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2026-2027



Lectures 1 to 20

Weeks 1 to 7

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Details

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International Trade – IBEB – Lecture 1, week 1 (International Trade 1) General introduction on world trade flows

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)

Following all the empirics above we can combined then and formulate the gravity model:
The **gravity model** predicts the **volume of trade** between any 2 countries:

- The idea come from Newton's law of gravity, where gravitational attraction is proportional to the product of their masses and diminishes with distance

"The trade between any 2 countries is, other things equal proportional to the product of their GDPs and diminishes with distance"

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

- A is a constant term
- Tij: the value of trade between country i and j
- Yi: GDP of country i
- Yj: GDP of country j
- Dij are the trade impediments between country i and country j
- Exponents measure the important of each factor

By taking the ln of the equation above, we can create a simple regression model that can be used to predict actual trade flows and how important each factor in the gravity model is

$$ln(T_{ij}) = a \cdot ln(Y_i) + b \cdot ln(Y_j) - c \cdot ln(D_{ij})$$

- By creating an OLS model, we can get estimates of a, b, c, which tells us the importance of respective GDP's and the Distance

Example:

- 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: wheels, sails, compasses, railroads, telegraph, steam power, automobiles, telephones, airplanes, computers, containers, Internet, GPS satellites, etc; however, 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.

We also have the political factors, which can change trading patterns much more significantly (and quicky) 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 merchandise exports of which around 70% are **manufactured goods**

In 1910, Britain mainly exported manufactured goods while the US traded mostly agricultural and mineral products, but, by 2011 manufactured goods dominated both countries' imports and exports.

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
   - Today, more than 50% (!) of world exports involve intermediate goods

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, dentists, house painters)
- More and more services jobs will become outsourceable (e.g radiologists, and lecturers)

International Trade – IBEB – Lecture 2, week 1 (International Trade 2)
Differences in technology: The Ricardian model

Theories of trade

The 2 main reasons for which countries engage in international trade is:

- **Countries are different**: difference in labour skills, natural resources, physical capital, technology
- **Economies of scale**: nothing about differences between countries, it's just more efficient for each country to specialise in few products only, thus benefitting from economies of scale

In the real world, trade patterns are determined by all these forces.

To fully understand the causes and effects of trade it's useful to look at models that focus on one particular reason for trade separately:

- **Ricardian model:** Trade arises because of differences in relative labour productivity between countries (due to e.g. technological differences)
- **Specified Factor model:** Allows us to assess the effects of trade on the distribution of income within a country
- **Hecksher-Ohlin model:** Trade arises because of differences in the relative endowment of factors of production between countries (e.g. land, labour, skills)
- **Economies of scale:** Can explain why a priori similar countries end up producing different goods, trading them with each other

Opportunity cost and comparative advantage

Both opportunity cost and comparative advantage are crucial concepts in the Ricardian model

"Opportunity cost is the cost of not being able to produce something, because resources have already been used to produce something else"

Example to illustrate with comparative advantage

Suppose a limited amount of workers could be employed to produce either roses or computers

- Suppose that in the US 10 million roses can be produced with the same resources that can produce 100000 computers
- Suppose that in Colombia 10 million roses can be produced with the same resources that can produce 30000 computers

Workers in Colombia would be less productive than those in the U.S. in manufacturing computers, and equally productive in producing roses

- Colombia has a lower opportunity cost of producing roses in terms of computers than the US
- The U.S. has a lower opportunity cost of producing computers in terms of roses than Colombia

"A country has a comparative advantage in producing a good if the opportunity cost of producing that good is lower in that country than in other countries"

- The US has a comparative advantage in producing computers
- Columbia has a comparative advantage in producing roses

Suppose initially that countries do not trade, but want to consume computers and roses. Colombia produces 30000 computers itself and the U.S. produces 10 million roses itself

- We can make both better off by start trading and specialise
- As stated in the question, Initially US and Colombian resources produced 10 million roses and 30 thousand computers

If they were to produce the goods that they have a comparative advantage and trade, they can still consume 10 million roses, but consume 70 thousand more computers, as you can see below:

	Roses (Millions)	Computers (Thousands)
U.S.	-10	+100
Colombia	+10	-30

	Roses (Millions)	Computers (Thousands)
Total	0	+70

"When countries specialise in producing those goods in which they have a comparative advantage, and then trade, the pie is larger in terms of goods and services, compared to the situation where each country makes all goods and services itself"

A one-factor Ricardian Model

Developed by Ricardo in 1817. A slightly more complex model of the two countries' economies (takes into account that the prices of the goods and wages paid to workers can be different)

Assumptions of the Ricardian model:

1. Labour is the only factor of production
2. Labour productivity varies across countries due to differences in technology, but labour productivity within each country is constant
3. The supply of labour in each country is constant
4. Only two goods are important for production and consumption (here we call them: wine and cheese)
5. Perfect competition between firms, and free entry/exit of firms
6. Perfect labour mobility between sectors
7. The world consists of two countries: Home and Foreign

Production possibilities

To understand this model, we first need to define the production possibilities in each country (i.e. how much cheese and wine it can produce if it employs all its workers), this depends on:

- Amount of labour available in the country
- Number of hours of work needed to produce one unit of the good, **'Unit labour requirement', high unit labour requirement = low productivity**

We shall construct the **Production Possibility Frontier**, which shows the maximum amount of goods that can be produced using a fixed number of resources in an economy

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

- L = total number of hours worked (constant by assumption)
- Q_C = how many pounds of cheese are produced

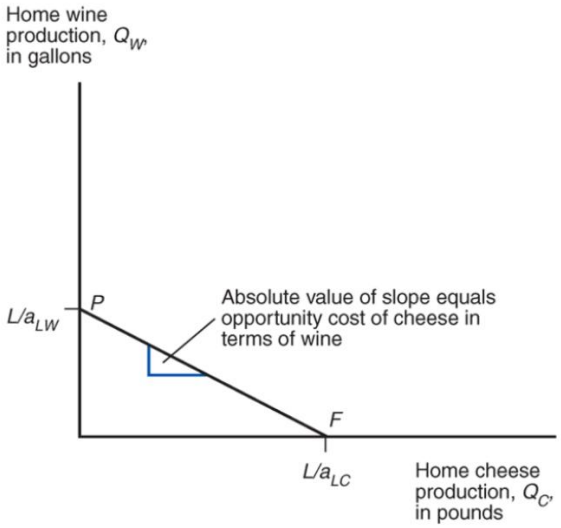
- Q_W = how many gallons of wine are produced
- a_{LC} = the unit labour requirement for cheese
  - ~ a_{LC} = 1 means that 1 hour of labor produces onepound of cheese
- a_{LW} is the unit labour requirement for wine
  - ~ a_{LW} = 2 means that 2 hours of labor produces one gallon of wine

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

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

Country's maximum cheese or wine production:

$Q_c = \frac{L}{a_{LC}}$, when QW = 0 or $Q_c = \frac{L}{a_{LC}}$, when QC= 0



Opportunity cost of producing an extra pound of cheese in terms of wine equals the absolute value of the slope of the PPF

- Q_W goes down by (a_{LC}/a_{LW}) if Q_C goes up by 1

Following our example of a_{LW} = 2, and a_{LC} = 1, slope = 0.5

- This means, that by producing an extra pound of cheese, you forgo 0.5 gallon of wine

Actual production

Using the PPF we have seem what an economy can produce, but to know what the economy actually produces, we must know the prices

- Because prices determine both, amount of production and consumption

Suppose we have perfect competition and free entry/exit:

- Meaning firm's profit is 0 and workers earn what they make
- P_C: Price of a pound of cheese
- P_W: Price of a gallon of wine

$$Q_C \cdot P_C - w_C \cdot L_C = 0 \Leftrightarrow w_C = P_C(Q_C/L_C) \Leftrightarrow w_C = P_C/a_L C$$

$$Q_W \cdot P_W - w_W \cdot L_W = 0 \Leftrightarrow w_W = P_W(Q_W/L_W) \Leftrightarrow w_W = P_W/aL_W$$

Since workers like higher wages (and we assumed that they are perfectly mobile across sectors), they will work in the industry that pays a higher hourly wage, so

If $W_C > W_W$, or $\frac{P_C}{P_W} > \frac{a_{LC}}{a_{LW}}$, workers will only make cheese

The economy will specialize in cheese production if the price of cheese relative to the price of wine exceeds the opportunity cost of producing cheese in terms of wine

- The opposite is true if $W_C < W_W$, or $\frac{P_W}{P_C} > \frac{a_{LW}}{a_{LC}}$,workers will only make wine

The only condition for which workers in a country are willing to make both wine and cheese is when $W_C = W_W$, because they get the same, they are indifferent

- Only if price of cheese relative to the price of wine equals the opportunity cost of producing cheese:

$$\frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}}$$

So, when there is no international trade (i.e. Autarky), for the country to have both wine and cheese, we require $W_C = W_W$

Trade in the Ricardian model

Now suppose we also have a foreign country ('*' denotes foreign); however, home country is more efficient at producing both wine and cheese

- We will see that even if above, is the case, it's still better for home country to engage in trade with foreign country, because it's **comparative advantage** that matters, not absolute advantage
- A country can only have a comparative advantage in the production of one good

Suppose that the **domestic** country has a **comparative advantage in cheese production**: its opportunity cost of producing cheese is lower than that in the foreign country

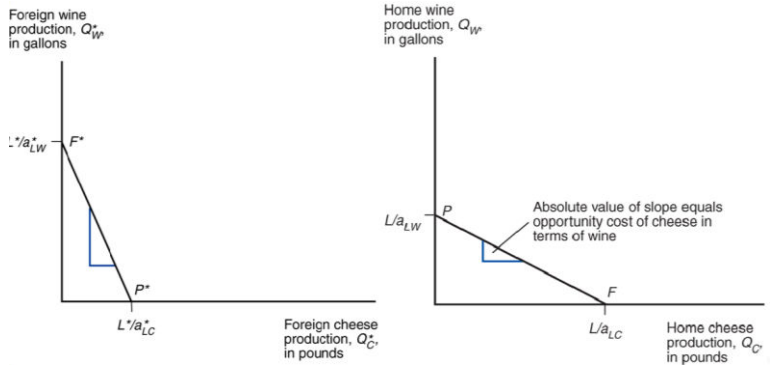
$$\frac{a_{LC}}{a_{LW}} < \frac{a_{LC}*}{a_{LW}*}$$

By rearranging the equation, we get that **foreign** country has a **comparative advantage in wine production**

$$\frac{a_{LW}}{a_{LC}} > \frac{a_{LW}*}{a_{LC}*}$$

Foreign's PPF is steeper than Home's:

- to produce one extra pound of cheese workers must stop producing more wine in Foreign than in Home



We have seem above that in autarky, where each country produces all goods:

- $\frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}}$, the same goes for foreign country, thus we have

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

Meaning, the relative price of cheese will be higher in Foreign than in Home because Home has a comparative advantage in cheese production

- It will be **profitable to ship cheese from Home to Foreign**, and **wine from Foreign to Home**

As we now know it's better to trade, thus we begin to do so, however, to analyse this we must know where does the (world) relative price settle:

- It helps us determine how much trade will be observed, and how much the 2 countries benefit from it
- We begin by defining the world relative supply and the world relative demand for the 2 goods

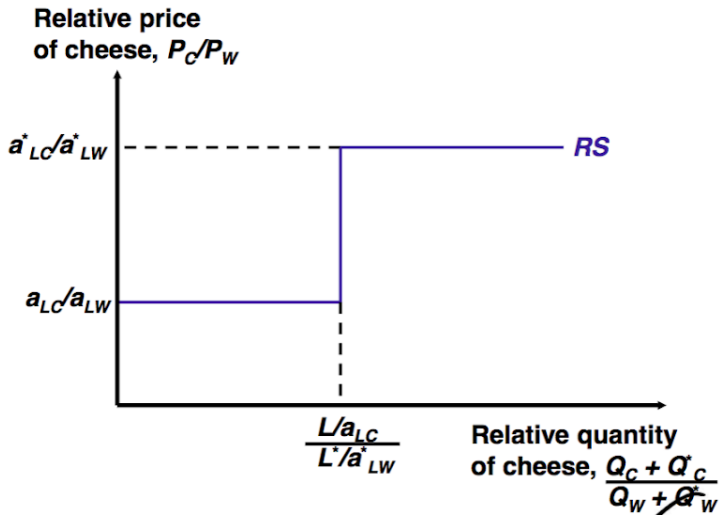
Relative supply: quantity of cheese supplied by all countries relative to quantity of wine supplied by all countries

$$RS = \frac{Q_C + Q_C^*}{Q_W + Q_W^*}$$

To construct RS, we know:

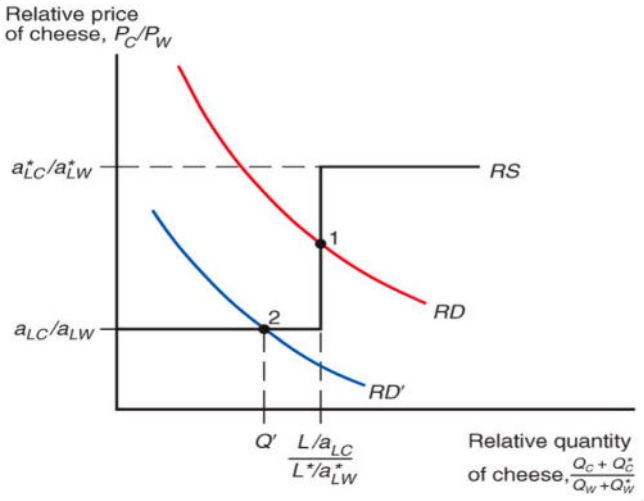
- If the relative price is below the opportunity cost of cheese in both countries, no country will be willing to supply, **RS = 0** $\quad \frac{P_C}{P_W} < \frac{a_{LC}}{a_{LW}} < \frac{a_{LC}^*}{a_{LW}^*}$
- If the relative price is above the opportunity cost of cheese in both countries, they both will be eager to supply cheese, **RS =** ∞ $\quad \frac{P_C}{P_W} > \frac{a_{LC}}{a_{LW}} > \frac{a_{LC}^*}{a_{LW}^*}$
- 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, **0** $\leq$ **RS** $\leq$ **(L/aLC) / (L*/ a*LW)** $\quad \frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}} < \frac{a_{LC}^*}{a_{LW}^*}$

- 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, **(L / aLC) / (L*/ a*LW) ≤ RS ≤ ∞** $\frac{a_{LC}}{a_{LW}} < \frac{P_C}{P_W} = \frac{a^*_{LC}}{a^*_{LW}}$
- If the relative price is between the opportunity cost of cheese at home and foreign, specialisation will take place, **domestic** workers produce **only B** and **foreign** workers produce **only wine**, **RS = (L/aLC) / (L*/a*LW)** $\frac{a_{LC}}{a_{LW}} < \frac{P_C}{P_W} < \frac{a^*_{LC}}{a^*_{LW}}$



Relative demand: quantity of cheese demanded in all countries relative to the quantity of wine demanded in all countries

As the price of cheese relative to the price of wine rises, consumers in all countries will tend to purchase less cheese and more wine so that the relative quantity of cheese demanded falls



Generally, when opening up to trade the world relative price level will be between the 2 countries' price levels when in autarky, because:

- For Foreign consumers cheese is relatively cheap in Home
  - ⇨ increased relative demand in Home drives up the relative price of cheese in Home
- for Home consumers wine is relatively cheap in Foreign
  - ⇨ this increased demand reduces the relative price of cheese in Foreign (relative price of wine goes up)

$$\frac{P_C}{P_W} < \frac{P_C^{world}}{P_W^{world}} < \frac{P_C^*}{P_W^*}$$

⇒ each country specializes in the good in which it has a comparative advantage in production (i.e. Home in cheese and Foreign in wine)

International Trade – IBEB – Lecture 3, week 1 (International Trade 3)
Differences in technology: The Ricardian model - continued

Trade, world prices and specialization

Before trade (autarky), each country's relative prices reflect its opportunity costs of production. When trade opens, the world relative price settles between the autarky prices.

$$\frac{P_C}{P_W} =< \frac{P_C^{world}}{P_W^{world}} < \frac{P_C^*}{P_W^*}$$

⇒ each country specializes in the good in which it has a comparative advantage in production (i.e. Home in cheese and Foreign in wine)

Gains from trade

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.

Proof of Gains from trade

Domestic workers earn a higher (real) income from specializing in cheese production since the relative price of cheese increases with trade: they can now buy more wine with their cheese

With trade:

- Earn $w = \frac{{P_C}^{World}}{a_{LC}}$
- This wage buys them: $\frac{w}{{P_C}^{World}} = \frac{1}{a_{LC}}$ of cheese, or $\frac{w}{{P_W}^{World}} = \frac{{P_C}^{World}}{{P_W}^{World}} * \frac{1}{a_{LC}}$ of wine

Before trade:

- They earned $w = \frac{P_C}{a_{LC}}$
- This wage buys them: $\frac{w}{P_C} = \frac{1}{a_{LC}}$ of cheese, or $\frac{w}{P_W} = \frac{P_C}{P_W} * \frac{1}{a_{LC}}$ of wine

As we have seem last lecture generally, $\frac{P_C}{P_W} < \frac{{P_C}^{World}}{{P_W}^{World}}$, meaning they can buy the same amount of cheese, but more wine than before trade

- Their purchasing power remains the same in cheese and increases in wine

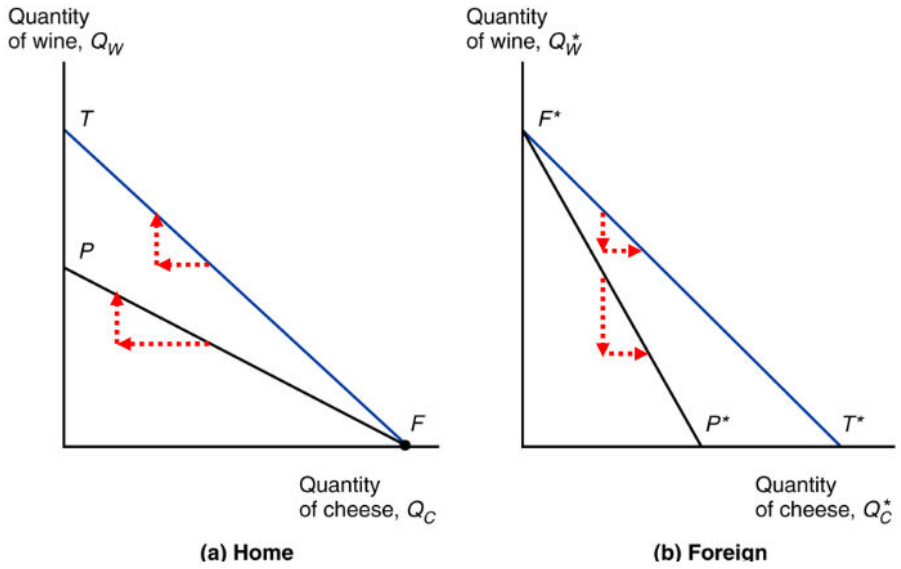
The **same analysis** can be done with the **foreign country**, and we will see a similar outcome, where $\frac{{P_C}^*}{{P_W}^*} > \frac{{P_C}^{World}}{{P_W}^{World}}$, or $\frac{{P_W}^*}{{P_C}^*} < \frac{{P_W}^{World}}{{P_C}^{World}}$

- Their purchasing power remains the same in wine and increases in cheese

Graphical prove for gains from trade

Generally, trade expands a country's consumption possibilities beyond production possibilities. This can be illustrated with graphs as follows:

- **No trade (black)**, consumption can only be within the constraints of the PPF
  - If Foreign country wants to consume 1 more pound of cheese, this requires consuming $(\frac{a_{LC*}}{a_{LW*}})$ gallons of wine less
- **With trade (blue)**, a country can specialize its production and exchange it
  - If Foreign wants to consume 1 more pound of cheese, it can buy it on world markets by selling $(\frac{{P_W}^{World}}{{P_C}^{World}})$ gallons of wine, and buying cheese for the money earned
- Since $\frac{{P_W}^*}{{P_C}^*} = \frac{a_{LC*}}{a_{LW*}} < \frac{{P_W}^{World}}{{P_C}^{World}}$, we can see, by trading they can consume more
- The same can be said for Home country



Numerical prove for gains from trade

Unit labour requirement for domestic and Foreign

	Cheese	Wine
Domestic	$a_{LC} = 1hour/pound$	$a_{LW} = 2hour/gallon$
Foreign	$a_{LC}^* = 6hour/pound$	$a_{LW}^* = 3hour/gallon$

Without trade:

- $\frac{P_W}{P_C} = \frac{a_{LC}}{a_{LW}} = \frac{1}{2}$, and $\frac{P_W{}^*}{P_C{}^*} = \frac{a_{LC*}}{a_{LW*}} = 2$
- **Domestic**: 1 hour of labour = 0.5 gallons of wine
- **Foreign**: 1 hour of labour = 1/6 pounds of cheese

With trade:

- Assume $\frac{P_W{}^{World}}{P_C{}^{World}} = 1$, one pound of cheese trades for one gallon of wine
- **Domestic**: 1 hour of labour = 1 pound of cheese, can then be traded for 1 gallon of wine
- **Foreign**: 1 hour of labour = 1/3 gallon of wine, can then be traded for 1/3 pound of cheese

As you can see for both Domestic and Foreign, they are both better off with trade

Relative wages

We can also analyse how wages in the 2 countries compare when they trade, this will be **crucial for when we extend the model to more than 2 goods**.

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
$\frac{{P_C}^{World}}{{P_W}^{World}} < \frac{P^*{}_C}{P^*{}_W} = \frac{a^*{}_{LC}}{a^*{}_{LW}}$:

- $\frac{w_C}{{w_W}^*} = \frac{{P_C}^{World}}{{P_W}^{World}} \cdot \frac{a_{LW}{}^*}{a_{LC}} \rightarrow \frac{w_C}{{w_W}^*} < \frac{P^*{}_C}{P^*{}_W} \cdot \frac{a_{LW}{}^*}{a_{LC}} \rightarrow \frac{w_C}{{w_W}^*} < \frac{a^*{}_{LC}}{a^*{}_{LW}} \cdot \frac{a_{LW}{}^*}{a_{LC}}$
- $\frac{w_C}{{w_W}^*} < \frac{{a_{Lc}}^*}{a_{LC}}$

$\frac{{P_C}^{World}}{{P_W}^{World}} > \frac{P_C}{P_W} = \frac{a_{LC}}{a_{LW}}$ (we follow the same process as above)

- $\frac{w_C}{{w_W}^*} > \frac{a_{LW}{}^*}{a_{LW}}$

We get the inequality:

$$\frac{a_{LW}{}^*}{a_{LW}} < \frac{w_C}{{w_W}^*} < \frac{{a_{Lc}}^*}{a_{LC}}$$

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 cheese compared to Foreign

Numerical example

- $a^*_{LW} = 3, \quad a^*_{LC} = 6, \quad a_{LW} = 2, \quad a_{LC} = 1$
- Home is 6 times as productive as Foreign in making cheese
- And, 1.5 times as productive as Foreign in making wine

Suppose world price for both goods = 12:

- ${w_W}^* = \frac{{P_W}^{World}}{a_{LW}{}^*} = 4/hr$

- $w_C = \frac{{P_C}^{World}}{a_{LC}} = 12/hr$
- One pound of cheese cost home, $12 \cdot 1 = 12$, but Foreign $4 \cdot 6 = 24$
- One gallon of wine cost home, 12 · 2 = 24, but Foreign 4 · 3 = 12

Both countries have a cost advantage in production of one of the 2 goods when they trade

- 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,...,N.

- Home country's unit labour requirement for each good is aLi
- Foreign country is a*Li.

With more than 2 goods **comparative advantage alone cannot determine the trade patterns**, this is because:

- Comparative advantage depends on the opportunity cost, which measures the the amount of one good that must be given up to produce another good
- As opposed to before, now there are many possible comparisons
- Home may have a comparative disadvantage in producing caviar compared to bananas
- But it may also have a comparative advantage in producing caviar compared to dates
- As you can see comparative advantage is insufficient, to see if home should produce caviar or not, we look at how much it costs to hire people to produce the goods

In other words, we need to know **productivity differences between countries and their wages**, and determine whether **a country has a cost advantage** in a certain good

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.

- Similarly, $\frac{w}{w^*} < \frac{a_{Li}*}{a_{Li}}$, if the relative productivity of a country in producing a good is higher than the relative wage, then the good will be produced in that country

Good	Home unit labour requirement (a_{Li})	Foreign unit labour requirement ($a_{Li}*$)	Relative Home productivity advantage ($\frac{a_{Li}*}{a_{Li}}$,)
Apples	1	10	10
Bananas	5	40	8
Caviar	3	12	4
Dates	6	12	2
Enchiladas	12	9	0.75

Suppose $\frac{w}{w^*} = 3$, this means home will produce Apples, Bananas and Caviar, while Foreign will produce the rest

- 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 labour in each country: $RS = \frac{L}{L^*}$

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

1. Relative wage $(\frac{w}{w^*})$ rising makes domestic goods more expensive, so demand for the goods and thus the labour service falls.
2. Increased relative wage $(\frac{w}{w^*})$ makes producing elsewhere cheaper, further reducing demand for labour.

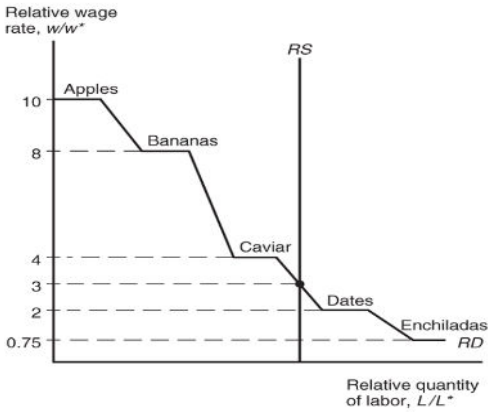
We can use the table above to illustrate:
If w/w* rises to 3.5:

- Home still produces apples, bananas and caviar,
- but they become relatively more expensive => relative demand for them falls
- fewer apples, bananas and caviar produced, requiring less labour, thus a gradual fall in relative labour demand

If w/w* rises further to above 4:

- Home becomes too expensive to produce caviar
- a shift in the international specialization pattern
- Foreign now produces caviar, and Home only produces bananas and apples:

- an abrupt fall in relative labour demand



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 evidence suggests that relative wages increase as relative labor productivity increases supporting what the model predicts.
2. Empirical studies show that countries tend to export goods in which their relative productivity to other goods is high.
3. Many economies with an absolute disadvantage in all industries can still have major exports thanks to comparative advantage in one.
4. 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.

Misconceptions about international trade

1. 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.
2. 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 compared to the alternative of not trading at all.

