

# EFR summary

International Economics, FEB12004  
2024-2025



Lectures 1 to 19  
Weeks 1 to 7

## Details

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# International economics – IBEB –

## Lecture 1, week 1

### National income accounting and Balance of payments

#### National income accounts

National income = income earned by a country's factors of production

#### GNP

**GNP:** Value of all final goods and services produced by a country's factors of production in a given time period

GNP is the sum of the 4 types of expenditures

1. **Private consumption (C):** all expenditures by domestic private individuals or households
2. **Investments (I):** all expenditures by private households on capital, such as building, infrastructure and equipment
3. **Government consumption (G):** expenditures by government on products and services
4. **Current account (CA):** net expenditures by foreigners on domestic goods and services (exports–import)

More precise measures of national income take into account:

**Depreciation** of physical capital: Subtracted from GNP

**Unilateral transfers:** remittances, foreign aid and pension payments to expatriate retirees.

=> National income = GNP - Depreciation + Unilateral transfers

As depreciation and unilateral transfers are often exogenous to government policies, GNP and national income are used interchangeably.

## GDP

**GDP:** 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.

$$\text{GDP} = \text{GNP} - \text{Payments from foreign countries to domestic factors of production} \\ + \text{Payments to foreign countries for foreign factors of production}$$

If  $\text{GNP}/\text{GDP} < 1$ , an economy's earnings are dominated by foreign factors of production.

## Expenditures and production in an open economy

$$Y = C + I + G + CA$$

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

### Exports > Imports

Exports > imports: the country earns more than it spends

=> Increasing net foreign wealth

=> In future periods, the domestic country can consume more than it produces.

### Exports < Imports

Exports < imports: the country earns less than it spends

=> Decreasing net foreign wealth

## National savings and the current account

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

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

$$S = S^p + S^g \text{ (national savings = private savings + government savings)}$$
$$\Rightarrow (Y - C - T) + (T - G)$$
$$\Rightarrow S = Y - C - G$$

We know that

$$CA = Y - (C + I + G)$$
$$\Rightarrow CA = (Y - C - G) - I$$
$$\Rightarrow CA = S - I$$

Therefore

Current account = national savings - investment = net foreign investment

When imports are larger than exports, national savings are low relative to investments.

Government deficit =  $G - T$

High government deficit can lead to a negative current account, assuming other factors are constant

## Balance of payments (BoP)

**Balance of payments:** records all transactions between a domestic and a foreign country.

Note: Due to double-entry bookkeeping

- Each transaction enters the BoP twice, as a credit (+) and as a debit (-)
- The sum of balance of payment should always equal 0 (current account + financial account + capital account = 0)

Balance of payment accounts

1. **Current account:** imports and exports of goods and services
  - Merchandise (physical goods)

- Services (eg payments for legal and shipping services)
  - Income receipts (interest and dividend payments, remittances and income from firms operating in foreign countries)
2. **Financial account:** imports and exports of financial assets or capital
  3. **Capital account:** flows of special, typically non-market, non-produced, or intangible assets (eg debt forgiveness, copyrights and trademarks)

Financial inflow: domestic assets sold to foreigners are recorded as a credit (+) as the domestic country gains cash.

Financial outflow: domestic citizens' purchase of foreign assets is recorded as a debit (-) as it results in cash outflow.

While it is common to assess and rank countries based on national income figures, this is not always effective because there are for example differences in work culture.

=> National income is not the best representation of the citizens' welfare.

=> Broader measure to evaluate the nations' welfare: the **Human Development Index (HDI)**, which equals  $1/3$  life expectancy +  $1/3$  GNP per capita +  $1/3$  literacy rate.

# International Economics – IBEB –

## Lecture 2, week 1

### 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 is a means of payment that can be in the forms of currency in circulation, checking accounts or debit card accounts.

**Liquid asset:** can be used to pay for goods and services without substantial transaction costs (but earns little or no interest)

- Examples: currency in circulation, checking deposits, debit card accounts, savings deposits, and time deposits

**Illiquid assets:** require massive transaction costs in terms of time, effort, or fees to be converted into means of payment (but they earn higher interest)

- Examples: bonds, loans, deposits of currencies, stocks, real estate, works of art

## Money supply and demand

### Money supply

#### Money supply

- Money supply is controlled by the central bank.
- The ESCB (European System of Central Banks) controls the monetary base and indirectly influences checking deposits, debit card accounts, and other monetary assets through banking regulations.

### Money demand

**Money demand:** the amount of money people want to hold instead of the illiquid assets.

Determinants of individual money demand

- (1) interest rates on non-monetary assets
- (2) risk of unexpected inflation
- (3) liquidity: the need for liquidity rises with price and the number of transactions

Determinants of aggregate money demand,

- (1) interest rates on non-monetary assets
- (2) prices (higher prices = higher money demand)
- (3) Income (higher income = higher demand for goods and services = higher money demand)

**Inflation is not important in explaining aggregate demand**, because while lenders lose, borrowers gain (therefore the effect balances out and there's no effect on aggregate money demand)

Aggregate money demand:  $M^d = P * L(R, Y)$

$P$  = price level

$Y$  = real income

$R$  = interest rates on non-monetary assets

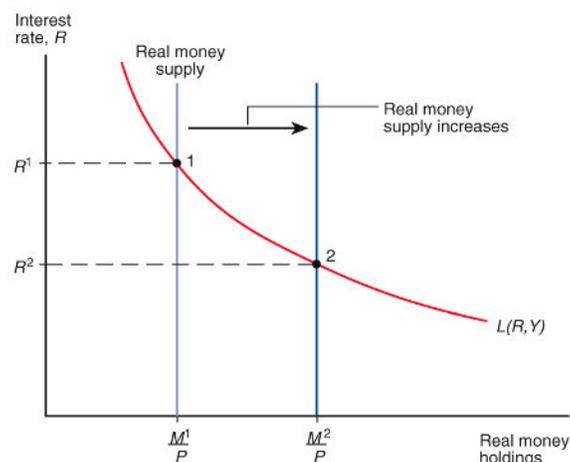
$L(R, Y)$  = aggregate real money demand.

The aggregate money demand is often written in the equivalent form:  $M^d/P = L(R, Y)$ .

**Money market equilibrium** is acquired when interest rate adjusts  $M^s = M^d$  or  $M^s/P = L(R, Y)$

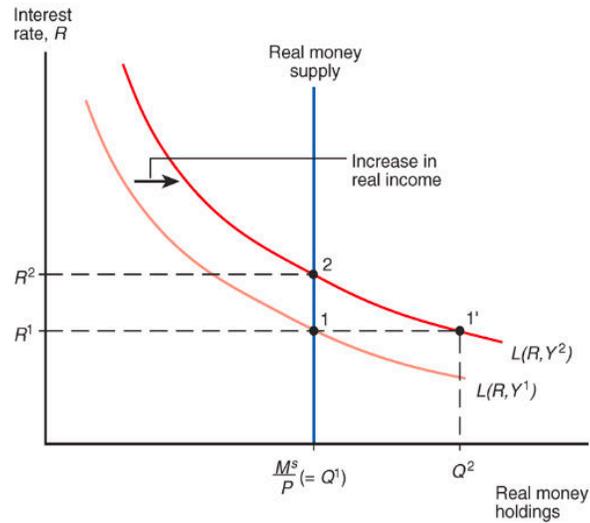
$M^s > M^d$ : the demand will not go up unless people pay a lower interest rate => interest rate falls and households will demand more money until their demand equals supply.

$M^s < M^d$ : households willing to pay higher interest rates, thus the interest rate will increase money demand decreases to reach equilibrium.



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.

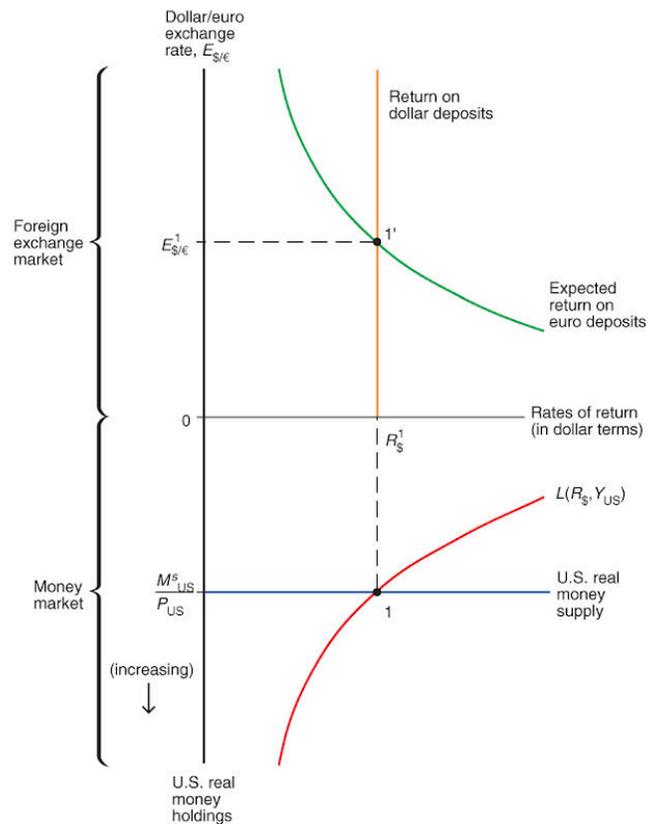
When  $Y$  (income) increases, this affects the demand for money, and  $L(R, Y)$  shifts upwards, leading to higher interest rates in equilibrium.



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 when goods prices are fixed due to 'menu costs'.



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 €.

When the US Fed increases the money supply, the interest rate on US non-monetary assets in dollars decreases. As there are now higher interest rates for assets denominated in euros, the demand for it increases. Investors thus supply dollars and demand euros => 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. Therefore, the green curve shifts to the left. This means that investors will sell more EU assets and demand US dollars => appreciation of the US dollar.

## Short-run vs. long-run

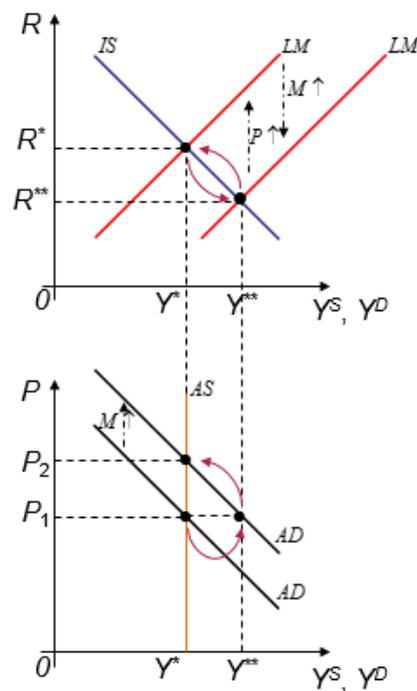
**Short run:** prices are fixed due to menu cost

**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.

Real output and income level are independent of money supply => interest rates are independent of money supply => price levels adjust so that real money supply does not increase.

If there is an increase in money supply, the LM curve (which shows the combinations of interest rates and levels of real income for which the money market is in equilibrium) shifts to the right.

=> Interest rate  $R$  decreases to establish an equilibrium in the money market again.  
=> The lower interest rate  $R$  increases the domestic demand for investment goods, so  $AD$  increases for a given price level  $P$  (short-run equilibrium).



After a while, firms will understand that the increase in the money supply is permanent and will adjust prices to  $P_2$ . This leads to a return to original equilibrium.

=> In the long-run,  $R$ ,  $Y$ ,  $M_s$  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.

## Long-run relationship between money supply and price level

$$\frac{M^s}{P} = L(R, Y)$$

$$\rightarrow P = \frac{M^s}{L(R, Y)}$$

$$\rightarrow \ln P = \ln M^s - \ln L(R, Y)$$

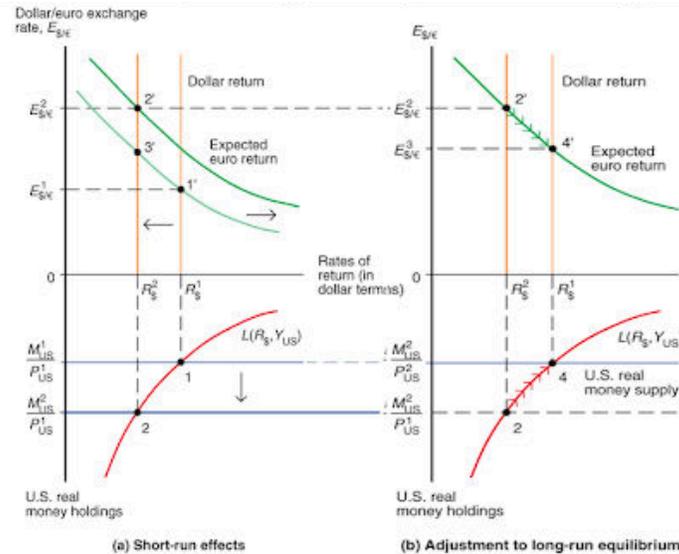
$$\rightarrow \frac{\Delta P}{P} = \frac{\Delta M^s}{M^s} - \frac{\Delta L(R, Y)}{L(R, Y)}$$

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

## Long run effects

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).



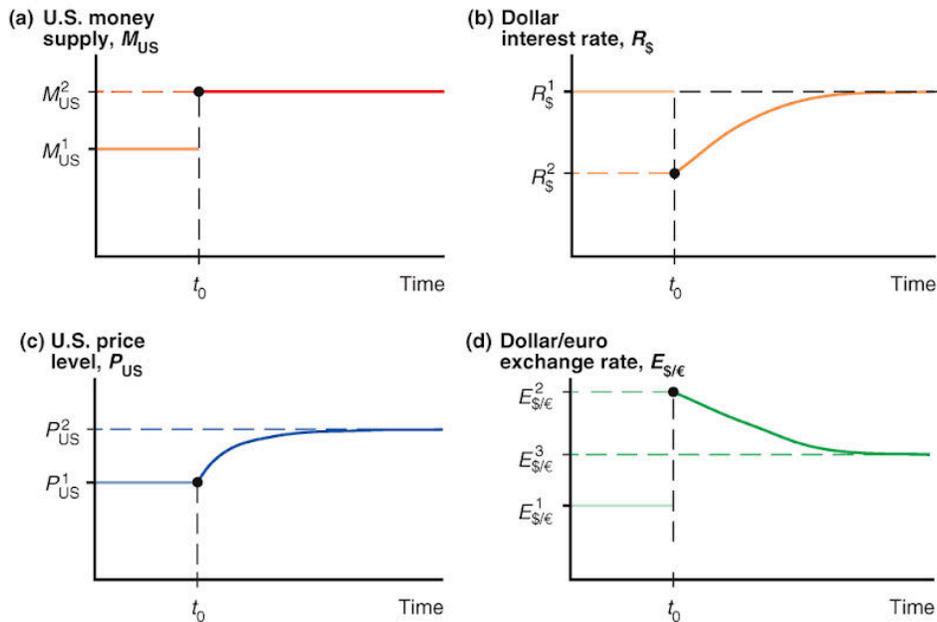
In the long run, workers demand wage compensation which increases production costs and, hence, prices. The money supply increase is now regarded as permanent.

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.

## Exchange rate overshooting

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* and hence output but eventually real variables ( $Y$ ) return to the original level.



## Short-run vs. long-run in 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, real output and income level only depend on a country's factor endowments and technologies, and nominal influence cannot last long.

