Economics – IBEB – Lecture 1, week 1 - World trade: an overview

Total world exports are enormous. However, it is not equal among countries. While some developing countries are catching up, most trade are among developed countries. The Gravity Model built by Jan Tinbergen will propose main drivers of trade that can well predict practical trends.

The gravity model by Jan Tinbergen (1962)

Despite the model's simplicity, it predicts actual trade flows quite accurately. In the model, T_{ij} denotes the value of trade between the two countries, Y_i and Y_j are the GDP of country i and country j respectively, and D_{ij} represents the trade impediments between the two countries. The relative significance of each component is shown by a, b and c, which are most of the time close to 1. The Gravity Model is expressed as:

$$T_{ij} = \frac{Y_i^a * Y_i^b}{D_{ij}^c}$$

According to the formula, the size of the economies – measured by **Gross Domestic Product (GDP)** – is *positively* related to the amount of trade with other economies. Economies with greater gross domestic product have greater national income thus they import more goods, produce more goods and export more. On the other hand, **Distance** between countries increases transportation costs, which reduces incentives to trade. Other factors that also hold an influence on international trade are:

- **Cultural affinity**: countries with similar cultural and historical ties are more likely to trade with each other and develop stronger economic ties
- **Geographic factors**: countries with more water bodies and less obstructions like mountains offer an easy accessibility of transportation to and from, thus have greater trade with others.

- **Borders**: rules and regulations, especially tariffs, are imposed between countries which can cost money and time. The harder it is to “cross” the border, the less incentive there is to trade, thus less volume of trade. For example, at similar distance, the Canadian province of British Columbia trades significantly less with US states than with other Canadian provinces.
- **Free trade agreements**: governments stimulate free trade within the trading bloc by means of mutual agreements. However, it should not be stated that such agreements can increase trade volume since many blocs are location-based, making their distances relatively small. For example, NAFTA members trade more with each other than the expectation based on just their GDP and distances to each other.

Globalisation: then and now

Technologies have enhanced trade and globalization by reducing trade impediments, but the world is not really “flat” yet, as distance still matters, and the location of a country on the globe is still of great relevance when it comes to how easy for it to get into markets. Also, the political factors can change trading patterns much more significantly than technologies do.

Examples of political factors include the sharp decline of trade due to WWII and the Great Depression. Only around 1970 had trade increased and returned back to the pre-war levels. Now, it has become more important due to the big reduction in trading barriers of developing countries and events such as the end of the Soviet Union and the decision of China to open up to world markets.

Composition of trade

In the past, trade comprised of mainly agricultural products and natural resources. Nowadays, however, in developed and some developing countries, the main component of trade is **manufactured products** (around 54%) such as automobiles, clothing, etc.; then come services (23%), mineral/natural resources products (12%), and agricultural products (8%).

Two important **recent developments** and reasons for change in the composition of trade are:

1. Trade in **intermediate goods**

    a. Goods used for producing other goods and not for direct consumption are increasing and make up a great share of world exports. In fact, today, more than 50% of world exports involve immediate goods. This is caused by more *complex international supply chains*, which are, at the same time, more vulnerable to shocks. Backing up this problem by setting different subsidiaries in different countries for the same good is desirable (diversification).
    b. Internationalization of production networks
        i. Pros: Countries can specialize in the production of goods and become more efficient in it.
        ii. Cons: Increase in vulnerability of the production process (i.g. wars in countries can result in a detrimental decrease in supply of an important good)
2. Trade in **services**
    a. Service outsourcing, locating the services of a business in foreign counter parts, is increasing. Since this is only applicable to those that can be performed and transmitted electronically, e.g. call centres, many services are still non-tradable, e.g. repair services. Even though services trading is still relatively small in proportion of world trade, it is becoming more and more outsourceable thanks to communication technology, standardization and increase in international skill levels.

International Economics – IBEB – Lecture 2, week 1 - the Ricardian model

Theories of trade - 2 categories

The theories of trade, which concern the main driver of trade, are classified into two categories. The first are models that emphasize the differences between countries, particularly in labour skills, natural resources, physical capital, and technology. Examples of this include the fact that Norway and Spain trade fish for oranges and Saudi Arabia and the US trade iPads for oil.

The second category consists of models emphasizing ***economies of scale***, where the concerned countries have no a priori differences but can benefit from economies of scale if they specialize in a few products only and then trade.

In the real world, however, both forces may combine. To understand each of the causes and effects of trade, we must look at them separately. This is what models are for.

In this course, we will have a look at multiple models of theories of trade. **Ricardian model**, which is discussed in this lecture, examines *trade arising because of differences in relative labour productivity between countries*. Specific factors model, Hecksher-Ohlin model, and economies of scale are some other models that we will study in later lectures.

Ricardian model

The two fundamental concepts of the Ricardian Model are the opportunity cost and comparative advantage:

- **Opportunity cost**: the highest benefit of using resources to produce goods other than what is being produced at the same time. Since there is a limited amount of resources, there is trade-off between how many goods A and B to produce.
    - Every country has opportunity costs when it produces goods and services. It is impossible to use a machine and a person's labour for two things at the same time.
- **Comparative advantage**: whichever country has the lower opportunity cost of producing a good compared to other countries has a comparative advantage.

Example: Country X can produce 5 units of good A or 10 units of good B, while country Y can produce 5 units of A or 7.5 units of B. The opportunity cost for country X of producing 1 unit of good A is 2 units of good B, and for country Y to produce 1 unit of A it sacrifices 1.5 units of B. Thus, country Y has a ***comparative advantage*** *(less sacrifice of good B) in good A. For one unit of B, country X sacrifices less of good A and therefore has a comparative advantage in good B.*

When opening to trade, countries specialise in the product in which they have a comparative advantage. Thus, the world output of goods and services is increased compared to when each country makes all goods and services itself.

A one-factor Ricardian Model

The one-factor Ricardian Model makes certain assumptions:

1. Labour is the sole resource in the economy.
2. Labour productivity is different across countries but uniform within one.
3. Labour supply in each country is constant.
4. The two goods represented are the only important goods produced and consumed.
5. There is perfect competition and free entry or exit barriers among firms.
6. Labour is perfectly mobile across sectors.
7. The world is represented by two countries only (Home and Foreign).

Production possibilities

The production possibility frontier of an economy shows the maximum possible combinations of two goods that an economy can produce with its given resources. The production possibilities in each country is dependent on the labor available and the time required to produce a single unit of both goods. It is represented as follows:

$$a_{LA}Q_A + a_{LB}Q_B \leq L$$

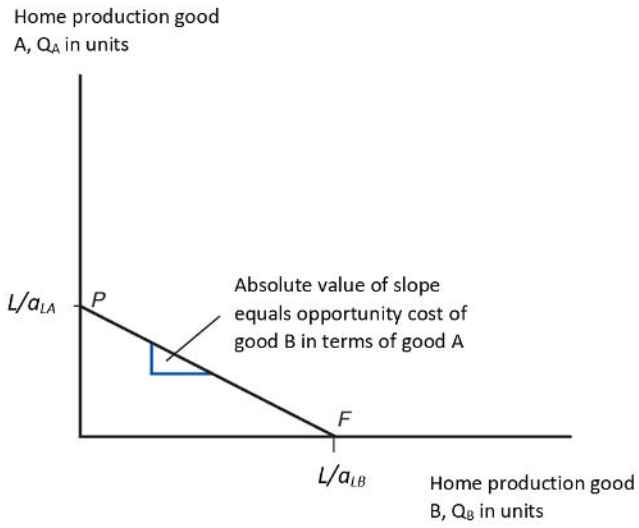
In the above function, L is the total number of hours worked in an economy if all labours are employed (constant by assumption), Q_A and Q_B are the quantity of A and B produced, and a_{LA} and a_{LB} are the **unit labour requirement** – hours of labour required to produce 1 unit of A or B. The higher the unit labour requirement for a good, the lower the labour productivity in that good (inverse relationship).

If the country **only** specializes in A or B then:

$Q_A = L/a_{LA}$ when $Q_B = 0$ or $Q_B = L/a_{LB}$ when $Q_A = 0$

The equation of the downward sloping PPF can be represented as:

$$Q_A = \frac{L}{a_{LA}} - \frac{a_{LB}}{a_{LA}}Q_B$$



(International Economics Theory and Policy 11th Edition, page 55)

where the absolute value of the slope of the PPF a_{LB}/a_{LA} is the **opportunity cost** of producing an extra unit of B in terms of A.

Actual production

Actual production, on the other hand, will also depend on the **prices** since they represent how many hours will be spent to produce as well as how much people are willing to buy of each good.

Since firms make normal profit = 0 in perfect competition, the difference between the total revenue and total cost is therefore zero.

$$Q_B P_B - w_B L_B = 0 \Leftrightarrow w_B = P_B(Q_B/L_B) \Leftrightarrow w_B = P_B/a_{LB}$$

$$Q_A P_A - w_A L_A = 0 \Leftrightarrow w_A = P_A(Q_A/L_A) \Leftrightarrow w_A = P_A/a_{LA}$$

Q indicates the respective units of B and A while w is hourly wage, L is fixed labour hours and P is the price.

If $(P_B/a_{LB}) = \mathbf{w_B} > \mathbf{w_A} = (P_A/a_{LA})$ equivalently $P_B/P_A > a_{LB}/a_{LA}$, the **relative price** of B exceeds the opportunity cost of producing B in terms of A (they are more than compensated for the sacrifice of resources to produce A), so workers will produce and specialise in B.

Similarly, if $(P_B / a_{LB}) = \mathbf{w_B} < \mathbf{w_A} = (P_A/a_{LA})$ equivalently $P_A/P_B > a_{LA}/a_{LB}$, the relative price of A exceeds the opportunity cost of producing A in terms of B, so the economy will specialise in A.

Workers only produce a good if it offers them a higher hourly wage (P_B / a_{LB} or P_A/a_{LA}), and if the price of the more time-consuming good at least compensates until the hourly wage is equivalent to the other good. Workers are indifferent when the hourly wage is the same ($P_B/a_{LB} = P_A/a_{LA}$) for two goods, and production occurs when the relative price equals opportunity cost of producing a good ($P_B/P_A = a_{LB}/a_{LA}$). Therefore, a combination of both goods can be produced, leading to the state of **autarky**. This involves no trade and no specific specialization in the economy.

Trade in Ricardian model

Absolute advantage is when one country is clearly more efficient at producing goods compared to another producer (it possesses greater labour productivity or lower unit labour requirement). An absolute advantage in good A and B for a Home country over a Foreign country (marked with *) is represented as $a_{LA} < a^*_{LA}$ and $a_{LB} < a^*_{LB}$. **Comparative advantage** indicates that the country is more efficient in producing one good compared to producing goods. Thus, a country with comparative advantage in good B will use its resources most efficiently when it produces good B as compared to producing good A.

Suppose Home country is comparatively better in production of good B over Foreign:

$$a_{LB}/a_{LA} < a^*_{LB}/a^*_{LA}$$

Similarly, Foreign is comparatively better in production of good A over Home:

$$a^*_{LA}/a^*_{LB} < a_{LA}/a_{LB}$$

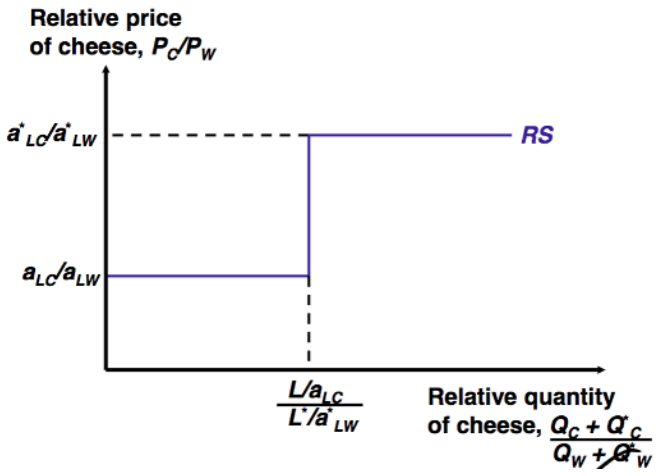
Since Home has a comparative advantage in production of B, the state of **autarky** will cause relative price of B to be lower at Home than in Foreign, similarly the relative price of good A will be lower in Foreign than in Home.

$$P_B/P_A = a_{LB}/a_{LA} < a^*_{LB}/a^*_{LA} = P^*_B/P^*_A$$
$$P^*_A/P^*_B = a^*_{LA}/a^*_{LB} < a_{LA}/a_{LB} = P_A/P_B$$

Mutual trade is thus beneficial for both countries.

The trade will be determined by the market forces of demand and supply. **Relative supply** of good B is **RS** = $(Q_B + Q^*_B)/(Q_A + Q^*_A)$

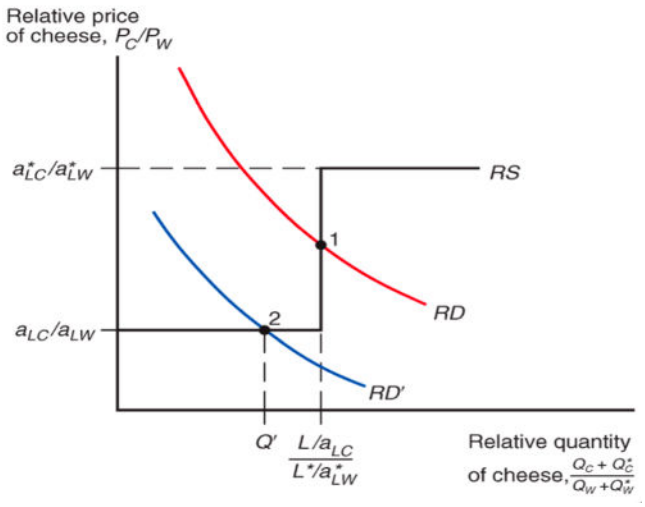
- If the relative price is below the opportunity cost of B in both countries, no country will be willing to supply, thus the relative quantity supplied = 0
- If the relative price is above the opportunity cost of B in both countries, they both will be eager to supply good B; thus, the relative supply will be infinite with both countries are not supplying A at all
- If relative price is equal to opportunity cost of B at home, then worker's hourly wage makes them indifferent between both goods; foreign workers produce only A
- If the relative price is equal to the opportunity cost of B in Foreign then worker's hourly wage makes them indifferent between both goods; domestic workers produce only B
- Finally, if the relative price is between the opportunity cost of B at Home and Foreign, specialisation will take place and the relative quantity supplied will be $(L/a_{LB}) / (L^*/a^*_{LA})$, domestic workers produce only B and foreign workers produce only A



(Lecture 2, slide 39)

Relative demand (RD) of B refers to the quantity of B demanded in all countries relative to the quantity of A demanded in all countries.

When the price of B rises, consumers worldwide tend to buy less B and more A, driving down the relative demand of B. The other way around applies to A. Therefore, RS and RD together determine prices, which can adjust to set RS = RD.



(Lecture 2, Slide 45)

Generally, opening up to trade sets the relative prices of goods in between both countries autarky levels:

$$P_B/P_A < P^{world}{}_B/ P^{world}{}_A < P^*{}_B/P^*{}_A$$

International Economics – IBEB – Lecture 3, week 1 - The Ricardian model - continued

Gain from trade

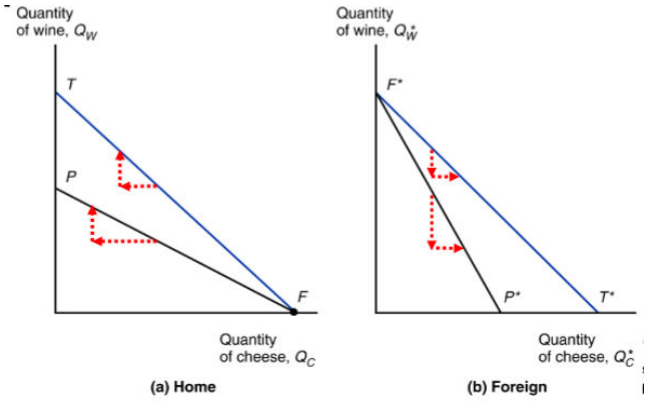
A country can have an absolute advantage in both productions, but only have a comparative advantage in one production. If each country specializes in the good in which they have a comparative advantage, their resources are allocated more efficiently. As a result, more goods can be produced than in autarky, and overall consumption is expanded. The income earned from their production is used to buy the desired goods and services, which are produced at home or bought from other countries.

With trade, workers have the same purchasing power in the goods they produce but higher in what they can buy, making them better off overall. Specifically:

Home workers earned $w = P_B/a_{LB}$ and with this, they could buy $w/P_B = 1/a_{LB}$ of B or $w/P_A = P_B/P_A * 1/a_{LB}$ of A.

With trade, they earn $w = P^{world}_B/a_{LB}$. This finances them $w/P^{world}_B = 1/a_{LB}$ of B or $w/P^{world}_A = P^{world}_B/P^{world}_A * 1/a_{LB}$ of A.
$P_B/P_A < P^{world}_B/P^{world}_A < P^*_B/P^*_A$

A similar case holds true for foreign workers. Generally, trade expands a country's consumption possibilities beyond production possibilities. This can be illustrated with graphs as follows:



(Lecture 3, slide 9)

Relative wages

In Home, workers that produce B earn: $wB = P^{world}B/aLB$. In Foreign, workers that produce A earn: $w^*A = P^{world}A/a^*LA$. The relative wage is the wage of the home country relative to the wage in the foreign country, expressed by: $(wB/w^*A) = (P^{world}B/P^{world}A)(a^*LA/aLB)$
To realise where the wages lie, we use $PB/PA < P^{world}B/P^{world}A < P^*B/P^*A$. First, we divide this inequality in two parts: $PB/PA < P^{world}B/P^{world}A$ and $P^{world}B/P^{world}A < P^*B/P^*A$.
For the first inequality $PB/PA < P^{world}B/P^{world}A$, since $PB/PA = (aLB/aLA)$ we have $(aLB/aLA) < P^{world}B/P^{world}A$ (1)
From the relative wages $(wB/w^*A) = (P^{world}B/P^{world}A)\ (a^*LA/aLB)$, we derive

$P^{world}B/P^{world}A = (wB/w^*A) / (a^*LA / aLB)$ (2)
From (1) and (2) we get: $(aLB/aLA) < (wB/w^*A)/(a^*LB/aLA)$ $(a^*LA/aLA) < (wB/w^*A)$
The same is done with the second inequality $P^{world}B/P^{world}A < P^*B/P^*A$
In this we get, $(wB/w^*A) < (a^*LB/aLB)$
Finally, we get the inequality as follows:
$(a^*_{LA} / a_{LA}) < (w_B / w^*_A) < (a^*_{LB} / a_{LB})$

This relation implies that differences in the level of productivity determine the relative wage differences across countries. The home wage relative to the foreign wage settles in between the ratio of how much better Home is at making B and how much better it is at making A compared to Foreign (in the case when it has absolute advantage in both).

Both countries have a cost advantage when they trade, even if one of them has an absolute advantage in both goods (only comparative advantage matters). For the economy with higher productivity, more output is produced within a given period of time, so the unit cost drops. On the other hand, for the less productive country, the lower wages paid to labour result in cost savings. Empirical studies have shown that relative wage does reflect relative productivity in the real world.

Misconceptions about international trade

The benefits of trade accrue not because of absolute advantage in productivity but **comparative advantage**. Even if a country displays lower productivity in all sectors, it can still trade and reflect cost advantage because of its lower wages as previously explained. Besides, they can also avoid high costs of producing inefficient goods domestically.

Consumers benefit from buying goods at lower prices and workers in the efficient export industries earn higher real wages than not trading at all.

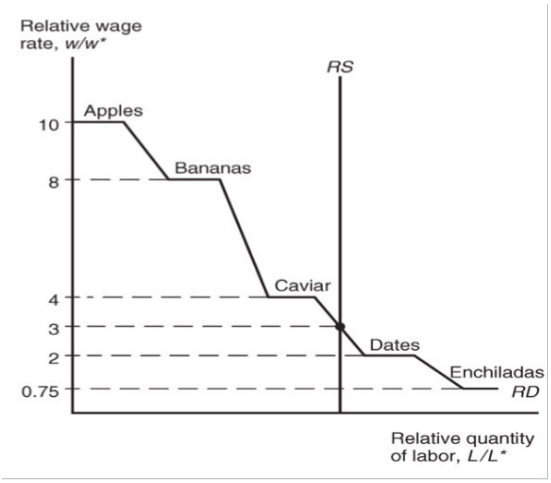
Trade in the multi-good model

In the real world, there are multiple goods that will be produced and traded which can be indexed by i = 1,2,3,...,N. Home country's unit labour requirement for each good is a_{Li} and that of the Foreign country is a^*_{Li}. In the multi-good model, goods are produced in the country which has the best cost advantage for that particular good.

In this case, we need to determine the productivity differences between economies and their wages.

Suppose w denotes the domestic wage level and w* foreign wage level. The good will be produced where the production cost is the lowest. For example, if $wa_{Li} < w^*a^*_{Li}$ or $w/w^* < a^*_{Li}/a_{Li}$, home has a cost advantage and should produce the good and vice versa.

Thus, relative wages and relative productivity determine the specialization pattern. The relative productivity is considered **stagnant** in the short run. The relative wages are determined by their **relative demand** and **relative supply of labour**. Relative supply RS = L/L*. Relative demand of labour RD declines as relative wage w/w* increases. This is because of two effects. Firstly, relative wage rising makes domestic goods more expensive, so demand for the goods and thus the labour service falls. Secondly, increased relative wage makes producing domestically more expensive, further reducing demand for labour.



(Lecture 3, slide 33)

Empirical evidence

The Ricardian model has its merits and demerits. Its unrealistic assumptions include:

- labour is the only factor of production (one-factor assumption)
- there are no differences in resources between countries
- there are no roles for economies of scale

These lead to some over-stylized predictions that:

- everybody benefits from trade. This is due to the one-factor assumption; in reality, some people benefit while some do not.
- there is no trade between similar countries. This is due to the exclusion of economies of scale. In reality, even when both countries are equally productive in all goods, economies of scale in one country drive down unit cost, making the goods cheaper for export.
- specialization pattern is strong – at most one good is produced in both countries while the rest is produced in one country only. In reality, specialization is not very strict because of:

+ transport costs which raise the cost of foreign goods so a country will rather produce the good itself.
+ non-traded goods due to the closeness required of the service/good provider.
+ existence of multiple factors of production.

On the other hand, the Ricardian model generally reflects the real world. Firstly, empirical studies show that countries tend to export goods in which their relative productivity to other goods is high. Secondly, many economies with an absolute disadvantage in all industries can still have major exports thanks to comparative advantage in one. Research was also able to link the Ricardian model and the theory of comparative advantage with the reality of the agricultural sector. This verifies that comparative advantage does determine production patterns.

International Economics – IBEB – Lecture 4, week 2 - The specific factors model

The **specific factors model** adopts a more realistic approach than the Ricardian model by using more factors of production, of which one (labour) is perfectly mobile. Moreover, it clearly specifies the gains from trade amongst different groups within countries. While some benefit from trade, others become worse off.

The specific factors model

In an example of the production of airplanes and wheat, the specific factors model assumes the following:

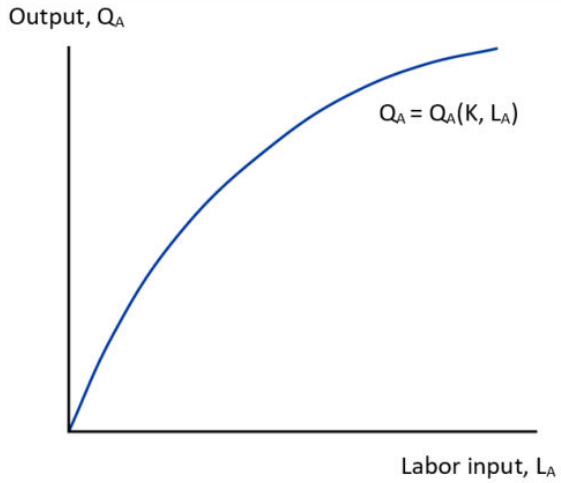
1. **Two** goods, airplanes and wheat, are produced and consumed in both economies
2. Three factors are used in production**: land**, **labour** and **capital**
3. Airplanes are produced using **labour** and **capital**
4. Wheat is produced using **labour** and **land**
5. The firms have **perfect competition** and there are no entry/exit barriers
6. The factors of production **cannot** be used beyond domestic borders
7. Labour is **mobile** between sectors within countries
8. Capital and land are **occupationally immobile** and are considered as **specific factors** pre-set for the nature of the good

Production function

A **production function** is a graphical representation of the **output** of a good that can be produced with different input bundles of the **factors** of production. The production function of airplanes and wheat can be represented as:

$Q_A = Q_A(K, L_A)$

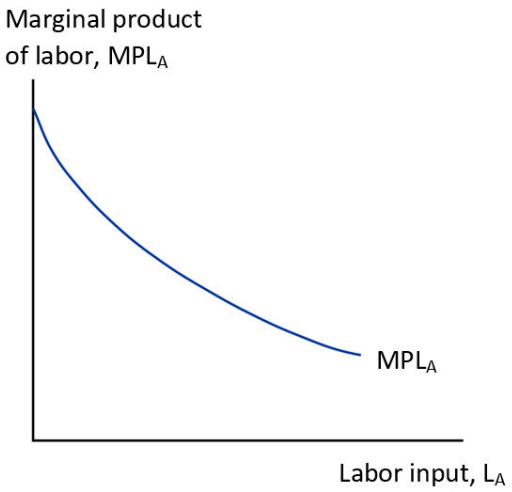
$Q_W = Q_W(T, L_W)$



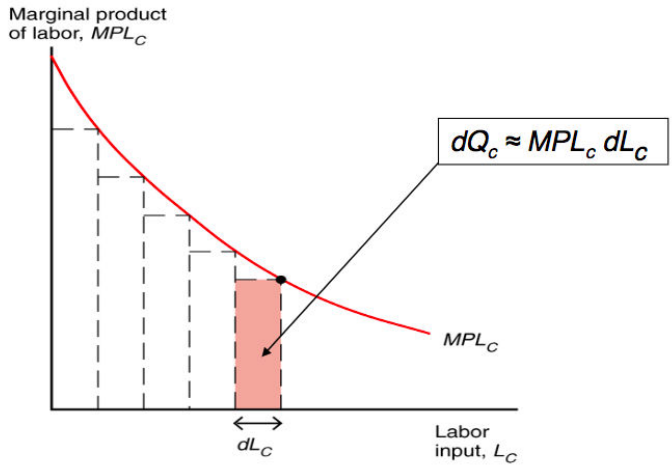
(Lecture 4, slide 9; International Economics Theory and Policy 11th Edition, p. 82)

Where Q denotes the quantity of the respective good, A stands for Airplane, W for wheat, K represents Capital, T represents Land and L is Labour.