International Trade – IBEB – Lecture 4, week 2 (International Trade 4)
The specific factors model

There are often large amounts of protest against trade, even though we have seem that trade can benefit both countries (Ricardian model), this is because:

- Trade can have **strong effects on the distribution of income within a country**,
- meaning the country as a whole may benefit, but it may hurt significant groups within the country

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

- It also shows us the different groups within a country are affected by trade

The specific factors model

Assumptions:

1. **Two** goods (eg car and food)
2. Three factors are used in production**: land (T)**, **labour (L)** and **capital (K)**
3. cars 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. **Land** and **capital** are **specific factors**: they can only be used in the production of food and cars respectively

Production function

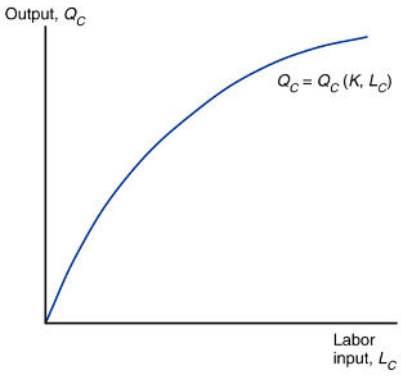
A production function is a graphical representation of the output of a good that can be produced with different input bundles of the factors of production. The production function of car and food can be represented as:

- $Q_C = Q_C(K, L_C)$

- $Q_F = Q_F(T, L_F)$

Where:

- Q_C and Q_F are the output of cars and food resp.
- K is the capital stock
- T is the amount of land available
- L_C and L_F is the amount of labour employed in cars and food resp.

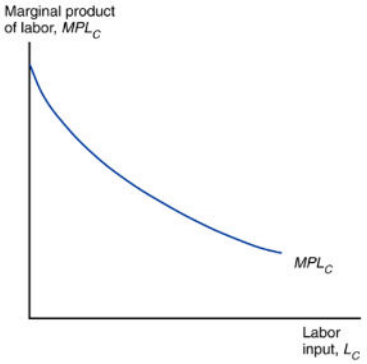


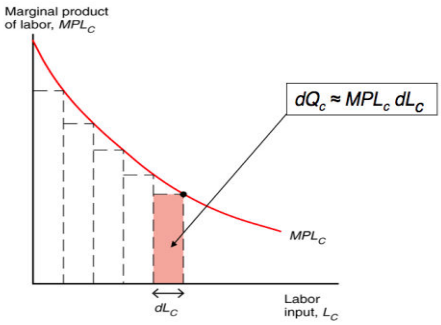
The graph shows **diminishing marginal return to labour**, meaning:

- Additional unit of labour increases output, but at a rate lower than before
- With constant capital, increasing the number of workers means each worker has less capital to work with, so they produce less

The **marginal product of labour** tells us the amount increase of Output due to additional Labour input:

- This decreases with the number of people already employed, because each extra worker gets less capital to work with



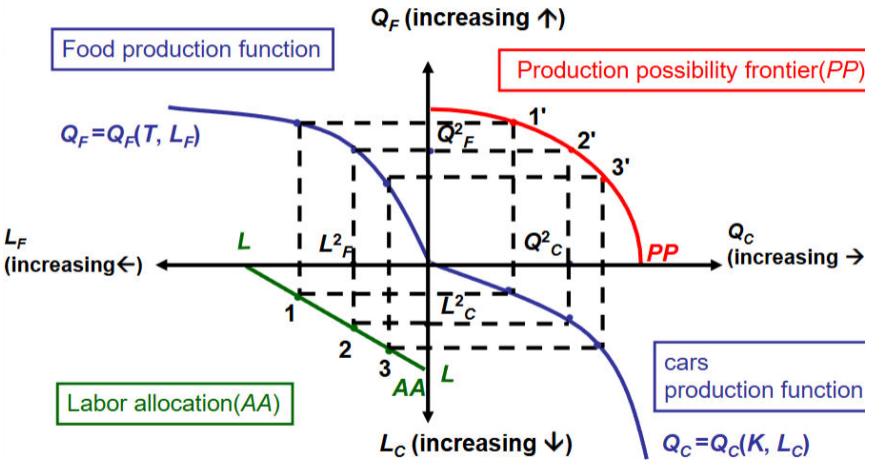


Note: The area under the marginal product curve represents output QC.

- Where, $dQ_c \approx MPL_c \cdot dL_c$

The **total labour supply L is fixed**, meaning that the labour used in car production and the labour used in food production **must satisfy** $L_C + L_F = L$

- This creates a trade-off: labour allocated to producing cars cannot be used to produce food at the same time, and vice versa.
- With labour market equilibrium and the production functions, the **production possibility frontier (PPF)** can be derived.



You start by choosing the combination of labour allocation

- Using the amount of labour for each good, you look up the quantity of food and cars in their respective production function,
- Using the quantities you plot a bundle in the PPF, by repeat this process for all the combinations of labour allocation you will get the PPF

The slope of the PPF measures the opportunity costs of cars in terms of food:

- how much food could be produced using the resources now used to produce one unit of cars
- We know that **MPL** tells us the amount produced for 1 extra unit of labour, so to produce 1 extra unit of car we need $\frac{1}{MPL}$ units of labour
- If we were to use the $\frac{1}{\boldsymbol{MPL_c}}$ units of labour used to produce 1 car, we would have been able to produce $\frac{\boldsymbol{MPL_F}}{\boldsymbol{MPL_C}}$ units of food

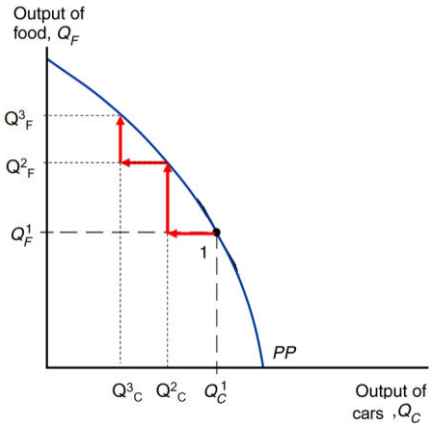
  MPL_F food produced with 1 unit of labour, times the labour freed up from cars $\frac{1}{MPL_C}$, $MPL_F \cdot \frac{1}{MPL_C}$
- This is the opportunity cost of producing 1 extra unit of cars in terms of food

Unlike in the Ricardian model, this opportunity cost is not constant, it depends on how much food and cars are already produced

- This is because of the diminishing returns to labour in each sector
- The opportunity costs of producing a good rise with the amount of the good already produced

- We need more and more labour to produce one additional unit of car, so if we produce less cars, the amount of labour freed up will increase at an increasing rate, which could have been used to produce food

As you can see in the graph, from Q3c to Q2c of cars, you go from making Q3F to Q2F of food, and for the same increase in cars, you go from making Q2F to Q1F, meaning the more cars you make the more food you give up at an increasing rate



Prices, wages, and labour allocation

How much will each sector produce?

As capital and land are specific factors, it's optimal to use all that is available, but labour is mobile, and this depends on labour demand and labour supply (together they determine wages)

- Labour supply is just L
- Labour demand, for each sector firms will employee amount of workers that maximise their profit

In the case of car:

$$\max \rightarrow P_c Q_c(K, L_c) - w_c L_c - rK$$

We find the F.O.C w.r.t L:

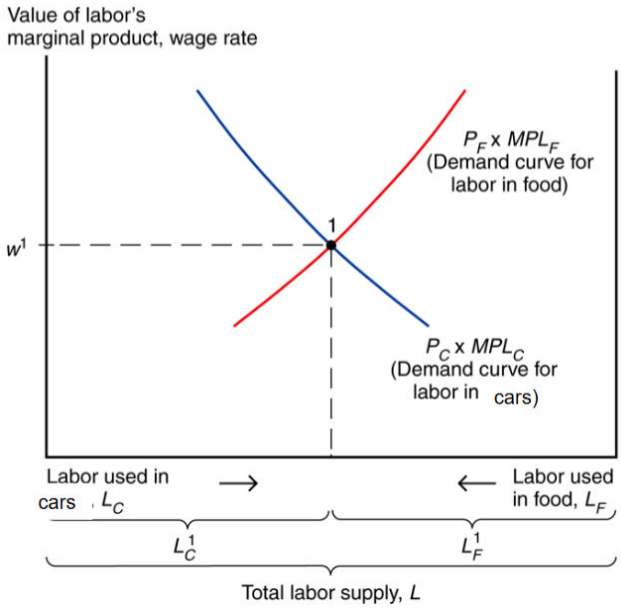
$$w_c = P_c \cdot MPL_c$$

Similarly, this holds for the food sector:

$$w_F = P_F \cdot MPL_F$$

Wages equal the value of the marginal product of labour

- This means in both sectors; an additional worker earns as much as the value they add to total production. The representation of both the labour demand curves



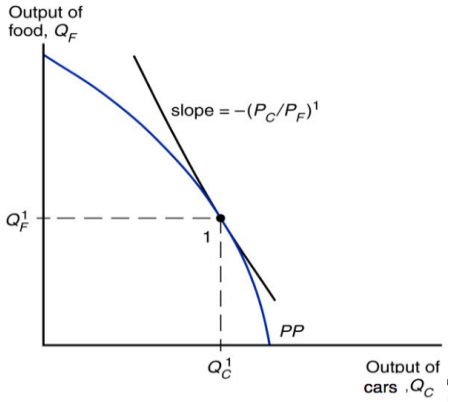
Where the labour demand curves intersect is the equilibrium wage and allocation of labour between the two sectors.

- At this point, the wage is the **same** for both sectors for workers to not be incentivized to switch sectors.

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

$$-\frac{\boldsymbol{MPL_F}}{\boldsymbol{MPL_C}} = -\frac{\boldsymbol{P_C}}{\boldsymbol{P_F}}$$

This equality tells us that the country chooses to produce the bundle of goods, at the production point where, the PPF is tangent to a line with slope given by the relative price of cars in terms of food (with a minus sign)



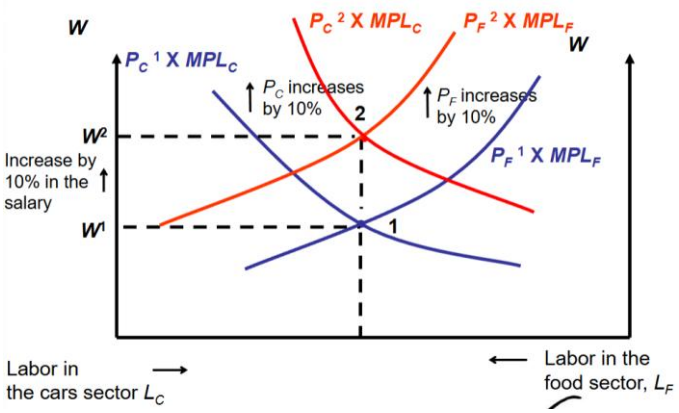
Proportional and relative change in prices

Changes in price of car and food can influence the labour demand in two ways:
A **proportional change** in prices: prices of both goods change with the **same** percentage.

If both prices increase by 10%, the demand for both car and food rises.

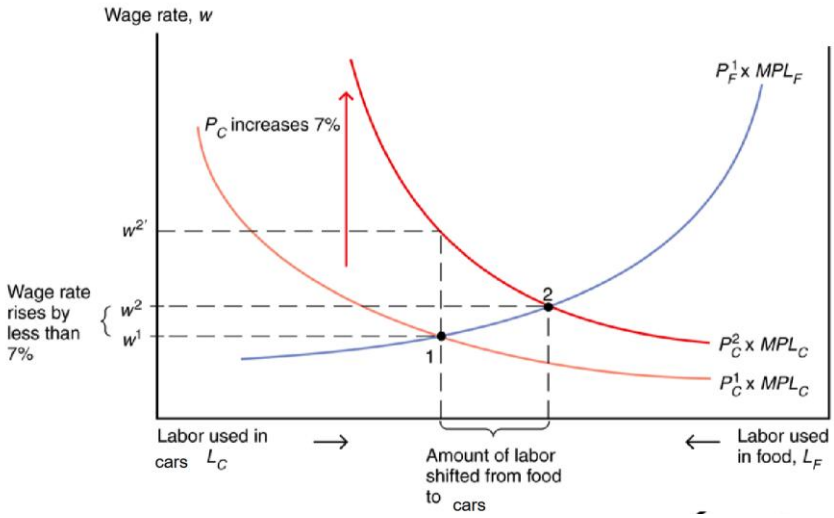
- Both curves will thus shift upwards by the same proportion.
- The demand curves intersect at the point where wages are 10% higher, but the labour allocation does not change.
- Real wages (the ratio of wages to the prices of goods) do not change:
    - Workers earn 10% more, but each extra € also buys them 10% less of each good (both prices have increased by 10%)
    - Also, owners of land and capital can ask 10% more for their output, but also have to pay 10% more to their workers

No real changes!

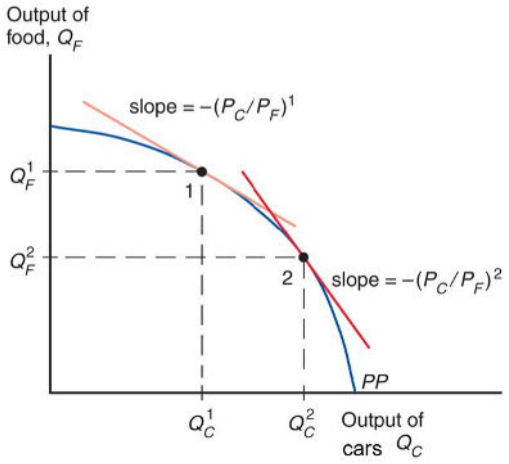


A **change in relative prices**: when the price of either or both goods change with **different** magnitudes.

- Suppose that the price of car rises by 7%, 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 7 %. Remember, w = $MPL_C \cdot P_C$
- 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.
- Intuition: higher wages attract more workers, but because more people want to work in the car sector now, employers can reduce wages a bit and still get enough people to do the job



This also means that with higher relative price we also produce more cars



Does everyone gain from this

The welfare of three parties is affected by this change:

1. **Capital owners are better off**: output of cars increases, wages rise by less than the rise in price of car, so they earn more; relative price of cars 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 cars increases, so they can buy less cars.
3. **Ambiguous for workers:** Wages go up, but
    a. Price of cars has gone up even more, so they can buy less cars: relative wage in terms of cars falls
    b. But, since price of food remains unchanged, they can buy more food: relative wage in terms of food rises
    c. It all depends on their preferences for food and cars

In general, a change in relative prices will:

- Benefit the owners of the factor specific to the sector whose relative price increases
- Hurt the owners of the factor specific to the sector whose relative price decreases.
- On the other hand, the impact on the 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, no good from other country will be cheaper or more attractive to import

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**; people in other countries have different preferences than those in your own country
    - (e.g.: at the same relative prices, they are willing to buy more cars and less food)
- **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).

Small example

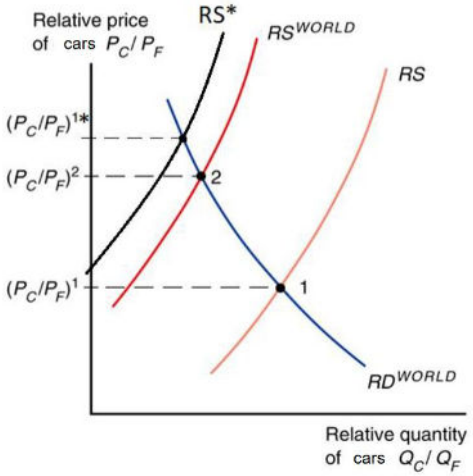
For simplicity: assume preferences are the same all over the world, so that relative demand does not change

Assume Foreign is willing to produce relatively less cars at a given relative price.

- This could be due to lower productivity in car production or higher in food sector;
- alternatively, the specific factors which it possesses are unfavourable in the production of cars over food.

This means Home can produce cars relatively cheaply compared to the rest of the world, so when they open up to trade:

- Foreign buys cars from Home, and Home buys food in return, this increased demand in cars, raises the relative price of cars
- So, the world RS curve lies to the left of Home's RS in autarky



Gains from trade

In autarky, the consumption of Home equals its production:

$$\mathrm{QC} = \mathrm{DC} \text{ and } \mathrm{QF} = \mathrm{DF}$$

- where D_F stands for food consumption and D_C for car consumption

With 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:

$$\mathrm{PC\ x\ DC} + \mathrm{PF\ x\ DF} = \mathrm{PC\ x\ QC} + \mathrm{PF\ x\ QF}$$

Rewriting this budget constraint yields:

Imports $(\mathrm{D_F} - \mathrm{Q_F}) = (\frac{P_C}{P_F})\ (\mathrm{Q_C} - \mathrm{D_C})$ **Exports**

This tells us how much a country needs to export in order to earn the funds it's imports.

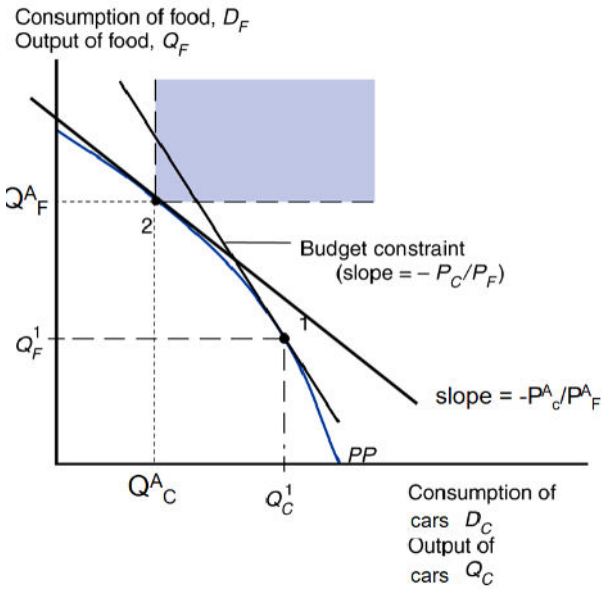
- If Home sells one more unit of cars on world markets it gets P_c for it, with this money it can buy $(\frac{P_C}{P_F})$ units of food in return

In Autarky it produces and consumes QAF and QAC

- With trade it produces Q1F and Q1C

It can always trade these goods at the prevailing world prices and consume any bundle of goods along the budget constraint

- So also those in the blue area, where both the amount of cars and food consumed are larger than in autarky



However, the resultant benefits are not equally distributed. Since trade changes relative prices,

- Benefit the owners of the factor specific to the sector whose relative price increases: **the exporting sector**
- Hurt the owners of the factor specific to the sector whose relative price decreases: **the sector that faces toughest competition from imports.**
- Impact on the mobile factor is **ambiguous**.

At an aggregate level, trade benefits the whole economy.

- There can also be redistribution of such as the ones that benefit compensate the ones that are hurt, though the situation is usually hard to enforce.

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

- specific factors can move between sectors in the real world: 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.

Adapting the specific factors model: International Labor Mobility

So far, labor can move freely between sectors within a country, but not between countries. Not a bad assumption, since in the real world restrictions on international labor mobility are very severe. However, if labor was allowed to move between countries, what would happen to the income in two countries and who benefits?

Suppose two countries produce the same good (food) using land and labor (with diminishing returns to labor). NOTE: no trade because the two countries produce the same good.

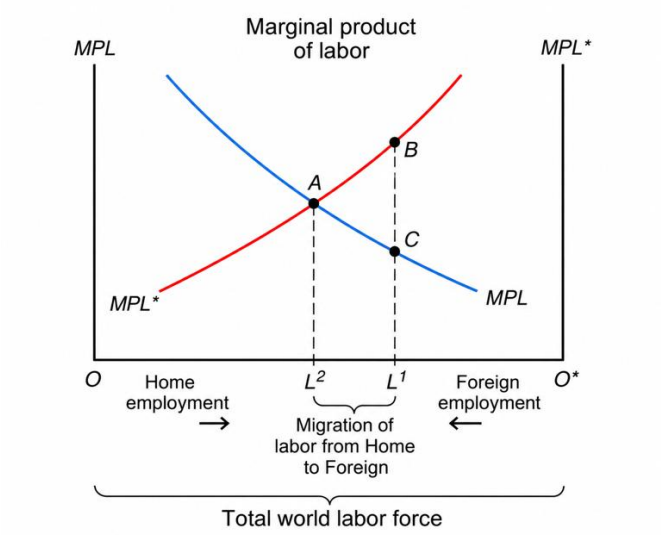
But, workers may still want to move to the other country because they might earn higher real wages in one country relative to the other.

- People move across borders until **real wages are equal** in the two countries
- Suppose technologies are the same, but initially more people live

and work in Home than in Foreign: OL1 in home > L1O* in foreign

- In each country real wages are determined by MPL (remember that $w_F = MPL_F \cdot P_F$; $w_C = MPL_C \cdot P_C$)
- The MPL is lower in Home than in Foreign because more people work in the sector. So, real wages in Home lower than in Foreign.

⇒ people migrate from Home to Foreign! Who wins and loses?



- Workers initially in Home gain (also those who moved to Foreign): their real wage rises
  Workers initially in Foreign lose: their real wage falls
- Output in Foreign rises (+dQF)
  Output in Home falls (-dQH)
  But, overall world output rises (triangle ABC): labor moves to places where it is more productive
- Landowners in Foreign gain: their output rises + they pay lower wages
  Landowners in Home lose: their output falls + they pay higher wages

Over the 1870 – 1913 period, migration did move the world toward more equalized real wages, evidence suggests

Immigration in the US economy

Recent migration, mostly concerns workers with the lowest skill levels: **increase in the supply of low-skilled workers**

This led to:

- reduced real wages for low-skilled US workers (increased competition with immigrants), while raising real wages for the more educated (goods/services produced by low-skilled workers become cheaper)
- widening income gap between high and low skilled workers

International Trade – IBEB – Lecture 5, week 2 (International Trade 5)
The Heckscher-Ohlin model

While the Ricardian model explains that trade stems from differences in the labour productivity, the **Heckscher-Ohlin (H-O)** model only looks at the other reason for trade, **the differences in resources between countries.**

Compared to the **Specific factor model** which only **labour is assumed mobile**, the H-O model assumes that **each factor of production can be used in each sector**.

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, which helps us analyse the winners and losers when opening up to trade.

Heckscher-Ohlin model

Assumptions:

1. Two countries: Home and Foreign
2. Two factors of production: capital and labour
3. Two goods: cars and food
4. Same technology in the two countries (= same production functions)
5. The supply of labour and capital in each country is constant, but **varies between countries**
6. Perfect competition and free/entry exit in **both sectors**
7. **Both capital and labour** can freely/costlessly move across sectors (but, no international factor mobility)
   - rental rate and wage equalization between sectors

Production function for car and food:

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

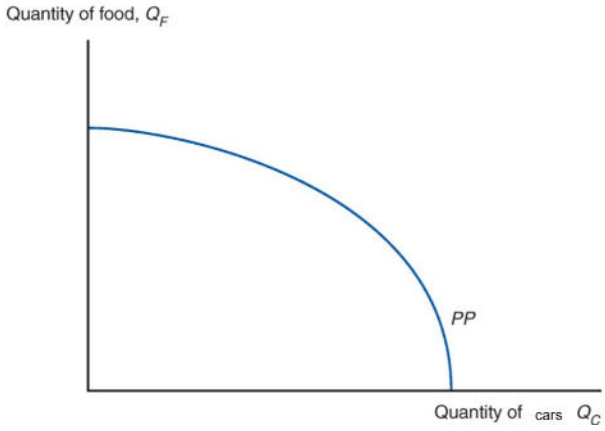
The production function is characterised by diminishing returns to labour and capital

The larger the initial output of one good is, the more labour and capital are released when reducing output of that good.

The slope of the PPF represents the opportunity cost of cars in terms of food, which varies along the curve:

- Low when the economy produces a small amount of cars and a large amount of food
- High when the economy produces a large amount of cars and a small amount of food

Because when the economy devotes more resources towards production of one good, the **marginal productivity** of those resources tends to be low, so the opportunity cost is high



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:

$$V = P_C \cdot Q_C + P_F \cdot Q_F$$

An **isovalue** line shows the combinations of two goods that result in the same constant value of production V*, **given the prices of goods**.

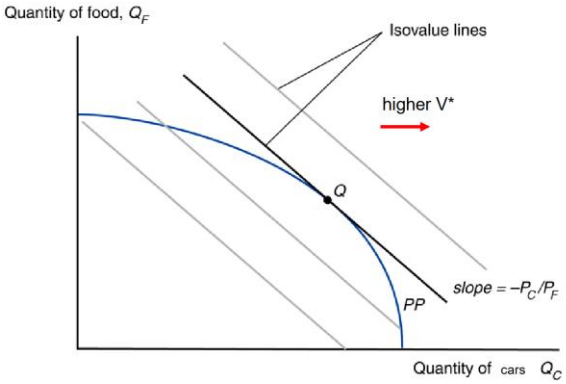
$$V^* = P_C \cdot Q_C + P_F \cdot Q_F \Leftrightarrow Q_F = \frac{V^*}{P_F} - \left(\frac{P_C}{P_F}\right) \cdot Q_C$$

Thus, the slope of an **isovalue** line is $-\frac{P_C}{P_F}$

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.

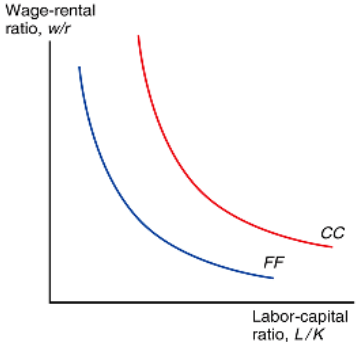
- Here, the relative price of car to food equals the opportunity cost.
- If relative price of cars in terms of food > opportunity cost of producing cars in terms of food:
    - Incentive to produce a bit more cars, selling them for food
- If relative price of cars in terms of food < opportunity cost of producing cars in terms of food:
    - Incentive to produce a bit less cars, buying them instead with the money earned producing food



To determine the actual production, we not only need to know the relative prices we also need to know **w, the wage paid to labour** and **r, the rate when renting capital**

- Usually, as the wage w increases relative to the rental rate r of capital, producers use less labour and more capital in the production of both food and cars

The graph below, shows that for any wage-rental ratio, car production (CC) uses relatively more workers than capital compared to food production (FF).



We are thus assuming:

- Car production is **labour-intensive**, and food production is **capital-intensive**
- For a sector to be labour-intensive, this means that for any given factor prices (wage-rental), production in that sector always uses more labour relative to capital than in the other sector

$$\frac{L_c}{K_c} > \frac{L_F}{K_F}$$

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.

Remember we are operating in a perfect competition, meaning profit for the firm is 0 so, production cost equals prices:

- If the price of a good is higher than its cost of production, (new) firms have an incentive to enter the market offering the goods at a slightly lower price and still make a profit
- If the price of a good is lower than its cost of production, no firms will want to produce that good

⇒ In equilibrium prices exactly cover the cost of production (profits are zero)

We need to understand how changes in wages and rents affect production costs ==> this depends on how much labor and capital are used in production!