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 investors. => In the end, an equilibrium is reached at the point where real money supply is at the same level as it was before the increase. The exchange rate jumps abruptly at first, and then decreases slightly afterwards.

# International Finance – IBEB –

## Lecture 3 & 4, week 2

### Price levels and the exchange rate in the long run

#### Law of one price and PPP

**Law of One Price (LOP):** when free trade is costless and the market is perfectly competitive, the prices of the same goods across countries are the identical when expressed in the same currency.

If prices differ across countries: **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 because

- Different taxes across countries.
- Transportation costs and differences in production costs under multinational activity (differences in regulations and taxes)
- Transportation costs combined with different forms of competition (a monopoly in the home market will charge higher prices at home while acting under perfect competition rules in the foreign market)

**Purchasing Power Parity (PPP):** application of the LOP for all goods and services (or a representative basket of goods and services) across countries.

PPP implies that the nominal exchange rate is equal to the ratio of average prices

For example:  $\frac{P^{NL}}{P^{CH}} = E_{\frac{EUR}{CHF}}$

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.

There are two types of PPP:

1. **Absolute PPP:** holds if the exchange rate equals the level of relative average prices across countries

$$\Rightarrow \frac{P^{NL}}{P^{CH}} = E \frac{EUR}{CHF}$$

2. **Relative PPP:** holds if the change in exchange rate equals the change in relative prices.

Relative PPP will definitely hold if absolute PPP holds

In the long run, countries with higher inflation rate see their currencies depreciate. If the money supply increases making prices higher, domestic goods first lose competitiveness 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** has been developed to indicate the exchange rate at which hamburgers cost the same in America as abroad.

If a currency is undervalued: its market exchange rate is higher than the exchange rate derived from the Big Mac.

## Monetary approach to exchange rates

**Monetary approach:** a long-run model in which prices are flexible and always adjust for absolute PPP to hold.

Consider the money market equilibrium in two countries:

$$P_{EU} = \frac{M_{EU}^S}{L(R_{EU}, Y_{EU})} \quad \text{and} \quad P_{US} = \frac{M_{US}^S}{L(R_{US}, Y_{US})}$$

If absolute PPP holds:  $\frac{P_{US}}{P_{EU}} = E \frac{US}{EU}$

The equilibrium exchange rate is determined by the exogenous factors  $M_s$ ,  $R$  and  $Y$  of both countries.

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 holds, the exchange rate then increases and there will be a proportional depreciation of the dollar relative to the euro.
- Because of higher prices, consumers demand fewer US goods, hence fewer dollars => Shift consumption partly from US goods to EU goods.

US interest rate increases

- 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 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.

**Interest parity condition:**

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

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.

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

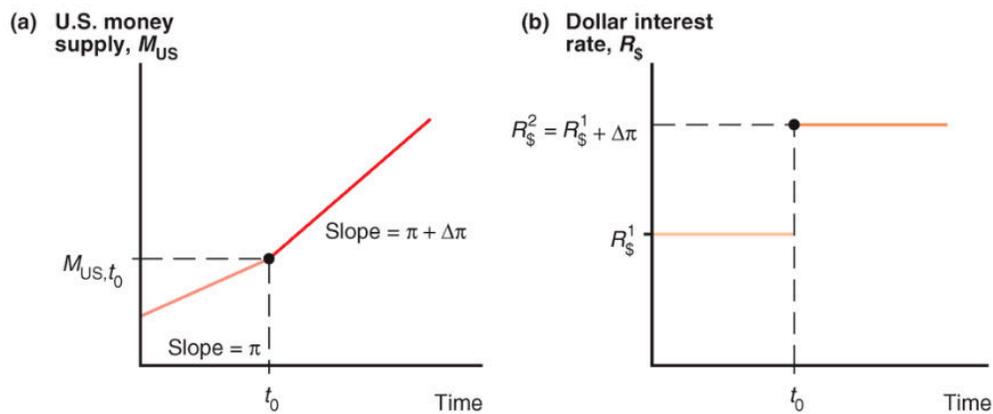
$$\pi_{EU,t} - \pi_{US,t} = \frac{E_{\frac{EU}{US},t} - E_{\frac{EU}{US},t-1}}{E_{\frac{EU}{US},t-1}}$$

Combining two above equations leads to:

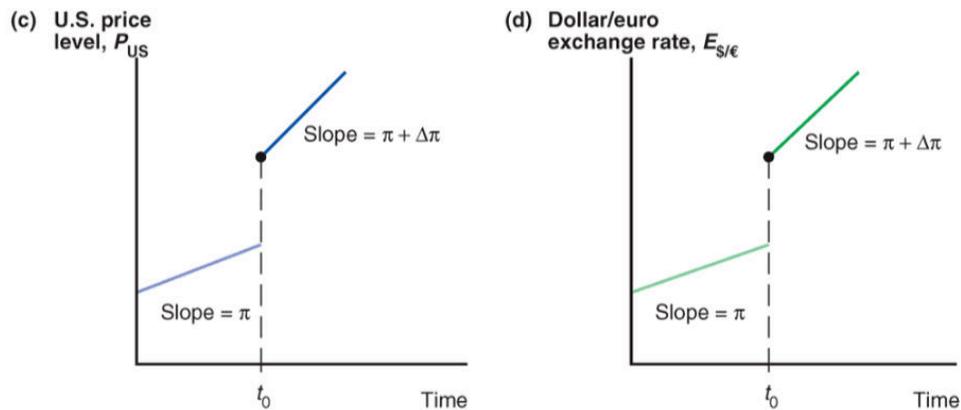
$$R_{EU} - R_{US} = \pi_{EU,t}^e - \pi_{US,t}^e$$

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.



Increase in US inflation rate immediately increases US interest rate



c) Increase in US interest rate decreases real money demand => price level has to increase to reach equilibrium

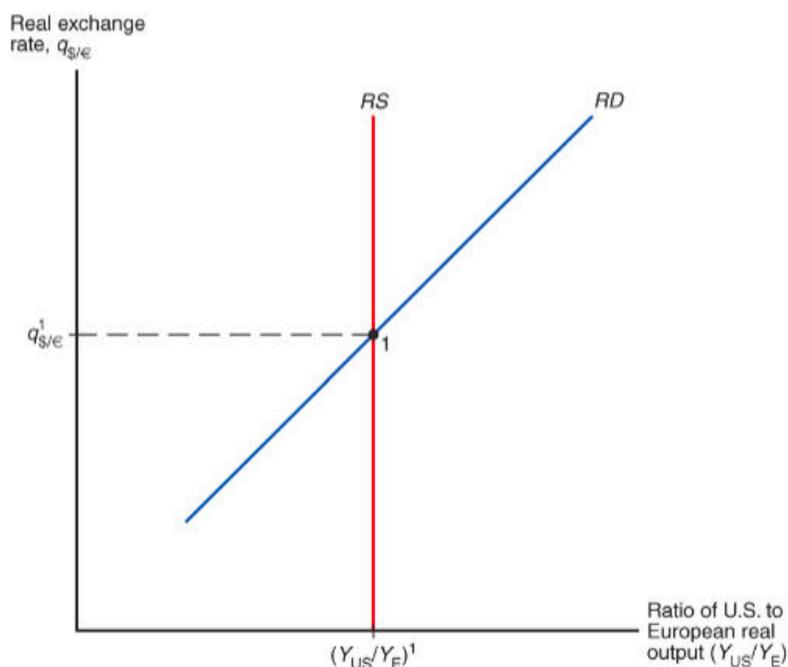
d) Due to PPP, an increase in US price level leads to depreciation of US dollar

## Real exchange rate approach

$$\text{Real exchange rate: } q_{\frac{US}{EU}} = \frac{E_{\$/\text{€}} * P_{EU}}{P_{US}}$$

Determinants of the real exchange rate:

1. nominal exchange rate
2. world relative demand for US goods (tradables and non-tradables): increase in relative demand for US goods increases relative price of US goods => increase of value of US goods relative to EU goods, real appreciation of the \$
3. relative supply of US goods: increase in relative supply of US goods decreases relative price of US goods => decrease of value of US goods relative to EU goods, real depreciation of the \$



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's 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 significance 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:

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

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.

Increase in the US inflation rate: leads to a higher interest rate (the Fisher effect)  
=> money demand in the US will be reduced and the US price level increased. The real exchange rate does not change, only the nominal exchange rate does (same result was observed in the monetary approach)

Increase in the relative demand for tradable and non-tradable domestic goods:  
Increases the US price level  
=> decreases the long-run real exchange rate since US baskets have become more expensive.

However, the long-run national price level is unchanged, as it only depends on money supply and aggregate money demand => for the above equation to hold, there must also be a fall in the long-run nominal exchange rate.

Increase in the relative supply of domestic products: As a result, the relative price of US goods lowers and the dollar depreciates in real terms. In addition, increased relative supply brings about increased aggregate US real money demand and drives down long-run US price levels.

=> the net effect on the nominal exchange rate is ambiguous since real exchange rate and US price level work in opposite directions

Note

- Monetary factors only change the nominal exchange rate, not the real value of goods.
- Real factors change the real value of goods as well as the real exchange rate.

## Interest rate differences

Expected relative change in real exchange rate = expected relative change in nominal exchange rate - expected inflation rate difference

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

$$q_{\frac{US}{EU}} = E_{\frac{\$}{\epsilon}} * \frac{P_{EU}}{P_{US}}$$

Taking the logarithm, we end up with:

$$\frac{q_{\frac{US}{EU}}^e - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} = \frac{E_{\frac{\$}{\epsilon}}^e - E_{\frac{\$}{\epsilon}}}{E_{\frac{\$}{\epsilon}}} - (\pi_{US}^e - \pi_{EU}^e)$$

Combining with the interest parity condition:

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

We end up with the augmented Fisher equation:

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

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

The real interest rate can be written as follows:  $r^e \approx R - \pi^e$

R = nominal interest rate

$\pi^e$  = expected inflation

$r^e$  = expected real interest rate.

Exact definition of the real interest rate:

$$\frac{1+R}{1+\pi} = 1+r$$

However, the two expressions are similar when  $R$  and  $\pi$  are insignificant.

Real interest parity condition:

$$r_{US}^e - r_{EU}^e = \frac{q_{S/\epsilon}^e - q_{S/\epsilon}}{q_{S/\epsilon}}$$

This formula results from combining two equations:

1. The predicted differences in real interest rates across countries:

$$r_{US}^e - r_{EU}^e = (R_{US} - \pi_{US}^e) - (R_{EU} - \pi_{EU}^e)$$

2. The augmented Fisher equation.

If productivity in the US improves, the real value of the US dollar falls

=> 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 (real interest parity condition).

## International Economics – IBEB – Lecture 5, week 3

# Exchange rates and open economy macroeconomics

## Aggregate demand

Components of aggregate demand

1. private consumption (C)
2. private investment (I)
3. government consumption and investments (G)
4. net expenditure by foreigners: the current account (CA).

Determinants of aggregate demand

1. Net income: 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 ( $CA = EX - IM$ ).
  - Assumption: 'home-bias' (the rise in C has a larger effect than that of the fall in CA.)
2. Real exchange rate: With an increase in the real exchange rate, domestic demand increases

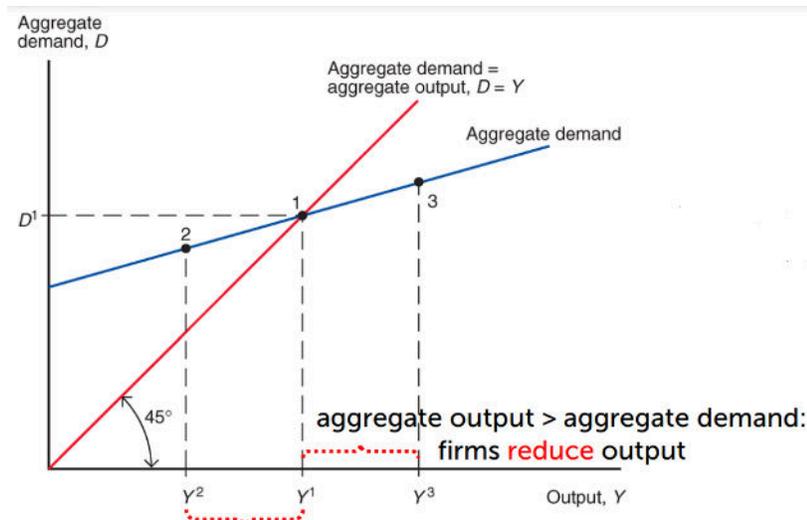
Aggregate demand can be expressed as:

$$Y^D = C(Y - T) + I + G + CA(q, Y - T) \text{ or in other words}$$

$$Y^D = Y^D(q, Y - T, I, G)$$

## Short-run equilibrium in the goods market

Short run: prices are sticky so production adjusts to clear the goods market and the equilibrium is  $Y^S = Y^D(q, Y - T, I, G)$



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.

## DD curve

### Determinants of DD curve

1. Increase in government expenditure: Higher governmental demand for goods and services increases aggregate demand for a given exchange rate  $E$   
=> DD-curve shifts to the right.
2. Decrease in  $T$ : Raises disposable income which induces higher aggregate demand for domestic goods  
=> DD-curve shifts to the right.
3. Increase in  $I$ : Increases aggregate demand for a given  $E$   
=> DD-curve shifts to the right.
4. Decrease in  $P$  relative to  $P^*$ : domestic goods are inexpensive relative to foreign goods, so the domestic demand for domestic goods increases and also export demand increases.

=> DD shifts to the right.

5. Increase in consumer preferences for today: 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.

=> DD shift to the right.

6. Increase in the home bias: households have higher demand for domestic goods relative to the demand for foreign good

=> DD shifts to the right.

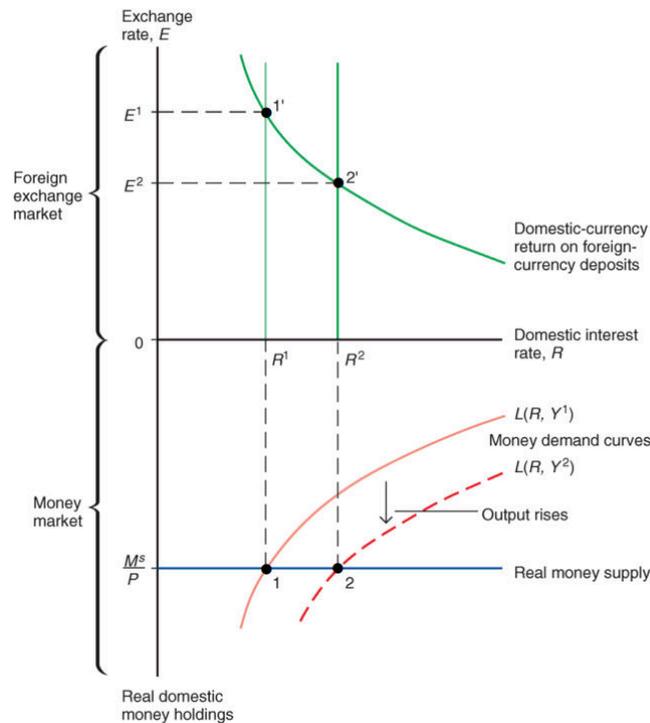
## Short run equilibrium in the money and foreign exchange market

For equilibrium to hold

- The interest parity condition has to hold:  $R^{EU} - R^{US} = \frac{E_{US}^{e} - E_{US}}{E_{US}}$  and
- The money market is in equilibrium:  $\frac{M}{P} = L(r, Y)$ .