An assumption made for the specific factors (land and capital) is that when the production takes place, the entire economy's land/capital is completely utilized in the production of the specified good. The production function implicitly captures **the diminishing marginal returns to labour** when capital/land is held fixed. An increase in the amount of labour, without any change in the other factors, leads to each additional worker contributing less to the produced output than the previous worker, thus the marginal product of labour declines as the number of workers employed increases. The first derivative of the production function results in the **marginal product of labour** and the integration of the marginal product results in **the production function**.



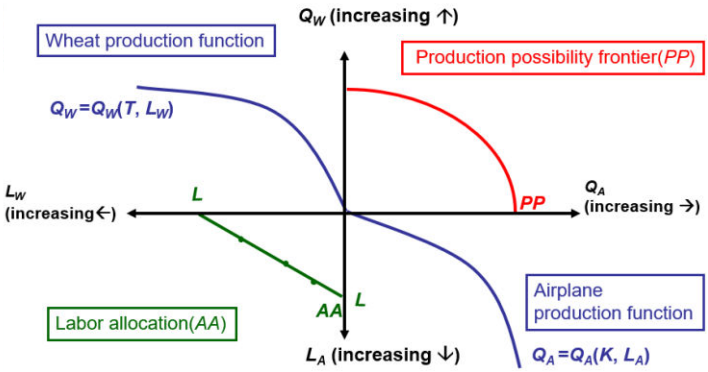
(Lecture 4, slide 11; International Economics Theory and Policy 11th Edition, page 83)



(Lecture 4, slide 12)

The area under the marginal product curve represents output Q_C.

In a country, the total labour supply L is fixed, $L_C + L_F = L$, so there will be a **trade-off** – labour can only be used in the production of either airplanes or wheat at the same time. With labour market equilibrium and the production functions, the production possibility frontier (PPF) can be derived.



(Lecture 4, slide 14; International Economics Theory and Policy Tenth Edition, page 84)

Every chosen combination of labour allocated to airplane and wheat production (3rd quadrant) corresponds to a level of output produced of airplanes (4th quadrant) and a level of output produced of wheat (2nd quadrant). These two outputs define one point of the PPF. The PPF is a bowed-out curve due to the presence of diminishing

returns. The slope of the PPF is the **opportunity cost** of producing an additional unit of airplane in terms of wheat.

If one person-hour of labour is shifted from wheat to airplane production, this extra input will increase output in that sector by the marginal product of labour in airplane, MPL_A. Since $dQ_A = MPL_A dL_A$, to produce an extra unit of airplane requires $1/MPL_A$ units of labour. These units of labour could have otherwise produced MPL_W/MPL_A units of wheat, because $dQ_W = MPL_W dL_W$. Thus, the opportunity cost of producing one extra unit of airplane is $\mathbf{-(MPL_W / MPL_A)}$ units of wheat.

Prices, wages, and labour allocation

In each sector, labour will be employed to the point where profit (total revenue – total cost) is maximised, which will determine the **labour demand**. Labour supply is fixed as L.

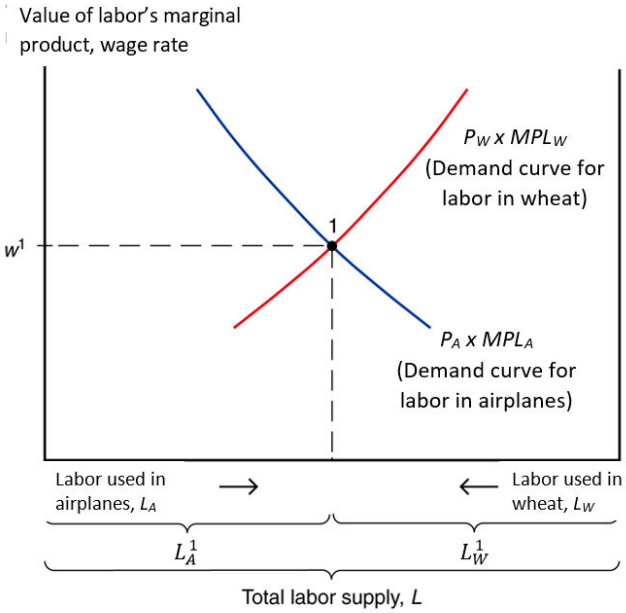
In the case of airplanes:
*max {price*quantity – wage expenses – capital rent}*
*⇔ derivative of (price*quantity – wage expenses – capital rent) = 0*

Which results in:
$w_A = P_A * MPL_A$.

Similarly, this holds for the wheat sector:
$w_W = P_W * MPL_W$

This means in both sectors, an additional worker earns as much as they add to total output.

The representation of both the labour demand curves is as follows:



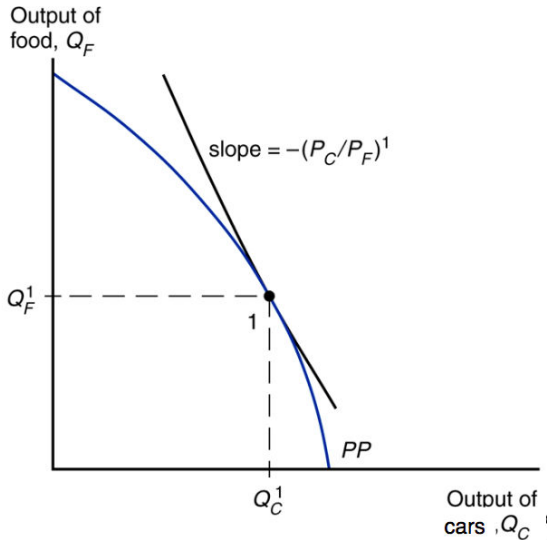
(Lecture 4, slide 20; International Economics Theory and Policy 11th Edition, page 86)

Where the labour demand curves intersect is the equilibrium wage and allocation of labour between the two sectors. At this point, the wage is the **same** for both sectors for workers to not be incentivized to switch sectors.

$w_w = w_A \Leftrightarrow MPL_wP_w = MPL_AP_A$

$$\mathbf{-(MPL_w/MPL_A) = -(P_A/P_W)}$$

This equality relates that the country chooses to produce the bundle of goods where the PPF is tangent to a line with slope given by negative the relative price of airplanes in terms of wheat.



(Lecture 4, slide 23)

Proportional and relative change (prices)

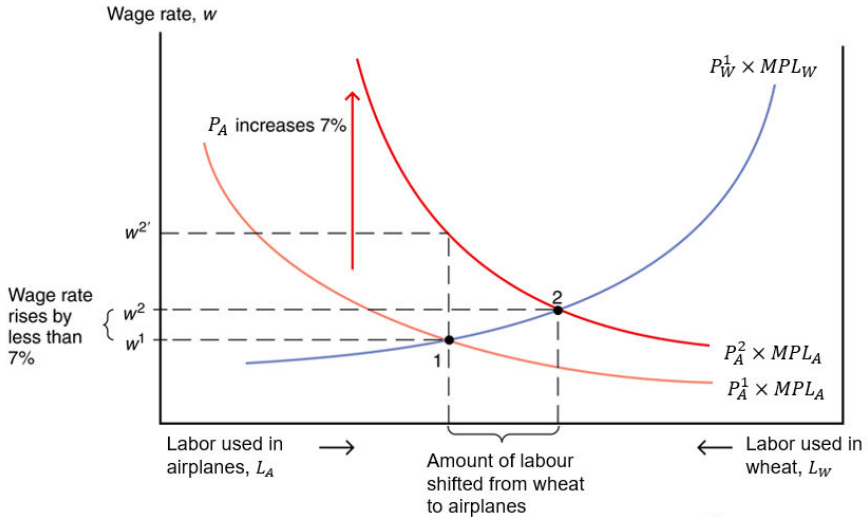
Changes in price of airplanes and wheat can influence the labour demand in two ways:

1. A **proportional change** in prices: prices of both goods change with the **same** percentage.

If both prices increase by 5 per cent, the demand for both airplanes and wheat rises. Both curves will thus shift upwards by the same proportion. The demand curves intersect at the point where wages are 5 per cent higher, but the labour allocation does not change. The real wage remained the same (nominal wage rises but prices rise by the same proportion), thus there is no incentive for labour to switch sectors, and output remains the same as the relative price is unchanged.

2. A **change in relative prices**: when the price of either or both goods change with **different** magnitudes.

Suppose that the price of airplanes rises by 5 per cent, whereas the price of wheat remains the same. As the relative price of airplanes increases, the labour demand for airplanes increases and more labour is allocated to airplanes production. However, MPL_A falls with more labour, so the new wage equilibrium increases less than 5 per cent. Altogether, wages rise but less than prices, so workers switch from the wheat to the airplane sector, and output of airplanes increases while the output of wheat falls.



(Lecture 4, slide 28; International Economics Theory and Policy 11th Edition, page 89)

The welfare of three parties is affected by this change:

- Capital owners are in a better state: output of airplanes increase, wages rise by less than the rise in price of airplanes, so they earn more; relative price of airplanes increases, so they have more purchasing power of wheat.
- Landowners are worse off: output of wheat declines, wages rise while price of wheat is unchanged, so they earn less; relative price of airplanes increases, so they have less purchasing power of airplanes.
- There is a wage increase for workers, but in real terms with regards to airplanes they are worse off while in the case of wheat, they are better off. The resultant impact is unknown as it varies with the personal preference of the labour.

In general, an *increase* in relative price of a good *benefits* the owner of the factor of production specific to that good while hurting the other owner; a *decrease* in relative price of a good *hurts* the owner of the factor of production specific to that good while benefiting the other owner. On the other hand, the impact on the occupationally mobile factor is ambiguous.

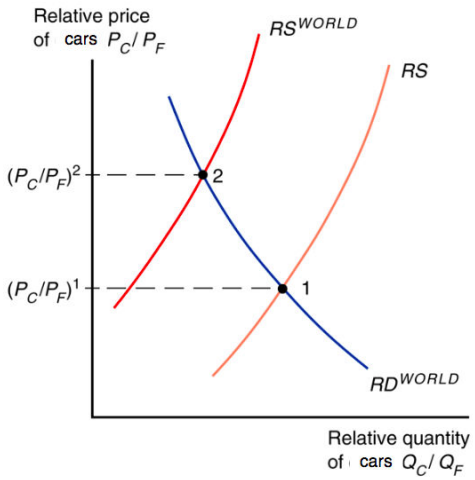
Trade in the Specific Factors model

Countries will trade only if the world relative prices are **different** from the domestic prices in the state of autarky. If the prices were the same, the country would not be incentivized to trade as neither imports appear cheaper to benefit from nor exports would be assuring profits to be made.

The world relative prices are determined by RS (relative supply) and RD (relative demand). The curves have the conventional form; demand is downward sloping and supply is upwards sloping. When a country commences trade, relative prices move due to changes in relative demand and supply. RD changes due to differences in people's **preferences** across countries, different nations may be willing to buy more or less at the same relative prices. RS changes, because firms in other countries can produce goods at a **cost** advantage or disadvantage when compared to Home (due to different technologies and resources).

Example of Home and Foreign with two goods airplanes and wheat:
By assuming that preferences are the same worldwide, the relative demand stays put. Assume Foreign is willing to produce relatively less airplanes at a given relative

price. This could be due to lower productivity in airplanes production or higher in wheat; alternatively, the specific factors which it possesses are unfavourable in the production of airplanes over wheat. Since Home country's relative supply lies to the right of world relative supply, it faces a lower relative price of airplanes domestically which makes it worthwhile to trade internationally. Foreign consumers find this lower relative price desirable and will start making purchases from Home of airplanes which thus increases the demand for airplanes further hiking the prices.



(Lecture 4, slide 41)

Gains from trade

In autarky, the consumption of Home equals its production:
$Q_A = D_A$ and $Q_W = D_W$
(where D_W stands for wheat consumption and D_A for airplane consumption).

After permitting trade, it is possible to produce more/less than consumption and export/import the remaining quantity. Assuming lending or borrowing internationally is not possible, thus only what is earned can be spent:

$P_A \times D_A + P_W \times D_W = P_A \times Q_A + P_W \times Q_W$
This can be rewritten as $(D_W - Q_W) = (P_A/P_W)\ (Q_A - D_A)$, which tells us how much a country needs to export in order to earn the funds for importing. If they earn P_A for an extra unit of airplane exported, then they can buy P_A/P_W unit of wheat in return. Thus, in case $(Q_A - D_A) > 0$, the country export airplanes and in transaction is able to import wheat. Otherwise, if it is lower than 0, the country imports airplanes.

If before trade the country produces a modest number of airplanes and greater quantities of wheat, after opening to trade the bundle it chooses involves greater production of airplanes than wheat. It can export the airplanes and thus consume its budget constraint positions where both amounts of airplane and wheat are greater than in autarky, including bundles outside of the domestic PPF, making them better off.

However, the resultant benefits are not equally distributed. Since trade changes relative prices, the exporting sector will benefit while the sectors that will face international import competition will be worse off. Again, the impact on the occupationally mobile factor is unknown. At an aggregate level, trade benefits the whole economy. There can also be redistribution of such gains to attain more equity, though the situation is usually hard to enforce.

In reality, the impact of trade can deviate from the model: specific factors can be mobile as in the long run, people can acquire new skills, machines can be reprogramed for other uses, etc. While moving between sectors is more difficult for workers, there is little empirical evidence that unemployment has resulted from import competition.

International labour mobility

We can adapt the Specific Factors model to allow for workers to migrate between countries.

Assume there are two countries producing the same good using two factors of production (one of which is labour), and there are diminishing returns to labour. As there is only one product, there is no trade, but workers may wish to migrate if they can earn higher real wages in the other country. People will no longer migrate when the two countries have the same real wages.

For example, if technology is the same but there are more workers in Home than Foreign, and furthermore the real wage is determined by the Marginal Product of Labour (MPL, where w = P*MPL => w/P = MPL). Because of diminishing returns, MPL falls when more people work in the sector, so initially real wages in Foreign are higher than in the Home country. Therefore, if people can migrate, Home workers will move to Foreign, until the real wages are equal.

- Workers initially in Home benefit because their real wage rises
- Workers who start in Foreign lose out because their real wage falls
- Overall, world output rises, as labour moves to wherever it is the most productive.

Similarly, landowners in Foreign benefit (higher output, lower wages) whilst Home landowners suffer (lower output, higher wages).

In practice, there is evidence that between 1870 and 1913, migration led to more equal real wages across borders. More recently, low-skilled immigrants to the USA reduced real wages for low-skilled jobs, and raised real wages for higher-skilled workers, as the produce of low-skilled workers became cheaper.

International Economics – IBEB – Lecture 5, week 2 - The Heckscher-Ohlin model

While the Ricardian model explains that trade stems from differences in the labour productivity, the **Heckscher-Ohlin model (H-O model**) focuses on **resource endowment** which a country is naturally bestowed with. Furthermore, compared to the Specific factor model which assumes occupational immobility in the specific factors, the H-O model permits full occupational mobility of each factor of production. In the long run reality, resources are a crucial factor of trade and are relatively mobile across sectors as well as flexible over time. Therefore, the H-O model can explain trade more easily and practically.

Heckscher-Ohlin model

The assumptions this model makes are as follows ("2 by 2 by 2" version):

1. Labour and capital are the **two** resources in the economy
2. The world is represented by **two** countries only, Home and Foreign

3. The **two** goods represent are the only important goods produced and consumed
4. Labour supply and capital stock are **fixed** in the economy, but vary across countries
5. The firms have **perfect competition** and there are no entry or exit barriers
6. Labour and capital are **occupationally mobile in the long run (not internationally)**
7. The **production function** (technology) is the **same** in the two countries

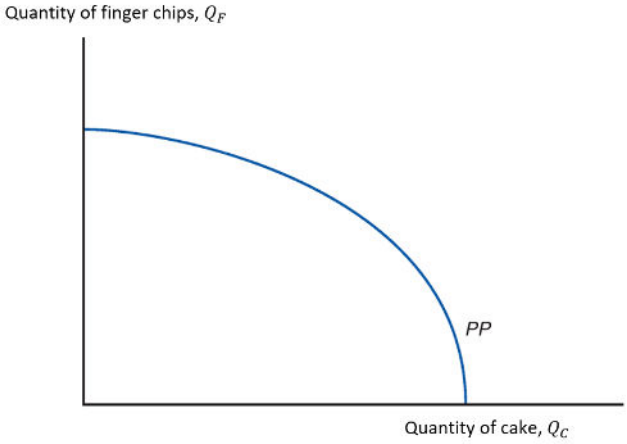
In our example, the two goods produced will be cakes and finger chips. Depending on the resources the **production function** for the two goods are:

$$Q_C = Q_C(K_C, L_C) \qquad \textit{and} \qquad Q_F = Q_F(K_F, L_F)$$

Q is the quantity of goods, while K and L are capital and labour respectively based on C, cake or F, finger chips

The production function is characterized by diminishing returns: each additional unit of labour/capital generates lower additional output when the capital/labour is fixed. *In other words, the larger the initial stock of labour/capital is, the greater the amount of labour/capital is required to produce one extra unit of output. Furthermore, the larger the initial output of one good is, the more labour and capital are released when reducing output of that good.*

The PPF is thus bowed outwards because the opportunity cost of cakes in terms of finger chips increases when the amount of cake produced is higher, and vice versa.



(Lecture 5, slide 10; International Economics Theory and Policy 11th Edition, page 119)

While the PPF shows all possible combinations, the exact mix of production is determined by the profit maximisation prospect. An economy would want to maximise V, value of production, such that:
$V = P_C Q_C + P_F Q_F$
Where P is the respective price of C, cake and F, finger chips and Q is the quantity produced (output).

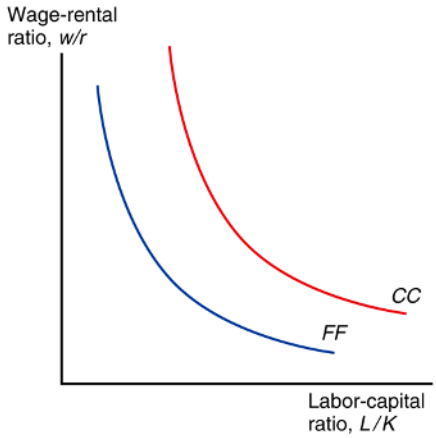
An **isovalue** line shows the combinations of two goods with the same value of production **given the prices of goods**. Assuming a value of production V*:
$V^* = P_C Q_C + P_F Q_F$
$\Leftrightarrow Q_F = V^*/P_F - (P_C/P_F)Q_C$

Thus, the slope of an isovalue line is $-P_c/P_F$

The production possibility represents the maximum capabilities of its resources and the economy will try to attain the furthest possible isovalue line with its given resources. The equilibrium state will be the point at which the isovalue line is tangent to the PPF. Here, the relative price of cake to finger chips equals the opportunity cost. If the relative price is greater than opportunity cost, there is incentive to produce more and sell that good for the other. Contrarily, when it is smaller, workers tend to produce less and use the money earned to buy more of the other good. In both cases, the mobile factors will move to the other good.

Although the prices of goods will determine what to produce, the relative cost of labour and capital, namely wage w and **rental rate** r, will derive the amount of factors to use. Typically, when relative wage to rental rate rises, the labour demand is contracted and capital is used more in producing both cake and finger chips.

Assuming that the finger chips production (FF) is more **capital intensive**, that means for each relative wage to rental rate it employs a lower quantity of relative labour to capital. On the other hand, cake production (CC) is more **labour intensive**, meaning for each relative wage to rent it employs a higher quantity of relative labour to capital. Therefore:
$L_C/K_C > L_F/K_F$

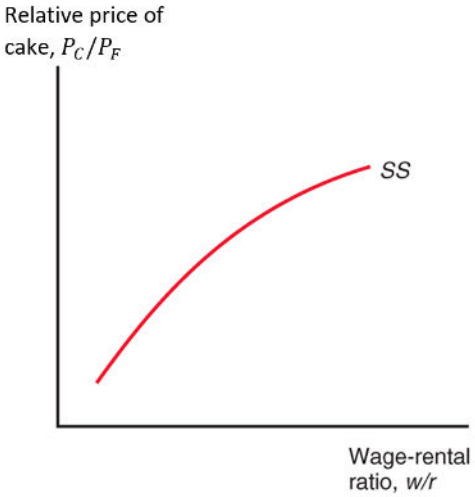


(Lecture 5, slide 21; International Economics Theory and Policy 11th Edition, page 121)

In perfect competition, **normal profit** is made, that is: zero economic profit. This implies that goods prices are equal to the production costs, and production costs are determined by factor prices, so goods prices and factor prices are related. Changes in wages and rents affect the production costs depending on the intensity of use of each factor. If the production of a good uses a lot of labour and a little capital, then a change in wages will affect prices more than a change in rents.

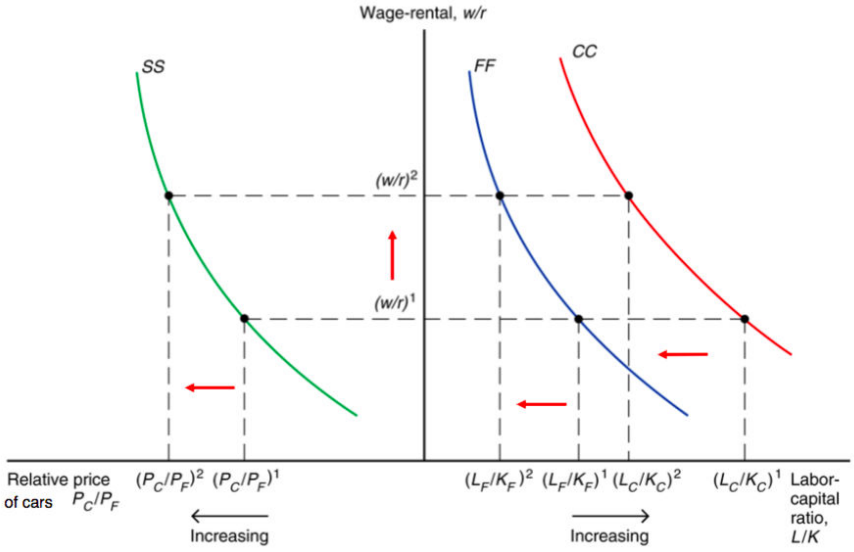
In the case of cake, wage hike will be more detrimental than capital rent hike. As a result, production costs will rise relatively more than in the case of finger chips. Besides, the relative price of cake to finger chips will increase.

Since relative goods prices affect relative factor prices and relative factor prices affect input combination **Relative prices affect input combination**



(Lecture 5, slide 26; International Economics Theory and Policy 11th Edition, page 122)

If the relative price of cake to finger chips increases, some firms will switch to producing cake to earn more. Since finger chips production is capital intensive and is now idle, there is excess supply of capital; in contrast, as cake production is labour intensive, there is excess demand for labour. The wage-rental ratio thus increases and firms will respond by using relatively lower labour than capital.



(Lecture 5+6, slide 29)

As firms use less labour or L/K reduces, marginal productivity of labour or MPL goes up whereas MPK goes down. Since profit maximization implies that w = P*MPL $\Leftrightarrow$ w/P = MPL as well as r = P*MPK $\Leftrightarrow$ r/P = MPK, real wage increases when MPL goes up and real rental rate decreases when MPK does down. After that, the ratio of labour to capital declines in both sectors since the labour has become more expensive in terms of production. Nonetheless, labour will be employed in the production of cake, although the magnitude of employing capital is greater. Overall, resources will be diverted more towards cake production.

Stolper-Samuelson theorem: If the relative price of a good increases, then the price of the factor used intensively in producing that good increases, whereas that of the factor used intensively in producing the other good decreases. Thus, the distribution of income is influenced.

Resource endowments and output

Given fixed goods prices, if the endowment of a resource rises, then output of the good that uses this resource more intensively increases while output of the other good decreases.

Example of when a country's labour population grows can be considered:
If the domestic labour supply increases (however the country is too small to affect the whole world) and relative prices are held constant, then the relative wage to rental rate and the input combination will be unchanged.

This means $L/K = (Lc+ LF) / (Kc + KF)$ increases, but Lc/Kc and LF/KF remain unchanged. This can be explained as follows:

1. This equation has to always hold: $L/K = (Lc+ LF) / (Kc + KF)$
   It can be rewritten as $L/K = Lc/(Kc + KF) + LF/(Kc + KF)$
2. Multiply $Lc/(Kc + KF)$ by Kc/Kc (one) and $LF/(Kc + KF)$ by KF/KF. This multiplication does not change the equality.
3. Now the equality will look like: $L/K = (Lc/Kc)(Kc/K) + (LF/KF)(KF/K)$
4. Note that (KC/K) and (KF/K) cannot both go up or both go down because $(Kc/K) + (KF/K) = 1$. One will go up and the other will go down. In order for equation (1) to hold after the increase in L: capital moves from finger chips to cake production: $(Kc/K) \uparrow$, $(KF/K) \downarrow$. Because the input combination has to remain fixed in both sectors: labour will switch to cake production.

Since the cake production employs more labour relative to the finger chips production, the increase in labour causes the PPF to shift outward in a sense that production bundles represent a greater output of cake compared to finger chips. Overall the number of cakes produced increase and the number of finger chips falls.