- In our example where Car production is labour-intensive, they use more labour than capital
- If wages rise relative to the rental rate of capital, this means production in cars production will rise relatively more than in food production
- As production cost equals prices, the relative prices of cars will increase

Changes in **relative goods prices** affect **relative factor prices**, since **firms choose input combinations** based on relative factor prices, this means that changes in relative goods prices also change the input combinations used in production

- Relative factor prices and relative goods prices are directly related

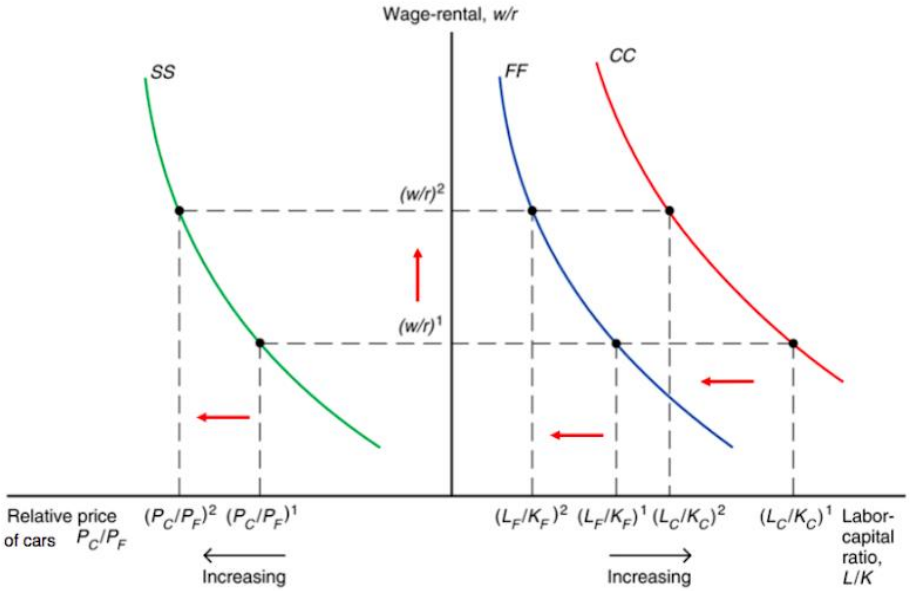


Suppose the relative price of car to food increases, some firms will switch to producing car to earn more.

- Since food production is capital intensive and cars production labour intensive, this means that we have excess supply of capital and excess demand for labour, $\frac{w}{r}$ **goes up**

Firms will respond by changing their input mix, where both sector firms will use relatively less labour and more capital than before

- We start with the green curve where there is an increase in the relative price of cars, which increases the wage-rental ratio
- This them change the input mix that the 2 sectors will choose



Since in both sectors, L/K decreases, we know that MPL goes up in both sectors and MPK goes down

- Each worker has more machines to operate, adding an additional worker adds more production than before
- Each machine has less workers to operate it, making it less productive to add another machine than before

Remember, from the specific factor model, profit maximizing firms pay their factors of production the value of their marginal product:

$$w = P_c \cdot MPL_c \text{ and } r = P_c \cdot MPK_c$$
$$\frac{w}{P_c} = MPL_c \text{ and } \frac{r}{P_c} = MPK_c$$

To conclude, an increase in the relative price of cars will lead to:

- Real income of workers goes up and that of capital owners goes down
- Lower the ratio of labour services to capital, $\frac{L}{K}$ used in both industries

- But, increase the amount of both labour and capital used in car production

Stolper-Samuelson theorem: If the relative price of a good increase, then
- the real wage or rental rate of the factor used intensively in the production of that good increases
- the real wage or rental rate of the other factor decreases.
- Any change in the relative price of goods alters the distribution of income.

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.

Suppose the domestic labour force increases (L↑)
- We assume relative prices are held constant (e.g. because the country is too small to affect the whole world)
- then relative wage to rental rate $\frac{w}{r}$ and the input combination will be unchanged

This means $\frac{L}{K} = (L_c + L_F)/(K_c + K_F)$ increases, but $\frac{L_c}{L_c}$ and $\frac{L_F}{K_F}$ remain unchanged. This can be explained as follows:

$$\frac{L}{K} = \left(\frac{L_c}{K}\right) + \left(\frac{L_F}{K}\right) \rightarrow We\ multiply\ L_c\ side\ by \frac{K_c}{K_c} and\ L_F\ side\ by \frac{K_F}{K_F}$$

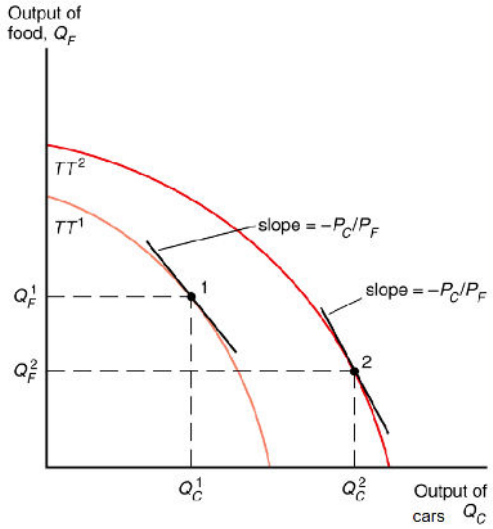
$$\frac{L}{K} = \left(\frac{L_c}{K}\right)\left(\frac{K_c}{K_c}\right) + \left(\frac{L_F}{K}\right)\left(\frac{K_F}{K_F}\right) \quad \rightarrow \quad \frac{L}{K} = \left(\frac{L_c}{K_c}\right)\left(\frac{K_c}{K}\right) + \left(\frac{L_F}{K_F}\right)\left(\frac{K_F}{K}\right)$$

Note $\left(\frac{K_c}{K}\right)$ is just the share of capital allocated to cars, so $\left(\frac{K_F}{K}\right) + \left(\frac{K_c}{K}\right) = 1$
- In other words, one share going up means the other goes down by equal amount
- We have also assumed that car is labour-intensive, so $\frac{L_c}{K_c} > \frac{L_F}{K_F}$

So, for the equality to hold even after increase in L, we must have that:
- Capital moves from food to cars production:
- As we have assumed that the labour-capital ratio remains the same, and capital move to cars production, we require that the extra labour moves towards car production to keep labour-ratio the same
- Overall car output rises and food output falls

Since the car production employs more labour relative to the food production, the increase in labour causes the PPF to shift "more outwards" in cars than in food (production possibilities in cars expand more than in food).

As you can see in the graph, for a given relative price, the result is an increase in cars production and a decrease in food production



Rybczynski Theorem: If you hold goods prices constant: as the amount of a factor of production increases, then the supply of the good that uses this factor intensively increases and the supply of the other good decreases

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

Trade in Heckscher-Ohlin model

From what we have seem in the previous lecture about a closed economy, we can now analyse the effects of trade in this model

- The assumptions are the same as in the previous lecture, now we have 2 economies
- To see **how differences in resource endowments lead to trade**, we assume that countries are equal in all aspects (production technology, consumer preferences)

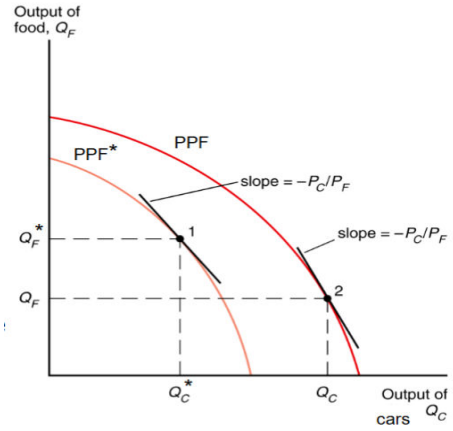
Suppose we assume that **Home is labour abundant** and **Foreign (*) is capital abundant**: $\frac{L}{K} > \frac{L^*}{K^*}$

- Country can have smaller population and smaller capital stock; it will still be either labour or capital abundant (compared to another country)
- Because it's **relative that matters not absolute**
- We assume that relative labour in Home and Foreign is both not too big or small, meaning **both countries produce both cars and food**

Combined with the assumption we made in the previous lecture, where car production is labour-intensive

- At given prices, Home always produces relatively more cars than Foreign
- This directly follows from **'Rybczynski theorem':** if you hold goods prices constant; as the amount of a factor of production increases, then the supply of the good that uses this factor intensively increases and the supply of the other good decreases

- As Home is the one with an "increase" (higher endownment) in labour supply, they will make more cars and less food, as you can see in the graph below



Equilibrium in trade

Suppose we begin to trade; the relative demand and supply of both countries help to determine the relative quantity consumed at world price.

- We have assumed that preferences are the same in both countries, so relative demand curves are equal.
- As we have seen above, at each relative price of cars, Home always supplies relatively more cars than Foreign; the same holds for Foreign for food
- So relative car prices are lower at home, and relative food prices are lower at Foreign
- Home will demand food from Foreign, and Foreign will demand cars from Home
- This results in **price convergence** as the demand extends for both good, such that:

For cars:

$$(\mathrm{P}^*C/P^*F) > (P^{world}{}_C/P^{world}{}_F) > (\mathrm{P}C/PF)$$

For food:

$$(\mathrm{P}F/PC) > (P^{world}{}_F/P^{world}{}_C) > (\mathrm{P}^*F/P^*C)$$

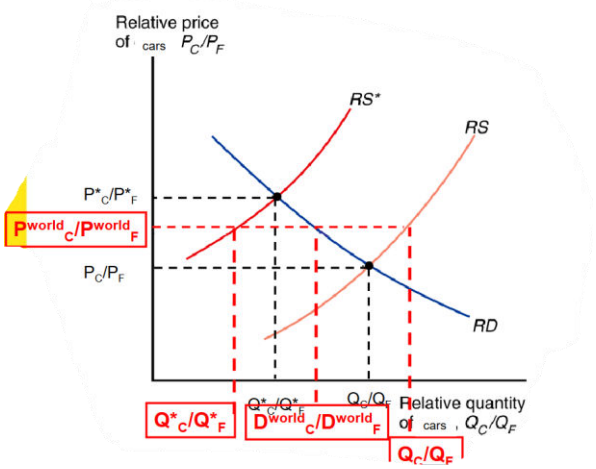
In each country, the relative price of the good that uses its abundant factor intensively rises.

- relative price of cars (= labour intensive) rises in Home (= labour abundant)

- relative price of food (= capital intensive) rises in Foreign (= capital abundant)

As a result of these changes in relative prices:

- Home increases its relative supply of cars and exports some of its cars to Foreign
- Foreign increases its relative supply of food and exports some of its food to Home



The Heckscher-Ohlin theorem

Heckscher-Ohlin theorem: An economy is predicted to export goods that are intensive in its abundant factors of production and import goods that are intensive in its scarce factors of production (no complete specialisation)

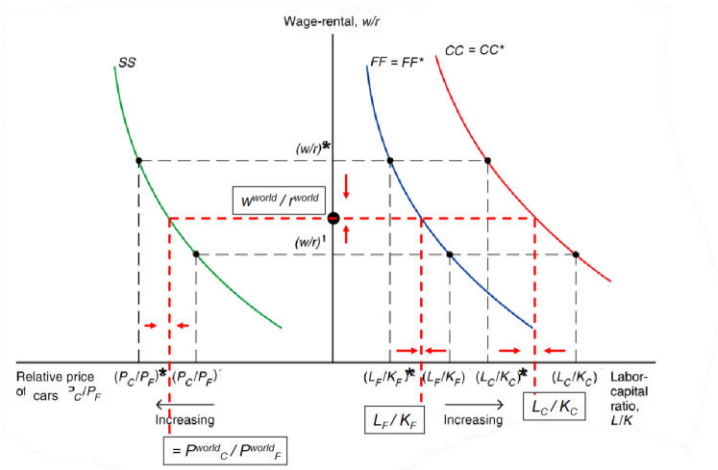
Factor price equalisation

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

- Opening 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!)
- labour to capital ratios in the two sectors converge across the two countries



Remember $w = P_c \cdot MPL_c$ and $r = P_c \cdot MPK_c$, for both countries:

- we have that L_C/K_C and L_F/K_F the same in the two countries
- with relative prices the same, technologies the same, and labour to capital ratios the same

⟹ **wages and rental rate are the same in the 2 countries**

w = w* and r=r*

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: $\boldsymbol{Q_F = D_F}$ and $\boldsymbol{Q_C = D_C}$
- With trade, it can consume more/less by importing/exporting from/to other countries, all within the limits of it's budget constraint

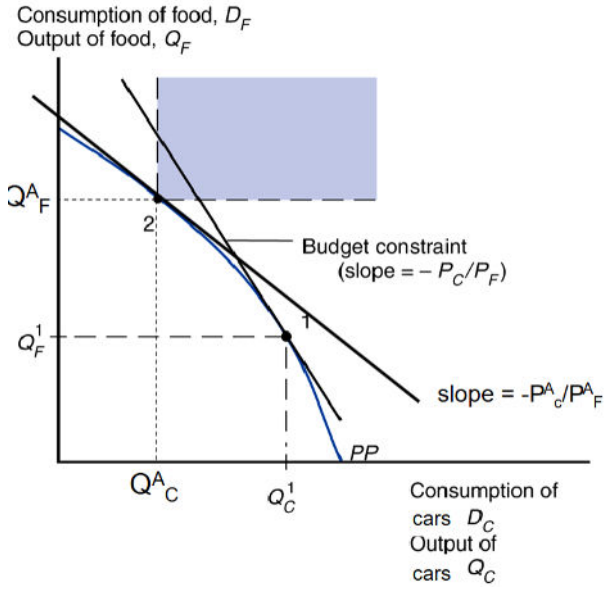
$$P_C \times D_C + P_F \times D_F = P_C \times Q_C + P_F \times Q_F$$

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

- If a country decides to export one more unit of cars, it can (only) finance an additional (PC /PF) units of imported food

It can always trade these goods at the prevailing world prices and consume any bundle of goods along the budget constraint

- So, those in the blue area, where both the amount of cars and food consumed are larger than in autarky



Although both countries as whole gain from trade, 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 rise 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.**

Bowen et al. (1987) – Global data

- They tested how often countries that are abundant in a particular factor are also net exporters of that factor.
- Results were mixed: the model's predictions were correct only 52% of the time for capital and 67% for labor, for example.
- This suggests that the H-O model does not explain global trade patterns particularly well.

The H-O model explains trade between developed **(North)** and developing **(South)** countries relatively well.

- Developed countries are relatively skill-abundant and export skill-intensive goods.
- Developing countries export relatively less skill-intensive goods, reflecting their relative abundance of less-skilled labor.
- Over time, developing countries have become more skill-abundant, and the skill intensity of their exports has increased. Asia's increase in skill abundance led to higher exports to US of more skill-intensive goods, empirical evidence suggests.

Factor price equalization

The evidence is very poor

- Factor prices are evidently not equalized across countries (a factory worker in Vietnam or Ethiopia earns less than a factory worker here or in Canada)

The main reason the model is so inaccurate in prediction of FPE is due to assumptions that does not reflect reality:

- countries have different production technologies: a country with better technology can offer higher wages (Ricardo....)
- or, since FPE follows from goods price equalization, when:
    - trading incurs trade costs: transport costs, tariffs, etc.
    - non-tradables produced with same factor(s) as tradables
    - policy: minimum wages

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 it could be 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 3 (International Trade 7)
The standard trade model

For all the 3 models we have discussed, the **reasons as to why the countries start trading in the first place** goes as follows:

- **Relative prices differ between countries**
    - some goods are cheaper abroad and thus attractive to import, others are cheaper domestically and thus attractive to foreigners
- The difference in relative prices is caused by **differences in production possibilities** between countries
    - For Ricardian model this is due to **differences in technology**
    - For H-O model this is due to **difference in resource endowments**

The **Standard trade model** summarises and combines all the 3 models. However, some issues related to trade can be looked at **without specifying** what exactly drives production differences between countries, e.g.

- Effect(s) of economic growth
- Effect(s) of import tariffs and export subsidies

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 compared to food (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)

Relative prices in autarky

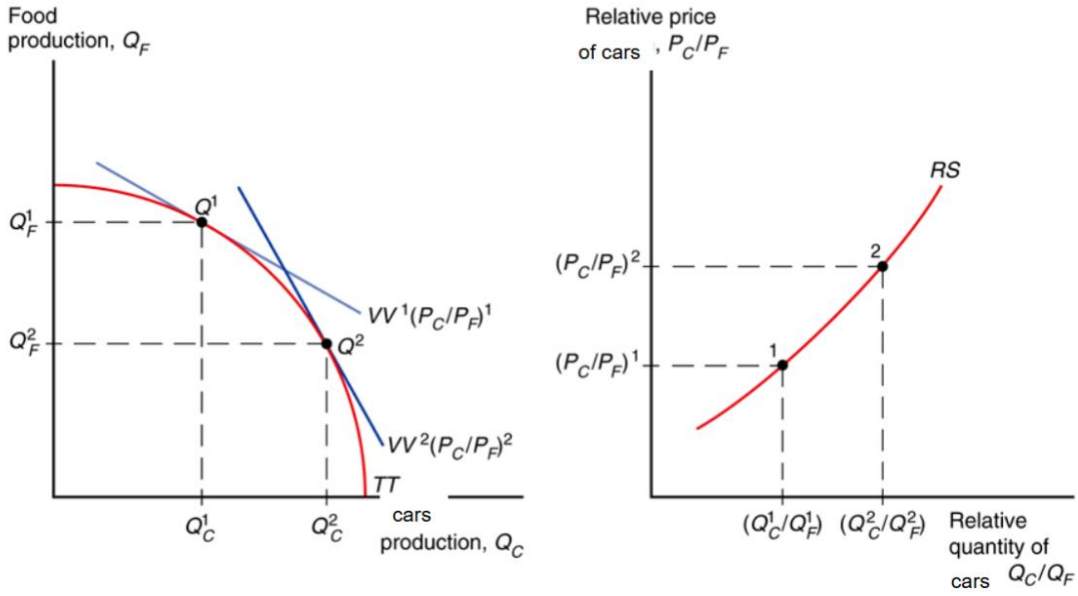
Production - relative supply

We can derive the **relative supply curve** by choosing different relative 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 collection 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**)

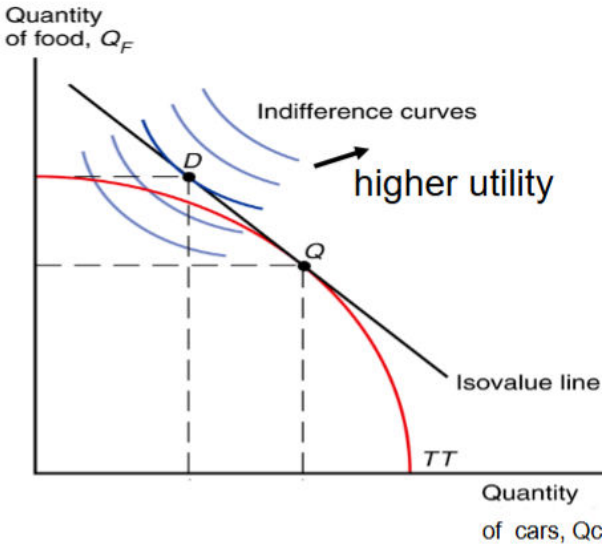
These Indifference curves:

- Are downward sloping – if you have less cars, then you must have more food to be equally satisfied
- That lie farther from the origin make consumers more satisfied – they prefer having more of both goods

- Become flatter when moving to the right – when you already have a lot of cars, another car becomes less valuable in terms of how much food you are willing to give up for it

In the graph below we see bundle D, which give the highest Utility, in other words:

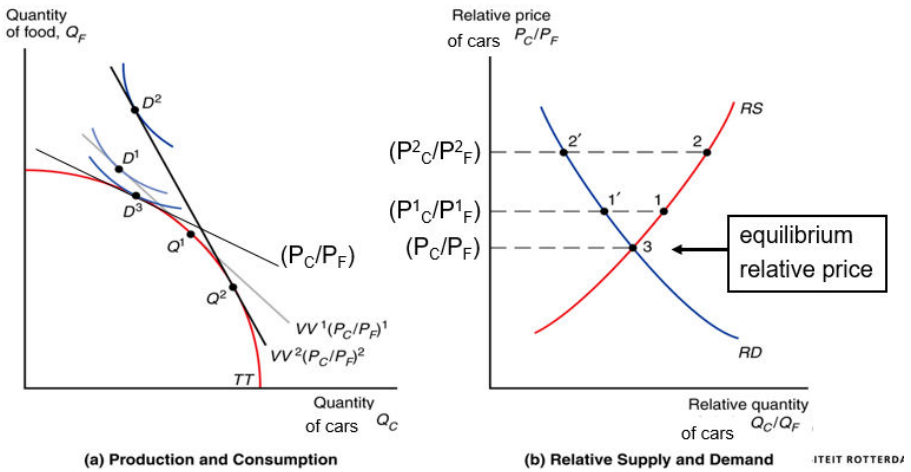
- Given the shown relative prices, consumers would like to consume more food and less cars than what the country's producers can produce (D is outside the PPF)



We can derive the **Relative demand curve**, by choosing different relative prices and using the different **isovalue** lines we can find the different bundles for which we get the highest indifference curve:

- From that the bundles we can get the relative quantity for both goods
- The loci of these points when plotted with axes of relative price and relative quantity represent the relative demand

Equilibrium relative price is at the intersection of Relative supply and the relative demand curve



Opening to trade

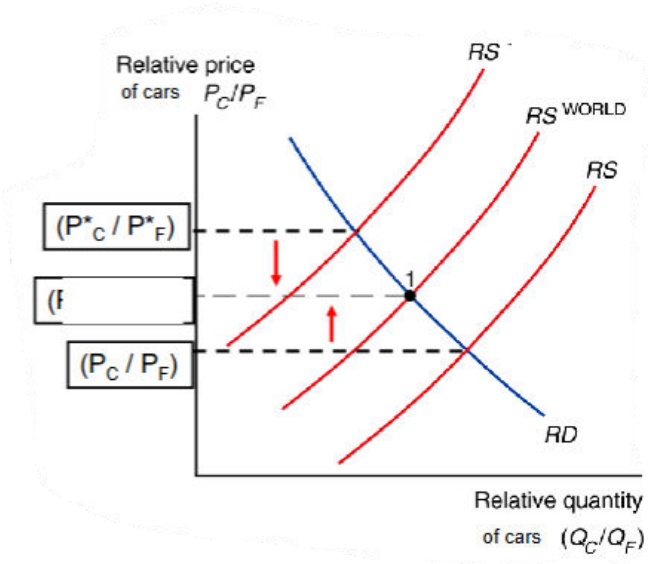
We assume that the whole world consists of two countries, Home and Foreign.

- 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** in each country.

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

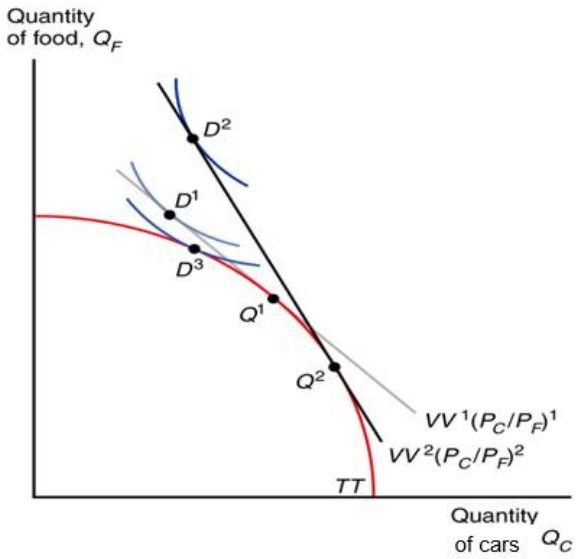
- At any given relative price of car, Home always produces more car relative to food and Foreign produces a lower quantity of cars to food (a higher quantity of food to car): $\frac{Q_C}{Q_F} > \frac{Q^*_C}{Q^*_F}$
- **Home exports cars and foreign export food**
  ⇒ So, RS curve lies to the right of the RS* curve.



And we know from previous lectures that the World RS will lie in between the relative supply curves of the 2 countries

- Meaning trade makes world relative prices converge

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



Trade: World's relative supply lies 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 D1, which contains less cars but more food, and which gives them higher utility.
- If the relative price of cars hikes further, Home will be able to consume bundle D2 by producing at point Q2, such that it exports cars and imports food.
- Since each additional unit of cars can buy more food than before with the increase in relative price, it attains higher welfare (on a higher indifference curve).

Gains from trade

Opening up to trade allows consumers to consume a bundle of goods that could not be consumed in autarky and that lies on a higher indifference curve = Gains from Trade, as we have seen in the bullet points above

From here on we will look at what happens when we have **already opened up to trade** and something changes; suppose that the relative price of cars rises even further, what we want to know is:

- Does the country's welfare increase/decrease
- Does it trade more or less

Because the country exports cars, the rise in the relative price of cars benefits the country: it can trade one unit of cars for more food than before

- it exports more cars
- it imports more food
- its welfare improves: it can consume a combination of goods that provides a higher utility (D1 => D2) of cars

Effect due to rise in relative price of cars:

- **Income effect:** They are exporters of cars, so their income goes up and they can buy more of both goods
- **Substitution effect:** Cars are relatively more expensive, so they demand less cars and more food

Terms of trade and welfare

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

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

In our example:

- Home's terms of trade: $\frac{P_C}{P_F}$
- Foreign's terms of trade: $\frac{P_F}{P_C}$

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**.
- Remember the higher relative price of car, the steeper the isovalue line, allowing to reach a higher indifference curve, in our example D1 → D2
- Despite this, **welfare cannot fall below the state of autarky**, otherwise, the country could just not trade at all.

Predictions using the Standard Trade model

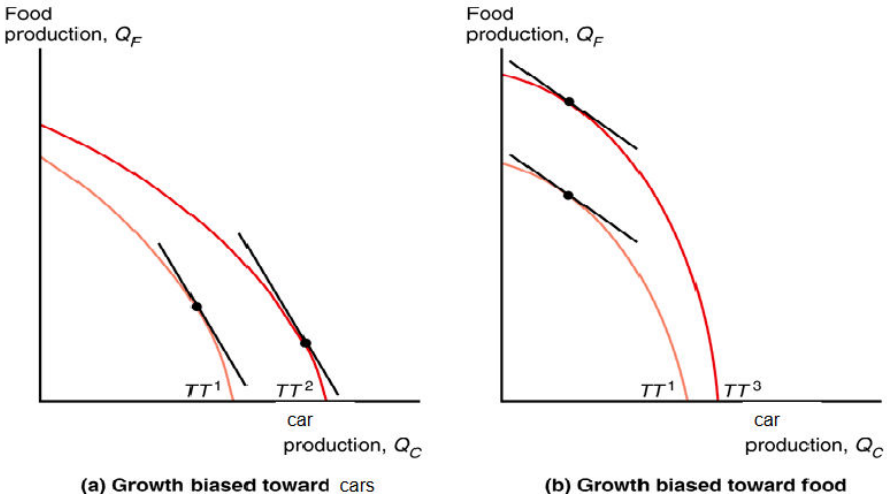
The Standard Trade model gives us clear predictions about the gains from trade, and the impact of changes in the terms of trade on welfare

- This is very useful, and helps us to understand important issues in international economics, e.g.
    - Is growth in other countries bad for the Home country?
    - What is the effect of import tariffs or export subsidies?