Relationship between Y and the nominal exchange rate is as follows: Suppose the domestic income increases

- Real money demand increases so the money demand curve moves downwards.
- At the new intersection between the money supply and money demand curves, the 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 E1 to E2. This implies that we have a negative relationship between income and the exchange rate.



## AA curve

The AA curve describes the relationship between exchange rates and output levels where the money and foreign exchange market are in equilibrium.

### Determinants of AA curve

1. Increase in money supply: Reduces interest rate => depreciate domestic currency  
=> Shift AA curve upwards
2. Increase in the domestic price level: Real money supply decreases => interest rate increases => domestic currency appreciation  
=> Shift AA curve downwards.
3. Decrease in preferences for liquidity: Real money demand decreases => interest rate decreases to match money demand and money supply => Domestic currency depreciate  
=> Shift AA curve upwards.
4. Increase in the foreign interest rate: Investors shift to assets denominated in foreign currency and this results in higher demand for foreign currency => domestic currency depreciates  
=> Shift AA curve upwards

5. Increase in **the expected nominal exchange rate**: Investors expect the domestic currency to depreciate in the future, so they will demand more foreign deposits today => depreciation of the domestic currency occurs today  
=> E increases  
=> Shift AA curve upward

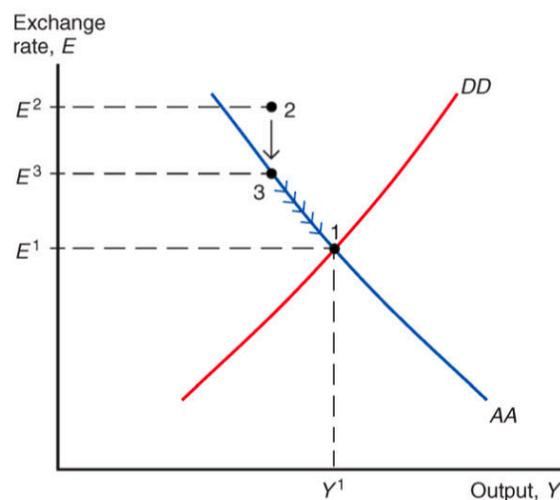
## Simultaneous equilibrium in all markets

(1) Equilibrium in goods market:  $Y^S = Y^D$  in goods market

(2) Equilibrium in the forex market (interest parity condition):  $R^{EU} - R^{US} = \frac{E^e_{EU/US} - E_{EU/US}}{E_{EU/US}}$

and equilibrium in the money market:  $\frac{M}{P} = L(r, Y)$ .

### Adjustment to equilibrium



Combine the DD (which gives all the equilibrium points of the 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 the exchange rate adjusts faster than income.

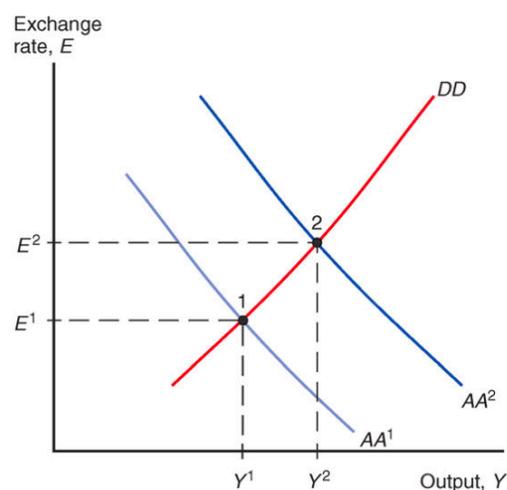
As  $E$  falls to point 3, the foreign exchange and money market are in equilibrium, meaning the expected returns are equalised for both domestic and foreign deposits. Nonetheless, point 3 is still above the  $DD$  curve so demand for domestic goods is still excessive. To match this excess demand, firms 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 => 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.**

1. Monetary policy: Central bank changes money supply
2. Fiscal policy: Government changes government expenditure and taxes

### Increases money supply (monetary policy)



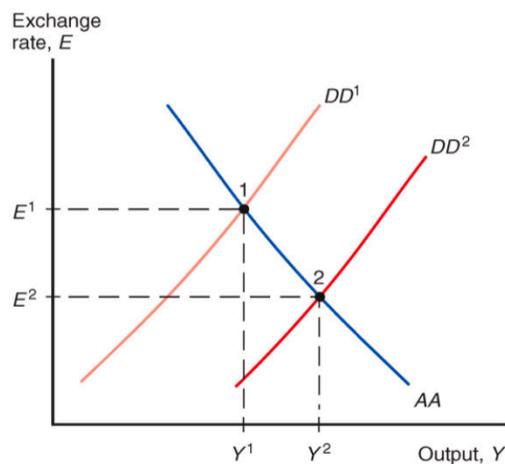
Money market:

- We have excess supply and there has to be a 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.

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.

## Surges expenditures $G$ or cuts tax $T$ (fiscal policy)



Goods market:

- Demand for domestic goods as well as production rises, so the  $DD$  curve shifts to the right

Money market:

- Real money demand increases due to an increase in  $Y$ , and the interest rate increases for equilibrium to be achieved.

Foreign exchange market:

- 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.

## 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.

### Problems with 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 decisions about which policies are necessary in order to reach full employment again.
3. There might be an *implementation lag*: 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.

## Permanent changes in monetary and fiscal policy

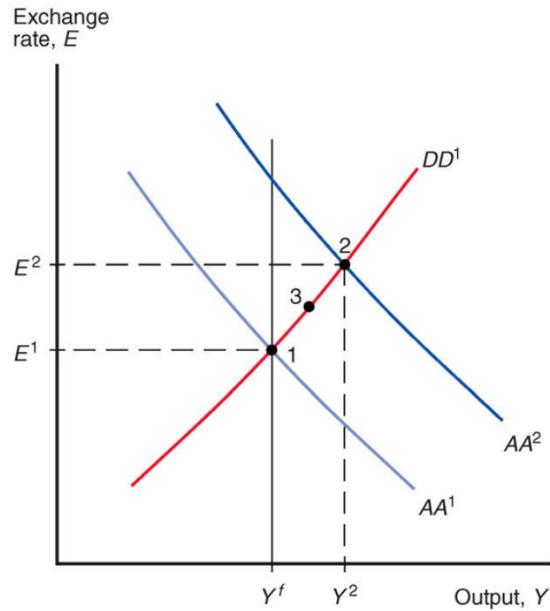
### Increase in money supply (monetary policy)

#### Short run

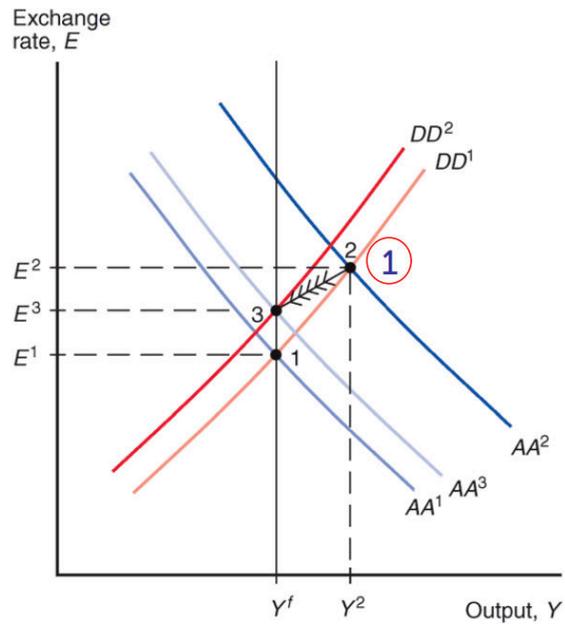
AA curve shifts further upwards than before since investors also expect future depreciation

=> There's a larger decrease in demand for domestic assets

=> Larger decrease in demand for domestic currency and hence a larger depreciation (self-fulfilling expectations)



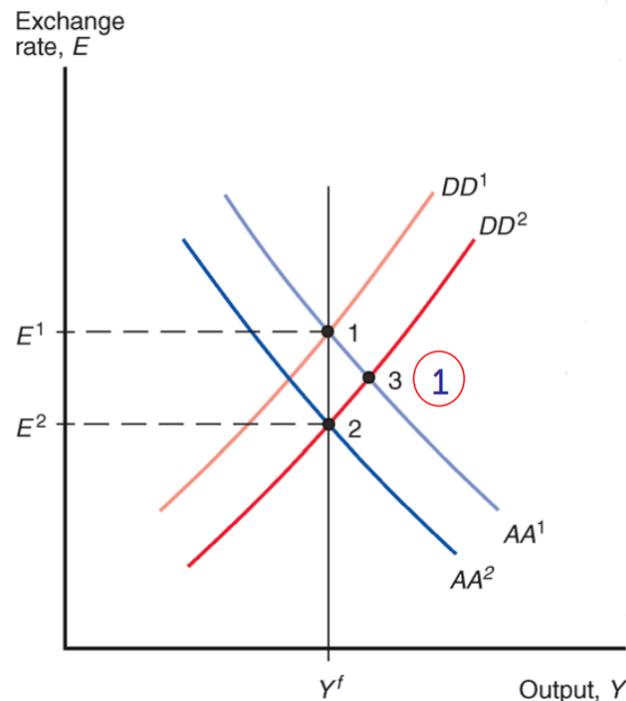
### Long run



1. Domestic prices increases  $\Rightarrow$  decrease demand for domestic goods  $\Rightarrow$  DD-curve to the left
2. There are higher domestic prices  $\Rightarrow$  decrease domestic real money supply leading to an appreciation of domestic currency  $\Rightarrow$  AA-curve shift downwards

Overall effect: In the long-run, output returns to the initial level which is only determined by factor endowments and technologies. Here, the exchange rate overshoot

## Permanent increase in government demand (fiscal policy)

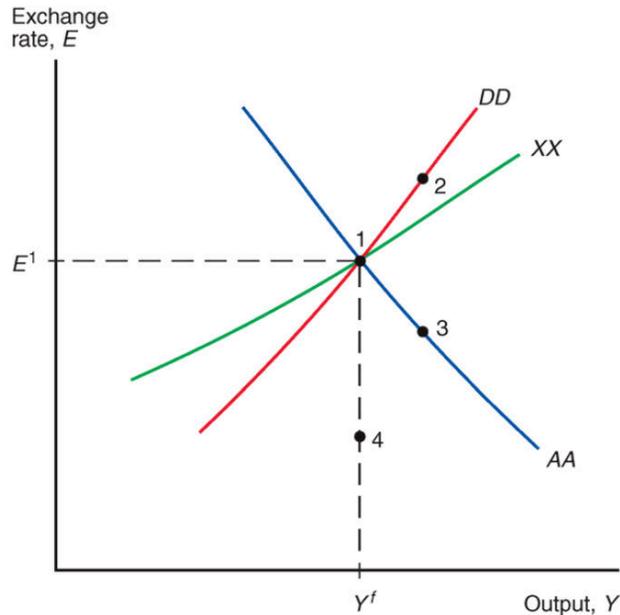


1. Permanent increase in  $G$ : investors expect exchange rate to decrease in the future expected exchange rate
2. Further appreciation of domestic currency  $\Rightarrow$  AA-curve downwards
3. Exports decrease and imports increase

Overall: Long run and short run output returns to initial level and public demand crowds out private demand

## Macroeconomic policies and the current account

We incorporate a current account curve into the the graph



Positive slope because an increase in exchange rate increases exports and decreases imports  
 $\Rightarrow$  CA increases

$$CA(E * \frac{P^*}{P}, Y - T) = X$$

Note: XX curve is flatter than the DD curve

# International Finance – IBEB – Lecture 6, week 3 Fixed exchange rates and foreign exchange intervention

## Types of exchange rate regimes

1. **Fixed exchange rate:** Central bank commits to one fixed exchange level.

2. **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.
3. **Flexible exchange rate:** Exchange rate is solely determined by market forces of supply and demand on the foreign exchange market.

## Central bank assets and liabilities

Assets:

- Foreign government bonds
- Domestic government bonds
- Foreign currency reserves
- Gold
- Loans to domestic banks

Liabilities:

- Deposits of domestic banks
- Domestic currency in circulation

Due to double-entry bookkeeping, whenever the value of assets decreases (or increases), the value of liabilities has to decrease (increase) as well.

How the central bank can influence the exchange rate

1. CB sells part of its foreign currency reserves and buys domestic currency
2. CB buys foreign currency and sells domestic currency

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

## 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 surges. 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: used as the main terms when there is an flexible exchange rate and the value of a currency changes only due to market forces.

Devaluation and revaluation: used when the fixed exchange rate and the value of a currency changes due to central bank interventions in the foreign exchange market.

## 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 devalued, 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**.

Conclusion: Policies that influence the money market will also influence the foreign exchange market, thus monetary policies are not independent with a fixed exchange rate.

## Imperfect asset substitutability and increasing independence of monetary policy

Types of risk:

- **Default risk:** the risk that the borrower cannot pay his debt
- **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 a risk premium  $\rho$  is added for foreign investors when they invest in domestic assets:

$$R - R^* = \frac{E^e - E}{E} + \rho$$

Note that when  $\rho$  increases,  $R$  also increases.

The risk premium depends on

- The difference between returns on regular stocks and government bonds
- The difference between government bonds of different countries.

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 lowers the interest rate. This consequently lowers the exchange rate back to its constant level.

# International Finance – IBEB –

## Lecture 7, week 3

### International monetary system

#### Fixed exchange rate regimes

1. **Gold Standard Era** (1870-1914): the exchange rate between gold and domestic currency is fixed
2. **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: output level at the natural rate of unemployment

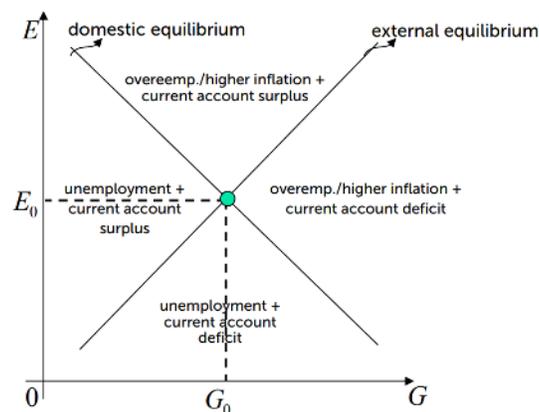
$$Y = Y(C, T, I, G, E)$$

## External equilibrium

External equilibrium: combination of  $G$  and  $E$  that leads to a balanced CA

$$CA = CA(G, T, E)$$

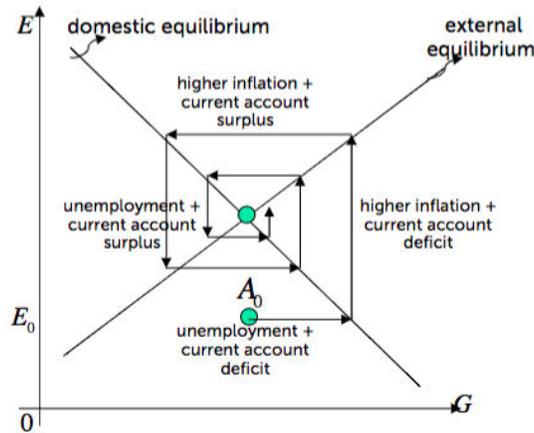
**The macroeconomic equilibrium is thus formed:**



## Problems with fixed exchange rate regimes

The government can only choose between reducing unemployment or reducing the current account deficit

**Tinbergen rule:** the government can only achieve a particular number of policy objectives if it has at least that same number of independent policy instruments available.