Rybczynski Theorem – Holding goods prices constant, an increase in the amount of a factor of production increases supply of the good that intensively uses this factor, and decreases supply of the other good.

International Economics – IBEB – Lecture 6, week 2 – The Heckscher-Ohlin model (continued)

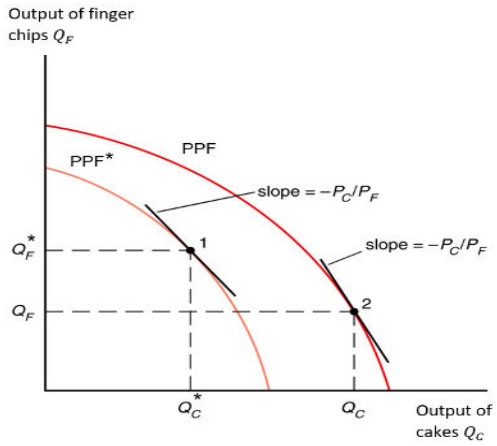
For trade in the **Heckscher-Ohlin (HO)** model, we make the assumption that the production technology and the consumer preferences are the same in both countries; however, what leads to trade is differences in resources, or **abundance**: Home is labour abundant while Foreign is capital abundant. Abundance is measured relatively to another country, and not absolutely, such that **L/K > L*/K*** (where L and K is labour and capital respectively and * denotes foreign's resources), and not L > L* and K > K* (absolute terms). The aggregate quantity of resources has no influence on the relative abundancy since one country can be abundant in only one resource relative to another country.

A stark contrast from the Ricardian model in the H-O model is the assumption that the relative abundance is not too small or too large in either country, so both countries produce both goods instead of strict specialization.

Rybczynski theorem

As previously mentioned, the **Rybczynski theorem** states: if the prices of goods are held constant, and at the same time the endowment of a resource increases, then output of the good that uses this resource in a more intensive sense increases while decreasing the output of the other good.

This leads to the fact that Home will produce more cakes than finger chips since Home is labour abundant and the production of cake is labour intensive.



(Lecture 6, slide 49; International Economics Theory and Policy 11th Edition, page 125)

Equilibrium in trade

The relative demand and supply of both countries help to determine the relative quantity consumed at world price. Because the preferences are the same in both countries, the relative demand curves are equal. Since Home is labour abundant, and cake is labour intensive, the relative supply of cake in Home will always be more than that in Foreign. The similar holds true for Foreign in the case of finger chips. Thus, Home will demand finger chips from Foreign, and Foreign will demand cake from Home. In this way, both goods are relatively cheaper for the importing country. This results in **price convergence** as the demand extends for both good, such that:

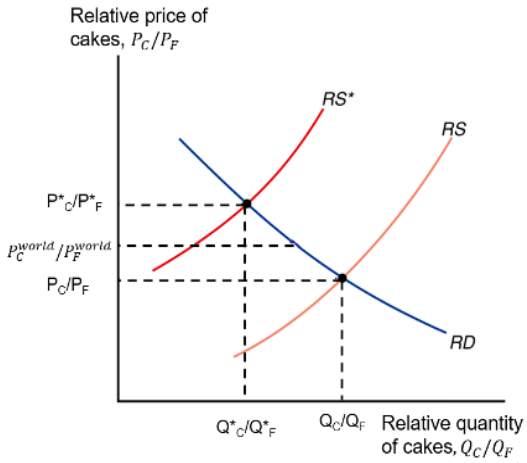
For cake:

$$(P^*_C / P^*_F) > (P^{world}_C / P^{world}_F) > (P_C / P_F)$$

For finger chips:

$$(P_F / P_C) > (P^{world}_F / P^{world}_C) > (P^*_F / P^*_C)$$

In each country, the relative price of the good that uses its abundant factor intensively rises. Thus, Home is incentivised to increase its production of cake and export some to Foreign while Foreign will increase its production of finger chips and export some to Home. This leads to a convergence such that:



(Lecture 6, slide 52; International Economics Theory and Policy 11th Edition, page 126)

The Heckscher-Ohlin theorem

The **Heckscher-Ohlin theorem** states that an economy tends to export goods that intensively use its abundant factors of production and import goods that are intensively produced by the scarce factors of production (no complete specialization).
The relative (goods) prices convergence also predicts that the relative factor prices tend to converge. This is because goods prices equal production costs in perfect competition and production costs depend on wages and the rental rate, given identical production technologies in two countries.

Gains from trade

Similar to the Specific Factor model, a country as a whole gains from trade. In Autarky, a country can only consume what it produces whereas with trade, it can consume more/less by importing/exporting, though only to spend as much as it earns (specified in a budget constraint). However, within a country, there are certain winners and losers in the long run, and redistribution from the better off to the worse off is required in the economy for better equity.

According to the **Stolper-Samuelson** theorem, if the relative price of a good increases, then real wage/rental rate of the factor used intensively in the production of that good rises while that of the opposite factor falls. As trade raises the relative price of the good that uses a country's abundant factors intensively, owners of these

factors end up with higher real income whilst owners of the scarce factor end up with lower real income.

Empirical evidence

Pattern of trade

As predicted by the H-O model, countries will export goods that use its abundant factors intensively. This did **not** hold in the case of the US, a highly capital abundant country, as their capital-labour ratio was higher for imports than exports. (Nonetheless, if the US is considered skill-abundant while the US manufacturing is also relatively skill-intensive, then the model is reflected in the trade pattern.) Globally, the factor abundance interplay in trade does not hold true, either. This is the **Leontief's paradox**.

However, in the case of workers' skills and **North-South** trade (between developed and developing economies), the empirical research supports that exported goods are more skill-intensive and they are produced in the developed countries which are skill-abundant; at the same time, developing countries have the least skill-intensive exports (despite that, skill-intensity and skill-abundance are increasing over time).

Factor price equalization

The huge disparity in earnings of workers between developed and developing nations shows that factor prices are **not** equalized across countries. This is because in reality, countries have different production technologies or one is naturally superior/inferior in terms of technology, so the production costs never coincide between the trading partners. In addition, many economies have different policies regarding minimum wages which interferes with trade equalising wages around the globe.

On the other hand, good prices are also not equal. The first reason is that, although the H-O model negates complete specialisation, some economies in the world can be so supremely endowed with a certain factor that they should only focus on the good that uses this factor intensively instead of producing both goods, leading to lower price of the good being focused on. Another reason is that trade always incurs additional costs such as tariffs, transport costs, etc., so imported goods can eventually be more expensive than the domestically produced. Thirdly, if the usage

of a factor in tradable goods overlaps with non-tradable, world prices of factors will never meet as the factor is demanded domestically for two or more uses and for one use it is not traded. As **factor price equalisation (FPE)** stems from goods price equalization, and good prices are not equal, FPE is thus prevented.

Trade income inequality (winners and losers of trade)

The model predicts that if the income inequality between unskilled and skilled labour is increasing in skill-abundant countries, then it should decrease in skill-scarce economies. However, this does **not** hold, as the gap is increasing similarly to the one of the developed economies.

The model also predicts that the rise in relative price of skilled workers should further contract the employment of these workers in production compared to the unskilled, but this is not yet proven empirically. In fact, the skilled to unskilled employment ratio in all sectors in the US economy is rising. This observation is not an outcome of the H-O model but rather a **skill-biased technological change** – a technological change that requires more skilled workers and that increases their productivity over unskilled workforce, resulting in favourable real incomes for skilled workers. This is starkly opposite to the H-O model, because firms still hire more skilled workers compared to the unskilled (higher relative wage is compensated by higher productivity). Accordingly, skill-biased technological change outweighs the effect of trade openness, especially when it comes to explaining the increased skill premium, i.e. income inequality between skilled and unskilled labour.

International Economics – IBEB – Lecture 7, week 3 - The standard trade model

The **Standard Trade Model** explains the motive for trade by combining the aspects of all three models previously studied: based on differences in relative prices. Relative prices differ as a result of different production possibilities, which is possibly brought about by either differences in technology (Ricardian model) or differences in natural resource endowments (Hecksher-Ohlin model). One thing to note is that the

Standard Trade Model does not specify the reasons for differences between production possibilities. However, we can still examine effects of economic growth and effects of import tariffs and export subsidies without specifying what drives production differences between countries.

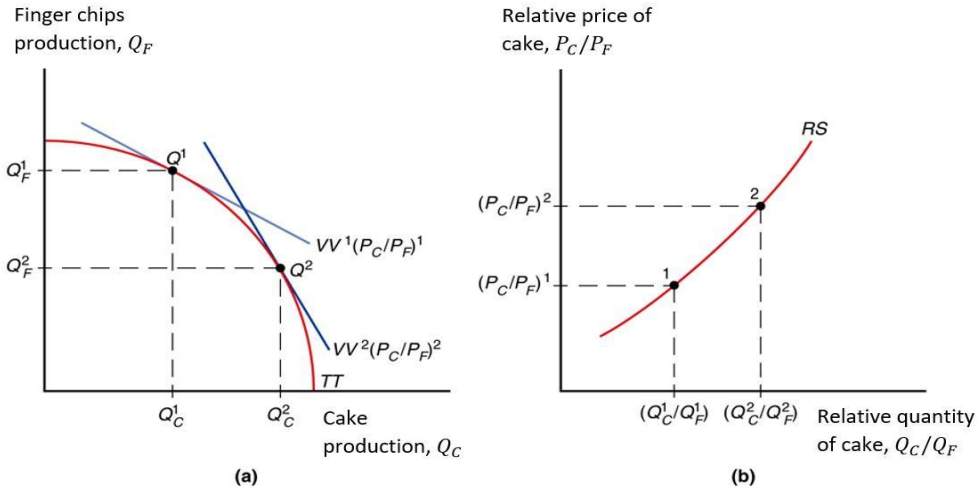
The standard trade model

Assumptions

1. There are two goods (cakes and finger chips)
2. There are two countries (Home and Foreign)
3. Home is relatively more efficient in producing cakes (for any reason possible).
4. Perfect competition with no entry and exit barriers for firms
5. Consumer's preferences in both countries are identical (otherwise, this could initiate trade)

Production - relative supply

We can derive the **relative supply curve** by first choosing different relative goods prices and make those isovalue lines tangent to the PPF. Then, we determine the relative output of both goods from the coordinates of the tangent points. The loci of these points when plotted with axes of relative price and relative quantity represent the relative supply. This is illustrated in the following graph, which implies that when the relative price of a good increases, its relative supply also increases. Overall, production choices are determined by the economy's PPF and prices of goods.

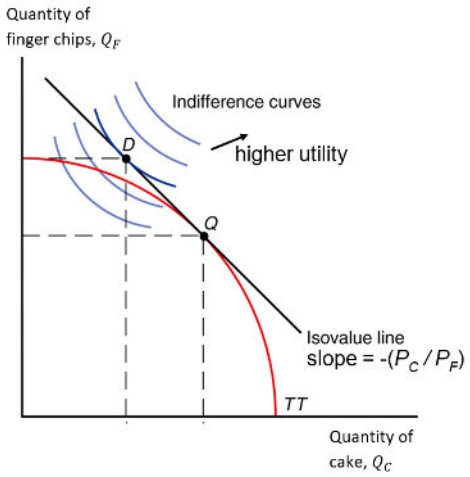


(Lecture 7, slide 7; International Economics Theory and Policy 11th Edition, page 154)

Consumption - relative demand

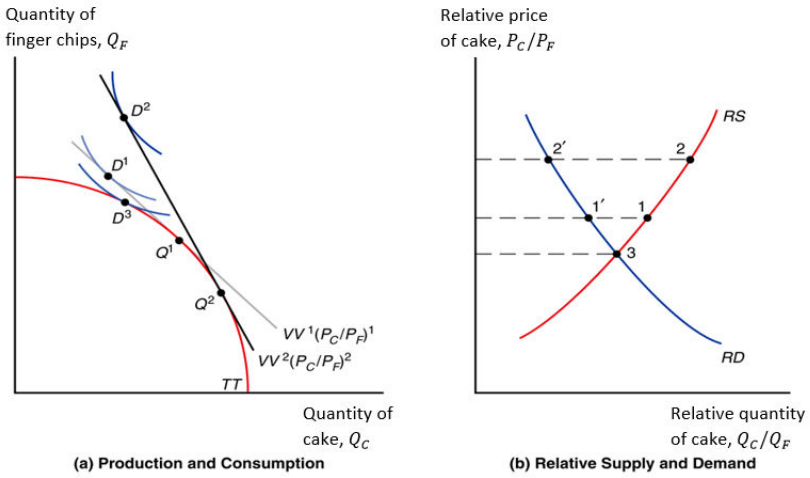
To derive the **relative demand curve**, we take into consideration the relative prices and consumer preferences. Consumer preferences can be represented by **indifference curves**, which give the utility levels of a consumer. All points on one indifference curve are bundles of goods providing the same utility level and, thus, about which a consumer is indifferent. Indifference curves are downward sloping, implying that if you have less of one good you need more of another good to be equally satisfied; the indifference curves further from the origin represent bundles that make consumers increasingly better off as more of both goods can be consumed. The indifference curve becomes flatter moving right and get steeper when tending left, which indicates **diminishing marginal utility** for consumers. When consumers have a lot of one good, they derive less and less utility from additional consumption of the same good while be willing to give up a great chunk of it in exchange for a marginal increase of the other good.

Given the relative prices, consumers would prefer bundles on the highest possible indifference curve that is tangent to the isovalue line. This means they would like to consume more finger chips and less cakes than what the country produces. In autarky, therefore, there is excess supply of cakes relative consumer's demand and excess demand for finger chips relative to trade. However, it is not possible to attain that bundle in autarky since prices will adjust so that supply equals demand.



(Lecture 7, slide 11; International Economics Theory and Policy 11th Edition, page 155)

Therefore, from the country's PPF and indifference curves, we plot the equilibrium state as follows:



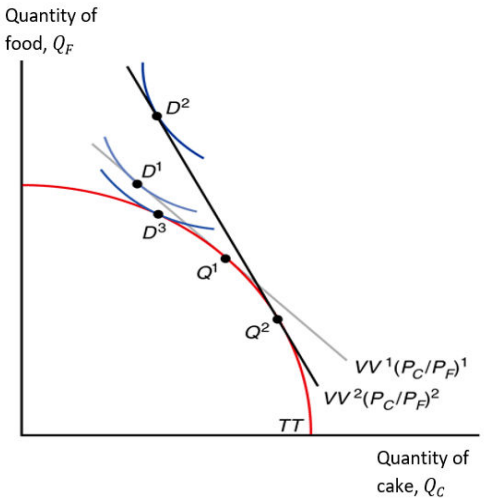
(Lecture 7, slide 12; International Economics Theory and Policy 11th Edition, page 156)

Trade

We assume that the whole world consists of two countries, Home and Foreign. The world relative prices will be determined by **world relative demand (RD)** $(D_C + D^*_C)/(D_F + D^*_F)$ and **world relative supply (RS)** $(Q_C + Q^*_C)/(Q_F + Q^*_F)$. The consumers are supposed to have the same preferences in both countries, so the world relative demand will be the same as the relative demand in each country.

Nevertheless, the relative supply of the world will be different as production possibilities in the two countries are not the same. Based on the assumption that Home is relatively more efficient in producing cakes and Foreign is relatively more efficient in finger chips, it is clear that, at any given relative price of cakes, Home always produces more cakes relative to finger chips and Foreign produces a lower quantity of cake to finger chips (a higher quantity of finger chips to cake): $Q_C/Q_F > Q^*_C/Q^*_F$. Consequently, the RS curve lies to the right of the RS* curve.

When countries open up to trade, the world relative supply will lie in between the Home's supply curve, which is on the right, and Foreign's supply curve, which is on the left. Hence, the relative price of cake to finger chips between Home and Foreign will converge. In the state of autarky, the country will consume what it produces (D^3):



(Lecture 7, slide 17; International Economics Theory and Policy 11th Edition, page 156)

Home is more efficient in producing cakes, so when it opens up to trade, the relative price of cake goes up. In that case, consumers start consuming bundle D^1, which contains less cakes but more finger chips, and which gives them higher utility. If the relative price of cake hikes further, Home will be able to consume bundle D^2 by producing at point Q^2, such that it exports cake and imports finger chips. Since each additional unit of cake can buy more finger chips than before with the increase in relative price, it attains higher welfare (on a higher indifference curve).

This change in welfare is caused by two effects, the **income effect** (income goes up, consumers have relatively more to spend on both goods) and the **substitution effect** (due to higher relative price of cakes, locals buy relatively less cakes than before). Also, note that $D^2_F - D^1_F > D^2_C - D^1_C$. In the example above, income effect dominates since more of both goods are consumed nonetheless.

Terms of trade and welfare

A country's **terms of trade** is the ratio of the price of exports to the price of imports:

$$Terms\ of\ trade = \frac{Price\ of\ exports}{Price\ of\ imports}$$

Based on the previous section, an increase in terms of trade raises the welfare of the country and a reduction in terms of trade lowers it. Despite this, the welfare cannot fall below the state of autarky, otherwise, the country could have not involved in trade at all.

Predictions from the Standard Trade model

Effects of economic growth

Growth is usually biased as it occurs in one sector more than others. For example, in the Ricardian model, technological development leads to growth in one sector only. Meanwhile, the H-O model suggests that increases in resource endowment lead to a biased growth of the sector that uses this factor intensively. In autarky, economic growth is always positive as it improves welfare by expanding production to consumption possibilities. Besides, a country's welfare is not affected by growth in other countries.

When countries do engage in trade, however, biased economic growth has additional effects on welfare in all involved countries. The reason is because it changes relative world prices. If growth is cake-biased, relative quantity of cakes rises so the relative price of cake drops. Otherwise, if growth is finger-chip-biased, relative quantity of cakes falls so the relative price of cake goes up. This means biased economic growth changes terms of trade, thus affecting a country's welfare.

- **Export-biased growth** (growth that enlarges the PPF of a country's exporting sector) **deteriorates** a country's terms of trade and so it has negative effect on its welfare.
- **Import-biased growth** (growth that enlarges the PPF of a country's importing sector) **improves** a country's terms of trade and so it has positive effect on its welfare.

However, the impact greatly depends on where this growth occurs.
In Foreign:

- Export-biased growth in Foreign (import-biased at home) elevates welfare at Home
- Import-biased growth in Foreign (export-biased at home) diminishes welfare at Home
- Unbiased growth would not impact the Home economy

At Home:

- Export-biased growth at Home diminishes the welfare of growth itself.

- Import-biased growth at Home elevates the welfare of growth itself.
- Unbiased growth would be beneficial for the economy.

The example of import-biased growth of China being detrimental for the developed US and European economies does not hold much of empirical evidence. This is because changes in terms of trade have been little in the developed world, while the developing Asian economies are witnessing worsening of terms of trade due to export-biased growth domestically.

Effects of import tariffs and export subsidies

Import tariff is a tax on the price of imports. **Export subsidies** are grants provided by the government to export businesses in order to support, stimulate and protect the exports. Both of these government tools have an influence over terms of trade (and, therefore, welfare) since they deviate the domestic price from that of the world.

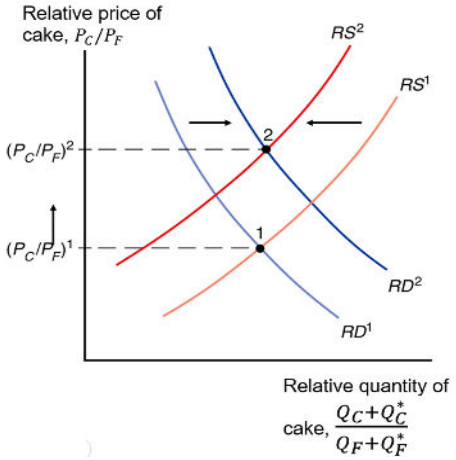
An import tariff of *T*% on a good, makes the home price of that good $P^D = P^{world}$ (1 + T/100), which is higher than the world price P^{world}. An export subsidy rate of *S*% on a good also raises the domestic price compared to P^{world}. If there is a subsidy to export finger chip, the producers who export will earn P^{world} + (S/100)*P^{world}. If home prices were just P^{world}, producers would export the goods entirely, as they would gain more by exporting than by selling to domestic consumers. Producers should then be indifferent between exporting and selling domestically. For this, the price at home should also be P^{world} + (S/100)*P^{world}, which again is greater than P^{world}.

The change in relative prices influences the relative demand and relative supply in that country, and if the country is dominant in the world economy, it can also influence world relative prices.

Suppose tariff is imposed on imported finger chips. As the relative price of finger chips is now higher for domestic consumers, the relative demand for finger chips falls, whereas the relative supply of it increases. These changes will be reflected in world relative supply and demand, impacting world relative prices.

The tariff on finger chip imports in Home drops the world relative price of finger chips and thus raises the world relative price of cakes. Since Home is a finger chip importer and a cake exporter, this elevates Home's terms of trade, while at the same time

dropping Foreign's terms of trade. As a result, Home's welfare increases and Foreign's welfare decreases.



(Lecture 7, slide 44; International Economics Theory and Policy 11th Edition, page 167)

Suppose now that Home issues an export subsidy on cake exports. The export subsidy increases the price that cake producers can get for their product (while exporting). Accordingly, this advances the relative price of cakes in the domestic market. Afterwards, relative supply of cakes starts to increase, and relative demand for cakes decrease. These changes in domestic relative supply and demand will translate into similar changes in world relative supply and demand, and thus influences the relative world prices. Specifically, Home's subsidy on cake exports depresses the world relative price of cakes. Since Home is a finger chip importer and a cake exporter, this lowers Home's terms of trade, while at the same time improving Foreign's terms of trade. As a result, Home's welfare declines and Foreign's rises.

Note: All of this will only hold true if a country is large enough and holds a significant position in the world economy.

Tariffs and subsidies do not only affect welfare, but also distort domestic production and consumption incentives which usually lowers welfare. The overall welfare effect of import tariffs and export subsidies thus includes both this direct effect and the terms of trade effect. An export subsidy definitely lowers domestic welfare; however, an import tariff raises domestic welfare if the terms of trade effect dominates the direct distortionary effect.

In any case, export subsidies/import tariffs by foreign countries on goods that a country (also) imports will reduce the price of its imports and increase its terms of trade (welfare). In contrast, export subsidies/import tariffs by foreign countries on

goods that a country (also) exports will reduce the price of its exports and decrease its terms of trade (welfare).

International Economics – IBEB – Lecture 8, week 3 - Economies of scale

Economies of scale

Developed economies in some sense have similar resource endowments and production technologies, yet there is incentive to trade between those economies. The previous models have failed to incite a reason why there is trade between similar countries: the existence of economies of scale. The models previously discussed all had constant returns to scale. In the Ricardian model, labour is the only factor of production. It shows constant returns to scale as the magnitude of increase of labour (%) is matched by the magnitude of the increase in output (%), regardless of the number of labour employed initially. In the Heckscher-Ohlin model, there are two factors of production (labour and capital). When there is an increase of both factors of production, by the same magnitude (%) the output increases by the same magnitude (%), regardless of the number of labour or capital employed initially.

The previous models also take into account diminishing returns to one factor of production. The diminishing returns to each factor of production and constant returns to scale can both hold true. **Diminishing returns to one factor** means when only one of the input factors is increased by a given percentage, the output produced rises less than that percentage. For example, suppose 10 of units cakes are produced using 10 units of labour and capital each, and either labour or capital is doubled from 10 to 20, then output possibly just increases to 15 and thus by a lower percentage. On the other hand, **constant returns to scale** is when all input factors are increased by a given percentage and the output produced rises by that same percentage. Suppose from the above example, both labour and capital are doubled from 10 to 20, then the production will be as effective as before the increase, so output also doubles to 20 and thus by the same percentage.

If economies have constant returns to scale, alongside similar resource endowment and technologies, then there will be no trade since the relative prices would be the same in both countries. Thus, to explain trade between these countries, we have to consider **increasing returns to scale** (economies of scale). In this case, as all inputs to an industry increase by a certain magnitude x%, output augments by *more than* x%. This implies more efficiency on a larger scale where average production cost lowers as a firm/industry increases its output. Increasing returns to scale therefore incentivises countries to specialise in specific products which they can export, and import the goods that they do not specialise in.

Suppose cakes can be produced such that:

cake output	total labour input	average labour input
1	2	2
2	3	1.5
3	4	1.333333
4	5	1.25

From this table, it can be observed that doubling the input (from 2 to 4) more than doubles the output (1 to 3), so the output is augmented by more than the increase in input. Besides, the average labour input, which implicitly conveys the average cost, is declining with successive increments of input. Therefore, increasing returns to scale is confirmed. However, this also implies that it is more productive for countries to specialise in only one or a few sectors (and trade) than producing goods from many different sectors. Thus, trade will be mutually beneficial if each country specialise and export certain goods while importing the rest from other countries which specialize in other goods. Otherwise, without trade, countries cannot benefit from economies of scale.

External economies of scale and market structure

Economies of scale could mean that either a larger industry or a larger firm incurs lower average cost and be more efficient. **External economies of scale** occur when the average cost depends on the size of the industry. **Internal economies of scale**, on the other hand, occur when cost per unit depends on the size of an individual firm. It

follows that in industries where economies of scale are mostly external, there will be a lot of small firms approaching an environment of perfect competition. Where economies of scale in production are internal, usually a monopoly (or oligopoly) is observed, as internal economies of scale permit a bigger firm to have a cost advantage over smaller firms.

External economies of scale stand to explain industrial clustering such as high-tech in Silicon Valley or investment banking in London. This is because concentrating the production of an industry within one or a few areas can reduce the industry's costs (even if individual firms are small) by the following ways: specialized equipment or services, labour pooling, and knowledge spillovers.

Specialized equipment or services

Specialized equipment or services may be utilised in an industry's production but are only supplied if there is large concentration of buyers. Therefore, firms cluster together to take advantage of their industry's aggregate size. Since individual firms would be too small to deal with directly, and distance could result in substantial transport costs, it is cheaper if the firms are clustered in the same location.