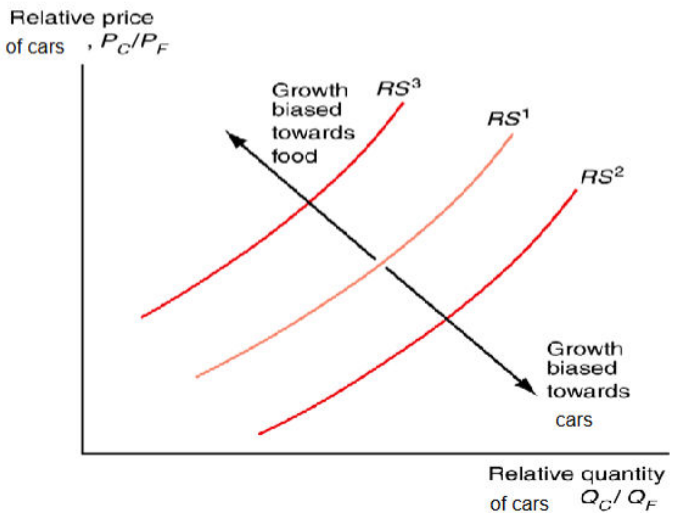
Effects of economic growth

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 of only one production factor lead to a biased growth of the sector that uses this factor intensively.



(a) Growth biased toward cars **(b) Growth biased toward food**



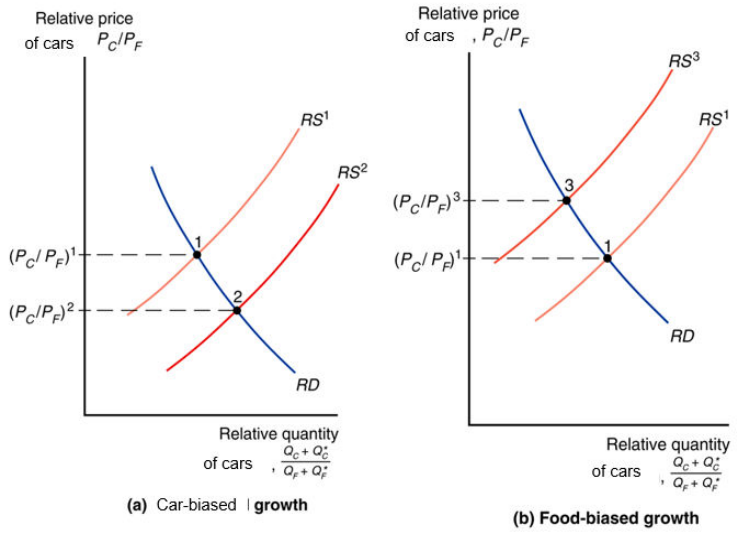
As you can see from the graphs above **in autarky, economic growth is always positive** as it improves welfare by expanding production, thus consumption possibilities.

- Besides, a country's welfare is not affected by growth in other countries when in autarky

When there is trade, growth improves welfare by expanding production possibilities!... but we also have that:

- Growth may have **additional effect** on welfare in the country itself
- And growth in one country affects welfare of other countries

Biased economic growth changes terms of trade, thus affecting a country's welfare.



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**.

In other words, biased economic growth **changes countries' terms of trade** (no matter if it happens at home or abroad!), which **changes welfare**

- **Export-biased growth** (growth that enlarges the PPF of a country's exporting sector **decrease relative price of exports**) **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 **increases relative prices of exports**) **improves** a country's terms of trade and so it has a positive effect on its welfare.

Note, the effects above are **only partial;** to know the **overall effect** of economic growth on a country's welfare depends on **whether growth happens abroad or at home**

If growth happens abroad, effects for home:

- 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

If growth happens at home, effects for home:

- If export-biased at home, it reduces the positive welfare effect of growth itself
- If import-biased at home, it raises the positive welfare effect of growth itself
- If unbiased, only positive effect 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 countries, 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 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

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

An export subsidy rate of *S*% on a good also raises the domestic price compared to P^{World}.

- When they export, they get $P^{World}\left(1 + \frac{S}{100}\right)$, when they sell domestically they get P^D,
- so, for producer to also sell domestically we need $P^D = P^{World}\left(1 + \frac{S}{100}\right)$, as you can see it's higher than the world price

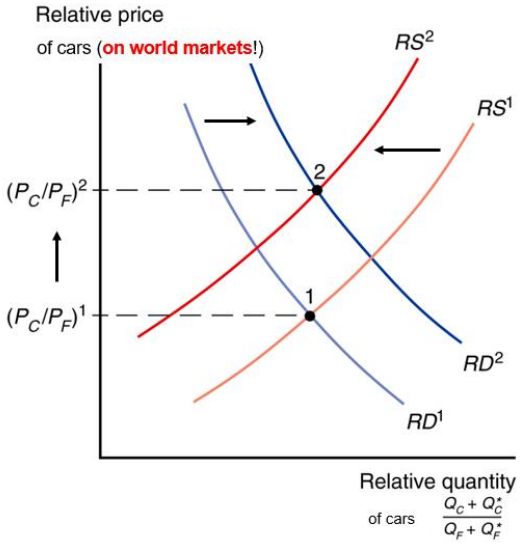
Effects of import tariffs

Unless the tariff / subsidy rate is the same in all sectors, their imposition changes relative prices in the country imposing the tariff or subsidy. The change in relative prices influences the relative demand and relative supply in that country, and if

the country is large enough in the world economy, it can also influence world relative prices.

Suppose tariffs are imposed on imported food in Home.

- As the relative price of food is now higher for domestic consumers, consumers willing to switch to cars: the relative demand for food falls; whereas domestic producers willing to switch to food production: the relative supply of it increases.
- These changes will be **reflected in world relative supply and demand, impacting world relative prices.**



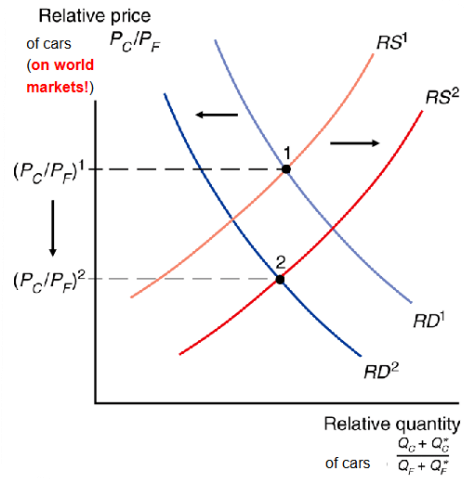
The tariff on food imports in Home drops the world relative price of food and thus raises the world relative price of cars.

- 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.

Effects of export subsidies

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**.



The subsidy on car exports in Home:

- **Lowers the world relative price of cars** (in the domestic market the relative price of cars is higher: world price + subsidy)
- Since Home is a food importer and a cars exporter, this **lowers Home's terms** of trade, while at the same time **improving Foreign's terms of trade**

As a result, this terms of trade effect decreases Home's welfare and increases Foreign's welfare

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

Caveats to the standard trade model

1. If country is really small these effects will be really small

2. Import tariffs and export subsidies do not only affect welfare by changing the terms of trade

- 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 unambiguously lowers domestic welfare!
    - An import tariff raises domestic welfare only if the terms of trade effect dominates the direct distortion effect

3. Our finding that imposing export subsidies or import tariffs has the opposite welfare effect in the foreign country depends on:

- the assumption that the world consists of two countries, a country always imports the good that the other country exports, and vice versa

In the real world, there are more countries

- This can change our conclusions, because e.g. a country can also export what another country is exporting

To conclude, remember:

- The effect of export subsidies and import tariffs **on relative world prices** are **the same, no matter which country imposes** them:
    - Export subsidies on a good decrease the relative world price of that good
    - Import tariffs on a good decrease the relative world price of that good

A foreign country may subsidize the export of a good that my country also exports:

- this reduces the price for my exports in world markets and decreases my terms of trade
- Example: the EU subsidizes agricultural exports, reducing the world price that US farmers receive for their agriculture exports

Or a foreign country may put a tariff on an imported good that my country also imports:

- this reduces the price for my imports in world markets and increases my terms of trade.

Export subsidies by foreign countries on goods that

- a country **imports reduce** the price of its imports and increase its terms of trade + welfare
- a country **also exports reduce** the price of its exports and decrease its terms of trade + welfare

Import tariffs by foreign countries on goods that

- a country **exports reduce** the price of its exports and decrease its terms of trade + welfare
- a country **also imports reduce** the price of its imports and increase its terms of trade + welfare

International Trade – IBEB – Lecture 8, week 3 (International Trade 8)
External economies of scale

Introduction

Up until now the main reason for trade is due to differences in comparative advantage

- However, remember trade is generally among the developed nations, which typically have very similar technologies and endowments, meaning there are no differences in comparative advantage
- So now the main reason they trade is due to increasing returns to scale
    - This incentivizes countries to specialise in certain products, thus exporting them and importing those products that they do not specialise in

Up until now we have considered for all models' **constant returns to scale**

- Meaning doubling **all inputs**, doubles total outputs

In **Ricardian model**: labour only factor of production.

- When increasing the amount of labour by x%, output goes up by x%, no matter how many workers already employed

In **Heckscher-Ohlin model**: two factors of production (labour and capital).

- When increasing **both** the number of workers and machines by x%, output goes up by x%, no matter how many workers or machines already employed

Note: Constant returns to scale and diminishing returns to each factor involved in production **do not contradict each other**, as you will see below

Economies of scale

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 14 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 endowments and technologies, then there will be **no trade** since the relative prices would be the same in both countries.

- However, in reality we see that there is a lot of trade between similar countries

Thus, to explain trade between these countries, we have to consider **increasing returns to scale** (economies of scale)

- When **all** inputs to an industry increase by a certain magnitude x%, output increases by ***more than*** x%.
- A larger scale is more efficient; the **cost per unit** of output falls as a firm or industry increases output

Suppose an industry produces microchips, using only labour:

Output	Total labour input	Average labour input
5	10	2
10	15	1.5
15	20	1.3333
20	25	1.25
25	30	1.2
30	35	1.16667

From this table, it can be observed that doubling the input (from 10 to 20) more than doubles the output (5 to 15), so the output is augmented by more than the increase in input.

- Besides, the average amount of labour used to produce each microchip is less when the industry produces more
- Meaning it exhibits **Increasing return 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, as they need to make everything themselves

Economies of scale and market structure

When production is characterized by economies of scale this typically has important implications for the market structure

- Economies of scale could either mean that **larger firms or a larger industry** would be more efficient

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

- Industries where economies of scale are purely external consist of **a lot of small firms** and are **perfectly competitive**.

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

- **large** firms have a cost advantage over small firms, **causing the industry to become imperfectly competitive** (monopoly, or oligopoly)

As you can see different types of economies of scale implies different types of market structure, which is why it's easier to analyse them separately

External economies of scale

There are many examples of industrial clustering such as high-tech in Silicon Valley or investment banking in London.

- External economies of scale are an important explanation to these cases
- Concentrating the production of an industry within one or a few areas can reduce the industry's costs

- Reasons such as specialized equipment or services, labour pooling, and knowledge spillovers.

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.

For example, Silicon Valley has a large concentration of silicon chip companies, which are serviced by companies that make special machines for manufacturing silicon chips.

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.

In London, a firm has easy access to a large pool of highly skilled workers, so it can respond in a much more flexible way to market conditions. Moreover, in search of well-paid jobs financial specialist move to London and not to Sheffield, for example.

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.

Because of the large financial sector, much easier for financial specialists in London to meet, interact, and talk about new ideas/developments in their field.

Supply and demand

Without specifying what is the main driver underlying external economies of scale, the presence of external economies of scale always means that

- The **larger the industry, the lower its average production costs**

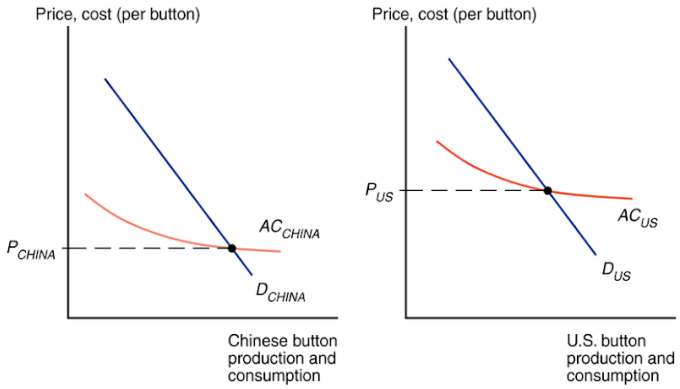
- As we have explained above, the source of economies of scale is external, so we will have **many small firms competing with each other**
- Thus, **prices reflect production costs**

The **larger the industry**, the **lower the prices** firms charge consumers for their products

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.

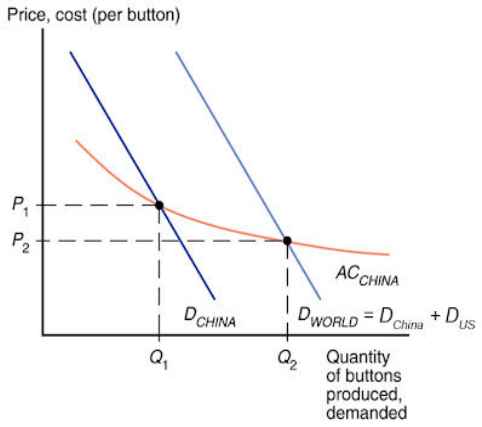
As you can see in the graph below, without trade prices in each country is determined by supply and demand in each of the 2 countries



External economies of scale and trade

When the countries open up for trade, China will expand its button 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, all button production will move to China



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.

Still, the trade patterns are determined by the efficiency in autarky; thus, the **initial price differences**.

- Countries can have initial efficiency because of differences in technologies or resource endowments, like that of previous models.
- But also, 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.

Examples:

- Would Frankfurt be one of the largest European airports without the US military designating it their main airport after WWII?
- Would Silicon Valley be Silicon Valley if Hewlett and Packard had started their business in Boston instead?
- Would Eindhoven be the Dutch high tech-hub without Anton en Gerard Philips starting to produce light-bulbs there in 1891?

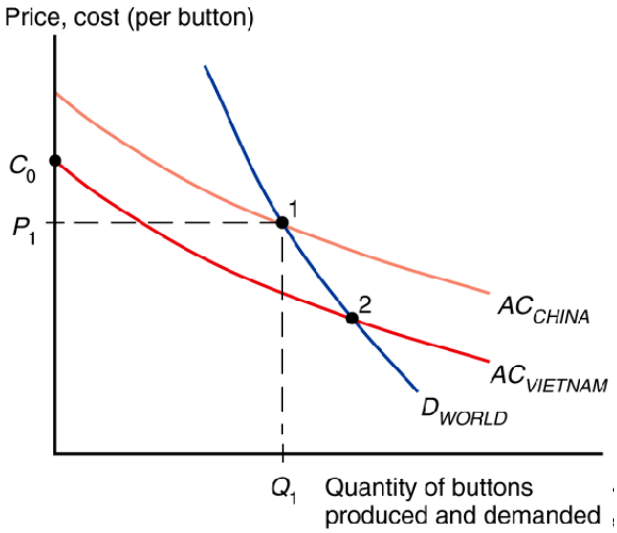
Important implications of External economies of scale

However, just because the country has an initial advantage bearer does not mean that it will always be the most efficient

- Sometimes the **'wrong' location will be locked in**,
    - Today, Brasilia is one of Brazil's largest cities, and an important commercial hub. But would it also be this without the Brazilian government moving there in 1960. What if resources used to build this city, were used elsewhere?
- Once production is **"locked-in" it may prevent more efficient producers from emerging**
    - Amsterdam might in principle be a more efficient supplier of financial services, but because of London's scale advantages the financial sector does not move there

Assume that the Vietnamese are in principle able to always produce buttons more cheaply than the Chinese

- Following our previous analogy, Vietnam should supply the buttons to the world
- However, if China starts producing first, then they are already benefitting from economies of scale (point 1)
- If Vietnam comes in later, the cost however is higher than the current cost in China (C_0 vs. P_1). China has enough of a headstart.



Gains from trade

Generally, countries gain from trade based on external economies of scale.

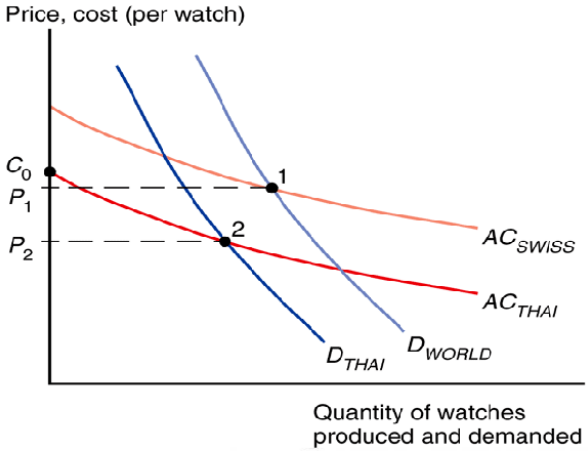
- Most of the time, only one country specialises in the production of a good such that the prices are lowest.
- However, there is also a possibility that individual countries are better off in autarky since they are naturally more efficient in a good production.

Imagine that Thailand could make watches more cheaply,

- but Switzerland got there first.
- Since $C_0 > P_1$, no Thai firm has an incentive to start producing in Thailand
- Thailand imports watches from Switzerland

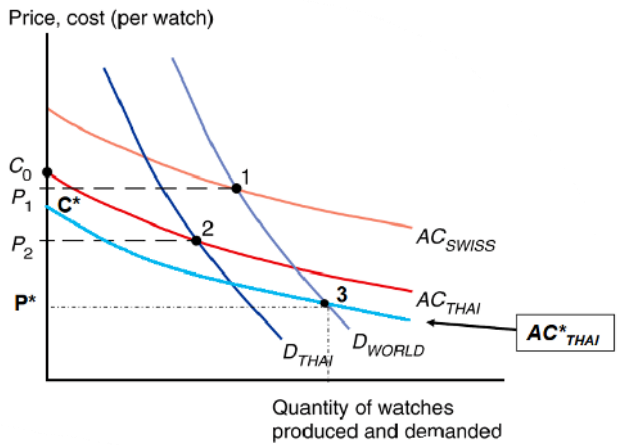
Suppose Thailand decides to impose very high trade barriers, that makes them go back to autarky,

- In principles this, lower the price of watches $P_1 > P_2$
- Incentive to protects it's own industry



Suppose now Thailand is even better (technological innovation or better educated workforce), and even the first watches cost less than the Swiss with economies of scale,

- There will be a rapid change in the in the location of production
- Watch production moves completely to Thailand
- The more firms move to Thailand, the larger the 'gap' between prices in Thailand and Switzerland, attracting even more firms



Empirical examples:

- Laptop producers moved quickly from Taiwan to China (now they are moving from Shanghai (Suzhou) to inland China)
- Textile producers are starting to move from Asia to Africa

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.

It may be justified to protect your industries from foreign industries:

- to gain enough experience, and sometimes form a large enough cluster, to compete in the world market (**infant industry argument**).
- 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 within countries 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** (haircuts, doctors, teachers, restaurants).
- 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.

In the Netherlands:

- creative industries, ICT, and business services cluster around Amsterdam
- high-tech, life-sciences and medical technology cluster around Eindhoven / Leiden
- transport services and industry cluster around port of Rotterdam

But what determines which region produces what (and thus interregional trade patterns)?

- Geography and policy (Port of Rotterdam / Brasilia)
- Historical coincidence is often crucial
  Utrecht would probably not be the 4th largest Dutch city, and the Dutch transport hub, if train track from Amsterdam to Arnhem (and on to Germany) had passed by Amersfoort as initially planned.

International Trade – IBEB – Lecture 9, week 3 (International trade 9) Instruments of the Trade Policy

Overview Trade policy

We have already looked at how trade policies, such as import tariffs and export subsidies can affect the terms of trade and thus affect the welfare of a country, in this lecture we will look into these policies in greater detail:

1. **Total welfare effect of a trade policy** is composed of:
    - Terms of trade effect
    - Welfare effect of the policy distorting production and consumption choices
    - Welfare effect of a change in government revenue
2. Different **types of trade policy**:
    - Import tariffs
    - Export subsidies
    - Import quotas
    - Voluntary export restraints
    - Local content requirements
3. Trade policy affects producers and consumers **differently**

We will analyse these in a **partial equilibrium** framework; in other words, we focus on the effects of different trade policies in **a single industry without** considering the full effect in the rest of a country's economy

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

Suppose in the market of cars in autarky the prices of cars is higher at Home than it is in Foreign, so

- With trade, cars will be shipped from Foreign to Home until price difference is 0
- **Home imports cars from Foreign**

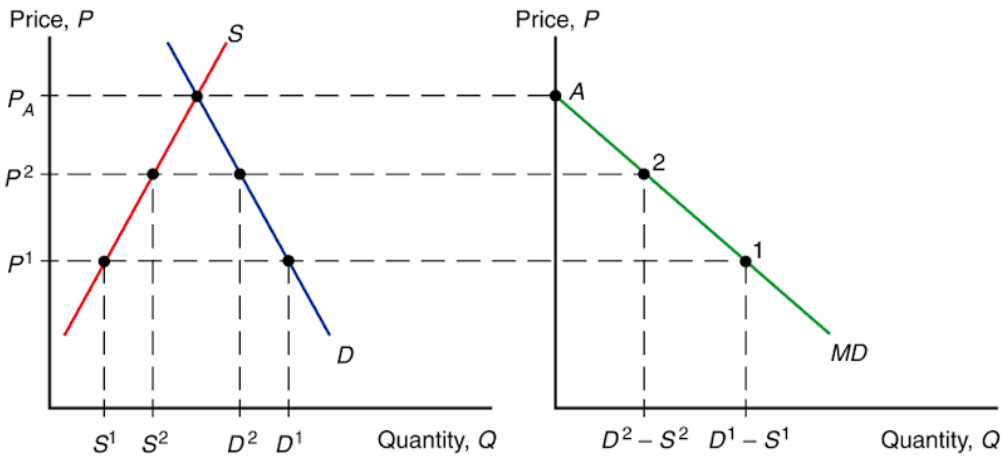
We now analyse the effects, when home starts imposing **import tariffs on cars**

To analyse the effects of trade, we start defining import demand and export supply.

- An **import demand curve (MD)**, shows at each price, the difference between the quantity that Home consumers demand minus the quantity that Home producers supply, meaning **amount of Home imports**
- An **export supply curve (XS)** , shows at each price, the difference between the quantity that Foreign producers supply minus the quantity that Foreign consumers demand, meaning **amount of Foreign Exports**

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, in the import demand curve this is **point A**

- If price falls, import demand increases, hence the **downward slope** of the curve.
- Remember a point in **MD curve = (Demand – Supply) at home**, for a given price



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.
- Remember a point in **XS curve = (Supply* - Demand*) in Foreign**, for a given price



In equilibrium prices adjust, such that Home's import demand equals Foreign's export supply,

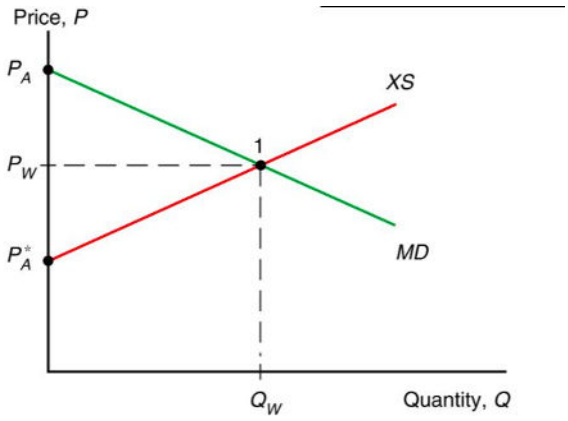
Home import demand = Foreign export supply

Home demand – Home supply = Foreign supply – Foreign demand

Home demand + Foreign demand = Foreign supply + Home supply

World demand = World supply

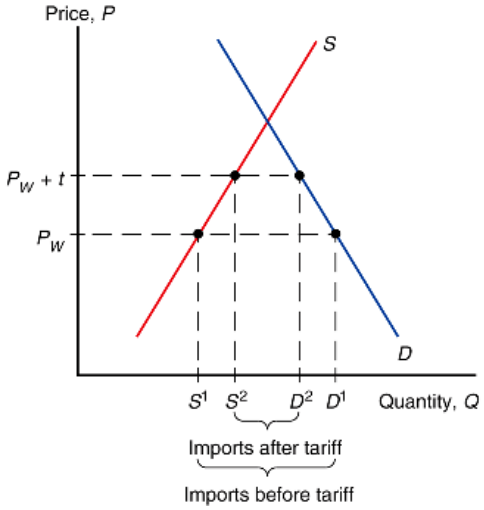
Note: curves will always cross as we have assumed $P_A^* < P_A$



Introducing Import tariffs

For a **small country**, an import tariff does not impact the world prices since it's 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:
    - PT = Pw + t (where Pw is the price before tariff).
    - Since Home producer face less competition and can increase price
- 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.

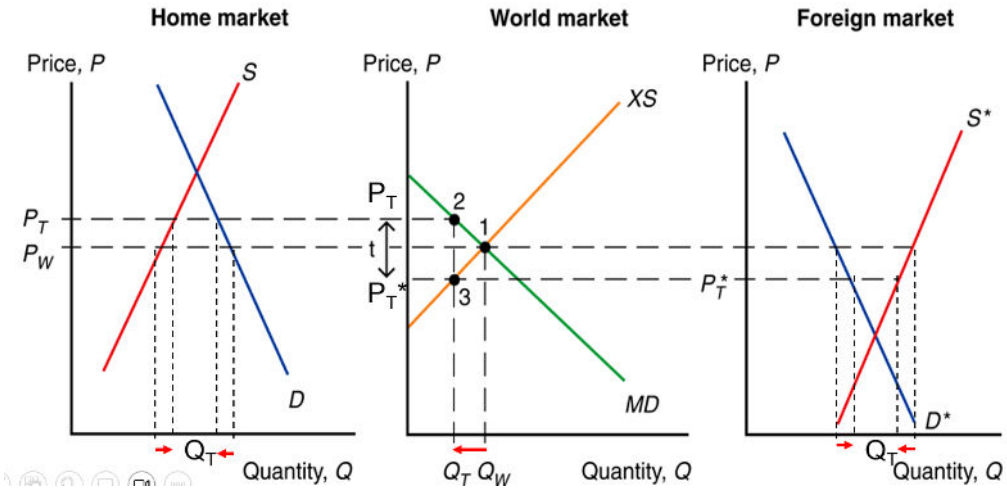
- Consumers demand less but producers supply more, causing the prices to go down in Foreign, as Home is large.
    - While prices fall in Foreign due to decreased demand
    - At Home producers faces less competition increase prices
- The trading equilibrium will therefore attest to two conditions:
    - (1) home consumers have to be indifferent between buying cars from Foreign or at home, and
    - (2) foreign sellers should be indifferent between selling cars at home or abroad. This will cause the prices to settle such that:

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

Note: the wedge between prices in the 2 countries is the tariff rate

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.