## 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.

Trilemma: only 2 of 3 objectives can be reached simultaneously because of the interest parity condition and transaction costs

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

## Changing exchange regimes

A nation might change its exchange rate regime to meet these objectives:

1. **Monetary policy independence**
2. **Fixed exchange rate** which gives more transparency in 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.

Problem: only two of these three objectives are accessible simultaneously (trilemma) because of the interest parity condition and transaction costs.

Typically, it is costly to buy foreign assets, so we adjust the interest parity condition by adding transaction costs:

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

- 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  $R = R^*$   
=> Nations face a trade-off between monetary independence and a fixed exchange rate.

## Regimes over time

**Gold standard (1870–1914):** fixed exchange rate system: countries valued their currencies in terms of gold, so banknotes are backed by gold

=> In reality: exchange rates fluctuated in narrow margins due to costs of shipping gold

### Disadvantages gold standard

- When new gold sources are found, the supply of gold increases causing inflation
- 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.
- No monetary policy available to fight unemployment

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 devaluing their domestic

currencies at other countries' expense (beggar-thy-neighbour policies) during the Great Depression.

=> Crises were aggravated and unemployment became larger

=> The Bretton Woods agreement was signed by 44 nations

Consequences:

- IMF and World Bank establishment
- New system of international economic order in place: Free trade and no 'beggar thy neighbour' policies and stable international monetary system to foster international trade flows

With this agreement, US \$ become an international reserve currency which is fixed at the price of gold at 35\$ per ounce (gold standard again)

=> Pegging of other currencies to US-\$ within 1%-band

However, because of the n-1 problem, the Bretton woods system broke down in 1973

N-1 problem:

- Other countries have no freedom in monetary policy
- US have complete freedom in monetary policy => during the Vietnam war there is a high inflation in US => other countries have to buy US-\$ => enormous US-\$ reserves of other countries => break down of Bretton Woods system

### **Potential organisations of exchange rate regimes**

- Conventional fixed-peg arrangements: country pegs its currency at foreign currency or basket of foreign currencies
- Pegged exchange rates within horizontal bands: like fixed-peg arrangement, but currency can fluctuate within the band around fixed exchange rate
- Crawling peg: fixed exchange rate is adjusted periodically
- Crawling band: central exchange rate or margins of band are adjusted periodically
- Managed floating: central bank influences exchange rate without commitment to a specific exchange rate
- Independently floating: exchange rate is determined by market forces

# International Finance – IBEB –

## Lecture 8, week 3

### International financial institutions

#### Theory of optimum currency areas

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

In general, monetary union is advantageous in that it helps avoid currency crises 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. But prices depend on wages and wages are inflexible  $\Rightarrow$  Real exchange rate cannot adjust.

Alternative adjustment mechanisms:

- Workers could migrate from Germany to Italy in case of large labour mobility within Europe.
- 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 the EU budget was large and solidarity between these countries was sufficient.

Adjustment is not necessary if the size of the shock is rather small or if the economy is highly diversified. Since European countries are highly diversified (not a single governing sector in the economy), real exchange rate modification is less essential.

EMU will be an optimal currency area if European countries possess these characteristics:

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

# International Trade – IBEB – Lecture 1, week 4

## World trade: an overview

### Overview

Total world exports are enormous. However, it is not equal among countries. While some developing countries are catching up, most trade is with 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)

$T_{ij}$ : value of trade between the two countries

$Y_i$  and  $Y_j$ : GDP of country i and country j respectively

$D_{ij}$ : trade impediments between the two countries

a, b and c: The relative significance of each component

### The Gravity Model:

$$T_{ij} = \frac{(Y_i)^a (Y_j)^b}{(D_{ij})^c}$$

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.

On the other hand,

### Latest evidence of the model:

- Estimates of the effect of distance (c): a 1% increase in the distance between countries is typically associated with a decrease in the volume of trade of 0.7% to 1%
- Estimates of the effect of countries' size (a and b): a 1% increase in a country's economic size is typically associated with an increase in the volume of trade of about 1%

## What influences the value of trade

1. **Size of economies (measured by GDP):** Economies with greater gross domestic product have greater national income thus they import more goods, produce more goods and export more.
2. **Distance:** Longer distances between countries increases transportation costs, which reduces incentives to trade.
3. **Cultural affinity:** countries with similar cultural and historical ties are more likely to trade with each other and develop stronger economic ties
4. **Geographic factors:** countries with more water bodies and less obstructions like mountains increase ease of international transportation and thus increases trade
5. **Borders (trade policies):** 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.

## Globalisation overtime

Technologies have enhanced trade and globalisation by reducing trade impediments, 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 it is 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.

## Changing composition of trade

- In the past: trade consisted mainly of agricultural products and natural resources.
- Nowadays: in developed and some developing countries, the main component of trade is **manufactured products** (around 54%), then come

services (23%), mineral/natural resources products (12%), and agricultural products (8%).

## Two important recent developments

1. **Trade in intermediate goods** (used for production not consumption)
  - => More complex international supply chains
  - => Increasing internationalisation of production networks (Allows countries to specialise which increases efficiency but also increases vulnerability of production processes)
  - => Companies diversify their intermediate goods production to different countries
2. **Trade in services:** Advances in modern communication technology allow more and more tasks to be outsourced
  - => Service outsourcing (offshoring) occurs when a firm providing services moves its operations to a foreign location (usually occur for services that can be transmitted electronically)
  - => Services outsourcing is currently not a significant part of trade, but it is increasing
  - => A large part of services are still non-tradable (eg hair cuts)
  - => More and more services jobs will become outsourceable (e.g radiologists, and lecturers)

# International Trade – IBEB – Lecture 2, week 4

## The Ricardian model

### Theories of trade – 2 categories

1. Models emphasising **the differences between countries**, particularly in labour skills, natural resources, physical capital, and technology (Eg Norway and Spain trade fish for oranges and Saudi Arabia and the US trade iPads for oil)

2. Models emphasising **economies of scale**, where the concerned countries have no a priori differences but can benefit from economies of scale if they specialise in a few products only and then trade.

## Ricardian model

The two fundamental concepts of the Ricardian Model: 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 a trade-off between how many goods A and B to produce.
- **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.

=> World output increases

## A one-factor Ricardian Model

**The one-factor Ricardian Model** makes these 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:** 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 labour available and the time required to produce a single unit of both goods:

$$a_{LC}Q_C + a_{LW}Q_W \leq L$$

$L$  = total amount of labor resources (number of hours worked in an economy if all labourers are employed which is constant by assumption)

$Q_A$  and  $Q_B$  = quantity of A and B produced

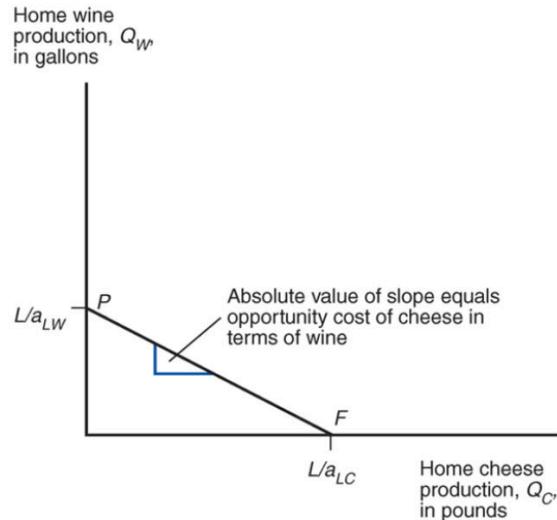
$a_{LC}$  and  $a_{LW}$  = **unit labour requirement** (hours of labour required to produce 1 unit of A or B). The higher the unit labour requirement for a good, the lower the labour productivity.

Country's maximum cheese or wine production:

$$Q_C = L/a_{LC} \quad \text{when } Q_W = 0 \quad \text{or} \quad Q_W = L/a_{LW} \quad \text{when } Q_C = 0$$

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

$$Q_W = \frac{L}{a_{LW}} - \frac{a_{LC}}{a_{LW}}Q_C$$



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

## Actual production

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

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

$$Q_C P_C - w_C L_C = 0 \Leftrightarrow w_C = P_C (Q_C / L_C) \Leftrightarrow w_C = P_C / a_{LC}$$

$$Q_W P_W - w_W L_W = 0 \Leftrightarrow w_W = P_W (Q_W / L_W) \Leftrightarrow w_W = P_W / a_{LW}$$

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  $(P_C / a_{LC}) = \mathbf{w_C} < \mathbf{w_W} = (P_W / a_{LW})$ , or equivalently if  $P_W / P_C > a_{LW} / a_{LC}$  workers will only produce wine.

Workers only produce a good if it offers them a higher hourly wage ( $P_C / a_{LC}$  or  $P_W / a_{LW}$ ), and if the price of the more time-consuming goods at least compensates until the hourly wage is equivalent to the other good. Workers are indifferent when

the hourly wage is the same ( $P_C/a_{LC} = P_W/a_{LW}$ ) for two goods, and production occurs when the relative price equals opportunity cost of producing a good ( $P_C/P_W = a_{LC}/a_{LW}$ ). Therefore, a combination of both goods can be produced, leading to the state of **autarky**. This involves no trade and no specific specialisation in the economy.

## Trade in Ricardian model

**Absolute advantage:** 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  $a_{LC} < a^*_{LC}$  and  $a_{LW} < a^*_{LW}$

**Comparative advantage:** 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 cheese over foreign:

$$a_{LC}/a_{LW} < a^*_{LC}/a^*_{LW}$$

Similarly, foreign is comparatively better in production of wine over home:

$$a_{LW}/a_{LC} > a^*_{LW}/a^*_{LC}$$

Since home has a comparative advantage in production of cheese, the state of **autarky** will cause the relative price of cheese to be lower at home than in foreign, similarly the relative price of wine will be lower in foreign than in home.

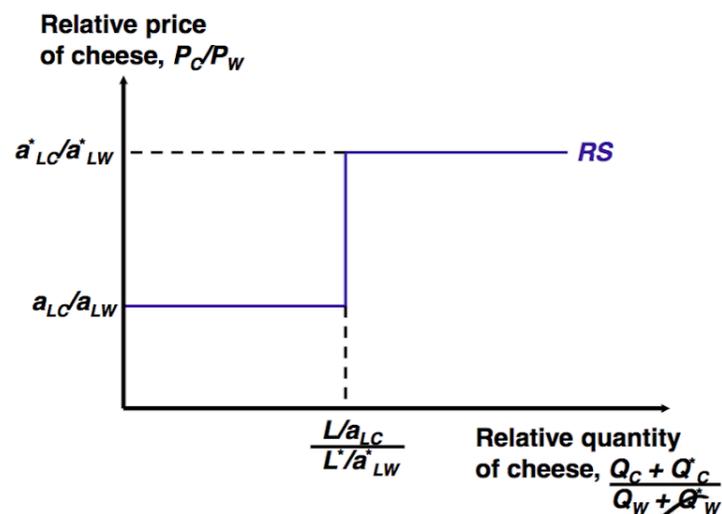
$$P_C/P_W = a_{LW}/a_{LC} < a^*_{LW}/a^*_{LC} = P^*_C/P^*_W$$

Mutual trade is thus beneficial for both countries.

The trade will be determined by the market forces of demand and supply.

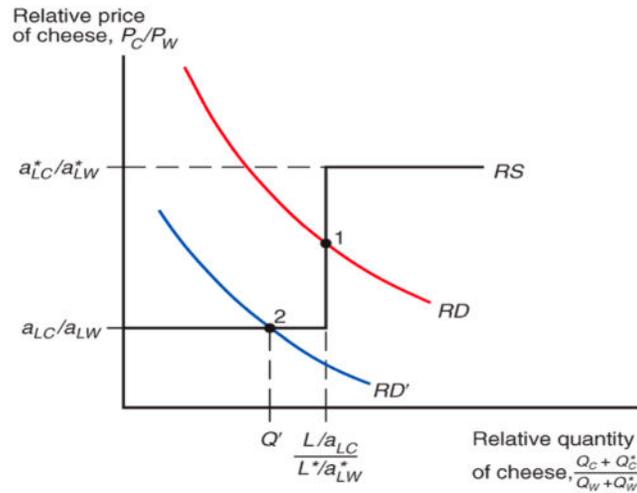
**Relative supply** of good B is  $RS = (Q_C + Q^*_C)/(Q_W + Q^*_W)$

- If the relative price is below the opportunity cost of cheese 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 cheese in both countries, they both will be eager to supply cheese => Relative supply will be infinite with both countries are not supplying A at all
- If relative price of cheese is equal to its opportunity cost at home, then worker's hourly wage makes domestic workers indifferent between both goods, foreign workers produce only wine
- If the relative price is equal to the opportunity cost of cheese in foreign then worker's hourly wage makes them indifferent between both goods; domestic workers produce only cheese
- If the relative price is between the opportunity cost of cheese at home and foreign, specialisation will take place and the relative quantity supplied will be  $(L/a_{LC}) / (L^*/a^*_{LW})$ , domestic workers produce only B and foreign workers produce only wine



**Relative demand (RD):** the quantity of that good demanded in all countries relative to the quantity of A demanded in all countries.

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



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

$$P_C/P_W < P_C^{\text{world}}/P_W^{\text{world}} < P_C^*/P_W^*$$

## International Trade – IBEB – Lecture 3, week 4

### 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.

=> 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.

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:

With trade: Domestic workers earn  $w = \frac{P_c^{World}}{a_{LC}}$

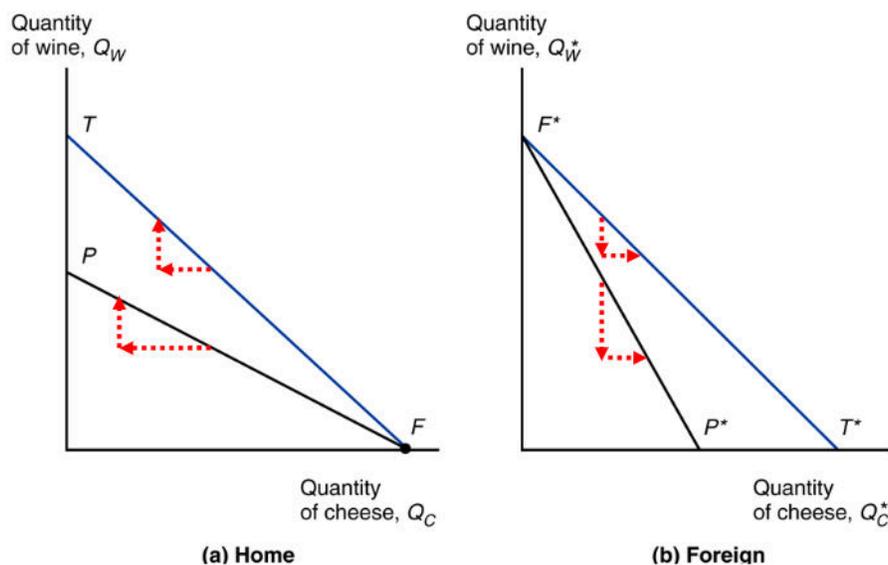
This wage buys them:  $\frac{w}{P_c^{World}} = \frac{1}{a_{LC}}$  cheese, or  $\frac{w}{P_w^{World}} = \frac{P_c^{World}}{P_w^{World}} * \frac{1}{a_{LC}}$  wine

Before trade: They earned  $w = \frac{P_c}{a_{LC}}$

This wage buys them:  $\frac{w}{P_c} = \frac{1}{a_{LC}}$  cheese, or  $\frac{w}{P_w} = \frac{P_c}{P_w} * \frac{1}{a_{LC}}$  wine

=> Their purchasing power remains the same in cheese and increases in wine

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:



## Misconceptions about international trade

- Free trade is beneficial only if a country is more productive than foreign countries.  
=> However, an unproductive country also benefits from free trade by avoiding high costs of producing inefficient goods domestically.