Labour pooling

A large and concentrated industry will attract a pool of workers, thus reducing the search and hiring cost for each of the firms. This concentration is self-reinforcing as individuals in search for (well-paid) job in that industry will automatically relocate there. Eventually, both employers and employees benefit.

Knowledge spillovers

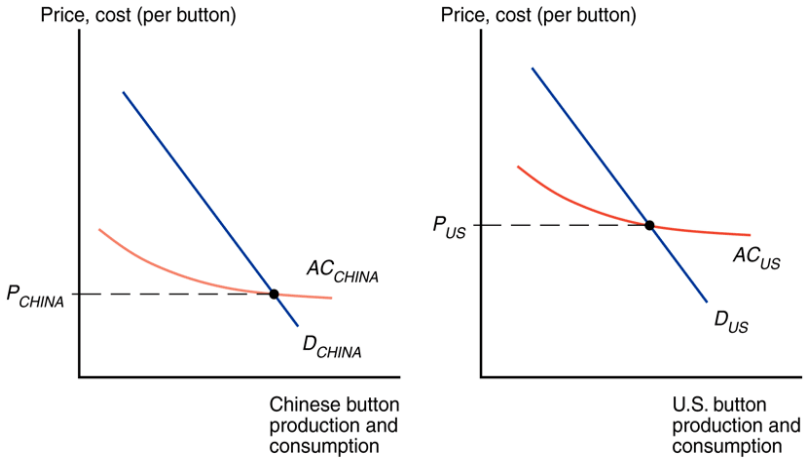
Knowledge spillovers means that employees from different firms, which locate in the same vicinity, have more opportunity to exchange ideas and learn about their competitors.

Assumptions: supply and demand

The external economies of scale exist because of the aggregate industry size. The larger the industry, the lower the average cost. As the source of increasing returns to

scale is external to all firms on an individual basis, many firms compete with each other. The market thus emulates that of perfect competition where prices reflect the production cost, leading to the fact that the larger the number of firms, the lower the prices will be.

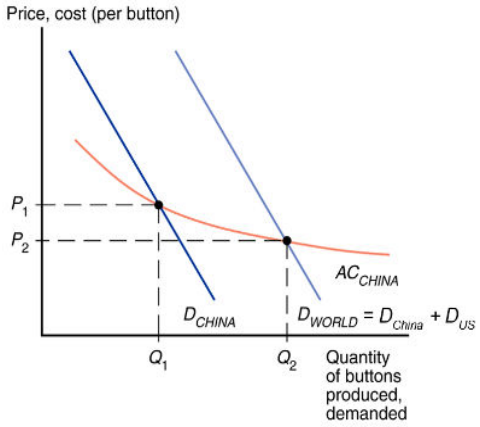
The supply curve in the situation of constant returns to scale is normally upwards sloping, but in the case of increasing returns to scale, production cost decline with growth in industry size, so firms will supply higher quantities at lower prices. The supply curve is thus forward falling, as new firms are always keen on entering to take advantage of economies of scale.



(Lecture 8, slide 24; International Economics Theory and Policy 11th Edition, page 186)

External economies of scale and trade

When the countries open up for trade, China will expand its cake production and the US will contract. This is because China is relatively more efficient, so prices will fall and the output of Chinese industries rises with the decline in American output. Because of external economies of scale, this process reinforces itself: the extra increase in Chinese output lowers average cost even further which in turn lower their prices. In the end, the world demand is met by Chinese producers.



(Lecture 8, slide 26; International Economics Theory and Policy 11th Edition, page 187)

With trade, prices fall in both countries. This is because production concentrated in one country can take full advantage of the external economies of scale. This result is very deviant from the standard trade model, where there is a convergence of relative prices.

Trade patterns are still determined by the efficiency in autarky. Countries can have initial efficiency because of differences in technologies or resource endowments, like that of previous models. Otherwise, with the presence of external economies of scale, efficiency can be reasoned from history, chance or government policy intervention. More specifically, even in the absence of differences between countries, the first country to attract an industry attains an advantage derived from external economies of scale over other countries. As this advantage gets locked-in, that country becomes the world leader in the production of this good. Over time, the external economies of scale further augment this advantageous position. However, just because the country is an initial advantage bearer does not mean that it will always be the most efficient state. Sometimes the 'wrong' location will be locked in, hence preventing a new and more efficient producer from developing.

Generally, countries gain from trade based on external economies of scale. Most of the time, only one country specialises in the production of a good such that the prices are lowest. However, there is also a possibility that individual countries are better off in autarky since they are naturally more efficient in a good production. Those countries are not the world leaders just because of the 'lock-in' of the current leader: sometimes, the price at which the current world leader is supplying is lower than the initial costs faced by the country. However, the country can still reduce its production costs through technological innovation or better educated workforce, or have the prices fall for other reasons. Then, instead of importing from the world

leader, it can protect its own industry and let it grow so as to eventually outperform and competes with the world leader. This difference in efficiency and prices augmented with external economies of scale will divert the entire world's demand to the most efficient country and thus break the lock-in.

Dynamic increasing returns to scale

Economies of scale can arouse in a dynamic sense by building up of knowledge and experience which enhance efficiency. If production costs decline with cumulative industry output over time, it can lead to dynamic external increasing returns to scale (graphically represented with a learning curve). This, similar to static external increasing returns to scale, can result certain effects, including lock-in of initial advantages to certain countries, rapid change in the location of production, and some countries being better off in autarky than with trade.

There have been arguments in regard to the learning curve. For example, the infant industry argument says that countries should be protected from foreign competition initially so as to gain enough experience, and sometimes form a large enough cluster, for competing in the world market. However, in practice, it is hard to identify beforehand which industries to protect and which can never compete. In addition, protection may discourage innovation and efficiency which are vital to having a competitive environment.

External economies of scale are also applicable to **interregional trade**, though differences in endowments are much lower and the factors mobility is very high. Thus, increasing returns to scale is even more important in shaping domestic specialization and trade pattern. One thing to note is that even within domestic borders, there are still many non-tradable services and goods. We can recognize this from the similar share of employment in different non-tradeable sectors across regions. On the other hand, the tradable good production is highly concentrated and localised, typically due to the lock-in from geography, policies, or historical coincidences.

International Economics – IBEB – Lecture 9, week 3 - Instruments of the Trade Policy

To decompose the welfare effects of trade policies for consumers, producers as well as the government at Home and in Foreign, a partial equilibrium analysis has to be approached by isolating the effect on a single industry.

Import tariff

An **import tariff** is a tax levied when a good is imported. There are 2 types of import traffic, namely:

1. **Specific tariff** is a fixed charge levied on the unit of agood. This type of tariff is:
    a. **independent of price** of the good, but **dependent on quantity**
    b. $P_T = P + t$ (where t = tariff, P = Price at home before trade policy)
2. **Ad valorem tariff** is levied as a proportion of the price of the imported good.
    a. Fraction P*Q of imported goods
    b. $P_T = P*(1+t)$ (where t = tariff)

Import tariffs attempt to shield domestic industries against low-price foreign competition.The **effective rate of protection** implicitly measures the change in good prices that firms experience in an industry after the implementation of a trade policy. The effective rate of protection will be equivalent to the tariff rate if a country (1) fully produces the good itself without intermediate goods, and (2) is small enough so it does not change world prices. In other words, $(P_T - P)/P = (P(1+t) - P)/P = t$. However, this does not hold true often as large countries impact the world prices and most traded goods are intermediate ones. If the country/sector is large, $P_T < P(1+t)$ so $(P_T - P)/P < (P(1+t) - P)/P < t$ or the effective rate of protection is smaller than the tariff rate. In the case of intermediate good, the effective rate of protection is also not equivalent to the tariff rate. Suppose a firm pays P^{intm} for the intermediates, the value added by the firm is equal to $P - P^{intm}$. If there is an import tariff, *t*, on *the final good*, this changes the value added to $P(1+t) - P^{intm}$. Therefore, the effective rate of protection:

$$[\,[P(1+t) - P^{intm}] - [P - P^{intm}]\,] \,/\, [P - P^{intm}] = \mathbf{t\,[P \,/\, (P - P^{intm})] > t}$$

If there is an import tariff, *t*, on *intermediate goods*, the value added declines to $P - P^{intm}(1+t)$. And the effective rate of protection is therefore:

$$[[P - P^{intm}(1 + t)] - [P - P^{intm}]] / [P - P^{intm}] = \mathbf{-t\,[P^{intm} / (P - P^{intm})] < 0}$$

Import demand and export supply

The equilibrium of trade can be established through import demand and export supply. An **import demand curve (MD)** reflects at various combinations the difference between the home demand and home supply: the amount of imports. An **export supply curve (XS)** reflects at various combinations the difference between the foreign producers' supply and foreign demand: the amount of exports. The equilibrium in the world hence becomes such that world demand equals world supply.

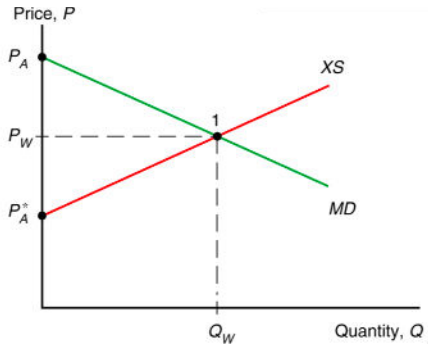
The MD curve intercepts the price axis at P_A which is the price of the good if everything is produced and consumed in the country itself. If price falls, import demand increases, hence the downward slope of the curve.

(Lecture 9, slide 19; International Economics Theory and Policy Eleventh Edition, page 245)

The XS curve intercepts the price axis at P^*_A which is the price of the good if everything is produced and consumed in the country itself. If price rises, export supply increases, hence the upward slope of the curve.

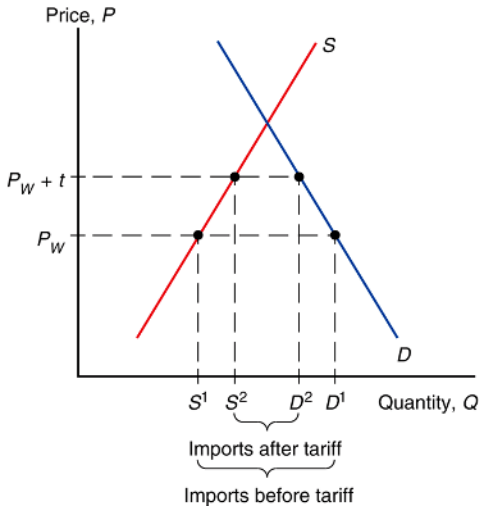
(Lecture 9, slide 20; International Economics Theory and Policy Eleventh Edition, page 245)

As we assume that $P^*_A < P_A$, the MD and XS curves will always cross at the bundle of world price and quantity of Foreign goods imported by Home.



(Lecture 9, slide 22)

If a country is small, an import tariff does not impact the world prices since its demand is not a significant part of the world demand. Therefore, Foreign's prices would not fall and the full impact of tariff is burdened on the Home consumers such that prices change to: $P_T = P_w + t$ (where P_w is the price before tariff). Furthermore, imports are contracted.



(Lecture 9, slide 25; International Economics Theory and Policy Tenth Edition, page 248)

If a country is large, then the tariff can impact the world prices since the higher price influences Home demand and supply. Consumers demand less but producers supply more, causing the prices to go down in Home as well as in Foreign. The trading equilibrium will therefore attest two conditions: (1) home consumers have to be indifferent between buying cakes from Foreign or at home, and (2) foreign sellers should be indifferent between selling cakes at home or to Foreign. This will cause the prices to settle such that:

$$P_T = P^*_T + t \quad \Leftrightarrow \quad P_T - t = P^*_T$$

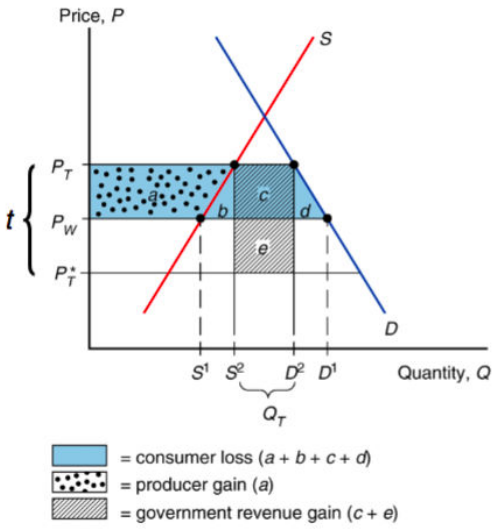
Home's prices rise by less than the imposed import tariff, since the burden is shared with foreign suppliers who supply at a lower price. Nonetheless, the overall increased prices result in the fall of Home's imports and Foreign's exports.

Costs and benefits of import tariffs

In order to assess the **welfare effects**, the concerned parties who have to be considered are producers and their workers; consumers; and the government (as well as the foreigners in case there is a possibility of retaliation). In general, producers benefit, consumers are hurt, and the governments gain tariff revenues.

The welfare of consumers and producers is assessed via the consumer and producer surplus. The **consumer surplus** is the difference between consumers' maximum willingness to pay and the actual price paid. With an increase in price, consumer demand decreases, so consumer surplus falls. The **producer surplus** is

the difference between the price received by the producers and the minimal price at which they would be willing to sell. An increase in price raises the quantity supplied, so the producer surplus is augmented. On the other hand, the government gains tariff revenues equivalent to $t*Q_T$.



(Lecture 9, slide 39)

The overall effect of welfare is thus:

$$\Delta \text{ consumer surplus} + \Delta \text{ producer surplus} + \Delta \text{ government revenue}$$
$$= -(a + b + c + d) + a + (c + e) = e - (b + d)$$

The government gains at the expense of consumers (c) and foreigners (e). If the **terms of trade gain** (e) outweighs the **efficiency loss** by the distortion (b + d), there will be a betterment for the country and this is always with a large country that can influence world prices. A small country will always have a negative welfare impact with the entire tariff cost received by domestic consumers.

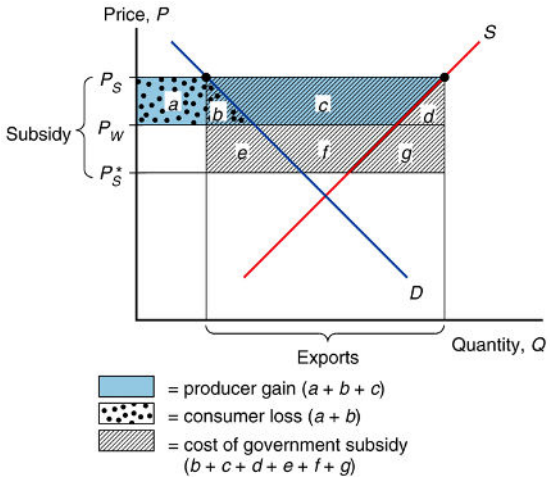
Export subsidies

An **export subsidy** is a grant provided by the government to domestic producers in order to stimulate exports. Export subsidies can be **specific** or **ad valorem** analogous to tariffs. An export subsidy increases the *domestic* price of a good. This results in firms producing more for export, so there is lower supply at home. Accordingly, domestic prices increase. If the country is large enough, this effect could be translated to world markets which then deteriorates the terms of trade (decreased

world prices of agricultural products caused by the EU's Common Agricultural Policy is an example). At home, the equilibrium is such that firms are indifferent between exporting and supplying domestically.

$$P_S = P^*_S + s \iff P_S - s = P^*_S$$

An export subsidy worsens the state of consumers and government, as consumer surplus decreases and government revenues are driven down by the expense of subsidies being $s*Q_S$. However, it increases the welfare of producers by increasing producer surplus.



(Lecture 9, slide 42; International Economics Theory and Policy Eleventh Edition, page 255)

The overall effect on welfare is equal to:

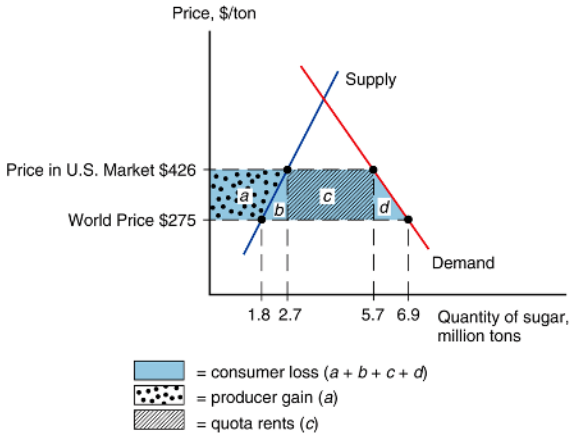
$$\Delta \text{ consumer surplus} + \Delta \text{ producer surplus} + \Delta \text{ government revenue}$$
$$= -(a + b) + (a + b + c) - (b + c + d + e + f + g) = -(b + d + e + f + g)$$

The efficiency loss is equal to $b + d$ and the terms of trade loss (welfare gain of foreigners) is represented by $e + f + g$.

Import quota

An **import quota** is a restriction on the quantity of imported good. A **binding quota** will augment prices as the imports demand outweighs the imports supply (import quota). Thus, producers would benefit, consumers would lose, and the government does not receive any direct revenues. **Quota license holders** receive revenues, also

called **quota rents,** from an import quota. These licenses can be held by firms or governments.



(Lecture 9 International Economics (2018), slide 47)

In the case of the above graph, total welfare equals –(b+d).

Voluntary export restraint

Voluntary export restraints (VER) function like import quota, except that the imposing party is the exporting country. Usually with an arrangement, the importing country requests this policy in return for the relaxation of other trade policy. The profit or rents from his policy are earned by foreign government/producers. As the exporting country can sell a limited quantity at an increased price, the importing country endures a welfare loss.

However, both countries have more policies at their disposal.

Other trade policies

Local content requirement (LCR) is a regulation that requires a certain proportion of final good to be produced domestically. It can be either in value terms (prices) or in physical units. For domestic *producers* of intermediate goods, the LCR protects in a similar way to imports quota. On the other hand, for firms *using* the intermediates, this requirement does not exactly limit the level of imports, but rather allows more imports if more domestically produced inputs are utilised. This typically raises the prices of their intermediates which would be passed on to consumers.

LCR does not provide government revenues or quota rents, but it is also difficult to enforce and often fails to deliver the expected result.

Export credit subsidies = loans that are subsidised to exporters. Its effect is analogous to export subsidies.

Government procurement = when government agencies are obliged to make purchases from domestic producers regardless of stark deviation in price or quality from foreign. Its effect is relatively similar to LCR but only for government purchases.

Bureaucratic regulations = regulations imposed on aspects of safety, health, quality or customs that function as a form of protection and trade restiction. They have the same effect as an import quota.

International Economics – IBEB – Lecture 10, week 4 - Trade policy in practice

Despite the gains from free trade, there exist policies and government interventions that attempt to inhibit it. This is mainly because particular groups who lose from trade lobby to protect their interests. Additionally, retaliation against foreign counterparts may be a motive to implement the policies. Other aspects not explicitly encountered in the models are the infant industry argument, the impact on environment and labour standards.

Politics of trade policy

In democratic countries, politicians promise to influence trade policies in a way that benefit people who vote for them to get more votes. However, there is also a monetary requirement in order to facilitate the campaigning. Political economy models are thus based on the assumption that politicians always attempt to

maximise their own political success rather than national welfare. The two concepts that underlay are **median voter theorem** and **collective action**.

Median voter theorem

The elected officials implement those policies that court the voter in the middle of the ideological spectrum. The assumptions of the models are the following:

- There are two competing political parties
- Only one policy can be implemented
- The objective of each party is to win by majority votes
- Parties keep their promises to the public

The equilibrium result will be such that both parties offer the same policy of median voter. The **median voter theorem** implies that a two-party democracy should always enact trade policy based on the number of voters it pleases. In other words, a policy that inflict losses on many people (consumers) while benefiting a small number of people (import-competing producers) should not be followed. Therefore, no quota, import tariffs, or export subsidies should be imposed.

In practice, however, the agriculture sector in many countries displays an opposite trend: farmers, who make up a small proportion of the voting population, receive generous subsidies and trade protection; for example, under European Union's Common Agricultural Policy, Japan's 1000% tariff on imported rice, and America's sugar quota. Recently, there is an observed protection of high-technology-orientated industries. Moreover, there is an increasing role of tariffs in developing economies in the world. As the median voter theorem does not solely explain these policies which support a small group, a second notion of political involvement is considered.

Collective action

While consumers on an aggregate level gain and have an incentive to advocate free trade, each individual consumer lacks the incentive because his/her gain is not substantially large compared to the cost required to support free trade. On the other hand, for groups where each individual suffers huge losses from free trade (unemployment, bankruptcy, etc.), each individual in that group has a strong incentive to back the policy he/she desires: import tariffs or export subsidies, for example. Their cost to advocate trade restrictions are relatively low compared to the

loss they endure as a result of free trade. Hence, they are not subject to the **problem of collective action**.

Trade policy in practice

Politicians win not only because they promise to impose policies as suggested by the median voter theorem, but they also first require money to support campaigns. This money may be especially gathered from groups who do not face the problem of collective action.

In general, trade restrictions are more prevalent when consumers do not bother to act in their interest strongly, and the special groups make large enough contributions to campaigns for a deviation from median voter theorem to happen. Sometimes, trade restrictions result as a response to another country's trade policy ("tit-for-tat"). In extreme scenario, this may lead to **trade wars**, eventually resulting in all countries to not have free trade and impose restrictions. However, the desirability of mutual agreements between trading partners is substantial.

Multi-lateral trade policy

In a prisoner's dilemma hypothetical scenario, countries without the knowledge of their trading partner would be better off relatively by imposing restrictions, solely based on the threat of other countries' trade restriction. However, the best outcome for all countries is free trade. Therefore, a trade binding agreement can be made. This reinforces the existence of the **World Trade Organization**, bilateral trade agreements and regional trade agreements.

Arguments for free trade

The previous models have pointed out the positives of trade: the expansion of consumption possibilities, the distortion of production and consumption incentives if trade is restricted, and the ability to compensate the losers by redistributive means. Moreover, because of increasing returns from scale, restrictions will limit the gain from external economies of scale. Reducing international competition also leads to unproductive firms, less incentives for being more productive and less learning by trade. Another argument is to make trade not war. Any policy that departs from free

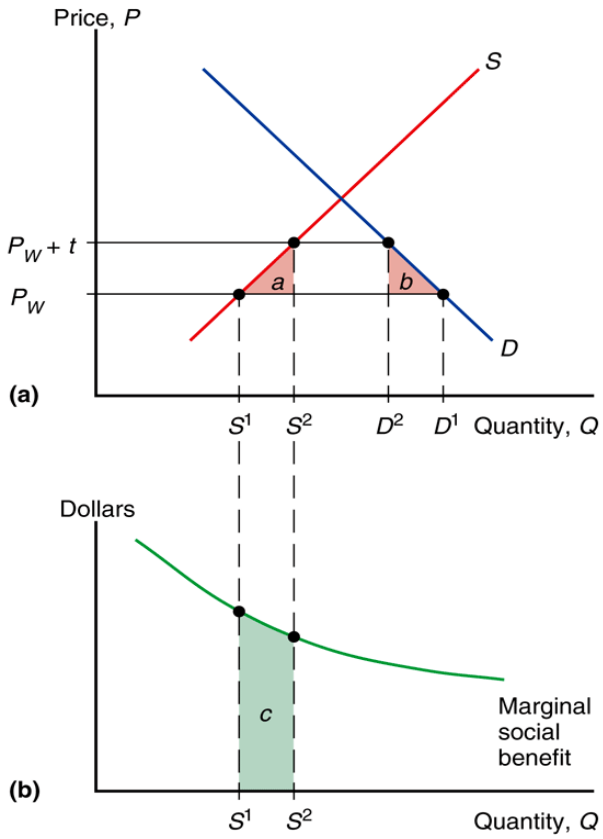
trade would be quickly deployed by political groups in a different way, leading to decreased national welfare, for example:

- **Rent seeking**: people spend time and resources looking for quota and the profit that they will earn, instead of optimally utilising for productive purpose
- **Excessive policy making**: for example, some EU policies inhibit importing of agricultural produce

Arguments against free trade

A theoretical-backed argument is that a **large country** can cause positive welfare effects by means of its trade policy to advance its terms of trade. However, two conditions must apply for this to hold. Firstly, this terms-of-trade effect must dominate the adverse welfare effect from distorting production and consumption incentives, and secondly, other countries do not retaliate. In reality, these are highly unlikely.

The second argument against free trade concerns **domestic market failures**, which include labour immobility, rigid wages, private firms not profiting from their innovation, badly functioning capital markets, environmental costs, etc. It is claimed that these market failures from trade restriction policy should be directly tackled. However, as such can be difficult, trade with tariff can alleviate market failure. Suppose there are positive externalities to production not considered by private firms and investors. **Marginal social benefit,** the extra benefit to people from private production, is not correctly measured by the producer surplus of private firms, so that economic efficiency loss calculations are misleading. When a tariff upsurges domestic production, the advantage to domestic society can rise by increasing the positive side-effects of national production, for example, knowledge spillovers.



(Lecture 10, slide 36; International Economics Theory and Policy Eleventh Edition, page 280)

However, it is uncertain when and to what degree a market failure occurs. Government policies to change market failures can also be deployed politically in powerful groups in an undesirable way. Furthermore, by distorting the incentives of producers and consumers, it can lead to other unintended consequences.

Infant industry argument

Import-substitution policy involves enormously high tariffs, import quotas, or local content requirements. These implementations, previously used by developing countries, attempt to justify the infant industry argument. However, despite some success stories, it is uncertain whether these contributed to economic growth. In reality, many domestic industries were unable to become competitive despite, or because of, these measures. This result in waste of economic resources, time, and in inefficiency.

Economic growth accompanying trade liberalization can be clearly observed in Asian and African economies. Despite this, it is difficult to imply a causal relation between free trade and economic growth. Other factors of education, investment or reforms could be the root cause of these positive effects. Overall, however, evidence supports the free trade.