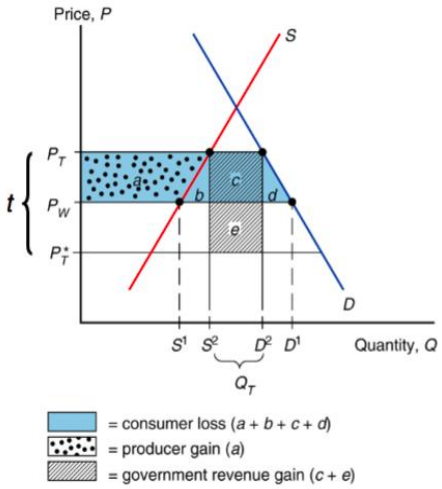
The **producer surplus** is the difference between the price received by the producers and the minimal price at which they would be willing to sell.

- An increase in price raises the quantity supplied, so the producer surplus is augmented.

An import tariff raises the price of imports in the country

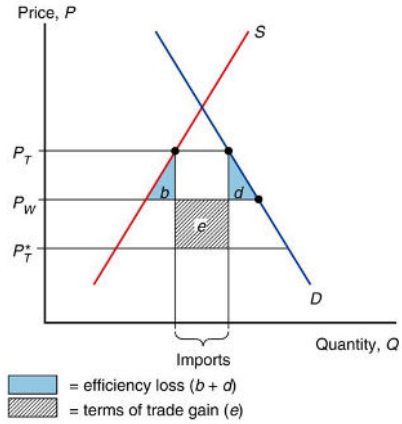
- Consumer surplus decreases (consumers worse off)
- Producer surplus increases (producers better off)
- The government collects tariff revenue equal to the tariff rate times the quantity of imports after tariff = $t \cdot Q_T$

Note: the following is a large country as tariff = different in countries' prices



The **overall effect of welfare** is thus:

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



If the **terms of trade gain** (e) > the **efficiency loss** by the distorting production and consumption choices (b + d)

- **A small country will always have a negative** welfare impact with the entire tariff cost received by domestic consumers. (The government gains at the expense of consumers (c) and foreigners (e))
- **A large country, possible positive** welfare effect if large enough gain in terms of trade

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**

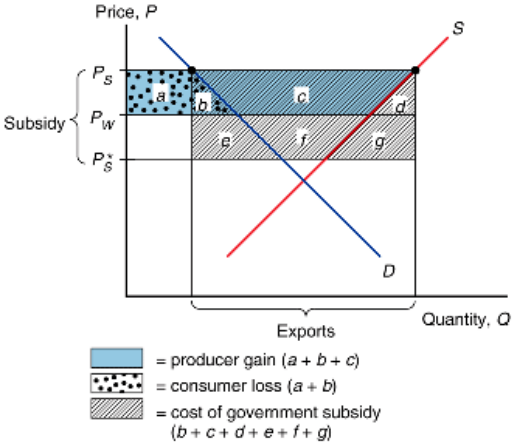
At home, the equilibrium is such that firms are indifferent between exporting and supplying domestically.

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

An export subsidy

- Decreases consumer surplus, consumers worse off
- Increases producer surplus, producers better off
- However, Government need to pay subsidies, $s \cdot Q_s$ decreasing revenue

If the country is **large enough**, change in domestic demand and supply, affects world markets, lowering world price of country's exports, **thus worse terms of trade**



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***.

- Example such as EU's subsidies for agriculture, costs yearly almost €30 billion for taxpayers more than it's benefits (in 2007).

Import quota

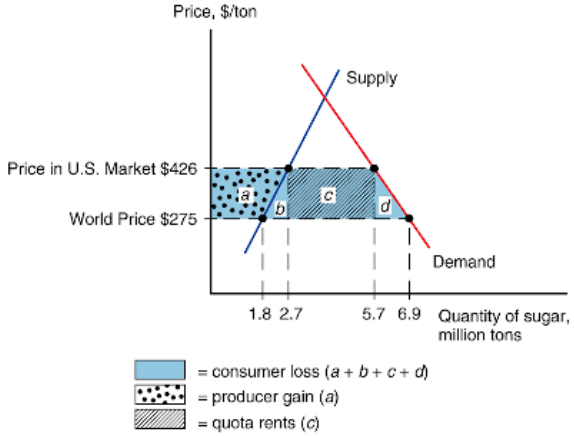
An **import quota** is a restriction on the quantity of imported goods.

- A **binding quota** will push up the prices of the imports as the import demand outweighs the imports supply (import quota).

The effects are as follows:

- Producers would benefit,
- Consumers would lose

- 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.
    - If government sells the licenses, it does get revenue



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

- Where quota rents are all gained by foreign producers

Other trade policies

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: firms have to use 50% domestic parts
    - Imported parts = $60; domestically produced parts = $100
    - Cost after LCR = 0.5*60 + 0.5*100 = $80 (= $20 more than before LCR)

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

Voluntary export restraints & others

Voluntary export restraints (VER) works like an import quota, except that the quota is imposed by the exporting country rather than the importing country

- The profit or rents from this 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**.
- This effect is limited if the importing country can easily switch to other suppliers in other countries
- This effect is limited if the importing country can easily switch to other suppliers in other countries
    - domestic demand for their products is much smaller than world demand, lower domestic price => (many) firms cannot survive

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

Effective rate of protection: Change in value (measured by goods prices) that firms in an industry add to the production process, due to change in trade policy

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**

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

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

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

⇨ 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.

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

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

International Trade – IBEB – Lecture 10, week 4 (International trade 10) Trade policy in practice

Introduction

In the previous lectures we have discussed and proved many times that there are **gains for countries engaging in free trade**, so the question now is:

- Why do we still observe countries actively implementing trade policy?
- Why do we still see so many protests against free trade/globalisation?

We will look at multiple reasons that helps us answer these 2 questions:

- **Politics**
  - Groups that lose from trade actively lobby for trade policy to protect their interests
  - Uncertainty about other countries trade policy and possibility of retaliation
- There may be **gains or losses from trade that has not been taken into account** by our (simple) models
  - Infant industry argument
  - Environment
  - Labour standards

Politics of trade policy

In democratic countries, politicians have an incentive to set 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**.

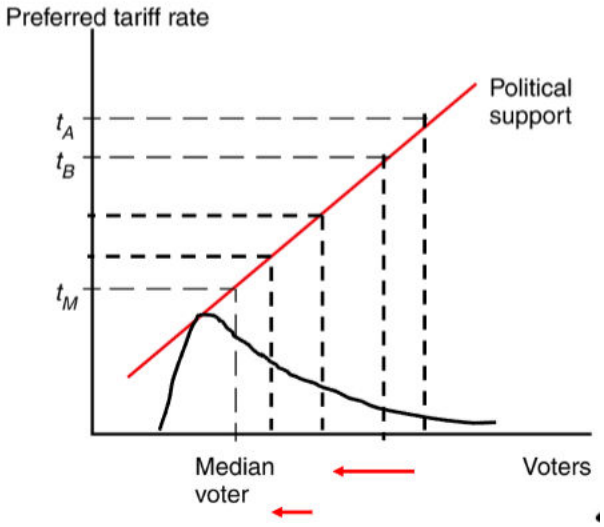
The two concepts are **median voter theorem** and **collective action**.

Median voter theorem

The **median voter theorem** predicts, democratic political parties pick their policies to court the voter in the middle of the ideological spectrum (i.e., the median voter)

Suppose:

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



If a party 1 proposes tariff tA and party 2 proposes tariff tB

- All the voters that prefer tA or higher will vote for party 1
- All the voters that prefer tB or lower will vote for party 2
- And the voters that prefer between tA and tB, they will choose the party that proposes the tariff that is closer to their preferred tariff
- As you can see there will be more votes for party 2 with tB, this means party 1 can then propose a new lower tariff,
- this process goes on until the proposes tariff is tM, which is the preferred tariff by the median voter

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

- **Note**: we have seem in the previous lecture that a tariff will lead to great loss for the consumers but a relatively small gain for producers
- A policy that inflicts losses on many people (consumers) while benefiting a small number of people (import-competing producers) should not be followed.
- So, 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 tells us that the **Median voter theorem** alone cannot explain why these policies do take place. Thus, to explain this we introduce 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.

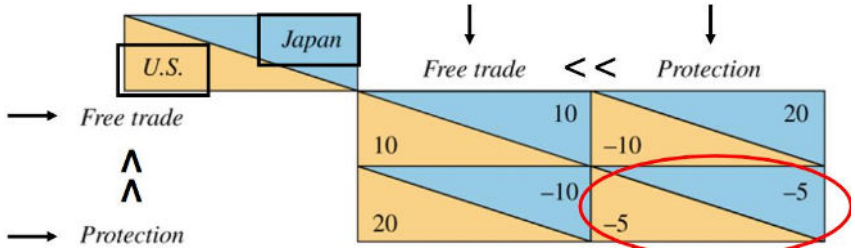
In general, trade restrictions are more prevalent when consumers do not care about trade restrictions too much, and the special groups make large enough contributions to campaigns for a deviation from median voter theorem to happen.

- Sometimes, trade restrictions also result as a response to another country's trade policy.

Multilateral trade policy

All countries could enact trade restrictions, **even if it is in the interest of all countries to have free trade**

- To avoid this, countries need an agreement that prevents a trade war or eliminates the existing protection



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 only limit the gain from external economies of scale by limiting the concentration of industries

- 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, trading nations are less likely to go to 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

Politics may be one explanation for why we still observe (substantial) trade barriers hampering free trade, the other one is:

- The models we discussed may have overlooked other gains/losses from trade
    - Dynamic gains (e.g. infant industry argument)
    - Environment
    - Labour standards

Alleviate domestic market failures

An important argument against free trade comes from observing a domestic market failure

- trade causes these market failures.
- restricting trade can solve these market failures, or alleviate its consequences

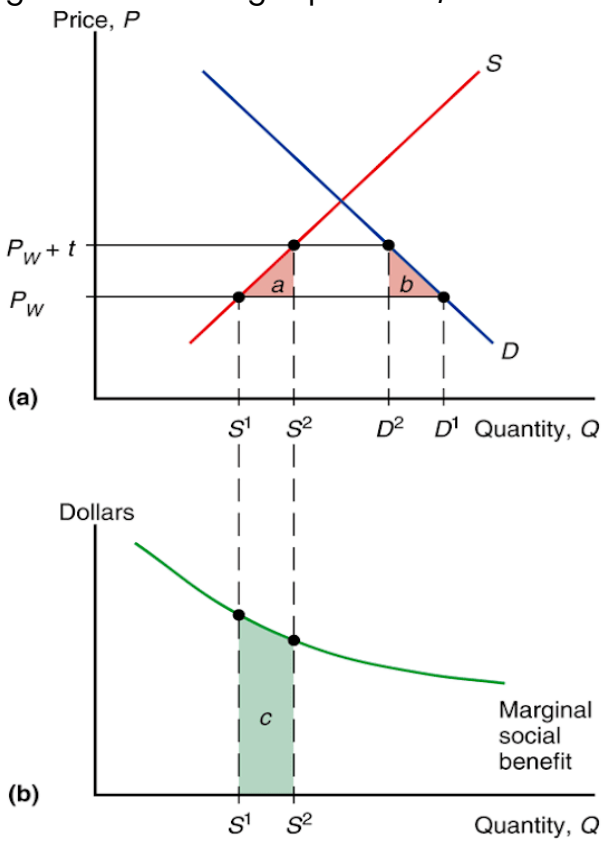
Market failures such as:

- Restrictions on labour mobility, or on wages
    - Persistently high underemployment of workers
- Technological benefits for society discovered through private production, but from which private firms cannot fully profit
    - lack of innovation
- Bad labour standards / worker protection
    - Exploitation of workers
- Environmental costs for society caused by private production, but for which private firms do not fully pay
    - too much pollution

Of course it's always best to directly tackle the market failure, but sometimes these measured might be hard to implement, so trade policy could be second best alternative

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

- When a tariff increases domestic production, the benefit to domestic society can increase by increasing the positive side-effects of domestic production (e.g. more knowledge spillovers / innovation)



However, it is uncertain when and to what degree a market failure occurs, and to what extent (no) trade is solving it

- 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 (e.g. discourage investment in other industries)

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.

Anti-globalization

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

Exploitation

Workers in developing countries are typically paid much less than those in rich countries

- Yes, working conditions in developing countries are typically much worse than those in rich countries
- But question should be: would they be better off without trade?

Empirical evidence suggests that workers are typically better off

- Terrible labour standards (= market failure) are set by the country itself, whether there is trade or not
- A solution to working conditions is a system that monitors wages and working conditions and makes this information available to consumers

Free trade hurts the environment

Pollution haven effect is a problem; the idea is that companies move their factories to countries where **environmental rules are weaker**

- Such as EU firms send ships to be dismantled on Indian beaches

It's **difficult** to regulate this

- Lack of environmental regulation is determined by country's own politicians; unclear how restricting trade is going to change their minds and stop damaging the environment
- Fines difficult, local foreign companies are the polluters

- Boycots may also do a lot of harm to workers (no job worse than bad job, or other job even worse)

Abolish cultures

This argument follows that with trade, big firms can affect or even destroy the culture of other countries

- Such as Starbucks or McDonalds being all over the worlds
- However, this argument forgets that people, also in developing countries, define their culture through the **choices that they make**, not through standards set by others

International Trade – IBEB – Lecture 11, week 4 (International Trade 11)
Firms in the global economy

Up until now in both Ricardo and Heckscher-Ohlin model, we have assumed that countries exchange **completely different** product categories

- However, countries also exchange different **varieties of identical goods**
- E.g. Germany exports Mercedes to France and import Renault from France
- In the following 2 lectures we look at models that shows **identical countries** (in terms of production function and factor endowments) exchanging different varieties of the same good

Stylized facts

Intra-industry trade is when a country both imports and exports similar products within the same industry

- This is formally reflected by the "Grubel-Lloyd Index"

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

- Where i denotes the industry, X exports and M imports by industry i
- If $GL_i = 1$, then imports = exports, meaning there is a large degree of intra-industry trade
- If $GL_i = 0$, then $X > 0$ and $M = 0$, or $X = 0$ and $M > 0$, meaning trade can be analysed by Ricardian or Heckscher-Ohlin model

The largest part of Western European trade is within Western Europe

Trade in identical goods (or different varieties of aggregate goods), and trade between similar countries cannot be explained by Heckscher-Ohlin or Ricardo model, so we need a new model

- **Note:** H-O and Ricardian are not useless, but they can only explain trade of different goods between different countries

Theory of imperfect competition

Pure monopoly

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, large firms more efficient than small firms, making the industry to consist of a monopoly or oligopoly

Imperfect 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.

- Therefore, these firms with differentiated products can 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.

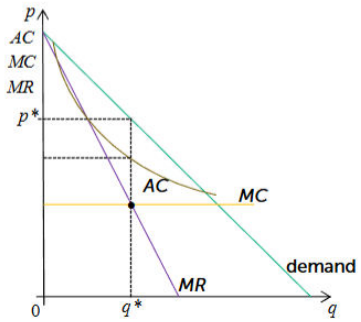
The **profit maximising** price and quantity of **a monopolist** is as follows

- 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 (MR = MC).

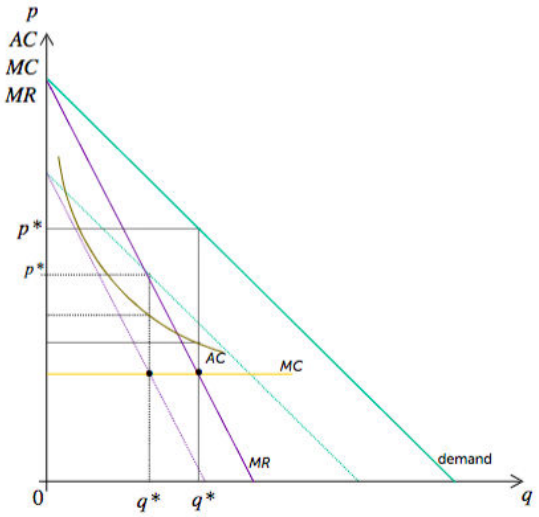
- Since average cost AC = F/q + c declines when the quantity produced increases, AC approaches marginal cost when quantity produced approaches infinity. A monopolist's profit is thus:

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



With the assumption that there exists **no Foreign monopolist**, **trade liberalisation** augments the world market size which in turn increases world demand.

- Essentially, the monopolist opens itself to foreign demand.
- Because we assume that **trade is costless**, the MC and AC do not change at all.
- Then, the marginal revenue curve moves outwards (due to trade), meaning the monopolist can achieve higher profits, so they are incentivised to export goods.



Monopolistic competition

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 increase 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.

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

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

- 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
- $\underline{p}$ = the average price in the industry

We also assume that all firms are **symmetric**, meaning they face the same demand function and have the same cost structure.

- Therefore, the prices and quantity demanded is such that $p = \underline{p}$ 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:

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

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

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

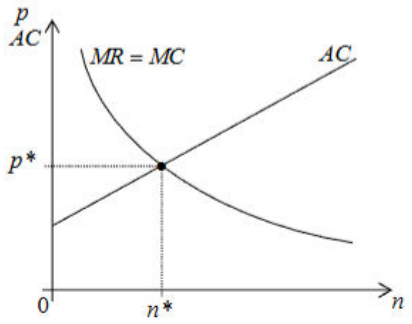
$$\text{Marginal Revenue} \rightarrow MR = \frac{1}{bn} + \underline{p} - \frac{2q}{bS} = p - \frac{q}{bS}$$

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:

$$p = c + \frac{1}{bn} = \frac{nF}{S} + c = AC \rightarrow n^* = \sqrt{\frac{S}{bF}}$$



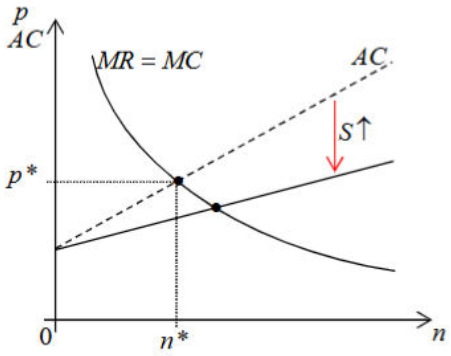
If otherwise:

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

Opening up to trade

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.
- **Note**: we assume foreign firm is also monopolistic



Accordingly, it can be seen that trade liberalisation impacts price and industry size in the same way as economic growth does

- increasing the number of firms and lowering prices.
- However, the shares of firms locating in domestic and foreign countries can only be determined by knowing their factor endowments.

Numerical example – Car example

- b = 1/30,000
- F = 750.000,000
- c = 5,000
- $S_{home} = 900{,}000 \qquad S_{foreign} = 1{,}600{,}000$

Autarkic equilibrium:

- Home:

$$n^*_{home} = \sqrt{\frac{900{,}000}{\frac{1}{30{,}000} \cdot 750{,}000{,}000}} = 6 \quad \rightarrow \quad p^*_{home} = 5{,}000 + \frac{1}{\frac{1}{30{,}000} \cdot 6} = 10{,}000$$

- Foreign:

$$n^*_{foreign} = \sqrt{\frac{1{,}600{,}000}{\frac{1}{30{,}000} \cdot 750{,}000{,}000}} = 8 \quad \rightarrow \quad p^*_{foreign} = 5{,}000 + \frac{1}{\frac{1}{30{,}000} \cdot 8} = 8{,}750$$

Open economy equilibrium:

$$n^*_{open} = \sqrt{\frac{900{,}000 + 1{,}600{,}000}{\frac{1}{30{,}000} \cdot 750{,}000{,}000}} = 10 \quad \rightarrow \quad p^*_{open} = 5{,}000 + \frac{1}{\frac{1}{30{,}000} \cdot 10} = 8{,}000$$

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.

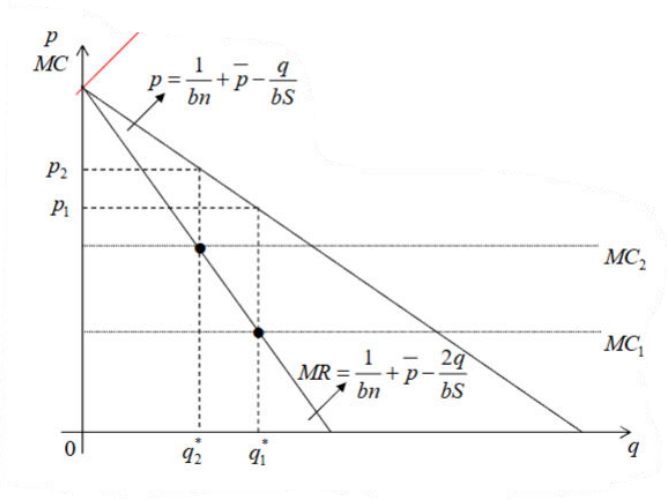
- Furthermore, the intra-industry represents majorly the manufactured goods which are dominant in world trade, especially for developed countries.

International Trade – IBEB – Lecture 12, week 4 (International trade 12) Firms in the global economy - continued

Effects of trade liberalisation on industry overall

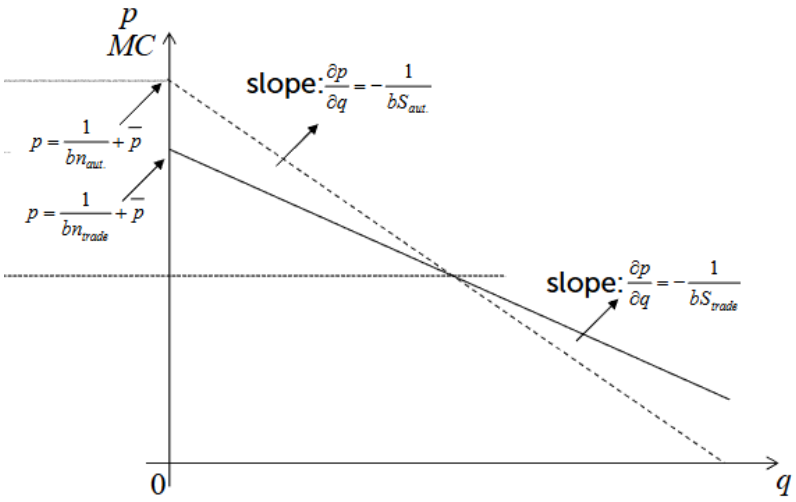
Firms with MC larger than intercept $(p = \frac{1}{bn} + \bar{p})$, will make a loss

- In the graph below we have 2 firms, we can see that
- Firm 1 has lower AC and higher sales than firm 2
- In general, is holds that, lower marginal costs lead to higher profits



Suppose we have trade liberalisation, this rotates the demand curve making it flatter, in such a way that helps filter out the inefficient firms

- Firms with MC between, $p = \frac{1}{bn_{aut}} + \bar{p}$ and $p = \frac{1}{bn_{trade}} + \bar{p}$, will "die" due to free trade
- Firms with MC between $p = \frac{1}{bn_{trade}} + \bar{p}$ and intersection point will make a loss due to lower intercept
- Firms with MC below intersection will gain as the demand curve now is higher



In other words, trade liberalisation makes **least efficient** firms "die", **inefficient** ones lose and **most efficient** firms gain

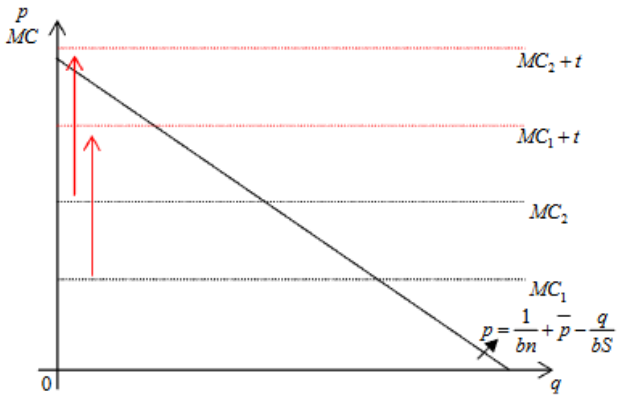
Empirical evidence

In the real world we see that most US firms do not export at all, in 2007 only 4% of US manufacturing firms' export

- However, we also know that the amounts of export are quite large
- This is because these **few** exporting firms are usually **very large**, meaning low share of firms exporting very large share of export amounts

This is because the fixed cost and time that are incurred when exporting are very high

- And that is why only **the few most efficient and often the largest firms** are the ones that export
- The graph shows how for firm 1 due to the marginal cost of transport (t), makes it so that they are better off not exporting
- While for firm they can still make a profit even with transport costs



We can also see this in real life for 2 firms in the same industry:

- Unilever and a local bakery, both produce consumer goods (food)

- However Unilever is much larger and exports, while your local bakery is small and only serves the local market

Dumping

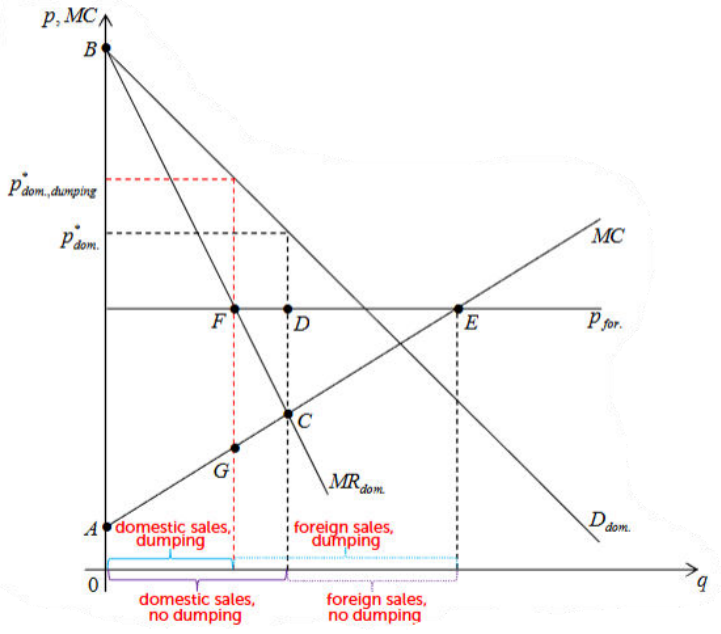
Dumping refers to charging a **lower** price for **exported** goods than for goods sold domestically

- An example of **price discrimination**, where different customers are charged different prices
- This can **only** occur if:
  - **imperfect competition** exists, firms can influence market prices
  - markets are **segmented**, goods are not easily bought in one market and resold in another

Dumping for a firm can be a profit-maximising strategy

- Instead of maximizing profits on the domestic and the foreign market **separately**, a firm can **jointly** maximize profits over the two markets
- For example, if at $\mathbf{MR_{dom.}} = \mathbf{MC}$ we have $\mathbf{MR_{For.}} > \mathbf{MR_{dom.}}$, a firm increases profits if it sells **part** of its output abroad, instead of at home
- dumping is typically regarded as an **"unfair"** trade practice

In the following example we assume firm is **a monopolist at home**, but has **no influence** on foreign price (perfect competition abroad)



Without dumping:

- Firm sets MR = MC separately for both markets
- So domestically at point C and in Foreign at point E
- Profits without dumping ("small" difference between domestic and foreign price)