- Free trade exploits less productive countries.  
=> However, consumers can benefit from free trade by having access to cheaply produced foreign goods and workers can benefit from having higher wages

## Relative wages

In Home, workers that produce cheese earn:  $w_C = \frac{P_C^{World}}{a_{LC}}$

In Foreign, workers that produce wine earn:  $w_W^* = \frac{P_W^{World}}{a_{LW}^*}$

**Relative wage:** the wage of the home country relative to the wage in the foreign

country, expressed by:  $\frac{w_C}{w_W^*} = \frac{P_C^{World}}{P_W^{World}} * \frac{a_{LW}^*}{a_{LC}}$

Given that

- $\frac{P_C^{World}}{P_W^{World}} < \frac{P_C^*}{P_W^*} = \frac{a_{LC}^*}{a_{LW}^*}$
- $\frac{P_C^{World}}{P_W^{World}} > \frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}}$

We get the inequality:

$$(a_{LW}^* / a_{LW}) < (w_C / w_W^*) < (a_{LC}^* / a_{LC})$$

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 cheese and how much better it is at making wine 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).

- High wages can be offset by high productivity
- Low productivity can be offset by low wages

**Each country produces goods they have a cost advantage in.**

# 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  $i = 1, 2, 3, \dots, N$ .

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 goods will be produced where the production cost is the lowest.

For example, if  $wa_{Li} < w^*a_{Li}^*$ , home has a cost advantage and should produce the goods and vice versa.

=> Thus, relative wages and relative productivity determine the specialisation pattern.

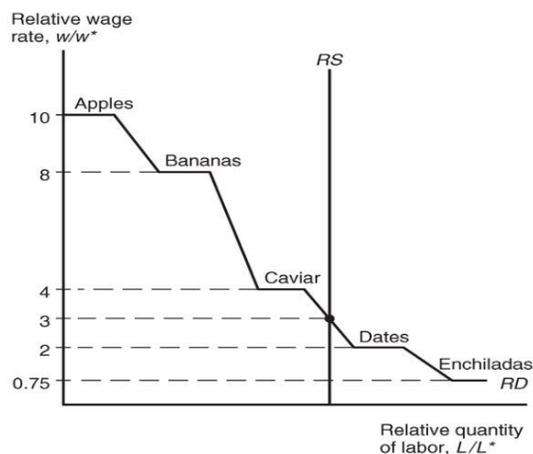
=> The relative productivity in each product is fixed, at least in the short run.

=> The relative wages are determined by their **relative demand** and **relative supply of labour**.

**Relative supply:** Fixed by the amount of labor in each country:  $RS = \frac{L}{L^*}$

**Relative demand:** RD declines as relative wage  $w/w^*$  increases because

1. Relative wage rising makes domestic goods more expensive, so demand for the goods and thus the labour service falls.
2. Increased relative wage makes producing domestically more expensive, further reducing demand for labour.



## Empirical evidence

Weakness: Include some unrealistic assumptions

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

These lead to some over-stylized predictions that:

1. Everybody benefits from trade. This is due to the one-factor assumption. In reality, some people benefit while some do not.
2. 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.
3. The specialisation pattern is strong: at most one good is produced in both countries while the rest is produced in one country only. In reality, specialisation is not very strict because of transport costs, non-traded goods, and the existence of multiple factors of production.

Strengths

1. Empirical studies show that countries tend to export goods in which their relative productivity to other goods is high.
2. Many economies with an absolute disadvantage in all industries can still have major exports thanks to comparative advantage in one.

3. 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 Trade – IBEB – Lecture 4, week 5

## 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

Assumptions:

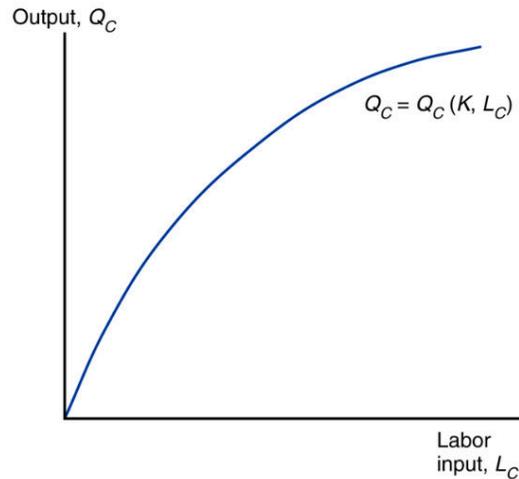
1. **Two** goods (eg car and food)
2. Three factors are used in production: **land, labour** and **capital**
3. car are produced using **labour** and **capital**
4. food is produced using **labour** and **land**
5. **Perfect competition** and there are no entry/exit barriers
6. All production factors are internationally immobile
7. Labour is perfectly **mobile** between sectors within countries
8. Capital and land are **occupationally immobile** and are considered as **specific factors**

## 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 car and food can be represented as:

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

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

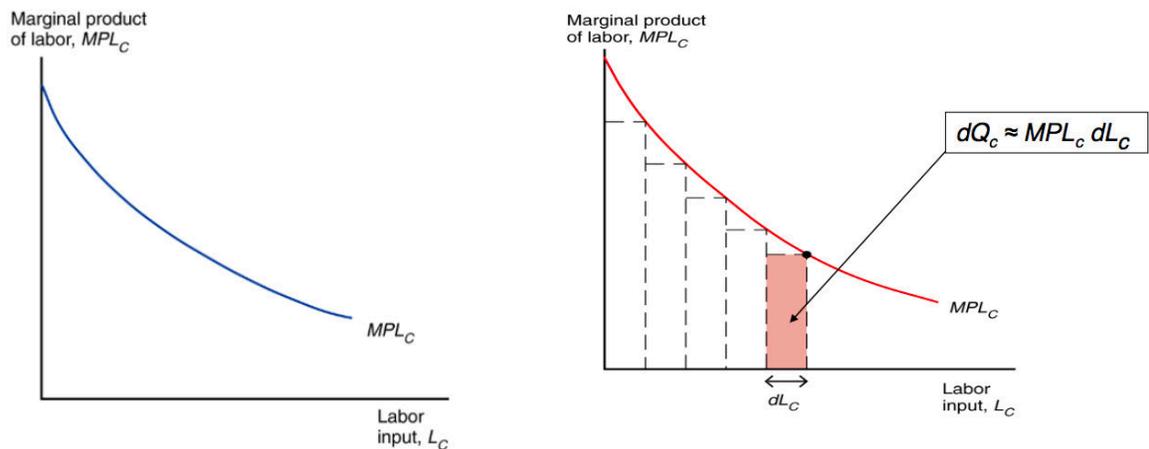


Where  $Q$  denotes the quantity of the respective good,  $A$  stands for Airplane,  $W$  for food,  $K$  represents Capital,  $T$  represents Land and  $L$  is Labour.

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 utilised in the production of the specified goods. The production function implicitly captures **the diminishing marginal returns to labour** when capital/land is held fixed.

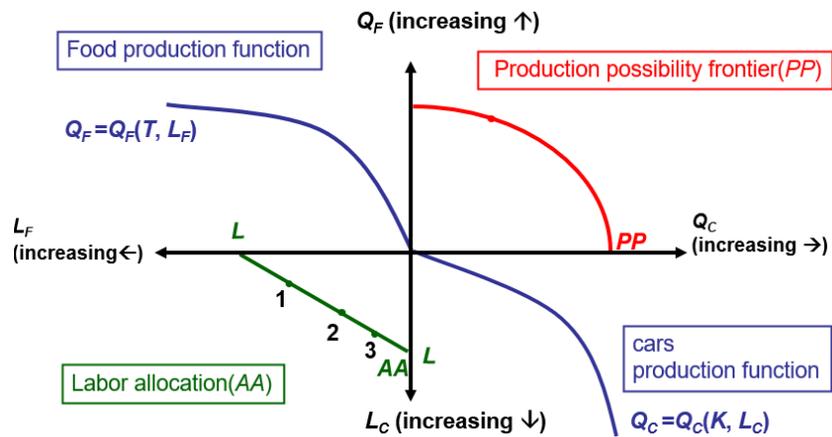
An increase in the amount of labour, without any change in the other factors, leads to each additional worker contributing less to the produced output than the previous worker, thus the marginal product of labour declines as the number of workers employed increases.

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**.



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** in which labour can only be used in the production of either airplanes or food at the same time. With labour market equilibrium and the production functions, the production possibility frontier (PPF) can be derived.



Every chosen combination of labour allocated to car and food production (3rd quadrant) corresponds to a level of output produced of car (4th quadrant) and a level of output produced of food (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 car in terms of food.

If one person-hour of labour is shifted from food to car production, this extra input will increase output in that sector by the marginal product of labour in car,  $MPL_C$ . Since  $dQ_C = MPL_F dL_F$ , to produce an extra unit of car requires  $1/MPL_C$  units of labour. These units of labour could have otherwise produced  $MPL_F/MPL_C$  units of food, because  $dQ_C = MPL_F dL_F$ . Thus, the opportunity cost of producing one extra unit of car is  $-(MPL_F/MPL_C)$  units of food.

## 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 car:*

$\max \{price * quantity - wage\ expenses - capital\ rent\} \Leftrightarrow \text{derivative of } (price * quantity - wage\ expenses - capital\ rent) = 0$

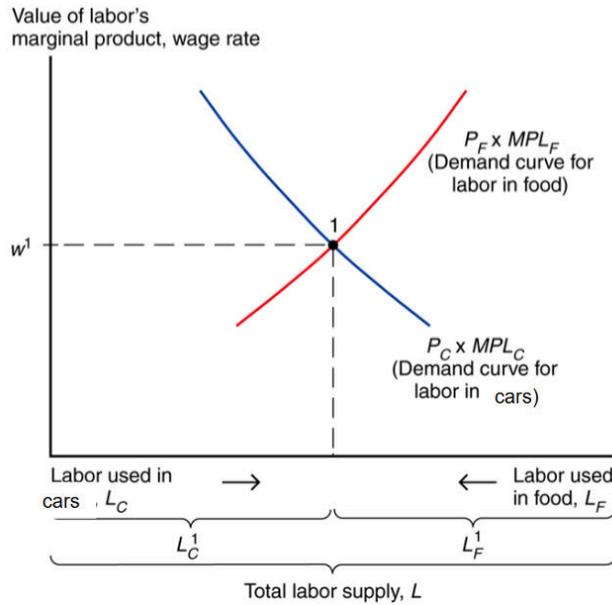
*Which results in:*

$$w_C = P_C * MPL_C$$

*Similarly, this holds for the food sector:*

$$w_F = P_F * MPL_F$$

*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:*

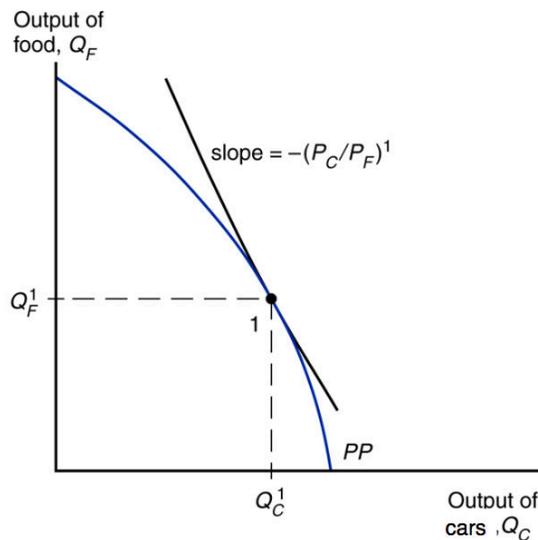


Where the labour demand curves intersect is the equilibrium wage and allocation of labour between the two sectors. At this point, the wage is the **same** for both sectors for workers to not be incentivized to switch sectors.

$$w_F = w_C \Leftrightarrow MPL_F P_F = MPL_C P_C$$

$$-\left(\frac{MPL_F}{MPL_C}\right) = -\left(\frac{P_F}{P_C}\right)$$

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 car in terms of food.



# Proportional and relative change in prices

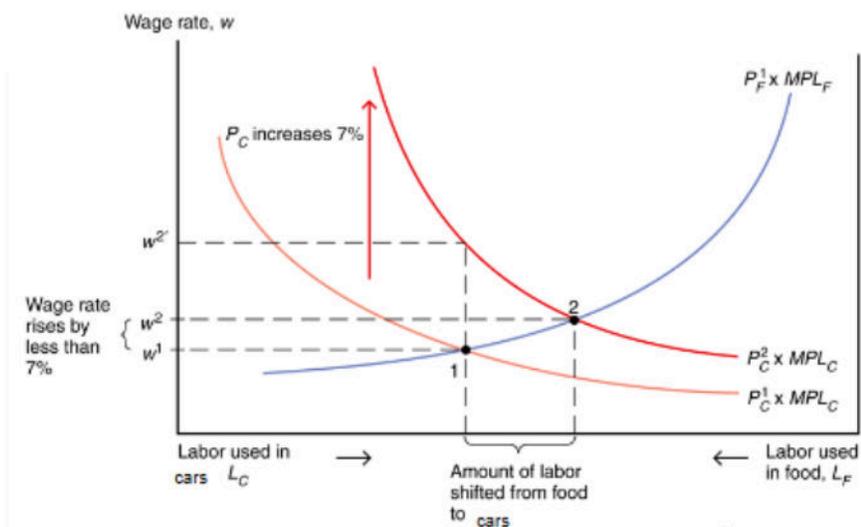
Changes in price of car and food can influence the labour demand in two ways:

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 car and food 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 rose 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 car rises by 5 per cent, whereas the price of food remains the same. As the relative price of car increases, the labour demand for car increases and more labour is allocated to car production. However,  $MPL_C$  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 food to the car sector, and output of car increases while the output of food falls.



The welfare of three parties is affected by this change:

1. Capital owners are in a better state: output of car increases, wages rise by less than the rise in price of car, so they earn more; relative price of car increases, so they have more purchasing power of food.
2. Landowners are worse off: output of food declines, wages rise while price of food is unchanged, so they earn less; relative price of car increases, so they have less purchasing power of car.
3. There is a wage increase for workers, but in real terms with regards to car they are worse off while in the case of food, 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 ensuring 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).

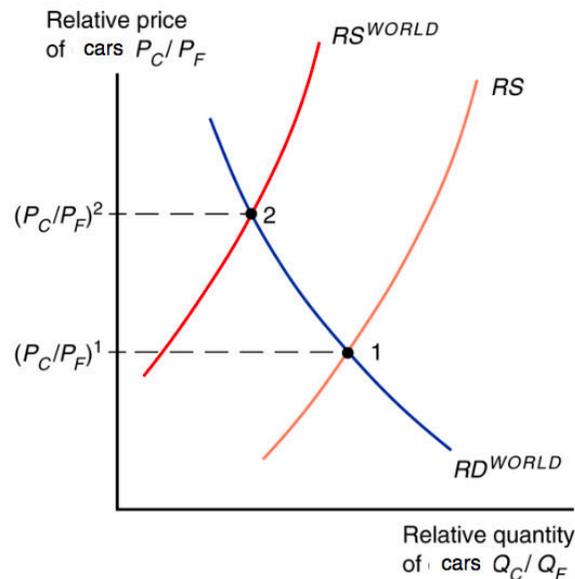
*Example of Home and Foreign with two goods car and food:*

By assuming that preferences are the same worldwide, the relative demand stays put.