Anti-globalization

Under **anti-globalization,** trade is bad because rich countries would exploit developing countries' low-wage workers. The argument is that workers are paid too little under bad working circumstances. As is seen, the situation could be worse if these individuals are unemployed, and workers from developing countries have never protested for these problems whatsoever. However, in order to fix this problem, a system that regulates wages and working conditions could be adopted. These policies can only be implemented by the developing countries, not the foreign counterparts.

The 'trade is detrimental for the **environment**' argument again does not consider that environmental degradation is in control of the countries' own government, and pollution is more generally because of consumption. Sustainable development can curb these problems. Nevertheless, pollution haven effect is an issue, in which developed countries outsource the pollution-generating activities to developing ones.

Another reason why globalisation would be a bad thing is that free trade abolishes cultures. However, people are independent to make their own choices, and if they desire goods outside their culture, it should not be inhibited.

Overall, empirical evidence suggests that trade inclines more towards the good side.

International Economics – IBEB – Lecture 11, week 4 - Firms in the global economy

The previous models were unable to explain the drive to trade different varieties of the same goods of the same industry. Correspondingly, perfect competition was assumed. Nevertheless, in reality, the firms size concentration varies and thus perfect competition does not necessarily exist.

Stylized facts

1. Countries trade identical goods (i.e. exporting cars)
2. Countries have similar technologies and resource endowments
3. Intra-trade is more dominant than extra-trade

*Intra-trade is the trade of, for example, western EU countries with other western EU countries.

Grubel-Lloyd index

Similar countries trade different varieties of the good belonging to the same industry **(intra-industry trade)** and have similar technologies and resource endowments. The **Grubel-Lloyd index** helps us to realise the degree of intra-industry trade such that X denotes exports and M denotes imports.

$$GL_i = 1 - \frac{|X_i - M_i|}{X_i + M_i}$$

If the Grubel-Lloyd index is close to 1, it implies that there is a large degree of intra-industry trade. This means that the value of exports = value of imports and the degree of intra-industry has reached its maximum.

If the Grubel-Lloyd index is close to 0, it shows that Ricardian or Heckscher-Ohlin trade is dominant. No need for intra-industry trade

Among the evidence, it has been observed that the sum of north-north trade and south-south trade is greater than north-south trade, which indicates that the intra-industry trade is more over-riding in the economies worldwide. In other words, countries tend to mainly export and import with similar countries and same industries. The north-south trade which captures the Heckscher-Ohlin trade is not very widespread. Nonetheless, the Heckscher-Ohlin model is still very relevant and important, as it is realised that countries still very much specialise in identical goods based on their relative factor abundance. Heckscher-Ohlin and Ricardo model can only explain trade of *different* goods between *different* countries.

However, the Grubel-Lloyd index **does not say anything about the volume of trade** between industries.

Monopolistic competition - introduction

Monopolistic competition bestows to firms the opportunity to reflect some monopoly power by differentiating the product to a certain degree. **Internal economies of scale** are cost savings that accrue to a single firm: average cost of production declines as the amount of output is increased. As a result, there tends to be an imperfect competition with the existence of few large, concentrated firms, resembling a monopoly-like competitive environment. Monopolistic competition and the opportunity to exploit internal economies of scale (increasing returns to scale) causes firms to charge prices higher than $p = MC$ to take advantage of their monopoly power. $p = MC$ leads to losses for these firms as the last unit sold would reflect the substantially reduced cost which accrues due to internal economies of scale, although the initial goods would face higher costs. Therefore, these firms with differentiated products charge $p > MC$.

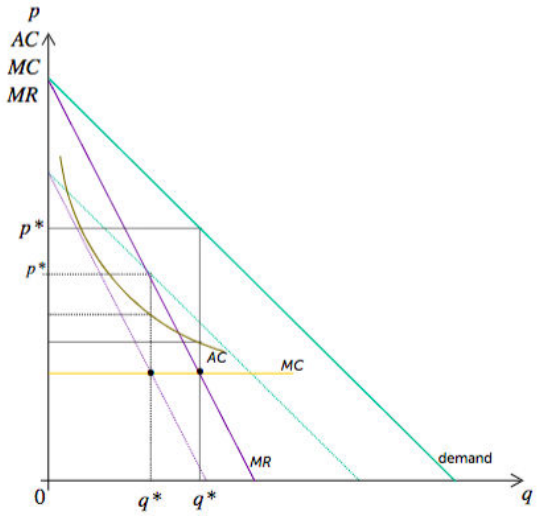
This implies that firms who produce differentiated goods have the ability to influence their prices such that demand will not fall to zero if price increases. Each firm can therefore be the price setter and maximise their profits. The market then resembles a monopoly/oligopoly.

The demand function is such that $q = a - bp$, where q represents the quantity, p the price per unit and a and b are the constants; the **inverse demand function** (price as a function of quantity) is such that p = a / b – q / b; marginal revenue is equal to MR = p – q/ b. Moreover, the **total cost function** is C = F + cq, where F represents the fixed costs, and c is the constant marginal costs.

In order to maximise profits, firms produce where marginal revenue is equal to marginal cost. Since average cost AC = F/q + c declines when the quantity produced increases, AC approaches marginal cost when quantity produced approaches infinity. A monopolist's profit is thus:

$$(p - AC)*q = \text{total revenue} - \text{total cost}$$

With the assumption that there exists no other monopolist, trade liberalisation augments the world market size which in turn increases world demand. Essentially, the monopolist opens itself to foreign demand without trade costs. Because of this, the MC and AC do not change at all. IThen, the marginal revenue curve is more outwards, meaning the monopolist can achieve higher profits, so they are incentivised to export goods.



(Lecture 10, slide 15)

Monopolistic competition is more widespread than monopolies and we would consider their case under certain assumptions:

- A single firm differentiates its products from those of the competitors.
- When fixing its price, each firm takes prices of competitors as given.

Additionally, a single firm sells more if the aggregate demand for a product increases and if prices of competitors increase; a single firm sells less if the number of competitors increases and if the price of its own good increases. Trade liberalisation is reflected by an outward shift of the inverse demand curve.

Monopolistic competition

Assumptions of the model

- Variety differentiation of a single firm to that of its competitors.
- Each firm takes prices of competitors as a given while it sets its price.
- Single firms sell more when: ↑ aggregate demand for the class of product or ↑ price of rivals
- Single firms sells less if the number of competitors and own price increase

The following **demand function** represents the above assumptions:

$$q = S\,[1/n - b(p - \bar{p})]$$

- q = a single firm's sales
- S = overall sales of the industry
- n = number of firms in the industry
- b = parameter showing price sensitivity of sales
- p = price charged by the firm itself
- $\bar{p}$ = the average price in the industry

We also assume that all firms are symmetric, face the same demand function and have the same cost structure. Therefore, the prices and quantity demanded is such that $p = \bar{p}$ and $q = S/n$. The **average cost** is such that $AC = F/q + c = n\,F/S + c$. Therefore, as the number of firms, n, increases, AC upsurges since each firm produces a reduced amount. Finally, as total sales, S, increase, AC declines since each firm produces more.

In order to derive the equilibrium, the demand function can be rewritten as:

$$\text{demand function faced by single firm} \rightarrow q = S[1/n - b(p - \bar{p})]$$

$$\text{inverse demand function} \rightarrow p - \frac{1}{bn} + \bar{p} - \frac{q}{bS}$$

$$\text{Revenues} \rightarrow R = pq = \frac{1}{bn}q + \bar{p}q - \frac{q^2}{bS}$$

$$\text{Marginal Revenue} \rightarrow MR = \frac{1}{bn} + \bar{p} - \frac{2q}{bS} = p - q/bS$$

And for $MR = MC$: $\quad p - \frac{q}{bS} = c \rightarrow p = c + \frac{q}{bS} = c + \frac{1}{bS}\frac{S}{n} = c + \frac{1}{bn}$

The profit-maximising price is therefore sensible as the wedge between p=mc decreases as n increases. Additionally, there is free entry in the market so firms will enter the market until market entry is no longer profitable. Thus, when price exceeds

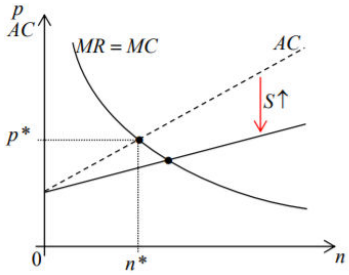
average cost, additional firms enter the market, and when average cost exceeds price, currently active firms exit the market. When price is equal to the average cost, the equilibrium number of firms operate. We thus attain:

$$n^* = \sqrt{\frac{S}{bF}}$$

If otherwise:

- p > AC → firms enter the market
- p < AC → some exit the market
- p =AC → equilibrium number of firms are active in the market. Nobody leaves/enters.

Trade therefore augments market size which in turn results in a decline in average cost, and with a decline in average cost, the number of firms increases as they want to reap advantages of lower cost. However, having many suppliers eventually causes the price to fall. Trade liberalisation, therefore, augments consumers' utility as price is lowered and products are varied, and we assume more variety increases an individual's utility. Below is a graph for the market equilibrium in autarky:



(Lecture 11 International Economics (2018), slide 22)

Accordingly, it can be seen that trade liberalisation impacts price and industry size in an analogous way to economic growth: increasing the number of firms and lowering prices. However, the shares of firms locating in domestic and foreign countries are only determined by their factor endowments. Due to trade, the number of firms 'n' increases, and therefore trade increases market size, lowers AC, and lowers p. In this model, there is therefore an increase in consumer utility (but ONLY with the assumption that more variety increases utility).When a country liberalises trade, aggregate demand increases and the AC curve turns clockwise. Hence, trade liberalisation causes gains from trade. Also, smaller countries gain more due to trade liberalisation in this model.

Trading between similar countries permits product differentiation alongside internal economies of scale being exploited. If products are not varied, the incentive to import different variants of a good from abroad would not exist. Furthermore, without

internal economies of scale, there would be no cost savings to attract production of each variety to concentrate in one location. To add to that, unlike in the previous models, there are still gains from trade in differentiated goods between identical countries, even when there is no comparative advantage relating to resource endowments or technologies. Those gains come from the availability of new varieties as well as lower prices following lower costs. In general, smaller countries gain more from trade liberalisation in intra-industries in comparison to larger countries. Furthermore, the intra-industry represents majorly the manufactured goods which are dominant in the world trade, especially for developed countries.

International Economics – IBEB – Lecture 12, week 4 - Firms in the global economy - continued

Trade liberalisation

Prior to this, we have made the assumption that firms are completely symmetrical and face the same demand function and production technology. However, in reality, there are different types of firms that can be more productive even if they are in the same industry.

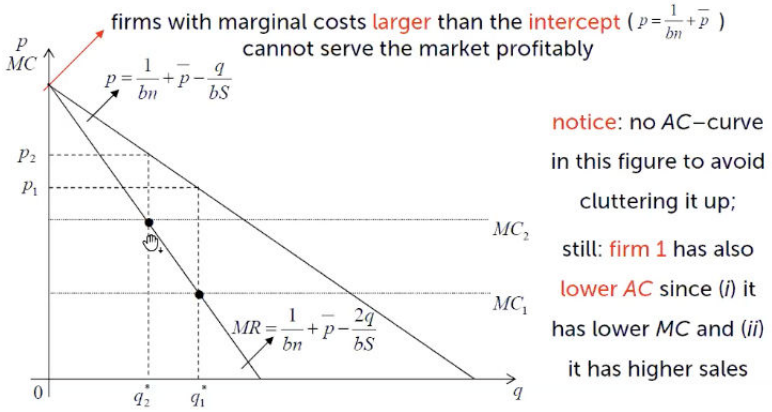
Now, in this lecture, we drop the prior assumption and adapt the reality that there are firms with different levels of productivity.

Trade liberalisation leads to increased competition in the goods and factors markets as the national boundary is no longer prevalent. The previous assumption that all firms have the same production costs also does not hold. After trade liberalisation, the least efficient firms are forced out, the inefficient make losses and only the most efficient ones gain and survive. Thus, there is an increase in the average productivity of the industry which is an additional source of gain from trade.

If the marginal cost of a firm is greater than the intercept of the inverse demand curve, that firm is highly unproductive and cannot serve the market profitably. On the

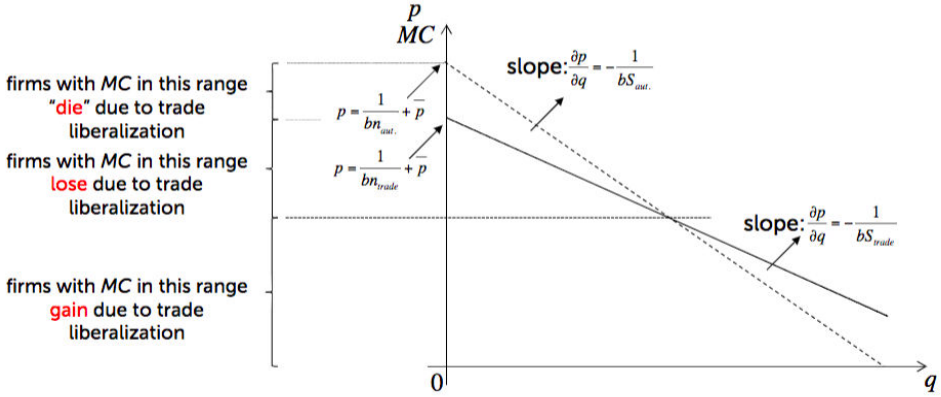
other hand, firms with lower marginal cost will have lower average cost as well as higher quantity of sales at $MR = MC$; hence they make greater profits.

Productive firms with a lower MC sell at a lower price and therefore have a higher amount sold. This is exhibited by the graph below, where firm 1 is more productive.



(Lecture 11+12, slide 28)

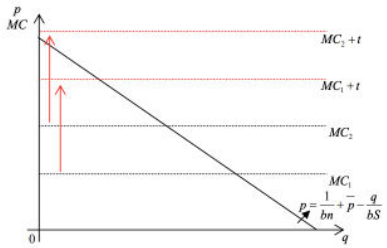
After trade liberalisation, the intercept of the inverse demand curve is lower and the inverse demand becomes less steep, because the slope depends inversely on the market size, which is expanded due to trade. Hene, the inverse demand curve rotates counter-clockwise. This causes some firms, particularly those with marginal costs higher than the intercept of the new inverse demand, to exit the market. For firms that are less productive, it appears that their aggregate demand has shifted inwards, their marginal costs are not too much lower than the inverse demand's intercept, thus they lose. Finally, for highly productive firms, their aggregate demand seems to have shifted outwards (i.e. increased demand), and with much lower marginal costs, they are the only ones who gain. These changes can be illustrated with the following graph.



(Lecture 11+12, slide 29)

From empirical researches, it is realised that the existence of fixed export costs – administrative costs, costs to set up distribution network, transportation costs, time, etc. – increases the marginal costs in international transactions. As a result, many unproductive firms are deterred from exporting, hence a low number of exporters. Most exporters then are large in size and have higher productivity than non-exporters within the same industry.

Moreover, once firms begin to supply to foreign markets, an additional cost 't' is added to their MC equation. Only firms productive enough can afford to supply to foreign markets. In the graph below, firm 2 cannot sell in foreign markets because it's MC + t is higher than the demand line. Hence, only large firms can supply to foreign markets because AC is typically smaller if we assume that quality levels are the same between firms.



notice:

marginal costs for supply to the foreign market is given by $MC + t$

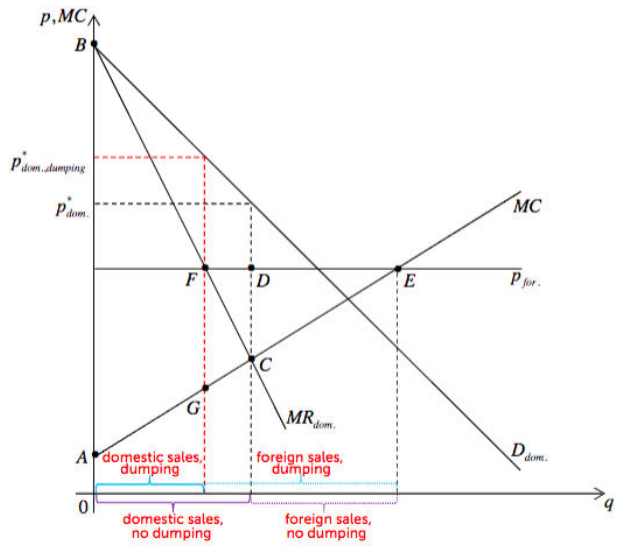
→ only firms with MC_1 export

(Lecture 11, slide 35)

Dumping

Dumping is considered a price discrimination in which exporting firms charge a much lower price to foreign consumers than to domestic consumers. For dumping to exist, two conditions must be met: (1) imperfect competition, where firms are price setters and not takers, and (2), the market is segmented, so it is not easy for goods to be bought in one market and resold in another.

Dumping can be also considered as a profit-maximizing strategy. In this strategy, a firm jointly maximises profit in both Home and Foreign, instead of doing it in each country separately. For example, if the marginal revenue at foreign exceeds that of home, firms have an incentive to sell a portion of domestic sales abroad to maximise profit. Dumping is thus regarded as an unjust trade practice.

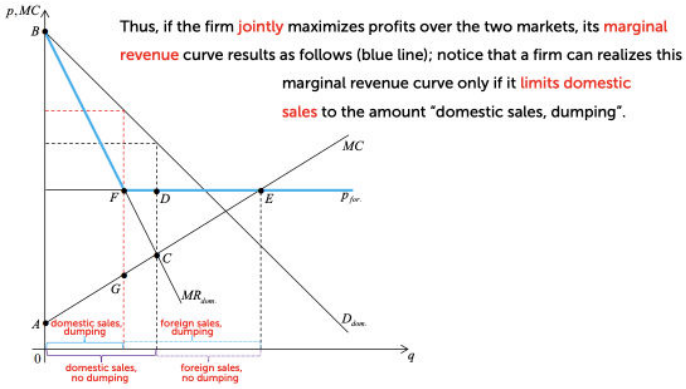


(Lecture 12 International Economics (2018), slide 40)

From the above graph, assuming that the firm faces perfect competition in foreign and imperfect competition at home, we observe the following:

- The profit without dumping is equal to the area *ABC (domestic consumers profit)* + area *DEC (foreign consumers profit)*
- The profit with dumping is equal to the area *ABFG (domestic consumers)* + area *FGE (foreign consumers).* Thus, there are additional profits due to dumping: area *FCD*

This causes the firm's MR curve to become BFE.



(Lecture 12, slide 41)

According to the **World Trade Organisation**, it is fully acceptable for domestic firms to ask for an **anti-dumping tariff** if a foreign firm engages in dumping. The tariff

should raise the price until the price that the foreign firm charges its own domestic consumers equals the price at which it engages in dumping. In this way, domestic firms are not driven out of the competition, so they are protected against more efficient foreign firms. However, from an economic standpoint, dumping makes domestic consumers better off with lower prices.

Multinationals and outsourcing

Foreign direct investment (FDI) are investments in which a domestic firm controls or possesses a firm in foreign countries. If a domestic firm holds at least 10% of the voting shares of the foreign firm, the domestic firm can control the foreign firm's operations, and two firms function as multinational. There are two types of FDIs:

- **Greenfield FDI** is when a company builds a plant from start in foreign
- **Brownfield FDI** are mergers/acquisitions when a domestic firm buys 10% or more of the voting shares of the foreign firm

The top host and also home country of FDI is the U.S. Based on the value of foreign assets as a percentage of total assets, world's largest multinationals include General Electric (U.S.), Royal Dutch Shell (Netherlands/ Britain), BP (Britain), Exxon Mobil (U.S), and Toyota (Japan).

Greenfield FDI has been observed to be more stable over time while Brownfield FDI varies with waves of the macroeconomic and financial climate. The FDIs can be classified in other two ways depending on the nature of involvement:

- **Horizontal FDI** is when a foreign firm imitates the production process of the parent domestic firm
- **Vertical FDI** reflects buyer–seller relationship wherein the foreign firm produces intermediate goods for the parent domestic firm

Horizontal FDI dominates amongst developed economies, and the main reason for it is that firms prefer to locate closer to the largest markets to minimize transport costs or import tariffs. On the other hand, vertical FDI dominates between developed and developing nations, i.e. the parent company bases in the developed country while the affiliate is in the developing one. Such involvement is driven by the incentive to exploit the production cost differences of the countries. However, recently, firms have been reshoring back to home because poor institutional environment of developing economies outweighs the benefits of cheaper labour.

Proximity-concentration trade-off

Horizontal FDI reflects a **proximity-concentration trade-off**, whereby firms have to choose between locating near customers to avoid high transport costs and concentrating production in few locations to exploit internal economies of scale. More often, FDI activity is concentrated in sectors with high trade costs, and multinationals are much larger and more productive than other exporting firms in the same industry.

The trade-off can also be cited as a trade–off between the aggregate trade cost *t(Q)* and the fixed cost *F,* which is incurred in setting a new production plant in Foreign. When t(Q) > F – which is most likely when the foreign market base is large – firms have an incentive to engage in horizontal FDI.

Besides this, firms also have to consider the trade–off between cost savings that accrue due to lower factor costs abroad versus the fixed cost involved in setting the new plant.

On the other hand, while a firm can engage in foreign **outsourcing** from independent firms for intermediate goods, it has to consider another trade-off which entails the **internalisation** decision. In particular, it has to decide between having a vertical FDI and outsourcing. The first reason in favour of vertical FDI concerns technology transfer: it is much easier to transfer the right knowledge and technology within the organization than through market transactions. Moreover, there is a threat of patents and property rights being unable to deter independent firms from copying firm-specific processes. The second reason for vertical FDI instead of outsourcing involves agency efficiency where an internal production process can avoid holdup problems and the consequences of incomplete contracts. However, independent firms are more likely to benefit from internal economies of scale since they repeat this process for many downstream firms, resulting in a high production volume and efficiency.

Dunning summarised the decision-making process for a multinational company to arise in the approach called **OLI**, which are the **ownership advantages** (it is beneficial for a firm to own a foreign plant due to patents or trademarks), **location advantages** (there is low input prices but high transport costs and tariffs) and, **internalisation advantages** (there are costs saved when undertaking foreign production within the firm).

Zipf's Law

Zipf's law shows a strong statistical relationship of geographic concentration in terms of population and the corresponding economic activity. This is done by plotting the logarithm of a city's rank versus the logarithm of a city's population and creating a regression line. This regression line can then be used to estimate the population of a certain city by looking at its population size ranking.

International Economics – IBEB – Lecture 13, week 5 - Balance of payments

International finance considers macroeconomic principles with the drivers of aggregate variables and the interrelationship between them; prices are fixed in the short-run and flexible in the long-run (price and money supply are important factors).

National income

National income in a closed economy is described as the income earned by its factors of production from production and expenditures. In a closed economy, the income of suppliers will always be equal to the expenditures of buyers, as well as equal to the value of production. National income is the income earned by a country's factors of production.

GNP

The value of all final goods and services which are produced and sold by a country's factors of production in a specified time period is measured by **GNP**.

Two important parts of GNP are highlighted. Firstly, it counts only final goods, not intermediate goods, in order to avoid double counting. Secondly, the emphasis is on the own country's factors of production. The factors of production – land, labour, capital, enterprise and natural resources – which are owned by, say, Dutch citizens, are accounted for in the Dutch GNP even if they are used outside the Netherlands. This also means that only nationals of a country can contribute to the GNP of a country (i.e. a French student working in NL does not contribute to Dutch GNP).

4 types of expenditures

GNP consists of four parts:

- **Private consumption (C):** all expenditures by domestic private individuals or households – the main component of GNP
- **Investments (I):** all expenditures by private households on capital, such as building, infrastructure and equipment
- **Government consumption (G):** expenditures by government on various products and services
- **Current account (CA):** the value of export minus imports; in other words, net expenditures by foreigners on domestic goods and services

Private consumption normally dominates the calculation of GNP in a country.

More precise measure of national income

A more precise measure than GNP will take into account **depreciation** of physical capital as machines become obsolete over time. Furthermore, the GNP does not cover **unilateral transfers,** which include payments of expatriate workers to the home country, foreign aid and pension payments to expatriate retirees. Since the net value of such sources of money is still income, we have:

$$GNP - Depreciation + Unilateral\ transfers = National\ income$$

Typically, depreciation and unilateral transfers are harder to account for as they are exogenous to government policies. GNP and national income are thus used interchangeably.

GDP

GDP measures the value of all final goods and services that are produced within a country in a specified time period. Here, the geographic border is emphasised. This implies that, unlike GNP, there is no consideration of who owns the factors of production in the concept of GDP. Hence, the nationality of the producer does not the GDP of a country.

*GDP = GNP – Payments from foreign for domestic factors of production**
+ Payments to foreign for foreign factors of production
= GNP – net receipts of factor income from foreign countries

**Payments from foreign for domestic factors of production* are subtracted because these factors of production are bought by foreign countries for them to use in their *own* production.

Typically the difference between GDP and GNP is relatively subtle. If GNP/GDP < 1, an economy's earning is dominated by foreign factors of production. National welfare depends more directly on national income than on domestic products, and GNP tracks national income more closely than GDP does, so we will focus on GNP.

National income accounts in an open economy

Consider an open economy. National income is the value of domestic production, and domestic production in this case is only considered if it is sold. Expenditures by foreign households on domestic products and those by domestic households on foreign products are included in the **current account (CA)**.

$$CA = EX - IM = Y - (C + I + G)$$

Exports > Imports

If exports are larger than imports ($EX > IM$), the country earns more from selling on the world market than it spends on purchasing goods and services from foreign counterparts. Thus, its net foreign wealth is increasing. This means that domestic

households finance the consumption of foreign households. In future periods, the domestic country can produce more than it consumes.

Exports < Imports

Meanwhile, if exports are smaller than imports **($EX < IM$)**, the country earns less than it spends on importing from foreign counterparts. The net foreign wealth is decreasing, which is reflected in a current account deficit, but it does not become negative. This is not necessarily something positive or negative, but rather depends on the country's preferences and plans for the future. This is only negative if we care about future generations more, as they would have to produce more in the future. A current account deficit implies that the country consumes more than it produces.