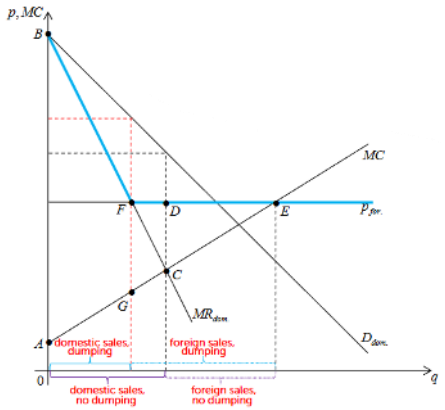
- Meaning area **ABC** + area **DEC**

With dumping:

- Notice that for quantities FD $\mathrm{MR_{for.}}\ (=\mathrm{p_{for.}}) > \mathrm{MR_{dom.}}$
- This means firm shifts quantities equals to distance FD of it's sales to foreign market
- Profits with dumping ("large" difference between domestic and foreign price)
- Meaning are **ABFG** + area **FGE**

So, if firm **jointly** maximises profits over the two markets, its **marginal revenue** curve becomes **kinked** (blue line)

- This can only be achieved if it **limits** domestic sales to the amount **"domestic sales, dumping"**



According to WTO-rules: if foreign firm engages in dumping, domestic firm can ask for anti-dumping tariffs

- These increases price at which foreign firms can supply domestically, domestic firms are not driven out of the market
- anti–dumping tariff should be equal to the difference between actual price and "fair" price of imports
- where "fair" price is typically price in the foreign firm's domestic market

Multinational and outsourcing

Investments in which a domestic firm **controls** or **owns** a subsidiary abroad is known as **Foreign Direct Investment (FDI)**

- The **threshold** is such that, only if domestic firm holds **at least 10%** of the **voting shares** of the foreign firm (investing company can **control** operations of foreign firm), the 2 firms make a multinational firm
- Investments by Home firms in production facilities abroad are considered Home FDI outflows

- While investments by foreign firms in production facilities at Home are considered Home FDI inflows
- We can measure world's largest multinationals based on their value of **foreign assets**
- Some peaks in the worldwide FDI inflows are caused by important mergers such as when Daimler Benz buys Chrysler at the end of 1998

There are 2 modes of FDI

- **Greenfield FDI**: company build a foreign production plant from scratch
- **Brownfield FDI**: domestic company buys at least 10% of voting shares of foreign company

And 2 types of FDI

- **Horizontal FDI**: foreign affiliate replicates the production process of the parent company
    - These dominate FDI flows **between developed** countries, meaning both the parent company and the affiliates are located in developed countries
    - This type of FDI is mainly used to locate production **closer** to large market(s) to **avoid** transport costs or tariffs

- **Vertical FDI**: Foreign affiliate produces intermediate goods for parent company
    - These dominate FDI flows between **developed** and **developing** countries, meaning **parent** company is located in developed country and **affiliate** in developing country
    - This is mainly because of production **cost differences** between countries (Heckscher-Ohlin arguments for FDI)
    - However recently there is a trend of **reshoring** foreign production back to home country, because even though labour in developing countries are **low**, but **institutional environments** are also very poor

When deciding for Horizontal FDI, firms face a proximity-concentration trade-off

- **Proximity**: high export costs create an incentive to locate production near customers
- **Concentration**: Increasing return to scale in production create an incentive to concentrate production in fewer locations
- Thus, FDI activities are concentrated in sectors with **high trade costs** and multinational on average are **larger** and **more productive** than other firm in the same industry (even exporters)
- As an **example,** you can think of Toyota, which has many production affiliate around the world, this is mainly because exporting a car is very costly

When deciding for Vertical FDI, firms face a trade-off between **cost savings** due to lower factor prices abroad and **fixed cost** of setting up production plant abroad

- Another option, why don't they **outsource**, meaning buy intermediate goods from an independent foreign supplier
- There are 2 main reasons, **vertical FDI over outsourcing**
    - Transfer of knowledge is easier within an organisation, as they risk problems with **patents**
    - Producing intermediate goods inhouse avoids **holdup** problems and **hassles** with writing **complete contracts**
        - However, independent supplier might be more efficient if they produce for many downstream firms and benefits from **economies of scale**

International Finance – IBEB – Lecture 13, week 5 (International finance 1) National income accounting and Balance of payments

Overview

In this lecture we will answer the following questions:

- How is the size of an economy measured?
- Where are trade flows (imports & exports) recorded?
- Where are financial flows between countries recorded?
- Why are we interested in the size of an economy?

The national income accounts

- Measures of **national income**
- Measures of **value of production**
- Measures of **value of expenditures**

From this point on we will look at **international macroeconomics**, emphasizing on macro-relationships, neglecting micro-foundation, we will look at how economics policy influences **aggregate** values like:

- GDP
- Savings and trade imbalances
- Exchange rates
- Price levels
- Unemployment

We start with:

- **National income Accounts**: records value of national income, meaning income earned by a country's factors of production
- **Balance of payments:** records a country's international transactions

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, we separate these, so that we can analyse which component is responsible for e.g. a recession

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**.

Gross Domestic Product (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.

GDP = GNP – Payments from foreign countries to domestic factors of production
+ Payments to foreign countries for foreign factors of production

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

Expenditures and production in an open economy

National Income

National income = value of domestic production

- Following this we come up with the following equation
- Where Y = national income
- C = consumption, I = Investment, G = government purchases
- EX = expenditure by foreign on domestic production

$$Y = C^d + I^d + G^d + EX$$

Note: C, I and G are based on the total domestic expenditure, however some output is are imported

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

We have National Income equals expenditure by domestic private and public households and the net expenditures by foreign private and public households on domestic goods and services

Production > Expenditure by domestic households (**Exports > Imports**)

- Current Account > 0 or trade balance > 0
- Country earns more income from exports than it spends on imports
- Increasing net foreign wealth

Production < Expenditures by domestic households (**Exports < Imports**)

- Current Account < 0 or trade balance < 0
- Country earns less income grom exports than it spends on imports
- 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

$S = S^p + S^g$ (national savings = private savings + government savings)

$$=> (Y - C - T) + (T - G)$$
$$=> S = Y - C - G$$

We know that

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

Current account = national savings - investment = net foreign investment

- When imports > exports, national savings are low relative to investments.

Government deficit = G − T, which can be negative or positive, so we have

$$CA = S^p + S^g - I$$
$$CA = S^p - govenment\ deficit - I$$

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: We follow 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: Foreigners loan to domestic citizens by buying domestic assets; domestic assets sold to foreigners are a credit (+) because the domestic economy acquires money

Financial outflow: domestic citizens loan to foreigners by buying foreign assets; foreign assets purchased by domestic citizens are a debit (-) because the domestic economy gives up money

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 Finance – IBEB – Lecture 14, week 5 (International Finance 2) 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)

- Typical 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)

- Typical examples: bonds, loans, deposits of foreign currencies, stocks, real estate, works of art

Note: dividing line between liquid and illiquid assets is arbitrary

Money supply and demand

Money supply

Money supply is controlled by the **central bank**.

- The European System of Central Banks (ECB + NCB of EU states) controls the monetary base and indirectly influences checking deposits, debit card accounts, and other monetary assets through banking regulations.

- Where monetary base (M^s) is currency in circulation and commercial banks' deposits to ECB's deposit facility
- M2 = liquid assets

Money demand

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

Determinants of **individual** money demand
- **interest rates** on non–monetary assets
- risk of unexpected **inflation**, reduces the purchasing power of money (cash)
- **liquidity**: the need for liquidity rises with price and the number of transactions

Determinants of **aggregate** money demand,
- **interest rates** on non-monetary assets
- prices (higher prices = higher money demand)
- 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:

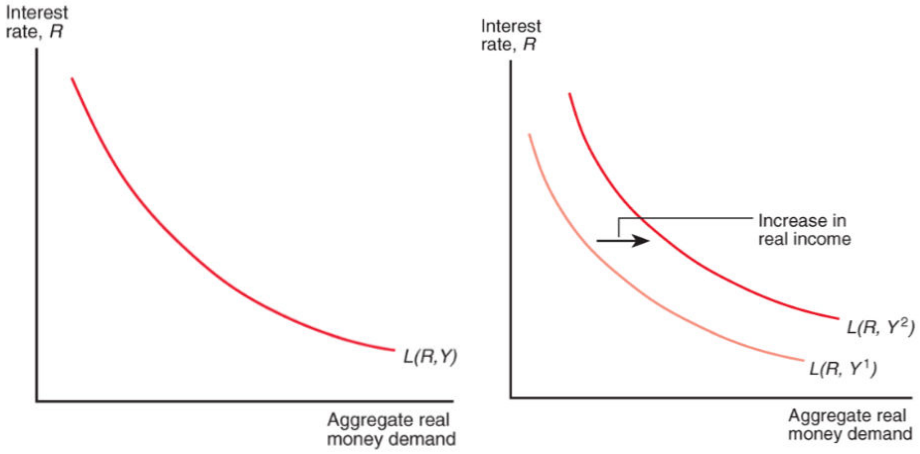
$$M^d = P \cdot L(R, Y)$$

- 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:

$$M^d/P = L(R, Y).$$

- The real money demand tells us how many **units** of the aggregate consumption good can be **bought** with the **nominal money demand** for a given price, as you can see in the alternative equation above
- For a **given level of income**, real money demand decreases as the interest rate increases, left graph, downward sloping
- For a **given interest rate** real money demand increases with increase in Y, right graph, shifts right



Money market equilibrium is acquired when interest rate adjusts such that

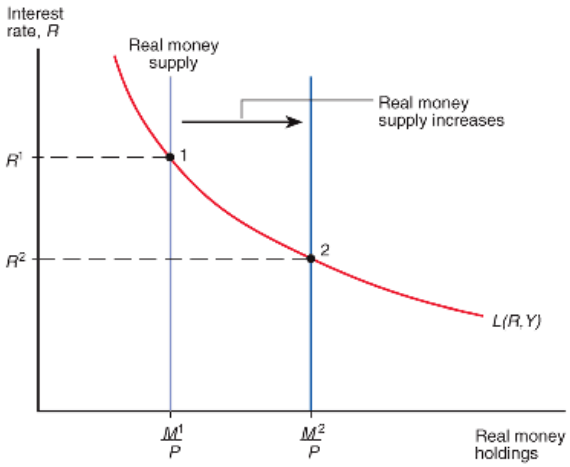
$$M^s = M^d \text{ or } M^s/P = L(R,Y)$$

When $M^s > M^d$ 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.

When $M^s < M^d$ the households (demand money) are willing to pay a higher interest rate

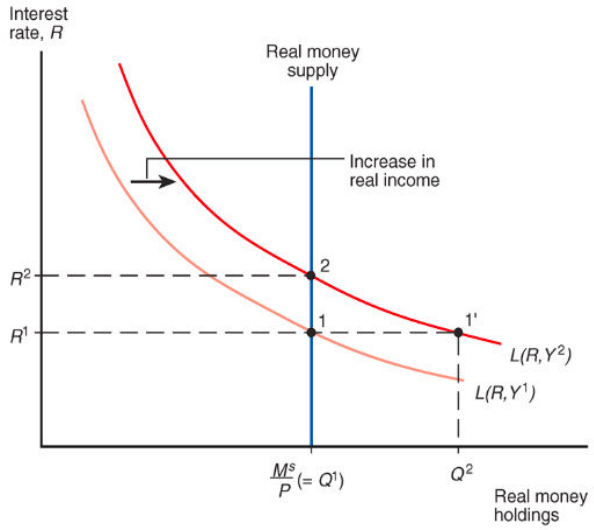
- the interest rate increases less households will demand money (or hold less cash)



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

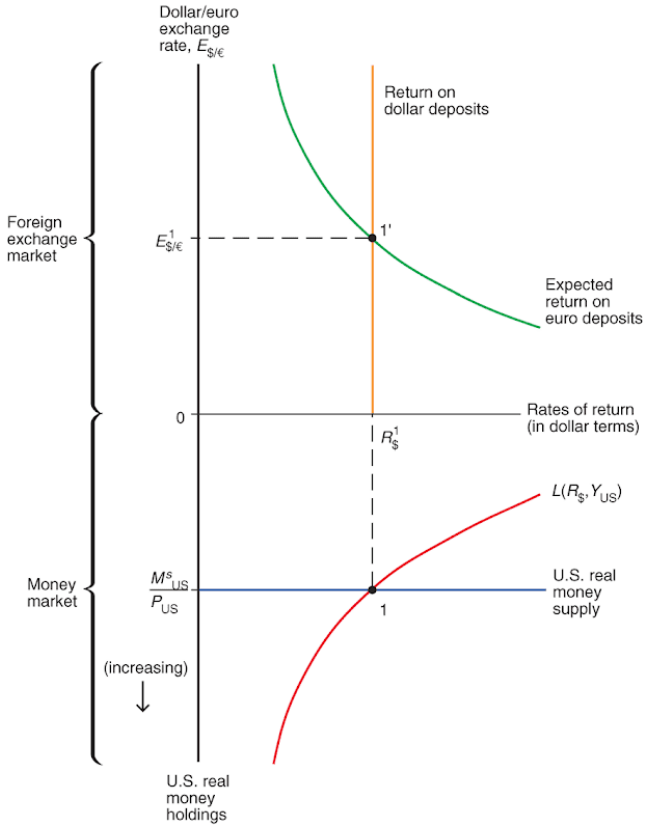
- If the supply decreases, households would be willing to pay higher interest rates.

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



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.

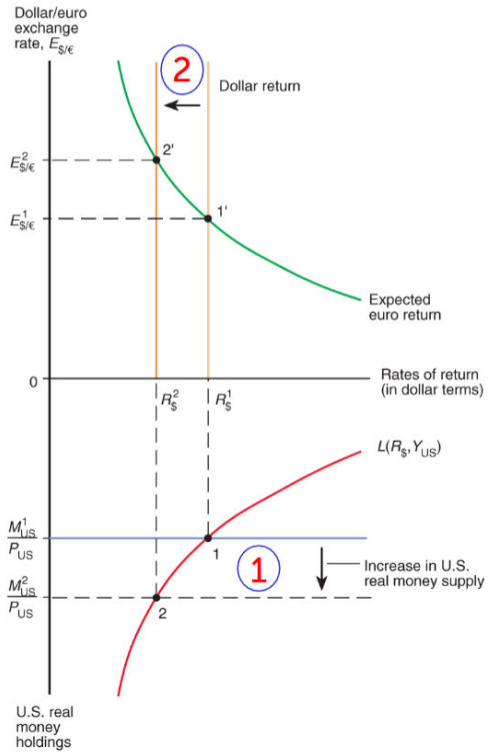
- Whenever the exchange rate increases, investors have to pay more dollars to get 1 euro, thus there is a **depreciation** of the US dollar.

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.

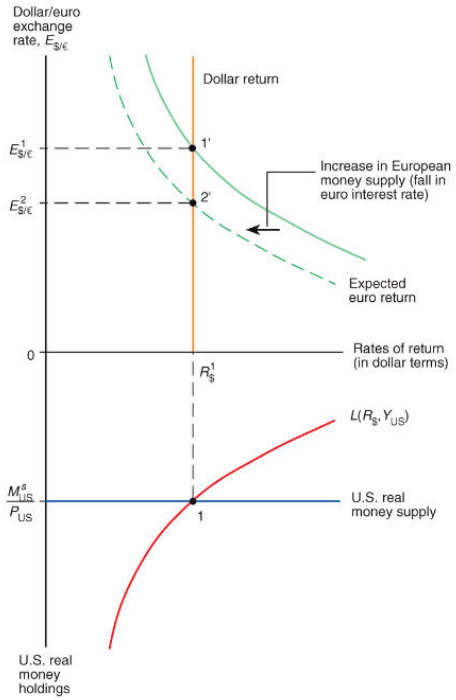
- There, the returns on investments of both types are identical, so the investors do not have an incentive to change $–deposits into €–deposits, i.e. to supply $ and demand €.



When the US Fed increases the money supply, the interest rate on US non-monetary assets in dollars decreases (Dollar return shifts left).

- As there are now **higher interest rates** for assets denominated in **euros**, the demand for it increases.
- Investors thus supply dollars and demand euros

- Exchange rate increases, meaning 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
    - Exchange rate decreases, meaning **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.

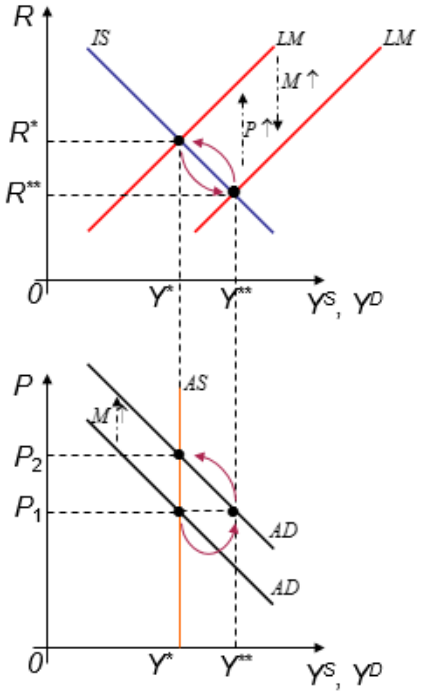
- Then, real output and income level only depend on a country's factor **endowments** and **technologies**, and **independent of money supply**.

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** stays **costant**

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 down.

- **Interest rate** *R* decreases to establish **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 *P2*. This leads to a return to original equilibrium.

- Meaning LM also shift back
- In the **long–run**, *R*, *Y*, M^s/P are 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.

- Since we know from the previous analysis in the long run R and Y do not change,
- We can say that in the **long-run** there is **positive** relationship between money supply and price level

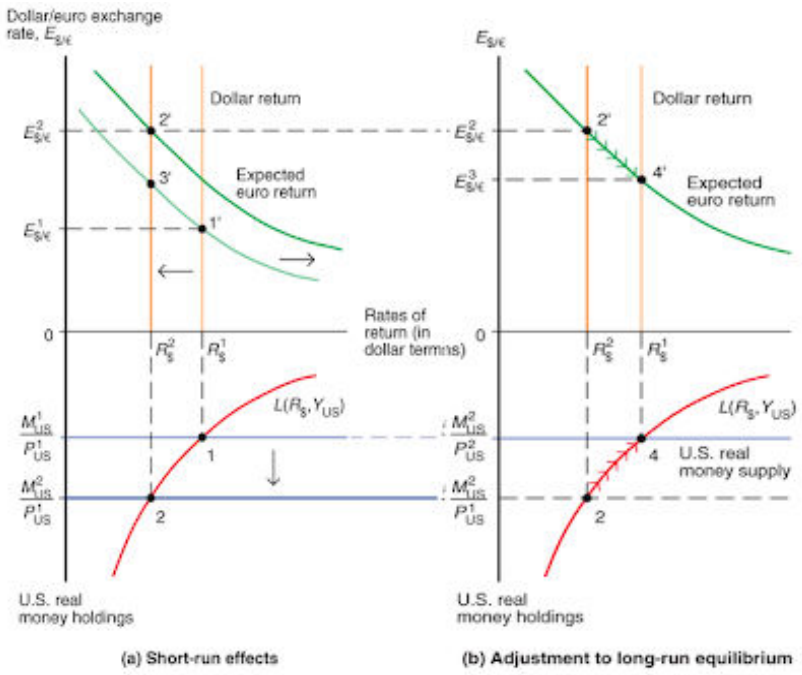
Long run effects

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 **increase** in US-money supply,

1. the interest rates **decrease**, then increase in money demand causes investors to **expect** a future increase in money supply.
2. The **expected** returns on €-denominated assets thus grow, i.e. the dollar is believed to be less valuable than the euro.
    a. 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.
3. Demand for dollar assets **decreases**, and demand for € assets **increases**, **depreciation** of US-dollar
4. In the **long run**, workers demand wage compensation **which increases** production costs and, hence, prices. The money supply increase is now regarded as permanent.
    a. US price level increase in the long-run, thus US real money supply decreases, meaning the **return on dollar assets increases**
5. Demand for dollar assets increases and demand for € assets decreases, meaning **appreciation of the US-dollar**, increase in exchange rate

Note: the new long-run exchange rate is still higher than the initial exchange rate since the green has shifted to the right



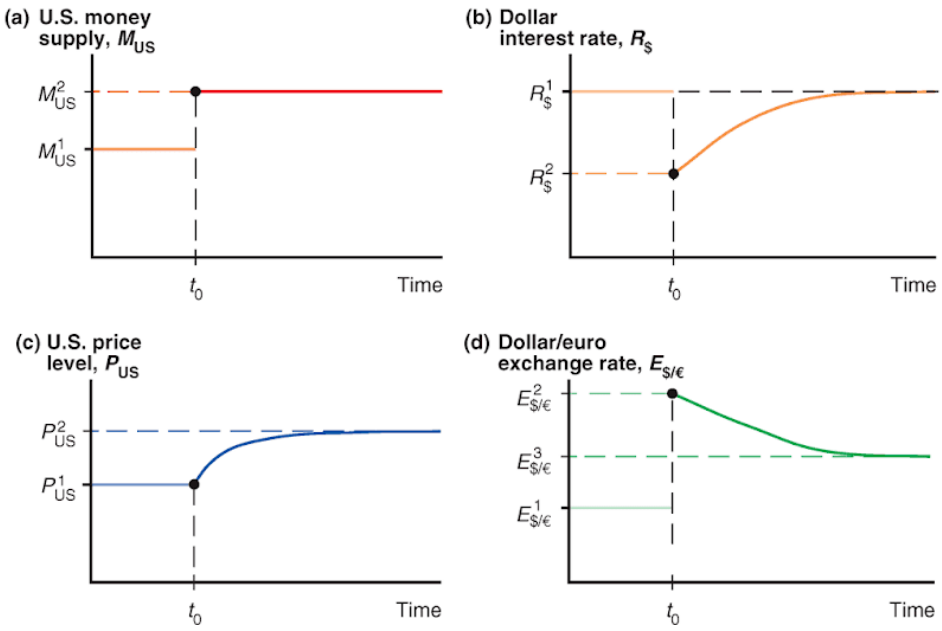
Exchange rate overshooting

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 15, week 5 (International finance 3) Price levels and the exchange rate in the long run

Overview

In this and the next lecture we will mainly talk about the models to predict the **exchange rate**

In the previous lecture we distinguished between short-run and long-run, where the link between money supply and exchange rate:

- **Short run**: Money → Interest rate → demand for domestic & foreign **financial assets** → demand for currencies → exchange rate
- **Long run:** Adjustment of P mitigates initial change of exchange rate

In this lecture we will **only** take the long-run approach, meaning prices are completely **flexible**

- Link between money supply and exchange rate:
    - Money → Prices → demand for domestic & foreign **goods** → demand for currencies → exchange rate

To follow our model, we first need to understand 2 main concepts **'Law of one price'** and **'Purchasing Power Parity'**

Law of one price and PPP

Law of One Price (LOP): when free trade is costless and the market is perfectly competitive, the same good is sold for the same price in all trading countries

- If prices differ across countries **arbitrage trade** will occur, demand in expensive country decreases and demand in cheap country increases
- Price in expensive country decreases and price in cheap country increases
- **Arbitrage trade** stops when prices are identical across countries

Empirical example

According to LOP, prices for the same good in different countries expressed in same currency must be identical

$$P_{car}{}^{NL} = P_{car}{}^{CH} \cdot \frac{EUR}{CHF}$$

Same BMW in Netherlands and Switzerland

- Price Netherlands: € 142,161.33
- Price Switzerland: CHF 142,930
- Using our equation: 142,161.33 EUR = 132,053.12 CHF
- As you can see LOP does not hold

Reasons for violation of LOP:

- 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

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

If the same basket of goods costs 100 EUR and 200 CHF, the exchange rate would be 1/2 if PPP holds.

- PPP implies that households have the same purchasing power in all countries
    - 200 CHF buy the basket of goods in CH
    - 200 * 0.5 = 100 EUR buy the same basket of goods in NL

There are two types of PPP:

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

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

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

$$\frac{P^{NL}}{P^{CH}} = E_{\frac{EUR}{CHF}} \quad \rightarrow \quad lnP^{NL} - lnP^{CH} = lnE_{\frac{EUR}{CHF}} \quad \rightarrow \quad \frac{\Delta P^{NL}}{P^{NL}} - \frac{\Delta P^{CH}}{P^{CH}} = \frac{\Delta E_{\frac{EUR}{CHF}}}{E_{\frac{EUR}{CHF}}}$$

$$\rightarrow \pi_{\mathrm{NL.\,t}} - \pi_{\mathrm{CH,\,t}} = \frac{E_{\frac{EUR}{CHF},\ t} - E_{\frac{EUR}{CHF},\ t-1}}{E_{\frac{EUR}{CHF},\ t-1}}$$, with π_t= inflation rate from t-1 to t

Price of Big Mac in **euro area** = 4.65€
Price of Big Mac in **Nicaragua** = 139 Cordobas

- This implies that if relative PPP holds exchange rate = $\frac{139}{4.65} = 29.89$ C$/€
- However actual exchange rate = 36.78 C$/€
- This means C$ is undervalued, approximately (1 - 29.89/36.78) % = 18.7%

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.

- **Absolute** LOP for individuals' goods implies **absolute** PPP and **relative** LOP for individuals' goods
- **Absolute** PPP implies **relative** PPP
- **Relative** LOP for individuals' goods implies **relative** PPP

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:

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

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

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

Money supply (MS) in EU 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 € relative to the dollar.
- Similar prediction as previous long-run model without PPP

EU interest rate (R) increases:

- Demand for EU money decreases as it becomes more costly to hold money.
- In order to maintain the equilibrium on the EU money market, prices increase.
- As PPP holds, € depreciates proportionally relative to dollar. This outcome is different from that in the previous model.

EU households' output/income (Y) increases:

- Real money demand rises.
- This can be compensated by a decrease in the EU price level.
- Since PPP holds, the € appreciates relative to the dollar.

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

International Finance – IBEB – Lecture 16, week 6 (International finance 4) Price levels and the exchange rate in the long run - continued

The Fisher effect

The Fisher effect shows the relationship between nominal interest rates and inflation

Interest parity condition:

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

In this case, investors do not have any incentive to relocate their investments as the interest rate difference equals the expected appreciation of the domestic currency.