Assume Foreign is willing to produce relatively less car at a given relative price. This could be due to lower productivity in car production or higher in food; alternatively, the specific factors which it possesses are unfavourable in the production of car over food.

Since Home country's relative supply lies to the right of the world's relative supply, it faces a lower relative price of car domestically which makes it worthwhile to trade internationally.

Foreign consumers find this lower relative price desirable and will start making purchases from Home of car which thus increases the demand for car further hiking the prices.



## Gains from trade

In autarky, the consumption of Home equals its production:

$$Q_C = D_C \text{ and } Q_F = D_F$$

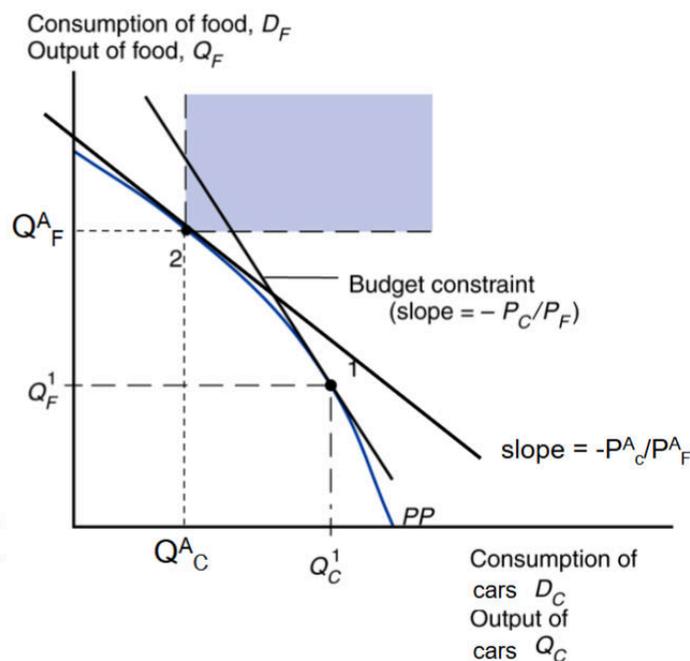
(where  $D_F$  stands for food consumption and  $D_C$  for car consumption).

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:

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

This can be rewritten as  $(D_F - Q_F) = (P_C/P_F) (Q_C - D_C)$ , which tells us how much a country needs to export in order to earn the funds for importing. If they earn  $P_C$  for an extra unit of car exported, then they can buy  $P_C/P_F$  units of food in return. Thus, in case  $(Q_C - D_C) > 0$ , the country exports car and in transaction is able to import food. Otherwise, if it is lower than 0, the country imports car.

If before trade the country produces a modest number of car and greater quantities of food, after opening to trade the bundle it chooses involves greater production of car than food. It can export the car and thus consume its budget constraint positions where both amounts of car and food 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 reprogrammed 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.

## Trade and income redistribution

Trade creates winners and losers in the Specific Factors model. In the real world the effect of trade may actually be smaller or larger

Effect can be smaller because

- Different from the assumption, specific factors can move between sectors: people can acquire new skills, machines can be changed, land can be replanted or used to build a factory on => Heckscher-Ohlin model

Effect can be larger because

- Opening to trade shifts jobs from import-competing to exporting sectors
- In the Specific Factors model, workers move costlessly between sectors. However, in the real world this may not happen instantaneously as finding new jobs in the exporting sector may not be easy
- Opening to trade may lead to an increase in short-run unemployment

## The Political Economy of Trade

Trade creates winners and losers, but it increases welfare in a country as a whole. Therefore, it is the government's role to provide a safety net for groups at risk of losing a lot from trade.

# International Trade – IBEB – Lecture 5+6, week 5

## 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.

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, 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

Assumptions:

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

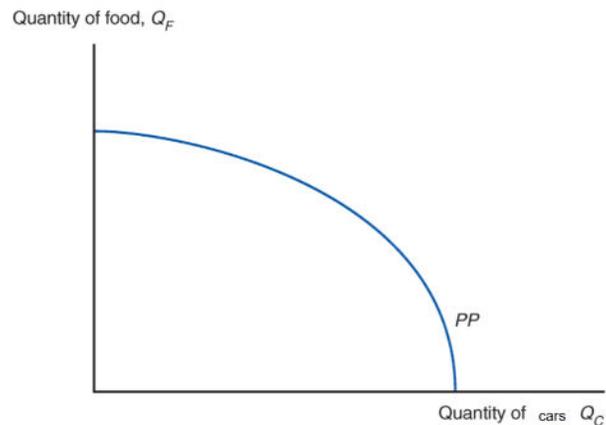
**Production function** for car and food:

$$Q_C = Q_C(K_C, L_C) \quad \text{and} \quad Q_F = Q_F(K_F, L_F)$$

The production function is characterised by diminishing returns to labor and capital

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 car in terms of food increases when the amount of car produced is higher, and vice versa.



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:

$$V = P_C Q_C + P_F Q_F$$

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  $V^*$ :

$$V^* = P_C Q_C + P_F Q_F \Leftrightarrow Q_F = V^*/P_F - (P_C/P_F)Q_C$$

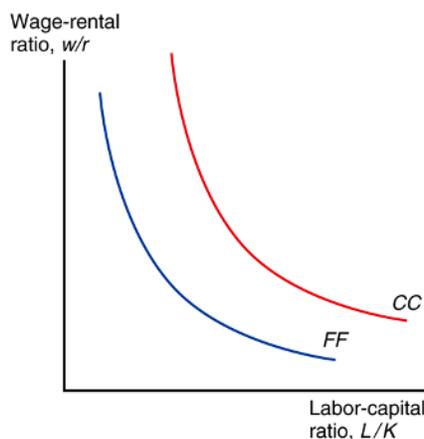
Thus, the slope of an isovalue line is  $-P_C/P_F$

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 car to food 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 goods. 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 car and food.

Assuming that the food 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, car production (CC) is more **labour intensive**, meaning for each relative wage to rent it employs a higher quantity of relative labour to capital. Therefore:

$$L_C/K_C > L_F/K_F$$



In perfect competition, **normal profit** is made, that is: zero economic profit.  
 => Goods prices are equal to the production costs, and production costs are determined by factor prices, so goods prices and factor prices are related.

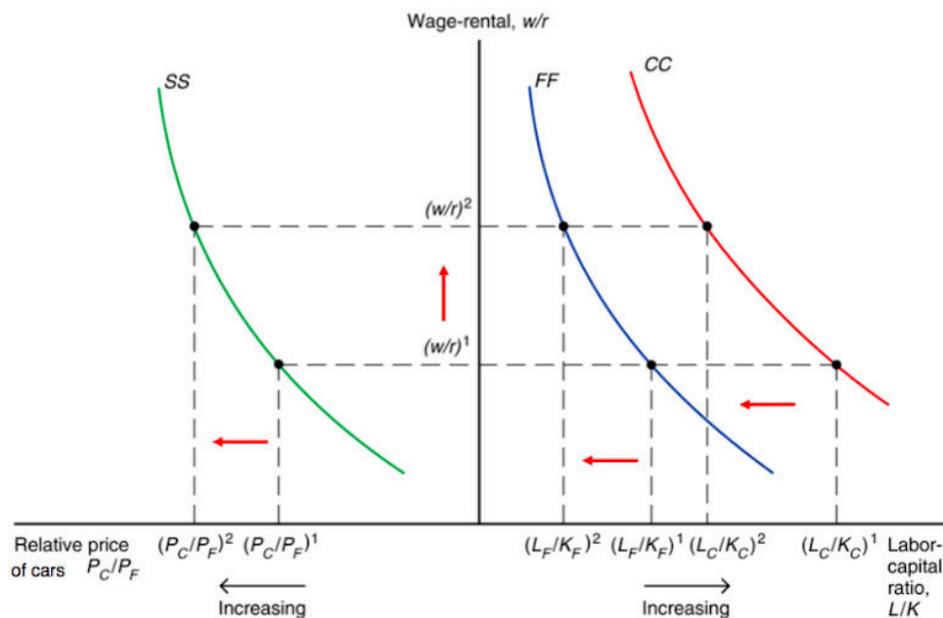
Changes in wages and rents affect the production costs depending on the intensity of use of each factor. If the production of goods uses a lot of labour and a little capital, then a change in wages will affect prices more than a change in rents. In the case of car, wage hike will be more detrimental than capital rent hike. As a result, production costs will rise relatively more than in the case of food. Besides, the relative price of car to food will increase.

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



If the relative price of car to food increases, some firms will switch to producing car to earn more. Since food production is capital intensive and is now idle, there is excess supply of capital

In contrast, as car 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.



As firms use less labour or  $L/K$  reduces, marginal productivity of labour or  $MPL$  goes up whereas  $MPK$  goes down. Since profit maximisation implies that  $w = P \cdot MPL \Leftrightarrow w/P$

= MPL as well as  $r = P \cdot MPK \Leftrightarrow r/P = MPK$ , 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 labour has become more expensive in terms of production. Nonetheless, labour will be employed in the production of car, although the magnitude of employing capital is greater.

=> Overall, resources will be diverted more towards car 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 increases more intensively while output of the other good decreases.

*Example:* If the domestic labour force increases (however the country is too small to affect the whole world) and relative prices are held constant, then relative wage to rental rate and the input combination will be unchanged.

This means  $L/K = (L_c + L_f) / (K_c + K_f)$  increases, but  $L_c/K_c$  and  $L_f/K_f$  remain unchanged. This can be explained as follows:

This equation has to always hold:  $L/K = (L_c + L_f) / (K_c + K_f)$

It can be rewritten as  $L/K = L_c / (K_c + K_f) + L_f / (K_c + K_f)$

Multiply  $L_c / (K_c + K_f)$  by  $K_c / K_c$  and  $L_f / (K_c + K_f)$  by  $K_f / K_f$ . This multiplication does not change the equality.

Now the equality will look like:  $L/K = (L_c / K_c)(K_c / K) + (L_f / K_f)(K_f / K)$

Note that  $(K_c / K)$  and  $(K_f / K)$  cannot both go up or both go down because  $(K_c / K) + (K_f / K) = 1$ . 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 food to car production:  $(K_C/K) \uparrow$ ,  $(K_F/K) \downarrow$ .  
=> Because the input combination has to remain fixed in both sectors: labour will switch to car production.

Since the car production employs more labour relative to the food production, the increase in labour causes the PPF to shift outward in a sense that production bundles represent a greater output of car compared to food. Overall the number of car produced increases and the number of food 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.

## Trade in Heckscher-Ohlin modell

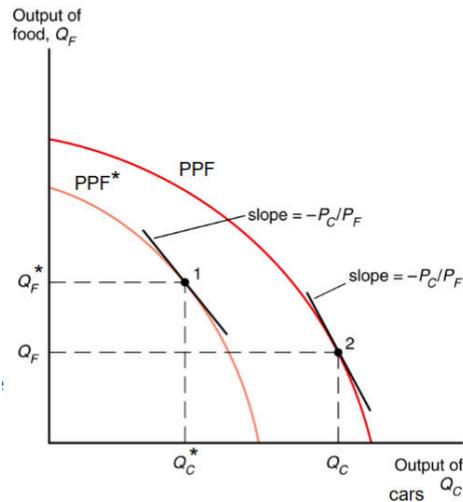
Assumptions:

- Two countries: Home and Foreign
- Two factors of production: capital and labor
- Two goods: car and food
- Production technology and the consumer preferences are the same in both countries
- Same technology in the two countries (same production functions)
- The supply of labor and capital in each country is constant, but varies between countries
- Perfect competition in both sectors
- Both capital and labor can freely move across sectors (but, no international factor mobility) => rental rate and wage equalization between sectors !!

## Rybczynski theorem

**Rybczynski theorem:** 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 car than food since Home is labour abundant and the production of car is labour intensive.



## 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 car is labour intensive, the relative supply of car in Home will always be more than that in Foreign. The similar holds true for Foreign in the case of food. Thus, Home will demand food from Foreign, and Foreign will demand car 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:

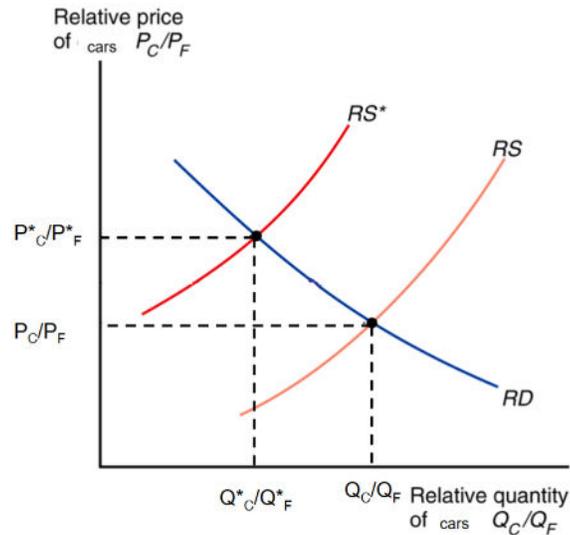
For car:

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

For food:

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

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 car and export some to Foreign while Foreign will increase its production of food and export some to Home. This leads to a convergence such that:



## The Heckscher-Ohlin theorem

**Heckscher-Ohlin theorem:** 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 specialisation).

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.

## Factor price equalisation

Besides predicting the trade patterns between countries, the OH model also predicts factor price equalisation

Opening up to trade causes relative goods prices to converge in the two countries  
Perfect competition in both sectors implies that goods prices equal production costs

Relative goods prices converge => relative factor prices converge => (given identical technologies in the two countries!) => labor to capital ratios in the two sectors converge across the two countries

As a result, wages and rents (factor prices) also converge in the two countries: remember that:  $w = P_c \times MPL_c$  and  $r = P_c \times MPK_c$  (and similar for the food sector)

## 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 the 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 goods that use 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

The HO-model makes several predictions

1. Pattern of trade: Countries export goods that use their abundant factor intensively
2. Factor price equalization Prices of the factors (wages, rents) involved in producing traded goods equalize among countries
3. The effect of trade on income inequality A country's abundant factors gain and its scarce factors lose

### 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 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).

## 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 Trade – IBEB – Lecture 7, week 6

## The standard trade model

**Standard Trade Model:** explains the motive for trade by combining the aspects of all three models previously studied: countries trade due to differences in relative prices that arises due to different production possibilities (differences in technology - Ricardian or differences in natural resource endowments - Heckscher-Ohlin).