National savings

National savings (S) are that part of national income (Y) which is not spent on consumption (C) or government purchases (G). Assume that:

- Y = National income of private households
- C = Total expenditures om consumption of private households
- T = total tax payments of private households
- G = Government purchases

So:

$$S = Y - C - G \Leftrightarrow S = (Y - C - T) - (T - G)$$

$$S = S^P + S^G = private\ savings + government\ savings$$

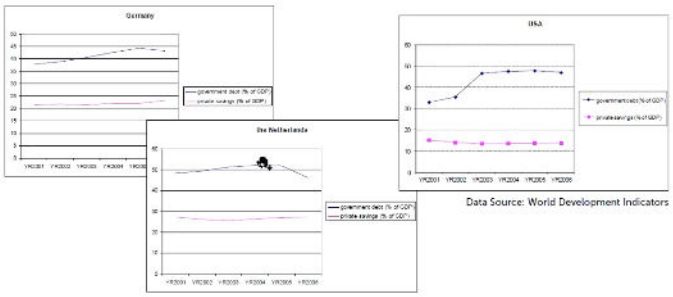
We know that $CA = Y - (C + I + G) = (Y - C - G) - I = S - I$. Therefore

$$current\ account = national\ savings - investment = net\ foreign\ investment$$

When imports are larger than exports, national savings are low relative to investments. The government deficit could be either negative or positive and is equal to government savings $(T - G)$. High government deficit can lead to a negative current account, assuming other factors are unchanged.

$$CA = S^P + S^G - I = S^P - government\ deficit - I$$

Whether or not a huge public deficit leads to a current account deficit depends on whether other factors, such as private savings, remain constant. When Ricardian equivalence holds, ↑ public deficit = ↑ private savings.



(Lecture 13, slide 26)

In the graphs above, none of the countries depict Ricardian equivalence. This is because the two lines (which stand for public deficit and private savings) are *not parallel*.

Balance of payments (BoP)

The **balance of payments** reports all the transactions between a domestic and a foreign country. The sum of which must equate to zero. The crucial accounts of the BoP are:

- **Current account:** imports and exports of goods and services
    - This includes merchandise, services, income receipts, import/exports of capital and labor
    - Logically, the CA must equal zero, but this is not the case in real life. This is normally due to the time it takes to ship items and due to rounding errors.
- **Financial account:** imports and exports of financial assets

It also contains the **capital account**, which records the flows of special categories of assets: typically non–market, non–produced, or intangible assets like debt forgiveness, copyrights and trademarks. Statistical offices typically choose the value of these special assets to make the value of the BoP equal to zero.

Each transaction enters the BoP twice, both as a credit (+) and a debit (-), according to double-entry bookkeeping. The BoP balances by the following formula:

$$Current\ account\ +\ Financial\ account\ +\ Capital\ account\ =\ 0$$

In particular, the CA consists of merchandise, services and income receipts (interest and dividend payments, earnings of firms and workers operating in foreign). The capital account records special transfers of assets – typically of negligible importance. The financial account has both positive and negative entries. If it is a financial inflow, i.e. domestic assets are bought by foreigners, it is considered a credit (+) as the domestic economy gains cash. If it is a financial outflow, i.e. domestic citizens purchase foreign assets, it is recorded as a debit (-).

While it is common to assess and rank countries based on national income figures, this is not always effective because there are differences in work culture and various other factors. Thus, national income cannot be the best representation of the citizens' welfare. There is a broader measure to evaluate the nations' welfare: the **Human Development Index (HDI)**, UNDP, which calculates 1/3 life expectancy, 1/3 GNP per capita and 1/3 literacy rate.

International Economics – IBEB – Lecture 14, week 5 - Money, interest rates and exchange rates

The interest rate is the opportunity cost of holding cash, i.e. the price of money in a country, while the exchange rate is the relative price of national currencies.

Money

Money used as a means of payment can be in the forms of currency in circulation, checking deposits or debit card accounts. Most importantly, money is a **liquid asset**, which implies that it can be used to pay for goods and services without substantial transaction costs. The disadvantage of a liquid asset is that it earns little or most often no interest**. Illiquid assets**, on the other hand, require massive transaction costs in terms of time, effort, or fees to be converted into means of payment, but they earn higher interest than liquid assets. They often lead to higher returns. The division

between liquid and illiquid assets is nonetheless subjective. Most often, liquid assets consist of currency in circulation, checking deposits, debit card accounts, savings deposits, and time deposits (which earn higher interest than savings deposit but are sometimes non-accessible). Illiquid assets include bonds, loans, deposits of currencies, stocks, real estate, works of art, etc.

Money supply and demand

Money supply

Money supply is the amount of money in circulation in the country. Its quantity is controlled by the central bank. The ESCB (European System of Central Banks, which consists of the ECB and the NCB of member EU states) controls the monetary base M^S of the euro and indirectly influences checking deposits, debit card accounts, and other monetary assets through the regulation of the banking sector.

Money demand

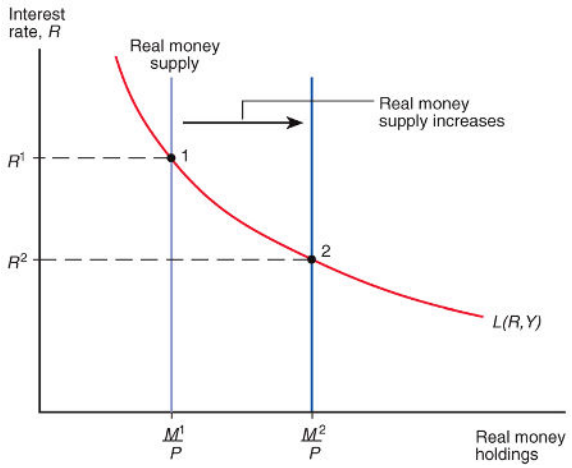
Money demand is the amount of money people want to hold instead of the illiquid assets. Money demand can be individual and aggregate. Considering **individual money demand**, the determinants are the (1) interest rates on non–monetary assets and (2) the risk of unexpected inflation which lessens the purchasing power. Another factor is (3) liquidity: the need for liquidity rises when the price of each transaction and the number of transactions increase. On the other hand, regarding **aggregate money demand**, while (a) interest rates on non-monetary assets also influence demand, the other factors are (b) prices and (c) income. In fact, if the price of a product is higher, the demand for money will be higher. Besides, with higher income, the demand for goods and services will increase, thus more money is demanded. **Inflation is not important in explaining *aggregate* demand,** as while lenders lose, borrowers gain. Aggregate money demand can be expressed by the formula:

$$M^d = P \times L(R, Y)$$

P denotes the price level, *Y* the real income, *R* the interest rates on non–monetary assets, and $L(R,Y)$ the aggregate real money demand.

The aggregate money demand is often written in the equivalent form: $M^d/P = L(R, Y)$. This shows that for a given Y (income), aggregate real money demand decreases as the real interest rate increases, i.e. it is costlier to hold money. In case of an increase in Y, the curve would shift to the right, meaning that when income increases, the real money demand increases given an interest rate.

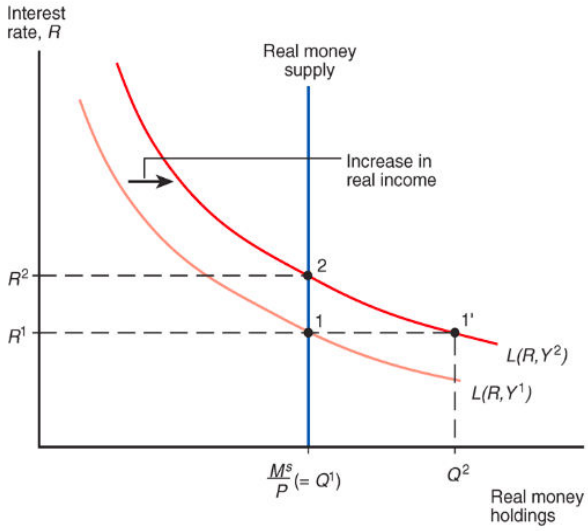
The **money market equilibrium** is acquired when interest rate adjusts so that supply meets demand ($M^s = M^d$). Alternatively, it can be written as $M^s/P = L(R, Y)$. If $M^s > M^d$, the demand will not go up unless people pay a lower interest rate. So, the interest rate falls and households will demand more money until their demand equals the supply. Alternatively, if $M^s < M^d$, households demand more money and some of them will be willing to pay higher interest rates, thus the interest rate will increase till the equilibrium is reached again. Hence, it is the interest rate that adjusts to make money supply equal to money demand.



(Lecture 14+15, slide 15; International Economics Theory and Policy 11th Edition, p. 423)

When **real money supply** increases, households will be willing to pay a lower interest rate, so the equilibrium will move to point 2. If the supply decreases, households would be willing to pay higher interest rates.

When Y (income) increases, this affects the demand for money, and $L(R,Y)$ shifts upwards, leading to higher interest rates in equilibrium.

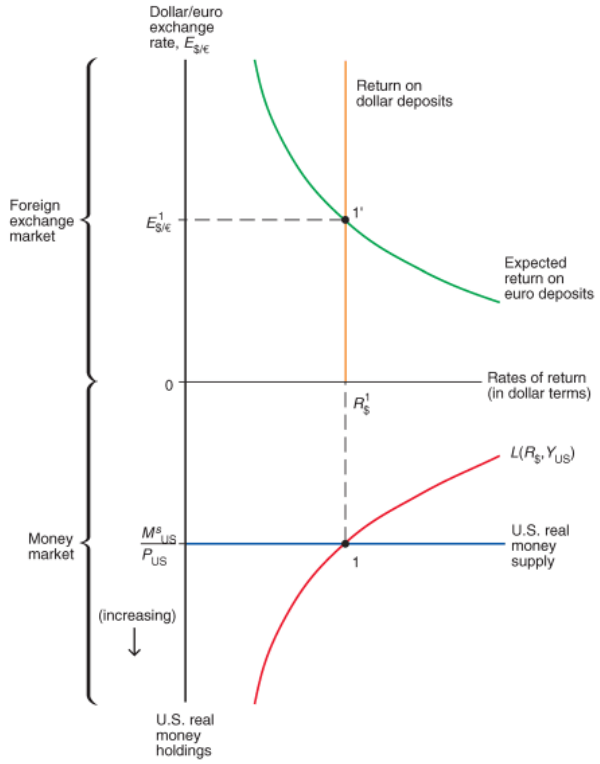


(Lecture 14+15, slide 17)

**If income increases for a given interest rate, the red curve shifts to the right.*

Money supply and the exchange rate in the short-run

Short run is the situation in which goods prices are fixed. In the short run, prices are sticky (due to 'menu costs': costs of repeatedly changing prices in accordance to fluctuations in the inflation rate). So far, we have considered a single market with a single money market, and now we will consider two separate markets: the US and the EU. This means we now have two currencies, the dollar and the euro.



(Lecture 14+15, slide 19; International Economics Theory and Policy 11th Edition, p. 425)

The lower part of the picture demonstrates the equilibrium for the home country – the US – in the money market. It is the same graph introduced previously but rotated by 90 degrees. The upper figure represents the relationship between the returns on deposits and the $/€ exchange rate. Whenever the exchange rate increases, investors have to pay more dollars to get 1 euro, thus there is a **depreciation** of the US dollar. Note that the returns on deposits denominated in US-$ are not influenced by the $/€ exchange rate. The yellow line which illustrates this fact is thus vertical. However, the returns on €-deposits decrease when the $/€ exchange rate increases. The reason is because investors have to pay more today regardless of future changes in the $/€ exchange rate. Hence, whenever the exchange rate increases, the value of the domestic currency relative to the foreign currency decreases.

At point 1, the two lines intersect so the money market is in equilibrium. There, the returns on investments of both types are identical, so the investors do not have an incentive to change $–deposits into €–deposits, i.e. to supply $ and demand €.

Look further into the impact of the exchange rate. When the US Fed increases the money supply, the interest rate on US non-monetary assets in dollars decreases. As there is now higher interest rates for assets denominated in euros, the demand for it

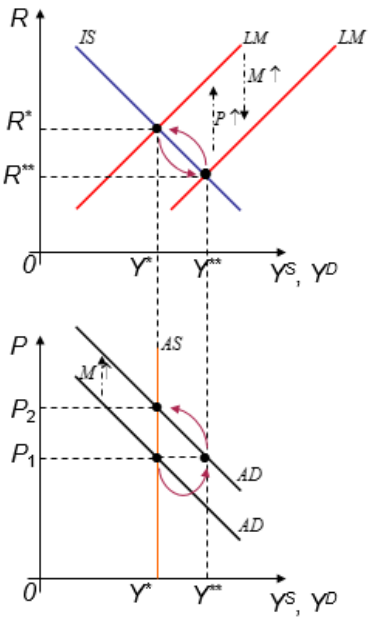
increases. Investors thus supply dollars and demand euros. Consequently, the exchange rate increases and the dollar depreciates.

Otherwise, there can be an increase in €–money supply. This decreases interest rates on non–monetary assets in the EU for a given exchange rate, and investors demand more assets denominated in dollars than they did before. Therefore, the green curve shifts to the left. This means that investors will sell more EU assets and demand US dollars, leading to an appreciation of the US dollar.

The long run

In the long run, both final goods and factor prices are flexible, meaning factor prices adjust to clear factor markets. Then, real output and income level only depend on a country's factor endowments and technologies, and not on money supply. Since real output and income level are independent of money supply, it follows that the interest rates are also independent of money supply. In this case, price levels adjust so that real money supply does not increase.

Short-run vs. long-run



(Lecture 14+15 International Economics (2018), slide 26)

If there is an increase in money supply, a shift of the LM curve (which shows the combinations of interest rates and levels of real income for which the money market is in equilibrium) occurs to the right. After this shift, the markets are not in equilibrium, so the interest rate *R* will decrease in order to establish an equilibrium in the money market again. The lower interest rate *R* increases the domestic demand for investment goods, so the aggregate demand *AD* increases for a given price level *P1.* This is a short–run equilibrium.

After a while, firms will understand that the increase in the money supply is permanent and they will adjust prices to *P2*. This leads to a return to the equilibrium of the beginning. Thus, in the long–run, *R*, *Y*, M^S/P are unchanged. An increase in money supply leads to a price increase which compensates for the higher level of money supply, so that real money supply stays unchanged.

Money, interest rates and exchange rates – continued

The long–run relationship between money supply and the price level can be derived as follows. Firstly, we rewrite $M^s = L(R, Y)$ into $P = \frac{M^s}{L(R,Y)}$. Then, the change in price levels will be: $\ln ln\, P = \ln ln\, M^s - \ln ln\, L(R, Y)$ which is also:
$\frac{\Delta P}{P} = \frac{\Delta M^s}{M^s} - \frac{\Delta L(R,Y)}{L(R,Y)}$

According to the above equation, when the money supply increases, prices increase as well if there are no simultaneous changes in L.

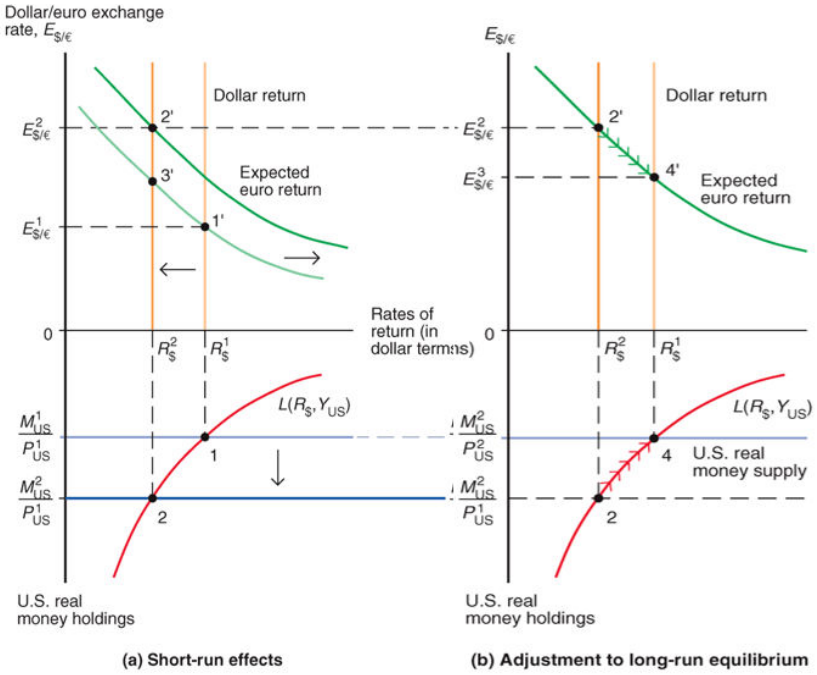
Effects in the long run

When there is an increase in US money supply, there is a decrease in interest rates on US non–monetary assets. In the long run, an important factor for consideration is the expectation about exchange rates in the future.

Following the decrease in interest rates, the increase in money demand causes investors to expect a future increase in money supply. The expected returns on €-denominated assets thus grow, i.e. the dollar is believed to be less valuable than the euro. Consequently, the green curve shifts to the right. Since at this point, the $/€

exchange rate has risen, the demand for $-denominated assets drops while the demand for €-denominated assets surges. In the foreign exchange market, then, increased demand for the € and increased supply of the $ result in a depreciation of the US–$ (panel a).

In the long run, workers demand wage compensation which increases production costs and, hence, prices. The money supply increase is now regarded as permanent. This means that *real* money supply in the US declines. As a result, the interest rate hikes which implies that the returns on US–$ assets increase (lower panel, figure b). If the returns on US-$ assets increase, investors will demand more $-denominated assets and less €-denominated assets. Thus, more euros are supplied while more dollars are demanded. The US dollar appreciates (upper panel, b, leads to point 4'). Note that the equilibrium exchange rate in the long run is still higher (dollar has still depreciated) than the one before the increase in money supply in the US.

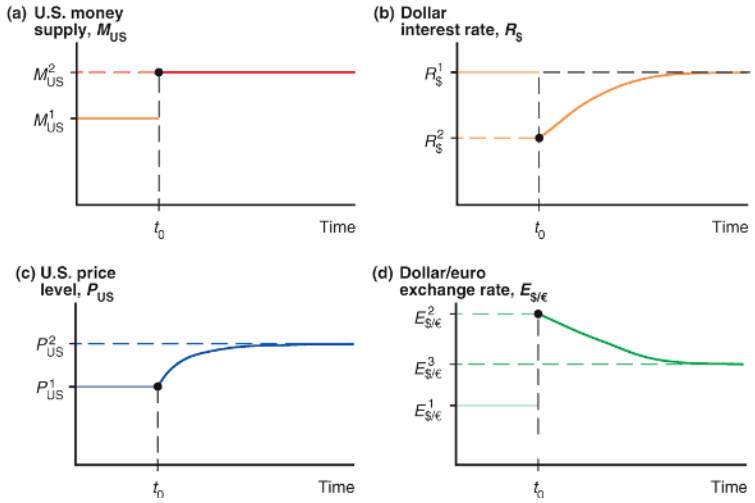


(Lecture 14+15, slide 32 and 33)

Exchange rate overshooting

The evolution of all variables over time in the long run are summarized by the graphs. The interest rate falls sharply and then improves over time (b), whereas prices adjust gradually (c). Finally, due to expectations, the exchange rate increases more than its new equilibrium (overshoots), and then eventually corrects to some degree by reaching a new equilibrium (d). This large rise in the beginning for the exchange rate

is called **exchange rate overshooting**. There is initially a great depreciation of the domestic currency, which is followed by a minor appreciation as prices adjust. The overshooting idea highly relies on the *sticky prices*' theory in the short run, as changes in nominal money supply have a *short–term effect on real money supply* but eventually real variables return to the original level.



(Lecture 14+15, slide 34)

Short-run vs. long-run in an open economy

Consider an open economy. Short-run reasoning is based on the idea that prices are sticky because of menu costs. The long run suggests that final goods prices and factor prices are flexible; besides, real output and income level only depend on a country's factor endowments and technologies, and nominal influence cannot last long. Most importantly, the economy's final output cannot hinge on monetary policy.

In the short run, a domestic increase in their money supply leads to a depreciation of domestic currency but an appreciation of foreign currency. Contrarily, a decrease in the domestic money supply leads to an appreciation of domestic currency and depreciation of foreign currency. In the long run, however, an increase in money supply in the home country amends both the home market and the foreign market due to the expectations of the investors. At last, an equilibrium is reached at the point where real money supply is at the same level as it was before the increase. Only the exchange rate jumps abruptly at first, and then decreases slightly afterwards.

International Economics – IBEB – Lecture 15, week 6 - Price levels and the exchange rate in the long run

In this lecture, we will have a look at exchange rates in the long run (where goods prices are perfectly flexible) and the relationship between domestic goods prices and foreign goods prices.

Law of one price and PPP

The **Law of One Price (LOP)** indicates that when there are no tariffs or transport cost and the market is perfectly competitive, the prices of the same good across countries are the identical when expressed in the same currency. If prices would vary in the case of no transport costs, there would be **arbitrage trade**, which eventually would still lead to the same outcome of identical prices due to the forces of demand and supply. However, LOP hardly holds in reality. The first reason is that there are different taxes across countries. Secondly, there are transportation costs and differences in production costs under multinational activity. The third reason is transportation costs combined with different forms of competition. For instance, a monopoly in the home market will charge higher price at home while acting under perfect competition rules in the foreign market.

The Law of One Price states that the same good will eventually have the same price everywhere after converting currencies, meaning $\sigma = S\frac{P}{P^*} = 1$.

This is because cheaper price of a good in country A will raise demand there and decrease demand in country B. As a result, prices in country A go up while that in country B goes down. The cycle, called arbitrage, continues until SP = P*.

Most of the time the law of one price does not hold because of all restraints. **Purchasing Power Parity (PPP)**, however, is less severe. It is an application of the LOP

for all goods and services (or a representative basket of goods and services) across countries. The principle of PPP is that the real exchange rate is constant in the long run. PPP holds if this equation holds:

*aggregate/average price country A = $E_{A/B}$ * aggregate/average price country B*

This may seem completely identical to the LOP except that here, the prices represent the aggregate prices/average price levels for baskets of goods, and not the prices of individual goods.

$$\frac{Price\ of\ a\ basket\ in\ country\ A}{Price\ of\ a\ basket\ in\ country\ B} = E_{A/B}$$

PPP implies that the nominal exchange rate is equal to the ratio of average prices. So, this implies that households have the same purchasing power in all countries. For example, if the same basket of goods costs 100 A's currency and 200 B's currency, the exchange rate would be 1/2 if PPP holds.

If the LOP holds for every commodity, then the PPP must automatically hold as long as the baskets referenced are the same. Otherwise, even if the LOP does not hold, prices and exchange rates would not differ much from the relation predicted by PPP as eventually, economic forces would equalize all countries' purchasing power. In reality, LOP does not usually hold due to differences in regulations, taxes, transportation and production costs.

There are two types of PPP:

- **Absolute PPP**, which holds if the exchange rate equals the level of relative average prices across countries.
- **Relative PPP,** which holds if the change in exchange rate equals the change in relative goods prices.

Relative PPP will definitely hold if absolute PPP holds. This can be illustrated after we take the natural logarithm and rearrange the equation:

$$\frac{P_A}{P_B} = E_{A/B} \Leftrightarrow \ln ln\, P_A - \ln ln\, P_B = ln\, E_{A/B} \Leftrightarrow \frac{\Delta P_A}{P_A} - \frac{\Delta P_B}{P_B} = \frac{\Delta E_{A/B}}{E_{A/B}}$$

The change in the price level divided by the initial price level is called the **inflation rate**. In this case, π_t is the inflation rate from time t-1 to t. We thus have the relative PPP equation as follows:

$$\pi_{A,t} - \pi_{B,t} = \frac{E_{A/B,t} - E_{A/B,t-1}}{E_{A/B,t-1}}$$

Note that the absolute PPP cannot be concluded from relative PPP.

It is important to note that countries with high inflation also possess currencies that depreciate at the same rate. If foreign inflation is a given, then the lower the domestic rate of inflation, the higher the rate of appreciation. In the long run, countries with higher inflation rate see their currencies depreciate. Iif the money supply increases making demand and prices higher, domestic goods first lose competitiveness compared to foreign goods but then nominal exchange rate will lower to compensate.

PPP assumes that all households consume identical baskets of goods. However, as households in different countries consume different baskets, the **Big Mac index** (the Big Mac is a good produced in 120 countries) has been developed to indicate the exchange rate at which hamburgers cost the same in America as abroad. This index can thus imply whether a currency is undervalued (or overvalued), i.e. its market exchange rate is higher (or lower) than the exchange rate derived from the Big Mac. When a currency is undervalued, it is cheaper to buy the same good from producers in that country. In economics, it is uncertain if undervaluation of a currency is bad or not as in that case, US consumers can purchase cheaper goods by foreign producers while US firms cannot compete and have to exit the market.
The relation between LOP and PPP is demonstrated below. Note that there is no backward causation – relative PPP does not imply that absolute PPP should hold, for instance.

Absolute LOP for individual goods	→ implies	Relative LOP for individual goods
implies ↓		implies ↓
Absolute PPP	→ implies	Relative PPP

Monetary approach to exchange rates

The **monetary approach** is a long-run model, in which prices are flexible and always adjust for absolute PPP to hold. To analyse changes in exchange rates using this approach, M^S and the determinants of M^D are examined.

We consider explicitly the money market equilibrium in two countries. Prices are thus as follows for the Eurozone and the US:

$$P_{EU} = \frac{M^S_{EU}}{L(R_{EU}, Y_{EU})} \text{ and } P_{US} = \frac{M^S_{US}}{L(R_{US}, Y_{US})}$$

Accordingly, prices depend on the money supply and the money demand in these two regions. As absolute PPP holds, i.e. $\frac{P_{US}}{P_{EU}} = E_{US/EU}$, the equilibrium exchange rate is determined by the exogenous factors M^S, R and Y of both countries. Consider how a change in exogenous factors affects the exchange rates.