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

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

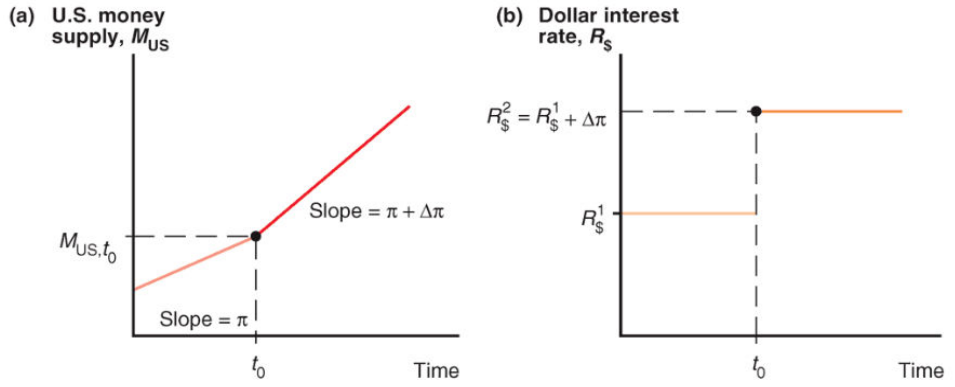
Combining two above equations leads to:

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

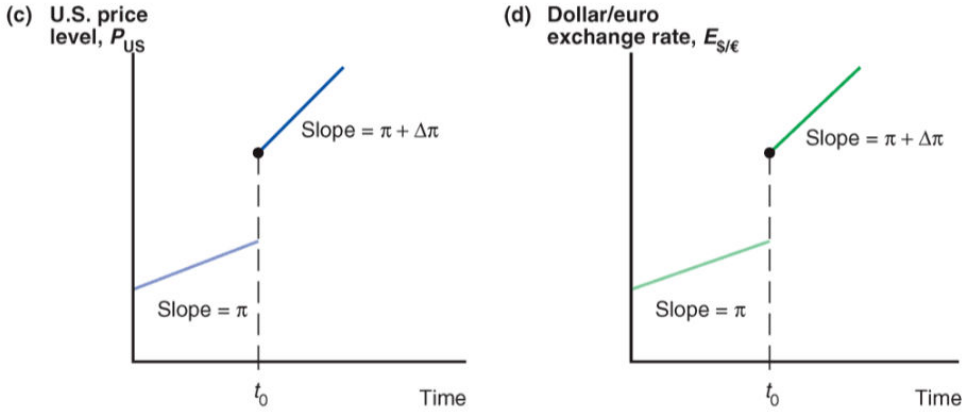
The Fisher effect states that an **increase** in the expected **domestic inflation** rate ceteris paribus leads to an equal increase in the **interest rate** on domestic assets.

To understand the interaction of interest rates and exchange rates under the monetary approach, consider the graphs below.

- They show effects of an increase in US inflation on different US macroeconomic variables



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

Note: The main difference from the long-run model without PPP is the Fisher effect, without PPP, change in money supply increases price levels once, no ongoing inflation expected so exchange rate remains constant after adjustment

Real exchange rate approach

In simple terms, we now consider that the composition of goods is allowed to **differ** between countries, households also demand non-tradable goods, meaning goods which are only supplied to one country.
Real exchange rate is the rate of exchange for goods and services across countries, meaning the rate of exchange for real assets instead of monetary assets

$$q_{\frac{US}{EU}} = \frac{\frac{E_{\$}}{\epsilon} * P_{EU}}{P_{US}}$$, E is nominal Exchange rate

Example: Average Dutch household demands a basket of goods for €100; average US household demands basket of goods for $120; if the nominal exchange rate is given by 1.20 $/€, the real exchange rate is given by

$$q_{\frac{US}{EU}} = \frac{1.2\frac{\$}{€} \cdot 100 \frac{€}{\text{basket}_{EU}}}{120 \frac{\$}{\text{basket}_{US}}} = 1 \frac{\text{basket}_{US}}{\text{basket}_{EU}}$$

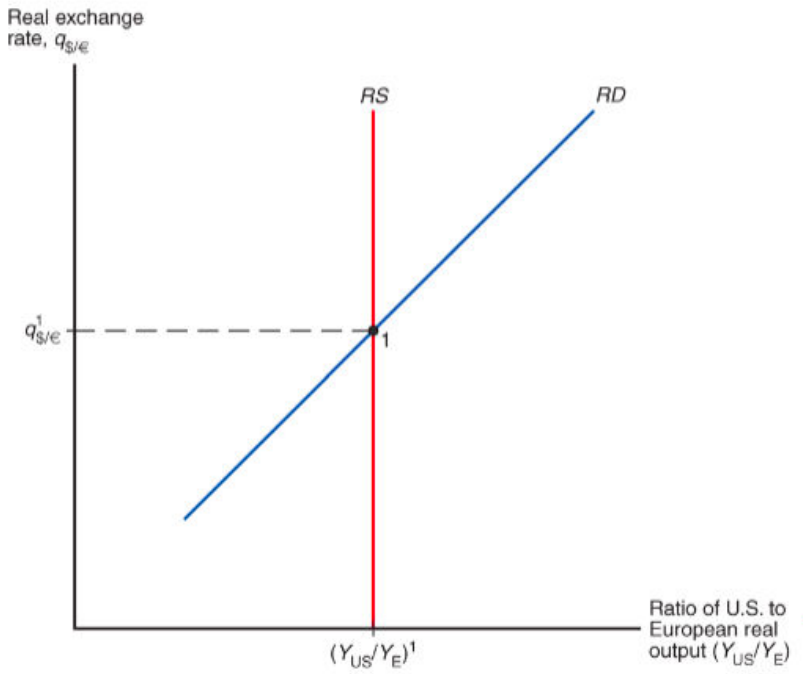
A rise in the real exchange rate, such as due to rise in nominal exchange rate is known as a real **depreciation** of the US-$

- US basket of goods becomes less valuable relative to EU basket, more of the US basket of goods has to be spent to obtain one EU basket of goods

Note: when absolute PPP holds, the real exchange rate equal unity

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.
- Due to **flexible prices** in the long-run factor markets always clear and total production is **constant**

The RD is **upward sloping**

- An increase of the real exchange rate implies that US goods become **cheaper** relative to European goods,
- Thus, the **demand** for US goods **increases** relative to demand for EU goods.

Suppose US is preferred, then relative demand for US goods increases and the RD **shifts to the right.**

- Price of US goods **increases** relative to price of EU goods
- The new equilibrium real exchange rate will be at a lower level, which means a real appreciation of the dollar, real exchange rate decreases.

Suppose there is some form of **technological progress** in the Netherlands, meaning 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 is **no real consequences** in terms of change.

Another way to use the real exchange rate approach

A more general use of the real exchange rate approach is to explain variations in the nominal exchange rate (monetary and real factor count)

- If we rewrite the expression for the real exchange rate, we obtain:

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

1. Increase in **US money supply**, leads to variations in price levels in the long run.
   - The nominal exchange rate **rises proportionally** (the monetary approach) and there is **no change** of the real exchange rate.

2. Increase in the US **inflation rate**, leads to a higher **interest rate** (the Fisher effect)
   - Real 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 changes **proportionally** (monetary approach)

3. Increase in the **relative demand** for tradable and non-tradable US goods
   - Increases the US price level
   - decreases the long-run real exchange rate since US baskets have become more expensive.
   - So, change of nominal exchange rate is **ambiguous**

4. Increase in the **relative supply** of US goods
   - As a result, the relative price of US goods decreases, and the dollar depreciates in real terms.
   - In addition, increased relative supply brings about increased demand for US goods and tradeable European goods, increasing the price of both US and EU goods, net effect of relative prices is ambiguous
   - 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, meaning real factors influence the real and the nominal exchange rate

Interest rate differences

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

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

$$\ln q_{\frac{US}{EU}} = \ln E_{\frac{\$}{\epsilon}} + \ln P_{EU} - \ln P_{US}$$

$$\rightarrow \frac{\Delta q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} = \frac{\Delta E_{\frac{\$}{\epsilon}}}{E_{\frac{\$}{\epsilon}}} + \frac{\Delta P_{EU}}{P_{EU}} - \frac{\Delta P_{US}}{P_{US}}$$

$$\rightarrow \frac{q^e_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} = \frac{E^e_{\frac{\$}{\epsilon}} - E_{\frac{\$}{\epsilon}}}{E_{\frac{\$}{\epsilon}}} - \left(\pi^e_{US} - \pi^e_{EU}\right)$$

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

Taking the logarithm, we end up with:

$$\frac{q^e_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} = \frac{E^e_{\frac{\$}{\epsilon}} - E_{\frac{\$}{\epsilon}}}{E_{\frac{\$}{\epsilon}}} - (\pi^e_{US} - \pi^e_{EU})$$

Combining with the interest parity condition:

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

We end up with the augmented Fisher equation:

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

'Nominal interest rate differences = expected real depreciation of US-$ + Expected inflation rate differences between US and EU'

Note: when absolute PPP hold, meaning $q^e_{\frac{US}{EU}} = q_{\frac{US}{EU}} = 1$, the Fisher effect equation results

Differences in real interest rate

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

- R = nominal interest rate
- π^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 π are insignificant.
Real interest rates are measured in terms of real output

$$M_1 = M_0 \cdot (1+R)$$
$$\rightarrow \frac{M_1}{P_1} = \frac{M_0}{P_0} \cdot (1+r)$$
$$\rightarrow \frac{M_1}{M_0} = \frac{P_1}{P_0} \cdot (1+r) = 1+R$$
$$\rightarrow \left(\frac{P_1}{P_0} - 1 + 1\right) \cdot (1+r) = 1+R$$
$$\rightarrow (\pi+1) \cdot (1+r) = 1+R$$
$$\rightarrow r = \frac{1+R}{1+\pi} - 1 \quad \rightarrow r \approx R - \pi$$

Predicted differences in real interest rates across countries

$$r^e_{US} - r^e_{EU} = \left(R_{US} - \pi^e_{US}\right) - \left(R_{EU} - \pi^e_{EU}\right)$$

Combined with the augmented Fisher effect

$$R_{US} - R_{EU} = \frac{q^e_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}} + \left(\pi^e_{US} - \pi^e_{EU}\right) \rightarrow R_{US} - R_{EU} - \left(\pi^e_{US} - \pi^e_{EU}\right) = \frac{q^e_{\frac{US}{EU}} - q_{\frac{US}{EU}}}{q_{\frac{US}{EU}}}$$

Leads to the real interest parity condition:

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

If investors expect a real depreciation of the US–$,

- meaning investors need more US baskets of goods to buy a certain amount of European baskets of goods,
- investors will not switch from US assets to European assets if the expected real depreciation of the US–$ is compensated by a higher expected real interest rate in the US (i.e. investors expect to get more US baskets of goods to buy the certain amount of European goods)

International Finance – IBEB – Lecture 17, week 6 (International finance 5) Exchange rates and open economy macroeconomics

Overview

So far, output Y has been an exogeneous variable, meaning changes have been explained outside not inside the model

- We will go back to the assets approach
- Short-run model, goods and factor prices fixed
- Long-run model, factor and goods prices have time to adjust

We will see how monetary and fiscal policies affect output, the exchange rate, employment and the current account in the short-run and the long-run

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**
   - Total factor income (Y) – taxes (T, exogenous)
   - Increase in net income, increases C and Imports (increases CA)
   - Due to savings, households don't consume all their net income, thus rate of consumption is not proportion to the net income, $\frac{\partial C}{\partial (Y-T)} < 1$
2. Real **Interest rate (r)** increases, leads to decrease in private investment (I)
   a. However, we will assume that I is exogenous
3. **Real exchange rate** $q_{\frac{\$}{€}} = \frac{E_{\frac{\$}{€}} \cdot P_€}{P_€}$
   a. Increase in q due to increase in nominal exchange rate (depreciation of $) or in $P_€$, increases demand for US goods

The **current account** and the **real exchange rate (q)** in more detail:

- CA = EX -IM (value of exports -value of imports)
- Increase in q increases prices of foreign goods relative to prices of domestic goods
  - **Volume** of exports increases
  - **Volume** of imports decreases
  - Value of imports in terms of domestic currency increases, due to increase in price in terms of domestic currency

  We assume that volume effects **dominate** value effect, so increase in q **decreases** value of imports

Aggregate demand can be expressed as:

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

The 'reduced' form looks only at the positive or negative relationship

$$Y^D = Y^D\left(\underbrace{q}_{+}, \underbrace{Y - T}_{+/-}, \underbrace{I}_{+}, \underbrace{G}_{+}\right)$$

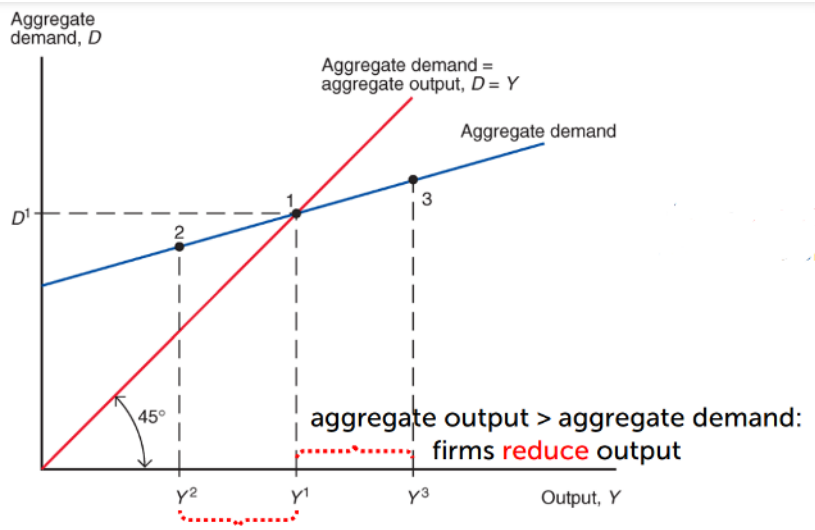
Increase in **net income (Y-T)** increases demand for domestic goods, thus increasing C (positive effect on Y^D), however it also increases demand for foreign goods as Imports increases (negative effect on Y^D)

However, we assume **'Home bias'**, meaning people usually buy more domestic goods, thus positive effect dominates

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 is positively sloped but less than proportionate, as we have seem before this is because household save

- 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.
- The **45° line** represents equilibrium as AD = AS
- If AD < AS, firms **reduce** output
  If AD > AS, firms **increase** 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.

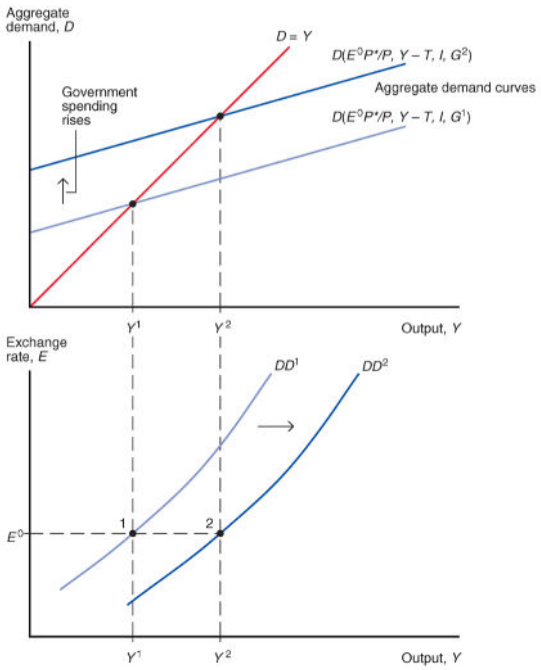
We can now draw the relationship between the nominal exchange rate and output, the **DD curve**

- The DD curve illustrates all **combinations** of the exchange rate and income which lead to an equilibrium in the domestic goods markets.
- **Positive slope** since increase in nominal exchange rate increases demand for domestic goods (output adjust and increases as well)

Note:

- positive relationship between exchange rate and output is illustrated by **move along** the DD–curve
- changes in **other** macroeconomic variables **shift** the DD–curve

Shifts in DD curve



Increase in **government expenditure (G)**

- Higher governmental demand for goods and services increases aggregate demand for a given exchange rate E
- DD–curve shifts to the **right**.

Decrease in **T**

- Raises disposable income which induces higher aggregate demand for domestic goods
- DD-curve shifts to the **right**.

Increase in **I**

- Increases aggregate demand for a given E
- DD-curve shifts to the **right**.

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**.

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**.

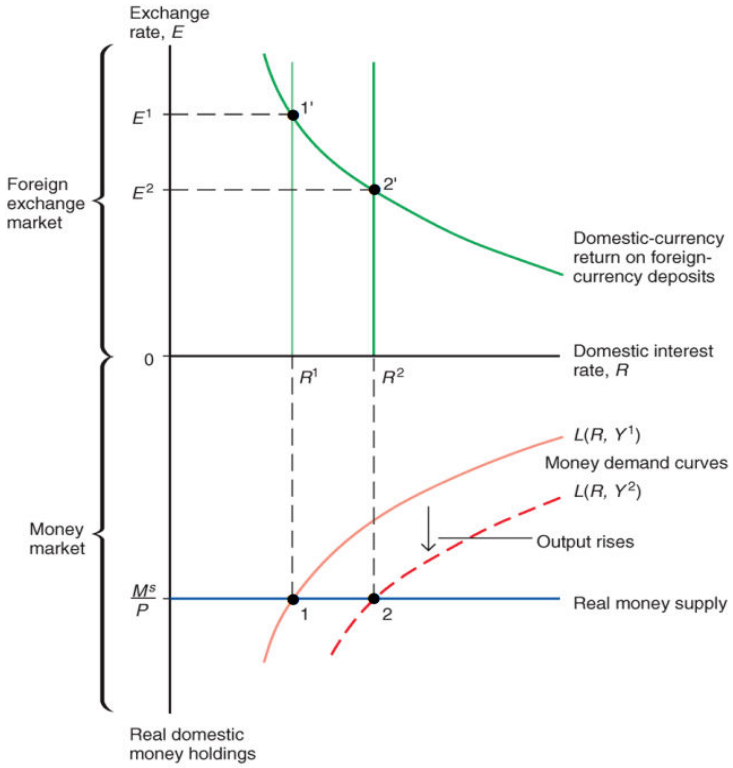
Increase in the **home bias**

- 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 must hold: $R^{EU} - R^{US} = \frac{E^{e}_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}$
- The money market is in equilibrium: $\frac{M}{P} = L(r, Y)$.



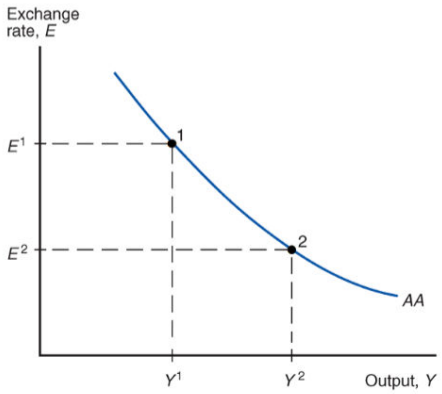
Suppose the domestic **real income Y** increases

- 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.



Increase in **money supply**

- Reduces interest rate, depreciate domestic currency
- Shift AA curve **upwards**

Increase in the **domestic price level**

- Real money supply decreases, increasing interest rate, appreciate domestic currency
- Shift AA curve **downwards.**

Decrease in **preferences for liquidity**

- Real money demand decreases, interest rate decreases to match money demand and money supply, thus Domestic currency depreciate
- Shift AA curve **upwards.**

Increase in the **foreign interest rate (R*)**

- Investors shift to assets denominated in foreign currency and this results in higher demand for foreign currency, thus domestic currency depreciates
- Shift AA curve **upwards**

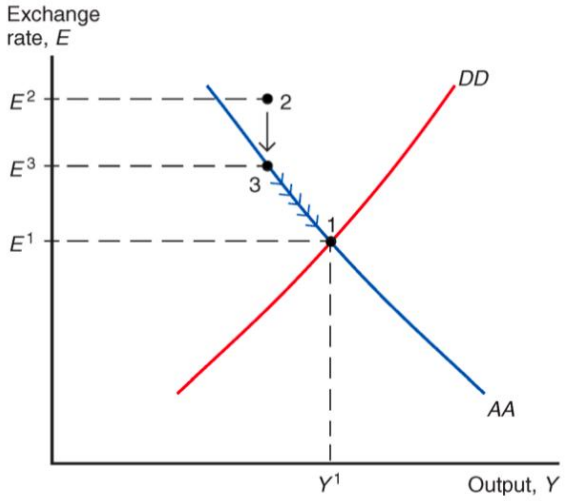
Increase in **the expected nominal exchange rate**

- 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): $R^{EU} - R^{US} = \frac{\frac{E^e_{\frac{EU}{US}} - E_{\frac{EU}{US}}}{E_{\frac{EU}{US}}}}{}$ 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.

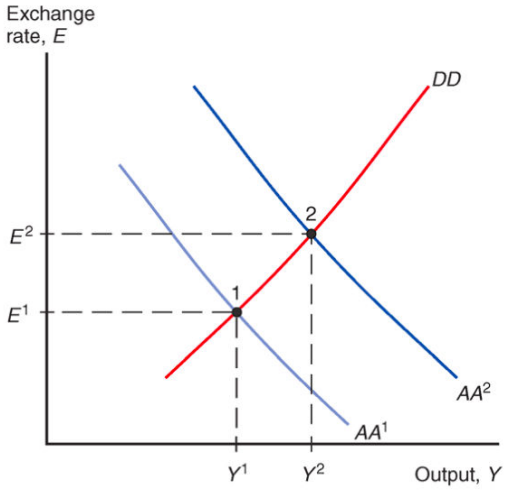
- Nonetheless, point 3 is still above the DD curve so demand for domestic goods is still excessive.
- To match this excess demand, firms start to increase their output and at the same time the domestic currency slowly appreciates until point 1 is reached

Temporary changes in monetary and fiscal policy

Policy measures are temporary and do not influence expectations about the future

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 have to be a decrease in r to restore equilibrium.

Foreign exchange market:

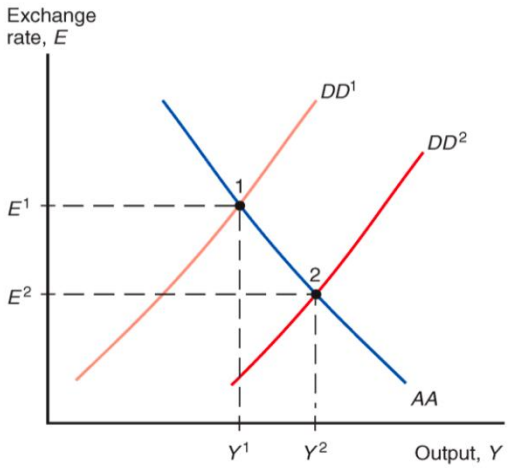
- Due to decrease in r, demand for domestic deposits and domestic currency decreases.
- The exchange rate E increases for a given Y, so the AA curve shifts upwards.

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 (north-east)

Note: no shift of DD curve since positive relationship between E and Y is already reflected by positive slope of 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.

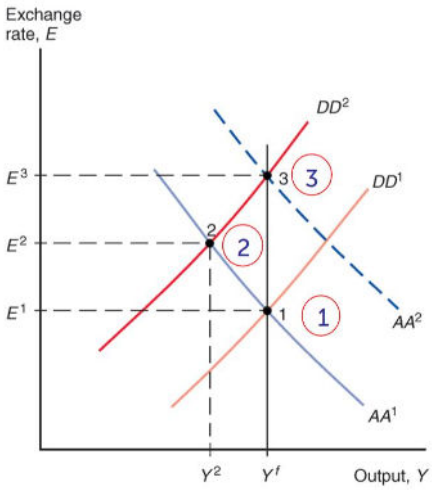
Note: no shift of AA-curve since negative relationship between E and Y is already reflected by negative slope of AA-curve (decrease in T, has the same qualitative effect)

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.

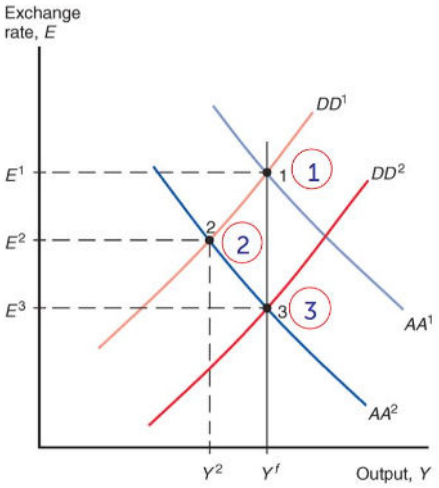
- Then, a shock occurs which temporary shift **world preferences against/in favour of** domestic goods/money

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.