### The standard trade model

#### Assumptions

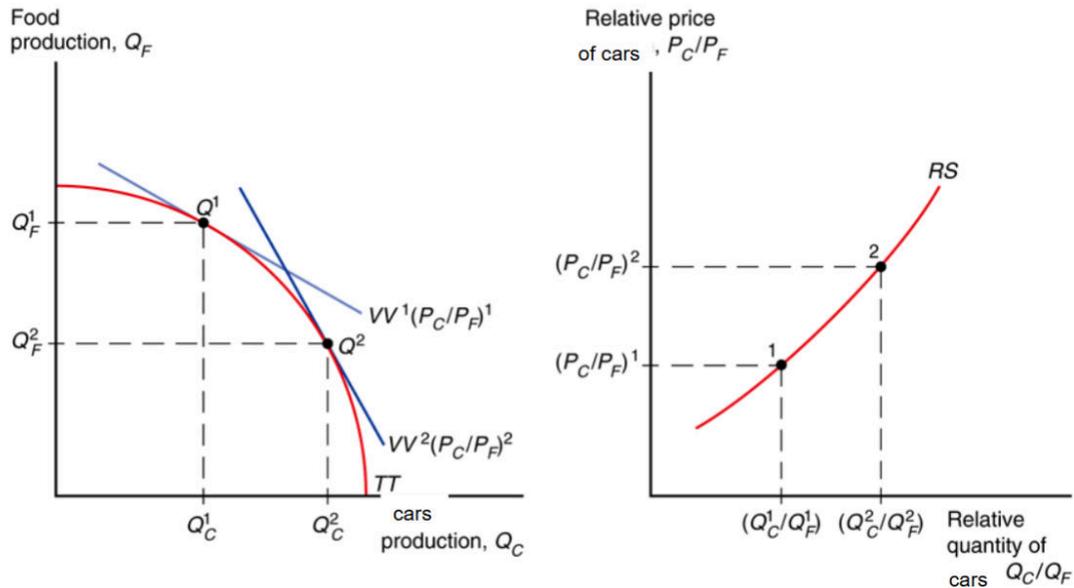
1. There are two goods (car and food)
2. There are two countries (Home and Foreign)
3. Home is relatively more efficient in producing car (for any reason possible).
4. Perfect competition with no entry and exit barriers for firms
5. Consumer's preferences in both countries are identical (otherwise, this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

=> When relative price of a good increases, its relative supply also increases.

=> Production choices are determined by the economy's PPF and output prices



## Consumption - relative demand

**Relative demand curve** is determined by

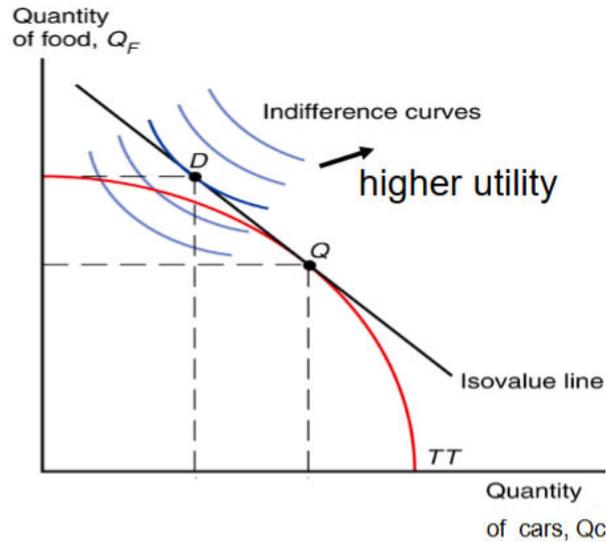
1. Relative goods prices
2. Consumer preferences (represented by **indifference curves**)

The indifference curve becomes flatter moving right and gets steeper when tending left, which indicates **diminishing marginal utility** for consumers.

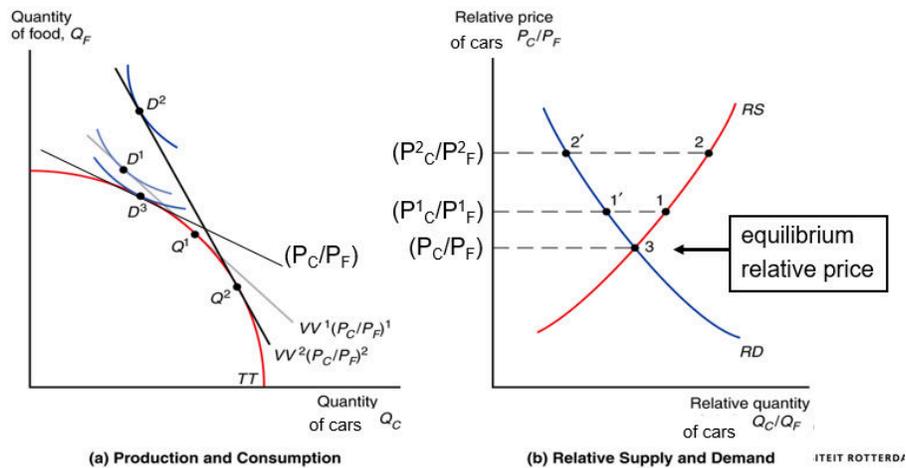
Given the relative prices, consumers would prefer bundles on the highest possible indifference curve that is tangent to the isovalue line.

=> They would like to consume more food and less car than what the country produces.

=> In autarky, there is excess supply of cars relative consumer's demand and excess demand for food relative to trade. However, it is not possible to attain that bundle in autarky since prices will adjust so that supply equals demand.



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



## 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)**  $(Q_C + Q^*_C)/(Q_F + Q^*_F)$ .

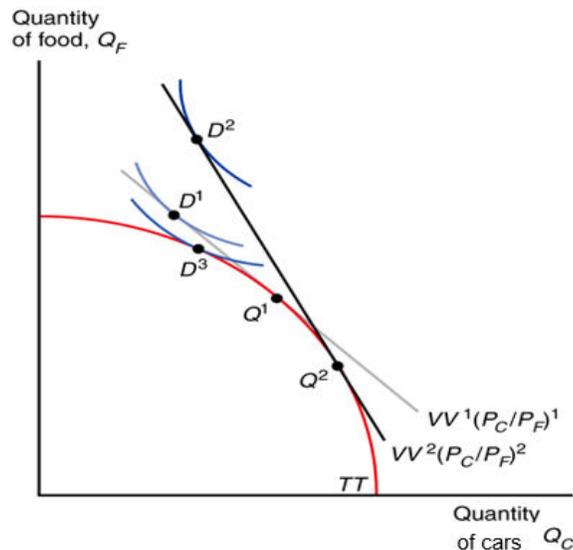
Consumers are supposed to have the same preferences in both countries, so the world's relative demand will be the same as the relative demand in each country.

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 car and Foreign is relatively more efficient in food, it is clear that, at any given relative price of car, Home always produces more car relative to food and Foreign produces a lower quantity of cars to food (a higher quantity of food to car):  $Q_C/Q_F > Q^*_C/Q^*_F$ .

=> RS curve lies to the right of the RS\* curve.

In autarky: The country will consume what it produces (D3):



Trade: World's relative supply lie in between the Home's and Foreign's supply curve => Relative price of car to food between Home and Foreign will converge.

Home is more efficient in producing cars, so when it opens up to trade, the relative price of cars goes up. In that case, consumers start consuming bundle  $D^1$ , which contains less car but more food, and which gives them higher utility. If the relative price of cars hikes further, Home will be able to consume bundle  $D^2$  by producing at point  $Q^2$ , such that it exports cars and imports food. Since each additional unit of car can buy more food 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

1. **Income effect:** income goes up, consumers have relatively more to spend on both goods
2. **Substitution effect:** due to higher relative price of car, locals buy relatively less car than before. Note that  $D^2_F - D^1_F \rightarrow D^2_C - D^1_C$ . In the example above,

income effect dominates since more of both goods are consumed nonetheless.

## Terms of trade and welfare

**Terms of trade** is the ratio of the price of exports to the price of imports:

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

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, welfare cannot fall below the state of autarky, otherwise, the country could have not been involved in trade at all.

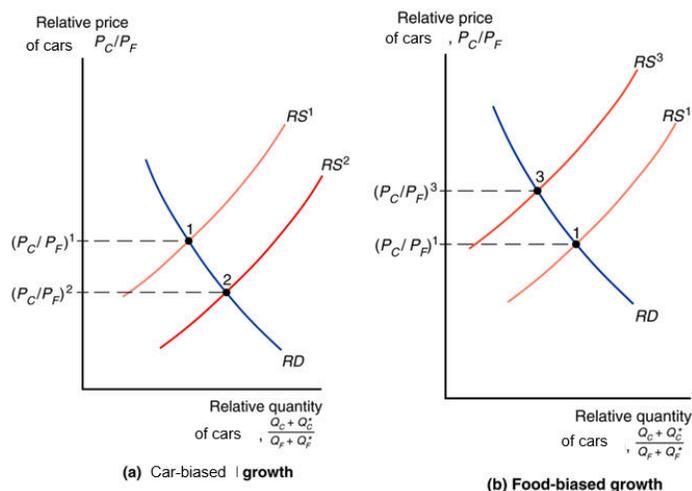
## Predictions from the Standard Trade model

### 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 engage in trade, however, biased economic growth has additional effects on welfare in all involved countries because it changes relative world prices. If growth is car-biased, relative quantity of cars rises so the relative price of cars drops. Otherwise, if growth is food-biased, relative quantity of cars falls so the relative price of cars goes up.

=> 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 a 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 a positive effect on its welfare.

However, the overall impact of economic growth greatly depends on whether growth happens abroad or at home

In Foreign:

- Export-biased growth in Foreign (import-biased at home) increases 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 increases the welfare of growth itself.
- Unbiased growth means there are only positive effects of growth itself

The example of import-biased growth of China being detrimental for the developed US and European economies does not hold much 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 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

$$P^D = P^{World} \left(1 + \frac{T}{100}\right), \text{ which is higher than the world price } P^{World}.$$

An export subsidy rate of  $S\%$  on a good also raises the domestic price compared to

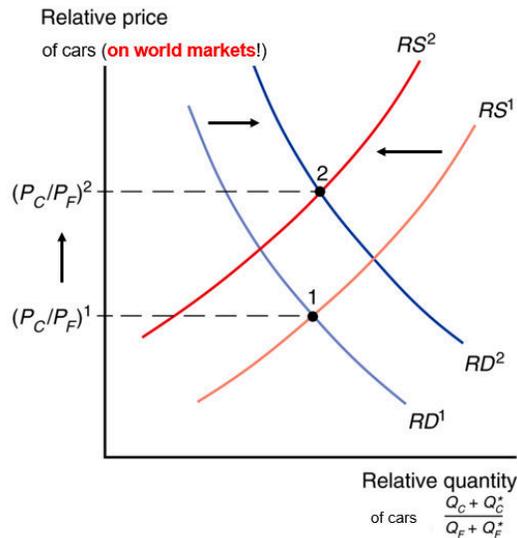
$P^{World}$ . If there is a subsidy to export finger chip, the producers who export will earn  $P^{World} \left(1 + \frac{S}{100}\right)$ .

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  $P^{World} + \frac{S}{100}P^{World}$ , 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 tariffs are imposed on imported food. As the relative price of food is now higher for domestic consumers, the relative demand for food 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 food imports in Home drops the world relative price of food and thus raises the world relative price of cars. Since Home is a food importer and a car 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.



Suppose now that Home issues an export subsidy on car exports.

=> The export subsidy increases the price that car producers can get for their product (while exporting).

=> Increases relative price of cars in the domestic market. Afterwards, relative supply of cars starts to increase, and relative demand for cars decreases. 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 car exports depresses the world relative price of cars. Since Home is a finger chip importer and a car exporter, this lowers Home's terms of trade, while at the same time improving Foreign's terms of trade.

=> 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 imports will reduce the price of its imports and increase its terms of trade and welfare.

In contrast, export subsidies/import tariffs by foreign countries on goods that a country exports will reduce the price of its exports and decrease its terms of trade and welfare.

# International Trade – IBEB – Lecture 8, week 6

## Economies of scale

### Economies of scale

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 units of car 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.

**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)

- As all inputs to an industry increase by a certain magnitude  $x\%$ , output increases by *more than*  $x\%$ .
- Cost falls as production increases
- Incentivises countries to specialise in specific products which they can export, and import the goods that they do not specialise in.

Suppose car can be produced such that:

car 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

=> Increasing returns to scale

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 specialises and exports certain goods while importing the rest from other countries which specialise in other goods. Otherwise, without trade, countries cannot benefit from economies of scale.

## External economies of scale and market structure

**External economies of scale** occur when the average cost depends on the size of the industry.

- Industries where economies of scale are mostly external, there will be a lot of small firms approaching an environment of perfect competition.
- 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 by the following ways: specialized equipment or services, labour pooling, and knowledge spillovers.

**Internal economies of scale** occur when cost per unit depends on the size of an individual firm.

- Internal economies of scale usually result in monopolies or oligopolies

### Specialised equipment or services

Specialised equipment or services may be utilised in an industry's production but are only supplied if there is a 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

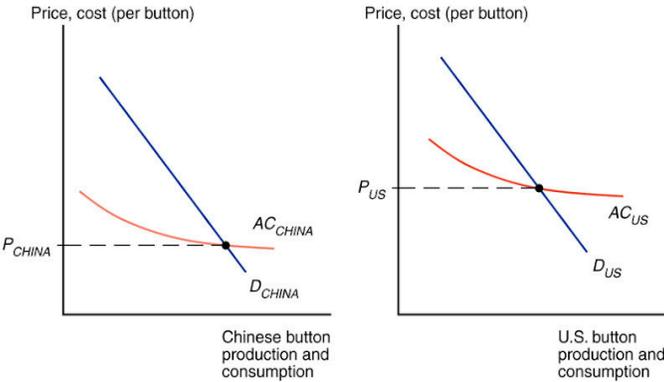
Knowledge spillovers means that employees from different firms, which are located in the same vicinity, have more opportunity to exchange ideas and learn about their competitors.

## 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.

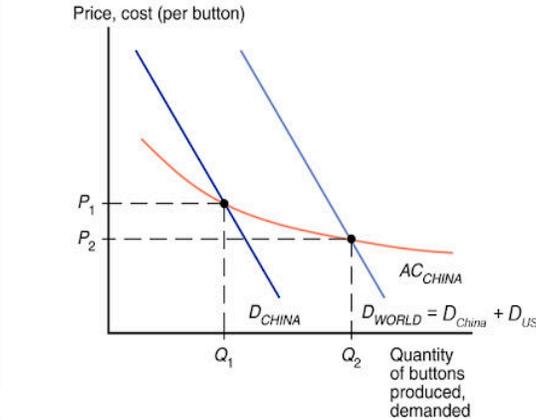
The supply curve in the situation of constant returns to scale is normally upwards sloping, but in the case of increasing returns to scale, production cost declines with growth in industry size, so firms will supply higher quantities at lower prices. The

supply curve is thus forward falling, as new firms are always keen on entering to take advantage of economies of scale.



## External economies of scale and trade

When the countries open up for trade, China will expand its car 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 lowers their prices. In the end, the world demand is met by Chinese producers.



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.