- If US money supply increases, there is an excess supply of money, so price levels rise to compensate and bring the money market back to equilibrium. As PPP $(\frac{P_{US}}{P_{EU}} = E_{US/EU})$ holds, the exchange rate then increases and there will be a proportional depreciation of the dollar relative to the euro. In fact, because of higher prices, consumers demand fewer US goods, hence fewer dollars. This will shift consumption partly from US goods to EU goods.
- When the US interest rate surges, the demand for US money decreases as it becomes more costly to hold money. In order to maintain the equilibrium on the US money market, prices increase. As PPP holds, US dollar depreciates proportionally relative to euro. This outcome is different from that in the previous model.
- If output/income of US households increases due to technological progress, for instance, real money demand rises, leading to excess demand. This can be compensated by a decrease in the US price level. From PPP, the dollar appreciates relative to the euro.

In general, the monetary approach implies that: since prices can adjust quickly to maintain market equilibrium after exogenous changes in M^S, R, Y, and that PPP holds, the exchange rate also adjusts accordingly.

The Fisher effect

The Fisher effect indicates that the difference between nominal interest rates is equal to the difference between inflation rates. How this relationship was developed starts with the **interest parity condition** for the foreign exchange market:

$$R_{EU} - R_{US} = \frac{E^{e}_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}$$

In this case, investors do not have any incentive to relocate their investments as the interest rate difference equals the expected appreciation of the domestic currency. That is, even if $R_{EU} > R_{US}$, investors would not switch from US assets to EU assets if they expect that the interest advantage is exactly outweighed by the depreciation of the euro.

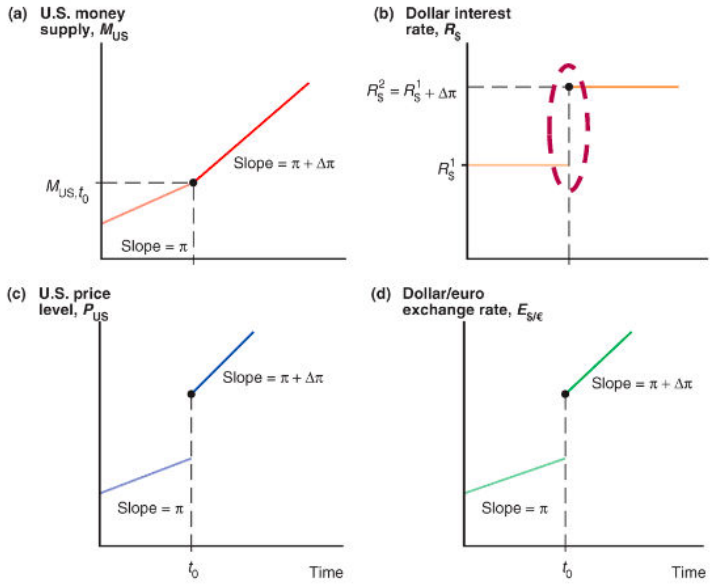
Under relative PPP, changes in the relative aggregate prices equal changes in the exchange rates such that:

$$\pi_{EU,t} - \pi_{US,t} = \frac{E_{\frac{EU}{US},t} - E_{\frac{EU}{US},t-1}}{E_{\frac{EU}{US},t-1}}$$

Combing two above equations leads to: $R_{EU} - R_{US} = \pi_{EU,t} - \pi_{US,t}$ which means:

$$R_{EU} - R_{US} = \pi^{e}_{EU,t} - \pi^{e}_{US,t}$$

The Fisher effect states that an increase in the expected domestic inflation rate ceteris paribus leads to an equal increase in the interest rate on domestic assets. To understand the interaction of interest rates and exchange rates under the monetary approach, consider the graphs below. They illustrate the effect of a sudden acceleration of the US money supply growth on the foreign exchange market.



(Lecture 16+17, slide 24)

Empirical evidence for the monetary approach

Empirical studies show that if several outliers would be ignored over the years, the models predict the trend well, more or less. We realise that absolute PPP does not hold in reality and relative PPP holds only approximately over very long periods of time. In reality, relative PPP fails due to trade barriers, transport costs, non-tradable goods, imperfect competition, and differences in goods baskets which are caused by different preferences across countries.

International Economics – IBEB – Lecture 16, week 6 - Price levels and the exchange rate in the long run - continued

Real exchange rate approach

So far, the nominal exchange rate implies nothing about purchasing power. What matters is how many baskets of EU goods we can buy with our dollars, or how many euros is needed to buy a basket of US goods. This is shown by the **real exchange rate**, which is the rate of exchange for real assets instead of monetary assets:

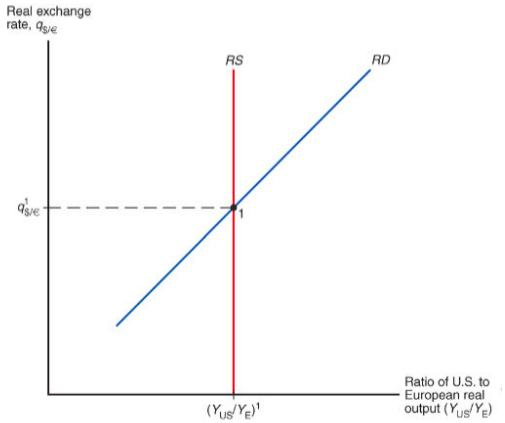
$$q_{\frac{US}{EU}} = \frac{E_{\frac{\$}{€}} \times P_{EU}}{P_{US}}$$

Whenever the real exchange rate increases, there is a real depreciation of the US dollar, and US baskets become less valuable relative to EU baskets. In such cases, it means that one needs to pay more in terms of US baskets for each EU basket. Absolute PPP holds when the real exchange rate is equal to 1.

Real exchange rate is the relative price of goods of two countries. It can appreciate either if the nominal exchange rate increases or inflation is higher at home. If the nominal exchange rate appreciates, domestic goods become relatively more

expensive – imports increase, exports decrease, so CA decreases. The other way applies if the nominal exchange rate depreciates. If domestic inflation>inflation abroad, the real exchange rate depreciates.

Based on the real exchange rate formula, the factors that influence the real exchange rate include the nominal exchange rate, world relative demand for US goods, and relative supply of US goods. The first factor is the nominal exchange rate. When the domestic currency depreciates, more domestic baskets of goods are needed to buy a single foreign basket of goods. In other words, when nominal exchange rate rises, so does the real exchange rate. Secondly, an increase in the world relative demand for US goods increases the relative price of US goods, thus an appreciation of the dollar. Lastly, relative supply also impacts the real exchange rate. When there is a rise in the supply of US goods, what follows is a relative decrease in US price. One needs more US goods baskets to buy a single European basket, so the real exchange rate increases and the US dollar depreciates. Note that if US long-run prices increase stems from an increase in US money supply, then the purchasing power is unchanged and there is no real consequence – the real exchange rate does not vary.



(Lecture 16+17, slide 35)

Looking at the above graph, on the vertical axis is the real exchange rate and on the horizontal axis the relative output. The relative supply (RS) of US goods is vertical because the RS is independent from the real exchange rate: in the long run, relative supply depends on the technologies and factor endowments of a country. The RD has a positive slope which is implied in the real exchange rate definition. An increase of the real exchange rate implies that US goods become cheaper relative to European goods, thus the demand for US goods also increases.
Consider now a change in preferences. Suppose US goods become more popular. Consequently, the relative demand for US goods increases and the RD shifts to the

right. The new equilibrium real exchange rate will be at a lower level, which means a real appreciation of the dollar. Suppose there is some form of technological progress in Germany, inferring that the relative supply of EU goods increases. As a result, the RS moves to the left. The price of EU goods drops relative to the price of US goods. The new RS curve implies that the real exchange rate declines.

Now let us consider a change in nominal variables. For example, a change in the US money supply. In the long run, this increases the price level, but the real exchange rate stays constant and there are no real significances in terms of change. A more general use of the real exchange rate approach is to explain variations in the nominal exchange rate. If we rewrite the expression for the real exchange rate, we obtain:

$$E_{\$/€} = q_{\frac{US}{EU}} \times \frac{P_{US}}{P_{EU}}$$

From the given formula, we will discuss the influence of both nominal factors and real factors.

1. An increase in US money supply leads to variations in price levels in the long run. The nominal exchange rate rises proportionally (the monetary approach) and there is no change of the real exchange rate.
2. An increase in the US inflation rate leads to a higher interest rate (the Fisher effect). Thus, money demand in the US will be reduced and US price level increased. The real exchange rate does not change, only the nominal exchange rate does. Once again, the same result was observed in the monetary approach.
3. Now we consider an increase in the relative demand for tradable and non-tradable domestic goods (this does not imply that there is a proportional decrease in demand for EU goods). This increases the US price level and, thus, decrease the long-run real exchange rate since US baskets have become more expensive. However, long-run national price level is unchanged, as it only depends on money supply and aggregate money demand. Thus, for the above equation to hold, there must also be a fall in the long-run nominal exchange rate.
4. Suppose there is an increase the relative supply of domestic products. As a result, relative price of US goods lowers and the dollar depreciates in real terms, i.e. the real exchange rate rises. In addition, increased relative supply brings about increased aggregate US real money demand and drives down long-run US price level. Considering the above equation, the net effect on the

nominal exchange rate is ambiguous since real exchange rate and US price level work in opposite directions – $q_{\frac{US}{EU}} \uparrow$ while $P_{US} \downarrow$.

It is crucial to note that in this approach, real changes (in demand or output) does not translate one-to-one into the foreign exchange market. In general, monetary factors only change the nominal exchange rate, not the real value of goods. On the other hand, real factors change the real value of goods as well as the real exchange rate.

Interest rate differences

The relationship between interest rates and inflation rates (Fisher effect) was based on relative PPP. We know that:

$$q_{\frac{US}{EU}} = E_{\frac{\$}{€}} \times \frac{P_{EU}}{P_{US}}$$

Taking the logarithm, we end up with:

$$\frac{q^{e}_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} = \frac{E^{e}_{\frac{\$}{€}} - E_{\frac{\$}{€}}}{E_{\frac{\$}{€}}} - (\pi^{e}_{US} - \pi^{e}_{EU})$$

This means that the expected change in the real exchange rate equals the difference of the expected change in the nominal exchange rate and the expected inflation. If we combine that result with the interest parity condition:

$$R_{EU} - R_{US} = \frac{E^{e}_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}$$

We end up with the augmented Fisher equation:

$$R_{US} - R_{EU} = \frac{q^{e}_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} + (\pi^{e}_{US} - \pi^{e}_{EU})$$

In words, this means that the difference in the nominal interest rates is the sum of the *expected rate of depreciation of the value of the domestic goods relative to foreign goods* and the expected inflation difference. Note that if the real exchange rate is expected to remain unaffected, the numerator of the first term on the right-hand side is equal to 0 and absolute PPP holds. Thus, we get the simple Fisher effect formula.

Differences in real interest rate

Naturally, investors are interested in real interest rates as they want to know the real return of their investments. The real interest rate can be written as follows:
$r^e \approx R - \pi^e$

R is the nominal interest rate, π^e the expected inflation and r^e the expected real interest rate. The exact definition of the real interest rate is $\frac{1+R}{1+\pi} = 1 + r$ or $r = \frac{1+R}{1+\pi} - 1$; however, the two expressions are similar when R and π are insignificant. The definition of real interest rate is derived from the equation: $M_1 = M_0 \cdot (1+R)$ and the detailed steps are given in the lecture slide 48.

Now that we have the real interest rate, we can consider investors' decisions. The decisions will be based on the *real interest parity condition.* The approximate formula for the real interest parity condition is:

$$r^e_{US} - r^e_{EU} = \frac{q^e_{\frac{\$}{€}} - q_{\frac{\$}{€}}}{q_{\frac{\$}{€}}}$$

This formula results from combining two equations: (1) the predicted differences in real interest rates across countries, or $r^e_{US} - r^e_{EU} = (R_{US} - \pi^e_{US}) - (R_{EU} - \pi^e_{EU})$, and (2) the augmented Fisher equation.

If productivity in the US improves, the real value of US dollar falls, which means the real exchange rate increases and the value of a US bundle of goods decreases relative to the value of an EU bundle of goods. Nonetheless, investors do not have an incentive to switch from US assets to EU assets if they expect that the real depreciation of the US dollar would be exactly outweighed by the real interest rate difference. This is based on the real interest parity condition.

International Economics – IBEB – Lecture 17, week 6 - Exchange rates and open economy macroeconomics - part 1

Output has so far been exogenous but from now on, it will be endogenously determined. There will be an explicit distinction between the short run and long run changes of monetary and fiscal policies. For the analysis, we will not only establish equilibrium in the money and foreign exchange markets, but also for general equilibrium setting in all the markets: goods, money, and exchange market.

Aggregate demand

For the goods market equilibrium, we have to derive the aggregate demand. The aggregate demand consists of the following components: private consumption (C), private investment (I), government consumption and investments (G), net expenditure by foreigners: the current account (CA).

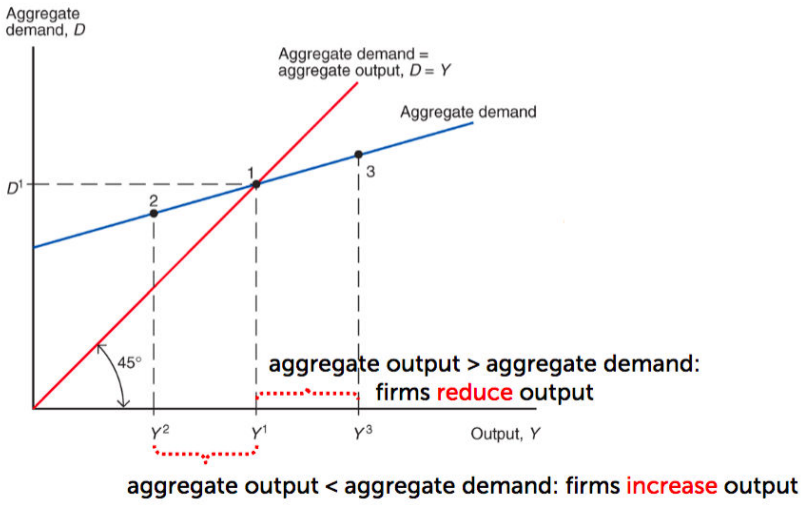
Private demand for consumption depends on disposable income, which is given as Y–T. An increase in disposable income will raise the consumption (but not proportionally, as a part of income goes to savings) and lower the current account as domestic households will consume more imports (CA = EX – IM). Here, the assumption is 'home-bias' – the rise in C has a larger effect than that of the fall in CA. Overall, the CA is determined by not only Y–T but also the real exchange rate: $q = \frac{E_{\frac{\$}{€}} \times P_{EU}}{P_{US}}$. With an increase in the real exchange rate, first of all, domestic goods become relative cheaper; therefore, the volume of exports increases and the volume of imports decreases. At the same time, however, the nominal exchange rate rises, causing the domestic currency to depreciate; therefore, the price of imports increases in terms of the domestic currency and the value of imports in terms of domestic currency increases. At this point, we assume that the volume effect dominates the value effect, implying that an increase in the real exchange rate decreases the value of imports and increases the CA.

Private demand for investment goods depends *negatively* on the real interest rate, but for simplicity, we assume that private investment is exogenous and does not depend on the real interest rate. G will also be an exogenous variable.

In summation, aggregate demand can be expressed as:
$Y^D = C(Y - T) + I + G + CA(q, Y - T)$ or in other words $Y^D = Y^D\left(q_{\omega+}, Y - T_{\omega+/-}, I_{\omega+}, G_{\omega+}\right)$

Short-run equilibrium in the goods market

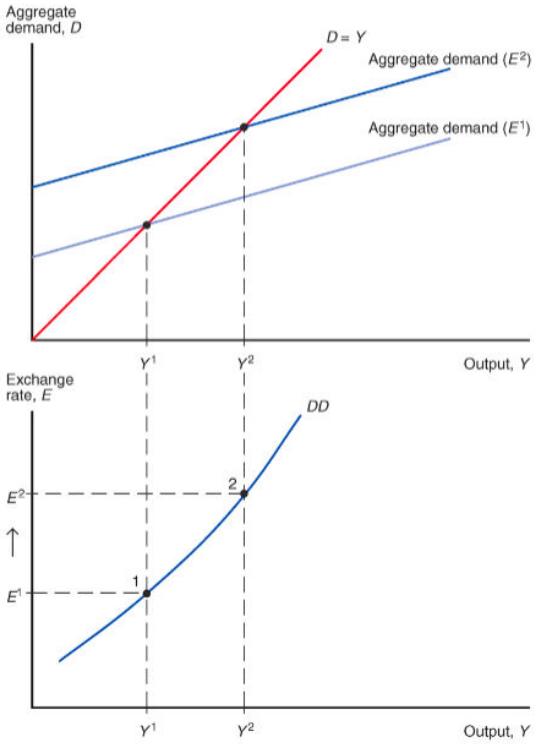
In the short run, prices are sticky so production adjusts to clear the goods market and the equilibrium is $Y^S = Y^D\left(q_{\omega+}, Y - T_{\omega+/-}, I_{\omega+}, G_{\omega+}\right)$.



(Lecture 18 – part 1, slide 12)

AD has a positive Y-intercept because the private demand for investment goods I and G are positive (they are given) even if there is no output.

When there is a rise in nominal exchange rate, domestic goods become cheaper relative to foreign goods, so the aggregate demand curve shifts upwards and aggregate output increases accordingly. We can now draw the relationship between the nominal exchange rate and output, the DD curve. The DD curve illustrates all combinations of the exchange rate and income which lead to an equilibrium in the domestic goods markets.



(Lecture 18 – part 1, slide 14)

Other variables can also influence the goods market and thus the derived DD-curve:

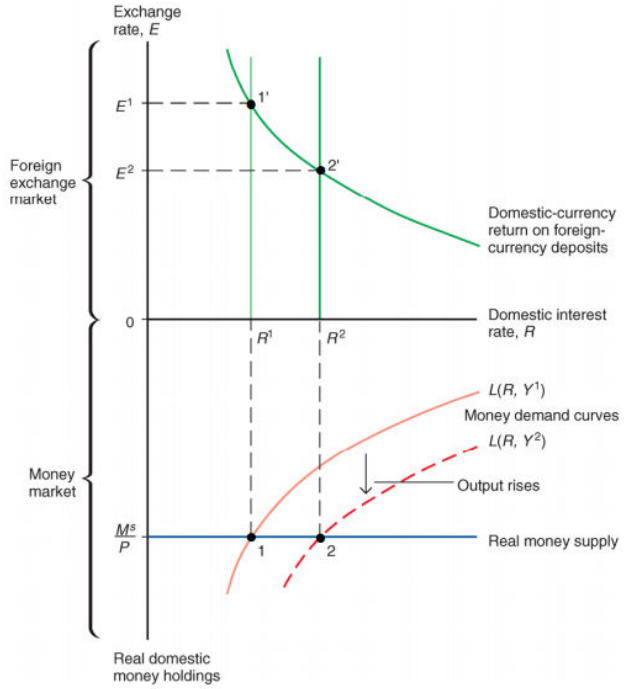
1. Suppose the government expenditure increases. Higher governmental demand for goods and services augments the aggregate demand for a given exchange rate E, so the DD–curve shifts to the right.
2. A decrease in T raises disposable income which induces higher aggregate demand for domestic goods. As a result, the DD-curve shifts to the right.
3. An increase in demand for investment goods I translates the aggregate demand upwards for a given E, so the DD-curve shifts to the right.
4. A decrease in P relative to P* makes domestic goods inexpensive relative to foreign goods, so the domestic demand for domestic good increases and also export demand increases. This shifts DD to the right.
5. There may also be an increase in consumer preferences for today which makes C increase while saving and investment decrease. We assume that aggregate demand increases by more than the corresponding decrease in investments as they are partly financed by credit. This means that the DD shift to the right.

6. In case of an increase in the home bias, households have higher demand for domestic goods relative to the demand for foreign good, so the DD shifts to the right.

Short run equilibrium in the money and foreign exchange market

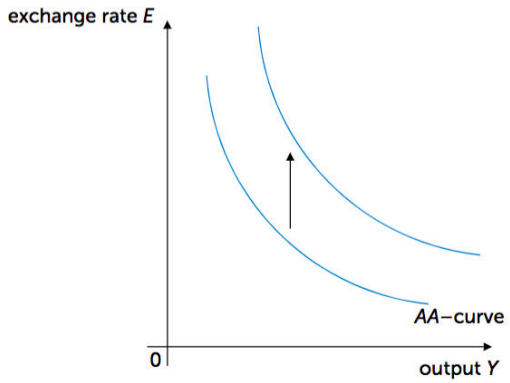
For equilibrium to hold, two formulas have to be satisfied. Due to international capital mobility, the interest parity condition has to hold: $R^{EU} - R^{US} = \frac{E^{e}_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}$. Furthermore, the money market is in equilibrium when $\frac{M}{P} = L(R, Y)$.

The relationship between Y and the nominal exchange rate is as follows. Suppose the domestic income increases. As a result, real money demand increases so the money demand curve moves downwards. At the new intersection between the money supply and money demand curves, domestic interest rate has become higher than before, as prices are fixed in the short-run. Thus, we end up in point 2 where the nominal exchange rate has dropped from E^1 to E^2. This implies that we have a negative relationship between income and the exchange rate.



(Lecture 18 – part 1, slide 21; International Economics Theory and Policy Eleventh Edition, page 500)

The AA curve describes the relationship between exchange rates and output levels where the money and foreign exchange market are in equilibrium. One can more extensively comprehend the AA curve shifts if certain policies, for example, expansionary monetary policy, are implemented. With an increase in the money supply, the interest rate reduces which depreciates the domestic currency; thus, the AA shifts upwards.

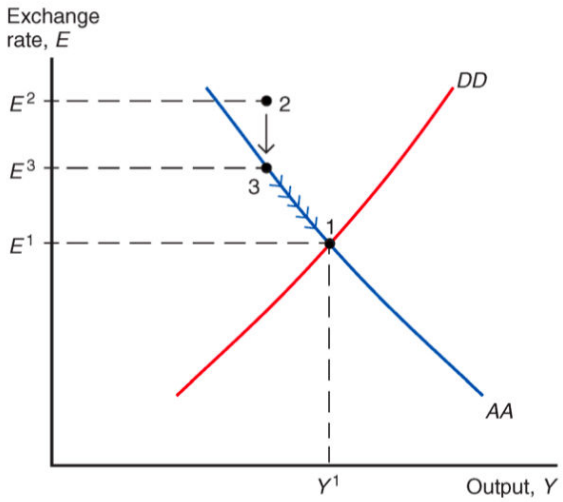


(Lecture 18 – part 1, slide 23)

1. Consider an increase in the **domestic price level**. The real money supply thus decreases and the interest rate increases which then leads to the domestic currency appreciating. This shifts the AA curve downwards.
2. If there is a **change in preferences for liquidity** (most likely in the long run), for instance, preferences decrease, then real money demand decreases. Therefore, the interest rate decreases to match money demand and money supply. Domestic currency experiences a depreciation, so the AA curve goes upwards.
3. Consider an increase in **the foreign interest rate**. Then, investors shift to assets denominated in foreign currency and this results in higher demand for foreign currency. As a result, the domestic currency depreciates, so the AA curve goes upwards.
4. Finally, if there is an increase in **the expected nominal exchange rate**, that means investors expect the domestic currency to depreciate in the future, so they will demand more foreign deposits today. Because of that, the depreciation of the domestic currency occurs today. E increases and AA curve goes upwards.

Simultaneous equilibrium in all markets

The equilibrium value will be determined by the equilibrium conditions in each market: (1) $Y^S = Y^D$ in goods market, (2) interest parity condition $R^{EU} - R^{US} = \frac{E^e_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}$ in the foreign exchange market, and (3) $\frac{M}{P} = L(R, Y)$ in the money market.



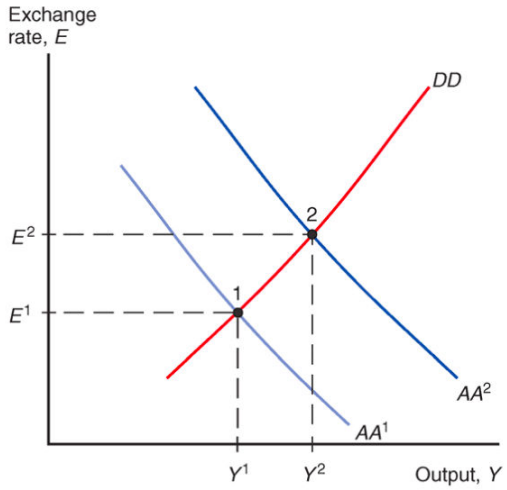
(Lecture 18 – part 1, slide 28)

Combine the DD (which gives all the equilibrium points of goods market) and the AA (which shows all the equilibrium points for the money and exchange markets), we can determine the general equilibrium and the resulting equilibrium nominal exchange rate in all markets. In reality, countries are typically not in equilibrium, so we start our analysis by looking at point 2. Here, there is excess demand for domestic output as the nominal exchange rate is too high. The point is above the AA curve for either one of two reasons: the exchange rate is too high for equilibrium on the foreign exchange market or income is too high for equilibrium on the money market. In this case, we assume that exchange rate adjusts faster than income. As E falls to point 3, the foreign exchange and money market are in equilibrium, meaning the expected returns are equalized for both domestic and foreign deposits. Nonetheless, point 3 is still above the DD curve so demand for domestic goods is still excesive. To match this excess demand, firms start to increase their output and at the same time the domestic currency slowly appreciates until point 1 is reached (a rise in output causes money demand to rise and thus interest rate goes up; then, to maintain interest parity, E appreciates).