We start at the initial equilibrium in point 1, sudden **decrease** in world-wide demand for **domestic good**, shift DD to the left to point 2, potential stabilizing policies:

- **Increase money supply**, leads to depreciation of domestic currency and increase in income Y, shift AA up
- **Increase government** demand for goods and services (G), shifts DD right back to point 1



We start at the initial equilibrium in point 1,

- sudden **increase** in domestic **money demand**, this increases domestic interest rate
- so, higher demand for domestic assets, thus appreciation of domestic currency for a given output level, shifts AA curve down to point 2

Potential stabilizing policies

- **Increase money supply**, leads to decrease in r, thus increase in E, shift AA back to point 1
- **Increase G**, thus higher AD, shift DD to the right to point 3

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

Policy measures are permanent and do influence expectations about the future

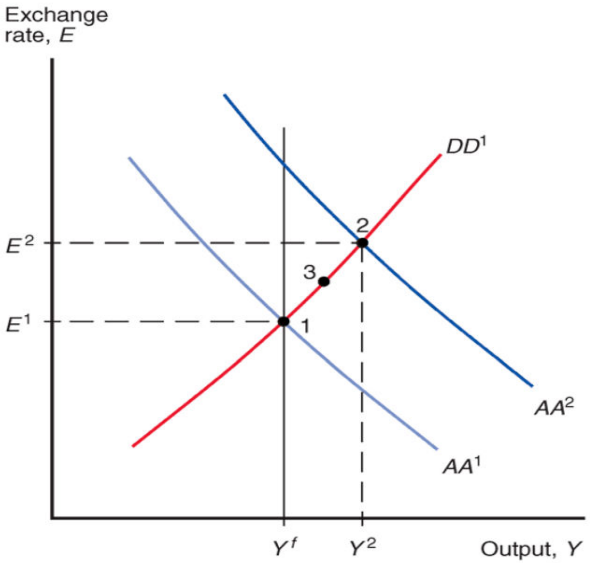
Increase in money supply (monetary policy)

With permanent increase in Money supply, **qualitatively** we get the same results as before

- There is a decrease in interest rates (equilibrium in money market), leading to decrease demand for domestic assets
- thus, depreciation of domestic currency and increase in nominal exchange rate (E)

However, with a **permanent** change people now expect future depreciation of domestic currency

- Meaning demand for domestic assets decreases **even further**, so larger increase in E than before



Short run

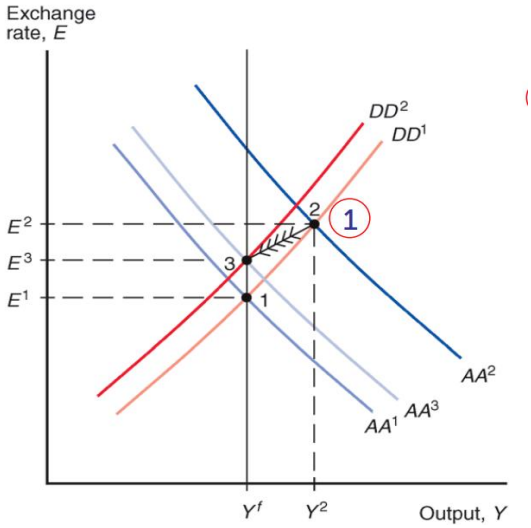
AA curve shifts further upwards than before since investors also expect future depreciation

- 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)

Adjustments to the long run

- Overtime workers will demand higher wages due to higher work
- Production costs increase, thus firms increase prices
- Demand for domestic goods decreases at given exchange rate, this shifts the DD-curve to the **left**
- Due to increase in prices, real money supply decreases, increasing the real interest rate for equilibrium in money market
- Thus demand for domestic assets and currency increases, decreasing E and the AA-curve **shifts down**

Long run



We start at point 1 in **short-run equilibrium** after permanent increase in MS

- Domestic prices increases => decrease demand for domestic goods => DD–curve to the left
- There are higher domestic prices => decrease domestic real money supply leading to an appreciation of domestic currency => 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 **overshoots**

Permanent increase in government demand (fiscal policy)

Suppose there is a permanent increase in G (same results as a permanent decrease in T)

- Increase in **public demand**, increase in Y, shifts DD-curve to the right

In the money market

- As real money demand increases due to increase in Y, r increases causing decrease in E
- Since it is a **permanent** measure, investors also expect future decrease in E, thus decreasing current E even further

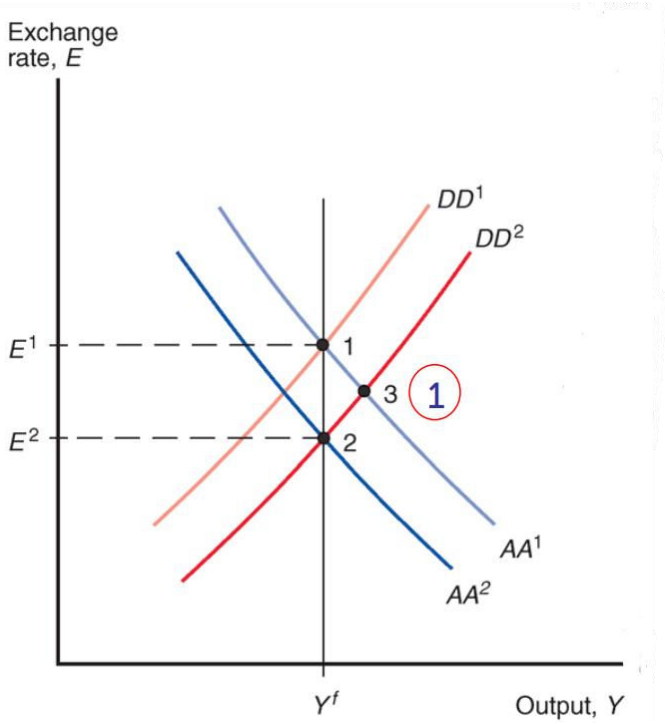
In goods market

- Due to increase in E, domestic currency appreciates meaning domestic prices are relatively higher than foreign, thus exports decreases, so private demand decreases, Y goes down

The **net effect** on Y goes as follows

- Increase in public demand for domestic goods reduces private demand for domestic goods (exports **down** and imports **up**)
- Public demand **crowds out** private demand

Note: Long run level of Y only depends on country's factor endowments and technologies



Short run equilibrium if the increase in G were **temporary** (Meaning no change in expectations about the future exchange rate), point 3

- With a **permanent** increase in G, investors expect exchange rates to decrease in the future, thus **further appreciation** of domestic currency, AA- curve shift down
- Exports decrease and imports increase, meaning private demand for domestic goods decrease, point 2

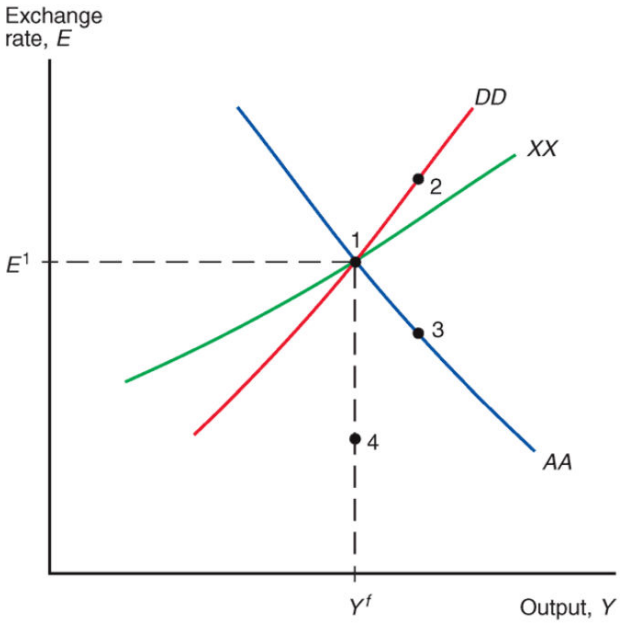
Overall: Long run and short run output returns to initial level and public demand crowds out private demand

Macroeconomic policies and the current account

We can also add the CA curve into our general equilibrium model, we will call it the XX curve

- This curve shows all combinations of exchange rate E and real income Y which lead to desired level of current account (we can assume 0, in equation is X)

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



Positive slope because an increase in E causes increase in exports and decrease in imports

- Assume desired CA values Is 0
- We assume that volume effect dominates value effect, so increase in E leads to increase in CA, surplus
- This means that to bring CA back to 0, we have to increase Y, which increases imports, thus decreasing CA to 0

Note: XX-curve flatter than DD-curve

Furthermore, we can see how changes in policies can affects the CA

- **Increase in MS**, shifts AA-curve up, leads to new temporary equilibrium above XX-curve, **positive** effect on CA
- **Increase in G or decrease in T**, shifts DD-curve to the right, new temporary equilibrium below XX-curve, **negative** effect on CA

International Finance – IBEB – Lecture 18, week 6 (International finance 6) Fixed exchange rates and foreign exchange intervention

Overview

In the previous lectures, exchange rate is perfectly flexible, no intervention of central bank in foreign exchange market

- Now, CB intervenes in foreign exchange market (selling/buying domestic currency in exchange for foreign currency) in order to keep exchange rate at a desired level

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

How the central bank can influence the exchange rate

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

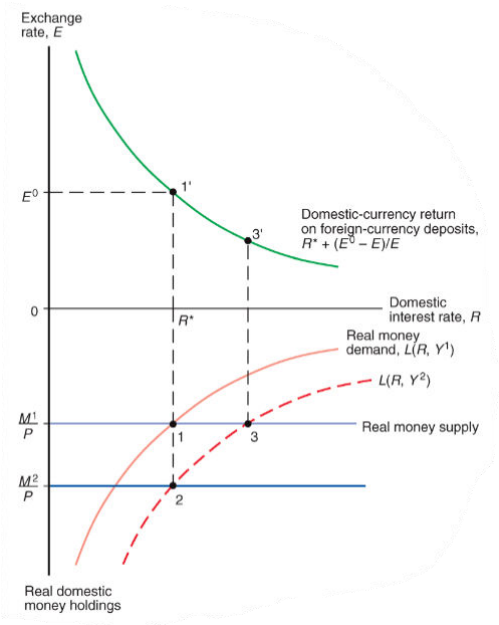
Examples:

- CB buys foreign currency and **sells domestic currency**, supply of domestic currency increases, increasing E
- central bank sells part of its **foreign currency reserves** and buys domestic currency, demand for domestic currency increases, decreasing E

Monetary policy with fixed exchange rates

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



Increase in Y, curve for real money demand shifts downwards;

Without any central bank intervention:

- R↑ for equilibrium in domestic money market → demand for domestic assets↑ → demand for domestic currency↑ → appreciation of domestic currency, so E↓

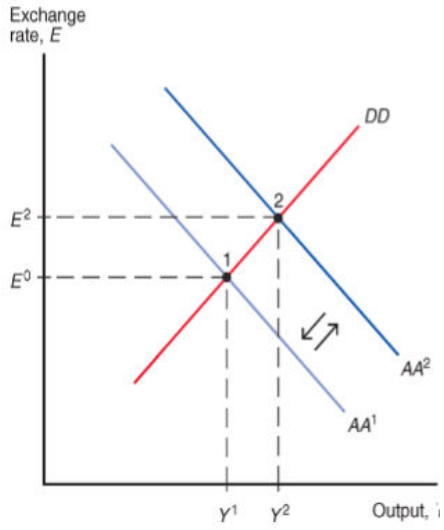
With central bank intervention:

- central bank **compensates** for increase in demand for domestic currency (also increase in relative demand for domestic currency) by increase in relative supply of domestic currency (buying foreign currency with domestic currency)

- **no change** in R, no change in E

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.

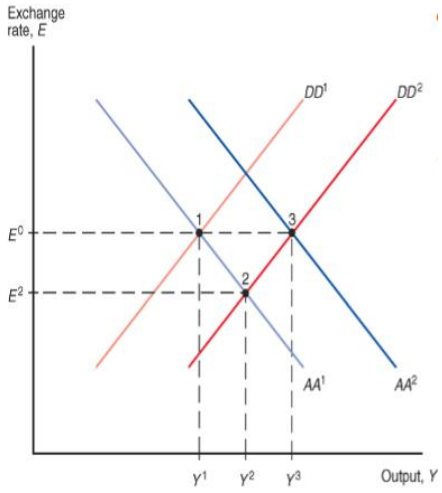
Without intervention, AA shifts upwards.

- However, the CB wants to commit to a **fixed exchange rate**, so it intervenes again by buying domestic currency for foreign currency.
- Increasing demand for domestic currency and increase supply of foreign currency, **thus appreciation** of domestic currency, AA-curve back to point 1

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,

- **Goods market**: demand for domestic goods, and hence income increases given an exchange rate, so DD shifts to the right.
- **Money market:** 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

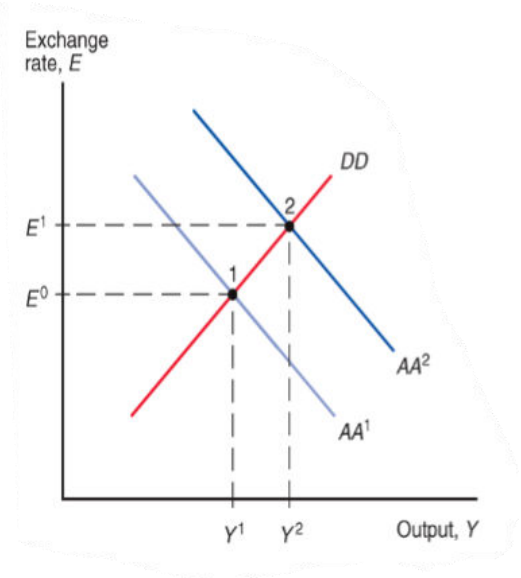
Depreciation and appreciation: used for a **flexible exchange rate** and the value of a currency changes due to market forces.

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

- Devaluation: **Higher fixed E**, central bank increases relative supply of domestic currency, meaning they buy foreign currency with domestic ones
- Revaluation: **Lower fixed E**, central bank decreases relative supply of domestic currency, meaning they buy domestic currency with foreign ones

Suppose the CB **devalues** the currency and supplies more domestic currency in exchange for foreign currency

- We move from point 1 to 2
- Now higher E, increases demand for domestic goods Y



Financial crises and capital flights

Fixing the exchange rate can cause some trouble.

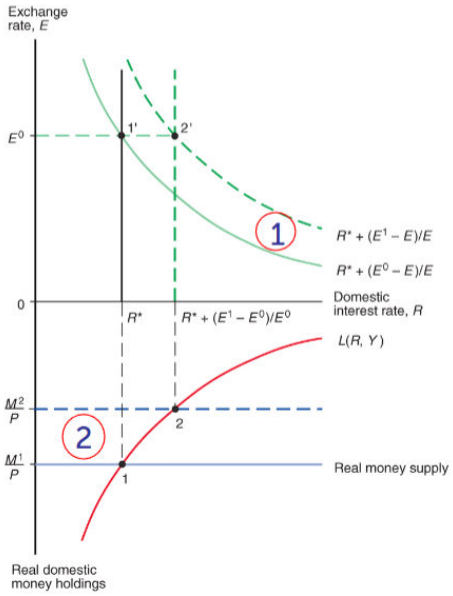
- Suppose demand for domestic currency decreases, CB want to **keep E fixed** so they buy domestic currency with foreign ones,
- however, when their foreign currency **reserves** are used up, the domestic currency devalues relative to foreign currency
- Then, when investors expect that the domestic currency 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 and keep financial assets

However, it has other consequences as the high interest rates reduce the demand for investment goods.

- In the end, domestic output and employment decrease.



There is an **expected devaluation** of domestic currency, thus increasing expected returns on foreign assets

- **Green curve** shifts to the right
- CB reduces domestic reduces MS to increase R to keep investor and maintain fixed E

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

Speculative attack

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 speculators exchange domestic currency into foreign currency at a **favourable exchange rate**.
- When the CB's currency reserves are used up, there is a **devaluation** of the domestic currency.
- Then, speculators 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

In reality we see that there is **imperfect substitutability** between domestic and foreign assets

- Mainly because assets which are denominated in different currencies imply different risk levels
- Usually, **higher risk** makes investors demand **higher return**

Types of risk:

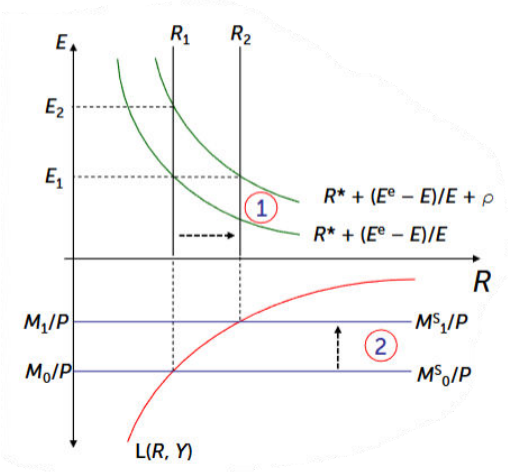
- **Default risk**: the risk that the borrower cannot pay his debt
- **Exchange rate risk**: the risk that foreign currency depreciates.
    - lead to lower expected returns for assets denominated in that currency.

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 ρ is added for foreign investors when they invest in domestic assets:

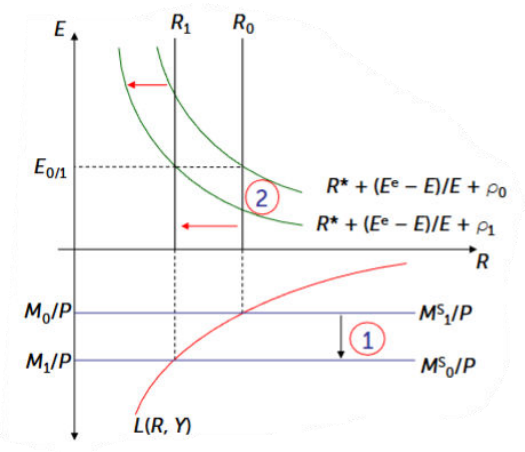
$$R - R* = \frac{E^e - E}{E} + \rho$$

Note that when ρ increases, R also increases.



The perceived **risk** of investing in domestic assets increases, thus curve for expected return on foreign assets shifts to the right

- So, demand for domestic assets decreases, **depreciating** domestic currency
- Note: if **fixed E is kept**, an increase in ρ is compensated by decrease in MS



Suppose we start at the equilibrium with R_0 and the higher green curve

- We now can see how even with fixed E, there is some **monetary independence**
- Increasing MS decreases R, so there is a **depreciation** of domestic currency
- Since we keep fixed E, the CB simultaneously **decreases risk** of investing in domestic assets, thus curve for **expected return on foreign assets** shift to the left thus keeping E fixed

How can CB/government influence ρ, the risk premium depends on

- The difference between returns on regular stocks and government bonds
- The difference between government bonds of different countries.
- Risk premium on regular stocks: securing trade credits, no expropriation, no war
- Risk premium on government bonds: government debt decrease, controlling E

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 19, week 7 (International finance 7) 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 EMU

Macroeconomic equilibrium

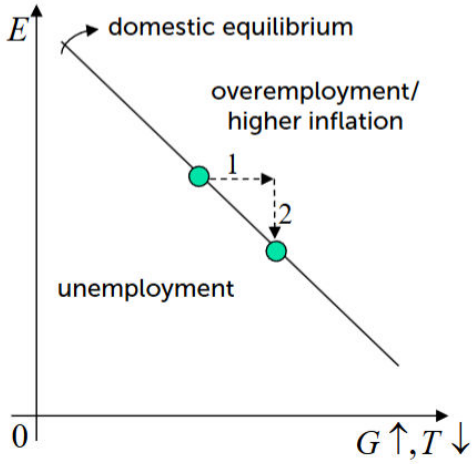
Objective of government is to reach macroeconomics equilibrium, which is only reach if we have both domestic and external equilibrium

Domestic equilibrium

Domestic equilibrium: output level at the natural rate of unemployment

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

The following graph shows all the combination of E and public demand for goods/services that leads to actual Y equal target Y, thus reaching domestic equilibrium



Suppose increase in G, leads to increase in demand for domestic goods

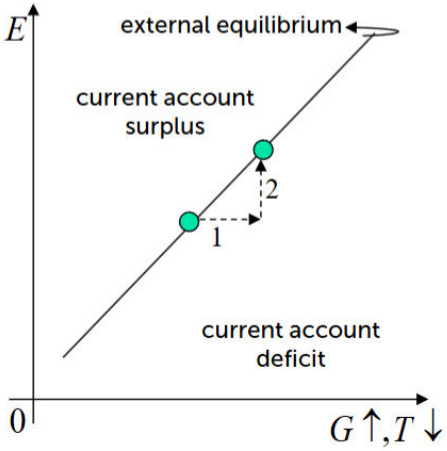
- Lead to high inflation/overemployment
- This needs to be **compensated** by decrease in E
    - Reduced foreign demand for domestic goods, increased domestic demand for foreign goods
    - This way domestic output returns to the level of natural rate of unemployment, **domestic equilibrium**

External equilibrium

External equilibrium: the graph below shows all combination of G and E that leads to a balanced CA (or 0)

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

CA depends on level of output Y (influenced by G and T) and exchange rate E

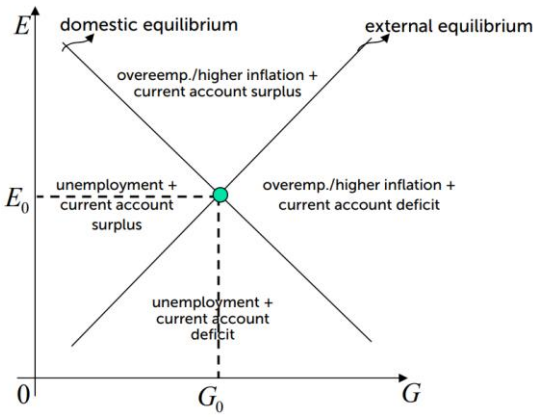


Suppose increase in G, leads to increase Aggregate production, which increases domestic income

- This leads to increased imports

- To keep CA balanced, we thus need to compensate it by increasing the exchange rate E, depreciation of domestic currency
- Thus, reaching external equilibrium

The macroeconomic equilibrium is thus formed:



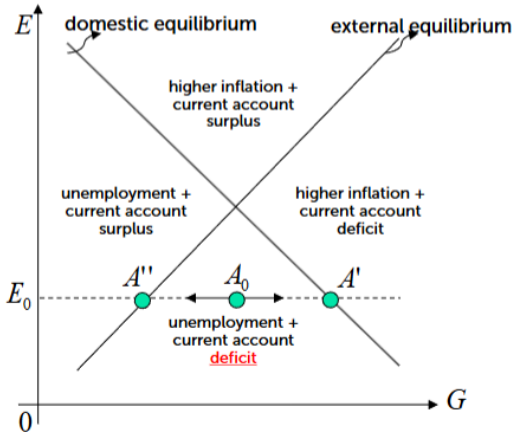
We can reach the macroeconomics equilibrium when we have both domestic and external equilibrium

- Meaning in the graph point E_0/G_0, any other combination leads to either of the 4 possible disequilibrium regimes

Problems with fixed exchange rate regimes

Adjustment problem with fixed exchange rate regime

- In reality the policy makers don't know what the exact curve for macroeconomics equilibrium is, so they might set a **wrong E**
- Suppose the CB set the fixed E at E_0, initially at point A_0 this means they have unemployment and current account deficit
- Since we have fixed E, then **monetary policy cannot be used**, meaning with fiscal policy we can **only** move right or left



We can **reduce unemployment**

- To A' increase in G increases domestic production, thus income leading to increase demand for imports
- This reduces unemployment, further increasing CA deficit

Or **reduce current account deficit**

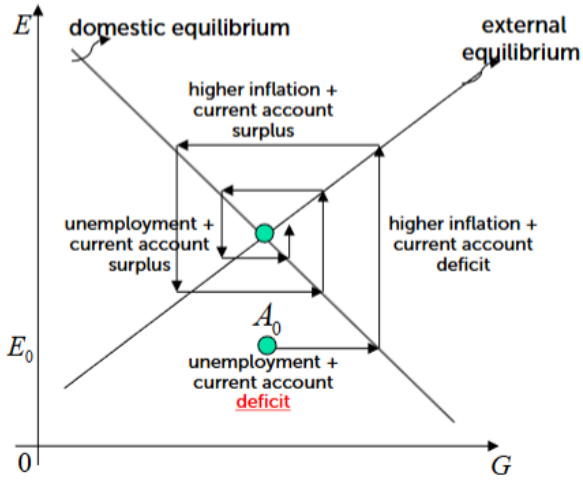
- To A'' decrease in G reduces domestic production, thus lower income, so lower imports
- This reduces CA deficit, but further increases unemployment

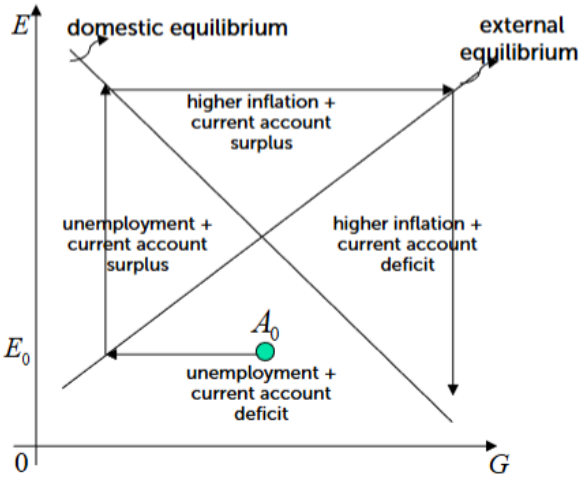
Note: The government can only choose between reducing unemployment or reducing the current account deficit

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

Problem with flexible exchange rates: into which direction should the government start

- With both monetary and fiscal policy independence
- Should they reach domestic or external equilibrium first?
- In our example economy reaches **both equilibria** only in case 1





Changing exchange regimes

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

1. **Monetary policy independence** allows country to adjust monetary policy according to economic conditions, such as labour market situation
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.

Trilemma: only two of these three objectives are accessible simultaneously 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:

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

Suppose condition 3 holds, 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.

Note: this trilemma can explain changes in international monetary system

Fixed exchange rate systems in recent past

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

- E.g. $35 per ounce of gold and €7 per ounce of gold, 35$/7€ = 5$/€
- 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, with following 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
- Change of band width only possible with IMF approval

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
    - breakdown 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

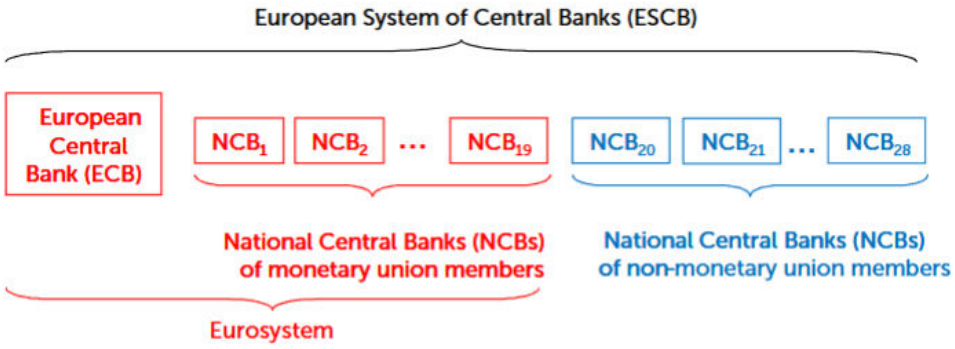
International Finance – IBEB – Lecture 20, week 7 (International Finance 8) International financial institutions

In 1991 the **Maastricht treaty** was proposed with the following criterias for new members of the EMU (Economics and Monetary Union)

- **Inflation** less than 1.5 percentage points higher than average of three lowest inflation rates among EU member states
- **Interest rate** less than 2 percentage points higher than long-term interest rate in average of three low-inflation countries
- **Part of the EMS** (European monetary system) and **no devaluation** of E in the 2 years before entry into EMU
- **Budget deficit** (new debt) is less than 3% of GDP
- **Public debt** (accumulated debts) is less than 60% of GDP

The **ESCB** (European System of Central Banks) is the coexistence of national central banks and European central bank

- Consisting of the ECB (European Central Bank)
- National Central Banks of monetary union member as well as non-monetary members but still part of EU



Initial goal was to **fight inflation**, lead to appreciation of the euro

- Later the goal translated to inflation **below 2%**

Theory of optimum currency areas

In general, monetary union is advantageous in that it helps avoid currency crises, capital flight since there is only one currency. However, there is also disadvantages.

Consider the scenario in which Netherlands and France are hit by **asymmetric demand shocks**:

- Netherlands by a **positive** demand shock while France by a **negative** one.
- Following this, demand and employment increase in Netherlands but decrease in France, 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 Dutch currency relative to the French 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 (unions don't like lower wages) → Real exchange rate cannot adjust.

Alternative adjustment mechanisms:

- Workers could **migrate** from France to Netherlands in case of large labour mobility within Europe (language barriers).
- **Transfer of additional tax revenues** from Netherlands to France.
    - These tax revenues would be introduced in the form of unemployment benefits and thus increase demand in France.
    - 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)

Benefits of **common currency**

- Elimination of **transaction costs** (currency conversion)
- **Price transparency**: better arbitrage opportunities, more competition
- Less uncertainty with respect to foreign prices
- Greater market integration (economic growth)
- More uniform political interests due to common currency
- German influence moderated under European System of Central Banks
- No devaluations/revaluations, capital flight and speculations with common currency
- **International currency**: common currency can be reserve currency in other countries,
    - meaning seignorage gains by central bank of currency union
    - **Seignorage gains** is the difference between value of money and costs of issuing money

Costs of common currency

- Loss of monetary policy independence for stabilizing output
- No reaction of exchange rates to changes in aggregate demand

Furthermore:

- No **empirical study** on the benefits of the Euro exists
- **Intra-EU** relative to **extra-EU** trade is constant
- How important are transaction costs?
- Fixed exchange rate regime also before introduction of the Euro
- **Appreciation** of domestic currency makes imports cheaper and forces domestic firms to become **more productive**
- EU countries outside EMU have not performed worse in last decade

Country should join currency area if benefits exceed costs of joining, through 'revealed preferences', we see that part of EU countries joined EMU, meaning at least high degree of economic integration between member countries

- Large intra-EU trade
- Large amount of foreign financial investment and foreign direct investment Low migration across borders

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