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 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 compete 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 arise in a dynamic sense by building up 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 in 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 specialisation and trade patterns. 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-tradable 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 Trade – IBEB – Lecture 9, week 6

## Instruments of the Trade Policy

### Import tariff

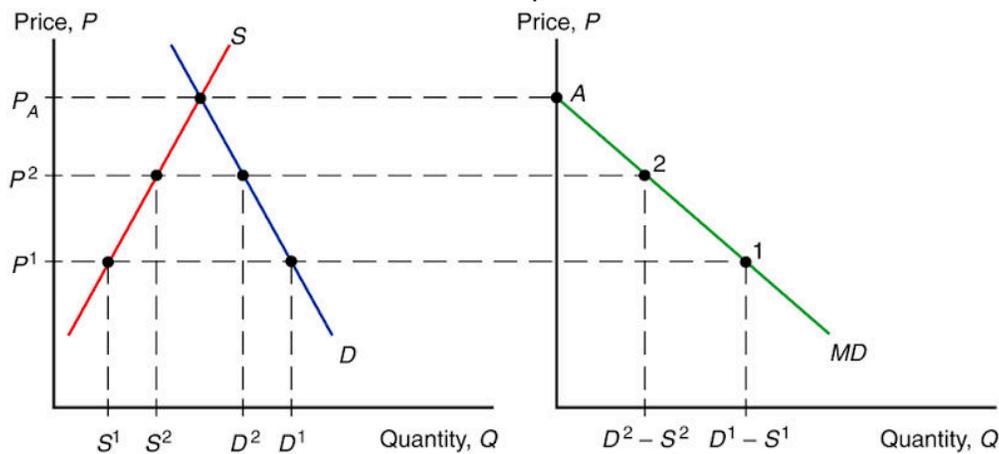
An **import tariff** is a tax levied when a good is imported. There are 2 types of import traffic, namely:

1. **Specific tariff** is a fixed charge levied on the unit of a good
2. **Ad valorem tariff** is levied as a proportion of the price of the imported good.

## 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 in 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.

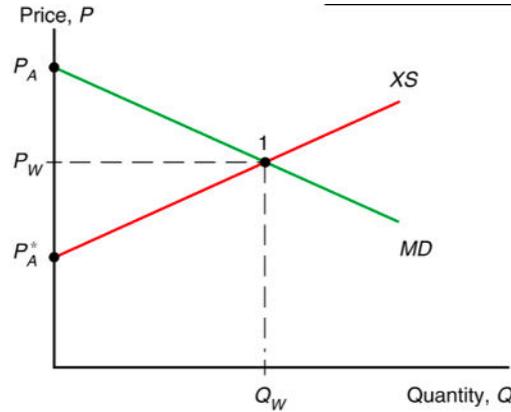
The MD curve intercepts the price axis at  $P_A$  which is the price of the good if everything is produced and consumed in the country itself. If price falls, import demand increases, hence the downward slope of the curve.



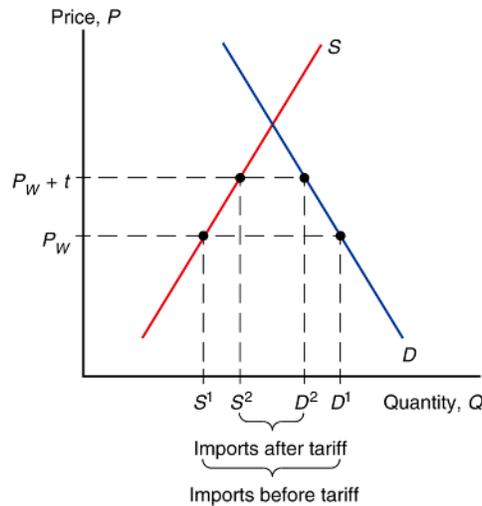
The XS curve intercepts the price axis at  $P^*_A$  which is the price of the good if everything is produced and consumed in the country itself. If price rises, export supply increases, hence the upward slope of the curve.



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.



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.



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 to 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:

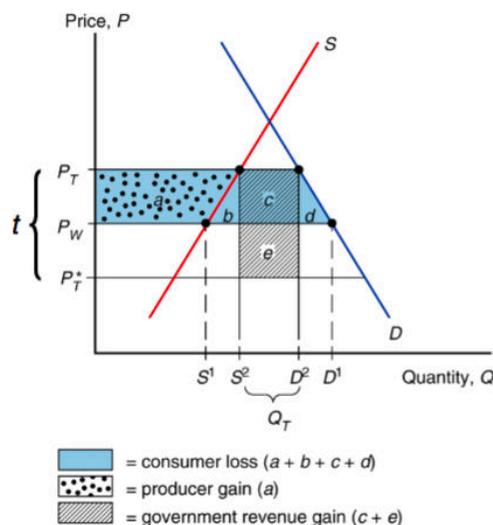
$$P_T = P_T^* + t \Leftrightarrow P_T - t = P_T^*$$

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  $t \cdot Q_T$ .



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

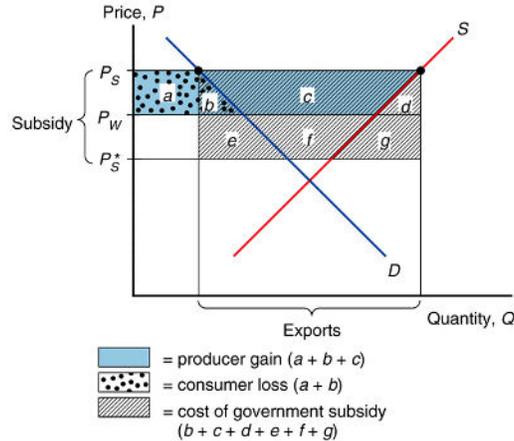
An **export subsidy** is a grant provided by the government to domestic producers in order to stimulate exports (Specific or ad valorem)

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.

At home, the equilibrium is such that firms are indifferent between exporting and supplying domestically.

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

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  $s \cdot Q_S$ . However, it increases the welfare of producers by increasing producer surplus.



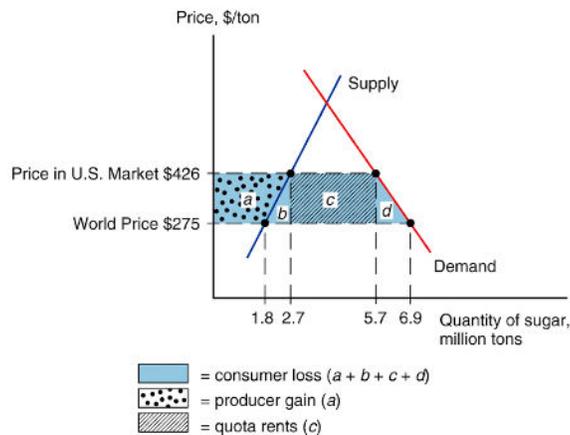
The overall effect on welfare is equal to:

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

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 goods. A **binding quota** will augment prices as the import 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.



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

# Local content requirement (LCR)

Local content requirement is a regulation that requires a certain proportion of final goods 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.

## Other trade policies

**Voluntary export restraints (VER)** = quota on exports.

Usually with an arrangement, the importing country requests this policy in return for the relaxation of other trade policies. The profit or rents from his policy are earned by foreign governments/producers. As the exporting country can sell a limited quantity at an increased price, the importing country endures a welfare loss.

**Export credit subsidies** = loans that are subsidised to exporters.

=> Its effect is similar 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 restriction.

=> Same effect as an import quota.

# Effective rate of protection

1. If a country fully produces the goods itself without intermediate goods, and is small enough so it does not change world prices, the effective rate of protection is equal to the tariff rate

$$\Rightarrow (P_T - P)/P = (P(1+t) - P)/P = t.$$

2. If a country is large, it impacts the world prices and most traded goods are intermediate ones. If the country is large

$$P_T < P(1+t) \Rightarrow (P_T - P)/P < (P(1+t) - P)/P < t$$

$\Rightarrow$  The effective rate of protection is smaller than the tariff rate.

3. In the case of intermediate goods, the effective rate of protection is also not equivalent to the tariff rate.

$\Rightarrow$  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  $P(1 + t) - P^{intm}$

$$\Rightarrow \text{Effective rate of protection } [P(1 + t) - P^{intm}] - [P - P^{intm}] = t[P/(P - P^{intm})] > t$$

## International Trade – IBEB – Lecture 10, week 7 – Trade policy in practice

### Politics of trade policy

In democratic countries, politicians promise to influence trade policies in a way that benefits 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.

Assumptions

1. Only one policy can be implemented
2. The objective of each party is to win by majority votes
3. Parties keep their promises to the public

**Median voter theorem** implies that a two-party democracy should always enact trade policy based on the number of voters it pleases.

=> A policy that inflicts losses on many people (consumers) while benefiting a small number of people (import-competing producers) should not be followed.

=> 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

This is explained by the **collective action problem**

## 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 care about trade restrictions too much, and the special groups make large enough contributions to campaigns for a deviation from median voter theorem to happen. Sometimes, trade restrictions also result as a response to another country's trade policy.

## Multilateral 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 restrictions. However, the best outcome for all countries is free trade. Therefore, a trade binding agreement can be made.

=> **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.

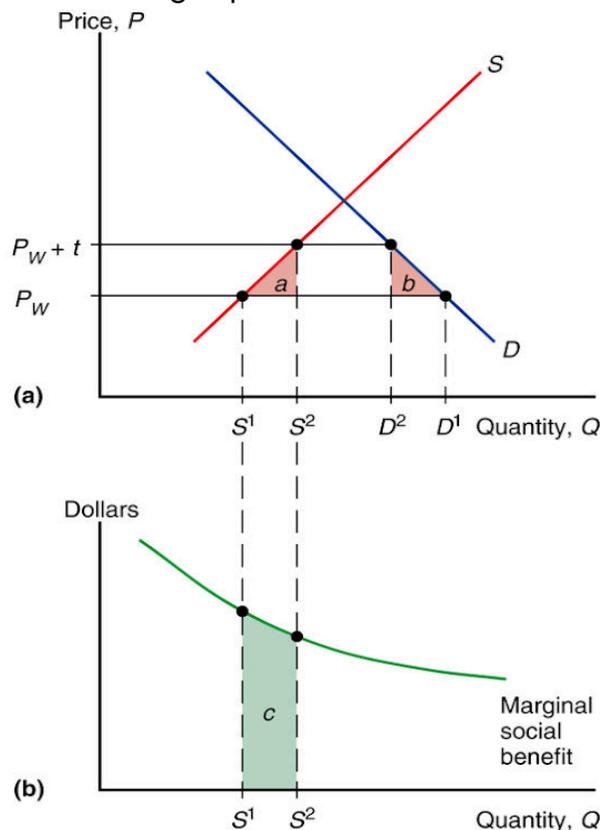
Moreover, because of increasing returns from scale, restrictions will limit the gain from external economies of scale. Reducing international competition also leads to unproductive firms, less incentives for being more productive and less learning by trade. Another argument is to make trade not war. 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

### 1. Alleviate domestic market failures

Suppose there are positive externalities to production not considered by private firms and investors. 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.



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.

## 2. 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 results in waste of economic resources, time, and inefficiency.

Economic growth accompanying trade liberalisation 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 free trade.

## 3. Anti-globalization

Under **anti-globalization**, trade is bad because rich countries would exploit developing countries' low-wage workers, destroy the environment, and abolish 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.

## Import Competition

Gains and losses from trade are not evenly distributed within countries. Certain regions do benefit from opening of trade to export markets but others suffer due to import competition.

The empirical evidence indicates that communities heavily affected by import competition, particularly from low-income countries like China, are more prone to experiencing a decline in manufacturing jobs. Adjusting to these changes is challenging, often requiring individuals to relocate or undergo retraining for new employment opportunities. The difficulties faced by those adversely affected by

trade openness are hard to compensate, with negative consequences extending beyond immediate labour market impacts. The repercussions include long-term income effects and adverse mental health effects. Proposed solutions involve improving support for job transitioning and providing compensation for income loss.

# International Trade – IBEB – Lecture 11, week 7

## 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 firm's size concentration varies and thus perfect competition does not necessarily exist.

### Stylized facts

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

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

### Monopolistic competition

**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 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

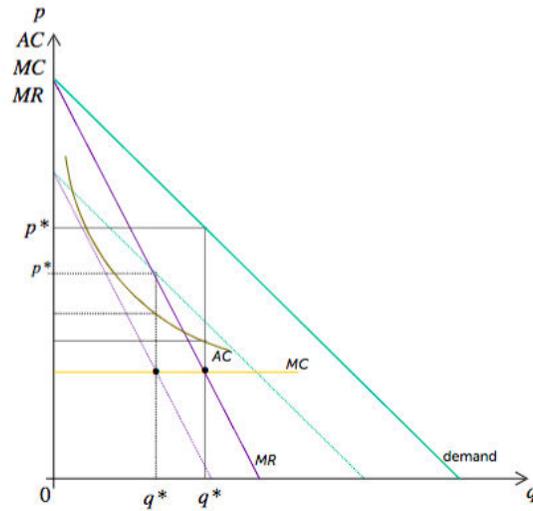
The **inverse demand function** (price as a function of quantity) is such that  $p = a/b - q/b$  and  $MR = p - q/b$ .

**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. Then, the marginal revenue curve is more outwards, meaning the monopolist can achieve higher profits, so they are incentivised to export goods.



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 goods increases. Trade liberalisation is reflected by an outward shift of the inverse demand curve.

## Monopolistic competition

### Assumptions of the model

1. Variety differentiation of a single firm to that of its competitors.
2. Each firm takes prices of competitors as a given while it sets its price.
3. Single firms sell more when:  $\uparrow$  aggregate demand for the class of product or  $\uparrow$  price of rivals
4. 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  $AC = F/q + c = nF/S + c$ .

=> As the number of firms,  $n$ , increases, AC upsurges since each firm produces a reduced amount.

=> 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:

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

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

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

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

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

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:

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

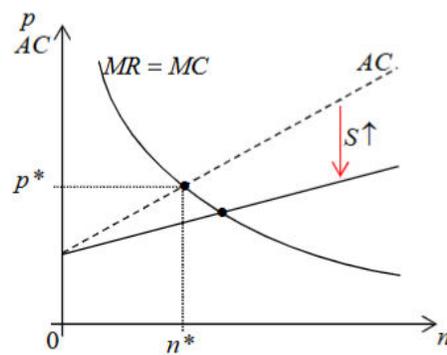
If otherwise:

$p > AC \rightarrow$  firms enter the market

$p < AC \rightarrow$  some exit the market

$p = AC \rightarrow$  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:



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  
=> Increases market size, lowers AC, and lowers  $p$ .

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 world trade, especially for developed countries.

# References

- Namini, E. (2024). *Lecture 1 - National income accounting and BoP* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99446061>
- Namini, E. (2024). *Lecture 2 - Money, interest rates, and exchange rates* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99429773>
- Namini, E. (2024). *Lecture 3+4 - Price levels and long run exchange rate* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99471844>
- Namini, E. (2024). *Lecture 5+6 - Exchange rates and open economy macroeconomics* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99528695>
- Namini, E. (2024). *Lecture 7 - International monetary system* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99527628>
- Namini, E. (2024). *Lecture 8 - International financial institutions* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99582066>
- Bosker, M. (2024). *Lecture 1 - World Trade overview* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99625200>
- Bosker, M. (2024). *Lecture 2 - The Ricardian model* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99625205>
- Bosker, M. (2024). *Lecture 3 - The Ricardian model-2* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99667959>
- Bosker, M. (2024). *Lecture 4 - Specific Factors model* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99691977>
- Bosker, M. (2024). *Lecture 5+6 - Heckscher Ohlin model* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99667611>
- Bosker, M. (2024). *Lecture 7 - Standard trade model* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99724780>
- Bosker, M. (2024). *Lecture 8 - External economies of scale* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99778044>
- Bosker, M. (2024). *Lecture 9 - Instruments of trade policy* [PowerPoint slides]. Retrieved from: <https://canvas.eur.nl/courses/47693/files/99788602>

Bosker, M. (2024). *Lecture 10 - Trade policy in practice* [PowerPoint slides].

Retrieved from: <https://canvas.eur.nl/courses/47693/files/99820314>

Bosker, M. (2024). *Lecture 11+12 - Firms in global economy* [PowerPoint slides].

Retrieved from: <https://canvas.eur.nl/courses/47693/files/9983484>