Temporary changes in monetary and fiscal policy

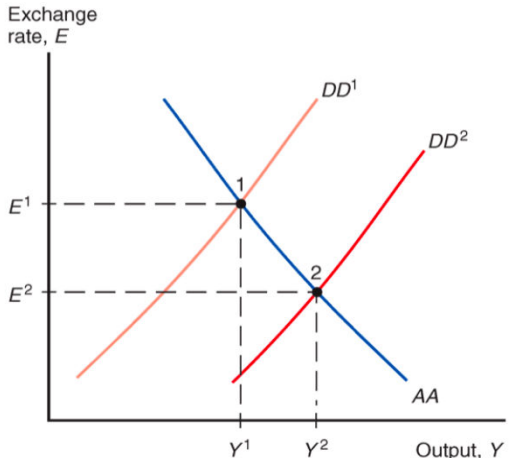
Policy measures would not influence future expectations as they are only temporary.

Suppose the CB increases money supply. This impacts the money market - we have excess supply and there has to be decrease in R to restore equilibrium. Due to this R change, in the foreign exchange market, demand for domestic deposits and domestic currency decreases. The exchange rate E increases for a given Y, so the AA curve shifts upwards. In the goods markets, the increase in E makes domestic goods cheaper relative to foreign goods, so the demand for them increases which leads to a production increase. The equilibrium point moves along the DD curve.



(Lecture 18 – part 1, slide 31)

Now assume that the government uses fiscal policy and surges expenditures G or cuts tax T. For the goods market, demand for domestic goods as well as production rises, so the DD curve shifts to the right. In the money market, real money demand increases due to an increase in Y, and the interest rate increases for equilibrium to be achieved. In the foreign exchange market, an increase in the interest rate makes domestic deposits more attractive than foreign ones, and thus E decreases. This makes the new equilibrium move along the AA curve to the south-east.



(Lecture 18 – part 1, slide 33)

Policies to maintain full employment

Assume that in the first place, there is no involuntary unemployment (but still some voluntary) and output is at its natural level in this open economy. Then, a shock occurs. The two policies that can be implemented are fiscal policy, which can impact the DD curve, and monetary policy, which can impact the AA curve. The effects of these policies can be similarly analysed as above.

However, there are several problems with such stabilisation policies:

1. There might be an *inflationary bias* as households reactions augment the effect of policy measures. For example, if policies are adjusted to ensure high employment, unions will demand higher wages and firms thus increase prices, so workers demand even higher wages, etc.
2. In reality, it is difficult for policy makers to interpret data and make decision about which policies are necessary in order to reach full employment again.
3. There might be an *implementation lag*, i.e. there is some time between the decision to implement a policy, the actual implementation of the policy, and the results of the policy. In some cases, therefore, anti-cyclical policies may actually convert to pro-cyclical.
4. *Rent-seeking behaviour,* which supports personal interests of political actors at the expense of the public, could occur.

Alternative shock: preference for liquidity increase

If preferences for liquidity increase, the domestic money market is affected because real money demand increases. This causes the domestic interest rate to increase in

order to attain equilibrium once more. This increase in interest rate then affects the FOREX market, causing more demand for domestic assets & currency, leading to an appreciation of domestic currency and a decrease in exchange rate (downward shift of the AA curve).

International Economics – IBEB – Lecture 18 - part 2, week 7 - Exchange rates and open economy macroeconomics - part 2

The Central Bank (CB) can adopt a fixed exchange rate regime, where it commits to one fixed exchange level. Alternatively, a bit weaker regime is "managed floating". Under managed floating, the exchange rate is determined by market forces but if it goes outside of a certain predetermined band, the CB intervenes to adjust it. Finally, there is the flexible exchange rate regime, where the exchange rate is solely determined by market forces of supply and demand on the foreign exchange market.

Fixed exchange rate regime

The balance sheets of the central bank are kept under the principle of double-entry bookkeeping. **Assets** consist of gold, foreign government bonds, foreign exchange reserves, domestic government bonds, and loans to domestic bank, while the **liabilities** include deposits of domestic banks and the currency in circulation. It is important for us to focus on **foreign exchange reserves** (assets) and **domestic currency of circulation** (liabilities). Due to double-entry bookkeeping, whenever the value of assets decreases (or increases), the value of liabilities has to decrease (increase) as well. Also note that foreign currency deposits are very liquid assets, so they move in accord instantaneously with liabilities. For example, when CB sells part of its foreign currency reserves and buys domestic currency, the supply of domestic currency falls while that of foreign currency rises. This leads to a relative appreciation

of the domestic currency. Alternatively, if the CB buys foreign currency and sells domestic currency, the supply of domestic currency increases and the domestic currency will depreciate. One probably extreme example of a fixed exchange rate is North Korean Won to US dollar.

Now assume that the CB commits to a fixed exchange rate, implying that the expectations about the exchange rate are set at today's exchange rate. The right side of the interest parity formula $R - R^* = \frac{E^e - E}{E}$ is thus equal to 0, or that $R = R^*$. Consider also the domestic money market. The equilibrium occurs when $\frac{M}{P} = L(R, Y)$. An increase in Y without any intervention of the CB will increase R, which leads to an increase in demand for domestic currency. As a result, the exchange rate would drop and the domestic currency appreciate. However, to keep E fixed, the CB can increase the domestic money supply to push up the exchange rate, resulting in the original domestic interest rate and exchange rate.

Monetary policy with fixed exchange rates

In the short run, monetary policy is non-existent under fixed exchange rates. This can be explained as we consider how changes in the supply of the domestic currency affect the exchange rate in the foreign exchange market. As the CB increases the domestic supply of money, the supply of domestic currency rises while that of the foreign currency falls, causing a relative depreciation of the domestic currency and E increases. Without intervention, AA shifts upwards. However, the CB wants to commit to a fixed exchange rate, so it intervenes again by buying domestic currency for foreign currency. In the end, the CB should not intervene at all in the first place.

Fiscal policy with fixed exchange rates

Fiscal policy is more effective under a fixed exchange rate regime in the short run. When G increases, Y also increases, leading to an excess demand for domestic assets; thus, the interest rate has to increase and it causes an appreciation of the domestic currency. Under a flexible rate regime, public demand crowds out private demand due to the caused appreciation. However, when there is a fixed exchange rate, there is no crowding-out effect.

When G increases, demand for domestic goods, and hence income, increases given an exchange rate, so DD shifts to the right. With higher real money demand, interest rate rises and the demand for domestic currency upsurges. If there is no intervention,

the exchange rate would react by falling. However, the CB intervenes to keep E fixed by increasing the money supply. In this way, they can lower the interest rate and depreciate the domestic currency. AA thus shifts upwards and reaches the new equilibrium where E is unchanged (domestic interest rate and demand for domestic assets are also unchanged).

In the long run, wages will increase, and so will the prices. This decreases demand for domestic goods, so DD shifts left and AA shifts down to their initial positions, reaching the same output Y. Therefore, when prices increase and output decreases in the long run, real money demand and real money supply both fall. It is important to note that though nominal exchange rate remains constant, real exchange rate will fall as domestic prices are raised.

Devaluation and revaluation

Depreciation and appreciation are used as the main terms when there is an flexible exchange rate and the value of a currency changes only due to market forces. However, when considering a CB with a fixed regime, we should use the terms **devaluation** and **revaluation**. These terms describe the situation in which there are fixed exchange rate(s) and the value of a currency changes due to central bank interventions in the foreign exchange market. More precisely, devaluation occurs when there is a higher fixed exchange rate, i.e. CB increases relative supply of domestic currency, while revaluation implies a lowered fixed exchange rate. When the CB devalues domestic currency, the higher exchange rate increases demand for domestic output and, as a result, the domestic output increases.

Financial crises and capital flights

Fixing the exchange rate can cause some trouble. If demand for the domestic currency decreases, the CB compensates by increasing its own demand for domestic currency in exchange for foreign currency. Then, when investors expect that the domestic currency will soon be devaluated, they sell all domestic assets and buy foreign assets instead, resulting in a sharp devaluation of the currency today. The decrease of the foreign exchange reserves of the CB is accelerated. At this point, we observe a **capital flight**; that is, a sharp outflow of financial capital. In order to fight against the capital flight, the CB decreases the money supply further to increase the domestic interest rate; however, it has other consequences as the high interest rates reduce the demand for investment goods. In the end, domestic output

and employment decrease. We can claim that the self-fulfilling expectations continue to hold as foreign investors' expectations about domestic assets contribute to the financial crisis.

Investors can engage in **speculative attacks** where they expect that the CB reserves of foreign currency are scarce. E is kept fixed, and the value of domestic currency is relatively high compared to the foreign currency, so investors exchange domestic currency into foreign currency at a favourable exchange rate. When the CB currency reserves are used up, there is a devaluation of the domestic currency. Then, investors change foreign currency into domestic currency again at a favourable exchange rate, so the speculators **gain real wealth in the short run if prices are fixed**. This can be illustrated with an example from 1992. In 1992, the so-called Black Wednesday occurred when Britain had to leave the European exchange rate mechanism. After this there was a subsequent sharp devaluation of the pound. The one person who benefitted from this was George Soros. In 1992, he expected that sooner or later Britain had to leave the mechanism, so he borrowed huge amounts of British pounds, 6.2 billion. He then exchanged that money for French Franc and Deutschmark. The CB could not buy back its currency forever in order to keep the exchange rate fixed, thus there was a devaluation. After this happened, Soros changed by little parts the French and Germany currencies into pounds at a favourable exchange rate.

We have come to the conclusion that policies that influence the money market will also influence the foreign exchange market, thus monetary policies are not independent with a fixed exchange rate, and cannot be used to keep interests rate low or fight against inflation.

Imperfect asset substitutability and increasing independence of monetary policy

So far, we have adopted a pessimistic view about the CB's ability of performing stabilisation policy. The monetary policy is not independent anymore, which can cause a financial crisis. Nonetheless, everything becomes more positive if one considers that, in reality, domestic and foreign assets are not perfect substitutes. This is because assets denominated in different currencies imply different risk levels. Typically, higher risk gives a higher return. There are different types of risk:

- **Default risk**: the risk that borrower cannot pay his debt. For example, the Argentinian bankruptcy in 2001.

- **Exchange rate risk**: the risk that foreign currency depreciates. In that case, it will lead to lower expected returns for assets denominated in that currency.

These types of risks vary between countries due to the imperfect substitutability between domestic and foreign assets and the fact that investors demand different returns to compensate for different risk levels. With such a variety of returns on assets, there should thus be an **adjusted interest parity condition** where is a risk premium ρ is added for foreign investors when they invest in domestic assets.
$R - R^* = \frac{E^e - E}{E} + \rho$

Note that when ρ increases, R also increases. The risk premium depends on investment alternatives, i.e. the difference between returns on regular stocks and government bonds or between government bonds of different countries. We assume that government bonds are safer than regular stocks.

The CB can influence the risk premium. For example, when the perceived risk of domestic assets investment rises, demand for domestic deposits falls which leads to domestic currency depreciation, or that E rises. However, to keep the exchange rate fixed, the CB increases the domestic money supply which then raises the interest rate. This consequently lowers the exchange rate back to its constant level.

International Economics – IBEB – Lecture 19, week 7 - International monetary system

In this summary, we discuss the advantages and disadvantages of having different rate regimes in a historical setting, thus understand why monetary systems changed over time. Four different systems which occurred since the 20th century are the Gold Standard Era (1870–1914), the world wars and recession era (1914–1945), the Bretton Woods era or the reserve currency system (1945–1971), and the floating rates era (1971– now). Among those, the reserve currency system and the Gold Standard Era were fixed exchange rate regimes, which we will focus on.

Fixed exchange rate regimes

- **Gold Standard Era** (1870-1914): the exchange rate between gold and domestic currency is fixed
- **Reserve currency system** (1945-1971): the exchange rate between the domestic currency and the foreign reserve currency is fixed. The most prominent examples are the US dollar in the 1944-1973 period and the Eastern European countries within EU but outside the euros.

Macroeconomic equilibrium

Domestic equilibrium

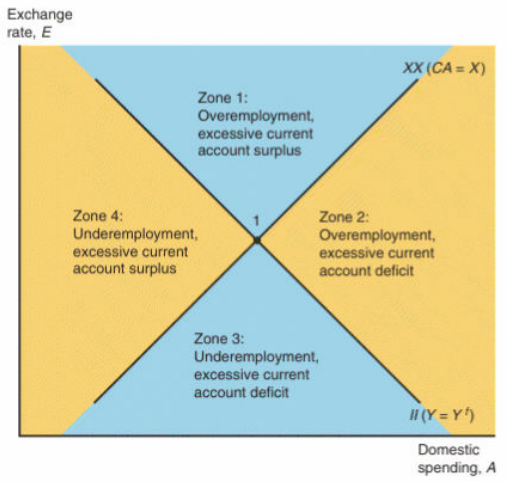
Domestic equilibrium requires that the aggregate demand is equal to the full-employment level of output Y^f, i.e. $Y^f = A + CA\left(\frac{EP^*}{P}, A\right)$ where A = C + I + G. In the short run, output increases if either the total spending A rises or the exchange rate E falls. These can be managed with fiscal policy or changes in the exchange rate, because fiscal expansion stimulates aggregate demand which raises output, and a depreciated currency makes domestic goods relatively cheaper which also increases demand. The relationship between the exchange rate E and total spending A is illustrated by the downward-sloping II schedule which defines a constant output Y^f. To keep output unchanged at full employment, a revaluation of the currency must be accompanied by higher domestic spending; equivalently, a decrease in aggregate demand matched by an increase. To the right of II, spending is higher than needed, so there is overemployment whereas the the left of II, there is underemployment.

External equilibrium

External equilibrium requires that the current account surplus is in equilibrium or meets a certain target value X, i.e. $CA\left(\frac{EP^*}{P}, A\right) = X$. A rise in the exchange rate improves the current account while a rise in the domestic spending deteriorates the current account. That is because as the domestic currency depreciates, domestic goods are relatively cheaper so net exports increase – the CA increases; and as domestic spending rises, imports volume increases – the CA decreases. The external balance

is illustrated by the upward-sloping XX schedule. To maintain the current account surplus at X, spending will have to increase as the currency is devalued. Above XX is where there is excessive current account surplus due to increased net exports as a result of increased exchange rate; and below XX is excessive current account deficit.

The macroeconomic equilibrium is thus formed:

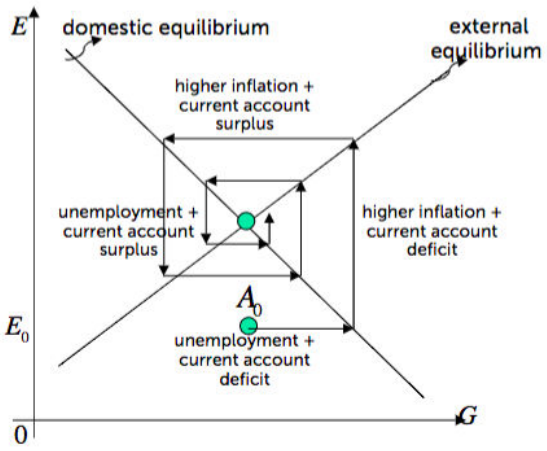


(Figure 19.2 – International Economics Theory and Policy 11th Edition, page 603)

Problems with fixed exchange rate regimes

The fixed exchange rate regime is not problematic if E is fixed at the equilibrium level. However, consider a situation where E is lower than the equilibrium and we have unemployment alongside a CA deficit. The equilibrium state has to be reached, but since E is fixed, the adjustment cannot move upwards – the only possible movement is to the right or to the left. If we move to the right, for instance, through an increase in G, there will be full employment, but the CA deficit worsens. Alternatively, if G is decreased, then an external equilibrium is reached, but there is lower income, less demand for foreign goods, and we have more unemployment as we are even further below the domestic equilibrium curve. Therefore, it is the choice of either domestic or external equilibrium, as only one policy instrument (changing G) is available. This result is sealed by the **Tinbergen rule** which says that the government can only achieve a particular number of policy objectives if it has at least that same number of independent policy instruments available.

The equilibrium could only be reached again if there were flexible exchange rates. First the government has to realize domestic equilibrium and afterwards external equilibrium. The process is demonstrated in the graph below:



(Lecture 19, slide 9)

Changing exchange regimes

A nation might have several objectives:

1. **Monetary policy independence** which gives the ability to adjust the money supply to the economic conditions, e.g. the labour market conditions
2. **Fixed exchange rate** which gives more transparency about the exchange rate that influences international transactions decisions
3. **International capital mobility** which implies that transaction costs equal zero and assets are perfectly substitutable. This benefits a country as it allows for investments into the most profitable projects worldwide.

Nonetheless, a serious problem is that only two of these objectives are accessible simultaneously (trilemma) because of the interest parity condition. Typically, it is costly to buy foreign assets, so we adjust the interest parity condition by adding transaction costs:

$$R_{EU} - R_{US} = \frac{E^{e}_{€/\$} - E_{€/\$}}{E_{€/\$}} + transaction\ costs$$

If transaction costs equal zero, the "true" interest parity condition holds and the difference in interest rates between countries equals the changes in exchange rate. However, if there is a fixed exchange rate, then $R = R^{*}$ or that interest rates cannot vary. Because of this, nations face a trade-off between monetary independence and a fixed exchange rate.

Regimes over time

The trilemma can explain the regime variations occurred over time. The Gold Standard era captures fixed exchange rate, as currencies were pegged to gold and, hence, to each other. Despite international capital mobility, there was no monetary policy independence to fight unemployment. In reality, E fluctuated within very narrow margins (as there were shipping costs for gold). The disadvantages of using gold was that the CB cannot control its resources: when new gold sources were found, the supply of gold increases causing inflation, but when economies grow, there might not be a corresponding amount of gold for circulation, causing deflation and unemployment. Countries with large gold reserves naturally become powerful.

In the period 1914—1945, the two world wars were financed by printing more money. In addition, countries were more interested in domestic economic conditions than in the international economic system, so they were prone to devaluating their domestic currencies at other countries' expense (beggar-thy-neighbour policies) and engaging in capital controls, especially during the Great Depression 1929. Thus, crises were aggravated and unemployment became larger. In general, there was a flexible exchange rate regime and no perfect capital mobility.

The Bretton Woods agreement was signed by 44 nations excluding Germany. On one hand, it led to IMF and World Bank establishment. On the other hand, a new system of international economic order was put in place. In this order, free trade was enforced and countries committed to abandon beggar-thy-neighbour policies. The international monetary system was to stabilised to cultivate international trade flows under a fixed exchange. Therefore, the participating countries pegged their currencies to the US, while the US pegged its currency to gold. The change of own currency values was only allowed upon the IMF's approval. However, this Bretton Woods system had an n-1 problem: only the US had monetary policy independence while all other n countries did not, and the US could exploit the situation. For instance, during the Vietnam war, high inflation of the US dollar, which was brought about by the need to finance the war and fight unemployment, resulted in enormous US–$ reserves in other countries. Then, in the early 70s, there were speculations against the US dollar. The German federal bank purchased 2 billion US dollars in 2 days before allowing the US exchange rate to float. In the end, the US dollar was sharply devalued relative to the Deutschmark, so other currencies had to be revalued with IMF's approval.

Finally, the Bretton woods system broke down in 1973. After that, the floating rates era came. However, we do not observe completely freely floating exchange rates as there are potential organizations of exchange rates. Conventional fixed-peg arrangements appear when a country pegs its currency at foreign currency; pegged exchange rates within horizontal bands are when currency fluctuates within a wider band around the fixed exchange rate than the previous. There are also **crawling peg** (fixed exchange rate is adjusted occasionally), **crawling band** (central exchange rate or margins of band are adjusted periodically), **managed floating** (CB impacts the exchange rate without assuring to a specified exchange rate), and **independently floating** (exchange rate that is influenced by market forces).

International Economics – IBEB – Lecture 20, week 7 - International financial institutions

European Union (EU)

The EU, which was started in 1957, consists of 28 European countries. It is the arrangement of international institutions including the European Parliament (the legislative body), the Council of the European Union (determines the guidelines of European politics), the European Commission (the executive body), the Court of Justice (interprets the EU law) and the European Central Bank (responsible for monetary policy).

European Monetary System (EMS)

The EMS was established originally in 1979 as a fixed exchange rate regime but then developed further into an Economic and Monetary Union (EMU). A country can be a member of the EMU if it meets the convergence criteria. Becoming part of the EMU infers that the exchange rates are fixed within certain bands so that fiscal and monetary policies are restrained and the domestic currency has to be changed into

the Euro. There are potential advantages of joining a monetary union. From an economic perspective, countries experience greater market integration due to a common currency-transparency in international transactions. Thus, this may lead to additional trade, hence economic growth. Besides, a uniform monetary integration may lead to a resulting political integration. With a fixed exchange rate regime and the same currency, countries cannot engage in beggar-thy-neighbours policies, and there are no capital flights or speculations under a common currency. Some economists, nonetheless, are not in favour of the European monetary.

EMS from 1979 to 1998

Part of the EMS since 1979 was the establishment of the Exchange Rate Mechanism (ERM). Under a fixed exchange rate regime, currencies were permitted to fluctuate 2.25% higher or lower than a target exchange rate. However, there were exceptions for Italy until 1990 and Portugal, Spain, Britain until 1992. During those periods, these countries needed greater flexibility with their monetary policies in order to differ monetary and fiscal policies and thus prevent speculative attacks. In the EMS, there was also a credit system to support countries that required assets and currencies to intervene in the foreign change market.

Germany's different monetary and fiscal policies led to high interest rates and excess demand for the Deutschmark. What followed was that Britain left the EMS in 1992 to let the pound float against the EMS currencies, and the ERM was redefined in 1993 so that currencies can float up to 15% around the target value and devaluate against the Deutschmark. Eventually, EMS members adopted German monetary and fiscal policies to converge all inflation rates in the EMS.

Maastricht Treaty

The Maastricht Treaty was put forward in 1991 and executed in 1992. To be a new member, countries have to meet the criteria regarding inflation, interest rates, budget deficits, public debts, and the minimum length of membership. The inflation rate should be at most 1.5 percentage point higher than the average of the three lowest inflation rates among the EU member states. Interest rate has to be less than 2 percentage points higher than the long–term interest rate average of the three low–inflation countries. The budget deficit (new debts) has to be less than 3 percent of GDP, and public debt (accumulated debts) has to be less than 60 percent of GDP.

Plus, there should be no devaluation in the two-year period before EMU entry. Nevertheless, some current EMU members do not meet the convergence criteria.

The timeline for the European monetary integration can be viewed in slide 15, lecture 20. At present, the Eurosystem is managed by the European System of Central Banks (ESCB) and consists of the ECB as well as the national central banks (NCBs) of the monetary union members. Next to the Eurosystem under ESCB are the NCBs of nonmonetary union members. The stance of ECB policy had been to fight inflation, but as a result of the 2008 economic crisis, it was changed to inflation below 2 percent per annual. However, preferences of member states concerning monetary policies are not all similar.

Theory of optimum currency areas

The theory of Optimum Currency Areas (OCA) states that countries want to join fixed exchange rates areas closely linked to their own economies through trade and factor mobility.

In general, monetary union is advantageous in that it helps avoid currency crisis since there is only one currency. However, there is also a disadvantage. Consider the scenario in which Italy and Germany are hit by asymmetric demand shocks: Italy by a positive demand shock while Germany by a negative one. Following this, demand and employment increase in Italy but decrease in Germany, so there is no equilibrium on either country's labour market. Typically, countries can adjust by changing the exchange rate so that there is a real appreciation of the Italian currency relative to the German currency. However, with a common currency, adjustment in E is not possible, so goods prices have to adjust. The problem is that prices depend on wages and wages are inflexible, so in the end, real exchange rate cannot adjust.

There are several alternative adjustment mechanisms. First of all, workers could migrate from Germany to Italy in case of large labour mobility within Europe. Secondly, there can be a transfer of additional tax revenues from Italy to Germany. These tax revenues would be introduced in the form of unemployment benefits and thus increase demand in Germany. However, this solution can be unrealistic unless EU budget was large and solidarity between these countries was sufficient.

In some cases, adjustment is not even necessary. That is, if the size of the shock is rather small or if the economy is highly diversified. Since European countries are highly diversified (i.e. not a single governing sector in the economy), (real) exchange rate modification is less essential.

Even when Italy and Germany are hit by symmetric shocks, it is not necessarily true that they will react in the same manner – same reactions occur only if they have homogenous preferences. From this, we can draw the conclusion that the EMU will be an optimal currency area if European countries possess these characteristics:

- Wage flexibility (goods prices can adjust to the shock)
- Labour mobility (migration can counteract the shock)
- Large budget (monetary transfers can shield from the shock)
- Solidarity between countries (for possibility of monetary transfers)
- Diversified production structure (shock would impact less)
- Homogeneous preferences (identical response to the shock)

Conclusion

The benefits of a common currency include less ambiguity with respect to foreign prices, great market integration for greater economic growth, more uniform political interests, and no more devaluations, revaluations, capital flights or speculations. Besides, there is the removal of transaction costs and **price transparency**: better arbitrage opportunities means an enhanced competitive environment. Moreover, it is more likely that a common currency will be used as a reserve currency in other countries. Thus, there will be **seignorage gains** (the difference between the value of the money and the costs of issuing money) by CB of currency union. On the other hand, the costs of a common currency can be the absence of monetary policy independence for stabilizing output and the unresponsive exchange rates despite changes in aggregate demand. Such costs depend on the degree of overall market integration, which is made up of integration in the product market and the factor market. Higher integration implies less severe loss. In the end, the common decision rule is that a country should join a currency area if the benefits exceed the costs.

Case study: is Europe an optimum currency area?

Based on empirical evidence, it can be claimed that EU is not an optimum currency area. Firstly, adopting the euro has not been that effective in promoting economic growth. Though much larger than EU-US trade, the volume of intra-EU trade has been

far behind that of the intra-US trade. Contrary to the expectation that trade would increase three times, in fact, trade only grew by 9 percent among members of the Eurozone whereas non-members managed to trade 7 percent more with the Eurozone countries. Secondly, the European labour force mobility is limited. This is caused by the differences in cultures and languages among countries as well as the government regulations, which make it harder for unemployed workers to land jobs far from their home countries. Finally, regarding fiscal federalism, it is also limited. The EU has no significant centralized fiscal capacity to cushion member countries in undesirable economic events.

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